Report for a New National Solid Organ Donation and Transplantation Plan in Greece

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ONASSIS FOUNDATION

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Forewords

Why do we need a national organ donation and transplantation plan in Greece?

In very difficult times for public health, the Onassis Foundation took a nation-wide initiative in cooperation with the Ministry of Health, the National Transplant Organisation, the Onassis Cardiac Surgery Center, and other hospitals, to rebuild the solid organ donation and transplantation system in our country.

Even though transplantation is considered the most modern therapeutic practice of the 21st century worldwide, since it is the only option in end-stage heart, liver and lung failure and the most effective treatment for renal failure, unfortunately Greece ranks last in Europe and finds itself among the last ten countries in the Western world.

The waiting list of patients in need for a transplant is long and the chances of finding this longed-for transplant are very slim. Ignorance, bias and our hostile health system are the key inhibitors obstructing the progress of transplantations in our country.

Almost 30 years ago, the creation of the Onassis Cardiac Surgery Center by the Onassis Foundation transformed the healthcare landscape in our country. Today, the Onassis Foundation aims at transforming the healthcare landscape in Greece once again, adopting a holistic approach and leaving its mark in the field of solid organ donation and transplantation. The Onassis Foundation builds new infrastructure for transplantations, invests in innovation, boosts the National Health System structures, helps develop scientific research and carries out citizen information and awareness-raising actions.

Of course, our efforts focus on the creation of the Onassis National Transplant Center, a cutting-edge transplant center that is open to everybody. Its construction by the Onassis Foundation is underway and its delivery to the Greek State is expected to happen in 2024. However, infrastructure alone is not enough to elicit change in the transplantation landscape in our country. Further actions are required; actions that will provide a solid foundation for the rebuilding of this sector. First of all, an institutional framework for an integrated national transplant policy is necessary for the operation not only of this specific hospital, but of the entire Greek donation and transplantation network.

Therefore, two years ago, having first ensured cross-party consent, we decided to support the elaboration of a National Plan for Transplantations, by assigning the relevant study to the London School of Economics headed by Professors Elias Mossialos and Vassilios Papalois, who have led a team of distinguished experts from Greece and other European countries.

The study on the National Plan for Solid Organ Donation and Transplantation in our country is ready. It is in front of you and the next step is to make it an official law of the State. It is a

pioneering scientific piece of work at a global level, an outstanding and comprehensive study that can become the road map for transplantations in Greece in the following years. It is an important step forward and, at the same time, an answer to the long-standing demand raised by healthcare professionals, patients and all transplantation stakeholders.

Our vision is to forge an "Alliance in favour of life", within the context of which, no one is to spare. Nevertheless, besides infrastructure, works and the appropriate institutional framework, this "Alliance in favour of life" also requires to raise citizen awareness, build trust in the National Health System and fight unjustified fears based on rumors and unsubstantiated scenarios. More importantly, the concept of citizenship and its connection to organ donation and transplantation must be introduced into our educational system. This means that we should all realise that we are individuals who should act as members of a society, where everybody is there for the others. Through organ donation, we give life its due value.

Dr Anthony S Papadimitriou
President, The Onassis Foundation

Towards a national donation and transplantation plan in Greece

The COVID-19 pandemic is a catastrophe, which has cost countless lives, devastated livelihoods, and tested many health systems to their very limits. But amid the crisis there is opportunity: a chance to reflect on how we want to change ourselves and our societies. It has brought health systems into focus as never before, and revealed the fault lines and underlying challenges they face. While the immediate focus is on the pandemic, now is the time to take stock and consider what needs to be done to build health systems that better meet the populations needs, both during and beyond the crisis. Health systems are enormously complex, and can only be transformed for the better through carefully planned, strategic reforms, requiring sustained commitment, investment and collective effort.

The Greek organ donation and transplantation system is a powerful example of this. A miracle of modern medicine, organ transplantation should be equitably available to as many people as possible who would benefit from it. In recent years, our European partners have made great strides in building systems that make this life-saving, and life-changing treatment available to ever greater numbers of people suffering from late-stage organ failure, whether that be of the kidney, liver, pancreas, lung or heart. But Greece stands in stark comparison: our transplantation rates are among the lowest in the developed world, despite having relatively high levels of need. The statistics, in terms of lives lost, and those who face an uncertain future while waiting for a transplant, paint a tragic picture, the human cost of which cannot be quantified.

Despite the efforts and commitment of hospitals and health care professionals and the National Transplant Organisation, Greece has never had a coherent national strategy or system for organ donation and transplantation. However, with the right set of reforms, investment and long-term commitment, Greece has the potential to become a leader in solid organ donation and transplantation. The Onassis Foundation's investment in the development of the Onassis National Transplant Center (ONTRC) represents an important step forward. This will be a world-class clinical facility, significantly improving the national infrastructure available for donation and transplantation activities. While no single hospital can transform a system, the ONTRC can act as a catalyst for wider change, spanning from how services are organised, funded and delivered, to public attitudes and awareness of the benefits of donation and transplantation.

In recognition of this, since late 2019, following the initiative of the Onassis Foundation, we have been working with a team of Greek and international experts as well as with a dedicated research team from the London School of Economics and Imperial College London, on a detailed review to identify the steps necessary to transform the Greek organ donation and transplantation system. Informed by extensive research and engagement with stakeholders across and beyond the health system, the report presents a comprehensive set of evidence-based recommendations.

Our vision is for Greece to establish an organ donation and transplantation system capable of attaining and sustaining world-class levels of performance within 10 years. This will be a major undertaking requiring wide-ranging reform, sustained commitment, investment and collaboration across the system, but dramatic improvements can be achieved in a much shorter time-frame. The story of one transplant recipient, Katerina, who tells her story in our report, shows just how transformative organ transplantation can be. It is our hope that the adoption of these recommendations will bring the same benefits and give a new life to thousands of Greek patients and their families.

Professor Vassilios Papalois
Professor Elias Mossialos
Co-Chairs, Commission for a New National Solid Organ Donation and Transplantation Plan in Greece

The need to improve organ donation and transplantation services in Greece: a patient's story

My name is Katerina, four and a half years ago I received a liver transplant and two and half years ago I also received a kidney transplant.

At just 13 years of age, I was admitted to hospital with kidney stones. I was subsequently diagnosed with a serious and aggressive disease which had started in my liver and then caused severe damage to my kidneys. My family and I were told that the only effective treatment for my condition would be a liver transplant followed by a kidney transplant. Without these transplants my illness would inevitably progress and be fatal.

For a number of years, medication kept my problem stable. I had a normal childhood, I went to school, learnt foreign languages, socialised with my friends and even managed to go to my university of choice. However, by the time I was 20 years old my kidneys were failing, and I had to start dialysis. My whole life came to a standstill. Due to the severity of my illness, I had to undergo dialysis five days a week, for five hours on each occasion. This is more than most dialysis patients, but it was necessary to keep me alive. Due to the time that I had to spend on dialysis it was impossible to attend university, and I was so weak and tired that I seldom saw my friends.

The strain caused by my illness and the dialysis sessions changed the atmosphere in our home. My parents and siblings were profoundly affected; I was constantly tired and crying about how bad I felt. I felt anxious all the time about the toxins building up in my body, and my family had to put up with constant changes in my mood. Despite my desperate state, my parents were a source of constant support. I feel very lucky and proud to have such a wonderful family, they gave me great strength and courage, and never treated me like a sick person. Without them I would have struggled to stay positive. In this difficult journey I also met many wonderful people who helped me with my health problems, and they also have a very special place in my heart.

I am also extremely fortunate that from the outset my parents were willing to become my organ donors. If they had not offered to donate their organs, I would have had to go on the waiting list for the two transplants I needed. I might have died waiting for a suitable donor. As my liver was failing it was especially urgent to find a donor, as there is no alternative to transplant in liver failure. Although it is very detrimental to quality of life, dialysis does at least offer an alternative for kidney failure and buys time until a donor is found.

In June 2016 my mother donated a lobe of her liver to me, and the liver transplant was performed. The liver had to be transplanted first, as the disease which had caused my illness originated in my liver, and there would have been no point in performing the kidney transplant before replacing my liver; the transplanted kidney would have become damaged again. Although the operation was not easy, and I took several months to recover, I felt much better than before the surgery. Although I remained on dialysis, I had more colour in my face and some of my strength returned.

After a further two years, in June 2018, my father donated a kidney to me and I underwent a kidney transplant. This was also a difficult operation, but I recovered more easily this time. From the moment that my recovery was complete, and I no longer needed dialysis, I became stronger day by day. I realised that my troubles were over, and that a new life was starting for me.

My life, and my family's life is now back to normal. My parents both recovered very well from the donation operations, and lead full lives. They are full of joy to see their children in good health and pursuing their dreams. I am now strong and resilient. I exercise regularly and can walk for hours without having to sit down every ten minutes. I have started my studies again, and hope to finish soon. I have travelled abroad and visited countries I always wanted to see. Prior to my transplants I couldn't travel unless I could find a dialysis unit. Now I can follow my

dreams and make plans without restrictions. This was impossible before, I had to constantly think about my health problems and plan everything around them. I am now the master of my life, and no longer limited by the difficulties with my health. I am recovered, I can finish my studies, move abroad, and maybe even fulfil my ambition to travel the world.

Finally, I would like to highlight the importance of transplantation. Transplantation is the gift of life; it is a second chance to live life and realise dreams. Organ donation is the only way in which this can be achieved.

My name is Katerina, and I am the recipient of two organ transplants. Thanks to these transplants, and my donor parents, I am able to follow my dreams again.

Executive summary

Commissioned by the Onassis Foundation and undertaken by London School of Economics (LSE) in collaboration with Imperial College London, the Report for a New Solid Organ National Donation and Transplantation Plan in Greece presents recommendations to enable Greece to transform its organ donation and transplantation system in order to achieve rates of transplantation in line with the leading countries in Europe. **This executive summary presents a brief overview of the content and key points from the report.**

Key points

- Greece has the lowest rates of transplantation in the Organisation for Economic Co-operation and Development (OECD), with rates declining over recent years, and no dedicated paediatric provision.
- End-stage renal disease (ESRD) is the leading cause of organ failure requiring transplant. Greece has one of the highest rates of incidence of ESRD in the EU, and a 40% higher than average prevalence of patients on renal dialysis.
- Compared with the European average, Greece has almost 100% greater need for transplants, but performs 74% fewer. The average wait for a renal transplant in Greece is 8.8 years, but 57% of patients on dialysis will die within five years.
- At present, approximately 10% of Greek patients with ESRD are on the waiting list for a transplant. This is very low compared to other European countries with successful programmes. Given the current performance of the system, if all ESRD patients in Greece whose condition requires/allows a transplant were on the list, the waiting time would be many years longer.
- Building an effective and efficient organ donation and transplantation programme has potential to transform the quality of life of thousands of Greek citizens, their families and carers.
- Comparable European countries such as Croatia, Italy, Portugal and Spain have established excellent organ donation and transplantation programmes, with some of the best rates of transplantation in the world.

- Globally, the most successful programmes have benefited from continuous high-level support, and organ donation and transplantation are the remit of a single independent authority. However, in Greece, organ donation and transplantation have never been envisioned, organised, or operated as independent clinical services.
- The gaps and challenges identified in this report touch on many aspects of the health care system in Greece. Action is needed to address issues in public health and prevention, legislation, organisation and management, financing, quality standards, training and research, infrastructure, and information systems, among others.
- Importantly, a successful organ donation and transplantation programme requires extensive cooperation and collaboration at every level, from government departments to the operational details of every process involved.

Background

Organ donation and transplantation is one of the greatest achievements of modern medicine, and has provided a lifeline to patients with organ failure worldwide. Over the past few decades astonishing advances in medical science, and remarkable progress in medical and surgical care have taken successful organ transplantation from a dream to reality. However, the accomplishment of successful transplantation and good long-term outcomes was only a beginning. Building an effective and efficient organ donation and transplantation system that meets the needs of patients and their families has been a challenge for all jurisdictions, and requires much more than advanced clinical knowledge, skills and facilities. As set out in this report, a successful system requires many other ingredients such as sustained commitment from government, high levels of public support and trust, considerable investment in infrastructure, carefully designed reimbursement mechanisms and a highly trained and motivated workforce.

In relation to comparable European countries, Greece is lagging far behind in the field of organ donation and transplantation, and little progress has been made over the past decade. Previous efforts to improve the Greek programme and increase rates of organ donation and transplantation have been hampered by many systemic problems, which have proven resistant to change. There is no doubt that the challenges faced by Greece in building a world-class organ donation and transplantation programme are substantial. Despite this, with consistent support and collaborative engagement from all relevant stakeholders, these difficulties can be overcome. Some may argue that the poor performance to date has been the consequence of the severe fiscal constraints faced by Greece in the recent past. However, it must be noted that other Mediterranean countries such as Spain, Portugal and Croatia, all of which have been subject to similarly difficult financial circumstances and which have a comparable spend on health care, have achieved great advances in their programmes. These countries have attained some of the best rates of organ donation and transplantation in the world, showing that it is possible to succeed despite the economic constraints.

The Onassis Foundation, which has invested in the development of the new Onassis National Transplant Center in Athens, approached LSE Health in late 2019 to perform a review of the current situation in Greece and propose recommendations for reform. A research team, led by Professor Elias Mossialos and Professor Vassilios Papalois and supported by a panel of distinguished international and Greek experts in the field of organ donation and transplantation, was convened to undertake this work. The resultant report is the product of many months of careful research and multiple interviews with experts and stakeholders which, due to the constraints of the COVID-19 pandemic, were mainly conducted remotely. The key output is a set of recommendations (see Table 1 for a summary) for changes required to improve the Greek organ donation and transplantation system. These recommendations are the culmination of a methodologically rigorous process which included:

- Development of a conceptual framework outlining the most important components of a successful national donation and transplantation plan.
- Case studies of five countries with successful donation and transplantation programmes: Croatia, Italy, Portugal, Spain and the United Kingdom (UK).
- A detailed case study of the current state of the Greek organ donation and transplantation system.
- A gap analysis of the Greek organ donation and transplantation system against standards of international best practice.
- Interviews with international experts.
- Interviews with key stakeholders in Greece.

Conceptual framework

A conceptual framework was constructed which aimed to outline the essential components and overall structure required for a successful donation and transplantation programme (see Figure 1). This framework was carefully developed with reference to a large number of key documents recently published in the field of organ donation and transplantation, and was also informed by the country case studies. Based on current internationally agreed best practice, the framework provided a benchmark against which the current Greek programme could be assessed, and was the starting point for conceptualising the recommendations. It is worth noting that, although broad in scope, the framework is not exhaustive or intended to be fully prescriptive, and there are many internationally recognised documents which provide technical and ethical guidance on the more intricate and sensitive aspects, which are referred to throughout the report.

International case studies

Case studies of five countries with notably successful organ donation and transplantation programmes were made. The countries – Croatia, Italy. Portugal, Spain and the UK – were selected for the particular characteristics of their donation and transplantation programmes, and/or their similarity to Greece in terms of population and economic circumstances. Each case study was reviewed and ratified by the relevant country expert. Despite different socioeconomic contexts, all the jurisdictions studied have had substantial and timely results from national reforms. The points below summarise some of the many lessons which Greece could derive from these successful examples.

- With commitment and persistence, national solid organ donation and transplantation programmes can succeed in any country, regardless of socioeconomic context.
- Continuous commitment from all stakeholders, and ensuring public trust and a positive attitude towards donation are essential.
- Strong central governance and advocacy via a sufficiently resourced national transplant organisation is a common feature of all successful programmes.
- All the case study countries had opted for 'soft opt-out' legislation for organ donation; however, it must be noted that legislation serves as a tool for cultural recognition of the role of donation but itself is insufficient for success in transplantation performance.
- All organ donation and transplant activities must be recognised, adequately reimbursed and incentivised.
- Donor coordinators, who are responsible for the coordination and identification of donor organs, have been identified as the backbone of organ donation and transplantation programmes. These staff must have dedicated time for their roles, receive adequate and ongoing training and be adequately reimbursed for their duties.
- Continuous public and professional educational endeavours to foster a culture of altruism towards donation and transplantation are a necessity for a successful national programme.

Greek situational analysis

An in-depth analysis of the current donation and transplantation programme in Greece was undertaken. Initially, a review of the published and unpublished literature was conducted in English and Greek, using a number of databases and the Greek National Transplant Organisation (NTO)'s web archive. Numerous interviews were subsequently undertaken with Greek stakeholders in order to gain a better understanding of the current performance of the system, the gaps and challenges. Stakeholders included representatives of the transplant

centres and intensive care units, members of the scientific societies and professional bodies, patient associations, the national bioethics committee, Greece's representatives in the World Health Organization (WHO), political authorities and the press. Close collaboration with the current staff of the NTO was maintained throughout. Finally, as there were some areas in which the international literature was scarce (for example, the infrastructure and staffing requirements of transplant centres), a series of international surveys of practice were conducted to facilitate the analysis.

Every aspect of the Greek system was considered, from legislation and public campaigns to workforce, infrastructure and quality standards. The analysis revealed many different factors which have contributed to Greece falling far behind its European counterparts in organ donation and transplantation and to the scale of the task ahead.

Gaps identified in the Greek organ donation and transplantation system:

- No comprehensive prevention programmes, resulting in increased need for transplants.
- No national criteria for the suitability of donors and organs for donation and transplantation.
- No organ donation coordination in donor hospitals.
- No mandatory referral system for patients on dialysis to evaluate for transplant candidacy.
- Inadequate infrastructure to coordinate or carry out transplant activities.
- No national guidelines for primary care, allocation of organs, pre-transplantation, transplantation and post-transplantation.
- No quality standards and no ability to enforce standards.
- No systematic way of collecting data to make improvements.
- No dedicated training and research programmes.
- No adequately resourced national transplant organisation to implement change.

Interviews with experts and key stakeholders

The panel of eminent international and Greek experts were consulted via numerous remote interviews conducted at intervals throughout the process and they provided regular review and oversight of all the material produced by the research team. Many other key Greek stakeholders, as listed above, were also invited to contribute, and their views incorporated into the final version of this report.

Recommendations

The recommendations (see Table 1 for a summary) are necessarily comprehensive and far-reaching, and take a whole-system approach. Each overarching recommendation is accompanied by a number of sub-recommendations, specification of the main responsible bodies and a brief text which explains the underlying reasoning. The recommendations were carefully constructed through a gap analysis of the current Greek situation set against the conceptual framework and the key lessons of the five successful countries from the case studies. An iterative approach was taken by which feedback was gathered in a series of interviews from the panel of international and Greek experts and incorporated into the final version.

At first glance some recommendations may seem more important than others. However, it is believed that all are vital to achieving success in this field. Due to the complex nature of organ donation and transplantation and the high degree of professional and organisational cooperation which is required for a successful programme, they inevitably cover many diverse aspects of health care delivery such as public health programmes, professional training, health information technology systems, and funding and reimbursement mechanisms.

Finally, we would like to emphasise that the new Onassis National Transplant Center will have a central role in this national effort and has great potential to be a driving force for progress and innovation in the field.

Figure 1. Improving access and quality in organ donation and transplantation – a framework for a national action plan

ENABLEMENT

GOVERNMENT

Political support

Funding

Long-term commitment

KEY LEGISLATION

- Specific legislation addressing diagnosis of brain death, DBD, cDCD, uDCD, WLST, 'no-touch' time, donor maintenance, LD and altruistic donation.
- Minimum requirements for staffing and facilities.
- Prohibition of trafficking.
- Safeguards against coercion and for those lacking capacity.
- Consent policy.

PUBLIC HEALTH

REDUCING THE NEED FOR TRANSPLANT

A whole system approach including:

Primary prevention of underlying causes of organ failure: Comprehensive public health programmes eg: smoking cessation/ healthy eating/excercise promotion.

Secondary prevention: National screening and diagnostic guidelines. Regular health checks in primary care. Incentives to primary care clinicians. Access to health improving interventions.

Tertiary prevention: Optimal management of organ failure. Delaying and treating the long-term complications of chronic disease. Standardised referral processes for transplant assessment.

BUILDING AND MAINTAINING PUBLIC SUPPORT AND TRUST IN THE SYSTEM

- Improving knowledge, awareness and attitudes via campaigns and tailored educational programmes.
- Conducting and acting upon the results of periodic surveys.
- Building confidence in standards and ethics via strict adherence to fair, equitable and transparent processes.
- Building a supportive relationship with the media, religious and other community institutions via a comprehensive and continuous public relations strategy.

STRUCTURAL

NATIONAL TRANSPLANT ORGANISATION (NTO)

An independent, adequately staffed and funded body with overarching responsibility and accountability for the entire process from donor selection to long term follow-up.

- Coordinates all processes, provides 24/7 support and advice
- Maintains national registries, databases and waiting list
- Responsible for good governance of the system
- Ensures fair and ethical allocation of organs according to national criteria
- Coordinates organ matching
- Oversees workforce planning and training, regulation and inspection of facilities
- Publishes national reports
- Promotes organ donation and transplantation via educational and publicity programmes
- Collaborates with the inter-national organ donation and transplantation community.

Clear leadership and representation of all relevant interests is essential. The board must provide strategic vision and uphold the highest expectations in terms of quality and performance.

REIMBURSEMENT MECHANISMS/ INCENTIVES

- Cover all parts of the process, staff and facilities.
- Takes account of antisocial hours.
- Includes incentives for participating units and staff.

INFRASTRUCTURE

- Distribution and capacity of transplant centres.
- ICU capacity and distribution.
- Clinical space and equipment.
- Laboratory, radiology and other supporting services.
- Operating theatre capacity and availability.
- Administrative support.
- IT and communications.
- Transport

DATABASES AND INFORMATION TECHNOLOGY

- The NTO is responsible for; Organ donor registries (including the living donor register), waiting lists and waiting list management and the organ donation and transplantation database.
- Data collection in keeping with the data requirements of international organ exchange schemes.
- The databases must be easily accessible and intuitive to use.
- Information must be real-time and easily updated.
- Information governance, data protection and confidentiality are priorities.
- Connectivity with international databases.

PRINCIPLES

ALIGNMENT OF VISION, VALUES AND IDEAS

Comprehensive communication and cooperation between all stakeholders and patients.

Patient-centred practice.

PATIENT-CENTRED CARE

- Involvement of patient and carer organisations.
- Tailor-made multidisciplinary and holistic clinical care of all patients and families.
- Involvement of patients and carers in development of services and clinical curriculums.
- Regular patient and carer surveys.
- Development of electronic health records and telemedicine.

ACTIVITIES

DECEASED DONATION

Organ Donation Coordinators – available 24/7 – specifically trained with protected time for their duties.

Potential sources of organs: DBD, cDCD, uDCD, living and altruistic donation.

- Involve all staff in every area where there may be potential donors, especially ICU.
- Continual scanning for potential donors.
- Donor identification, evaluation and management.
- Consent and family support.
- Incentives/recognition for deceased donor families.
- Organ retrieval – specialist teams available 24/7.
- Organ preservation, packing, transportation.
- Organ sharing schemes.

LIVING DONATION

Pre-emptive renal transplant from a LD is the treatment of choice in ESRD.

- Safeguards in place to prevent coercion and protect the rights of LDs.
- Reimbursement of LDs for any costs or loss of earnings.
- All LDs assessed according to nationally approved guidance.
- All dialysis assessments include consideration of possible LDs.
- Close collaboration between medical specialists (especially nephrologists) and the donation/transplantation system.
- Establishment of kidney exchange schemes.
- Long-term follow-up must be offered to LDs and outcomes recorded.

TRANSPLANTATION

Transplant personnel available 24/7.

Multidisciplinary assessment and follow-up teams.

All staff specifically trained with protected time for their duties.

- Assessment of potential recipients according to nationally agreed organ-specific listing criteria.
- Preparation for transplant and regular re-assessment of those on the waiting list.
- Close collaboration with NTO and donation units to ensure compliance with national allocation criteria.
- Alerting and transporting recipients.
- Transplant surgery by specialist teams.
- Perioperative management, post-transplant hospitalisation.

POST-TRANSPLANT FOLLOW-UP

Multidisciplinary organ-specific teams provide long-term follow-up.

- National guidelines based on international best practice.
- Regular reviews and assessments.
- Shared-care arrangements for those living in remote locations facilitated by telemedicine technology.
- Immunosuppressive protocols and optimisation of immunosuppressive therapy.
- Preventing recurrence of disease. Eg; management of hypertension, diabetes, inflammatory disorders.
- Minimisation and management of post-transplant related complications.
- Optimising psychosocial outcomes.
- Recording and dissemination of nationally agreed outcome data.

GOVERNANCE

QUALITY STANDARDS AND QUALITY IMPROVEMENT

- Regular inspection and accreditation of all establishments combined with processes to facilitate improvement.
- Protocols, standards and standardised documentation for every step of the process.
- Regular assessment of efficiency and effectiveness against carefully designed key performance indicators.
- Regular audit cycles and quality improvement initiatives.
- Vigilance systems to respond rapidly to and learn from adverse events.
- Minimum annual, publicly available report of activity and outcomes to NTO from all participating units.

SCIENTIFIC/PROFESSIONAL BODIES

- Provide expert advice and support.
- Devise guidelines and protocols.
- Set standards for professional education, conduct and training.
- Coordinate educational events and facilitate exchange of ideas and experience.

TRAINING & RESEARCH

RESEARCH AND DEVELOPMENT

- Research advisory group within the NTO.
- Local and national audit and research activities.
- Collaboration with international research programmes.
- Approval by established research ethics committees.
- Funding of research, awarding grants and fellowships.
- Publication and dissemination of results to all stakeholders.

TEACHING, TRAINING AND PROFESSIONAL DEVELOPMENT

- Tailored portfolios and regular appraisal.
- Clear supervision arrangements.
- Dedicated training modules and rotations.
- Incorporation to medical and nursing school curriculum.
- Education of the wider health community.
- Collaboration with international teaching and training schemes.

DBD – Donation after brain death, cDCD – controlled donation after circulatory death, uDCD – uncontrolled donation after circulatory death, LD – living donation, WLST – withdrawal of life-saving treatment, ESRD – end stage renal disease.

Table 1: Summary of recommendations

Domain | Responsible bodies | Key components

Government: political support and long-term commitment

Ministry of Health | NTO

A national donation and transplantation programme will save lives and save the health system money. To achieve a comprehensive, high quality and safe national programme, long-term governmental commitment and support is necessary.

- The NTO to be re-launched as an independent organisation.
- Targeted and sustainable funding to be identified.

Donation after circulatory death (DCD)

Ministry of Health | NTO | Scientific societies

A legal framework for donation after circulatory death must be established, and DCD protocols should be developed and piloted in selected centres.

- A working group of experts to establish appropriate legislation and guidance.
- Government to approve legislation.
- Funding of pilot programmes in selected centres.

Diagnosis of brain death (DBD)

Ministry of Health | NTO in an advisory capacity

A culture must be fostered where brain death is routinely diagnosed according to international guidelines.

- Strengthened professional training programmes.
- Clear clinical guidance in accordance with international best practice.
- Public awareness campaigns.
- Separation of legislation for brain death diagnosis and legislation for transplantation.

Consent legislation

Ministry of Health | NTO

A soft opt-out system of presumed consent legislation with mandatory family consent should be established in order to maximise donation rates and help to frame discussions around end-of-life care and organ donation. The donor card may be retained in this type of system where it serves as a positive affirmation of the wish to donate.

- Change of legislation to a soft opt-out system with mandatory family consent.
- Retention of the donor card.
- Clear guidance for health care professionals and educational programmes for the general public.

Reducing the need for transplant: primary and secondary prevention

Ministry of Health | Regional health authorities

The success of the national donation and transplantation programme will depend on the expansion of comprehensive primary and secondary prevention strategies under the remit of primary care and public health.

To reduce the demand for organs and ensure the sustainability of the overall health and transplant system, primary and secondary prevention strategies should target the general population and high-risk individuals, and must target the most important modifiable risk factors linked to end-stage kidney and liver disease. These include: obesity, diabetes, hypertension, alcohol consumption and smoking.

- Strategy to be the responsibility of a special committee under the remit of the Ministry of Health and regional health authorities.
- Primary and secondary prevention should be the responsibility of primary care and public health.
- National guidelines and key performance indicators need to be developed.

Reducing the need for transplant: tertiary prevention

Ministry of Health | NTO | Scientific societies

A mandatory system should be established whereby those presenting with end-stage organ failure are referred for specialist supportive management and for consideration of suitability for transplant.

- Development of guidelines and referral processes in collaboration with scientific societies.
- Monitoring via key performance indicators.

Public support: addressing issues of trust

NTO | Transplant centres | Scientific societies

The NTO must recognise the widespread mistrust in the current organ donation and transplantation system and take measures to combat misinformation and misconceptions. A culture of altruism and social solidarity towards organ donation and transplantation must be fostered.

- Development of a comprehensive and continuous public relations strategy.
- Development of good governance structures and strict adherence to fair, equitable and transparent processes.
- Periodic survey of public attitudes and perspectives.

Public support: building relations with the media

NTO

The NTO should establish regular conferences and provide regular progress updates with the press and media. This can be achieved by the creation of a dedicated NTO Media Office.

- The media office of the NTO should have a 24/7 hotline for the press and media, with whom they should work in collaboration to build public trust.

Public support: public awareness

Ministry of Health | NTO | Ministry of Education

Investing in public education and national campaigns is necessary to raise public awareness of organ donation and transplantation, dispel misconceptions and stimulate collective reflection on end-of-life discussions. Public information and education campaigns should be undertaken in partnership with relevant organisations and aimed at a wide audience. The NTO should establish a dedicated Public Information and Education Office to oversee these efforts.

- Tailored educational campaigns to be developed for the entire population, with a focus on age-appropriate messaging. Educational campaigns should start from school age onwards.

NTO: governance and structure

Ministry of Health (proposing legislation) | Parliament (approving legislation)

The NTO must be empowered to lead the national donation and transplantation programme by being granted authority to enact change. As in other countries with successful programmes, the NTO should become an independent authority. This will require changes to legislation and governance structure.

- The NTO to be re-launched as an independent organisation.
- The selection of a board of directors to supervise the NTO and oversee strategy.
- The creation of advisory committees to provide scientific, ethical and clinical advice.

NTO: funding

Ministry of Health | Parliament

The NTO should be funded by the Ministry of Health. Early investment in the NTO is needed given the proposed structural reform, employment of additional staff and subsequent expansion of responsibility. The amount of funding should thereafter reflect levels of activity related to organ donation and transplantation.

- Sustainable, long-term funding must be identified which is commensurate with the duties and expectations of the new, expanded NTO.

NTO: organisation

NTO

To realise a comprehensive donation and transplantation programme, there must be structural reform within the NTO and establishment of dedicated roles. The NTO should aim to create an organisation that is representative, effective and efficient.

- Appointment of a Chief Executive Officer and Chief Medical Officer via a transparent and open selection process.
- In addition to the central (Athens) office, establishment of four regional offices with deputy lead roles.
- A significant increase of staffing in line with the mission and functions of the NTO.

NTO: national responsibilities

NTO

As the national donation and transplantation programme evolves, the NTO should revise and update its mandate and responsibilities. It must become the single authority in the processes of organ donation, transplantation and monitoring. It should be responsible for the maintenance of the registries, databases and waiting lists and for the regulation of the donation and transplantation programme. It must also take a lead in the regular review and development of clinical guidelines and protocols.

- A central team must be available 24/7 to support all activities related to donation and transplantation.
- The creation of advisory committees to provide scientific, ethical and clinical advice.
- The establishment of a separate quality, safety and regulatory division.

NTO: international responsibilities

NTO

The NTO should strive to develop collaborations with internationally recognised donation and transplantation organisations. This will help expand the donor pool for vulnerable populations, increase transparency and legitimacy of the national donation and transplantation programme, and provide access to expertise and alternative sources of funding.

- The NTO to have a longer-term goal to join a European network of transplant organisations (for example Eurotransplant).

Infrastructure

Donation and transplant centres NTO

Provision and maintenance of adequate infrastructure is vital to the development of a successful organ donation and transplantation system. To achieve sustainable improvements in donation and transplantation activity, infrastructure capacity must be expanded. All the national centres should be supported and facilitated to meet the current European standards in terms of infrastructure and resources.

- Expansion of operating theatre capacity.
- Rapid access to all diagnostic services.
- Adequate access to all supporting services.
- Sufficient clinical space and equipment.
- Adequate IT and telecommunications equipment.
- Regular maintenance of all equipment.

The Onassis National Transplant Center

NTO | ONTRC

The Onassis National Transplant Center (ONTRC) represents a significant step forward in the development of the infrastructure needed to underpin a high-performing national transplantation service. The ONTRC should act as part of a national network of excellence, with all transplant centres working in close collaboration. This is particularly the case in Athens, where the three centres are in close geographical proximity. The centres of Ioannina and Patras already work in alliance.

- Working in partnership with the NTO, the ONTRC should help to facilitate the close collaboration of transplant centres and transformation of the wider system in the following areas: quality assurance, clinical pathways, digitalisation, research, training and international collaboration.
- ONTRC to act as national centre for paediatric transplantation.

Reimbursement

Ministry of Health | Insurance funds

All activities related to organ donation and transplantation must be adequately financially reimbursed, this includes payments to staff, participating units and supporting services.

- Appointment of a panel of experts to agree details of reimbursement.
- Revision of the KEN-DRG system to ensure that all steps of donation and transplantation are reimbursed.
- Appropriate reimbursement of all personnel which adequately reflects the often-antisocial hours of the work.

Donation: Organ Donor Coordinators

NTO

In order to achieve good rates of organ donation it is crucial to have a sufficient number of specially trained Organ Donor Coordinators. (ODCs). There is an urgent need to expand this section of the workforce, and to train and appoint ODCs in every unit participating in organ donation.

- Every hospital with an ICU should appoint an adequate number of ODCs to provide 24/7 cover 365 days a year.
- ODCs must receive basic training provided by the NTO, and have access to further advanced training.
- ODCs must have protected time and receive adequate reimbursement for their duties.

Donation: processes involved in evaluation, retrieval and transport

NTO | Donation and transplant centres

All steps of the donation process must be covered by nationally agreed protocols and guidelines drawn up in accordance with internationally recognised best practice. This includes the evaluation and management of donors, organ retrieval, organ preservation, packing and transportation. There must be sufficient numbers of trained staff available at all times.

- Establishment of national guidelines in accordance with internationally recognised best practice.
- Staff trained in donor evaluation and maintenance and organ retrieval teams must be available 24/7, 365 days a year. These personnel must be appropriately reimbursed.

Living donation

NTO | Transplant centres

Living donation (LD) should become a cornerstone of the donation and transplantation programme, and pre-emptive renal transplantation from a living donor must become the treatment of choice for end-stage renal failure.

- Any financial burden to LD should be removed.
- Educational campaigns should be undertaken to raise awareness and dispel misconceptions.
- Assessment of all dialysis patients to include consideration of living donation
- Collaborative partnerships should be built with physicians potentially involved in referring patients for transplant.

Transplantation

NTO | Transplant centres | Scientific societies

Transplantation is a complex, time-limited process requiring skilled coordination. There is a need to expand the existing workforce, infrastructure and information technology capacity, and ensure that all processes are subject to nationally agreed protocols which are consistent with internationally agreed best practice.

- Referral for transplant, assessment and waiting list management: national guidance and criteria, transparent and timely decisions, regular re-assessment.
- NTO is responsible for IT systems containing all waiting list information, and all data for organ matching and allocation.
- Organ allocation and prioritisation: nationally agreed rules, adherence monitored by NTO.
- Coordination of the transplant procedure: expansion of the role of the Transplant Recipient Coordinator (TRC).
- Surgery and perioperative processes: nationally agreed guidelines; expanded numbers of transplant personnel.

Post-transplant follow-up

NTO | Transplant centres | Scientific societies

Transplant recipients should be offered life-long follow-up. The National Transplant Organisation (NTO), alongside a panel of experts with organ-specific expertise, must draw up national guidance for the follow-up of transplant recipients in accordance with internationally accepted best practice.

- Every transplant centre must have multidisciplinary organ-specific follow-up teams.
- Follow-up care should cover all relevant issues including psychosocial support and lifestyle advice.
- Shared-care protocols should be devised for patients who live far from the transplant centre.
- Outcome data must be recorded for every patient.

Patient-centred care

NTO | Patient and carer organisations

Patients, their families and loved ones, and live donors must be placed at the heart of the national donation and transplantation programme. Policies and procedures must be developed which promote collaborative engagement with patients, families and carers not only in their own clinical care, but also in all aspects of system planning and development.

- Establishment of a research advisory group within the NTO.
- Establishment of grants and fellowships.
- Sustainable funding streams must be identified.
- Publication and dissemination of the results of research.
- Participation in international research projects.

Research and development

NTO | Donation and transplant centres | Scientific societies | Ministry of Development

Improving the performance of the organ donation and transplantation system requires an innovative research and development programme. All units and staff must be actively supported and encouraged to participate in research activities at local, national or international levels.

- Establishment of a research advisory group within the NTO.
- Establishment of grants and fellowships.
- Sustainable funding streams must be identified.
- Publication and dissemination of the results of research.
- Participation in international research projects.

Quality standards and quality improvement

NTO | SEYYP | Donation and transplant centres

The existing national system of quality assurance should be strengthened and expanded to include pre-transplant care. Existing quality indicators on donation and transplantation should be broadened and regularly updated. The NTO should develop additional capacity to support health care facilities in reaching compliance, with regular audits based on key performance indicators conducted by the Body of Inspectors for Health and Welfare Services (SEYYP)

- NTO to establish a committee responsible for quality improvement, to revise and improve the current set of quality indicators in consultation with advisory groups.
- NTO to develop and improve current system for inspection and auditing of donation and transplant centres.
- Pre-transplant units (renal, liver, heart and lung units), donation and transplant centres: To collect and report relevant quality indicators to the NTO at regular intervals.
- Collection of quality indicators should become part of a collaborative feedback process.

Databases and information technology

NTO

A key responsibility of the NTO will be the establishment and maintenance of a national information technology system and associated databases to facilitate communication between ICU/laboratories/transplant centres/NTO (and any other involved parties) which will be essential to improving the efficiency and effectiveness of the donation and transplantation programme. The system will need to incorporate all information relevant to donation, organ matching and allocation, transplantation and long-term follow-up.

- NTO to appoint a Chief Digital and Information Officer.
- Establishment of an expert working group to design and implement a new national donation and transplantation IT system, connecting and facilitating all parts of the process.
- Data collection to be informed by the data requirements of internationally respected schemes such as Eurotransplant.
- Databases and IT systems must be compliant with the General Data Protection Regulation in EU law 2016/679.

Teaching, training and professional development

NTO | Ministry of Health | Scientific societies | Donation and transplant centres | Medical and nursing schools

There is a need to develop a national strategy to continuously train health care professionals in all areas relevant for organ donation and transplantation.

- The development of dedicated training modules following the guidelines of the European Union of Medical Specialists (UEMS).
- All professionals to have a tailored CPD portfolio and at least annual appraisal.
- Collaboration between the NTO and medical and nursing schools to develop relevant training modules.
- Specialist basic and advanced training must be available to all professional groups including: ODCs, transplant surgeons, transplant physicians, immunologists, intensivists and nursing staff. This should include opportunities to apply for fellowships and research grants.

Professional organisations and scientific societies

NTO | Professional organisations | Scientific societies

Professional organisations and scientific societies are an invaluable source of advice and support. They must be consulted at all stages of the expansion of the donation and transplantation programme and should play a pivotal role in developing and ratifying guidelines, protocols, regulatory standards and training programmes.

- The board of the NTO should include representatives of the relevant bodies.
- These bodies should be consulted on the development and implementation of issues such as national policy and national guidance and protocols.
- Appointment of members of the specialist advisory groups should be undertaken in consultation with the relevant scientific societies and professional organisations.

Implementation taskforce

Government | Ministry of Health

The implementation of the recommendations outlined in this report and the delivery of the new national donation and transplantation programme will be a monumental and rewarding endeavour; it should be overseen by an implementation task force under the remit of the Ministry of Health.

- The taskforce should be chaired by the permanent secretary of the Ministry of Health.
- A 7–10-person taskforce is recommended, representative of the relevant interests.
- The taskforce should produce annual progress reports.

Introduction

Transplantation is a miracle of modern medicine: it is the best treatment for organ failure, and offers significant benefits to patients in terms of both survival and quality of life. **It offers recipients the chance of returning to enjoying full lives, to participate more in society and to return to work**. While transplantation is a complex and expensive procedure, it is also significantly cost-saving compared to alternatives such as kidney dialysis.

The complexity of transplantation as a surgical procedure is mirrored by the degree of coordination needed across the health system in order to deliver a successful transplantation programme. However, just as with surgery, the vital steps in implementing such a programme are increasingly well understood. Given the magnitude of the returns, the moral and economic case for investing in a comprehensive organ donation and transplantation service is indisputable.

The need for such a service in Greece is also undeniable. Chronic kidney disease (CKD) accounts for the majority of cases of organ failure requiring transplantation, and Greece has one of the highest incidence rates of end-stage renal disease among high income countries, driven by high smoking rates, obesity, and poor cardiovascular health. As a result, Greece has double the average rate for Europe of patients starting kidney dialysis. Greece's ageing population, along with the lack of control over modifiable risk factors, is likely to increase the incidence of chronic diseases, and hence the need for transplants, in the years to come.

Despite a disproportionally high level of need, Greece lags behind European countries in rates of organ donation and transplantation, performing 75% fewer kidney transplants compared to the European average per million people, and with the lowest rates of transplantation in the OECD, with rates stagnating in recent years(1). According to the NTO, the current average waiting time for a kidney transplant in Greece is 8.8 years, whereas the average period of survival for patients starting dialysis is three years, and one quarter of dialysis patients will die within a year(2). Unless action is taken to improve the availability and quality of transplantation services in Greece, it is inevitable that many lives will continue to be unnecessarily cut short.

The economic crisis in Greece has certainly contributed to the recent decline in transplantation rates, which reached a low of 3.5 per million people (pmp) in 2015(3). However, other countries, such as Portugal, which were likewise severely impacted by the economic crisis of the late 2000s and early 2010s, have nonetheless been able to sustain significant performance

improvements in their organ donation and transplantation systems. So, a comprehensive service capable of meeting the needs of the population is possible within existing economic limitations, if underlying factors of poor performance are identified and tackled in a national reform effort.

In recognition of this, the Onassis Foundation, whose investment in the new Onassis National Transplant Center in Athens represents a major step forward in making the nation's transplantation infrastructure fit-for-purpose, contacted LSE Health in October 2019 to undertake a review of the system and make recommendations for its reform. LSE established a research team led by Professor Elias Mossialos and Professor Vassilios Papalois to undertake this work, advised by a panel of eminent international and Greek experts in organ donation and transplantation. The resulting report sets out the case for change through an analysis of the Greek organ donation and transplantation system in comparison to international case studies and standards of best practice and presents a set of recommendations to enable Greece to achieve rates of transplantation in line with the leading countries in Europe.

With the right set of reforms, investment and long-term commitment, Greece has the potential to become a leader in solid organ donation and transplantation: our vision is for Greece to establish a world-class organ donation and transplantation system, achieving and sustaining high levels of performance in line with the best-performing countries in Europe, within 10 years. It is our hope that the adoption of the recommendations in this report in a new national plan for organ donation and transplantation will accelerate progress towards this goal.

Structure of the report

This report is structured as follows:

Project team and methodology (rest of Chapter 2)

The final sections of this introduction list the members of the project team and give an account of how we conducted the research that underpins the report's recommendations.

Framework for best practice (Chapter 3)

Based on the findings of a literature review, the report presents a summary of a framework, with a detailed accompanying narrative, which encapsulates best practice in the design, operation and management of a national organ donation and transplantation system. The framework is comprehensive, providing a breakdown of the elements of a successful national programme against which the Greek system can be assessed. The full text of the framework can be found in Appendix 1.

Lessons from international experience (Chapter 4)

In order to derive further lessons on best practice in national organ donation and transplantation systems, Chapter 4 presents a summary of five case studies of successful systems: in Croatia, Italy, Portugal, Spain and the United Kingdom. The countries were selected

because of distinctive features of their transplantation systems and wider health systems, which are likely to yield valuable insights for Greece. The case studies provide detailed information on the organisation and performance of the health systems in those countries, and highlight specific organisational principles, policies and initiatives from which Greece can learn. The individual case reports can be found in Appendices 2 to 6.

Analysis of the Greek organ donation and transplantation system (Chapter 5)

Guided by the framework, the research team undertook a detailed review of literature on the organ donation and transplantation system in Greece, including both Greek and English language sources, to capture relevant details relating to each of the domains of the framework. We undertook a series of semi-structured interviews with key stakeholders in the Greek transplantation system. These enabled a detailed situational analysis of the system, and provided the basis for the generation of recommendations. The full list of stakeholders consulted is included in Appendix 7.

Recommendations for reform (Chapter 6)

The main body of the report ends with the recommendations necessary for the successful remodelling of the Greek transplantation programme. Accompanying each overarching recommendation are a number of sub-recommendations, specification of the main responsible bodies, and a brief text explaining the underlying rationale. The recommendations have been carefully developed through an iterative process. The recommendations are intended to be comprehensive, and take a whole-system approach.

Appendices

Appendix 1: A framework for a national action plan

Appendix 2: Croatia case study

Appendix 3: Italy case study

Appendix 4: Portugal case study

Appendix 5: Spain case study

Appendix 6: United Kingdom case study

Appendix 7: Stakeholders consulted

Project Team

This review has been undertaken by a team led by project co-chairs Professor Elias Mossialos and Professor Vassilios Papalois. A panel of international expert advisors, including senior transplant surgeons and officials from Greece, Croatia, Italy, Portugal and Spain made invaluable contributions throughout the project, advising on its coverage, and providing detailed input and feedback on country case studies, the best practice framework, the Greek situational analysis and the development of recommendations. In addition, the project team is grateful to the many stakeholders of the Greek transplantation system who provided invaluable advice and input.

Project co-chairs

Professor Elias Mossialos, Brian Abel-Smith Professor of Health Policy, Department of Health Policy, and Director LSE Health, London School of Economics and Political Science

Professor Vassilios Papalois, Professor of Transplantation Surgery, Imperial College London; President, European Society for Organ Transplantation

International expert panel (alphabetically):

Dr Mirela Bušić, National Transplant Coordinator, Ministry of Social Affairs and Health, Croatia

Professor Daniel Casanova, Head of Transplantation Surgery, University of Cantabria, Spain

Dr Ana Franca, Internal Medicine Consultant, Intensivist Transplantation Consultant, Instituto Português do Sangue e da Transplantação, Portugal

Dr Aliki G. Iniotaki, Former Director, Immunology Laboratory and National Tissue Typing Centre, General Hospital of Athens G. Gennimatas, Greece

Professor Anastasia Kotanidou, Professor, National and Kapodistrian University of Athens, Medical School, and Director, Critical Care Department, Evangelismos General Hospital, Greece

Dr Jorge Paulino Pereira, Head of Pancreatic Surgery, University of Lisbon, Portugal

Professor Jacopo Romagnoli, Head of Transplantation Surgery, Catholic University of Rome, Italy

LSE research team (alphabetically)

Dr Charlotte Johnston-Webber, Senior Research Associate, LSE

Dr Jasmine Mah, Research Officer, LSE

Dr Apostolos Prionas, Research Officer, LSE

Simon Streit, Research Officer, LSE

George Wharton, Senior Lecturer in Practice, LSE

Methodology

Framework for best practice

In order to establish a benchmark of best practice in national organ donation and transplantation systems, the project team developed a framework (see Chapter 3 for a summary and Appendix 1 for the full text of the framework) to inform and guide the future development of the Greek organ donation and transplant system, building on the current contextual and cultural situation. The framework has been carefully developed using the following methodological approach. First, we conducted a review of international literature for best practice guidelines in the governance and implementation of organ donation and transplantation systems and elicited key documents. These include, but are not limited to, the most recently published guidance from the World Health Organization (WHO)(4), the European Directorate for the Quality of Medicines and HealthCare (EDQM)(5), the Organ Donation European Quality System (ODEQUS)(6) and Eurotransplant(7). We also consulted the standards and guidelines of the Division of Transplant Surgery of the European Union of Medical Specialists (UEMS)(8) for the training of all transplant professionals, and accreditation of transplant centres. The framework was further informed by the findings of the international case studies and underwent several rounds of revisions in consultation with members of the expert panel in order to emerge as an evidence-based guide for best transplantation practices.

International case studies

In order to derive lessons from other countries from which Greece can learn in the development of its organ donation and transplantation system, the project team undertook case studies of successful systems in Croatia, Italy, Portugal, Spain and the UK. Each of these countries has implemented successful organ donation and transplant programmes and, although they continue to face many challenges, these examples can provide useful paradigms for development of the Greek system. The value of the chosen case studies is two-fold. First, they engage with real organ donation and transplantation systems that successfully perform above and beyond their neighbours; these leading systems demonstrate that the goals in this report are realisable, as well as providing lessons on how this may be accomplished. Second, each of these case studies was chosen specifically in relation to the Greek context, to inform one or more aspects of the Greek organ donation and transplantation system. The criteria for selection were as follows: (1) the country must be a world leader in one or more aspects of solid organ transplantation and/or (2) the country must share relevant cultural and socioeconomic characteristics with Greece (hence, case reports were limited to Europe and largely focused on Mediterranean countries). A summary of the key findings is presented in Chapter 2 of this report and the individual case studies can be found in Appendices 2 to 6.

We developed each case study in a two-step process. First, we researched and wrote an initial version. To do this, we conducted a literature review using two electronic databases, PubMed and Embase; we found additional publications by performing a grey literature search, hand-searching relevant papers and soliciting suggestions from the expert panel and stakeholders. One researcher per country extracted from this data to compile the country case study in

relation to the framework (Chapter 3 and Appendix 1). Each study therefore includes sections on: national context, background to the country's transplant system, performance indicators, key features of the transplant system (governance, regulation, strategy and coordination at national and hospital level), legislation, public awareness campaigns, prevention of diseases that lead to transplant needs, international collaboration, and key messages.

The second step involved an iterative process in which we sent the case studies to our expert panel, which included representatives from each of the countries studied. We conducted semi-structured interviews to elicit feedback, in addition to their written revisions. Updated versions were sent back and forth between country experts and each case study's researcher-writer, before sharing a final draft with the expert panel for final revisions. The final case studies are therefore a product of a rigorous process of data collection and validation occurring over multiple iterations between November 2019 and July 2020.

Analysis of the Greek organ donation and transplantation system

Our account of the Greek organ donation and transplant system aims to provide an in-depth analysis. In particular, we sought to quantify the existing national need for solid organ transplantation in Greece and used our framework to credibly assess the system's performance and benchmark it against current European standards. Based on the framework and lessons from the international case studies we identified those areas of the existing system where improvement is required in order to bridge the gap between need and performance.

In conducting the analysis, we followed a variety of methodological approaches. We initially performed an unstructured literature review to credibly define the national transplantation needs and the system's performance: Medline, Embase, Scopus, Google Scholar and NTO's web archive were searched in both English and Greek with no time restrictions; both published and unpublished literature were included. In order to gain a better understanding of the existing gaps in the system we carried out an extensive round of interviews with the main stakeholders in the Greek system (namely, the national transplant organisation, the national transplant centres, ITUs, the scientific societies, the professional bodies, the patients' associations, the country's bioethics committee, the country's representatives in the WHO, the political authorities and the press – see Appendix 7). Lastly, as part of our effort to benchmark the system's gaps and performance in areas where published international literature was lacking (for example, concerning transplant centre infrastructure and levels of staffing) we performed a series of international surveys of practice.

Recommendations

We developed the recommendations in an iterative process. Firstly, we assessed the Greek organ donation and transplantation system against the best practice framework and the international case studies to carry out a gap analysis, highlighting the disjuncture between the Greek situation and standards of best practice. The research team then developed a set of preliminary recommendations for actions that would enable Greece to address the gaps and attain high performance in each area of the framework. The project co-chairs reviewed these recommendations and made refinements. We undertook a series of stakeholder interviews

with the international expert panel and representatives from across the Greek organ donation and transplantation system (see Appendix 7 for a list of the stakeholders consulted) in order to generate initial feedback on these recommendations and receive additional suggestions. The aim of the interviews was to elicit feedback from as many disciplines of stakeholders involved in the transplantation process as possible; thus, broad categories of stakeholders consulted included representatives of the national transplantation organisation, the national transplant centres, ITUs, the scientific societies, the professional bodies, the patients' associations, the country's bioethics committee, the country's representatives in the WHO, the political authorities and the press. The research team integrated this feedback with the initial set of recommendations and undertook a further cycle of review and refinement. We shared the resulting set of recommendations with the international and Greek panels of experts who submitted written feedback and participated in online round-table meetings to provide further comments. These comments were incorporated in the final set of recommendations presented here.

Framework for a national action plan

The project team has constructed a framework which aims to outline the essential components and overall structure required for a successful transplantation programme

The framework has been carefully developed in consultation with experts in the field, and with reference to a number of key documents recently published in the discipline of organ transplantation(2–6). It is also informed by the accompanying country profiles (see Chapter 3 and Appendices 2 to 6), which give an overview of the successful systems in place in Croatia, Italy, Portugal, Spain and the United Kingdom. It is important to highlight that while the framework is based on currently agreed best practice and principles, it is not exhaustive or intended to be fully prescriptive. There are many internationally recognised documents which provide technical and ethical guidance on the more intricate and sensitive aspects, to which we refer throughout.

The following text is complementary to the Framework Schematic on pages 7 to 9, and is a summary of a more extensive version of the text which can be found in Appendix 1.

Government: political support, funding and long-term commitment

Achieving a successful, high-quality programme for organ donation and transplantation is a difficult and complex task requiring ongoing commitment at the highest level. The support of government is crucial to achieving and sustaining an effective and efficient programme. Many processes and professionals are involved; all must be aligned and coordinated seamlessly. High-level collaboration across the health system is essential, as is attention to the smallest detail at an operational level. It is vital that all involved are united in a shared vision of how to achieve the desired goals, and this requires clear, decisive and consistent leadership.

Governmental support must be accompanied by adequate and sustainable funding streams. Ultimately, an effective transplantation programme will deliver immeasurable improvements

to the quality of life of patients, resulting in savings to the health care system and to the wider public purse. However, in building a comprehensive programme considerable financial investment is required to ensure that all the necessary components are fit for purpose, and that every part of the process has adequate staffing and resources.

Key legislation

A clear legislative framework is necessary, and this must be respected and enforced. It is an essential component to establishing and maintaining public trust in the system. Legislation should guide and facilitate, and not pose an undue impediment to organ donation or transplantation(6). It should be in fitting with the prevalent culture and drawn up with input from expert clinicians and experts in clinical ethics. As a minimum, legislation should cover the consent policy (opt-in or opt-out), and all possible modes of donation: donation after brain death (DBD), donation after circulatory death (DCD) both controlled and uncontrolled; and living donation (LD), including altruistic non-directed donation. In the case of DCD, the withdrawal of life-saving treatment must be addressed, as should no-touch time (the minimum time which must elapse from the confirmation of death to the commencement of measures to preserve organ viability). Legislation should exist to protect living donors and those who may lack the capacity to consent from any form of coercion, and to prohibit the trafficking of organs.

Laws should also address minimum staffing and facility requirements for all units participating in donation and/or transplantation and specify standards for inspection and regulation.

Reducing the need for transplantation

National strategies which aim to reduce the incidence of organ failure and the future need for transplantation are of great importance(7). A number of preventable or modifiable chronic conditions are the main drivers of organ failure. For example; in most European countries, diabetic nephropathy accounts for around 20–30% of incident cases accepted for renal replacement therapy, and hypertensive nephrosclerosis accounts for around 10–20%(8). Cirrhosis and primary liver cancer are the leading causes of liver failure, and alcohol consumption, viral hepatitis B and C, and obesity are the main causes of these two conditions(9).

Primary prevention aims to prevent disease from occurring in the first place. Effective primary prevention requires a robust, respected and adequately funded public health body. A comprehensive primary care network, fully integrated with secondary and tertiary care, is also crucial. Primary strategies include activities such as:

- Smoking cessation.
- Promotion of physical activity and healthy eating.
- Drug and alcohol rehabilitation and harm reduction services.

Secondary prevention aims to limit the damaging effects of a disorder once it has already occurred. Strategies include medical interventions and encouragement of health-improving lifestyle changes:

- Regular checks in primary care settings at set age thresholds.
- Monitoring and management of those identified as at risk.
- Access to health-improving lifestyle interventions.

Tertiary prevention aims to reduce the impact of an ongoing chronic disease or disorder, and delaying and treating long-term complications becomes the priority.

Effective prevention strategies must concentrate on primary and secondary measures. Patients subject to tertiary preventative measures are already proceeding to terminal organ failure, and it can only be hoped to marginally delay the need for renal replacement therapy or organ transplant.

Building and maintaining public support and trust

Public support and trust in the transplantation programme is imperative, and can be built up over time by strict observance of the highest ethical standards and by adherence to fair, equitable and transparent processes. Demonstrable good governance of all aspects of the programme is essential, and can be conveyed via regular, publicly available reports of inspections, progress and activity. It is essential that there is transparency and accountability regarding any untoward events or incidents.

Public education campaigns are essential to ensure a sufficient rate of organ donation. These should be tailored to different sectors of society, and seek to dispel myths and misconceptions while promoting principles of social solidarity and altruism. Evidence suggests that education starting from school age can increase awareness, change attitudes and boost the number of those willing to donate their organs(10). Most religions are supportive of organ donation and transplantation(11–14). However, it is advisable that religious leaders are consulted, as some areas, such as the diagnosis of brain death, can be contentious. Periodic surveys may help to inform future campaigns and identify issues which need addressing.

The media can be an influential ally in the promotion of organ donation and transplantation, and good relations with the media should be actively pursued and maintained. Publicity and media programmes are thought to make a modest contribution to increasing the number of people on the Organ Donor Registry (ODR) and to boosting the donation rate(15–16). Personal accounts can be particularly powerful, capturing the hearts and minds of the public, and providing a helpful strategy to bolster support and drive change.

The National Transplant Organisation

One of the most important components of a successful programme is the establishment of a national transplant organisation (NTO) with overarching responsibility for every part of the process. The complex nature of donation and transplantation and the degree of collaboration that is required necessitate high-level coordination. International guidance on national strategy advises that an adequately funded and resourced single public body should be established(3,7). Inspirational, dedicated leadership and representation of all relevant interests are essential. The NTO board must provide strategic vision, uphold the highest expectations in terms of quality, safety and performance and ensure overall good governance.

The duties of the NTO should include (this list is not exhaustive):

- Coordinating all processes and providing round-the-clock support and advice to all professionals.
- The maintenance of national registries, databases and organ-specific waiting lists.
- Coordinating organ matching and ensuring fair and ethical allocation of organs according to nationally agreed criteria.
- Overseeing workforce planning and training.
- Overseeing regulation and inspection of staff and facilities.
- Publishing at least annual national performance and progress reports.
- Promoting organ donation and transplantation via educational campaigns.
- Collaborating with the press and media.
- Promoting integration with the international organ donation and transplantation community.

Infrastructure

The infrastructure requirements of the transplantation programme must be calculated based on current demand and projected future demand. The distribution of the donation and transplantation centres needs to be considered, particularly in regard to the time-limited nature of many processes, and the travel times required for transport of organs and/or patients. Infrastructure requirements include:

- Adequate operating theatre capacity and equipment; everything needed to facilitate organ retrieval, preservation, packing and transplantation.
- ICU capacity – this is of prime importance: many donors are patients on ICU who have suffered a catastrophic brain injury.

- An adequate number of laboratories with sufficient equipment to process the required immuno-genetic testing and other necessary tests; these facilities must have rapid response times.
- Rapid access to radiology, pathology, microbiology and other necessary supporting services.
- Adequate clinical space and equipment to undertake assessments for transplantation and provide comprehensive follow-up services.
- A fully integrated IT system including organ donor registries, waiting list data, and data necessary for organ matching and allocation, follow-up and outcome data.
- Sufficient office space and equipment for administrative support and communications.
- Rapidly available means of transport for transit of organs, including air transport.

Databases and information technology

The transplantation programme must be supported by a sophisticated information technology system in order to ensure maximal efficiency and effectiveness. This system should be overseen by the NTO and will include the organ donor registries (including a living donor register), the organ specific waiting lists (regularly updated) and all information pertinent to organ donation, matching and transplantation, including long-term outcome data. This system plays a vital role in organ matching and allocation, and in the smooth working of the entire programme. In many jurisdictions advanced AI algorithms are used to aid swift and accurate organ matching and boost rates of transplantation(17,18).

The NTO should appoint a chief digital and information technology officer. The design, maintenance and regular upgrade of the system should be undertaken with the input of experts in complex medical databases and medical information technology. The exact nature of data to be collected should be in keeping with the data requirements of international organ exchange schemes.

It is vital that all staff involved in donation and/or transplantation are able to easily access the IT system from their place of work, and that they have access to the information pertinent to their specialism. The system should be intuitive to use, and not require extensive training. Information must be easy to upload and available in real time to facilitate swift organ matching and allocation. Information governance, data protection and patient confidentiality are key priorities, and staff should not be able to access data in excess of that required for their role. It is desirable that the IT system has the facility to connect with the systems of international organ exchange schemes.

A number of good international examples of IT systems in organ donation and transplantation include that of National Health Service Blood and Transplant (NHSBT) in the UK, the United Network for Organ Sharing (UNOS) in the United States, and the ENIS system of Eurotransplant.

Reimbursement mechanisms and incentives

Transplantation has been shown to be highly cost-effective in the long-run(19). However, the processes of organ donation and transplantation are expensive and resource-intensive in the immediate term. Appropriate reimbursement mechanisms are essential to ensure that there are no financial barriers to organ donation or transplantation. Many different providers are involved, and every step of the process must be accounted for and reimbursed adequately at nationally agreed rates. Financial or other incentives may be useful, but need to be carefully designed and consistently implemented. Additionally, the work associated with both donation and transplantation often involves long, intense periods occurring at antisocial hours. Most personnel will have to work on a shift basis covering national holidays, nights and weekends. The remuneration provided must reflect these factors.

Clinical pathway

Donation

The potential sources of organs include:

- Donation after brain death (DBD)
- Donation after circulatory death (DCD), controlled and uncontrolled (cDCD and uDCD)
- Living donation (LD), including non-directed altruistic donation.

Countries with the highest transplantation rates have well-developed deceased donation (DD) schemes. Deceased donation includes donation after brain death (DBD), and donation after circulatory death (DCD). The diagnosis of death by neurological criteria is the cornerstone of DBD, and this route to organ donation is only possible via individuals who have been admitted to the ICU with a catastrophic and irreversible brain injury. DCD relates to the declaration of death following circulatory arrest. There are various clinical scenarios in which this can occur, and four categories are described by the Maastricht criteria(20). Both DBD and DCD present specific challenges which must be addressed by clear national legislation and guidance. DCD poses particularly difficult ethical dilemmas which must be addressed, taking into account national sensitivities and cultural understandings of death. Although DBD remains the main source of DD organs in most countries, DCD now represents a significant source in many countries with high donation rates; 24% of DDs in Spain(21), and 40% in the United Kingdom(22).

In DD the ischaemic time is of key importance. This is the time that the organ to be transplanted is deprived of a blood supply. Some organs, such as hearts, are particularly vulnerable to ischaemic damage, thus limiting organ viability. Where LD is possible (mainly relating to kidneys and livers) there is a clear advantage, and the donation and transplantation procedures can be arranged to ensure a very short ischaemic time. LD consistently shows better outcomes in terms of primary and long-term graft function(23). (For a more detailed explanation of DBD, DCD and ischaemic time please refer to Appendix 1.)

Maximising the proportion of potential donors who become actual donors is a key priority. This requires continual proactive identification and referral of possible donors. The role of the organ donation coordinator (ODC) is of prime importance, and all hospitals with a role in donation should have dedicated ODCs, with sufficient numbers to cover a 24/7 rota. These professionals should be readily available and easily contacted, with dedicated time for their duties. They must be appropriately trained in bereavement counselling and empathetic family approaches, and be fully informed regarding the relevant national legislation and guidance. ODCs should be responsible for the regular submission of donation activity data, and have an identified clinical lead to whom they report. They also have a key role in the education of the wider hospital staff and local community.

All staff working in areas where there may be potential donors should receive regular training to ensure that they are alert to such circumstances and know how to contact the ODC. ICU staff are a priority in this regard. Regular training of hospital staff has been shown to be an important factor in increasing the rates of deceased donation(24,25).

Every end-of-life care pathway should include consideration of organ donation. In accordance with EU Directives(26,27), a secure registry with the details of all possible donors, living and deceased, must be established by the NTO. This should be readily accessible by all members of the donation team. The evaluation of deceased donors must be undertaken by trained specialists or under the supervision of a trained specialist, and according to internationally approved criteria(3). Evaluation determines the suitability of the deceased person generally, and the suitability of specific organs. There should be standardised questionnaires and protocols in place for each step of evaluation. Only a few conditions completely preclude organ donation and many conditions will not be a complete contraindication. Evaluation involves an assessment of acceptable risks and, if there is doubt, a referral should be made to the ODC for their opinion. During organ retrieval further evaluation of organ quality can be made, and expert opinion sought regarding any unexpected findings.

In deceased donation cases will occur where there is a legal requirement for the coroner (or equivalent) to investigate the cause of death. As far as is possible, these circumstances should not pose an impediment to organ donation, and there should be arrangements in place with the coroner's office to facilitate organ donation. These arrangements may include a representative of the coroner's office being present at the retrieval operation in order to document the process and take photographs, thereby assisting the coroner in their investigation.

The pathophysiological changes that occur following brain death or circulatory death can cause severe end-organ damage. Donor management techniques mitigate against this damage and must be initiated as soon as possible once it is established that the patient is a potential donor(28). The type of management depends on factors including the circumstances of death and the organs to be retrieved, and involves a number of different techniques. Several internationally recognised documents provide guidelines on the management of deceased donors in the ICU(29,30). To facilitate prompt and effective initiation of donor management there must be clear legislation and guidance around the declaration of brain death, and

controlled and uncontrolled circulatory death. There must also be staff available who are experienced and approved to undertake the required tests, so that death can be recorded promptly.

Conversations about the diagnosis of death with the family and loved ones must be disengaged from conversations about donation. A good relationship must be established and the family must have understood the inevitability of death before the question of organ donation is raised. Prior to any conversation about donation the ODC should have checked the national registry to establish whether any opposition to donation has been registered. Discussions around organ donation may be highly emotional and stressful, and if they are to be successful in facilitating consent for donation they must be conducted in the most sensitive and empathetic manner possible. Staff must receive regular training in communication skills, family support and bereavement and be culturally competent. There should be dedicated space available, access to spiritual support and other comforts. Families must be assured that their loved one will be treated with the utmost dignity and respect. The ODC should take a leading role in these difficult discussions and evidence suggests that their involvement is one of the most important elements in gaining family consent(31,32).

There must be structured arrangements in place for organ retrieval so that it takes place in an efficient and timely manner. Retrieval should be achieved by a dedicated specialist team available 24/7 and able to convene at the donor hospital in as short a time frame as possible. There must be operating theatre capacity to accommodate them, and all the equipment they need at hand. The organ retrieval team needs to be supported by personnel who have the necessary skills and equipment available for organ preservation and storage. There are various techniques for organ preservation including static cold storage, normo- and hypo-thermic machine perfusion.

Storage of organs for transport should be undertaken according to nationally approved procedures and using approved preservation materials. Protocols must be in place to ensure appropriate verification checks on the contents of transport containers, and to ensure that all the necessary documentation is available. Traceability must be maintained at all times during the retrieval, packing and transportation process. Many organs will travel a considerable distance to the recipient hospital, and travel times may limit the viability of some organs, in particular hearts and lungs. There should be nationally and locally agreed provider organisations for transport who can demonstrate the capacity to maintain the integrity of organs during transport. Air transport may be necessary and there should be special arrangements in place to facilitate this.

Organ sharing between units and regions should be dictated by nationally agreed rules and criteria, coordinated by the regional offices of the NTO under supervision of the NTO itself. Organisations such as Eurotransplant facilitate international organ sharing, and membership of one of these exchanges schemes is advantageous in increasing the pool of organs for transplant.

Living donation (LD)

LD can provide an important source of organs, in particular, kidneys and livers. To maximise opportunities for organ donation and transplantation DD and LD should be seen as complementary (2,3,33). In the case of renal failure, a pre-emptive transplant (prior to the need for dialysis) from a LD should be the treatment of choice, and has many advantages: reduced ischaemic time, better graft survival and a decreased incidence of delayed graft function. International evidence clearly shows the excellent short- and long-term outcomes in LD, from both clinical and quality of life perspectives(34,36). With respect to livers, there is no alternative to transplantation in the case of terminal liver failure, and fulminant hepatic failure can lead to death in a matter of days.

Most LDs come from family or close friends. A small number of people become non-directed altruistic donors by donating an organ to someone they don't know. The safety and protection of LDs is paramount, and legislation must be in place safeguarding donors from exploitation, trafficking or other unethical practices. The WHO Guiding Principles on Human Cell, Tissue and Organ Transplantation(1), the Declaration of Istanbul(37) and the Council of Europe Convention against Trafficking in Human Organs(38) all provide standards and guidance.

The process of LD should be cost-neutral, and mechanisms should be in place to compensate donors for any financial or other losses resulting from donation. These include any direct expenses incurred (travel, accommodation, medical expenses) and any loss of income due to time off work. Such compensation may also include future medical expenses occurring as a result of donation, or increases in medical insurance premiums. Incentives may be offered such as prioritisation on the waiting list should the donor require a transplant in future, tax breaks or credits, and discounts on medical insurance.

Evaluation of suitability of the LD should be carried out by an appropriately qualified panel, and include a psychosocial evaluation taking into account the donor's mental health and resilience, and the risks of future psychological consequences. LDs must be fully informed of the risks and possible adverse consequences, and deemed to be competent and acting of their own free will. A number of internationally recognised documents give detailed guidance on the assessment of LDs(39–41).

All assessments for dialysis should include a discussion around the possibility of finding a willing LD. Poor communication and limited partnerships between referring specialists and the transplantation programme can pose a major barrier. Relationships must be built to help specialists understand more about the referral and assessment process. This is particularly important in relation to nephrologists who are responsible for the care of patients in receipt of dialysis. These clinicians have an invaluable part to play in the referral and assessment for LD(42–43).

Up to 40% of recipients will discover that their intended donors are incompatible with them(44). Under these circumstances the chance of achieving a LD can be greatly enhanced if these pairs join a kidney exchange scheme. These are large networks where recipients can swap donors, forming part of a chain which benefits everyone.

Comprehensive, life-long follow-up should be offered to all LDs. This is desirable, not just from an individual perspective, but also to add to the research base regarding the long-term sequelae of LD. Follow-up care should be provided by the transplant centre in the first few months, and thereafter, if it is more convenient, transferred to an appropriate local provider. A number of internationally recognised documents provide detailed advice on the follow-up of LDs(39–41, 45–47).

Transplantation

Transplantation requires close collaboration and cooperation between many different highly skilled professionals. It is severely constrained by the need to act swiftly in order to preserve organ viability. Transplant units must be adequately staffed to respond rapidly 24 hours a day, every day of the year. All staff must be specially trained and have protected time for their duties. The role of the transplant recipient coordinator (TRC) is crucial. TRCs should be distinct from ODCs, as their role is to coordinate the transplant processes, and support the recipients and their loved ones.

Transplantation requires specialist surgical teams comprising surgeons, surgical assistants, anaesthetists and supporting operating theatre staff. Nursing teams are needed to monitor patients in the post-surgical recovery period. In addition to surgical processes, a large multi-disciplinary team (MDT) is required to facilitate the assessment and monitoring of potential recipients, and provide pre- and post-operative care and long-term follow-up. The MDT will include appropriately trained physicians with expertise in immunosuppressive therapy, infectious disease specialists, diabetologists, specialist nursing staff, pharmacists, radiologists, dieticians, physiotherapists and any necessary psychological or social support. The MDT must be supported by administrative and secretarial support staff.

Listing

The demand for organs always exceeds the supply, necessitating organ-specific waiting lists which should be overseen by the NTO. Acceptance to the waiting lists should be dependent on nationally agreed criteria, and compliance with these must be monitored by the NTO. Many medical and psychosocial factors must be considered when assessing eligibility for listing and fitness for surgery. These are different for each organ due to the differing levels of urgency implicit in the failure of different organs, and the availability of alternative treatment. Factors determining graft and recipient survival also differ between organs.

Patients are usually referred from specialist centres to transplant units for assessment, which should take place promptly. The MDT should be involved from the outset and be instrumental in the decision to place a patient on the waiting list. Listing assessments involve multiple tests and interviews with a number of professionals. The main questions are:

- Does the patient meet the minimum eligibility requirements?
- Do they have a full understanding of the implications of the transplant, the risks and benefits?

Decisions must be recorded in a standardised fashion and communicated to the patient and

their loved ones in a timely manner. Listing criteria and reasons for listing or not listing must be completely transparent and fully discussed. Fully informed consent for the transplant must be obtained and recorded using specifically designed consent forms. Discussions around the acceptance of organs with specific risks should be undertaken prior to listing, and not when a donor becomes available as this could cause delays and compromise the viability of organs.

Reassessments must be performed at regular intervals to confirm ongoing suitability for transplant. Educational, physical and psychological support programmes should be available to support patients in optimising their health prior to surgery. If a patient has to be removed or temporarily suspended from the list, the reasons given must be clear, transparent and according to the nationally set criteria. Deaths while on the waiting list must be reported to the NTO promptly.

In cases of extreme urgency, for example, acute liver or heart failure, there may not be time to go through the full formal processes of MDT assessment and discussion. Such cases must be assessed on a case-by-case basis according to internationally respected clinical criteria, and fast-track provisions should be in place to allow for these circumstances.

Poor vascular access for dialysis may also be an indication for urgent listing. However, it is vital that this route to transplant should not be subject to inappropriate exploitation. Under these circumstances there must be arrangements in place for an independent assessment of the patient, and the final decision should be made by an expert panel under the remit of the NTO. A good example of practice in dealing with these difficult decisions can be taken from the Italian transplant programme(48).

The MDT will also frequently assess patients for a re-transplant. In the case of re-transplant due to graft failure, immune sensitisation makes it more difficult to find an organ that is likely to be tolerated by the recipient's immune system. National policies and procedures ensuring eligibility, fitness and understanding must be followed as with the first transplant.

Matching and allocation

The NTO is responsible for the national databases containing all the details of those awaiting a transplant, their blood group, HLA phenotype, immune status and other details. Donor units and transplant units must be fully integrated within this system, and the NTO must play a central role in organ matching and prioritisation. Excellent communication systems should facilitate close collaboration between ODCs and TRCs, supported by the NTO. There should be protocols available governing the process of offering and formal acceptance of organs for transplant. The guiding principles of the WHO state that rules for allocation must be 'equitable, externally justified and transparent'(1). Decisions regarding national allocation rules should be delegated to committees comprising medical, public health and ethics experts. Tissue type and antibody matching are clearly crucial elements, but other factors such as age, time on the waiting list and clinical urgency are usually taken into account. Different rules will apply to different organs. For example, in some instances of acute liver failure, patients may die within a few days, and a transplant is the only treatment option. Travel time must also be considered, and may become the deciding factor in the case of organs with a short viability period.

Peri-operative management

A trained member of staff must receive the organs and be responsible for the hand-over. They should verify that the organs have arrived in good condition with all the necessary documentation. As it is difficult to predict when a good match will become available there must be arrangements in place to call in recipients at short notice and transport them promptly to the transplant unit.

The transplant team must commence pre-operative work-up as soon as recipients arrive. This is essential to identify any new problems, and assist the surgical and anaesthetic team in perioperative management. Laboratory and radiology support must be available 24/7. Transplant recipients are frequently in poor health, with multiple comorbidities and taking many medications. Therefore, perioperative management is often complex, necessitating the input of many different specialists. National guidelines should be in place to help inform clinicians.

Transplant surgery

The transplant centre must employ an adequate number of surgical specialists to ensure availability 24 hours a day every day of the year. In addition to transplant surgeons, surgical teams will need sufficient anaesthetic and nursing support and access to operating theatres. Surgery and intra-operative care should be performed in accordance with internationally recognised best practice.

Post-transplant hospitalisation

The transplant unit must have sufficient ICU capacity to accommodate patients in the immediate post-surgical period. There are many possible complications and monitoring requirements, depending on the organ(s) transplanted and the underlying illness and comorbidities. Staff should be specifically trained to identify and manage any complications arising. Arrangements must also be in place for provision of post-surgical care to LDs.

Post-transplant follow-up

Following a successful transplantation, the priority is to maximise the outcomes in the long-term, and optimise graft function and survival. This requires a holistic approach, taking into consideration multiple factors and with the aim to maximise patient survival and quality of life, and minimise the possible complications. Follow-up comprises an early post-operative phase involving preventing acute rejection, optimising graft function and preventing opportunistic infections, and a later phase involving preserving graft function, ensuring adherence to medication, and monitoring the long-terms effects of immunosuppression(48). Initial follow-up should be provided by the surgical team and thereafter by a comprehensive MDT. Care may be transferred to local services under a shared-care protocol.

National guidelines based on international best-practice should be devised. There are a number of internationally recognised documents providing guidance as to the ideal follow-up arrangements post-transplant. These guidelines provide specific recommendations regarding renal(49–52), liver(53,55), and heart/heart-lung(56,57) transplantation.

Key clinical issues to be addressed include:

- Optimising immunosuppressive therapy.
- Medication adherence (with particular attention to children and adolescents).
- Identifying and managing the complications of chronic immunosuppression.
- Addressing drug interactions.
- Managing complications related to transplant surgery both in the short- and long-term.
- The detection, diagnosis and treatment of acute and chronic rejection.
- Screening and management of comorbid disease.
- The treatment of any infections: bacterial, viral and fungal.
- The diagnosis and treatment of bone and joint disease and haematological complications.
- Vaccination.
- Maximising mental health, social outcomes and providing social, dietary and lifestyle advice.
- Support for smoking cessation, alcohol use and any illicit drug use.
- Reproductive and sexual health support including pregnancy.
- Growth and development in children and adolescents.

On an operational level, the following issues must be taken into consideration:

- Comprehensive organ-specific follow-up must be offered at nationally agreed time intervals.
- Follow-up must be provided by MDTs including medical and psycho-social support.
- Sufficient clinical space with appropriate equipment must be provided.
- Rapid access to specialist laboratory, pathology, microbiology and imaging must be available.
- Shared-care arrangements should be available for patients who live far from the transplant centres and virtual clinics/telemedicine technology should be considered.
- Special protocols should be in place for children and adolescents, and their parents or guardians.
- Nationally agreed outcome measures must be recorded.
- Electronic records should be developed to facilitate communication and patient engagement.

Patient-centred care

Patient-centred care encompasses a number of core concepts(58–62). These include:

- Providing collaborative, personalised and well-coordinated care.
- According people dignity, compassion and respect.
- Respect of individual choices and preferences, values, culture, and religious beliefs.
- Inclusion of family and loved ones in the care pathway and in decision making.
- Taking account of emotional, social and practical issues in all decision-making processes.
- Making decisions with patients, not for them; mutual agreement on goals and expectations
- Ensuring prompt, full and transparent sharing of information.
- Improving health literacy, thus facilitating shared decision making.

Building collaborative, supportive relationships between the providers and recipients of care has been shown to improve clinical outcomes, especially in long-term, chronic conditions. Evidence shows positive impacts on medication compliance, emergency hospital admissions, resource allocation, patient satisfaction(58,63–66) and measures of quality and safety(67,68). Staff working in patient-centred environments are happier and more productive(69,70). A patient-centred approach has also been shown to build public trust and confidence in health care providers(71,72), and involvement of patients and their families in all aspects of service development and training helps to create user-friendly services and enhance relationships between clinicians and patients.

There are many different ways in which health systems have sought to achieve person-centred care:

- Providing tailor-made, holistic and multidisciplinary support of all patients and families.
- The development of shared, interactive and easily accessible electronic health records(73).
- The development of telemedicine technology for follow-up of those in remote locations(74).
- Regular surveys of patient and carer experience(75,76).
- Involvement of patients, carers, and patient and carer organisations throughout the system.
- Appointing patient-centred care champions at a high-level(77).
- Ensuring patient and carer input to decisions around service planning and development.
- Making patient-centred care an integral part of the educational curriculums for all health care staff and involving patients, carers and related organisations in their development(78).

A patient-centred approach has many potential benefits in the context of organ donation and transplantation. It has been shown to have a dramatic positive effect on donation rates, both live and deceased(79,80). This philosophy will also help to prepare patients for transplant, aid understanding of the processes and the possible risks, aid in medication compliance and ensure inclusion of the person's wider social support system. It will also promote self-management in terms of monitoring of symptoms, and making behavioural changes with respect to lifestyle choices(63).

Quality standards and quality improvement

A quality and safety framework which covers every step of the processes involved in donation and transplantation is essential, and is a requirement of the EU directive 2010/53/EU on the standards of quality and safety of human organs intended for transplantation(81). The framework should be devised, maintained and overseen by the NTO, with the advice and support of experts in the field, and must be supported by national legislation.

Key components include:

- National standardised operating procedures and documentation covering all steps of donation and transplantation.
- A system for the accreditation, audit and inspection of all organisations involved in donation and transplantation, combined with processes to facilitate improvement.
- Local and national audit and research activities.
- A programme of approved ongoing national audit cycles used to inform improvements to services. For example, NHSBT runs an annual potential donor audit(82).
- Regular assessment of efficiency and effectiveness assessed by key performance indicators.
- Minimum annual, publicly available reports of activity and outcomes submitted to the NTO from all participating units; these should then be collated by the NTO to provide a national report.
- Traceability arrangements with unique identifiers for each donor.
- Vigilance systems able to respond rapidly to and learn from adverse events, including dissemination of information and fully transparent reporting.
- Systems to ensure confidentiality and protection of data.
- Systems to ensure: appropriate qualifications and training; senior supervision of key tasks (eg donor selection and evaluation); staff are able to attend training.
- Systems to collect and analyse follow-up and outcome data.
- Regular ongoing audit cycles and quality improvement initiatives.

The ODEQUS manual on quality criteria and quality indicators(2) provides detailed recommendations on quality criteria and indicators across different modes of donation.

Teaching, training and professional development

All staff involved in donation and/or transplantation must have a tailored CPD portfolio in which to record training activities and be subject to a regular (at least annual) appraisal process including a personal development plan. There must be clear supervision arrangements in place for all junior members of staff (or staff in training), and arrangements in place for senior supervision of key tasks such as diagnosis of brain death, donor evaluation and surgical processes. There should be dedicated training modules and clinical rotations available covering basic to advanced skills. It must be ensured that all staff are able to access and attend training events and keep their skills updated.

Internationally respected training opportunities are available for all professionals involved in organ donation and transplantation. The European Union of Medical Specialists (UEMS) provides comprehensive training and accreditation programmes, the European Society for Organ Transplantation (ESOT) offers extensive educational portfolios and support, and the Spanish TPM-DTI foundation provides many acclaimed training and research opportunities(83).

It must be emphasised that communication skills are a core competency. This is of particular importance for ODCs and ICU staff who take a lead in highly emotive discussions around the diagnosis of death, the withdrawal of life-saving treatment and the topic of organ donation. Issues such as breaking bad news, supporting the recently bereaved, and empathetic and sensitive family approaches must be addressed.

Education of the wider health community should be an integral part of the role of ODCs and their clinical leads. The training of staff in all areas where there might be potential donors (ICU/emergency/acute medicine) and of physicians responsible for providing care to patients with organ failure (in particular nephrologists) are of particular importance. ODEQUS suggest that at a hospital-wide seminar on organ donation should be organised at least once a year(2). The topic of organ donation and transplantation must also be included on medical and nursing school curricula.

Research and development

Research plays a vital role in helping to understand many diverse issues including the changing trends in diseases and associated risk factors, the efficacy (or otherwise) of different treatments and interventions, the impact of public health campaigns and the economic effect of different health programmes. Research is also vital to the discovery and assessment of new medicines and other therapeutics, and essential in determining their safety, efficacy and effectiveness(84). Many of the achievements in organ donation and transplantation over the past century can

be attributed to the extraordinary research efforts of pioneering clinicians and scientists such as Thomas Starzl and Jean Dausset(85–87). Research in this field continues to provide invaluable information and encompasses a wide range of disciplines including social and political science, psychology, anthropology, ethics and law, medical, surgical and related sciences.

An effective research and development programme should comprise the following:

- Ongoing local and national research activities.
- Collaboration with international research programmes such as Eurotransplant(88).
- Clear, nationally approved arrangements for ethical approval – for example, in the UK all research must be approved by the Health Research Authority (HRA)(89).
- A research division in the NTO which helps to ensure that research activities are promoted and supported – for example, in the UK NHSBT has a dedicated research and development division, working in close collaboration with the organ specific advisory groups(90).
- Funding of research initiatives and awarding grants and fellowships including participation in international schemes such as ESOT (91) or partnerships with private organisations funded by unrestricted educational grants.
- Publication and dissemination of results to all stakeholders locally, nationally and internationally – this is essential if the results of research are to become part of the formulation of national policy and lead to improvements in national strategy and clinical practice.

Scientific societies and professional organisations

All fields of clinical practice are associated with a number of scientific societies and professional organisations. These bodies have many important roles, and need to be recognised as an invaluable source of expert advice, opinion and support. They are well-placed to promote a collegiate environment, and can provide excellent opportunities for professionals from different disciplines and regions to meet regularly and exchange experience and ideas. They support research by funding initiatives, grants and fellowships, and help to disseminate the results via various publications and educational events. They play a central role in setting professional standards and codes of conduct, and in providing accredited training programmes. The development of guidelines and protocols should be made in collaboration with the relevant bodies, and their advice should be sought in matters relating to changes in legislation, regulation and complex ethical issues.

Lessons from international experience

The experiences of countries who are known to have successful solid organ donation and transplant systems can provide insights to inform the development of such a system in Greece. **An analysis and comparison of these existing programmes can give us an understanding of their key common elements, along with valuable knowledge about how each system functions in its unique political, social and economic conditions.**

Donation and transplant systems in all high-income countries face similar challenges, but they also differ widely in the solutions they adopt. Acknowledging these commonalities while recognising the need for nationally tailored approaches provides learning opportunities for any country developing its own donation and transplant system.

Our analysis of the donation and transplant systems in our five case study countries – Croatia, Italy, Portugal, Spain and the UK – led us to identify 10 common elements and explore to what extent these were key to their systems' success, and how. These elements are as follows: national reforms, backed up by continuous commitment; presumed consent legislation for deceased donation; public trust and a positive view of organ donation; a culture of professional engagement; national governance and coordination; international collaboration; reimbursement; auditing and quality assurance; a dedicated organ donation professional role; reducing demand for organ transplantation.

In this chapter we first present these common elements, and then briefly examine the 'next steps' undertaken by some of our case study countries.

I National reforms, backed up by continuous commitment

Our case studies illustrate the potential of national reform efforts. Countries that are successful today have substantially increased their donation rates via structural reform efforts in the past, typically following what has become known as 'the Spanish model'. These reforms can be narrowed down to a basic set of three measures implemented by Croatia, Italy, Portugal, Spain and the UK: a focus on donation after brain death (DBD); restructured and centralised national transplant authorities (see section 5); and the creation of a donor coordinator role in public hospitals (see section 9).

This basic set of measures can deliver a substantial improvement in donation rates in a reasonable time frame. Portugal, for example, restructured its national transplant organisation and appointed hospital donor coordinators in 2007. These changes were accompanied by increased training efforts and public health campaigns in the following years. Donation rates increased significantly from 24 per million of population (pmp) to 31 pmp within three years of implementation of these reforms. Croatia achieved even greater improvement. After a two-year implementation period for the role of donor coordinator, Croatia's donation rate rose from 2.6 pmp to 36.5 pmp within 12 years. Today, it has a rate of 40.2 pmp, making it a world leader in organ donation. This example illustrates that enormous success can be achieved despite a challenging starting point.

Success stories in Croatia and Portugal also illustrate that these national reforms can be implemented in settings with relatively few resources. Croatia spends €1,272 per capita on health care, placing it at the low end of the European average of €2,887 per capita. Similarly, Portugal spends less on health care than the European average and was also disproportionally affected by the financial crisis of 2008. Despite these financial constraints, an improvement in donation rates and even a world-leading position in organ donation is possible.

However, sustainable success requires continuous commitment. In the fallout from the late-2000s' economic crisis, the Portuguese authorities cut funding for organ donation. As a result, the organ donation system faced substantial financial problems and a slow downwards trend in organ donation rates was exacerbated significantly. In part due to renewed commitment, and in part due to a pre-existing well-established procurement and donation system, Portugal has subsequently recovered from this drawback and reached donation rates of 33.4 pmp in 2018. Likewise, the Spanish system has faced challenges in becoming and staying the world leader in organ donation. A (welcome) reduction in traffic accidents in turn reduced the number of potential donors from brain death. To maintain – and increase – donation rates, the Spanish authorities placed greater emphasis on DCD, expanded their donor eligibility criteria and focused on identifying potential donors outside of intensive care units (ICUs). Combined with a system of quality assurance and benchmarking, Spain has created a culture of continuous improvement that has helped it sustain its world-leading position in organ donation. As a result, Spain achieved donation rates as high as 49 pmp in 2019(1).

Taken together, our case studies send a positive message: substantial and immediate improvement can be achieved with a set of basic reforms, despite financial constraints. However, sustained success requires continuous improvement, and continuous financial and political commitment.

II Presumed consent legislation for deceased donation

A presumed consent policy that respects the wishes of close relatives is a common feature across successful organ donation and transplantation systems but requires accompanying structural reforms to take effect.

Presumed consent policy in the academic literature

Presumed consent legislation (or opt-out legislation) considers every citizen as an organ donor, unless an objection to donate has been stated during their lifetime. The concept has gained popularity as part of the ´nudge` policy approach described by behavioural economist Richard Thaler and is often controversially discussed in the context of organ donation reform(2–4).

There are a number of academic studies which attempt to determine the effect of various different forms of consent legislation on donation rates(5,6). The results of these studies are mixed; some show a positive effect of opt-out policies on deceased donation(5), and others are less conclusive(6). There are major methodological challenges to performing such studies as other factors often change alongside changes in consent policy legislation, making it difficult to directly attribute consent policy changes to changes in donation rates.

Contextual factors also vary widely between different jurisdictions, and cross-country comparisons such as that performed by Arshad et al., attempt to account for potential confounding factors using multivariate regression analysis. However, it is extremely difficult to identify all potentially relevant variables in every country-specific context(6). Therefore, the academic literature does not yet provide robust supporting evidence for any specific legislative approach, and it remains challenging to make any final conclusions regarding the impact of consent policies on donation rates.

It is important to note that the categorization of consent systems into opt-in and opt-out does not sufficiently reflect policy practice. The distinction between these two approaches is not always clear-cut. Multiple variations exist between a strict opt-out and a strict opt-in system depending on each country`s legislation, non-donor registries and clinical practice(6).

Implementation of presumed consent policy

Regardless of the academic debate outlined above, and reflecting the aforementioned variable interpretation of consent systems, all the successful countries in our analysis share a so called ´soft` opt-out approach that can be seen as a middle way between opt-in and opt-out. A ´soft`

opt-out system does follow the principle of considering citizens donors unless otherwise stated, but requires family consultation before donation and will not pursue donation in the case of objection by close relatives. In this way, organ donation as the standard rather than non-donation is communicated, and sets the tone when discussing organ donation with family members. At the same time, respecting the wishes of close relatives is believed to prevent resistance and mistrust which are detrimental to the success of any organ donation system.

All countries in our analysis follow some variation of this ´soft` presumed consent policy. In Wales 'soft' opt-out legislation was enacted in 2015 following evidence of favourable public opinion and an international review of evidence which the Welsh Government felt supported the adoption of this policy for the Welsh context(7). England and Scotland followed suit in 2020 after Wales reported good experiences subsequent to the change in legislation. In Spain, presumed consent legislation is part of the regulatory framework, but in practice donation is not pursued if the wishes of the donor cannot be determined (arguably, even making it an opt-in system). Consultation with the family also plays a major role in the Spanish system. Similarly, family objection will prevent organ donation in Croatia, Italy and Portugal. However, in Portugal, an exception is made in the case of an urgent organ request, when donation can take place without obtaining family consent provided the donor is not listed in the national non-donor registry. All things considered, a presumed consent legislation combined with flexible clinical practice and involvement of the family is a feasible policy approach which is widely practiced internationally.

Structural reforms and transparent communication are essential to ensure the success of any consent policy

Despite the above-mentioned presumed consent policy approach being a common international model, what is strikingly clear from this review is that in order for any consent policy to be successful, it must be nested within a wider set of reforms. This is most prominently illustrated by the Spanish example. Although opt-out legislation was established in 1979, a significant increase in organ donation rates was not reported until after the authorities implemented the key reforms outlined in the sections above. These reforms are regarded as the main reason for the success of the Spanish system rather than its consent legislation(4,8).

Finally, changes in consent legislation need to be communicated carefully and in a transparent way in order to avoid misconceptions or unintended consequences. They should be discussed thoroughly by relevant stakeholders, and accompanied by health-literacy campaigns in order to increase knowledge, acceptance and trust in the organ donation system.

III Public trust and a positive attitude towards organ donation

All five of our case study countries are conscious of the need to avoid strict presumed consent legislation in order to build public trust and maintain goodwill towards the donation and transplant system: establishing a positive view of organ donation among the country's population is crucial for the system's success. In particular, a culture which encourages a view of organ donation as altruistic and desirable plays a significant role in optimising donation rates. All the countries whose systems we have examined succeed, to varying degrees, in promoting a favourable image of organ donation among their population.

We identified four areas that are important when dealing with public attitudes and trust towards an organ donation and transplant system.

Building relations with the media

The media's perspective on a transplant system has a powerful influence on public attitudes. Media coverage of transplant scandals can be devastating for public trust, such as the case of Italy's unintended transplantation of organs from an HIV positive individual(9). Therefore, building positive relationships with the media is crucial to winning public support. Positive media coverage is associated with influencing attitudes, improving knowledge and awareness, and, most importantly, increasing donation rates(10). Spain and Portugal provide excellent models of how to forge these links with the media. Both countries have established good relations with journalists, scheduling regular meetings to share transplant information and updates. In Spain, the national transplant organisation is directly accessible to journalists as well as the general public via a 24-hour phone line, thereby creating a direct means of communication without any intermediaries. Overall, the goal is to be transparent and promote a positive image of organ donation.

Building on personal stories

Facilitated through positive relations with the media, there is power in using personal stories to convey the importance of organ transplantation. In Italy, public opinion on donation and transplantation became increasingly favourable following the tragedy of a young American tourist, Nicholas Green, who was killed in an attempted car robbery in southern Italy(11). His family's decision to donate the child's organs in Italy sparked the well-known L'Effetto Nicholas ('the Nicholas effect'). L'Effetto Nicholas continues to be sentimentally associated with organ donation and is said to represent the national consciousness Italy now exhibits in solidarity for organ donations(12,13).

Similarly, recent opt-out consent legislation in England was personalised and sentimentalised. The legislation has become known as Max and Keira's Law after the little girl who was fatally injured in a car accident and the little boy who received her heart(14). With the consent of their families to use their stories, the popular press ran a prominent and successful campaign to

change the law to enact the opt-out principle. Personal accounts which enable the public to identify with the poignant mixture of tragedy and joy in such situations seem to have made a significant impact in multiple countries.

Education

Successful donation and transplant systems do not limit their education and training sessions to health care professionals or those directly involved in the transplant process. To further promote good relations with the media, in Spain and Portugal, selected journalists are invited to join professional training and education sessions, which include specific workshops for journalists. Italy's national transplant centre (CNT) has developed education programmes for children and adolescents in primary and secondary school; for example, Salvo e Gaia ('a gift worth a lifetime') is a national campaign that educates children on the human body and includes the subject of organ donation in its educational objectives(15). Likewise, in Portugal, transplant authorities prepare special presentations on organ donation in schools and are working together in community events with stakeholders such as the Catholic Church and patient organisations. It appears that targeting educational endeavours to a wide range of audiences helps to create and maintain good will towards donation and transplantation in these communities.

Public awareness campaigns

All five case study countries invest in mass public awareness and media campaigns. The UK developed the 'Pass it On' campaign aimed to highlight the topic of organ donation and stimulate conversations between families and friends. Croatia launched 'New Life as a Gift' in 2005 and Italy's campaign was entitled 'Diamo il Meglio di Noi' ('we give the best of us')(15). Both Portugal and Croatia have introduced national organ donation days for annual reminders about collective national responsibility(16).

All four of these areas are important and mutually reinforcing. One meta-analysis estimated that communication campaigns promoting organ donation, on average, increase signing up for donation registries or individuals informing their family of their donation wishes by 5%(17). Interestingly, it is possible that independent media coverage has a more direct impact on public opinion and donation rates than large public campaigns. This is especially true for targeting specific groups within a population who may respond better to culturally sensitive messaging. Additionally, for outcomes such as intention to donate and donation rates, interventions that involved direct communication and ongoing media coverage showed better outcomes than general media campaigns(17).

Overall, a multi-pronged long-term campaign strategy including television coverage, radio commercials, newspaper articles, social media and additional educational programmes targeted towards the general population and specific populations can have substantial effects on intention to donate rates. Positive media coverage, widespread educational endeavours and public awareness campaigns have fostered a favourable attitude towards donation entrenched in civil solidarity and responsibility.

IV A culture of professional engagement

In addition to creating a positive attitude towards donation among the general population, successful donation and transplant systems have managed to engage health care professionals, national authorities and political representatives in a positive way. A positive culture of professional engagement was described variously across our case studies as 'trusted interactive collaboration', 'healthy competition' or 'loyal competition' by country experts from Croatia, Portugal and Spain, respectively. These descriptions indicate a collaborative approach as well as a drive to keep improving the system.

As a global leader in organ donation, pride in the national leadership was an additional cultural factor in the Spanish system. Achieving a sense of unity and commitment to a common goal has been particularly important in the context of a complex national political situation in Spain.

A professional culture as described in our case studies develops over time and cannot be attributed to a single policy. However, we identified three factors that play a role in creating a culture of engagement among professionals in the field of organ donation.

Creating opportunities to build relationships

Multiple experts emphasised the importance of building relationships between involved professionals. Training programmes, especially when they bring together professionals from across the country, can help to build networks between professionals of different hospitals that have a positive effect on the system in general. In addition, regular evaluations as part of a systematic quality assurance system not only improve quality but also help to foster long-term relationships between national authorities and involved professionals at the hospital level. Similarly, meetings and discussions that involve professionals from the hospital, regional, national or international level help to facilitate communication between different levels of the system.

Getting clinicians on board

Health care professionals have multiple tasks requiring their attention. Drawing attention towards organ donation requires commitment.

Experience from Croatia points towards the importance of engaging clinical leaders in the field of organ donation, including actors who are not traditionally considered in the transplant process – in particular, the Croatian authorities targeted radiologists and neurologists to help diagnose brain death, before then focusing on other clinicians. Promoting and highlighting clinical success such as the first organ transplant in a hospital can help to motivate senior clinicians. In addition, positive effects of organ donation for participating hospitals should be emphasised. Hospitals that participate in organ donations and transplantations require a certain level of infrastructure, professional skills and cooperation. Other areas of care can benefit from efforts to achieve this level of competence for the purpose of organ donation.

Additionally, training of donor coordinators and of other staff members by donor coordinators helps to engage non-senior staff in organ donation. Health care systems should enable clinical

rotations between centres in order to foster the exchange of best practice and expand focus on organ donation. Medical, nursing and related curricula should incorporate aspects of organ donation and placements should be offered in order to recruit clinicians into the field of organ donation. Finally, receiving feedback from transplant centres after a successful transplantation can further motivate professionals in donor hospitals to pursue organ donations.

Involving relevant stakeholders

In order to achieve a culture of collaboration it is important to involve all relevant stakeholders. As pointed out before, political commitment is crucial for the success of organ donation. Similarly to health care professionals, political representatives have limited time to deal with a myriad of relevant policy areas. Pointing out clinical effects on patients in need as well as cost-savings can be helpful. Additionally, national transplant organisations should include professional associations and patient organisations in their policy processes in order to build broad national support for improving organ donation.

V National coordination and governance

A common theme throughout all the case studies is that national coordination and governance plays a prominent role in organising a successful donation and transplant system. Each country we examined has a strong central body that takes responsibility for guiding the system at a macro level. Table 2 provides a summary of the national transplant organisations. It should be noted that unlike many European countries whose donation and transplantation programmes are governed by a designated national transplant organisation (NTO), the Croatian transplant programme is governed, coordinated and overseen by the Ministry of Health directly. In general, the role of national organising body (whether an NTO or ministry/department of health) is to coordinate transplantation and donation nationally and internationally. They are responsible for writing, adapting and releasing national guidelines, ensuring quality standards, managing waiting lists and registries, promoting training activities, organising media campaigns and providing support and information to health care professions who are undertaking the organ procurement or transplant processes. But here too we see variation in composition, activities and responsibilities.

Table 2: National transplant organisations in country case studies

Country	National transplant organisations
Croatia	Republika Hrvatska Ministarstvo zdravlja
Spain	Organización Nacional de Trasplantes (ONT)
Italy	Centro Nazionale Trapianti (CNT)
Portugal	Instituto Portugues do Sangue e da Transplantação (IPST)
United Kingdom	NHS Blood and Transplant (NHSBT)

Some countries have more centralised systems, where responsibility for every step in the organ donation process falls upon the NTO or ministry of health. This ensures unity, clarity and consistency of transplant messaging. This is the case with NHSBT in the UK who are responsible for the organ donation register and national transplant database; the employment and professional development of specialist nurses, clinical leads and organ retrieval teams; and establishing local organ donation committees. Eight solid organ advisory groups, the Department of Health, commissioners of services, clinicians and scientists can come together to review activity and outcomes, discuss policy and research, and liaise with key stakeholders. This centralisation of organ transplant services, especially the allocation and retrieval process, has helped to maximise coordination and organ retrieval potential.

Croatia is also a model for centralised transplant activation, for smaller countries with resource constraints. The countrywide Transplant Network is represented by one national transplant coordinator/team; a key donation person/team at each of the 32 public hospitals; five transplantation programme directors in teams at the university hospitals that perform transplants; and two tissue-typing affiliated labs. This highly streamlined and efficient system manages to provide almost all the transplant activities of larger transplant organisations and moreover does so 24/7.

Other countries have established independent regional transplant teams that function fairly autonomously to detect, procure and transplant organs in their own communities. The NTO in Spain reflects the organisation of the country's political system, with 17 regional offices, each representing one of the 17 Spanish autonomous regions. Along with the NTO, they provide an intermediate level of organisation between political decision-makers and hospital personnel. Regional offices and the NTO come together in commissions to agree on policies dealing with organ donation and transplantation(18). Portugal is very similar in that it has established regional organ procurement offices that are based in university hospitals. While they follow national guidelines from the IPST, they are also largely autonomous in their day-to-day operation. The idea is that regional offices are better attuned to specific regional needs. These offices work closely together with hospital coordinators to coordinate donor assessments in cooperation with histocompatibility centres and allocate locally retrieved organs according to national guidelines, transporting them to transplant units in their area. However, they also work in close partnership with the IPST, especially with respect to vulnerable populations that may not be well served by resources in the local region. Italy too has regional or interregional transplant centres (CRT) which are public structures that coordinate procurement, donation and transplant activities at the regional level. The role of the CNT in Italy is to issue guidelines, organise training and guarantee safety and quality surveillance. The CNT also directly manages the organ donation and transplant process in specialised areas: emergencies, paediatrics, subgroups of wait-listed patients and the national reallocation of suboptimal organs(19). The CNT provides a national allocation office that is available 24/7 to support the detection and referral of possible donors. Regional coordination is preferred in countries where high regional independence is the norm or regions have larger geographical areas.

It is important to have national coordination for high-level governance of transplant activities, but it is also important to adapt a transplant system to the existing political, economic and

health care realities. In certain cases, a smaller country with fewer resources may opt for a highly efficient but small team of well-trained professionals. In another context, where there is existing regional infrastructure, it may be useful to delegate and grant autonomy to regional offices for the day-to-day management of organ procurement and transplant activities. Regardless of the way of structuring the system, good governance and central leadership capable of seeing 'the big picture' is needed to fulfil the main activities/goals of a transplant system while also maintaining accountability, quality and safety standards.

The path to developing a competent and trusted NTO is different, then, in each country. Croatia is an example of a situation where the Ministry of Health was initially responsible for lending authority and resources to enable the national transplant programme to develop. In countries with strong regional independence, an NTO may gain authority by negotiating strong partnerships with other organisations; regional bodies, clinical colleagues or advocacy groups are potential candidates. Another strategy may be to use the support of international transplantation organisations to help build a national transplant agency, which will be discussed in the next section. Built up over time, the national transplant agencies in our case studies are credible in their own right and have also managed to have close ties with multiple international and national organisations as well.

VI International collaboration

One common factor that has helped to achieve successful national reforms across our case studies is international collaboration. Collaborations between countries offer multiple benefits to a country's donation and transplant system. We have identified several international transplantation groups (presented in Table 3) that can support national programmed and can promote collaborations. Apart from international transplantation groups, EU programmes are also valuable resources.

Table 3: International transplant collaborations

Eurotransplant	Scandiatransplant	South-Eastern Europe Health Network
Austria	Denmark	Albania
Belgium	Finland	Bosnia and Herzegovina
Croatia	Iceland	Bulgaria
Germany	Norway	Croatia
Hungary	Sweden	Republic of North Macedonia
Luxembourg		Moldova
The Netherlands		Montenegro
Slovenia		Romania
		Serbia

First, collaborations can help ensure optimal donor-recipient matching, more efficient management and reduced loss of donated organs. Sharing transplant pools provides benefit for specific populations which may be especially vulnerable. Croatia, despite its impressive domestic transplant numbers, still engages in international collaborations – for example, it is part of the Eurotransplant – which results in benefits to its paediatric patient population.

Second, being part of an international organisation can serve as a means to maintain high standards of safety, quality assurance and fair allocation. For example, aiming to be part of Eurotransplant helped ensure laboratory testing was above par in Croatia as it was required to meet the quality standards set out in the ODEQUS. Furthermore, experience from Croatia shows that having a third party leading the allocation process in the most transparent fashion can build trust within the donor population.

Third, partnerships offer a way of exchanging best practice, facilitating education and training and achieving accreditation. For example, the 'transplant procurement management' training institute in Barcelona cooperates with multiple countries throughout the world in order to set up and accredit national training programmes, while also sharing expertise by inviting international colleagues (especially from Portugal and Italy) to complete parts of their training in Spain. Additionally, Italy has become known as a leader for quality and safety standards for which they produce international guidelines.

Aiming for cross-national collaboration with international transplant networks and building on EU resources is a key factor for building a success system.

VII Reimbursement

A successful donation and transplant system reimburses the health care professionals and processes involved in the system. However, our case study countries differed in their methods of funding. To a large extent, this is due to the differences in health care system and the economic circumstances of each country. Reimbursement to hospitals for procuring organs and transplanting organs is essential. Recognising the importance of reimbursement, hospitals in Spain receive an annual budget for donation purposes. Reimbursement is based on the previous year's donation activities and compensates for the significant resources required(20). In the UK, most transplant activities are commissioned and funded centrally by NHS England as they are classified as 'specialised services' (in contrast to most health services in England which are commissioned under local agreements). Specifically, for renal transplantation in England payment is made to hospital Trusts (a Trust is a legal entity that provides health care services within the NHS) as the processes involved in renal transplantation are subject to the national tariff (the national tariff covers in detail all the different possible scenarios envisaged for billings), with some adjustment for varying local expenses(21).

In Croatia, the National Transplant Programme (which includes the national waiting list management fee, administrative and logistic costs, training costs and organ procurement transportation costs) is directly funded by the Ministry of Health budget. Since 2006, the DRG

system has been complemented by a code assigned for deceased donor-management-related costs. This cost reimburses donation-related costs beyond a hospital's regular operation limits(16,22). Common to all systems is ensuring that such payments account for costs outside of a hospital's regular budget to make organ donation a financially neutral clinical procedure, and not a financial burden.

Reimbursement for professionals involved in the transplant process must also be considered (i.e. ICU specialists or key donation coordinators). In Croatia, the Ministry of Health has issued detailed instructions for how hospitals should pay key donation persons/teams and procurement and transplant teams. The payment for key donation persons is provided by the hospital from the reimbursed fee received for donor management related costs. Italy, Portugal and Spain have similar professional reimbursement schemes given similarities in their health care system with many physicians per capita, but relatively low basic pay(23,24).While not essential to success, a variable reimbursement scheme that allows for financial incentives to hospitals and health care professionals who undertake organ donation and transplant activities is favoured in the Spanish Model(25). Transplant professionals have individual compensation arrangements that can vary between regions and centres. This type of system provides some incentives to help stimulate transplant activities.

Portugal exemplifies the importance of ongoing financing of organ donation and transplant activities. Donations in Portugal were at an all-time high in 2009 with 35.1 organs pmp. However, the reduction in financial support by 50% in 2011 following the economic crisis(26) put the donation and transplant system under enormous pressure: training was reduced, staffing was short on donation teams, there was a reduction in transplant-specific beds and lack of resources for diagnoses of brain death(21). As a result, collections and transplants fell by 19% between 2011 and 2012 – an objective lesson in why continuous and sufficient reimbursement for performing organ donation and transplantation is crucial in achieving successful structural reforms.

Every country must finance its donation and transplant system and reimburse transplant activities and those who undertake them. The example of Portugal, which has since rebounded, serves as a reminder that no matter how a donation and transplant system chooses to organise its finances, it must consider also sustainability.

VIII Auditing and quality assurance

A common factor across successful organ donation and transplant systems is a national quality assurance system. The national transplant organisations in Croatia, Italy, Portugal, Spain and the UK all take a systematic approach to assessing and improving quality in donation hospitals.

Typically, donor coordinators document and report standardised hospital data, often based on the quality indicators for organ donation summarised in the ODEQUS project. The indicators typically reported on include numbers for the following: deaths in ICUs, brain deaths, potential donors, actual donors and refusal rates; as well as reasons for non-retrieval or non-use of

organs. Additionally, outcome data can be collected for several years post-transplant.

This data collection is then analysed in both internal and external audits. Based on regular reports, national authorities can review local hospital performance, compare and benchmark performance across hospitals and engage with local staff members to identify barriers for improvement and give feedback. This process helps to systematically identify quality issues. It also helps to identify best practice and direction for future policy reform.

A systematic approach to collect, analyse and compare data on local hospital performance can help to improve donation rates locally and inform policy nationally.

IX Dedicated organ donation professional role

Creating a professional role with responsibility for facilitating organ donation, and recruiting intensivist staff to perform that role with dedicated time to fulfil it, underpin the success of organ donation and transplantation reform. The striking increase in Spain's rates of organ donation dates back to the authorities' introduction of the role of organ donor coordinators into every public Spanish hospital. Following this model, assigning dedicated clinical leadership 'on the ground' has formed part of successful reform efforts across all our case studies and is promoted as part of best practice in the EU action plan on organ donation(27). Each of our case study systems has an established professional role for coordinating organ donation with someone appointed to that position in every single public hospital. The importance of this approach was highlighted during our stakeholder interviews when success stories and high donation rates at particular hospitals were often associated with the personal commitment of individual coordinators.

Concept and tasks

Establishing a professional role to facilitate organ donation in every hospital serves two major purposes. First, for all the professionals involved, assigning local leadership for the process of organ donation clarifies whose responsibility the process is. Second, the role ensures strong commitment for the multiple steps involved in a successful pathway to organ donation.

A key donation person facilitates this pathway by coordinating donor detection, maintenance and evaluation, and by handling related legal matters. They ensure the most critical step of consulting with the family takes place in order to obtain consent for organ donation. They train their colleagues, so promoting local awareness of organ donation. They also act as a link to national policy efforts to increase organ donation. Responsible for documenting local statistics such as the numbers of potential and actual donors, as well as reasons for family refusal and for organs not being used, they build a database for national audit, performance and benchmarking systems.

Countries label the role differently, whether key donation person, transplant coordinator, organ donor coordinator or hospital donor coordinator. However, certain characteristics are the same across countries. Those who fill the role are typically recruited from in-house staff, have a

background in emergency or intensive care and are fully embedded in the local clinical environment. The latter helps to facilitate communication with other relevant professionals. The level of experience required for the role also varies between countries. While Italian coordinators are typically appointed early in their career, Croatia appoints more experienced intensivists.

The role can also be held by different professions. In the UK, specialised nurses fulfil the key tasks set out above and are supported by senior physicians with dedicated time to promote organ donation. In most of our case study countries, however, the role is held by physicians, potentially supported by nurses in larger centres. Thus, both the level of experience and profession can vary according to local circumstances.

Dedicated time

A key component of assigning the role of a donation coordinator is ensuring that the person appointed has dedicated time to fulfil its tasks, which will not get subsumed by other clinical duties. This can be achieved whether the role is full- or part-time. While Italy has had greater success with full-time coordinators, Spain also assigns part-time responsibilities to professionals who keep working as regular clinicians. The latter model allows clinicians to remain fully embedded in their local clinical environment and enables coordinators to be appointed even in small hospitals. A related ODEQUS quality indicator suggests that a minimum of 10 hours per week should be dedicated to the purpose of organ donation.

Reimbursement is another critical factor in ensuring dedicated commitment to the purpose of organ donation (see section 6 above). In the UK professionals are funded centrally, whereas Croatia reimburses coordination activities as part of its funding for organ donation and maintenance. Receiving independent funding also creates autonomy from other areas of clinical care.

Training

Specialised training programmes ensure that appointed donation professionals are properly trained to fulfil their responsibilities. All our case study countries offer specialised training, whether organised centrally or locally. The Transplantation Procurement Management-Donation and Transplantation Institute (TPM-DTI) in Barcelona can be seen as an international training model. The institute is closely connected with the University of Barcelona and was set up to train transplant coordinators in Spain. Today, it specialises in providing training across multiple areas of organ donation and cooperates with countries throughout the world to share expertise and accredit national training programmes. Training donor coordinators from Spain and Portugal remains a central function of the institution. In particular, training in consultation with the family is crucial for reducing family refusal rates and ultimately increasing organ donation rates.

X Reducing demand for organ transplantation

Successful donation systems aim not only to increase the supply of available organs for transplantation but also to reduce the demand for transplantation by means of various prevention measures. These include general programmes to reduce common risk factors for organ failure, targeted approaches to detect and treat underlying conditions and managing care for patients with severely reduced organ function.

Primary prevention measures should target common behavioural risk factors for organ failure. As illustrated by Table 4, public health efforts to promote exercise, improve diet and limit tobacco and alcohol consumption tackle the most important risk factors for renal and liver failure. Taking this approach, Croatia has introduced a 'Living Healthy' campaign to address poor habits and lifestyle through educational initiatives addressing nutrition and exercise in schools and workplaces. Similarly, Italy has started a public health campaign called 'Gaining Health: Making Healthy Choices Easy' and participates in the World Action on Salt, Sugar and Health programme.

The Italian authorities also emphasise secondary prevention for chronic kidney disease. Training general practitioners and other health care professionals in the early detection of chronic kidney disease is seen as an important step to prevent a transition to end-stage renal disease. Testing should be performed for patients with risk factors such as diabetes or family members with chronic kidney disease and can be pursued with relatively inexpensive blood- and urine-testing. Thus, actions to improve early detection of underlying conditions in existing care settings help to reduce the need for organ transplants.

Table 4: Common aetiologies in chronic renal failure and liver failure

Common aetiological factors in chronic renal failure	Diabetes Hypertension Obesity (increasing risk of diabetes and hypertension) Smoking Long-term use of some medicines e.g. lithium, non-steroidal anti-inflammatory drugs
Common aetiological factors in liver failure	Alcohol-related liver disease Non-alcoholic fatty liver disease – often due to obesity Cirrhosis due to viral hepatitis B or C Acute hepatitis – viral, alcohol-related, drug-related (e.g. paracetamol overdose)

Targeting demand also includes managing patients in the later stages of organ failure. A successful example of managing care of patients with end-stage renal disease comes from Portugal. Faced with a high number of patients with end-stage renal disease and patients receiving renal replacement therapy, mostly from private providers, Portugal restructured its dialysis care. Essentially, it replaced its existing fee-for-service scheme with a capitated up-front payment that includes a pay-for-performance component and an information and monitoring system. Providers now receive a comprehensive bundle payment covering the costs of dialysis per patient per week. This payment is combined with a set of quality indicators. A national dialysis monitoring commission uses these quality indicators to monitor provider performance as well as general trends in patients with end-stage renal disease. The commission is comprised of representatives of professional, patient and hospital associations, as well as government officials including from the IPST. Over time, the commission has developed a more strategic role in shaping a combined policy response to address end-stage kidney disease. In addition, although co-payments were reduced, travel costs continue to be supported by the health care system and barriers to specialist or family physician referral have been reduced in order to improve access and coordination between different providers. Thus, taking a strategic approach to the care of chronic conditions that can lead to organ failure complements preventative efforts to reduce demand for transplants.

Next steps: further possibilities for reform

A major part of the success of the donation and transplant systems in our country case studies is based on the factors outlined above and a focus on donation after brain death. However, some countries have also implemented additional, more sophisticated reforms as part of their continuous improvement process. We identified several measures that can be clinically, ethically or logistically challenging but have helped organ donation systems achieve the next level.

Eligibility criteria

Spain, for example, has expanded its eligibility criteria for donation in terms of age and medical suitability. The criteria now allow for more flexibility in accepting organ donations from donors over the age of 65 or who exhibit more frailty. Such donations are age-matched and contribute significantly to kidney donation rates in Spain. In addition, the Spanish authorities have established national evaluation criteria for donors and introduced a programme to foster the use of organs from non-standard risk donors – for example, hepatitis C-positive donors. As a result, in 2019 a total of 101 transplants were successfully performed from hepatitis C-positive donors to hepatitis C-negative recipients(1). These changes are supported by a 24-hour consultation service provided by the NTO that offers advice and a second clinical opinion on the criteria for medical suitability.

Scanning potential donors outside of ICUs

Additionally, professionals in Spain place a greater focus on potential donors outside of ICUs. Analysing end-of-life care practices, the Spanish authorities found out that a significant number of potential donors die outside of ICUs where awareness of the possibility of organ donation is low. In order to technically facilitate organ donation from these patients, there is the possibility of starting intensive care for them (including continuing or starting ventilation) specifically for the purpose of facilitating organ donation (elective, non-therapeutic intensive care). The authorities have put effort into creating, harmonising and implementing guidelines for this strategy. It has also been integrated into the curriculum for transplant coordinators and relevant medical staff. It is estimated that 24% of donors in Spain are identified outside of ICUs and admitted for donation purposes(28).

Encouraging donation after circulatory death

Encouraging donations after circulatory death (DCD) is a further means of increasing the number of potential donors. Technical advancements in the field of mechanical perfusion with ECMO (extracorporeal membrane oxygenation) devices have improved graft survival and removed obstacles such as long no-touch periods that reduce organ quality. These developments have enabled a new focus on DCD. In 2019, 32% of all donations in Spain derived from such donations(29). In the UK, DCD accounted for 42% of all donations in 2018/2019(30). Thus, establishing DCD can significantly contribute to national donation rates.

However, facilitating DCD requires overcoming legal as well as technical challenges. First, legal and technical guidelines need to be developed. Circulatory death needs to be defined, DCD permitted and technical details such as the duration of a no-touch period or the possibility of pre-mortem heparinisation and canulation discussed from an ethical perspective. Based on our set of case studies, a comprehensive consensus building process is required before answering these questions. The UK, for example, included government departments, transplantation societies, intensive care societies and the Academy of Medical Royal Colleges in the process of writing guidance and consensus documents. Similarly, the introduction of controlled DCD in Spain was preceded by broad stakeholder involvement.

In addition, advanced clinical procedures involving machine perfusion technology require investment in ECMO machines, the establishment of local protocols and training of health care professionals. Ideally, controlled and uncontrolled DCD programmes build on well-functioning organ donation protocols that have been developed by local multidisciplinary teams.

The Greek national organ donation and transplantation system

SITUATIONAL ANALYSIS

An in-depth analysis of the current donation and transplantation programme in Greece. **Many different factors have contributed to Greece falling far behind its European counterparts in organ donation and transplantation.**

Background

National context

Greece is a member state of the European Union (EU) with a population of 10.7 million inhabitants(1), The Greek economy is ranked as the 51st largest global economy(2). The national annual gross domestic product (GDP) is approximately €187 billion(2) Within the 27 EU members, Greece is currently the 17th largest economy(3) Between 2012 and 2019, Greece had the lowest average annual GDP growth rate (-0.64%) in the EU as a consequence of a national financial and public debt crisis that resulted in significant shrinking of the national economy(4). Since 2012, the national nominal GDP has dropped by approximately 4%(4).

Due to the adoption of large-scale austerity measures, there have been substantial reductions to public spending over the last decade in the country(5). During the period 2012–2017, the proportion of GDP spent on health in Greece, decreased by -9.4.% of the original value(6). In 2017, Greece spent €1,348 per capita on health care, representing 8.0% of the national GDP(7). This is well below the EU average, approximating 9.9% of GDP, or €2,887 per capita in 2017(7). The largest proportion of financing for health care in Greece comes from private expenditure (41%), followed by social health insurance and taxes (30% and 29%, respectively)(5). Public funds are used primarily for investment in medical products, appliances and equipment, hospitals and outpatient services. Additionally, the resources allocated to research and development, prevention and public health programmes are far below the European average(5).

Health system

The Greek health system has two major components. These are the public Greek National Health System (Greek NHS) and the private health sector. The Greek NHS is centrally governed by the Ministry of Health. Various semi-autonomous bodies contribute to the regulation and planning of the Greek NHS(5). The most important of these are (5):

- **The Central Health Council (KESY)**, which has a predominantly advisory role to the Ministry of Health.
- **The National Public Health Council (ESYDY)**, which is an independent authority responsible for the scientific supervision of all public health organisations in the country.
- T**he Central Council of Health Regions (KESYPE)**, which coordinates the policies of the Regional Health Administrations (YPEs)
- **The Health Procurement Committee (EPY)**, which unifies hospitals' annual tenders with the aim to reduce procurement costs, improve payment time, make uniform medical requests, transfer redundant materials from one hospital to another and improve management of expired products.
- **The National eHealth Governance Council (ESDHY)**, which is responsible for the elaboration of the e-health strategy and the overall functioning, financing and monitoring of e-health projects.
- **The Body of Inspectors for Health and Welfare Services (SEYYP),** which is responsible for conducting performance audits in public and private health and welfare services in order to improve quality, productivity and effectiveness.

With regards to the health care system's reimbursement, the National Organisation for the Provision of Health Services (EOPYY) is a self-governing public entity that operates under the supervision of the Ministry of Health. It functions as the sole purchaser of health services, setting the preconditions required for contractual commitments with health care providers. The organisation's budget derives directly from the government (tax revenues) or from social health insurance revenues from the Unified Social Security Fund (EFKA)(5).

The private health sector plays an important role in the provision of health services, although it does not have any direct involvement in the planning, financing and regulation of the public system. It includes profit-making hospitals, a large number of private diagnostic centres, and freelancer specialists. The private health sector is financed through EOPYY or directly by the patients through out-of-pocket (OOP) payments or private insurance funds, in a lesser extent(5).

History of transplantation in Greece

The Greek donation and transplantation system traces its roots back to 1968, with the performance of the first successful deceased donor renal transplantation in Thessaloniki(8–11). Between 1972 and 1978, the Greek Transplantation Society was founded (1976), the first law for solid organ retrieval and transplantation was passed (1978), and the first renal transplant

programme in the country was initiated at Laiko General Hospital of Athens (1972)(8–11). In 1984, the National Regulatory Committee for Renal Transplant Coordination was founded(8–11). National criteria for brain death diagnosis were established, and between 1990 and 1997 programmes for renal, hepatic, heart, lung and pancreas transplant were initiated across the country(8–11). The Greek National Transplant Organisation (NTO) was founded in 1999, and extensive legislation was produced defining all the dimensions of the transplantation sector including the role of coordinators (clinical coordinators, central coordinators and local hospital donor coordinators) (see below)((8–11). In 2005, the Local Hospital Donor Coordinators' programme was initiated. Major legislative change came in 2011, with the introduction of a presumed consent (opt-out) policy for deceased donation(8–11). A further legal change was made to the allocation system and a National Transplant Registry was set up in 2014(12). However, these measures have proved insufficient to significantly increase the size of the donor pool or the number of transplants undertaken.

Greece has five kidney transplant programmes, two active liver transplant programmes performing deceased donor liver transplantations, and one cardiac and lung transplant programme, all of which are public, with no transplantation license yet having been issued to private providers. At present, there are no active small bowel and pancreas transplant programmes across the country. A dedicated pediatric transplant centre is also lacking. The NTO is responsible for overseeing and coordinating organ donation and transplant processes in Greece, and provides oversight for the sharing of organs between Greece and other European countries. The NTO cooperates with ITU personell to screen donor eligibility and to coordinate the evaluation and allocation of organs(13).

Table 5 captures benchmarking data on the existing performance of the Greek Organ Donation and Transplantation System in renal transplantation compared to its European counterparts(42).

Table 5. European comparators of population, health care spending, rates of patients on renal replacement therapy, rates of deceased donation and kidney transplant, 2019

	Population	Spending	Need	Outcome	
	(millions)	€ per capita spend on health care	Patients on RRT (prevalence pmp, unadjusted)	Total actual DD (pmp)	Total kidney Tx (pmp)
Greece	11.1	1,348	1,319	5.5	16.0
Portugal	10.3	1,695	1,965	33.7	49.9
Croatia	4.2	805	1,248	32.0	32.9
Italy	60.8	2,523	1,137	23.3	36.1
Spain	47.0	2,221	1,284	49.6	73.8
UK	66.0	3,409	972	24.7	54.5
Europe	789.5	2,887	854	16.9	35.5

RRT = renal replacement therapy, pmp = per million population, DD = deceased donation, Tx = transplant.

Since the onset of the European financial crisis, organ donation and transplantation in Greece have declined sharply, resulting in increased morbidity and mortality among those on the transplant waiting list. Greece has also seen increased numbers of patients seeking transplantation abroad, which results in public health funds being channelled out of the country. Individuals without significant independent financial resources are particularly underserved(14,15).

The reasons for this poor performance are multi-factorial and include a lack of public information on organ donation and inadequate link of the NTO with donor hospitals. Austerity measures have resulted in budget cuts in health care and the NTO, with subsequent loss of deceased donors. However, similar trends have not been observed among other Mediterranean countries struck by the recession. Spain has consistently been a pioneer in organ donation rates, with Portugal following the Spanish model to significantly improve its performance, and Italy sustaining organ donation rates above the continental average. This indicates that Greece's poor performance is not solely due to the economic downturn. The Onassis Foundation's investment in the state-of-the-art Onassis National Transplant Center (ONTRC), which is currently under construction, represents a major step forward in establishing a national infrastructure capable of sustaining a high-performing donation and transplant system and can play an important role in supporting the improvement of performance across the system, for example through providing training, quality assurance, and performing research. However, as already noted, wide-ranging reforms will be needed if the ONTRC is to become part of a national network of excellence in organ donation and transplantation.

Need

Life expectancy at birth in Greece has been incrementally increasing since the late 1990s(5). In 2016, life expectancy at birth was approximately 81.5 years, above average for countries with similar finances, organisation and development(16). Cardiovascular disease is the leading cause of death in the population; rates of smoking and obesity are exceptionally high(5). The country faces significant demographic challenges; most notably an ageing population, low fertility rates and diminishing natural population growth with increasing emigration of younger populations(5). The rise of the proportion of older or frail patients in the general Greek population along with the lack of a comprehensive plan to reduce modifiable risk factors is likely to increase the incidence of chronic diseases in the years to come.

Chronic Kidney Disease

Data to determine the prevalence of Chronic Kidney Disease (CKD) in the Greek population is currently lacking. In 2014, Konstantinos Sombolos et al. in their multi-centre cross-sectional study found that the three most common causes of CKD in the Greek population were: diabetic nephropathy (29.7%), hypertensive vascular disease (25.3%) and glomerular diseases (16.3%). The authors stressed that the lack of screening for CKD in the general population and the lack of consensus guidelines for referrals to tertiary care further delay the diagnosis and management of the disease(17).

In contrast, the prevalence and annual incidence of end-stage renal disease (ESRD) are well monitored in the country. The National Regulatory Committee for Renal Transplant Coordination (YSE) is responsible for maintaining a registry for all patients in RRT and submitting the data to the European ERA-EDTA Group. In 2017, there were 14,785 patients with ERSD in RRT in the country. This corresponds to 1,319 patients pmp. This is far above the European average of 854 patients pmp. Furthermore, the annual incidence of ESRD in the country is double the European average. For example, during 2017, 2,712 patients, or 252 patients pmp, started RRT compared to a European average of 127 patients pmp(18).

The demographics of the affected population are also concerning. Patients with ERSD are in their majority men (64.8%). The average age (in years, mean± standard deviation) of the patients with ERSD is 65.5 ±15.5 years old(18). In 2017 there were 1,615 patients with ESRD in the country aged: 0–44; 4,760 aged: 45–64; 3,597 patients aged: 65–74; and 4,211 patients aged over 75 years old(18). In the same year, 54% of the patients aged: 0–44 years old received dialysis therapy. The corresponding percentages for the age groups: 45–64, 65–74 and over 75 years old were 73%, 86% and 97% respectively(18). The remaining patients in these age groups were transplanted(18).

Liver Disease

Liver disease is a broad term that includes a wide spectrum of underlying pathologies including alcoholic liver disease, non-alcoholic steatohepatitis (NASH), viral hepatitis, autoimmune hepatitis, hepatitis due to other causes (alcohol-related, drug-related etc.), primary sclerosing cholangitis, liver tumors, metabolic diseases (Wilson's disease, haemochromatosis), primary biliary cirrhosis and liver cirrhosis secondary to various other causes. According to 2014's epidemiological data, in Greece, liver disease affects approximately 60 patients pmp(19). This is below the European average for all causes. The relative standardised death rate in the country is seven deaths per 100,000 of population and has a decreasing trend(20). Reduction of alcohol consumption, reduction of obesity rates and prevention of viral hepatitis transmission can further reduce the incidence of the disease in the country.

Performance

Donation rates

Donation rates in Greece are significantly lower than the European average. Table 6 shows the reported brain deaths and the subsequent number of donors following brain death (DBD donors) in the country for the last 12 years(21–32) As illustrated on the table, the number of DBD donors in the country fluctuated between 4.1 and 8.9 donors pmp. These numbers include only DBD donors since donation after cardiac death (DCD donation), is not established in Greece. Between 2008 and 2019, in Europe the number of DBD donors presented a steady incremental increase from 9.93 donors pmp in 2008 to 14.4 donors pmp in 2019(33). If we also take into consideration donation following cardiac death (summative European average of deceased donors: 10.7 pmp in 2008 and 17.13 pmp in 2019), it becomes obvious that the country falls significantly behind the European average in deceased donation(33).

Table 6 also illustrates that there is significant annual fluctuation in reporting of brain death in Greece that ranges from 57 to 204 brain deaths per year.

Table 6. Reported brain deaths and DBD donors

	Reported brain deaths	Donors	Donors pmp
2008	176	98	8.9
2009	110	71	6.5
2010	57	45	4.1
2011	109	79	7.2
2012	204	77	7.0
2013	143	62	5.6
2014	106	50	4.5
2015	75	39	3.5
2016	120	51	4.6
2017	133	67	6.1
2018	109	45	4.1
2019	131	65	5.5

Source: NTO

Table 7 shows a detailed account of donation performance per ICU in the country for the last five years(21–32). A review of this data suggests that there is clear discrepancy in the donation performance of intensive care units (ICU) across the country. Even in tertiary centres with similar numbers of ICU beds and catchment population, there are wide differences in DBD donors ranging from 0.2 referred donors per year per unit to 6.8 referred donors per year per unit.

Table 7. Donation performance per ITU

Hospital/ICU	DBD in 2019		DBD in 2018		DBD in 2017		DBD in 2016		DBD in 2015	
	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual
Region: Athens										
Childrens Hospital "Agia Sofia", Athens	1	-	2	-	-	1	3	-	-	-
"Agios Savas" Hospital, Athens	-	-	-	-	1	1	3	1	-	-
Childrens Hospital, "P. & A. Kyriakou", Athens	1	-	1	-	2	-	-	-	5	-
"Alexandras" Hospital, Athens	-	-	2	-	-	-	1	-	1	-
"O Euagelismos" Hospital, Athens	3	1	1	2	3	3	3	2	5	2
Red Cross Hospital, Athens	-	-	-	-	-	-	1	1	3	2
"Laiko" Hospital, Athens	-	-	-	-	-	-	1	1	1	-
"Ippokrateio" Hospital, Athens	1	1	6	-	-	-			-	-
"Korgaleneio-Benakio" Hospital, Athens	1	1	1	1	-	-			-	-
"Asclipieion Voulas" Hospital, Athens	2	1	-	-	1	1	1	1	1	-
Sismanogleion Hospital, Athens	-	-	-	-	-	-	3	-	-	-
"Sotiria" Hospital, Athens	1	-	-	-	-	-	-	-	-	-
"G. Gennimatas" Hospital, Athens	-	-	1	1	2	1	-	-	-	-
"KAT" Hospital, Athens	-	-	1	-	1	-	-	-	-	-
"Agios Panteleimon" Hospital, Nikaia	-	-	-	-	1	1	1	1	-	-
"Thriasio" Hospital, Eleusina	2	-	2	2	-	-	2	2	2	2
"Tzaneio Hospital", Piraeus	2	-	1	1	3	3	-	1	2	1

Table 7 (continued). Donation performance per ITU

Hospital/ICU	DBD in 2019		DBD in 2018		DBD in 2017		DBD in 2016		DBD in 2015	
	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual
"Henry Dunan" Hospital, Athens	1	2	-	-	1	1	2	2	-	-
"Attikon" Hospital, Athens	3	9	1	3	3	8	1	1	-	-
Navy Hospital of Athens	-	-	-	-	1	-	1	1	-	-
General Military Hospital of Athens	1	-	-	-	-	-	1	1	1	1
General Hospital of Airforce, Athens	-	-	-	-	-	-	1	1	-	-
"Iatriko Athinon", Hospital of Athens	1	1	1	1	1	1	2	-	1	1
"Hygeia", Hospital of Athens	1	1	1	-	1	2	1	-	-	-
"Iaso", Hospital of Athens	-	-	-	-	-	-	1	1	-	-
"Mitera", Hospital of Athens	-	-	-	-	1	-	-	-	-	-
"Doctors Hospital", Athens	-	-	1	-	-	-	-	-	1	1
"Kentriki Kliniki Athinon" , Hospital of Athens	1	1	-	-	-	-	-	1	-	-
Onassis Cardiac Surgery Center, Athens	1	2	-	-	2	2	1	-	-	-
"Metropolitan Hospital", Athens	-	-	-	-	-	-	-	1	2	1
"Attiko Therapeutirion", Hospital of Athens	-	-	-	-	-	-	-	-	1	-
"Mediteranneo", Hospital of Athens	-	-	-	-	-	-	-	-	1	1
"Aiginiteio", Hospital of Athens	-	-	-	-	-	-	-	-	1	1
REGION: THESSALONIKI										
"AXEPA", Hospital of Thessaloniki	-	1	1	1	-	-	1	1	1	1

Table 7 (continued). Donation performance per ITU

Hospital/ICU	DBD in 2019		DBD in 2018		DBD in 2017		DBD in 2016		DBD in 2015	
	Referredv	Actual	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual
"Ippokrateion", Hospital of Thessaloniki	3	-	2	-	1	1	-	2	2	2
Pediatric Department, "Ippokrateion", Hospital of Thessaloniki	-	-	1	-	1	1	-	-	-	-
"G. Gennimatas", Hospital of Thessaloniki	-	-	-	-	1	-	-	-	-	-
"Agios Dimitrios", Hospital of Thessaloniki	-	-	-	1	-	-	-	-	-	-
A' ITU, "G. Papapanikolaou", Hospital of Thessaloniki	-	2	1	-	4	4	1	1	2	1
B' ITU, "G. Papapanikolaou", Hospital of Thessaloniki	9	1	9	3	10	3	4	5	2	2
Other Departments, "G. Papapanikolaou", Hospital of Thessaloniki	-	-	1	1	-	-	-	-	-	-
"G. Papageorgiou", Hospital of Thessaloniki	9	5	6	5	4	3	8	6	5	4
"Agios Pavlos", Hospital of Thessaloniki	1	1	-	-	-	-	1	-	2	2
"Interbalkan Medical Centre", Hospital of Thessaloniki	-	1	-	-	1	1	1	1	1	-
General Military Hospital of Thessaloniki	2	-	-	-	-	-	-	-	-	-
"Theagenneio", Hospital of Thessaloniki	-	-	1	-	-	-	-	-	-	-
"St. Luke's", Hospital of Thessaloniki	1	1	1	-	1	-	-	-	-	-
REGION: NORTHEN GREECE										
Hospital of Seres	-	2	1	1	-	-	-	-	-	-
Hospital of Gianitsa	2	-	-	-	1	1	2	-	-	-
Hospital of Ptolemaida	1	-	3	-	-	-	-	-	1	-

Table 7 (continued). Donation performance per ITU

Hospital/ICU	DBD in 2019		DBD in 2018		DBD in 2017		DBD in 2016		DBD in 2015	
	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual
University Hospital of Alexandroupolis	1	1	1	1	2	2	2	-	-	-
Hospital of Kavala	-	2	2	2	2	2	-	-	-	-
Hospital of Katerini	3	-	-	-	2	1	-	-	-	-
Hospital of Veroia	-	-	-	-	1	-	-	-	-	-
Region: Central Greece										
Hospital of Lamia	4	3	2	1	2	2	3	-	4	2
Hospital of Volos	1	2	1	2	2	1	3	2	3	1
"Koutlibaneio", Hospital of Larissa	1	3	1	1	1	1	1	-	1	-
University Hospital of larissa	1	2	2	3	1	1	3	2	2	2
Hospital of Karditsa	-	-	-	-	-	-	1	-	-	-
Hospital of Trikala	-	-	-	-	1	1			-	-
Region: Western Greece, Peloponnese										
University Hospital of Patras	-	-	2	2	-	3	2	5	1	1
Pediatric Department, University Hospital of Patras	-	2	1	-	1	-	-	-	-	-
"Agios Andreas", Hospital of Patras	-	-	1	-	-	-	-	-	-	-
Hospital of Kalamata	-	-	-	-	2	-	-	-	-	-
Hospital of Korinthos	-	-	-	-	-	-	1	-	-	-
"Euagellistria", Hospital of Tripolis	2	=	3	3	5	-	4	-	4	-

Table 7 (continued). Donation performance per ITU

Hospital/ICU	DBD in 2019		DBD in 2018		DBD in 2017		DBD in 2016		DBD in 2015	
	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual	Referred	Actual
University Hospital of Ioannina	-	1	1	2	1	1	1	-	-	-
"G. Xatzikosta", Hospital of Ioannina	3	1	1	-	1	2	2	2	5	3
Hospital of Arta	-	1	1	-	-	-	1	-	1	1
Hospital of Corfu	-	1	1	1	1	1	-	-	-	-
Hospital of Zante	1	-	-	-	-	-	-	-	-	-
REGION: CRETE-AEGEAN										
University Hospital of Herakleion	2	3	2	2	2	1	1	1	-	-
Pediatric Department, University Hospital of Herakleion	-	-	1	1	1	-	-	-	-	-
Hospital of Agios Nikolaos	-	-	-	-	-	-	1	-	1	-
"Venizeleion", Hospital of Herakleion	3	2	3	3	3	3	1	3	1	-
"Agios Georgios", Hospital of Chania	1	2	2	-	1	-	2	-	2	1
"Iasis", Hospital of Chania	-	-	-	-	1	-	-	-	-	-
Hospital of Mitilini	-	1	-	-	-	1	-	-	-	-
Hospital of Rethymno	-	-	1	-	1	-	-	-	-	-
Hospital of Samos	-	-	1	1	-	-	-	-	-	-
Hospital of Chios	1	-	1	-	-	-	-	-	-	-
Total	75	62	80	45	82	67	76	51	73	39

Source: NTO

Waiting lists

As of 31 December 2019, there were 1,351 patients on the waiting list for a kidney transplant(32). The median waiting time for a kidney transplant in the country was 8.8 years(32). This ranged between a minimum of one year and a maximum of 20 years' waiting time(32). There were also 166 patients on the waiting list for a liver transplant and 42 patients waiting for a heart transplant(32).

Transplants

Table 8 demonstrates the performance of the national transplant programme(28–32). Over the past five years, there have been eight kidney transplants from DBD donors pmp, five transplants from living donors pmp, 2.5 liver transplants pmp and one heart transplant pmp per year. The European equivalents are 26 deceased donor renal transplants pmp, 10 living donor renal transplants pmp, 11 liver transplants pmp and three heart transplants pmp per year, for the last five years(33).

Table 8. National transplant performance per year

	2019	2018	2017	2016	2015
Kidney transplants from deceased donors	110	72	108	75	63
Kidney transplants from living donors	68	69	68	49	35
Liver transplants	33	23	28	21	22
Heart transplants	15	8	8	6	6
Total	226	172	212	151	126

Source: NTO

Outcomes

Only limited transplant outcomes are published and disseminated annually through the National Transplant Organisation. Over the last three years, one-year graft survival for renal transplants has ranged between 90.9% and 97.1% in the country(30–32). This is in line with international standards(18).

Regarding liver transplant, the national one-year patient survival rates following transplant were 60.7%, 65.2% and 78.7% in 2017, 2018 and 2019 respectively(30–32). The corresponding one-year graft survival rates were 53.6%, 60.8% and 78.7%(30–32). Regarding heart transplants the one-year survival rates in the country were 100%, 87.5% and 86.7% for 2017, 2018 and 2019 respectively. Long-term follow-up data is currently lacking(30–32). Due to the small number of cases this data is not comparable with international outcomes.

Supply

Awareness, knowledge, attitudes

Status quo

There are gross disparities in awareness of organ donation among different population groups in the country. According to the results of the Eurobarometer survey in 2009, only 30% of the individuals questioned had ever had an informed discussion with their family members about organ donation(34). The European equivalent was 40%, at the time(34). Symvoulakis et al. in their 2014 survey found that among a population of health science students, four out of five had considered the possibility of deceased donation(35–37). Another study from the same group in 2019, showed that in a rural general population group only one out of two individuals were aware of the possibility of deceased donation and had considered donation after death(35-37).

Furthermore, there is limited knowledge about the process of organ donation even among health care professionals in the country. Only 16% of the non-medical and 37% of the medical students were adequately informed about the existing legislative framework on organ donation and the latest changes on the national consent policy, according to the study by Symvoulakis et al(35-37). In the rural population, the corresponding figure in 2019 was 3.8%(35–37).

Overall, the Eurobarometer study showed that, when asked, approximately 40% of Greek citizens were in principle willing to donate. The donation in question referred to either their own or their family members' organs, after death(34). Exploring the reasons for unwillingness to donate reveals that one out of every two Greek citizens is unwilling to donate due to lack of trust in the system (consent system / transplant system / health system). This is far above the European average; only 20% of Europeans demonstrate this level of mistrust of their health care system. The proportion of other reasons for unwillingness to donate such as religious reasons (10%) and fear of manipulation of the human body (31%) are aligned with the rest of Europe. Greece is one of the few countries in Europe to see an increase in family refusal rates (DBD donors) for the last eight years, from 20% in 2012 to 27.4% in 2019(34).

Communication strategy

The NTO strives to have a planned, coherent, continuous and targeted communication strategy for promoting organ donation in Greece. At present, there is no allocated department within the organisation with the duty of planning, implementation and monitoring of communication interventions. The existing communication strategy incorporates the promotion of organ donation through mass media projection. Different TV spots have been shared with national television over the years. TV and press journalists maintain a good relationship with the NTO and regularly participate in the organisation's activities. Furthermore, they have an officially recognised advisory role in national organ donation and transplantation policy making; the president of the national journalists' union (ESHEA) is a member of the National Transplantation Council (NTC)(10). It is unclear, though, to what extent (the NTC) is still operational. Moreover, there are efforts to promote organ donation through the NTO's social media channels.

Public campaigns are organised annually by the NTO for the promotion of organ donation. The Greek national campaign within the context of the European EUDONORGAN action in 2019 is an example of this. Furthermore, national conferences, seminars and webinars for health care professionals are also organised annually by the NTO. In local communities, interventions and events for organ donation promotion are held on an annual basis. These are organised mainly by non-profit organisations and patients' associations under the auspices of the NTO. Particularly in Thessaloniki, where an NTO branch operates, there is a significant number of events, seminars and interventions in targeted populations (school presentations, medical students' seminars, seminars for nursing staff) throughout the year.

At present, organ donation is not included in the national school curriculum. The students are not formally introduced to the topics of organ donation during their primary or secondary education. In an effort to increase students' awareness, the NTO recently added relevant educational material (Orgamites) to the website of the organisation with free access for students(38). At a university level, organ donation and transplantation are not included in the core curricula of the national medical and nursing schools. Organ donation is not promoted on a regular basis in places of worship.

Consent policy

L. 4512/2018 is the latest extensive legislation document in the area of consent policy for organ donation.[38] This re-introduces the opt-in consent policy in Greece – a major shift from the previous opt-out policy introduced by the L. 3984/2011(38).

In the domain of living donation, adults with capacity are able to provide informed consent for organ donation and withdraw it at any time. Donations from relatives (up to fourth-degree relatives) are allowed. Non-related donations are subject to approval by a committee comprised of a member of the NTO, a judge, a psychiatrist and a social services officer. Living donations from children are not allowed(38).

With regards to deceased donation there are two different consent practices(38):

1. **Presence of a donor card.** In this case adults with capacity declare their informed consent for organ donation after death to the NTO. This refers to specific organs, specified by the potential donor. This declaration of consent can be withdrawn at any time (opt-in policy).
2. **Familial consent and lack of registered objection.** This refers to providing family consent for brain dead relatives (that have not declared unwillingness towards organ donation throughout their life) and for deceased pediatric organ donation (by the parents/ individuals having legal custody rights).

In practice, in cases of living related donation, written informed consent is considered sufficient in order to proceed to organ retrieval and transplantation. In non-related donations, there are extensive work-up processes and inspections before the individual's informed consent is approved and the process of organ donation/ transplantation is authorised. In case of DBD donation, the decision for retrieval is only taken following written informed consent from the potential DBD donor's family.

Donor Documentation

In Greece, there is a national registry for organ donors. This registry is authenticated, managed and updated by the NTO. This registry includes all the individuals that have declared (and not withdrawn) willingness for organ donation to the NTO. Following their inclusion in the registry, the potential donors receive a Positive Donor ID card. The registry also includes DBD donors where the consent is provided by the family. The data entries to the registry before the initiation of the donation process are minimal. These sensitive data are protected by the NTO and cannot be accessed by third parties(38).

Once the organ donation process begins, the data entries in the registry include (data provided by the NTO) :

1. Donor/hospital geographical information.
2. Organs that the donors/family have consented to donate.
3. Donor demographics and somatometry.
4. Medical history, clinical course and relevant data, time and circumstances of death.
5. Laboratory test results (including histocompatibility and communicable diseases status, i.e. HIV, HCV).
6. Relevant investigations and reports (echocardiogram, abdominal ultrasound, bronchoscopy etc.).

These data are imported to the NTO via fax from the local hospitals. The data are not easily traceable or accessible by the organ retrieval teams/transplant centres. It is common practice for the transplant centres' representatives to travel to the potential donors' hospital to assess the donors' suitability.

In parallel to the national donors' registry, the NTO maintains a national non-donors registry. All patients that have formally declared (and not withdrawn) their unwillingness towards organ donation are included(38).

Decision-making practice

There are no national criteria or guidelines for the suitability, eligibility and matching of donors with transplant recipients. The decisions for the donors' and the organs' suitability are judged on a case-by-case basis according to the international guidelines and local knowledge and expertise. The decision of whether to proceed to organ donation is taken when consensus has been achieved between the donors' family, the ICU team, the NTO's members and the transplant team. This leads to a highly arbitrary decision process contingent on context rather than a transparent consensus process among all transplant experts. At present donation after cardiac death (DCD) has not been legislated in the country. Elective, non-therapeutic intensive care programmes for the purpose of organ donation across the country do not exist.

National regulation, strategy and coordination

National body and responsibilities

National body

The Greek NTO is an officially recognised non-profit body operating under the authority of the Ministry of Health(38). As defined by the L.2737/1999 and the presidential decree of 2001, the organisation's duties and responsibilities include(38):

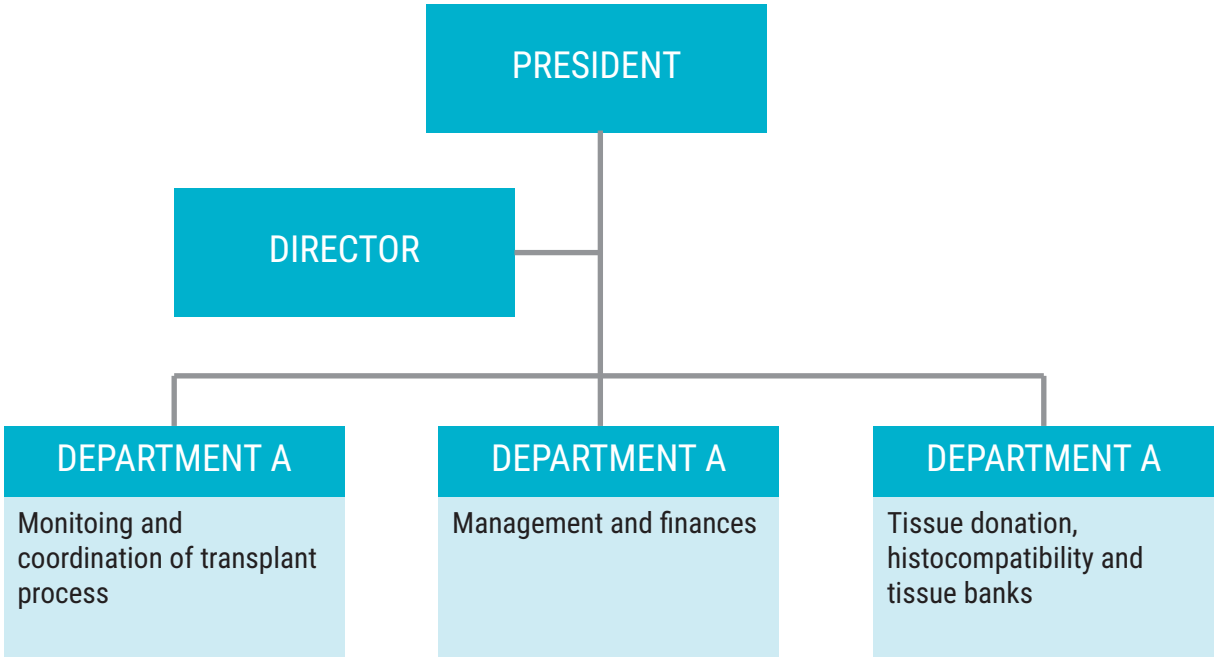
1. Contribution to the establishment, merging, and reformation of organisations involved in the transplant process.
2. Setting the operational terms and conditions, the institutional framework of control and evaluation, the granting, the renewal and the revocation of the licensing organisations involved in the transplant process.
3. Setting the national quality and safety framework for the donation and transplant process.
4. Ensuring the traceability of organs, tissues and cells from the donor to the recipient.
5. Maintaining a data management system where serious adverse/unwanted events and reactions can be submitted and followed up.
6. Participating in the inspection of organisations involved in the donation/ transplant process.
7. Monitoring of transplant activity and outcomes, collecting data and submitting annual reports to the Ministry of Health.
8. Monitoring the implementation of the quality and safety framework principles.
9. Organisation and coordination of the distribution of organs, tissues and cells at a local, national and international level, including setting the relevant Standard Operating Protocols.
10. Maintaining the national registries for donors, recipients and non-donors, including waiting lists.
11. Data protection.
12. Representation of the country at European and international level and cooperation with international and European organisations in projects relating to donation and transplantation; the NTO has the capacity to make international agreements with a relevant content.
13. Contribution to the national policy for pricing, financing and compensation of health and other services involved in the organ donation and transplant process.
14. Certification, continuous education and support of health professionals in the transplant sector.

15. Guidelines and clinical protocols' production.
16. Provision of information, guidance and psychosocial support to prospective recipients, transplant patients, living donors and relatives of organ donors
17. National communication strategy and public interventions for the promotion of organ donation
18. Management and implementation of international/EU-funded projects.

The NTO is located in Athens. There are no branches in the Greek periphery except for one unofficial branch in Thessaloniki. Figure 2 illustrates the organisation chart of the NTO.

Figure 2. NTO organisation chart

The organisation's board is responsible for governing the NTO. The board has 11 members. Its membership is defined by the presidential decree of 2001(38):



Source: NTO

- One professor from a Greek medical school.
- One representative from bone marrow transplant centres.
- One ICU representative.
- One representative from solid organ transplant centres.
- One representative from histocompatibility laboratories.
- One academic from a Greek law school.

- One representative from the Greek Medical Association.
- One representative from the Ministry of Health.
- One representative from the Church of Greece.
- One patient representative.
- One nurse representative.

A review of the board's composition reveals that the majority of the stakeholders involved in the organ donation and transplant process are represented at board level. Since the national organ donation and transplantation programme relies on collaborations between a myriad of sectors, we note that geographical representation is unaccounted for and that the medical and scientific societies (i.e. anaesthesiologists, nephrologists etc.) and public health bodies are currently unrepresented in the governance process.

L.172737/1999 and the presidential decree of 2001 define the NTO's staffing as(38):

TEMPORARY PERSONNEL:

- Two medical doctors specialised in an area relevant to organ donation and transplantation.
- One journalist.
- One psychologist.
- Three nurses specialised in an area relevant to organ donation and transplantation.
- One statistician.

PERMANENT PERSONNEL:

- One senior medical doctor specialised in an area relevant to organ donation and transplantation.
- One administrator.
- One manager.
- Eight health scientists to serve as transplant coordinators.
- Two accountants.
- Two occupational workers.

In practice, the NTO currently has 18 employees but only three are permanent positions. The remaining 15 temporary employees experience high turnover rate with varying transplant experience and training. There are only seven transplant coordinators. The Greek NTO is the only NTO in Europe that is not available 24/7 to support the time-sensitive nature of transplant activities.

Authorisation and inspection

At present authorisation and inspection of transplant centres and the relevant organisations (i.e. histocompatibility labs) are part of the NTO's duties and responsibilities. Reports on the centres' outcomes and performance are published annually by the NTO with attempts to benchmark performance every three years. A clear, standardised protocol for carrying out these inspections is unavailable which hinders the ability to improve the existing Greek donation and transplant system(38).

Organ allocation

The allocation of organs is coordinated by the NTO. There is a system in place for allocating renal donations at the national level rather than at a local level. Donated kidneys are allocated to the national waiting list using a points-based system which includes scores for blood group, histocompatibility and time on the waiting list. Priority is given to transplant recipients who cannot achieve vascular access for haemodialysis (although documentation for this complication is not required); hypersensitised recipients; recipients under 18 years of age; and previous living kidney donors. There is no local allocation of kidneys(38).

With regard to liver grafts, these are allocated in one of the two separate local waiting lists in the country, which are managed by the NTO and the local transplant centres. The centre where the graft is allocated depends on the date that the organ becomes available. Patients (recipients) are scored against set criteria for organ allocation (namely blood group, somatometry, clinical severity and time on the waiting list). There is no clear points-based system for organ allocation within the liver waiting list(38).

Regarding hearts and lungs, these organs are allocated to the national waiting lists managed by the NTO and the relevant transplant centres. Recipients are scored against set criteria. These are blood group, somatometry, histocompatibility, clinical severity and time on the waiting list(38).

Quality and safety framework

The NTO is responsible for setting the quality and safety framework for the entire organ donation and transplant process, including the relevant national standard operating procedures (SOPs) for the coordination process (38). These protocols are monitored at an outcome level through the annual reports of the NTO (i.e. not transplanted organs, delays in organ retrieval etc.). A significant gap in the quality and safety process of the transplant system is that the national SOPs are not regularly updated and the level of adherence to these is not monitored. Any adverse events during the donation and transplant process are reported to the NTO. It is unclear whether there is a system in place for follow-up of adverse events.

Training

Recognised training programmes for medical personnel in transplantation are currently lacking. There is no recognised transplant surgical fellowship in the country. Recognised fellowships in nephrology, hepatology and immunology of transplantation are also lacking. To date, individuals gain experience in transplantation during their core and higher parent specialty

training (i.e. general surgery, nephrology etc.) or during ad hoc training periods abroad (these are usually organised by the national transplant centres through communication with transplant centres in the Europe or, less so, in the USA). There is no viable national workforce strategy in place.

In contrast, there is a national fellowship for transplant co-ordination. This curriculum equips the trainees with the necessary educational background to take on any of the three distinctive roles involved in the transplant co-ordination process, namely clinical coordinators (transplant units), central coordinators (NTO), and local hospital donor coordinators (local hospitals, NTO branches) . This fellowship is provided by the NTO. It is a one-year fellowship divided into two six-month terms. Training takes place initially in the NTO and then in the transplant centres. Certification is provided by the NTO upon successful completion of the programme. The training objectives include(38):

- Identification and assessment of potential donors.
- Brain death diagnosis.
- Organ retrieval and preservation.
- Organ allocation.
- Ethics of donation and transplantation.
- Organ donation promotion.

Overall, the Greek organ donation and transplant system lacks a structured approach to training. The necessary competences to be able to deliver independent practice at each level are well defined for health care professionals(38). Nevertheless, processes to facilitate individuals achieving these competences (continuous professional development, regular appraisals) are currently lacking.

Quality assurance

The Ministerial Decree of 2005 M4a/71720-part-B defines the accreditation process and the criteria that should be met for the establishment of a transplant unit in Greece(38). The accreditation process is divided into two stages. Following approval of the hospital's application by the NTO and KESY a provisional license is issued by the Minister of Health for a period of three years. At the end of this period the organisation's transplant activity and outcomes are reviewed by the NTO. If the necessary standards are met, then the unit is licensed.

The law dictates that solid organ transplant units can be developed as part of the public National Health System (Greek NHS). These units can operate either under the centre's Divisions of Surgery or Medicine. A minimum of four high-dependency care beds within the unit is necessary. With regards to infrastructure, the transplant centres should meet the following criteria(38):

1. One department of surgery with relevant expertise (i.e. general surgery, hepato-pancreato-biliary, cardiothoracic, urology department etc.).

2. One department of medicine with relevant expertise (i.e. nephrology, cardiology, hepatology, gastroenterology, endocrinology, respiratory medicine etc.).
3. Access to histocompatibility laboratory.
4. Access to microbiology, virology, clinical biochemistry and immunology labs.
5. 24/7 availability of catheterisation laboratory (heart and lung transplant centres).
6. Access to pathology laboratory.
7. Blood transfusion laboratory.
8. Access to psychiatry and psychology services.
9. Access to physiotherapy services.
10. Access to occupational therapy and social services.

With regard to staffing levels and expertise the transplant centres should meet the following criteria(38):

1. One clinical lead, surgical or medical consultant with expertise in the relevant field and a minimum working experience of five years in transplant centres.
2. Three surgical consultants and two medical consultants with expertise in the relevant field and a minimum working experience of three years in transplant centres.
3. Organ retrieval team consisted of two surgeons, one clinical coordinator and doctors of other specialties where necessary.
4. Two clinical coordinators.
5. Nursing staff with expertise in transplantation
6. One administrator to provide managerial support.

Apart from the accreditation process and the relevant criteria, the Ministerial Decree of 2005 defines the minimum transplant caseload and the quality standards that the transplant centres should meet in order to maintain their license. The quality standards include(38):

1. Annual reports: all transplant centres are obliged by law to submit to the NTO an annual report of their transplant activity and outcomes.
2. Minimum caseload: all transplant centres should perform at least 10 solid organ transplants per year.
3. Quality assurance: all transplant centres should be compliant with the relevant European directives and follow the NTO's guidance.
4. Inspection: all transplant centres should successfully complete inspections run by the NTO.

However, the performance of regular local audits and quality improvement activities are limited in the country. There is no system in place to support these efforts.

International cooperation

Greece is part of international collaborative transplant schemes. The cooperation between the NTO and the National Transplant Organisation of Italy (CNT – Centro Nazionale Trapianti) is one of these examples. Their collaboration started in 2005 and initially included only emergency hepatic transplants. When a graft was not available in Greece, patients with end-stage liver disease requiring urgent transplant (within days) were transferred to Italy. In return, Greece provided Italy with a liver graft when this became available. The successful collaboration between the two countries resulted in the agreement being expanded to cover all urgent and elective pediatric organ transplants, in addition to the adult liver emergencies. Nowadays, more than five pediatric and 10 adult patients from Greece receive organ transplants in Italy every year.

Legal framework

Over the last four decades an extensive and complex legal framework has been developed in Greece in order to define all the dimensions of the transplant sector. During this period, there were four major legislative efforts. Starting in 1978, the practices of organ donation and transplantation were first legislated under L. 821/78; this law was never implemented in practice and was consequently replaced by L. 1383/1983. The latter introduced the concept of brain death and provided a broad and generic framework for organ donation and transplant activities. The law remained in place for a period of 15 years and facilitated progress in the field. In 1999, L. 2737/1999 was passed to incorporate recent scientific progress and to increase the country's compliance with the Oviedo Convention. This law introduced the NTO and the concept of informed consent for deceased donation (opt-in system). In 2011 the L. N.3984/2011 was introduced to the Greek Parliament. This was a groundbreaking legislative effort that created an advantageous framework for the promotion of organ donation and defined quality standards for the transplant process. This law introduced an opt-out policy for organ donation which was later abolished; the opt-in consent system was re-introduced with L. 4512/2018(38).

The state of brain death was first mentioned in article 7, paragraph 4 of L.1383/83. Brain death was defined by KESY in 1985 as 'irreversible loss of consciousness accompanied by loss of spontaneous respiration'. L. 2737/1999 is the most recent regulation for brain death diagnosis. This law dictates that when the responsible clinician suspects brain death in a patient whose organ function has been preserved with mechanical support, the clinician should perform the relevant tests for brain stem death diagnosis; these should be performed twice and be witnessed by an anaesthesiologist and a neurologist or a neurosurgeon. All doctors involved in the process should have at least two years' experience post certification of completion of training (CCT) and, to avoid conflict of interest, cannot be part of the transplant team. After confirmation of brain death through these clinical tests, a death certificate should be issued(38).

At present in Greece, the law does not allow for DCD donations and pediatric living donations. Adult DBD and living organ donations are permitted along with pediatric DBD donations. With regard to adult living organ donations and altruistic donations, there is an extensive legislative

framework protecting living donors from exploitation or coercion along with a mechanism to facilitate the law's implementation (see Consent Policy). Trafficking of human organs or tissues is criminalised by the existing legislation(38).

Reimbursement

At present in Greece, there is no system in place to reimburse organ donation. Identification of donors, admission to ICU, organ retrieval, organ procurement and transport are not included within the KEN-DRG system. In contrast, the processes associated with organ transplantation are formally recognised by the KEN-DRG system and reimbursed. At a general population level, there are no financial or other motives to incentivise organ donation. In the case of living organ donation, the law states that any financial losses to donors directly deriving from the donation process should be covered (including time off work).

Research and development

Solid organ transplantation research in the country is at present in an embryonic stage. According to the National Archive of PhD Theses, since 1985 there have been 19 doctoral projects in total within the field of solid organ transplantation (39). Of these, only 12 referred to original research studies. This translates to one original research project per three years on average in the country over the past 36 years.

In terms of infrastructure, the vast majority of Greek transplant centres do not have access to experimental laboratory or experimental surgery facilities on site. Furthermore, as mentioned previously, the resources allocated to research and development in the country are far below the European average(5).

Infrastructure

Transplant infrastructure varies significantly among organised transplant centres across Europe. Quantitative and qualitative data on the basic infrastructure requirements necessary for the transplant process is currently lacking at an international level. Furthermore, the national transplant centres' staffing levels and available resources are not systematically registered and monitored in Greece. Therefore, in order to inform the present recommendations, we undertook two surveys of practice: one across Greece's national transplant centres and one across the major European centres in five countries, namely Croatia, Italy, Portugal, Spain and the UK. The aim was to describe the current basic transplant infrastructure capacity across Europe and the situation in Greece.In response to our invitation four transplant centres in Greece and 15 transplant centres across Europe (seven British, one Croatian, one Italian and six Spanish) provided data on their infrastructure and capacity. The comparative analysis of the results can be seen in Table 9.

Organisation

Hospital donor coordinators

There are three distinctive roles associated with the transplant coordination process: the clinical coordinators (transplant units), the central coordinators (NTO) and the local hospital donor coordinators (local hospitals, NTO branches). This section will focus on the latter role.

The role of the local hospital donor coordinator was first introduced into the country with L. 2737/1999. The coordinators' background, duties and responsibilities were further specified by the presidential decree of 2002(38). In 2005, there were 55 hospital donor coordinators in the country: 39 doctors (four consultant surgeons, 28 consultant intensivists/anesthetists/respiratory physicians and seven consultant medical doctors) and 16 nurses(38). These numbers gradually declined during the years when transplant activity was decreasing and today it is unclear how many health care professionals actively perform the role.

A background in human studies (health sciences/social work) and successful completion of the transplant coordination fellowship provided by the NTO are required for candidates to qualify for the role of hospital donor coordinator. The duties of the role include:

- Organ donation promotion
- Donor selection and evaluation
- Participation in organ retrieval
- Liaison with ICUs, the NTO and organ retrieval teams to coordinate the donation process.

According to L. 2737/1999, the hospital donor coordinators should cover all the hospitals and ITUs of a given area. This role is usually undertaken by ITU clinicians who perform it in parallel to their clinical duties. No additional protected time is provided. Although reimbursement for transplantation activities is required by L. 237/1999, in practice this reimbursement is not linked to organ procurement and outcomes and does not cover out-of-hours work(38). The donor coordinators report to the NTO.

Management of waiting lists

The waiting lists are managed centrally by the NTO that makes the listing decisions. Patients are initially reviewed in the transplant centres where their suitability for transplant is assessed. This is further complemented by extensive pre-transplant investigations. The relevant documentation is shared with the NTO. A decision is then taken as to whether the patient should be included in the waiting list for the relevant organ. There are no strict nationally agreed listing criteria. Following inclusion in the waiting list, the patients are regularly followed up by the transplant units and the NTO. This follow-up serves as a mean to reassess the patients' clinical status and priority for transplant. If patients are subsequently found to be unsuitable for transplant during the follow-up, they are removed from the waiting list. When an organ is allocated, the patient is called to complete a crossmatch test. The patients have the right to decline receipt of an organ up to three times and still remain on the waiting list(38).

Table 9. Transplant infrastructure capacity in comparator countries

Infrastructure domain	Greece	Croatia	Italy	Spain	UK
Regular ward beds dedicated to transplantation per department	11–20	1–10	11–20	11–20	21–30
High dependency care beds per transplant centre	6–10	1–5	1–5	≥21	6–10
Theatre lists per week dedicated to transplantation per department	1–2	2–5	2–5	2–5	2–5
Frequency of on-calls per department	more than 3 times a week	less than 3 times a week	every day	3 times a week	more than 3 times a week
Consultant transplant surgeons per department	1–5	1–5	6–10	6–10	≥11
Trainee transplant surgeons per department	1–5	1–5	1–5	1–5	6–10
Consultant transplant physicians per department	1–5	1–5	1–5	6–10	>=11
Trainee transplant physicians per department	1–5	1–5	1–5	1–5	6–10
Consultant transplant anaesthetists	0	0	6–10	1–5	1–5
Access to interventional radiology	limited	n/a	24/7	24/7	24/7
Access to endoscopy (including ERCP and bronchoscopy)	limited	n/a	24/7	24/7	limited
Access to ultrasound scanning	limited	n/a	24/7	24/7	24/7
Access to magnetic resonance imaging (MRI)	limited	n/a	24/7	24/7	24/7
Access to urology	24/7	n/a	24/7	24/7	24/7
Access to pathology	limited	n/a	off-site transfer required	24/7	limited
Access to histocompatibility lab	off-site transfer required	24/7	24/7	24/7	24/7
Access to experimental surgery laboratory	no access	24/7	24/7	limited	limited
Transplant operations per year, per department	35	20	100	145	201

With regard to deceased donation, the deceased or the family of the deceased do not have the right to decide to which patient the organ will be allocated. The organ recipient does not know the identity of the donor. On the contrary, in living organ donations (related and non related) the donors dictate the identity of the recipient. Paired exchange programmes are in place for when targeted living organ donation is not possible due to lack of histocompatibility(38).

Perioperative care and follow-up

The initial pre-operative check is performed in the transplant unit when the patient is listed for organ transplant. When an organ becomes available the patient is called for crossmatch. If the crossmatch is negative and there is histocompatibility between the donor and the recipient, then the organ is allocated, and the transplant operation is scheduled. The law dictates that transplant operations take priority among all elective operations in the transplant centres(38). In practice, this is not always possible and theatre capacity needs to be increased, according to transplant surgeons. With regards to post-operative care, national guidelines defining best post-operative practice are currently lacking. Both living donors and transplant recipients are followed up in the transplant centres. Length and frequency of follow-up differ between the national transplant centres.

Patient-centred care

The success of a health care system is dependent on defining and addressing the patients' needs. These needs often extend far beyond the traditional health care setting. Instead of adopting a paternalistic approach, modern health care should promote patient and public engagement (PPE) in defining such needs. At present, PPE is not part of the activities of the Greek organ donation and transplantation system. The general public and the patients' associations are not formally or regularly consulted when health policy and services are designed or delivered.

To remedy this, we reached out to the national associations for heart, lung, kidney and liver transplant patients. Our objective was to determine from their feedback to what extent the existing national health policy for solid organ transplantation covers their needs and whether there are any areas requiring improvement. According to the feedback we received, overall the patients feel satisfied with the existing national social and health care policy and the benefits received. However, they identified four areas of improvement.

- The existing complex bureaucratic processes pose significant barriers to lung transplant patients in accessing immunosuppressive medications. Simplification of these processes would bring relief to this vulnerable population.
- National/European recognition of the transplant patients' disability status is currently lacking. Therefore, transplant patients are not currently receiving the relevant social benefits, attention and support required.
- Despite existing government support, travel expenses still constitute a considerable financial burden for all transplant patients.

Demand

Primary prevention

Greece currently lacks broad public health programmes targeting cardiovascular risk factors, liver disease and lung disease. Primary prevention is still in an embryonic state. On this front, it is encouraging that the smoking cessation campaign recently started producing important and valuable output.

Secondary prevention

Secondary prevention is provided by an extensive network of private and public health care providers in the country (GPs, physicians etc.). Open access to these services is available through rural health centres, urban units and private health care providers. Data on the outcomes of secondary prevention is currently unavailable. A system for referring patients to specialist care is also lacking.

Tertiary prevention

An accessible tertiary prevention service has been developed in Greece over the past 50 years. This becomes obvious if we look into the provision of haemodialysis care for patients in ESRD. Greece has approximately 145 haemodialysis units for a population of 10.7 million inhabitants(40). The area of the country measures 131,957km^2. This means that one haemodialysis unit corresponds to approximately 73,000 individuals and 910km^2 . The total includes both private (which account for the majority) and public haemodialysis units(40).

Greece has almost twice the number of dialysis units compared to the the UK (comprising England, Wales, Scotland and Northen Ireland) which has 78 haemodialysis units for a population of 66,650,000 people. The area of the United Kingdom measures 242,495km. This is equal to 1 unit per approximately 855,000 individuals and 3,109km^2(41). The population density of dialysis units in Greece equals 10 times the corresponding density in the UK. Dialysis units in Greece are approximately 300% closer to each other than the UK dialysis units.

However, the quality of care provided by the haemodialysis units in Greece is not monitored and measured against quality performance standards on a regular basis.

Finances – savings estimates

To develop an estimate of the savings that can be realised by improving the performance of the Greek donation and transplant system, we designed a global savings prediction model based on the current system's performance data, the associated expenses for renal transplant and RRT, and the projected expenses if the system was to achieve levels of performance of kidney transplants in line with Portugal. Portugal was selected as a comparator because it is a country of similar size and demography to Greece that achieves high rates of transplantation. The calculations are shown in Table 10 on page 95.

Our calculations demonstrate that, for a given population of RRT patients, if Greece were to increase its rates of kidney transplantation to achieve parity with Portugal, it would generate savings of €50,400,000 over five years, from the point at which it attains Portugal's levels of performance.

We made the calculations by comparing the baseline scenario with the Portugal scenario. The baseline scenario represents the cost of RRT and transplantation in Greece if current levels of performance are sustained. The Portugal scenario represents the costs of RRT and transplantation if Greece achieves rates of kidney transplantation in line with those of Portugal.

To design our model, we contacted the NTO to request data on the annual cost of haemodialysis, peritoneal dialysis and renal transplant per patient. We were provided with the following data:

1. Annual cost of haemodialysis/peritoneal dialysis = €40,000 per patient
2. Annual cost of renal transplant for the first-year post-transplant = €30,000 per patient
3. Annual maintenance cost of renal transplant following the first-year post-transplant = €10,000 per patient.

For the baseline scenario, we then defined the prevalence of RRT in Greece in year 1, based on the ERA EDTA 2017 report(18). The prevalence of RRT was defined as 11,399 patients in year 1. For renal transplant, the prevalence was defined as 2,604 patients with renal transplant in year 1, while the incidence of renal transplant was defined as 178(18).

For the Portugal scenario, we used the same prevalence for patients on RRT and transplant patients as the baseline scenario for year 1. Given the similarities of Portugal's and Greece's populations, we used Portugal's actual performance of kidney transplants in 2019, giving a target figure of 514 transplants per year. The increase of 336 transplants per year over the baseline scenario was subtracted from the prevalence of patients on RRT.

In each year, we reduced the prevalence of patients on RRT by the number of transplants undertaken in the previous year. In both scenarios, we assumed that the incidence of renal transplant would remain constant for the period of five years.

Our model focuses solely on the annual cost per patient of RRT, unit costs for kidney transplant surgery, and the annual cost maintaining patients with transplants. It does not take into account the additional workforce or infrastructure costs required to achieve increased rates of transplantation. Nor does it take into consideration graft failure, mortality rates either for transplant patients or patients continuing on dialysis, incidence of new patients requiring haemodialysis/peritoneal dialysis, or transplant failure rates. These are major limitations, and so this estimate should be treated as indicative.

Overall for year 1, national figures were defined as:

- Number of patients on RRT in year 1 = prevalence of RRT in year 1 = 11,399 patients
- Number of transplant patients in year 1= prevalence of renal transplant = 2,604 patients
- Renal transplants performed in the country in years 1 to 5 (baseline scenario) = 178

- Renal transplants performed in the country in years 1 to 5 (Portugal scenario) = 514

The figures for year 2 were based on the following calculations:

- Patients on RRT in year 2 = patients on RRT in year 1 less the number of renal transplants performed in the country in year 1

The values for years 3 to 5 were calculated using the same methodology.

These values were multiplied with the annual costs presented above, in order to calculate global expenses. By using this model, we made projections for a five-year time period and compared costs across two different health care strategies.

Table 10. Renal transplants – savings projection models

BASELINE SCENARIO	Year 1	Year 2	Year 3	Year 4	Year 5
Patient numbers					
On haemodialyis	11,399	11,221	11,043	10,865	10,687
In first year of transplant	178	178	178	178	178
In later years after transplant	2,604	2,782	2,960	3,138	3,316
Annual costs (€ million)					
Haemodialysis	455.96	448.84	441.72	434.60	427.48
In first year of transplant	5.34	5.34	5.34	5.34	5.34
Subsequent maintenance	260.40	27.82	29.60	31.38	33.16
Overall expenditure	487.34	482.00	476.66	471.32	465.98

PORTUGAL SCENARIO	Year 1	Year 2	Year 3	Year 4	Year 5
Patient numbers					
On haemodialyis	11,399	10,885	10,371	9,857	9,343
In first year of transplant	514	514	514	514	514
In later years after transplant	2,604	3,118	3,632	4,146	4,660
Annual costs (€ million)					
Haemodialysis	455.96	435.40	414.84	394.28	373.72
In first year of transplant	15.42	15.42	15.42	15.42	15.42
Subsequent maintenance	26.04	31.18	36.32	41.46	46.60
Overall expenditure	497.42	482.00	466.58	451.16	435.74

SAVINGS	Year 1	Year 2	Year 3	Year 4	Year 5
€ million	-10.08	0	10.08	20.16	30.24
				Total savings (€million)	50.40

Recommendations:

Reform and development of the Greek organ donation and transplantation programme

This chapter comprises the recommendations necessary for the successful remodelling of the Greek organ donation and transplantation programme. **Each overarching recommendation is accompanied by a number of sub-recommendations, a specification of the main responsible bodies, and a brief text explaining the underlying rationale.**

The recommendations have been carefully developed through an iterative process which included:

- Development of the conceptual framework – this outlines the necessary components of a successful national donation and transplantation plan.
- Case studies of five countries with successful donation and transplantation programmes: Croatia, Italy, Portugal, Spain and the UK.
- Interviews with international experts.
- Interviews with key stakeholders in Greece.
- A gap analysis of the existing Greek organ donation and transplantation programme, including two surveys: one conducted across all the national transplant centres and one across the major European transplant centres in five countries, Croatia, Italy, Portugal, Spain and the UK. The goal was to determine the current donation and transplantation infrastructure capacity and staffing levels across Europe and compare this with the current situation in Greece. Responses were collated from four transplant centres in Greece and 15 transplant centres across Europe (seven British, one Croatian, one Italian and six Spanish) which provided data on their infrastructure capacity. The comparative analysis of the results can be seen in table 9 in Chapter 4.

It is crucial to remember that the establishment of a successful organ donation and transplantation programme requires changes spanning the entire health care system. The recommendations are intended to be comprehensive, and take a whole-system approach. As the donation and transplantation programme does not operate in isolation, it is inevitable that the recommendations touch on many aspects of the overall provision of health care. While some recommendations may appear more important than others, they are all intricately interconnected, and each one must be adequately addressed to ensure proper functioning of the programme.

Government: political support and long-term commitment

Ministry of Health | NTO

Recommendation

- A national donation and transplantation programme will save lives and save the health system money. To achieve a comprehensive, high-quality and safe national programme, long-term governmental commitment and support is necessary.

Sub-recommendations

- The planning, coordination and implementation of the national donation and transplantation programme should be the responsibility of an **independent national donation and transplantation organisation** which answers directly to Parliament (see recommendation: NTO).
- The government should make available **targeted and sustainable funding** to enable the planning and delivery of the national donation and transplantation programme.

Rationale

Achieving a successful and high-quality system for organ donation and transplantation is an arduous but worthy endeavour that saves individual lives and saves the health system precious funds. Substantial improvement in donation rates in a reasonable time frame is possible, but only when the government wholeheartedly supports reform. The realisation of the Onassis National Transplant Center provides a window of opportunity for the government to renew commitment to provide life-saving organ transplant solutions.

Other countries in Europe have undertaken and succeeded in national transplantation reforms, some under even less favourable economic conditions than those faced by Greece. Italy, Portugal, Spain and the UK all delegate national transplant reform to an independent authority (the National Transplantation Organisation – NTO) which answers directly to its respective parliament and works in collaboration with its ministry of health. These countries have shown that the long-term success of a national transplant programme will require longitudinal governmental support and targeted, sustainable funding mechanisms. When governmental support wanes, as was the case in Portugal following the 2008 recession, the productivity of the transplantation system declines. In order for Greece to develop and sustain a world-class organ transplantation programme there must be adequate resources available, excellent governance structures in place, and the NTO must have the authority to enact reform. These goals are achievable only with continuous political and financial commitment.

Donation after circulatory death (DCD)

The Ministry of Health in collaboration with the NTO and scientific societies

Recommendation

- A legal framework for donation after circulatory death must be established, and DCD protocols should be developed and piloted in selected centres.

Sub-recommendations

- The NTO should convene a **working group of appropriately qualified experts in order to establish a legal framework and national protocols** for controlled DCD and/or uncontrolled DCD.
- Legislation and protocols must give **clear definitions and guidance** around the diagnosis of circulatory death, no-touch periods and permitted ante-mortem procedures.
- Pilot DCD programmes should be implemented in selected centres:
  - Selected centres must have the **requisite expertise and infrastructure** in place. This includes machine perfusion technology and existing well-established donation protocols.
  - Based on these criteria, it would be appropriate to establish **one pilot programme in Athens and one pilot programme in Thessaloniki**.
- These selected centres should be provided with **additional funding** for the implementation of DCD pilots and for any related research activities.
- Pilot programmes should be **evaluated and potentially extended** to other centres.

Rationale

Although not the first component in the process of development of a successful transplant system, the framework (Chapter 3) describes how DCD can contribute significantly to organ donation rates, and outlines some of the challenges and technical aspects of this mode of deceased donation. DCD now represents a significant source of organs in many countries: 24% of deceased donors (DDs) in Spain(1), and 40% in the United Kingdom(2). These examples illustrate the potential to increase rates of organ transplantation by using this route of deceased donation. However, establishing the practice of DCD poses certain legal, ethical and technical challenges. For this reason, legislation needs to clearly define circulatory death as well as no-touch periods and permitted ante-mortem procedures that

can improve organ survival. This requires tackling challenging ethical considerations due to the potentially reversible nature of circulatory arrest. A number of internationally recognised documents provide detailed guidance on DCD(3–7).

Health care professionals in Greece have expressed optimism regarding the feasibility of implementing DCD for which there is currently no legislation. However, the high levels of mistrust in the donation and transplantation programme among the general population mean that new and ethically demanding procedures such as DCD must be approached with great care. Therefore, it would be prudent to employ a step-by-step approach starting with a comprehensive consensus-building process including government, the relevant medical societies, experts in medical ethics and patient associations. Following this, technical and operational challenges will need to be addressed, including fostering collaborations with emergency response teams. However, the initial step should focus on a pilot phase in selected centres to assist in identifying these challenges, and to find solutions before attempting a national roll-out of DCD protocols. The identified centres must receive dedicated funding and be selected based on their expertise and existing infrastructure including the availability of machine perfusion technology. Early pilots would benefit from focusing on controlled DCD initially and expanding to uncontrolled DCD as the programme evolves. Additionally, they should already have donor coordinators and a well-functioning donation system in place. This would help to ensure that DCD practice builds on existing protocols and technical and ethical challenges are more likely to be overcome.

Diagnosis of brain death (DBD)

The Ministry of Health | The NTO, in an advisory capacity

Recommendation

- A culture must be fostered where brain death is routinely diagnosed according to international guidelines.

Sub-recommendations

- There should be **strengthening of training programmes** for ICU physicians, neurologists, neurosurgeons and anaesthetists in the diagnosis of brain death in collaboration with scientific societies. These could follow international examples of simulation-based training in brain death diagnosis.
- **Organ donor coordinators (ODCs) should be responsible** for monitoring and facilitating the diagnosis of brain death in patients who have suffered from catastrophic and irreversible brain damage.

- **Legislation on the definition and diagnosis of brain death** should be distinct from legislation on transplantation.
- ODCs should **educate local staff** regarding the national legislation and international best practice in the diagnosis of brain death.
- Brain death diagnosis should be **based on clinical criteria and performed by two experienced physicians** trained in conducting a neurological examination in the context of brain stem death and who are independent from the organ donation process.
- **Ancillary testing**, such as brain blood flow imaging, **should not be routinely performed**, and should only be conducted under certain circumstances (for example, where comprehensive neurological examination is not possible)
- **Medical training and public educational campaigns** should include the concept of brain death (see recommendation: Public Awareness).

Rationale

Identification of all possible organ donors with a devastating and irreversible cerebral injury in the ICU is critical to achieving a good donation rate(8), and the diagnosis of brain death is a critical step in this process. The framework (Chapter 3 and Appendix 1) discusses the need for clear, comprehensive, and transparent national legislation, guidance and protocols regarding the diagnosis of death by neurological criteria which must be drawn up in accordance with internationally accepted best practice. Key criteria for diagnosing neurological death are an established aetiology resulting in irreversible loss of consciousness and breathing, exclusion of reversible conditions and a clinical examination demonstrating profound coma, apnoea and absence of brain stem reflexes. The UK National Health Service (NHS) organ donation and transplant website describes circumstances for the use of neurological criteria to confirm or diagnose death as follows:

Where brain injury is suspected to have caused irreversible loss of the capacity for consciousness and irreversible loss of the capacity for respiration before terminal apnoea has resulted in hypoxic cardiac arrest and circulatory standstill.' (9)

Without specific training and support, clinicians may lack confidence in the diagnosis of brain death, and in conveying this information to families and loved ones. International examples (Chapter 3) show that training, in particular simulation training, can greatly help improve clinical knowledge and skills (including communication skills) in this challenging and emotive area of medical practice(10,11). The UK NHS organ donation and transplantation website provides a number of training videos for clinicians filmed with the support of UK national experts(12). There are a range of ancillary tests available which can be used to confirm the clinical diagnosis of brain death(13). In broad terms these tests examine blood flow and electrical activity in the brain. However, as these tests are time-consuming, not always available locally, and may cause false hope or distress to families, they should only be used under specific circumstances – for example, when a full clinical examination is not

possible(14). These circumstances should be clearly laid out in national guidelines in accordance with international best practice.

In Greece, national legislation includes a definition of brain death and there is an official diagnosis proforma. This definition is currently a part of the legislation on transplantation, which may create the false impression that diagnosis of brain death is performed primarily to facilitate transplantation. There remains ambiguity in practice, and there is a lack of clarity as to when to initiate and apply the process of diagnosing death by neurological criteria. The role of ancillary testing is poorly defined, and this contributes to the lack of confidence of clinicians in relying on their expertise and clinical judgement. The resultant hesitancy in performing and interpreting the necessary assessments impedes the prompt diagnosis of brain death, and the ability to convey information to families and loved ones in a timely and appropriate fashion. This is a major contributing factor to the low numbers of DBD in Greece.

Clear national guidelines and protocols should be created in collaboration with the relevant scientific societies and experts in medical ethics. A large number of internationally respected institutions have published guidelines on the diagnosis of brain death and in DBD which can be referred to in this process(15–19). These guidelines should be complemented by a comprehensive training programme for all professionals working in specialties where deceased donation opportunities might arise, in particular staff working in the ICU. This training should be an integral part of the CPD portfolio of all trainee neurologists, neurosurgeons and anaesthetists. In addition, ODCs should play a key role in educating hospital staff regarding the diagnosis of death, and disseminating information to the wider health community. As in the UK, BD diagnosis can be safely performed by two clinicians (neither of whom should be a part of the hospital's transplant team) providing standards of clinical practice, training and communication are upheld.

Consent legislation

Ministry of Health | NTO

Recommendation

- A soft opt-out system of presumed-consent legislation with mandatory family consent should be established in order to maximise donation rates and help to frame discussions around end-of-life care and organ donation. The donor card may be retained in this type of system where it serves as a positive affirmation of the wish to donate.

Sub-recommendations

- The NTO must be **responsible for the maintenance of the donor and non-donor registries**. Should individuals wish to opt out, or register any preference regarding which organs they are willing to donate, it must be easy for them to register their wishes with the donor registry.
- All citizens who do not opt out will be considered as potential donors under this system (although the consent of family/loved ones will remain mandatory). However, it **should remain possible to register a positive desire to donate with the organ donor register** and to carry evidence to this effect (for example, an organ donor card). This will further help to frame conversations around donation and aid ODCs in their task.
- The NTO should create a **guiding document** clarifying the current legal situation to clinical professionals.
- The NTO should be responsible for the implementation of a **public information campaign** to ensure that the general public are aware of the change to legislation. This campaign must be carefully designed so as to avoid any unintended negative consequences.
- Organ donor coordinators should **inform and educate local staff** on consent legislation.
- **Professional curricula** should include education about consent legislation and related issues

Rationale

In cases where the wishes of a potential donor are not clearly documented the consent policy determines whether donation will be pursued and clarifies the role of the family in this process.

Internationally, countries with successful donation rates favour a system in which donation can be pursued in case of non-documentation, but still requires family consent (known as ‘soft opt-out’). This system frames donation as the norm in family consultations but also prevents resistance by not overruling the wishes of relatives. The latter is crucial in order to maintain public trust in the system. In the UK, where an opt-out system has recently been adopted, it also remains possible to register a positive desire to donate with NHSBT, and to carry an organ donor card. This option leaves both ODCs and families in no doubt as to the wishes of the deceased(20).

International evidence suggests that opt-out policies are only effective when nested within a comprehensive embedded system with clear clinical roles and commitments and effective media and educational campaigns(21). There is evidence that, in the absence of other supporting structures, an opt-out policy can have little effect and this highlights the

importance of entire system change. In Spain, the improvements in donation rates were not realised until the establishment of the comprehensive national transplant organisation 10 years after opting-out was introduced(22). In other countries, such as Wales, an opt-out policy has been adopted as part of a whole-system approach, and this strategy seems to have had moderate success in boosting rates of donation and family consent(23).

In Greece, in accordance with international practice, a system of presumed consent was introduced in 2013. However, this was followed by the re-introduction of organ donor cards in 2018 (these had been in use prior to the 2013 change in legislation), effectively re-establishing an opt-in system. To add to this, multiple variations of consent legislation have been passed over the past couple of decades, and knowledge about the legal situation remains poor among the general population. Similarly, clinicians have expressed uncertainty about the legislation and their protection from legal claims.

It is worth noting that between 2013 and 2018 the introduction of presumed consent legislation did not have any significant influence on donation rates. This highlights the fact that changes to the consent policy must be accompanied by system-wide structural reform in order to have a significant impact. Therefore, structural reforms, as suggested in the following sections, are crucial in order to achieve improved rates of activity in the organ donation and transplantation programme.

The NTO needs to develop a clear guiding document for clinical professionals which covers the legal situation and issues around family consent. It must also take a lead in informing and educating the general public regarding national legislation and the underlying rationale for change. Once there are sufficient numbers of trained ODCs in place, these professionals can take a lead in educating local staff. Consent legislation and related issues should be covered in medical and nursing school curricula and other relevant professional training programmes.

Reducing the need for transplantation: primary and secondary prevention

Ministry of Health | Regional health authorities

Recommendation

- The success of the national donation and transplantation programme will be dependent on expansion of comprehensive primary and secondary prevention strategies under the remit of primary care and public health. To reduce the demand for organs and ensure sustainability of the overall health and transplant systems, primary and secondary prevention strategies should target the general population and high-risk individuals; they must also target the most important modifiable risk factors linked to end-stage kidney and liver disease. These include: obesity, diabetes, hypertension, alcohol consumption and smoking.

Sub-recommendations

- The type and content of prevention activities should be the responsibility of a **special committee under the Ministry of Health and regional health authorities**.
- The implementation of primary and secondary prevention strategies should be considered the **remit of public health and primary care**, taking into account recommendations made by the NTO.
- There should be national consensus on, and adoption of, a single **national guideline for the modification of risk factors of ESRD and ESLD**.
- There must be national consensus on, and adoption of, a single **national guideline on the screening and early diagnosis of kidney and liver disease**.
- Guidelines and prevention programmes should be created **in collaboration with the relevant specialist scientific societies as well as general practitioners**.
- Prevention programmes should be **linked to key performance indicators** (see recommendation: Quality Standards and Quality Improvement).

Rationale

As it seems unlikely that the supply of organs is ever going to be sufficient to meet the demand, no organ donation and transplantation policy would be complete without including national strategies which attempt to reduce the incidence of chronic diseases leading to organ failure and the need for transplantation. Across Europe, 70–80% of the health care budget is spent treating these chronic diseases(24). Targeting the most important modifiable risk factors of obesity, diabetes, hypertension, alcohol consumption and smoking will lower levels of preventable chronic disease, decrease premature deaths and decrease disability in the population(24).

In Greece, reducing ESRD and ESLD can be achieved by preventing the development of risk factors for these conditions (primary prevention). Reductions in dietary salt intake can decrease the incidence of hypertension(25). Achieving a 10% decrease in blood pressure in a hypertensive population has been shown to lead to a decrease of 0.7 to 5.8 CKD events per 100,000 person-years(26). Likewise, lifestyle modifications can reduce the incidence of diabetes and obesity, and so decrease the incidence of ESRD and ESLD. International best practice guidelines suggest that primary prevention programmes should promote healthy diets (lower consumption of salt, fat and sugar), increased physical activity and the cessation of excessive alcohol consumption and smoking. They should also focus on reducing risk factors for hepatitis (IVDU harm reduction, high-risk sexual behaviours, immunisation where possible) and improving health literacy(24).

Secondary prevention strategies should focus on screening and detection of high-risk populations, routine monitoring, and prevention of early disease progression using pharmacological and non-pharmacological means. For those individuals at high risk for kidney disease, regular screening for markers of kidney damage is recommended. Certain populations (e.g. people with diabetes) also benefit from initiation of targeted therapies (e.g. ACE inhibitors) to prevent kidney disease. For liver disease detection, people with a significant alcohol history, history of IV drug use, metabolic syndrome, hepatitis or genetic liver disease should be screened at routine health visits. The key to secondary prevention is early identification and treatment of CKD or liver damage. Guidelines and examples of good practice in population-wide health promotion of primary and secondary prevention can be found as part of the Joint Action CHRODIS PLUS initiative(3). Examples of good policy practice include the Preventative Health Care Act (2015) in Germany that motivated insurers to fund prevention initiatives exclusively or Portugal's Health Literacy Repositories projects that focus on sharing education on health literacy and self-care(3).

The most successful prevention programmes in Europe are led by strong and professionally respected public health bodies with adequate funding and supporting infrastructure to execute their functions. Furthermore, such strategies are linked to comprehensive primary care networks and supported by relevant scientific organisations. Prevention strategies should be broad in nature, aimed at a wide audience and linked to payment schemes to aid implementation. Prevention programmes cannot be implemented alone: collaborations with existing organisations can help with the execution of these prevention strategies.

Reducing the need for transplantation: tertiary prevention

Ministry of Health | NTO | Relevant scientific societies

Recommendation

- A mandatory system should be established whereby those presenting with end-stage organ failure are referred for specialist supportive management and for consideration of suitability for transplant.

Sub-recommendations

- The NTO should develop a **mandatory and standardised referral process** for specialist supportive management and consideration of suitability for transplant for patients meeting national thresholds of ESRD/ ESLD.
- Implementation of, and adherence to, this system of mandatory referral should be **monitored by the NTO using key performance indicators**.

- The development of these guidelines and referral processes should be undertaken **in collaboration with the appropriate scientific societies**. These include nephrology units, the Greek Society of Nephrology and the Greek Association for the Study of the Liver.
- Transplant centres should make **preparations for an anticipated increase in demand** for services.

Rationale

Patient survival and quality of life can be improved by investing in health care for patients with existing kidney or liver disease(25). These tertiary prevention strategies include surveillance of disease progression, medical management of the complications of disease and referral to appropriate specialists to prepare for definitive management (i.e. transplantation). All successful European donation and transplantation programmes have a standardised, transparent and well-respected referral process for evaluation of candidacy for solid organ transplantation. Recommended guidelines and referral standards that are adaptable to the Greek context include: ERA-EDTA Clinical Practice Guidelines, KDIGO guidelines, NKF KDOQI guidelines, and EASL guidelines. Referrals for assessment of transplant candidacy are a gap in the current system despite renal transplantation being the international gold standard treatment for end-stage renal disease. Development and implementation of a referral process for transplant candidacy is one part of a comprehensive national transplant programme, and must be established with the development of waiting lists and registries to be successful.

Public support: addressing issues of trust

NTO | Transplant centres | Relevant scientific societies

Recommendation

- The NTO must recognise the **widespread mistrust** in the current organ donation and transplantation system and take measures to **combat misinformation and misconceptions**. A **culture of altruism and social solidarity** towards organ donation and transplantation must be fostered.

Sub-recommendations

- **Correcting existing misconceptions should be a core element in all public relations activities** and part of a comprehensive and continuous public relations strategy. This includes communications with the media, public awareness campaigns, educational campaigns, and training programmes.

- Strict adherence to **fair, equitable and transparent processes** and the establishment of good governance structures will build confidence in donation and transplantation standards and ethics.
- **Confidence and trust established at the bedside and during the process of organ donation** by the medical team and medical community is crucial, and aid in the transparency of end-of-life decision making.
- **Periodic surveys** monitoring attitudes and perspectives towards organ donation and transplantation will assist in monitoring and addressing issues of public trust.
- Establishment of **partnerships and alliances with reputable organisations** may aid the NTO with its communication strategies.

Rationale

The Eurobarometer on Organ Donation and Transplantation shows that Greece consistently stands out as having low support levels for organ donation(27). In comparison to 55% and 53% of Europeans, only 43% and 41% of Greek citizens would say yes to personal and family organ donation, respectively. Among all European countries, Greece had the highest proportion (45%) of respondents who were not willing to donate organs and citing distrust in the system as the primary reason. Fear of manipulation of the human body and religion were two other reasons for refusal, also higher in proportion than the European average(27). As a result, over 70% of the Greek population have never had a discussion about organ donation.

Without public trust, it is unlikely that any national transplant programme will succeed. Instilling trust requires strict adherence to fair, equitable and transparent organ transplant processes and governance. Over time, faithfulness to the highest ethical standards may result in cultural change where organ donation is seen as part of an altruistic society, and this will be reflected in an expanded pool of available donors and resources. As detailed in the case studies (Appendices 2 to 6), prior to national transplant reform in the 1990s, Italy had similar levels of mistrust in transplantation. Within two decades, Italy has managed to become a global leader in transplantation and is now said to possess a national consciousness in solidarity for organ donation, reflected in public attitudes and donation rates. Universally, organ donation is a sensitive issue as it is often at odds with human expectations of death, religious teachings and culturally accepted rituals around death and dying. These issues must be addressed with sensitivity in Greece, allowing for gradual reversal of misconceptions held by the population. Public trust will evolve with time and demonstration of a fair and equitable transplantation system in conjunction with providing education on the safety of altruistic donation. This is a highly complex and multifactorial issue and therefore benefits from a multi-faceted approach. It may be useful to periodically monitor public attitudes and perceptions as surrogate markers of public trust.

Public support: building relations with the media

NTO

Recommendation

- The NTO should establish regular conferences and provide regular progress updates with the press and media. This can be achieved by the creation of a dedicated NTO Media Office (see recommendation: NTO).

Sub-recommendations

- The media office of the NTO should establish a **24/7 hotline**, whereby the press and media can obtain reliable, accurate and timely donation and transplantation information.
- Organ transplantation is the **gold standard treatment in ESRD**, and the **only curative treatment available for ESLD**. The NTO should aim to present this information in a transparent, ethical and favourable manner.
- The media office of the NTO, guided by experienced media professionals, should ensure that the **press and media are made aware of all donation and transplantation conferences and any other events of national importance**. Sufficient content must be made available to ensure transparency and encourage constant press and media support for the national organ donation and transplantation programme.
- The NTO must work in **collaboration with the press and media** to build public trust in organ donation and transplantation, and disseminate information to dispel misconceptions and foster cultural change.
- It may be helpful to assemble a r**epository of visual arts, literature, music and cinema** favourable to organ donation and transplantation which can be used appropriately in public relations activities.

Rationale

It is indisputable that the portrayal of transplantation in the media has a powerful influence in shaping public attitudes and perceptions as detailed in the framework (Chapter 3) and international lessons (Chapter 4). Positive media coverage can be harnessed to address issues of mistrust, show fairness in the transplant process and highlight the lives saved through transplant activities. Consistent positive media coverage is equally or more important than public campaigns to improve knowledge and awareness, and increase population donation rates(28). Portugal and Spain provide good examples of developing these links with the media. Both countries schedule regular meetings to share

transplantation information, provide regular updates, and invite journalists to select educational and training events/conferences. Spain's NTO has a branch directly responsible for media relationships, which is available by telephone 24/7. Establishing good relations with journalists is crucial for public trust, and they can also be allies when there are errors in the transplant system that require clear and concise disclosure.

The media remain one of the most important channels for spreading information in Greece. For organ donation, the media were the number one source of information used by adults to form their attitudes and behaviour towards organ donation according to a 2012 survey in Thessaloniki(29). Interviews identified a willingness on the part of the Greek media to disseminate information on organ donation and transplantation. However, better communication, professional materials and more frequent updates were requested from the NTO.

Public support: public awareness

Ministry of Health | NTO | Ministry of Education | Transplant centres | Scientific societies

Recommendation

- Investing in public education and national campaigns is necessary to raise public awareness of organ donation and transplantation, dispel misconceptions and stimulate collective reflection on end-of-life discussions. Public information and education campaigns should be undertaken in partnership with relevant organisations and aimed at a wide audience. The NTO should establish a dedicated Public Information and Education Office to oversee these efforts.

Sub-recommendations

- Educational campaigns should be tailored to address the entirety of the population with special attention to age-appropriate messaging. These campaigns should be devised to target populations across age groups, including programmes for school-aged children, young adults and older adults.
- National campaigns should highlight successful stories that resonate with all age groups. **Personal stories from the unique perspective of the transplant recipient, particularly paediatric stories,** have been shown to be effective in presenting the benefits of organ donation and transplantation.
- Further, **tailored educational campaigns for select groups** should be considered, such as religious congregations and the armed forces, for whom targeted messages would be appropriate. These campaigns should be undertaken in partnership with community members, governmental organisations and the press and media.

Rationale

Public awareness campaigns are investments to achieve sustainable supplies of organs for transplant over the long term. There is often a natural reluctance to discuss death and end-of-life wishes, and national programmes play a key role in reaching a wide audience and dispelling commonly held myths and misconceptions. Awareness campaigns are associated with an overall 5% improvement in health outcomes, especially registry signing(28). However, the positive influences are only sustained when awareness campaigns are repeated or longitudinal. Such initiatives need to be thoughtfully planned and executed, and be respectful of local cultural norms and practices if unintended adverse consequences are to be avoided. Carefully constructed publicity and media programmes are thought to have modest impact in increasing the number of people on registry lists and in the donation rate.

Furthermore, culturally tailored and issue-targeted strategies undertaken in collaboration with community partners are more likely to lead to successful organ donor campaigns(28). Our country case studies (Appendices 2 to 6), suggest that in some jurisdictions personal stories can be a very helpful strategy to increase support and drive change. Personal accounts are a potent mix of tragedy and joy, and tend to capture the hearts and minds of the population. Examples include ‘Effetto Nicholas’ (Italy) or ‘Max and Keira’s law’ (UK). Recipient stories are typically more effective than donor stories. Italy, Spain and Portugal run educational programmes in partnership with education ministries targeted at primary and secondary schools. Educational programmes directed at younger people play a role in stimulating family debate and reflections about end-of-life wishes and contribute to a culture of solidarity. Other transplant programmes organise educational activities in the community, in partnership with advocacy or religious organisations.

NTO: governance and structure

Ministry of Health (proposing legislation) | Parliament (approving legislation)

Recommendation

- The National Transplant Organisation (NTO) must be empowered to lead the national donation and transplantation programme by being granted authority to enact change. As in other countries with successful programmes, the NTO should become an independent authority. This will require changes to legislation and governance structure.

Sub-recommendations

- The government should introduce legislation to **re-launch the NTO as an independent authority**. As an independent authority, the NTO will answer directly to the Greek Parliament, increasing its authority and accountability. Although independent, the NTO should have a relationship of close cooperation and collaboration with the Ministry of Health.
- **A board of directors should be created to supervise the NTO** and oversee the national donation and transplantation programme and strategy. The members of the board of the NTO should be appointed by parliament.
- The Board of the NTO should be **representative of the following interests**: solid organ transplantation, cell transplantation, national bioethics, immunohistology facilities, the ICU sector, transplant centres, patient and carer organisations, the Church of Greece, and professional scientific societies related to the field of organ donation and transplantation.
- The Board should be **supported by advisory committees** representative of each of the above fields to provide scientific and clinical advice (see recommendation: National responsibilities of the NTO)

NTO: funding

Ministry of Health | Parliament

Recommendation

- The NTO should be funded by the Ministry of Health. Early investment in the NTO is needed given the proposed structural reform, employment of additional staff and subsequent expansion of responsibility. The amount of funding should thereafter reflect the levels of activity related to organ donation and transplantation.

NTO: organisation

The NTO (acting as an independent authority in line with legislative change outlined above)

Recommendation

- To realise a comprehensive donation and transplantation programme, there must be structural reform within the NTO and establishment of dedicated roles. The NTO should aim to create an organisation that is representative, effective and efficient.

Sub-recommendations

- The NTO should appoint a **permanent and full-time Chief Executive Officer** (CEO). The CEO will be responsible for the everyday business and administrative aspects of the NTO and will be a key champion for the national donation and transplantation programme.
- A **permanent and full-time Chief Medical Officer** (CMO) should also be appointed. The CMO will be responsible for the health care professionals and other staff involved in the national donation and transplantation programme. The CMO will also be a key champion.
- Responsibility for the oversight of donation and transplantation activities should be divided between a **central office (Athens) and four regional offices** (Thessaloniki, Ioannina, Patra, Herakleion). Each regional office should appoint a permanent and full-time deputy chief executive officer who reports directly to the CEO and CMO of the NTO.
- **The CEO should be responsible for the appointment of appropriately qualified and adequately trained staff** to support the implementation of the national donation and transplantation programme.
- Given the expanded responsibilities of the NTO, a **significant increase in staff numbers** across the organisation is needed commensurate with its functions and mission.
- All appointments should be filled through a **transparent and open selection process**.

Rationale

The complex nature of donation and transplantation, and the degree of collaboration and consensus that is required to achieve successful outcomes, necessitate high-level coordination.

Current **international** guidance and experience from top-performing countries on national strategy recommend that an adequately funded and resourced single public body referred to as a National Transplant Organisation (NTO) should be established. The NTO must be

adequately funded as it will have overarching responsibility for the entire process from donor selection to long-term follow-up. In countries with a system of regional government, the NTO often has regional branches to coordinate the organ retrieval and transplant processes (e.g. Spain). In other countries, a smaller population leads to a strong central organisation of the transplant organisation (e.g. Croatia).

In Greece, consistent commentary from stakeholders revealed that a comprehensive NTO currently exists only on paper. In practice, the NTO is severely short staffed, under-resourced and lacks multi-representation. There is little trust in the NTO as the authority for organ donation and transplantation, and little faith in the process of transplantation overall. The NTO in its present form lacks the power to coordinate activities, to implement and enforce legislation and regulations, and to control quality standards. The NTO suffers as its decisions do not have immediate effect, and must first be approved by Parliament or the other relevant health committees/councils. For these reasons, it has had little success in enacting changes to the programme or realising improvements to the national donation/transplantation infrastructure. Resolving these difficulties is a crucial area for reform.

NTO: national responsibilities

NTO

Recommendation

- As the national donation and transplantation programme evolves, the NTO should revise and update its mandate and responsibilities. It must become the single authority in the processes of organ donation, transplantation and monitoring. It should be responsible for the maintenance of the registries, databases and waiting lists and for the regulation of the donation and transplantation programme. It must also take a lead in the regular review and development of clinical guidelines and protocols.

Sub-recommendations

- The NTO must have a **central team available 24/7** to support the time-sensitive nature of donation and transplantation activities.
- The NTO should establish **advisory committees** in the following domains:

  (1) donation activities

  (2) transplantation activities

  (3) waiting times

(4) equity of access

5) selection and organ allocation

6) transplant outcomes and research.

Advisory committees should be inclusive and representative of each organ system as well as relevant scientific societies. The advisory committees should be responsible for ensuring evidence-based practice through the formation of guidelines and determination of quality indicators.

- The NTO should establish a **separate quality, safety and regulatory division** authorised to carry out inspections and quality assurance measures within the national donation and transplantation programme (see recommendation: Quality standards and quality improvement).

Rationale

According to international best practice, essential functions of every NTO, regardless of structural composition, include:

- The process of donation, from registration of potential donors to organ retrieval and transplantation.
- Maintenance of transplant waiting lists (there must be nationally agreed rules for admission to the waiting list).
- Ensuring that organs are allocated according to nationally agreed rules (these should ensure equal access, be based on ethical norms and structured according to nationally agreed and transparent criteria).
- Coordinating the results of tissue matching and screening from donor to recipient teams.
- Ensuring sufficient laboratory capacity for Human Leukocyte Antigen (HLA) and immune-compatibility testing, and ensuring regular maintenance and updates of the data required for tissue matching.
- Responsibility for all information technology (IT) infrastructure and data handling required for maintenance of the organ donor list, transplant waiting lists, follow-up and outcome data.
- Ensuring the confidentiality of donors and recipients is respected and upheld.
- Ensuring that transport arrangements are in place that will enable rapid and safe transfer of organs from the donor hospital to the transplant unit.
- Making sure that there are robust traceability mechanisms for transplanted organs in place to facilitate bio-vigilance and quality assurance processes.
- Ensuring full transparency and accountability for the donation and transplantation system.

- Taking national / international responsibility for organ donation and transplantation.
- Responsibility for establishing quality assurance systems which are based on international standards and which address all parts of the donation and transplantation process.
- Providing accurate, up-to-date information/reports on organ donation and transplantation and promoting public and professional awareness and education.

This list is not exhaustive, and we would recommend referring to the EDQM's very comprehensive list of essential and additional functions for an NTO in its 2018 7th Edition Guide to the Quality and Safety of Organs for Transplantation. Due to the time-sensitive nature of organ transplantation, it is essential to have an on-call advisory member available 24/7, promoting the NTO's reliability and credibility as the country's transplant leader. There are other functions which would ideally be included in the remit of the NTO (i.e. primary and secondary prevention strategies), but these could be fulfilled in close collaboration with other agencies. To carry out the national responsibilities of a NTO, advisory groups should be established, similar to those used by NHSBT in the UK. These advisory groups consist of experts, scientists, clinicians, politicians and health administrators who work in conjunction with the NTO to develop best practices, implement policies and evaluate programmes in their area of expertise. Establishment of the advisory committees must be complemented by a separate quality, safety and regulatory division that is able to ensure the standards set out by the advisory committees.

NTO: international responsibilities

NTO

Recommendation

- The NTO should strive to develop collaborations with internationally recognised transplantation organisations. This will help expand the donor pool for vulnerable populations, increase transparency and legitimacy of the national donation and transplantation programme, and provide access to expertise and alternative sources of funding.

Sub-recommendations

- The NTO may initially focus on the development of the national donation and transplantation programme. However, it is important for the NTO to aim to **join a European network of transplant organisations** (i.e. Eurotransplant) by expressing early interest in membership and developing collaborations as soon as possible. Planning to meet membership standards and actively working towards this goal will help improve the national transplant system.

Rationale

As highlighted in the **international** lessons, while not sufficient on its own to provide assurance of a high-performing organ donation and transplantation system, membership of an established international network of transplant organisations provides numerous benefits for a country developing its own transplant programme. There is a direct benefit for patients with end-stage organ failure by expanding the donor pool. Collaboration and an international waiting list are especially important for high-urgency or specialised populations for whom it takes considerable time to develop a suitable programme for transplantation. International collaborations also provide access to knowledge and information sharing between specialists and transplant organisations. This will help the national organ donation and transplantation programme remain up to date and in accordance with world standards. Finally, there are resources and monetary grants afforded to members of these organisations, whether for further development of the transplantation programme or to enhance research endeavours.

Currently, **Greece** has a small partnership with Italy but there is the potential to do so much more. Aiming to join an international network is harmonious with the goal of achieving a strong transplantation programme in Greece. As the international representative for Greece, the NTO's path to joining such a network offers greater opportunities for collaborations, access to expertise, additional funding and building up Greece's reputation as a leader in transparent, fair and safe organ and transplantation practices.

Infrastructure

Donation and transplant centres | NTO

Recommendation

- Provision and maintenance of adequate infrastructure is vital to the development of a successful organ donation and transplantation system. To achieve sustainable improvements in donation and transplantation activity, infrastructure capacity must be expanded. All the national transplant centres should be supported to meet the current European standards in terms of infrastructure and resources.

Sub-recommendations

- **Transplant theatre capacity should be doubled** in order to reach the European average. This should include both elective and emergency theatre lists.
- Centres involved in organ donation must ensure that there is **adequate theatre capacity to facilitate organ retrieval**, and that this is given appropriate prioritisation.

- Rapid 24/7 access to **computed tomography, ultrasound scanning, interventional radiology and endoscopy services** should be established in all centres. There must be trained staff and equipment available at all times.
- Local arrangements must be in place for the **regular maintenance** of the above equipment and policies must be established for **addressing equipment failures** in a rapid and effective manner.
- **ICU capacity** must be sufficient to facilitate donation processes, and ICU staff must have access to the necessary equipment for donor maintenance.
- **Laboratory capacity** (general pathology, histocompatibility, immuno-genetics capacity) must be adequate and have rapid response times in order to support donation and transplantation processes.
- There must be **sufficient space and equipment** to conduct assessment and follow-up clinics, and to accommodate administrative support.
- All staff must have access to adequate **IT and communications equipment**.

Rationale

The Infrastructure supporting the donation and transplantation programme must be fit for purpose and regularly updated. Existing infrastructure varies significantly across Europe, and quantitative and qualitative data on the basic infrastructure requirements necessary for the donation and transplantation processes are lacking at an international level. In making decisions regarding infrastructure requirements, the current and the projected future demands should be taken into consideration. The geographical distribution of the organisations needs to be considered, particularly with regard to the time-limited nature of many processes and the travel times required for the transportation of organs and/or patients. Infrastructure considerations must take into account not only clinical processes, but also supporting functions such as administrative support, IT and communications (for IT infrastructure see recommendation: Databases and Information Technology).

This recommendation is informed by the two aforementioned surveys of national and European transplant centres which were undertaken in order to conduct the gap analysis of the existing Greek organ donation and transplantation programme: the comparative analysis of the results can be seen in table 9, Greek situational analysis (chapter 5).

In Greece, the national donation and transplantation centres' available resources are not systematically registered. However, the survey and the national situational analysis revealed an urgent need to expand operating theatre capacity (both for donation and transplantation procedures) and improve access to imaging and other diagnostic services such as endoscopy. Although ICU capacity in the transplant centres themselves is comparable to that in other European transplant centres, it is low overall, and there is a need to address

this. It was also demonstrated that there is a need to improve access to pathology services and to histocompatibility testing, which at the moment often requires an off-site transfer. In view of the predicted increased demand, it will also be necessary to ensure that there is adequate clinical space and equipment available to conduct transplant assessments and follow-up. It must not be forgotten that clinical staff will need the support of an administrative team who will require office space and equipment to perform their tasks including up-to-date IT and communications technology. The expanded NTO will also need accommodation and equipment.

The Onassis National Transplant Center

NTO ONTRC

Recommendation

- The Onassis National Transplant Center (ONTRC) represents a significant step forward in the development of the infrastructure needed to underpin a high-performing national transplantation service. The ONTRC should act as a part of a national network of excellence, with all transplant centres working in close collaboration. This is particularly the case in Athens, where the three centres are in close geographical proximity. The centres of Ioannina and Patras already work in alliance.

Sub-recommendations

- Working in partnership with the NTO, **the ONTRC should help to facilitate** the close collaboration of transplant centres and transformation of the wider system in the following areas:

  - Quality assurance of clinical outcomes
  - Pioneering innovative clinical pathways
  - Digitalisation of health care
  - Translational and clinical research in transplantation
  - Continuity of training in all transplant disciplines
  - Fostering international collaborations.

- **The ONTRC should act as the national centre for paediatric transplantation**, ensuring ample infrastructure and health care staffing is available in a coherent unit.

Rationale

The ONTRC will confer major benefits on the wider organ donation and transplantation system. Beyond extending the availability of infrastructure, service and training capacity for transplantation, the ONTRC should work in close collaboration with the NTO to foster greater connectivity and collaboration across the national organ donation and transplantation system. The benefits of close collaboration within clinical networks of transplant centres have been demonstrated by the success of the UK in maintaining transplantation services during COVID-19. The ONTRC can establish programmes in support of the enhancement of services across the nationwide network of centres involved in transplantation, pioneering innovative clinical pathways and supporting other centres to adopt them, providing support in the quality assurance of clinical outcomes, leading in the adoption of digital technologies, acting as a centre for translational and clinical research, providing opportunities for training and continuous professional development, and fostering international collaborations in research, training and development.

Strategic planning on how the future transplantation activity is going to be distributed among the national transplant centres is crucial in order to enable effective collaboration within the network. As mentioned before, reaching Portugal's transplantation performance would be a feasible mid-term objective for Greece. Table 11 shows the current annual shortfall in the numbers of transplants performed in Greece when compared to Portugal's performance (for liver and lung disease, adjusted UK performance is used as a benchmark,

Table 11. Numbers and shortfall in solid organ transplants in Greece per year compared to rates achieved in Portugal and the UK (UK numbers adjusted for population)

Transplant type	Portugal 2019	UK 2019 (adjusted)	Greece 2019	Greece shortfall 2019
Kidney	**514**	558	138	336
Liver	240	**150**	33	117
Pancreas	**25**	33	0	25
Lung	70	**26**	0	26
Heart	**21**	28	15	6
Pediatric	**31**	35	3	28
Total	**901**	830	229	672

Note: Numbers in bold were used to calculate the shortfall in Greece's performance in comparison to Portugal, for kidney, pancreas, and heart transplants, and all solid organ transplant types, and relative to the UK for liver and lung transplants.

since it better reflects the epidemiological pattern of these diseases in Greece). Table 12 shows the projected future distribution of solid organ transplants per centre, if Greece is to meet the above-mentioned targets.

Table 12. Projected number of solid organ transplants per centre per year when Greece meets the proposed targets, compared to 2018–2019 numbers

Transplant type	ONTRC	Laiko	Ippokrateio Thessalonikis	Evagelismos	University Hospitals of Patras and Ioannina
Kidney	168	171 (97)	100 (33)	55 (24)	20 (5)
Liver	55	33 (10)	62 (18)	–	–
Pancreas	10	8	7	–	–
Lung	26	–	–	–	–
Heart	21	–	–	–	–
Pediatric	31	–	–	–	–
Total	311	212	169	55	20

Note: Numbers in parenthesis = annual average number of transplants performed over two years (2018 and 2019) is presented (2020 is considered a non-representative year due to the COVID-19 pandemic).

Reimbursement

Ministry of Health | Insurance funds

Recommendation

- All activities related to organ donation and transplantation must be adequately financially reimbursed; this includes payments to staff, participating units and supporting services.

Sub-recommendations

- A **panel of experts** should be convened to discuss and agree the exact details of appropriate reimbursement for all donation and transplantation activities.
- There must be a **revision of the KEN-DRG system** to include reimbursement of hospitals for donation activities. This must include any ICU activities and cover all eventualities related to donor management including a per diem payment for the time spent on the ICU from the time of declaration as a donor.

- There must be a **specific KEN-DRG for organ retrieval**. As a minimum, this should be reimbursed at the rate of a major laparotomy and/or thoracotomy.
- **All personnel must be adequately reimburse**d for their activities related to donation and/or transplantation. This should include an appropriate supplement to their pay to recompense them for the often antisocial hours of work involved.
- There must be a **review of and any necessary revisions made** to the current funding arrangements in place to reimburse transplant units and/or local providers for **long-term follow-up care and treatment of any complications** following discharge from hospital. This should include follow-up of live donors.
- There must be funding arrangements in place to **reimburse all supporting services** including laboratories, radiology services, transport and IT support.

Rationale

The framework (Chapter 3) highlights the need for a carefully designed reimbursement system covering all aspects of organ donation and transplantation. Although organ transplantation is highly cost-effective in the long-run(30), the immediate costs and resource requirements are considerable. Without a sophisticated reimbursement system, there may be financial burdens which pose a barrier to the effective functioning of the organ donation and transplantation programme. Additionally, donation and transplantation activities often occur during, or extend into antisocial working hours in the middle of the night, at weekends and during national holidays. It is of great importance that all staff and facilities involved in the donation and transplantation programme are considered and adequately recompensed for their activities, taking into account the often antisocial nature of the work. This must include all supporting services such as laboratories, radiology and transport.

The exact mechanisms of reimbursement are dependent on existing financial structures and funding arrangements, and, as shown by our case studies, different countries have found a variety of creative solutions. What they all share in common is that donation and transplantation do not incur any financial strain on institutions and that personnel are adequately paid for their efforts and rewarded for their willingness to regularly work during antisocial hours. Carefully designed incentives may be helpful, although they must be strictly monitored and honoured. In Spain, a system of variable reimbursement provides incentives for donation and transplantation activities and is thought to have helped to boost rates of activity.

In Greece there is a KEN-DRG for transplantation, but not for activities related to donation, including maintenance of donors in ICU and organ retrieval. As a result, donation activities pose a considerable financial burden to participating hospitals. Donation coordinators receive no extra pay for their work related to donation, and there is no provision to recompense any staff members for the often-antisocial nature of their work, and the long hours which are frequently involved. There is a need to revise funding arrangements to

ensure that all steps of the process are accounted for, from identification of potential donors to long-term follow-up. All supporting services must be taken into account when undertaking a review of funding, from laboratory support to the transportation of organs. As the Greek organ donation and transplantation programme evolves, cost-savings incurred from reducing more expensive modalities of end-stage organ care should be re-invested in the programme, aiming for a self-sustaining system.

Donation: Organ Donor Coordinators

NTO

Recommendation

- In order to achieve good rates of organ donation it is crucial to have a sufficient number of specially trained Organ Donor Coordinators (ODCs). There is an urgent need to expand this section of the workforce, and to train and appoint ODCs in every unit participating in organ donation.

Sub-recommendations

- Every hospital with an intensive care unit in Greece should appoint a **minimum of two ODCs, and a number proportionate to the size of the hospital with sufficient cover to guarantee round-the-clock coverage 365 days a year**.
- **Appropriately trained clinicians with additional training in the role of donation coordination** should be recruited as ODCs.
- Physician ODCs **should be supported by specialised nursing staff or nurses with appropriate training**. ODCs should further be supported by ICU directors and hospital administrators.
- In larger centres the donation team should be available **24 hours a day, 365 days a year** including weekends and national holidays.
- ODCs should have a **minimum of 10 hours per week** dedicated to their responsibilities.
- ODCs should receive **dedicated reimbursement for their role** taking into account the often antisocial nature of their work.
- **Basic training for ODCs** should be provided by the NTO via an introductory module with further support from NTO as necessary.

- **Introductory and advanced training** should follow the curriculum of the European Society of Organ Donation and Transplantation.
- ODCs should aim to achieve the **Certification of European Transplant Coordinator** (CETC).
- **Adherence to the existing legal framework** pertaining to ODCs must be monitored and enforced:

- There must be dedicated time and reimbursement for donation activities.
- The **responsibilities** of ODCs include:
  – Identifying potential donors.
  – Approaching families and facilitating consent.
  – Collecting and reporting local data on organ donation.
  – Collaborating with NTO officials and local administration to implement. national protocols and improve local processes.
  – Providing local teaching activities.

Rationale

As discussed in the framework, ODCs are responsible for coordinating the process of organ donation at hospital level. It is essential that they have dedicated time to fulfil their role alongside competing clinical demands and that their pay reflects the arduous and often antisocial nature of their work. Their appointment should be subject to completion of basic training provided by the NTO and supported by their employer. They must be able to access and attend ongoing training updates and opportunities to achieve advanced qualifications (see recommendation: teaching, training and professional development). Communication skills must be a core component of their training. Experience shows that, if the above conditions are met, involvement of an ODC is one of the most important elements in the process of gaining consent for donation(31–34).

Greece made an attempt to implement ODCs in 2003, and loosely defined their responsibilities in the PD 93/2002. However, in practice, implementation was not sustainable and the role of ODCs remained somewhat unclear. The lack of protected time, adequate reimbursement and dedicated training have been key barriers to recruiting and retaining sufficient numbers of ODCs.

The pay of ODCs must be urgently reviewed, and funding streams identified to ensure that they are adequately reimbursed for the nature of their work. To ensure long-term commitment, reimbursement and minimum protected time dedicated to donation purposes should be defined in legislation. With the support of the NTO, all hospitals with a role in organ donation should initiate processes to train and deploy an appropriate number of ODCs, taking into consideration the size of their facility and levels of activity (in particular ICU capacity). Considering cultural factors in Greece and professional requirements, in the

first instance it may be appropriate to recruit tenure-track physicians. These physicians should be supported by specialised nursing staff who must also be granted protected time, dedicated payment and tailored training for their role. It is unlikely that clinicians will dedicate their careers to the role of an ODC, and so it will be necessary to enable the role to be undertaken part-time with support of other professionals. The role of nurses should be progressively expanded, in order to move towards a primarily nurse-led model of donation coordination over time.

Donation: processes involved in evaluation, retrieval and transport

NTO | Donation and transplant centres

Recommendation

- All steps of the donation process must be covered by nationally agreed protocols and guidelines drawn up in accordance with internationally recognised best practice. This includes the evaluation and management of donors, organ retrieval, organ preservation, packing and transportation. There must be sufficient numbers of trained staff available at all times.

Sub-recommendations

Donor evaluation and management

- **Nationally approved guidelines for evaluation of potential donors** should be drawn up in accordance with internationally recognised best-practice.
- **Guidelines for 'expanded criteria donors'** should be developed in accordance with international examples. This would incorporate the consideration of older potential donors or those with a significant medical or risk history; this has the potential to significantly increase the donor pool.
- **Nationally approved guidelines for management of potential donors** should be drawn up in accordance with internationally recognised best-practice. These guidelines should cover in situ organ preservation techniques and aim to enhance organ viability for transplantation.
- Every hospital involved in organ donation must ensure that **staff trained in donor evaluation and donor maintenance are available 24/7**, including weekends and national holidays.

Organ retrieval

- Every region must be able to **rapidly deploy an adequately staffed and specially trained organ retrieval team** to donor hospitals. This process should be supported and coordinated by the NTO.
- **Organ retrieval teams must be available 24/7**, including weekends and national holidays. To ensure timely attendance, hospital management must recognise that organ retrieval should be prioritised over any other tasks and support the immediate release of on-call staff from other duties when they are needed for a retrieval.
- **Staff involved in organ retrieval must be adequately reimbursed** for this duty, and the level of reimbursement should reflect the often antisocial nature of the work.
- All hospitals involved in organ donation must ensure that there is **adequate operating theatre time and equipment** available for organ retrieval teams to perform their tasks in an efficient and timely manner.
- The retrieval team must have **rapid access to specialist advice and support including pathology, histopathology and microbiology**. This is especially important in the context of unexpected findings (e.g. a previously undiagnosed tumour) occurring during the retrieval procedure.

Organ preservation and packing

- **Nationally approved guidelines for the preservation, packing and labelling of retrieved organs** should be drawn up in accordance with internationally recognised best practice.

Organ transportation

- The NTO should support the ODCs in arranging for **organs to be transported to recipient hospitals safely and swiftly**. Any courier services contracted to undertake this task must meet international standards in organ transportation. There may need to be special arrangements in place for air transport.

Rationale

The framework (chapter 3) outlines the complex processes involved following identification of a potential donor through to the transportation of organs to the recipient hospital. Nationally agreed criteria and protocols which cover donor evaluation and maintenance, organ retrieval, preservation, packing and transportation must be in place, and these should be in accordance with internationally approved best practice(35–37). Every hospital involved in organ donation must ensure that there is adequate infrastructure, equipment and

appropriately trained staff available to cover all processes 24 hours a day, every day of the year. The NTO should be available at all times to provide support and advice.

Our case studies (chapter 4) highlight some practices which have worked well in their particular country context. Spain has had notable success in the use of 'extended criteria' donors implementing programmes which age match older donors with older recipients(38). The UK has overcome difficulties in the coordination of organ retrieval procedures by instituting a National Organ Retrieval service(39), and Spain and Portugal regularly use their air force for the transportation of organs(40,41),

In Greece, there is a need for harmonised national guidance and protocols to cover the steps of the donation process outlined above. There is an urgent need to ensure that the staff and facilities involved in donation are adequately reimbursed (see recommendation: Reimbursement), and that they have dedicated time for their duties and are in receipt of regular tailored training and appraisal (see recommendation: Teaching, training and professional development). Attention must also be paid to the interface with vital supporting services such as expert pathology or microbiology advice and specialist laboratory support.

Living donation

NTO | Transplant centres

Recommendation

- Living donation should become a cornerstone of the donation and transplantation programme, and pre-emptive renal transplantation from a living donor (LD) must become the treatment of choice for end-stage renal failure.

Sub-recommendations

- **Appropriate legislation** must safeguard against any form of coercion.
- There must be **no perverse incentives** to living donation. However, measures must be in place and enforced to remove any financial burden including loss of earnings, and any additional expenses incurred as a direct result of donation.
- LDs should continue to **receive prioritisation on the waiting list** should they need a transplant in future.
- **Education and publicity campaigns** must be undertaken to raise awareness around the benefits of pre-emptive renal transplantation from a LD, and dispel any myths or misconceptions regarding the risks of living donation.

- T**he Greek Society of Nephrology** will play an active role in promoting living donation, through their representation on the advisory committee of the NTO.
- **All assessments for dialysis** should include discussions around living donation, and exploration of whether there might be a potential willing donor in the patient's family or wider social circle.
- **Partnerships and communication channels must be established between the donation and transplantation programme and any secondary or tertiary care physicians** who may be involved in referring patients for assessment for transplant. It is particularly important that the lead nephrologists of dialysis units are engaged in a collaborative and constructive manner.
- **A LD registry** must be created. This would facilitate the expansion of **kidney exchange schemes** and boost successful rates of transplantation.
- National organ-specific guidelines for the **life-long follow-up** of LDs must be devised. These should be drawn up in accordance with internationally recognised best practice.
- **Outcome data** must be collected and collated by the NTO for national monitoring purposes and for contribution to international research efforts.

Rationale

While deceased donation remains the primary cornerstone of a transplantation programme, the framework (chapter 3) demonstrates the importance of the role that living donation plays in the development of a successful donation and transplantation system. It is extremely important to recognise that, in the case of renal failure, pre-emptive transplant (prior to the need for dialysis) from a living donor is the treatment of choice, and a wealth of international evidence is available which clearly shows the excellent short- and long-term outcomes in LD, from both clinical and quality of life perspectives (42–45). Living donation has many advantages including reduced ischaemic time, better graft survival and a decreased incidence of delayed graft function. The patient is in better health when a transplant recipient and avoids the risks associated with dialysis. The European Renal Association has reported an adjusted five-year survival on dialysis of 45.5% compared with 94.5% after the first transplant from a LD(46), and the United States Renal Data System reports an adjusted five-year survival of 43.3% on dialysis, compared with 85.3% after first transplant from a LD(47). Additionally, in cases of fulminant liver failure, a living donation may be the only way in which to save the life of the patient, as death can occur within days, and there is little time available to wait for a good match from a deceased donor. This can be especially pertinent in paediatric cases where it can be more difficult to source a good match from a deceased donor(48).

There are important ethical issues around living donation which must be **specifically addressed by national legislation**. Donation must be motivated entirely by altruism, and it is imperative that legislation safeguards against coercion, exploitation, trafficking or other unethical practices. A number of internationally recognised documents provide standards and guidance(49–51).

Raising public awareness and dispelling misconceptions are of great importance. Greece, with its strong family-based culture, should represent fertile ground for living donation, and the subject must be given prominence in public awareness campaigns and educational programmes. An effective mechanism for promotion of living donation should be in place in all hospitals with a transplant programme(8) and a LD register is also essential (this should be managed by the NTO). If the data is of sufficient quality, it can facilitate participation in national and international kidney exchange schemes.

Poor communication and limited partnerships between referring specialists and the transplantation programme can pose a major barrier. Relationships must be built to help specialists understand more about the referral and assessment process. Nephrologists who are responsible for the care of dialysis patients are of particular importance, and they play a crucial role in the referral and assessment for living donation(52,53).

The process of living donation should be cost-neutral, and mechanisms must be in place to compensate donors for any financial or other losses resulting from donation. This includes any direct expenses incurred (such as travel, accommodation and medical expenses) and any loss of income due to time off work. It should cover future medical expenses occurring as a direct result of donation, or any increase in medical insurance premiums. Incentives are sometimes offered such as prioritisation on the waiting list should the donor require a transplant in future, tax breaks or credits, and discounts on the cost of medical insurance.

Although there are **risks associated with living donation**, improvements in surgical techniques and perioperative care have greatly reduced the risks over the past few decades(54). In the case of donor nephrectomy, the majority of live donations are now performed via laparoscopic nephrectomy substantially reducing the risks and length of hospital stay(53). In the short term, the risks of donation are comparable to those of any major surgery, which in a modern surgical context can be considered to be low, and the vast majority of donors make an excellent recovery from the procedure.

Although donors have legitimate concerns that donation will have long-term consequences for their health, it must be emphasised that numerous studies show that **LDs are at no greater risk of premature death or ESRD than the general population**. In fact, some studies show that LDs live longer and have a lower risk of ESRD than the population they originate from(55–62). However, potential donors are a self-selected group with better initial health than the general population, and research does demonstrate a slightly increased risk of ESRD, hypertension and cardiovascular mortality in living kidney donors when matched with comparably healthy controls(63,64). Despite this, the absolute risks remain low, and

methodological concerns around the control group sizes and composition and genetic susceptibility (the majority of LDs are genetically related to their recipient) may have skewed the results(65). A large study from the USA showed that when compared with matched healthy non-donors, kidney donors had a slightly increased lifetime risk of ESRD. However, the magnitude of risk increase was small and remained lower than that of the general population. The risks were found to be higher for black donors(66), and have also been shown to be greater for those who are obese(67).

For women of childbearing age, there may be concerns regarding the risks of pregnancy following kidney donation. A few studies have shown that when compared to the general population there is a small increased risk of pre-eclampsia and gestational hypertension post-donation, but no other increase in adverse pregnancy outcomes (such as pre-term birth, still birth, neonatal mortality or low birth weight)(68–70). It is recommended that women wait for six months post-donation before attempting to conceive.

Careful assessment of potential LDs mitigates the risks of long-term complications, and there are international guidelines which give detailed advice on assessment of LDs to ensure that they are suitable candidates(65,71). Life-long follow-up should be offered, and a number of documents provide detailed advice on the follow-up of living kidney and liver donors(65,71–75).

Internationally, there are many examples of effective living donation schemes. The Netherlands, the UK, New Zealand, Israel and Turkey all have good rates of living donation. One feature of the schemes in each of these countries is that they have well-developed policies which aim to remove any financial or other barriers to living donation while preserving the principle of altruism and individual autonomy(76–79). As up to 40% of recipients will discover that their intended donors are incompatible with them(80), these countries also have long-established national (and international) kidney exchange schemes which enable donor–recipient pairs who have discovered that they are not compatible to enter a wider pool, thus enhancing the possibility of a successful match. Some jurisdictions, such as Israel, give LDs priority on the waiting list should they need a transplant in future. It is worth noting that these countries are characterised by a high level of trust and confidence in the donation and transplantation system. In the UK a living donation coordinator supports and advises LDs through the process, and the USA has created independent LD advocates who help to guide and safeguard living donors.

One might expect **Greece**, a country in which family and kinship ties are of the utmost importance, to be a world leader in LD. However, in 2018 the rate of LD kidney transplantation in Greece was only 6.2 pmp. By comparison, in the same year, Turkey (a country with much more limited health resources than Greece) had one of the highest rates of LD kidney transplant in the world at 36.8 pmp. Other examples of countries with a high contribution include the Netherlands and the UK at 24.6 pmp and 15.5 pmp respectively(81). In Greece, poor levels of trust in the system and lack of awareness and education regarding LD are significant barriers. Unfounded fears concerning the possible risks prevent potential donors coming forward, and many patients are not even aware that this is a feasible

treatment option. There is legislation regarding reimbursement of the expenses of LDs, but this is not enforced, and although LDs do have priority on the waiting list should they need a transplant in future, there are no other incentives in place. Patients are not automatically assessed for a transplant when referred for dialysis, and LD is not routinely discussed as an option. Nephrologists and other secondary and tertiary care physicians who might need to refer patients for a LD transplant are not actively involved in the donation and transplantation network. There is no LD registry or widespread participation in kidney exchange schemes. There is a lack of national harmonisation regarding the recording of outcome data, and the quality of data collected and collated varies widely.

Transplantation

NTO | Transplant centres (as part of advisory group)

Scientific societies (as part of advisory group

Recommendation

- Transplantation is a complex, time-limited process requiring skilled coordination. There is a need to expand the existing workforce, infrastructure and IT capacity, and ensure that all processes are subject to nationally agreed protocols which are consistent with internationally agreed best practice.

Sub-recommendations

Referral for transplant, assessment and waiting list management

- **The NTO must be responsible and accountable for the maintenance of several databases including the National Waiting Lists and the National Organ Donation and Transplantation Database**. These databases must be connected to one another to facilitate the effective and timely matching of organs (see recommendation: Databases and Information Technology).
- Nationally agreed **organ-specific guidelines for referral for an assessment** for transplant which are consistent with internationally recognised best practice must be drawn up.
- There must be nationally agreed **organ-specific criteria for inclusion on the waiting list** for transplant drawn up by a panel of experts.
- **Listing assessments** must be performed by **organ-specific multi-disciplinary teams** (MDTs) with the appropriate skill mix according to the criteria referred to above. This must include a psychosocial assessment

- Decisions regarding listing must be **transparent and conveyed in a timely manner** to the patient and their loved ones.
- The listing process must include **consent for transplant**, taking into consideration all foreseeable eventualities (e.g. acceptance of organs from extended-criteria donors, or donors whose medical history is not well known).
- Processes must be in place to **regularly re-assess the fitness** of those on the list for transplant and, if necessary, remove or suspend a patient from the list if they are no longer fit for surgery. These decisions must be transparent and clearly communicated.
- **Those referred for dialysis should be assessed for listing** at the point of referral, and at agreed periods thereafter.
- **Support programmes** should be in place to ensure that patients are in the best possible physical and psychological shape prior to surgery.
- There must be **nationally approved organ-specific guidelines for criteria for re-transplant**, drawn up in accordance with internationally recognised best practice.

Organ allocation and prioritisation

- There should be a **revision of the nationally agreed rules for prioritisation/allocation of organs** and these should be ratified by a panel of experts with organ-specific expertise. Different criteria will apply to different organs. These rules should be replicated in an algorithm to facilitate computer-based organ matching.
- **'Super-urgent' listing should only apply to liver, heart and lung transplants** and in circumstances where death is likely to occur in a short period of time should a transplant not be performed. These decisions should be made on a case-by-case basis and be based on internationally respected clinical criteria.
- There should be processes in place to enable **the NTO to monitor adherence** to these rules, with the expectation that individual units will need to justify any deviation from the rules.

Coordination of the transplant procedure

- There must be development and expansion of the current programme of specially trained **Transplant Recipient Coordinators** (TRCs) to coordinate the process from the point of identification of a possible donor.
- There must be **24/7 support** available to the TRCs from the NTO.
- There must be processes in place to ensure that those awaiting transplant who live far from the transplant centre can be **alerted, transported safely and undergo any necessary perioperative checks or procedures** at short notice.

- **Excellent communication systems** must be established between the ODCs and the TRCs facilitated by the NTO.

Surgery and perioperative processes

- **Sufficient numbers of suitably trained staff** must be available 24/7 to perform all steps necessary for the transplant operation and provide perioperative care.
- In order to achieve performance levels of approximately 100 transplants per year per department, **five permanent, full-time consultant transplant surgeons** should be employed in every national transplant centre.
- In order to achieve the target above, **three permanent, full-time consultant transplant anaesthetists** must also be employed in every national transplant centre.
- There must be **nationally approved organ-specific guidelines for the perioperative and surgical care** of transplant recipients, drawn up in accordance with internationally recognised best practice.

Rationale

The framework lays out in detail the complex processes involved in a successful transplant, from the assessment of potential recipients to the perioperative care of transplant candidates. Achieving success at the transplantation end of the national programme involves a number of components:

Well-managed and regularly updated waiting lists and clear national guidelines regarding eligibility for inclusion on the waiting list and re-assessment at regular intervals to affirm fitness for transplant (or re-transplant). It is vital that dialysis patients are assessed for transplant at point of referral for dialysis, and that the option of living donation is considered. Waiting list assessment and management requires the employment of comprehensive organ-specific MDTs including psychosocial support and capacity to prepare patients for transplant to ensure optimal medical and psychological fitness prior to the procedure. These teams must have access to adequate clinical space and administrative support to carry out their duties.

The adherence to ethical, fair and nationally agreed allocation and prioritisation rules which are in accordance with the guiding principles of the WHO(49), and the principles of equity, utility and benefit(82). Adherence should be monitored by the NTO. As a minimum these include organ-matching criteria, time on the waiting list, the age of recipient (and donor) and distance. The NTO must have overall responsibility for the maintenance of the transplant waiting lists and should coordinate the correct allocation of organs to the most appropriate recipient. This should be facilitated by a sophisticated donation and transplantation IT system (see recommendation: Databases and IT) which plays a key role in ensuring that the process of organ matching, prioritisation and allocation is smooth and well-coordinated.

Excellent coordination of the components of the transplant process. Due to organ viability these processes are time-limited and therefore need to be done swiftly and efficiently while maintaining the highest quality and safety standards. The role of the Transplant Recipient Coordinator (TRC) is crucial and there must be established and reliable means of communication between the TRCs and ODCs, facilitated by the NTO.

Adequate workforce and infrastructure to deliver transplant surgery and perioperative care. There must be sufficient numbers of transplant surgeons and staff to ensure availability 24 hours a day, every day of the year. This includes anaesthetists, nurses and other supporting staff. There must be rapid access to well-equipped operating theatres and ICU beds for post-operative recovery. As with listing and allocation, there must be clear nationally approved organ-specific guidelines available covering the perioperative and surgical care of transplant recipients, and these should be drawn up in accordance with internationally recognised best practice(83–86).

All successful systems have established and nationally harmonised protocols and pathways in place for transplantation, with clear designation of roles and responsibilities, and excellent lines of communication between professionals supported and facilitated by their NTO. Different countries have adopted slightly different models to coordinate transplantation which suit their national context and the configuration of their health system. The case studies (chapter 3 and Appendices 2 to 6) illustrate this, and roles and responsibilities vary significantly and are not always directly comparable. In the UK the role of the TRC is a dedicated, full-time post, and the TRC is responsible for every step of the pathway from referral for assessment through to coordinating the transplant procedure and arranging follow-up. Conversely, in other jurisdictions the role of the TRC is confined to organising and coordinating the perioperative period from the time that a suitable organ is found, and the other steps of the transplant process are the responsibility of multidisciplinary clinics under the supervision of a physician with appropriate expertise.

Transplantation staffing capacity varies significantly across Europe, and this recommendation is informed by the two surveys of national and European transplant centres which were performed in the process of conducting the gap analysis of the existing Greek organ donation and transplantation programme. The comparative analysis of the results can be seen in Table 9 (chapter 5, page 16).

In Greece, there are currently only seven transplant coordinators who are all based in Athens and supported by the NTO. This is an insufficient number to manage the projected expansion of the national donation and transplantation programme. It would be desirable that each transplant unit has an appropriate number of TRCs based at the unit, to facilitate communication between disciplines and local planning of services. There is an insufficient number of dedicated transplant surgeons and anaesthetists to perform the anticipated increased number of transplants. At present these specialists have other competing clinical commitments, thus limiting the time that they are able to dedicate to transplantation. There are currently no national guidelines regarding pre-transplant assessment or protocols for regular re-assessment while awaiting transplant. Neither are there nationally agreed protocols for operative or perioperative management. Although there is a national protocol

regarding the allocation and prioritisation of organs, there are concerns that this is not always strictly adhered to, in particular that 'super-urgent' listing criteria are sometimes applied inappropriately, and there are no mechanisms in place to monitor compliance with the rules. Communication between the ODCs, TRCs and the NTO is hampered by the absence of a sophisticated national database for either the waiting lists or for organ donation and transplantation (see recommendation: Databases and IT).

Post-transplant follow-up

NTO | Transplant centres | Scientific societies

Recommendation

- Transplant recipients should be offered life-long follow-up. The NTO, alongside a panel of experts with organ-specific expertise must draw up national guidance for the follow-up of transplant recipients in accordance with internationally accepted best practice.

Sub-recommendations

- **Multidisciplinary organ-specific follow-up teams** must be established in every transplant unit.
- **Nationally agreed organ-specific protocols for the frequency of post-transplant reviews** in uncomplicated patients should be agreed.
- **Nationally agreed organ-specific protocols** must be drawn up regarding all relevant issues including monitoring of post-transplant complications, immunosuppressive therapy optimisation, monitoring of complications of immunosuppressive therapy, prevention of recurrence of primary disease and treatment of comorbid conditions.
- Follow-up care should include access to **psychosocial support and lifestyle advice** with a focus on enabling patients to return to a normal family and everyday life.
- **Protocols should be established for shared-care arrangements** for those recipients who live far from the transplant centre, and whose routine reviews could be conducted by a suitable identified local physician.
- The implementation of **telemedicine technology and electronic health records** would facilitate the follow-up of those patients who live in more remote locations.
- **Nationally agreed outcome data** should be recorded at every follow-up visit, periodically collated and sent to the NTO for the purpose of monitoring, quality improvement and research.

Rationale

The framework sets out in detail the key items involved in post-transplant monitoring and care. National guidelines for the follow-up of transplant recipients should be drawn up in accordance with international best practice. A multidisciplinary, holistic and patient-centred approach is required in order to maximise long-term outcomes, minimise possible complications and optimise graft function and survival. The finer details will vary according to the organ transplanted, and there are a number of internationally recognised documents which give detailed guidance. These provide specific recommendations regarding renal(84,87–89), liver(83,90,91), and heart/heart-lung(92,93) transplantation.

It is crucial that transplant follow-up is conducted by comprehensive MDTs including psychosocial support. Follow-up should initially be provided by the transplant centre, but in the longer-term, and if it is more convenient, can be delivered by approved providers in the patient's locality. In this eventuality support and advice should be provided by the transplant centre when needed. The follow-up team must have sufficient clinical space to carry out their duties and rapid access to supporting services such as laboratories and radiology. Systems should be in place to swiftly address any concerns or complications. Observing the principles of patient-centred care (see recommendation: Patient-centred care) will aid in communication, enhance safety and improve overall outcomes.

Internationally, countries with good outcomes in organ donation and transplantation offer comprehensive long-term follow-up, provided by multidisciplinary teams. In addition to surgical and medical follow-up, the care provided incorporates support with psychological and social issues and promotes a return to normal family and vocational life. Once the immediate post-surgical period has passed, and in cases where patients live too far from the transplant units to travel for regular checks, shared-care protocols have been adopted with local providers. Locally arranged follow-up under a shared-care protocol will also facilitate better overall engagement of local services with the donation and transplantation network. All the countries in our case studies meticulously record data on long-term outcomes to inform research and future service planning.

In Greece, there is no consensus on the follow-up of transplant recipients. Follow-up is currently planned according to the protocols of individual transplant units, with no national harmonisation. There is no established system of shared care with local providers in place, necessitating some patients to travel long distances for routine check-ups. Electronic health records and telemedicine, both of which would be helpful in this respect, have not been developed. There is no system for recording of outcome data which would help inform future quality or research initiatives.

Patient-centred care

NTO | Patient and carer organisations

Recommendation

- Patients, their families and loved ones, and live donors must be placed at the heart of the national donation and transplantation programme. Policies and procedures must be developed which promote collaborative engagement with patients, families and carers not only in their own clinical care, but also in all aspects of system planning and development.

Sub-recommendations

- The principles of patient-centred care must become a **core component of the curriculum** for all donation and transplantation personnel from the outset of their training. These principles should be reinforced in ongoing professional development as clinicians progress through their career.
- The donation and transplantation programme must be **attentive to the needs of patients and their carers**, responding promptly and appropriately to any issues which they see as important. This includes consideration of any proposed benefits or assistance programmes.
- **Patient and carer representatives should be involved in the planning of professional curricula** to ensure that the focus of training accurately represents their needs.
- **Personal electronic health records and telemedicine** must be developed to promote the involvement of patients in their own care, and improve access and communication for those who live in more remote locations.
- Service planning and development must be informed by **regular surveys of patient and carer experience**. The content of these surveys should be tailored to the national context, and devised with input from patient and carer organisations.
- **Patient and carer representation** should be established at all levels of the system, including the boards of individual hospitals and national and regional branches of the NTO.

Rationale

The framework outlines the key components of patient-centred care. The success of a health care system is dependent on the benefits realised by patients and their families, and in order to maximise these benefits, they should be proactively involved in every aspect of health care. This involves building a collaborative culture not only around delivering individual clinical care, but also around the planning and delivery of services and the development of professional curricula. Changing from a paternalistic approach to one which is collaborative and holistic, and which encompasses the wider needs of the patient and their family requires a major culture-shift in the way in which health care is taught and delivered. However, it can bring many benefits to both patients and clinicians, enhancing relationships, improving services, and ultimately contributing to better outcomes for all. In addition to improving the experience of patients, their families and carers, this approach has been shown to improve overall outcomes(94–98), enhance quality and safety(99,100) and build public trust and confidence in the system(101,102). It has also been demonstrated that staff working in patient-centred environments are happier and more productive(103,104).

Various aspects of patient-centred care have been successfully implemented in many different jurisdictions and there are many good international examples of patient-centred care. For example, in the UK, patient-centred approaches are now an integral to the provision of clinical care, and to the training of all health care personnel(105). The UK NHS also has well established mechanisms for involving patients and carers in the development and planning of services(106). Patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) are regularly collected, the results disseminated and used to inform quality-improvement projects(107). Electronic health records have been developed in many jurisdictions (Estonia is a particularly good example(108)), and telemedicine technology has been implemented for many years by NHS Scotland to facilitate access to health care for those living in remote regions(109). In early 2019 NHSBT implemented a donor-reported outcome measure (DROM), a 20-point questionnaire survey to capture self-reported outcomes from living donors to complement the clinical information collected in the UK Living Donor Registry(110). Finally, and of key importance, patient-centred care has been shown to have a dramatic positive effect on donation rates, both living and deceased(111,112).

However, **in Greece,** to date, there have been few developments in respect to implementing person-centred care in the context of organ donation and transplantation, or in health care more generally. This relatively neglected area of health care urgently needs addressing. Applying the principles of patient-centred care to the organ donation and transplantation programme could have many benefits, helping patients and their families to understand the processes involved, weigh up the possible risks and benefits, enhancing medication compliance, promoting self-management and ensuring inclusion of the person's wider social support system.

Multiple stakeholders, including patient and carer organisations, were contacted and consulted in the process of compiling this report and recommendations.

Research and development

NTO | All hospitals and centres participating in donation and transplantation | Ministry of Development (National Research Council) | Scientific societies

Recommendation

- Improving the performance of the organ donation and transplantation system requires an innovative research and development programme. All units and staff must be actively supported and encouraged to participate in research activities at local, national or international levels.

Sub-recommendations

- **A research advisory group** should be established within the NTO.
- Research must become a core part of the **professional development portfolio** of all professionals involved in donation and transplantation.
- **Sustainable funding streams must be identified** for research activities, which might include partnerships with private collaborators or other innovative approaches.
- **Grants and fellowships** should be established for those training in the field.
- Clear processes must be in place at a national level for the **ethical approval** of all research activities.
- Mechanisms must be established to **ensure that the results of research are published and disseminated** nationally and internationally.
- **Participation in international research projects** should become an integral component of the organ donation and transplantation programme, and the NTO should support and encourage units to participate in such projects.

Rationale

As discussed in the framework (chapter 3), research is vital to the progress of organ donation and transplantation. The progress which has been made in this field of medicine over the past few decades has been dependent on the extraordinary and persistent research efforts of many individuals and organisations such as Thomas Starzl and Jean Dausset(113–115). Through their contributions to this field, and their collaboration and exchange of ideas, organ donation and transplantation have become the treatment of choice for end-stage organ failure. A diverse range of activities is involved in the

construction, maintenance and continual improvement of a high-quality organ donation and transplantation system, and therefore research in this field encompasses a wide range of disciplines. These include the social and political sciences, basic medical sciences, translational research and clinical trials.

Internationally, successful donation and transplantation systems have well-developed research programmes, operating at local, national and international levels. All the countries represented by our case studies actively promote and support research in all the aforementioned disciplines. Some NTOs such as NHSBT have a dedicated research and development division, which works in close collaboration with the organ specific advisory groups(116). Additionally, there are clear, national arrangements in place for obtaining ethical approval(117). Funding streams for research are identified and innovative solutions for funding, including partnerships with the private sector, are pursued and realised. Grants and fellowships are awarded and participation in international schemes such as those provided by the European Society of Organ Transplantation (ESOT)(118) is encouraged. Additionally, these jurisdictions all have sophisticated systems for collecting and collating data on donation and transplantation which feeds into international research collaborations (see recommendation: Databases and IT). This enables participation in various studies of international importance, some of which are coordinated by organisations such as Eurotransplant(119). There are arrangements in place to ensure that the results of research are published, widely disseminated and used to inform future clinical practice, service planning and development. These mechanisms include local seminars and teaching

In contrast, **in Greece**, there is currently no high-level coordination or support of research activities in the field of organ donation and transplantation. Research efforts are hampered by insufficient organisational structure, inadequate IT systems and lack of funding. There is poor participation in the international collation of data or research efforts, and there is a need to improve the existing data collection systems in order to facilitate these activities.

Quality standards and quality improvement

NTO | Body of Inspectors for Health and Welfare Services (SEYYP)

All centres participating in donation and transplantation | Scientific societies

Recommendation

- The existing national system of quality assurance should be strengthened and expanded to include pre-transplant care. Existing quality indicators on donation and transplantation should be broadened and regularly updated. The NTO should develop additional capacity to support health care facilities in reaching compliance, with regular audits based on key performance indicators conducted by the Body of Inspectors for Health and Welfare Services (SEYYP).

Sub-recommendations

The NTO

- The principle of using quality standards and performance indicators for evaluation of donation and transplantation activities is fundamental to a successful programme and should be **enshrined in law**. The NTO should establish a **regulatory committee responsible for quality improvement**. The committee should consult with advisory panels (see recommendation: NTO) to establish standards for quality assurance.
- The committee should **revise the list of currently collected indicators** and ensure that it is regularly reassessed for relevance and appropriately updated.
- The committee should set **additional quality indicators** to be collected in pre-transplant care facilities (liver, heart, lung and renal units and dialysis facilities).
- The committee should prioritise development of the existing **auditing system**.
- Based on periodic inspections and performance measurements, NTO staff should **audit local facilities and identify areas for improvement**.
- The NTO authorities should **provide feedback** to local administration and **offer support** to units as required.

Rationale

It is vitally important that data is collected in the national organ and transplantation programme to be used in a constructive manner, to consider ways in which improvement may be achieved, and to celebrate excellence and examples of good practice and outstanding achievement. A commitment to excellence, to fulfil and exceed patient expectations and requirements, can succeed through the implementation of a quality assurance and management system(120). Systematic quality improvement and assurance should take a comprehensive approach and cover pre-transplant care, donation, transplantation, as well as follow-up. Indicators should be devised to provide information about the most critical components of the donation process, and a standardised system established for documentation and regular collection of data.

At present, only a limited number of quality indicators are collected in the field of organ donation and transplantation. The NTO attempts to pool national data but missing information and sporadic contributions are a problem. Important data points such as long-term graft survival and pre-transplant care information are either missing or not reported on a regular basis. The NTO does not currently have the capacity to inspect local centres, give feedback in the form of an audit or enforce much needed improvements. Thus, the NTO needs to develop a more comprehensive set of indicators and should be empowered to inspect and improve processes in local facilities (see recommendation: NTO). Finally, the

NTO, through the regulatory committee, will ensure that quality is being upheld through a system of audits and inspections after hiring and training competent personnel equipped with authorisation and resources(120). The principles of this system of quality standards and improvement should be enshrined in legislation.

Pre-Transplant Units (renal, liver, heart and lung units)

- Pre-Transplant Units should collect **relevant quality indicators**.
- The data should be **reported to the NTO** at agreed intervals.
- Key indicators are:

- The number of patients that have been assessed for transplantation or have been referred for assessment (referral for assessment for pre-emptive transplantation in renal units is especially important).
- The number of patients that have received a transplant.
- Risk-adjusted mortality.
- Risk-adjusted hospital readmissions.
- Risk-adjusted clinical indicators of care.[1]
- Patient-reported outcomes.
- Patient experience.

Rationale

Centres, units and institutions that provide medical care for the relevant organ systems are a clinically relevant part of the pathway for transplantation. They play an important role in guiding patients into the transplant system. Currently this part of care is not being evaluated systematically in Greece and it is unclear whether patients are being appropriately referred for transplant assessment. Working with those who care for patients with chronic kidney and liver disease will allow for identification of those who may benefit most from transplantation and assist with follow-up measures. In addition to fostering a collaborative relationship, there are key indicators that can be measured to be used for benchmarking and quality improvement. In addition to those listed above, we have also identified a potential list of indicators that can be used to monitor general quality of care for chronic kidney and liver disease. It is important to remember, however, that while quality indicators and audit are used to highlight areas of concern, they must not come to be regarded as a punitive process, or they will lose their value.

[1] Risk adjustment describes taking into account individual patient characteristics that have an influence on the measured outcome. Risk adjustment is crucial to make fair comparisons between facilities serving different patient populations. For example, facilities with older patients should not be expected to achieve similar mortality rates as facilities with younger, healthier patients.

Donation hospitals

- **Donor coordinators** should collect relevant data on organ donation in every hospital with an ICU unit.
- **Key indicators** are:
  - Identification of patients with significant brain damage (potential donors).
  - The number of potential donors with a diagnosis of brain death.
  - The number of potential donors that have been referred to the donation team.
  - Family refusal rate and reasons for refusal.
  - The number of actual donors.
  - The number of donors evaluated completely and processed to donation.
  - Any adverse events related to the donation process.
  - Limiting factors.
- **Pilot programmes** for donation after circulatory death should also report on the number of donations after circulatory death.
- These indicators should be the basis for a **collaborative feedback process** between the NTO and local donation teams.

Transplant centres

- Transplant centres should **collect relevant quality indicators** on transplantation and post-transplant follow-up.
- **Key indicators** are:
  - Risk-adjusted mortality (one, three, five and 10 years).
  - Graft survival (one, three, five and 10 years).
  - Perioperative mortality and complications.
  - Patient-reported outcomes.
    – including donor-reported outcomes for living donors.
  - Patient experience.

Rationale

Measuring quality in organ donation and transplant hospitals is at the heart of a successful organ donation system. Demonstrating high quality donation and transplantation processes will promote confidence in the transplant system. Quality assurance in donation achieves four objectives: (1) minimising risks to the donors and recipients, (2) guaranteeing the

process is ethical, legal and medically safe, (3) ensuring good documentation and transparency, and (4) establishing a system of continuous improvement by increasing numbers of donors and improving quality and length of life for living donors and recipients(120). In Spain, donor coordinators collect data on donation potential and donation rates on ICU level and these rates are compared and benchmarked across the country by the NTO. Through national and local feedback mechanisms, this has led to substantial improvements in donation and transplantation rates. At present, it is difficult for the under-resourced NTO to collect, evaluate and monitor the data needed to make substantial reform. Upgrades to the existing system would be welcomed. Expansion of the role of ODCs and increasing the resources available to them would facilitate the collection of these quality indicators and provide a good start towards achieving similar goals as other leading global organ donation and transplantation systems. When establishing the indicators with relevant scientific organisations, professional bodies and donation and transplantation centres, it is important that the indicators provide information about the most critical components of the donation process. Collection of such indicators can be facilitated once the NTO has established a standardised system for the regular documentation of data. Every unit should participate in regular audit cycles which should be set at a national level and represent an ongoing process contributing to the quality improvement process. The ODEQUS project provides a guide for the Greek transplant programme with regard to quality management systems and evaluation of performance at hospital level(120). Collection of recommended quality indicators is part of fostering a culture of collaboration, service development and quality improvement in the transplant system, which ultimately leads to more and higher-quality donations and transplants.

Databases and information technology

NTO

Recommendation

- A key responsibility of the NTO will be the establishment and maintenance of a national information technology system and associated databases to facilitate communication between ICU/laboratories/transplant centres/NTO (and any other involved parties) which will be essential to improving the efficiency and effectiveness of the donation and transplantation programme. The system will need to incorporate all information relevant to donation, organ matching and allocation, transplantation and long-term follow-up.

Sub-recommendations

- **A Chief Digital and Information Officer** should be appointed by the NTO.
- **A working group**, including clinical experts, IT specialists and data engineers with expertise in managing complex medical databases should be established to design, implement and maintain the new national donation and transplantation IT system and associated databases.
- In the process of building the new IT system and databases there must be collaboration with individual hospitals or other units regarding any **existing data** they may hold. This data must be **carefully preserved and transferred securely** to the new system.
- The **data currently collected by the donation and transplantation system needs review**, and specific decisions regarding data recording should be informed by the data requirements of internationally respected organ exchange schemes such as Eurotransplant.
- The databases will include **pre-transplant data** which is relevant to patients on organ-specific waiting lists and **necessary for donor–recipient matching** (see recommendation: Transplantation).
- The system must include a **living donor registe**r. In cases where recipients discover that their intended LD is not a good match, this register could form the basis of a **national kidney exchange network.**
- As a **minimum** the following information will need to be recorded and regularly updated:
  - All information required for organ matching
  - Data on donation activity and transplant activity
  - Demographic and clinical data regarding donors and recipients
  - Recipient outcomes
  - Living donor outcomes
- It must be possible for all units and personnel involved in donation or transplantation to have **rapid access to the IT system** wherever they are based. A web-based platform such as that of Eurotransplant (ENIS) is suggested. The IT systems of all participating units must be compatible.
- The database must be **easily accessible and intuitive to use** for all personnel who need to access it.
- The information must be **real-time and easily updated**.

- **Data protection, patient confidentiality and information governance** must be prioritised. Databases must be compliant with General Data Protection Regulation (EU) 2016/679.
- **Interconnectivity with international databases** such as those of Eurotransplant and ESOT is recommended to facilitate exchange schemes and for research purposes.
- The NTO should evaluate the potential for the introduction of software into hospitals to support the **early identification of potential donor patients** in ICU at risk of brain death.

Rationale

Throughout the framework (chapter 3) the importance of sophisticated data and IT systems has been highlighted. Carefully designed, interoperable and easily accessible IT systems and databases are essential to the efficient and effective functioning of the entire system and the importance of this cannot be emphasised enough(121). In the context of organ donation and transplantation these systems have multiple functions, and the NTO must be responsible and accountable for their establishment and maintenance. Data recorded and held on the IT system must include the national donor and non-donor registries (see recommendation: Consent legislation), the national waiting lists and all information necessary for organ matching, prioritisation and allocation. All data related to donation (living and deceased) and transplantation activities must be recorded, including information on long-term outcomes. The database must also ensure traceability of individual organs, from the details of the retrieval procedure through to transplant at the recipient hospital.

The IT system plays a vital role in organ matching and allocation, and in many jurisdictions advanced AI algorithms are used to aid swift and accurate matching and boost the rates of transplantation(122–124). In the case of living donation, it may facilitate the development of a LD exchange scheme, both nationally and internationally. In addition to facilitating clinical processes, IT systems and databases play a crucial role in the monitoring of quality, adherence to national standards, identifying areas in need of improvement and enhancing system vigilance and safety. They are also of vital importance in facilitating national and international research. If well designed, they can also help ODCs to collate regular reports and submit them when required to the NTO.

The NTO should have a chief digital and information technology officer, and it is very important that the development of a national database is supported by experts in managing complex datasets, computer science and medical IT, as well as experts in the field of organ donation and transplantation. The specific decisions as to what should be included in data collection must be informed by the data requirements of internationally respected organ exchange schemes such as Eurotransplant(125).

All professionals and participating organisations, including laboratories and other supporting services, must be able to access the system no matter where they are based. The system should be intuitive to use, and not require extensive training. Information must be easy to

upload and available in real time to facilitate the smooth functioning of the system. Information governance, data protection and patient confidentiality are key priorities, and staff should not be able to access data in excess of that required for their role. It is desirable that the IT system has a mechanism for connectivity with the systems of international organ exchange schemes.

Internationally, in those countries with effective donation and transplantation systems well-designed national databases have been a crucial component to their success, and have contributed to the unification of different parts of the system. They have also facilitated participation in national and international organ exchange schemes, living donor exchange schemes and valuable research projects. Good examples of secure, comprehensive and effective systems include those of the Organ Procurement and Transplantation Network in the USA(126), and the ODT Hub Information Services of NHS Blood and Transplant in the UK(127) and the ENIS system of Eurotransplant(125).

In Greece, although donation and transplantation data is collected and collated by the NTO, there is no living donor register, and there is no national agreement on the exact details of the data to be collected. There is no comprehensive centralised IT system in place to facilitate the timely and efficient exchange of information between the component parts of the donation and transplantation system, or to record consistent data on outcomes. The current data collection falls short of the international standards which would be expected if Greece wishes to join an international collaboration such as Eurotransplant. Information is often transmitted by fax from individual hospitals, and stored in paper form. This means that the entire system is slow and cumbersome, leading to significant problems with data access and traceability.

Teaching, training and professional development

NTO | Ministry of Health | Scientific societies | Donation and transplant centres | Medical and nursing schools

Recommendation

- There is a need to develop a national strategy to continuously train health care professionals in all areas relevant for organ donation and transplantation.

Sub-recommendations

- **Dedicated training modules** should be developed and these should follow existing guidelines developed by the European Union of Medical Specialists.
- All professionals training in organ donation and transplantation should have a **tailored CPD portfolio and a regular (at least annual) structured appraisal** with an appropriate designated supervisor.
- The NTO should **collaborate with medical schools** to develop relevant training modules.
- Issues related to organ donation should be covered in **all medical and nursing curricula**.

Organ Donor Coordinators

- The NTO should design a **mandatory introductory training module** for ODCs:
  - This training module should be offered by the NTO on a regular basis.
  - The module should follow the training requirements set out by the European Organ Donation and Transplantation Coordination Organisation (EDTCO).
- Following completion of the introductory training module there should be **advanced training** opportunities available to facilitate the achievement of the European Certification of Transplant Coordinators provided by the UEMS.
- Existing short-term online courses on donor coordination and family consultation offered by the **TPM-DTI in Barcelona** should be used to complement national training programmes.

Rationale

As detailed in the framework, training of ODCs, especially in communication skills and sensitive family approaches, is essential to achieving improved rates of organ donation. International training institutions such as the TPM-DTI in Barcelona(128) offer a variety of teaching activities from short-term online courses to master's degrees. Similarly, ESOT, in collaboration with the UEMS, offers a qualification for ODCs, the Certification of European Transplant Coordinators (CETC)(129).

Greece has had positive experiences with the training of ODCs in the past. In accordance with the training requirements set out in the presidential degree 93, the NTO initiated training for ODCs, some of which was undertaken in cooperation with the TPM-DTI. This training programme made a significant impact on donation rates in those hospitals that sent participants. Unfortunately, there was little continuity (from 2006 until 2012 there was no training available at all), and the programme was not sustainable in the long run. The training

requirements set out in the presidential degree were extremely comprehensive, stipulating a one-year training course for ODCs, but this is neither realistic nor practicable. A step-by-step approach with a short core module offered by the NTO and further training options complemented by online training offered by existing institutions could help to overcome these challenges.

Transplant surgeons

- The Ministry of Health, the NTO and the Greek Transplantation Society should establish a **national fellowship for transplant surgery**.
- The fellowship should incorporate **rotations across national transplant centres** and a rotation in a transplant centre **abroad**.
- The fellowship should **follow European training requirements in transplant surgery** set out by the UEMS.
- **The fellowship should cover**:
  - Multi-organ retrieval.
  - Kidney transplantation.
  - Pancreas transplantation.
  - Liver transplantation.
  - Professional skills.

Transplant Physicians and Immunologists

- Similar **fellowships should be established for transplant physicians** (with training and accreditation for each individual are of transplant practicee) and immunologists.

Rationale

Our framework emphasises the importance of training donation and transplant professionals for their difficult tasks. Dedicated training programmes for transplant surgeons, transplant physicians and immunologists are currently lacking. To date, individuals gain experience in transplantation during their core and higher overall specialty training (for example, general surgery) or during their independent practice (for example, by working in a European transplant centre). Establishing a national fellowship with a structured training pathway would help to close this gap.

Intensivists and nursing staff

- Senior ODCs should offer **regular seminars** to local hospital staff on issues related to organ donation such as brain death diagnosis, donor maintenance or DCD.
- **Continuing Medical Education (CME) credits** should be made available to motivate medical staff to undertake transplantation training.
- **Roles and responsibilities of ICU doctors** with regard to transplantation and end-of-life care should be clearly stated and emphasised in medical codes of practice and codes of medical ethics.

Rationale

ICU staff play a key role in achieving high rates of organ donation. At present, organ donation does not constitute a core training module for intensivists and their supporting staff. Consequently, these professionals lack confidence and feel uncertain about issues such as brain death criteria, consent legislation, and how to communicate these difficult matters to families and loved ones. Once properly trained and deployed, senior ODCs with a background in intensive care can commence local teaching initiatives to complement the regular training of ICU staff.

Professional organisations and scientific societies

NTO | Professional organisations | Scientific societies

Recommendation

- Professional organisations and scientific societies are an invaluable source of advice and support. They must be consulted at all stages of the expansion of the donation and transplantation programme and should play a pivotal role in developing and ratifying guidelines, protocols, regulatory standards and training programmes.

Sub-recommendations

- The **board of the NTO should include representatives** of the relevant professional organisations and scientific societies.
- The development and implementation of the following items should be undertaken in consultation with the relevant professional organisations and scientific societies:
  - **National policy** regarding all aspects of organ donation and transplantation
  - **National clinical guidance and protocols** for all steps of the process

- **Professional portfolios and national standards for training**
- **Regulatory standards** for professionals and organisations

- The NTO should partner with the professional organisations and scientific societies to run **educational meetings, conferences and other events w**hich promote shared learning and a collegiate environment.
- **Appointment of members to the specialist advisory groups of the NTO** should be undertaken in consultation with the relevant professional organisations and scientific societies (see recommendation: NTO – Governance and structure).

Rationale

As outlined in our framework (chapter 3) all fields of clinical practice are associated with a number of scientific societies and professional organisations. These bodies have many potentially important roles, and need to be recognised as an invaluable source of expert advice, opinion and support. They are also well placed to promote a collegiate environment, and can provide excellent opportunities for professionals from different disciplines and regions to meet regularly and exchange experience and ideas. Some of the many functions of scientific societies and professional organisations are listed below:

- Devising and funding research initiatives and awarding grants and fellowships
- Supporting and publishing research; disseminating the results to the wider community
- Devising and publishing best-practice guidelines and standards
- Providing expert opinion and support in relation to difficult ethical issues
- Setting up and running educational and accreditation programmes for professionals
- Setting standards and codes of conduct for professionals and organisations
- Running national or international events, meetings, conferences, congresses
- Issuing awards and prizes for contributions to the field of interest
- Providing a source of expert opinion in relation to regulation and legislation
- Engaging with the media and the public, devising and running publicity campaigns.

International scientific societies and professional organisations of importance to the organ donation and transplantation field include:

- The European Society for Organ Transplantation (ESOT)
- The European Renal Association (ERA-EDTA)
- The Transplantation Society (TTS)
- The European Union of Medical Specialists (UEMS)

There are a number of examples of collaboration with national and international bodies which have been central to the improvement of quality and training in the field of donation

and transplantation. The Division of Transplantation of the UEMS works closely with ESOT to set standards of training and accreditation of professionals and transplant units(118,130,131), and run international education events. These excellent initiatives have been supported by more than 40 countries and their relevant scientific societies and medical associations. The Spanish TPM-DTI foundation(128) runs numerous internationally acclaimed training and research projects, and facilitates communication and collaboration between a wide network of international experts.

In the context of **Greece**, there has been very little engagement with national professional organisations and scientific societies in attempts to reform the organ donation and transplant system. In particular, there is a need for collaboration in respect to drawing up national guidance regarding tricky ethical questions around deceased donation. There are a number of societies and associations which should be actively engaged in the development of the organ donation and transplantation system, including:

- The Greek Transplantation Society
- The Greek Society of Anaesthesiology
- The Panhellenic Medical Association.

Implementation task force

Government | Ministry of Health

Recommendation

- The implementation of the recommendations outlined in this report and the delivery of the new national donation and transplantation programme will be a monumental and rewarding endeavour; it should be overseen by an implementation task force under the remit of the Ministry of Health.

Sub-recommendations

- The implementation task force should be **chaired by the permanent secretary of the Ministry of Health**
- The implementation task force should be **representative of the following interests**: MoH, NTO, transplant centres, the ICU sector, relevant scientific societies and professional organisations, and medical schools. A seven to 10 person task force is recommended.
- The task force should produce an **annual report** detailing the progress made in the implementation of the recommendations in this document.

Rationale

All too often there is a gap between policy plans and policy implementation. For this reason, it is crucial that a task force is appointed to oversee the implementation of the recommendations. This task force must be convened without delay, and the members must be representative of the key stakeholders in the donation and transplant programme. The task force must view its responsibilities as being long-term and ongoing; and publish and make publicly available an annual report detailing progress and identifying remaining gaps.

The recommendations in this report are far-reaching and comprehensive, and achieving full implementation may seem a daunting task. It must be recognised that while some recommendations might seem more important than others, they are all interconnected and interdependent. Improvement to the organ donation and transplantation programme will not be realised unless there is system-wide change and close collaboration between all parties. All the areas outlined in the recommendations must be addressed, and timelines must be borne in mind so that every part of the process is ready to manage the anticipated increased demand. However, it is recognised that there are areas in which full implementation may not be possible without wider health system reform (for example in the area of prevention) and it will take time before the benefits are fully realised.

Acronyms

A&E	Accident and Emergency/Emergency Department
ACCORD	Achieving Comprehensive Coordination in Organ Donation through the European Union
ASST	Autoridade para os Serviços de Sangue e da Transplantação (Portugese National Transplant Organisation)
ATP	Adenosine Triphosphate
BAME	Black and Minority Ethnic
BD	Brain Death
BTS	British Transplantation Society
CCU	Critical Care Unit
CD-P-TO	European Committee on Organ Transplantation (Council of Europe)
CL-OD	Clinical Lead in Organ Donation (UK)
CIT	Cold Ischaemic Time
CKD	Chronic Kidney Disease
CNT	Centro Nazionale Trapianti (Italian National Transplant Centre)
COORENOR	Coordinating a European Initiative Among National Organization for Organ Transplantation
CPD	Continuous Professional Development
CPR	Cardio-Pulmonary Resuscitation
CRT	Regional or Interregional Transplant Centres (CRT) – Italy
CV	Cardiovascular
CVD	Cardiovascular Disease
DBD	Donation after Brain Death
DCD	Donation after Circulatory Death
cDCD	Donation after Controlled Circulatory Death
uDCD	Donation after Uncontrolled Circulatory Death
DD	Deceased Donor/ Donation

DG SANTE	Directorate-General for Health and Food Safety
DOPKI	Knowledge and Practices in Organ Donation European Commission project
DRG	Diagnosis Related Group
DVT	Deep Vein Thrombosis
ECT	European Credit Transfer (and Accumulation System)
ECG	Electrocardiogram
ECMO	Extra-Corporeal Membrane Oxygenation
ED	Emergency Department
EDQM	European Directorate for the Quality of Medicines and Health care
EODD	European Organ Donation Day
NTO	National Transplant Organisation
EFI	European Federation of Immunogenetics
ERA-EDTA	European Renal Association
ESOT	European Society of Organ Transplantation
ESRD	End-Stage Renal Disease
EU	European Union
EUR	Euro (currency)
FOEDUS	Facilitating Exchange of Organs Donated in EU Member States
GDP	Gross Domestic Product
GODT	Global Observation on Donation and Transplantation
HDU	High Dependency Unit
HEPC	Hepatitis C
HIV	Human Immunodeficiency Viruses
HLA	Human Leukocyte Antigen (used in tissue typing)
HRK	Croatian Kuna (currency)
HTA	Human Tissue Authority (UK)
HTC	Hospital Transplant Coordinators
HZZO	Hrvatski Zavod za Zdravstveno Osiguranje (Croatian Health Insurance Fund)

ICU	Intensive Care Unit
ILBF	Irreversible Loss of Brain Function
IPST	Instituto Portugues do Sangue e da Transplantasao (Portugese Institute of Blood and Transplantation – the National Transplant Body)
I/R Injury	Ischaemia-Reperfusion Injury
IRODaT	International Registry in Organ Donation and Transplantation
ISS	Istituto Superiore di Sanita (Italian Ministry of Health)
IT	Information Technology
KEN-DRG	Greek system of Diagnostic Related Groups
KEP	Kidney Exchange Program
LD	Living Donor/Donation
LDC	Living Donor Coordinator
MDT	Multidisciplinary Team
MRC	Malattia Renale Cronica (Chronic Kidney Disease in Italian)
MZRH	Ministarstvo zdravstva Republike Hrvatske (Ministry of Health of the Republic of Croatia)
NCA	National Competent Authorities
NHS	National Health Service (UK)
NHSBT	National Health Service Blood and Transplant (UK)
NICE	National Institute for Health and Care Excellence (UK)
NORS	National Organ Retrieval Service (UK)
NRP	Normothermic Regional Perfusion
NTC	National Transplant Coordinator (Croatia)
NTO	National Transplant Organisation
ODC	Organ Donation Coordinator
ODC	Organ Donation Committee (UK)
ODEQUS	Organ Donation European Quality System
ODR	Organ Donation Register
ODT	Organ Donation Taskforce (UK)

ODT	Organ Donation and Transplantation
OECD	Organisation for Economic Co-operation and Development
ONT	Organización Nacional de Trasplantes (Spanish National Transplant Organisation)
PSHE	Personal Social and Health Education (UK)
pmp	Per Million Population
RHDC	Regional Health Development Centre on Organ Donation and Transplant Medicine
RIDT	Italian Registry of Dialysis and Transplant
RNT	Rete Nazionale Trapianti (Italian National Transplant Network)
SAT	South Alliance for Transplant network
SEEHN	South-Eastern Europe Health Network
SES	Socioeconomic Status
SIT	Sistema Informativo Trapianti (Italian National Transplant Information System)
SN-OD	Specialist Nurse in Organ Donation (UK)
SSN	Servizio Sanitario Nazionale (Italian National Health Service)
TPM	Transplant Procurement Management
TRC	Transplant Recipient Coordinator
TTS	The Transplantation Society
Tx	Transplant
UEMS	European Union of Medical Specialists
UKDEC	UK Donation Ethics Committee
UNOS	United Network for Organ Sharing (USA)
WHO	World Health Organization
WIT	Warm Ischaemic Time
WLST	Withdrawal of Life Saving Treatment

Glossary of terms

Key organisations (alphabetically per country)

CROATIA	
Ministarstvo Zdravstva Republike Hrvatske (MZRH)	Ministry of Health of the Republic of Croatia.
South Eastern Europe Health Network (SEEHN)	A political and institutional forum set up by the governments of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, the Republic of Moldova, Romania, Serbia and the Republic of North Macedonia to promote peace, reconciliation and health in the region.
GREECE	
The Greek National Health System (Greek NHS)	The public Greek National Health System.
The Central Health Council (KESY)	Advisory Body to the Greek Ministry of Health.
The National Public Health Council (ESYDY)	Independent authority responsible for the scientific supervision of all public health organisations in the country.
The Greek Regional Health Administrations (YPEs)	Regional Health Authorities.
The Central Council of Health Regions (KESYPE)	Body that coordinates the policies of the Regional Health Administrations (YPEs).
The Health Procurement Committee (EPY)	Body that unifies hospitals' annual tenders with the aim to reduce procurement costs, improve payment time, make uniform medical requests, transfer redundant materials from one hospital to another and improve management of expired products.
The National eHealth Governance Council (ESDHY)	Body that is responsible for the elaboration of the e-health strategy and the overall functioning, financing and monitoring of e-health projects in Greece.
The Body of Inspectors for Health and Welfare Services (SEYYP)	Organisation responsible for conducting performance audits in public and private health and welfare services in order to improve quality, productivity and effectiveness.

The National Organisation for the Provision of Health Services (EOPYY)	A self-governing public entity that operates under the supervision of the Ministry of Health. It is the sole purchaser of health services, setting the preconditions required for contractual commitments with health care providers.
Unified Social Security Fund (EFKA)	National Public Insurance Fund.
Hellenic Transplantation Society	National Scientific Society for Transplantation.
National Regulatory Committee for Renal Transplant Coordination (YSE)	The Greek Branch of the ERA-EDTA.
The National Transplant Organisation (NTO)	The Greek National Transplant Organisation.
The Onassis Foundation	The Alexander S. Onassis Public Benefit Foundation.
The Onassis National Transplant Center (ONTRC)	A state-of-the-art transplant facility which is an investment of the Onassis Foundation.
The National Transplantation Council (NTC)	An advisory committee to the Greek National Transplant Organisation.
The Greek Medical Association	Medical Doctors Union in Greece.
ITALY	
Centro Nazionale Trapianti (CNT)	The Italian National Transplant Centre.
Istituto Superiore di Sanita (ISS)	The Italian Ministry of Health.
Rete Nazionale Trapianti (RNT)	The Italian National Transplant Network.
Sistema Informativo Trapianti (SIT)	The Italian National Transplant Information System.
Servizio Sanitario Nazionale (SSN)	The Italian National Health Service.

PORTUGAL	
Organizacao Portuguesa de Transplantacao (OPT)	First National Transplant Organisation in Portugal, 1993–2007.
Autoridade para os Servicos de Sangue e da Transplantacao (ASST)	National Transplant Organisation, 2007–2012.
Instituto Portugues do Sangue e da Transplantacao (IPST)	National Transplant Organisation from 2012 (merging of transplantation organisation with the Portuguese blood institute).
SPAIN	
Organización Nacional de Trasplantes (ONT)	Spanish National Transplant Organisation. Coordinates the activities of donation, recovery, preservation, distribution, exchange, and transplantation of organs and tissues throughout the whole Spanish Health Care System.
Transplantation Procurement Management-Donation and Transplantation Institute (TPM-DTI)	Based in Barcelona. Aims to coordinate professionals, projects and other initiatives in the field of organ donation and transplantation. Provides internationally recognised professional training and education.
UNITED KINGDOM	
Academy of Medical Royal Colleges	Coordinating body for the UK and Ireland's 23 medical Royal Colleges and Faculties. Ensures that patients are safely and properly cared for by setting standards for the way doctors are educated, trained and monitored throughout their careers.
British Transplantation Society (BTS)	Provides leadership, representation and guidance to all professionals involved in transplantation in the UK. Actively involved in developing national policy, commenting to the media on any issues relating to organ donation and transplantation and developing the scientific, clinical and ethical practices.
Human Tissue Authority (HTA)	Regulator of all activities related to the use of human tissues. Inspects establishments involved in donation and transplantation and issues licences or notices for improvement. Works closely with NHSBT (see below).

Intensive Care Society	Supports all intensive care professionals working in the UK. Provides guidance, research, educational resources, support and advice to members, patients and relatives.
The National Institute for Health and Care Excellence (NICE)	UK health technology assessment body. Provides evidence-based guidance, quality standards and recommendations on the effectiveness of treatments and medical procedures.
NHS Blood and Transplant (NHSBT)	National Transplant Organisation of the UK. Has oversight of the entire system across all four UK jurisdictions. Responsible for the coordination of all operational aspects of donation and transplantation.
UK Donation Ethics Committee (UKDEC)	Provided valuable ethical advice to the UK donation and transplantation system. Published guidelines covering complex and emotive ethical issues in the field. Dissolved as a result of general budgetary cuts in 2016.
INTERNATIONAL/EUROPE-WIDE	
Directorate General Sante (DG Sante)	Health and food safety directorate of the European Commission. Responsible for EU policy on food safety and health and for monitoring the implementation of related laws.
European Committee on Organ Transplantation (CD-P-TO)	Council of Europe steering committee in charge of organ transplantation activities at the EDQM (see below). Promotes the non-commercialisation of organ donation, the fight against organ trafficking and the development of ethical, quality and safety standards in the field of transplantation; activities include: collection of data, monitoring of practices, transfer of knowledge and expertise, and publication of reports, surveys and recommendations.
European Directorate for the Quality of Medicines and Healthcare (EDQM)	A directorate of the Council of Europe, it protects public health by enabling the development of quality standards for medicines and their safe use, and supporting the implementation and monitoring the application of those standards.
European Renal Association (ERA-EDTA)	Promotes fundamental and clinical advances in the field of nephrology, dialysis, renal transplantation, hypertension, and related subjects; involved in education, CPD, international collaborations and promoting awareness of renal issues.

European Society of Intensive Care Medicine (ESICM)	Association of physicians working in the field of intensive care; supports the advancement of knowledge in intensive care medicine, in particular the promotion of the highest standards of multidisciplinary care of critically ill patients and their families – through education, research and professional development.
European Society of Organ Transplantation (ESOT)	Official organisation covering the field of organ and cell transplantation in Europe. Represents all professionals involved in the field of donation and transplantation; champions high quality education and educational opportunities in the field. Organises courses, training and other events. Promotes collaboration and the exchange of knowledge and ideas.
Eurotransplant	A non-profit international service organisation that facilitates patient-oriented allocation and cross-border exchange of deceased donor organs at the service of its eight member states: Austria, Belgium, Croatia, Germany, Hungary, the Netherlands, Slovenia.
European Union of Medical Specialist (UEMS)	The representative organisation of the National Associations of Medical Specialists in the European Union and its associated countries. Membership drawn from over 40 countries. Strong links and relations with European Institutions. Sets standards for high-quality health care training and practice that are transmitted to the relevant authorities and institutions of the EU and the national medical associations.
Organ Donation European Quality System (ODEQUS)	A three-year project (Oct 2010–Dec 2013) co-financed by the European Agency for Health and Consumers which aimed to define a methodology to evaluate organ procurement performance at hospital level.

Professional roles

CROATIA	
National Transplant Coordinator (NTC)	Provides senior leadership and coordination of national efforts to develop Croatia's organ donation and transplantation system.
Hospital Transplant Coordinator (HTC)	An in-house coordinator who works in the transplant centre. Responsible for donor identification, management and realisation of organ and tissue donations. Mainly intensive care unit (ICU) specialists.
GREECE	
Clinical Coordinators	Recipient Coordinators in Transplant Centres, responsible for the co-ordination of the transplantation process.
Central Coordinators	Duty Officers in the Greek National Transplant Organisation , responsible for the overall coordination of the donation and transplantation process.
Local Hospital Donor Co-ordinators	Donor Co-ordinators , responsible for the co-ordination of the donation process in local hospitals / NTO branches.
ITALY	
Hospital Procurement Coordinator – Coordinatore Ospedaliero (TPM)	A physician who is supported by an in-house team to identify potential donors and coordinate procurement.
National Technical Transplant Council	Works within the CNT to set technical and operational directives for donation and transplant activities. Also maintains relationships with other national health services.
PORTUGAL	
Transplant Coordinator (national)	Portugal has one national transplant coordinator, a physician who has oversight and responsibility for the whole system together.
Regional Transplant Coordination Officers	Responsible for the coordination of organ retrieval and allocation across hospitals.

Transplant Coordinators (in hospital)	Identify potential organ donors, obtain family consent, overview legal requirements and have the task to promote organ donation in the hospital they are located in. Cooperate closely with intensive care physicians in donor maintenance as well as with regional coordinators for procurement and allocation of organs to transplant centres.
SPAIN	
Transplant Coordinators	Medical physicians, mainly ICU specialists, who are involved in promotion, training and education, relationships with the mass media, management of resources and research about organ transplantation.
In-hospital Transplant Coordinators (key donation person)	Responsible for coordination of the donation process 'on the ground'. Includes donor detection, evaluation and maintenance, organisational and legal matters and monitoring and reporting of donation activities.
UNITED KINGDOM	
Clinical Lead in Organ Donation (CL-OD)	Senior clinician with responsibility for promoting and coordinating organ donation in a designated locality. Works closely with organ donation coordinators in their locality and reports to the National Transplant Organisation.
Living Donor Coordinator (LDC)	Oversees activities related to living donors. Maintains local register of potential living donors. Promotes the concept of living donation in a particular local area and has a role in education and teaching.
Specialist Nurse in Organ Donation (SN-OD)	Responsible for coordinating all activities on the donation end of the chain. Key role in identifying potential donors in hospital setting. Provides teaching and training. Ensures policies and protocols are up to date. Collects and collates local data on activity and submits this to the National Transplant Organisation.
Transplant Recipient Coordinator (TRC)	Responsible for coordinating all activities at the transplant end of the chain.

Medical terms

Aetiology	The cause, set of causes, or manner of causation of a disease or condition.
Agonal period	Period between withdrawal of life-saving treatment (WLST – see below), cessation of cardio-pulmonary output and the declaration of death. During this time there may be insufficient perfusion of organs and insufficient supply of oxygen and nutrients to maintain optimal function, so this period many lead to significant end-organ damage. This is the reason that there are nationally set limits to the time that can elapse between WLST and organ retrieval.
Alloimmune responses / alloantigens / alloantibodies	Alloimmunity is the immune response to non-self antigens (see below) from members of the same species; these are called alloantigens. The resultant antibodies are called alloantibodies.
Anaemia	A deficiency of red cells or of haemoglobin (oxygen-carrying molecule) in the blood.
Anastomosis/anastomotic	A surgical technique to join organs, usually via blood vessels or body channels.
Ancillary testing	Additional tests required to confirm or refute a diagnosis.
Antigen	Any substance which can cause the immune system to react, especially by producing antibody (see below).
Antibody	A specialised immune protein, produced because of the introduction of an antigen (see above) into the body. The production of antibodies is a major function of the immune system and is carried out by a type of white blood cell called a B cell. The antibody combines with the antigen and identifies it for destruction by other cells of the immune system.
Apnoea	The absence of breathing (respiration).
Arrhythmia	A problem with the rate or rhythm of the heartbeat. During an arrhythmia, the heart can beat too fast, too slowly, or with an irregular rhythm.

Ascites	The accumulation of fluid in the abdominal cavity, causing swelling. Often occurs due to cirrhosis of the liver (see below).
Autoimmune disease	Disease caused by the body's own immune system.
Biopsy	To take a sample of tissue, usually via a surgical technique.
Brain death/Irretrievable Loss of Brain Function (ILBF)	When a person on an artificial life support machine no longer has any brain functions. Their brain is irretrievably damaged, and they have no chance of recovery. They will never regain consciousness or be able to breathe without artificial support. Must be differentiated from the terms 'coma' or 'vegetative state' in which some brain function remains, and there is a chance that recovery may occur. (Also sometimes referred to as 'brain stem death'.)
Brain stem reflexes	The most primitive responses of the brain. Absence of these reflexes usually indicates irreversible brain damage.
Calcineurin inhibitors	A family of three drugs (cyclosporine, tacrolimus and pimecrolimus) that clinicians can use to suppress the immune system.
Cannulation	To insert a tube into a vessel.
Cirrhosis	Scarring of the liver caused by long-term liver damage, usually the result of hepatitis or alcoholism. The scar tissue prevents the liver working properly and cirrhosis eventually leads to liver failure.
Chemokines	Cellular mediators that are part of the body's inflammatory response.
Coagulopathy	A condition in which the blood's ability to coagulate (form clots) is impaired. This condition can cause a tendency toward prolonged or excessive bleeding. The liver manufactures many of the clotting factors in the blood, and in liver failure coagulopathy is common.
Coning	Protrusion of the brain through the foramen magnum (see below). This is a neurological catastrophe that almost always results in death.

Cyclosporine	See calcineurin inhibitors.
Cytokines	Cellular mediators that are part of the body's inflammatory response.
Deep vein thrombosis	A blood clot in the deep veins, usually in the lower extremities.
Diabetic nephropathy	Diabetic nephropathy, also known as diabetic kidney disease, is the chronic loss of kidney function occurring in those with diabetes mellitus. Diabetic nephropathy is one of the leading causes of chronic kidney disease (CKD) and end-stage renal disease (ESRD) globally.
Donation following brain death/DBD	Organ donation from patients on the ICU whose death has been confirmed using neurological criteria. This diagnosis is only possible in patients who are on mechanical ventilation.
Donation following circulatory death/DCD uncontrolled or controlled (uDCD or cDCD)	The donation of organs from patients whose death is diagnosed and confirmed using cardio-respiratory criteria. Two principal types, controlled and uncontrolled. Uncontrolled DCD refers to organ retrieval after a cardiac arrest that is unexpected and from which the patient cannot or should not be resuscitated. Controlled DCD takes place after death which follows the planned withdrawal of life-sustaining treatments (see below) that have been considered to be of no overall benefit to a critically ill patient on ICU or in the Emergency Department. The clinical circumstances in which DCD can occur are described by the Maastricht classification (see below).
Doppler ultrasound	Imaging technique based on ultrasonography that can detect and measure blood flow.
Dyslipidaemia	A term which describes several conditions in which disturbances in fat metabolism lead to changes in the concentrations of lipids in the blood.
Encephalopathy	A build-up of toxins usually cleared by the liver leading to impaired cognitive function.

Extra-Corporeal Membrane Oxygenation/ECMO	A technique whereby a machine replaces the functions of the heart and lungs. An ECMO machine is connected up to major vessels and pumps blood from the body to an artificial lung where oxygen is added and carbon dioxide removed.
Expanded criteria donors	Donors over the age of 60, or those who are not in optimal health – for example, who have a diagnosis of high blood pressure or diabetes.
Foramen magnum	Opening in the base of the skull through which the spinal cord descends.
Glomerular disease	Glomerular diseases damage the glomeruli, letting protein and sometimes red blood cells leak into the urine. Sometimes a glomerular disease also interferes with the clearance of waste products by the kidney, so they begin to build up in the blood.
Gout	Gout is caused by a condition known as hyperuricemia, where there is too much uric acid in the body. Deposition of needle-like crystals of uric acid in the joints leads to arthritis and acute pain, often presenting in the smaller bones of the feet.
Haematology	A medical science that deals with the blood and blood-forming organs.
Heamochromatosis	An inherited condition where iron levels in the body slowly build up over many years. If it is not treated, this can damage parts of the body such as the liver, joints, pancreas and heart.
Haemodynamic	Relating to the body's circulatory system or blood flow.
Heparin	A type of anticoagulant used to thin the blood.
Hepatic	Relating to the liver.
Hepatorenal syndrome	Progressive kidney failure seen in patients with severe liver damage.
Histopathologist	Physician specialising in the study of tissues, usually at a microscopic level.

Histopathology	Study of tissues, usually at a microscopic level.
Homeostasis	The equilibrium in which the body is held under normal circumstances. Relating to factors such as temperature, blood pressure, acid/base balance.
Human Leukocyte Antigen (HLA)	A group of genes that encode the proteins responsible for identifying foreign agents to the immune system. These proteins are found on the surface of all cells and act as 'self-markers' telling the immune system not to trigger a response. However, there are many different genetic HLA subtypes. Without adequate immunosuppression (see below) HLA markers on donor organs which are non-self are likely to be identified for destruction by the recipient immune system. Donors and recipients are screened to find as close a match as possible to minimise the immune response.
Hypertension	High blood pressure.
Hypoxia	Low oxygen levels.
Hypotension/hypotensive	Low blood pressure.
Hypothalamus	The area of the brain that secretes substances that influence pituitary and other gland function; involved in the control of body temperature, hunger, thirst, and other processes that regulate body equilibrium.
Immune-compatibility screen	A series of medical tests to minimise chance of organ rejection. Tests both look at the genetic tissue types (see HLA above) and at any antibodies the recipient already has.
Immunosuppression	The partial or complete suppression of the immune system response of an individual. It is induced to help the survival of an organ after a transplant operation.
Immunosuppressive agents	Medication used to reduce the activity of the immune system as above.
Induction immunosuppression	Intense, prophylactic immunosuppressive therapy used at the time of transplantation. The aim is to prevent early acute rejection of the transplanted organ.

Inherited metabolic disorders	A category of inherited genetic conditions causing disorders of biochemistry. May lead to organ damage and failure.
Ischaemia/reperfusion injury	Injury which occurs on the re-establishment of blood supply to a transplanted organ following a period of ischaemia (see below).
Ischaemic time	Ischaemic time is the time that an organ has its blood supply cut off, thus depriving it of oxygen and nutrients. This is further classified as below:
Warm Ischaemic Time (WIT)	The time a tissue, organ, or body part remains at body temperature after its blood supply has been reduced or cut off but before it is cooled or reconnected to a blood supply.
Cold Ischaemic Time (CIT)	The time between the chilling of a tissue, organ, or body part after its blood supply has been reduced or cut off and the time it is warmed by having its blood supply restored.
Total Ischaemic Time	The sum of the WIT and CIT.
Leukocytes	White blood cells: usually involved in fighting infection; in the context of transplantation are involved in the rejection of transplanted organs.
Malignancy	Cancer.
Maastricht classification	A method of classifying the clinical circumstances in which DCD can occur.
Medulla	The part of the brain that joins the spinal cord and is concerned especially with control of involuntary activities, such as breathing and beating of the heart, which are necessary for life (full name – medulla oblongata).
Metabolic syndrome	A cluster of conditions that occur together, increasing the risk of heart disease, stroke and type 2 diabetes. These include increased blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels.
Myocardial infarction	Relating to heart disease, commonly known as a heart attack.
Myocardium	Heart muscle.

Necrosis	The death of living cells or tissues, for example due to ischaemia (see above).
Neoplasm	Cancer.
Nephrectomy	The surgical removal of a kidney.
Nephrosclerosis	A progressive disease of the kidneys that results from sclerosis (hardening) of the small blood vessels in the kidneys.
Nephropathy	A broad medical term used to denote disease or damage of the kidney, which can eventually result in kidney failure.
Neuroendocrine	Relating to cells or organs that have both neurologic and hormonal properties
Non-alcoholic Steatohepatitis (NASH)	Liver inflammation and damage caused by a build-up of fat in the liver.
No-touch time	As relating to DCD (see above). The minimum time period which must elapse from the confirmation of death as a result of cessation of cardiopulmonary function (according to national guidelines) to the commencement of measures to preserve organ viability.
Nuclear imaging	Imaging technique which produces images by detecting radiation from different parts of the body after a radioactive tracer material is administered.
Occult	Disease not accompanied by discernible signs/symptoms.
Oedema	Swelling.
Oesophageal varices	Distended, fragile blood vessels in the oesophagus which are caused by liver disease and liver cirrhosis.
Oncologist	A medical practitioner qualified to diagnose and treat tumours.
Osteoporosis	A condition that weakens bones, making them fragile and more likely to break. It develops slowly and is often only detected when a fall or other trauma causes a bone to break.

Plasmapheresis	A method of removing blood plasma from the body by withdrawing blood, separating it into plasma and cells, and transfusing the cells back into the bloodstream. It is performed to remove antibodies.
Pathologist	A doctor who specialises in the anatomic and chemical changes that occur with diseases. Pathologists work in laboratories, examining biopsies, and regulating tests performed by the hospital laboratories (blood tests, urine tests, etc). Pathologists also perform autopsies.
Pathology	The study of disease.
Pathophysiological	Changes in the body due to disease.
Peritonitis	Inflammation of the peritoneum, a covering in the abdomen.
pH	Power of hydrogen scale. A measure of acidity, neutrality or basicity.
Polycythaemia	Having a high concentration of red blood cells in the blood. This makes the blood thicker and less able to travel through blood vessels and organs.
Pons	A specific section of the brain formed by the rounded prominence on the front surface of the brain stem.
Portal vein thrombosis	A blood clot in the portal vein (the blood vessel that brings blood to the liver from the intestines) of the liver. May be seen in liver cirrhosis (see above).
Pre-eclampsia	A disorder of pregnancy characterised by the onset of high blood pressure and protein in the urine. This condition usually begins after 20 weeks of pregnancy.
Primary Sclerosing Cholangitis (PSC)	A long-term progressive disease of the liver and gallbladder characterised by inflammation and scarring of the bile ducts which normally allow bile to drain from the gallbladder.
Renal	Relating to the kidney.

Reperfusion techniques (normothermic, hypothermic, oxygenated)	Techniques which aim to preserve organ function: preservation solutions are flushed through the organ in an attempt to mimic normal physiological conditions. Can be performed at body temperature (normothermic) with oxygen added to the solution, or at low temperature (hypothermic) with or without oxygen.
Serum	The fluid and solute component of blood.
Somatometry	The measurement of the dimensions of the human body, especially while keeping the soft tissues intact.
Stenosis	The narrowing or restriction of a vessel, duct or valve that reduces fluid flow.
Sympathetic storm	Gross instability of the autonomic nervous system which is the result of severe brain injury and causes multiple physiological abnormalities.
Tacrolimus	See calcineurin inhibitors.
Uraemia	A raised level in the blood of urea and other nitrogenous waste compounds that are normally eliminated by the kidneys.
Vasculopathy	A term used to describe any disease affecting blood vessels.
Wilson's disease	A genetic disorder in which excess copper builds up in the body. Symptoms are typically related to the brain and liver.
Withdrawal of Life-saving Treatment (WLST)	Withdrawal of treatments that have been considered to be of no overall benefit to a critically ill patient on ICU or in the emergency department. In such circumstances death is considered to be inevitable and ongoing treatment futile.

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Chapter 1: Introduction

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Chapter 2: Framework for a national action plan

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Appendix 1
A framework for a national action plan

LIST OF TABLES & FIGURES

Introduction

Achieving a successful and high-quality system for organ donation and transplantation is a difficult and complex task. Many different processes and professionals are involved, all of which must be aligned and coordinated seamlessly. High level collaboration across the health system is essential, as is attention to the smallest detail at an operational level, and it is vitally important that all involved are united in a shared vision of how to achieve the desired goals. If one link in the intricate chain of events is not functioning adequately, then the whole system will not be fit for purpose. There are many different core aspects vital to the smooth functioning of a successful programme including legislation, public engagement, capacity, infrastructure, staffing, training and guidance. To add to this, organ donation and transplantation are urgent and time-restricted activities, usually taking place at the most emotionally distressing time of people's lives. Despite the time constraint, these circumstances must be managed with the utmost sensitivity and skill, and confidence in the ethics and fairness of the system is imperative. The combined importance of public support and approval together with government commitment cannot be emphasised enough, and educational programmes have a key role in this respect. It is notable that those countries with high rates of donation and transplantation have active health literacy programmes which encompass issues around organ donation and transplantation.

Bearing this complexity in mind, the LSE team has developed a framework to inform and guide the future development of the Hellenic organ donation and transplantation system, building on the current context and culture. The framework has been carefully developed in consultation with experts in the field, and with reference to a number of key documents recently published in the discipline of organ donation and transplantation. These include guidance from the World Health Organization (WHO)(1), the European Directorate for the Quality of Medicines and HealthCare (EDQM)(2), the Organ Donation European Quality System (ODEQUS)(3) and Eurotransplant(4). We also consulted the standards and guidelines of the Division of Transplant Surgery of the European Union of Medical Specialists (UEMS) for the training of all transplant professionals and accreditation of transplant centres. The framework is informed by the country profiles which accompany this document, and which give an overview of the systems in place in Croatia, Italy, Portugal, Spain and the United Kingdom. Each of these countries has implemented successful organ donation and transplantation programmes and, although they continue to face many challenges, these examples can provide useful paradigms for development of the Hellenic system.

It is important to emphasise that the framework focuses on the essential components and overall structure required for a successful programme. It is intended to inform and guide future developments; however, the recommendations are not exhaustive. There are many internationally recognised and approved documents which provide technical and ethical guidance on the more intricate and sensitive aspects, such as donation following circulatory death, organ matching, tissue compatibility, donor suitability, transplant surgery and immunosuppressive treatment. It was beyond the remit of this document to explore such

issues in detail, although they will clearly need to be addressed. We have also not specified criteria for prioritisation of transplant candidates, as this is a delicate and culturally dependent issue which will need to be decided by nationally approved committees. Work on this is being undertaken with the Hellenic Transplant Organisation (NTO) with whom we have collaborated in the process of writing this review.

It should also be highlighted that while the framework is based on currently agreed best practice and principles, it is not intended to be fully prescriptive. The current status of the Hellenic system and the contextual and cultural challenges it faces will be addressed in detail in other sections. Evidently, future plans will have to be context-specific, and the recommendations made in the later sections of the report take into account existing infrastructure, legislation, practice and policy.

It is essential that the timeline is carefully thought through. The development of different elements of the system will need to be streamlined so that there is capacity to manage the predicted increase in demand at each stage of the process. For example, there will be a substantial run-in time for recruitment and training of staff, varying by profession. National strategies for improving the rates of donor registration and family consent may take time to have an effect, but it will be vital that increased rates of consent are matched with increased capacity for tissue matching, organ retrieval and transplantation. The greatest tragedy would be to have many more available donors, but insufficient infrastructure to support this increase, and in the worst case scenario, organs which go to waste. This could lead to a damaging loss of public confidence in the system.

What follows aims to provide a narrative background to the main sections of the framework.

1 Reducing the demand for transplants

1.1 Prevention policies

The demand for organs is always going to outstrip the supply. Therefore, no organ donation and transplantation policy would be complete without including national strategies which attempt to reduce the incidence of organ failure and the need for transplantation. The Madrid Resolution on Organ Donation and Transplantation states clearly that:

> 'Of equal importance to infrastructure and professional development in organ donation and transplantation is sustained investment in prevention to reduce future needs for transplantation, through intervention in the major risk factors for end-stage organ failure and the development of health systems able to meet the challenges of chronic diseases such as diabetes, cardiovascular disease (CVD), and hepatitis.'(5)

Such strategies must focus on the prevention and/or effective treatment of the aetiologies which lead to end-stage organ failure. These programmes will often fall within the remit of large-scale public health measures whose aim is to improve the overall health of the population. For simplicity we will concentrate here on renal and hepatic disease. However, it is easy to see how these strategies also have implications for reducing the incidence of failure in other organs and organ systems, and in reducing the need for transplants generally.

Across Europe there are a few leading aetiologies which are implicated in the development of organ failure. Although there is wide variation, in most European countries diabetes and diabetic nephropathy account for around 20–30% of incident cases accepted for renal replacement therapy, and hypertension and hypertensive nephrosclerosis account for around 10–20%(6). Cirrhosis and primary liver cancer are the leading causes of liver failure in Europe, and alcohol consumption, viral hepatitis B and C, and obesity with its associated metabolic syndrome are the main causes of these two conditions(7).

There are, of course, other causes of renal and hepatic failure, such as autoimmune diseases and inherited metabolic disorders which will be less easy to address. However, effective preventative measures at primary, secondary and tertiary levels aimed both at reducing the burden of disease and effectively slowing or containing disease progression could make a significant difference to reducing the need for organ transplantation.

1.2 Primary prevention

Primary prevention aims to prevent disease from occurring in the first place. Vital to primary prevention is a strong and professionally respected public health body, with adequate funding and supporting infrastructure to execute its functions. Also crucial is a comprehensive primary care network, fully integrated with secondary and tertiary care.

For the purposes of this document we will not embark on a full discussion of the many diverse roles of public health and primary care in improving population health. However, a few items deserve mention as they are directly implicated in reducing the burden of need with respect to the demand for transplants:

- National programmes and community interventions for weight management
- Promotion of physical activity
- Educational programmes on nutrition, diet and exercise
- Smoking cessation services
- Drug and alcohol rehabilitation and harm reduction services
- Educational programmes on the use of alcohol, drugs and smoking
- Vaccination programmes for those at risk of hepatitis B infection
- Sexual health programmes; support for those working in the sex industry
- National curriculum in health, healthy living and sexual health starting from school age.

1.3 Secondary prevention

Secondary prevention is aimed at limiting the damaging effects of a disorder once it has already occurred. This is achieved by trying to detect disease early and treating it promptly to halt or slow progression. Measures include both medical interventions and encouragement of personal strategies which may improve health. In the best case scenario, these strategies may return individuals to their original health (for example, weight loss may reverse pre-diabetes). Secondary preventative measures will largely be the remit of primary and secondary care. Below are some suggested strategies which may be helpful in secondary prevention of organ failure.

- Programme of regular health checks in primary care setting at set age thresholds
- Good glycaemic control in those diagnosed with type 1 or 2 diabetes
- Weight loss programmes and dietary advice for those with a diagnosis of diabetes
- Exercise programmes and support with increasing physical activity for those diagnosed with diabetes
- Management of hypertension with appropriate medication

- Dietary and lifestyle advice for those diagnosed with hypertension
- Timely detection and treatment of viral hepatitis – investment in antiviral drugs and programmes to administer these
- Regular checks for all those identified as at risk from liver disease
- National registers for all those diagnosed with diabetes/hypertension
- National guidelines and targets for treatment of diabetes and hypertension including regular checks for renal function and reward for meeting these targets
- Early identification of impaired renal function and treatment of contributing factors.

1.4 Tertiary prevention

Tertiary prevention aims to reduce the impact of an ongoing chronic disease or disorder that has lasting effects. The focus is on delaying and treating the long-term complications and impairments that are the result of chronic disease. In chronic kidney disease this includes management and treatment of:

- Uraemia
- Anaemia
- Mineral and bone disorders
- Cardiovascular disease
- Other comorbidities.

In chronic liver disease it will include management and/or prevention of:

- Oesophageal (bleeding) varices
- Ascites
- Bacterial peritonitis
- Hepatorenal syndrome
- Portal vein thrombosis
- Encephalopathy.

Patients who are subject to tertiary preventative measures are already well on their way to terminal organ failure, and at this stage it can only be hoped to marginally delay the need for renal replacement therapy or transplant. Clearly, in the case of liver failure there is no alternative to transplant, and once tertiary preventative measures fail the patient will proceed to terminal illness and death. It is therefore recommended that in order to have any significant impact on the demand for transplants considerable investment in primary and secondary prevention is needed. Once tertiary prevention is required the need for transplant has become almost inevitable.

2 Supply of organs for transplant

2.1 Circumstances which allow for deceased organ donation

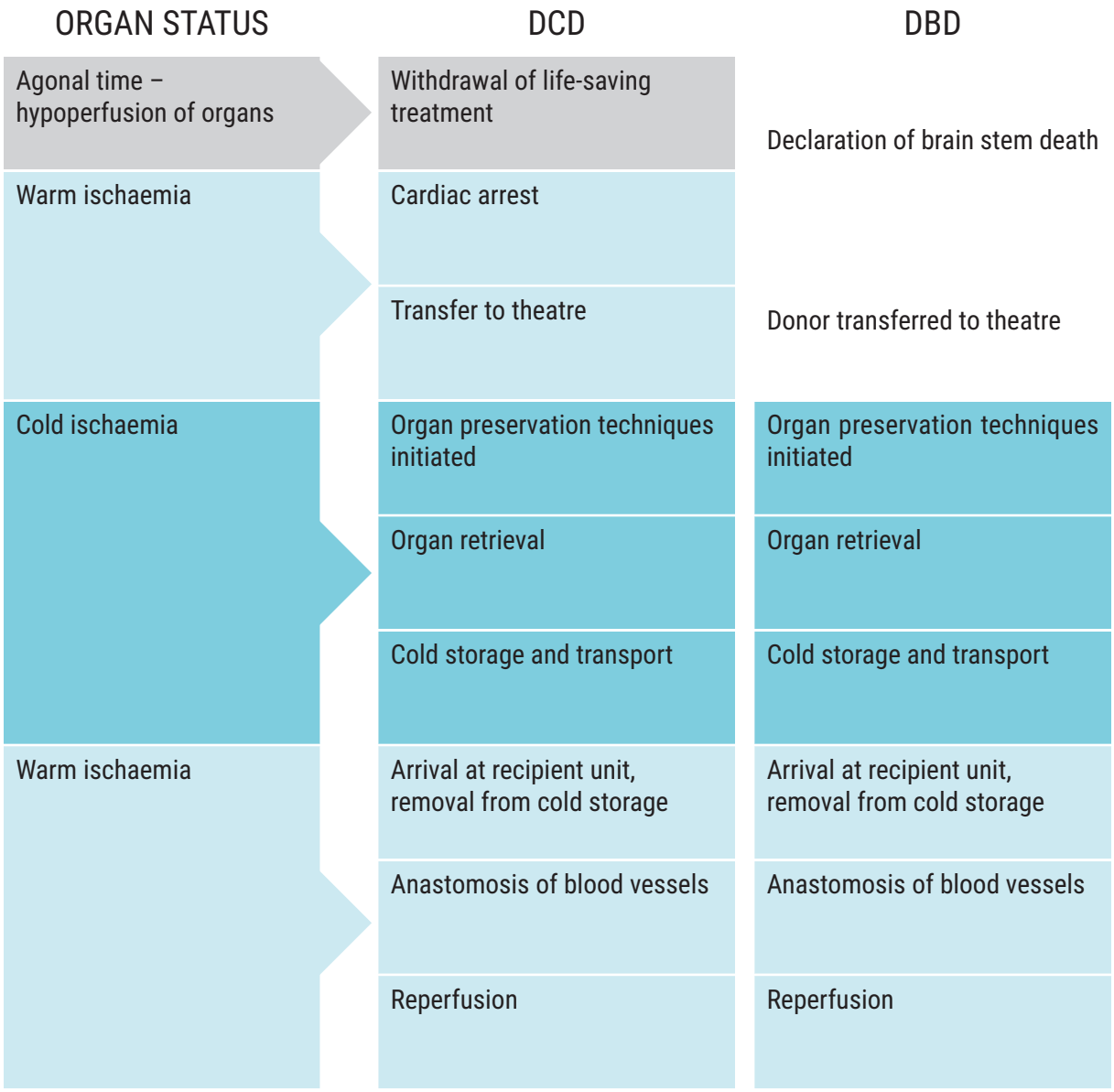
Although living donors (LD) can contribute significantly to the organ donation rate in any given jurisdiction, the countries with the highest transplantation rates have well-developed deceased donor (DD) schemes(2). There are two options in deceased donation: donation after brain death (DBD), and donation after circulatory death (DCD). In both circumstances there are specific challenges which must be addressed by clear national legislation, guidance and protocols if they are to lead to successful organ transplantation. Some of the challenges are common to both circumstances, but DCD poses some particularly difficult ethical dilemmas. If DCD is to be used then these dilemmas need to be explicitly addressed by the relevant authorities in a manner which takes account of national sensitivities and cultural understandings of death. Despite the challenges, DCD does now represent a significant part of the programmes in many countries which achieve high donation rates. For example, in Spain DCD now accounts for 24% of deceased donors(8), and in the United Kingdom (UK) 40% of deceased donors(9).

One of the most important issues to be taken account of in deceased donation is the ischaemic time. This is the time that the organ to be transplanted is deprived of a blood supply, and therefore of oxygen and nutrients. During ischaemic time there is a decrease in cellular pH and adenosine triphosphate (ATP) levels as a result of anaerobic metabolism and lactate accumulation. What follows is a cascade of events which ultimately leads to cell swelling, rupture and death. Unfortunately, this damage is exacerbated on reperfusion once the organ is transplanted, and the mechanism of injury is characterised by a build-up of reactive oxygen species, an overload of intracellular calcium ions and activation of inflammatory and pro-thrombogenic cascades. This sequence of events is usually referred to as ischaemia/reperfusion (I/R) injury. Some organs are more susceptible to I/R damage than others. For example, in the myocardium high intracellular calcium ion concentration leads to activation of intracellular proteases which is particularly damaging to cardiac myofibrils and leads to hyper-contracture and band necrosis.

The cooling of organs to be transplanted is an attempt to reduce the magnitude of damage incurred during the ischaemic time, and this is known as *cold ischaemic time (CIT)*. A drop in temperature reduces the metabolic rate of tissues, and mitigates to some extent the build-up of the products of anaerobic metabolism and the consequent damage. The interval between cardiac arrest and the initiation of measures to cool the organs is known as the *warm ischaemic time (WIT)*. It is now well known that limiting WIT is critical in order to limit I/R injury. WIT is often problematic in DCD where a significant period may pass between circulatory arrest and

organ retrieval. Even in cases of controlled DCD (cDCD) following the withdrawal of life-saving treatments, the agonal period before cardiac arrest may incur significant end-organ damage due to insufficient cardio-respiratory output. It is important to note however, that organ damage is still sustained as a result of cold ischaemia. Oxidative stress still occurs, as does a build-up of inflammatory agents. CIT should therefore also be limited as far as is possible. Additionally, all organs will sustain a short period of warm ischaemia when they are removed from cold storage for transplantation and prior to reperfusion. Figure 1 shows a schematic presentation of WIT and CIT in DBD and DCD.

Figure 1. Schematic showing cold and warm ischaemic time in DBD and DCD



In the case of kidneys and livers, where living donation (LD) is possible, there is a clear advantage. LD can be arranged so as to limit the ischaemic time to a very short period and consistently shows better outcomes in terms of primary and long-term graft function(10). In DBD there should be practically no warm ischaemic time, but cold ischaemic time can be problematic, and in DCD limiting warm ischaemia is crucial and remains one of the main obstacles to this route of donation. However, as noted, countries with highly successful programmes use all three routes of organ donation, albeit to different degrees. The Madrid Resolution on Organ Donation and Transplantation suggested that for self-sufficiency in organ donation and transplantation it is vital that jurisdictions develop their deceased organ donation programme, and that the living donation programme should be seen as complementary to this(5).

Donation after brain death

The diagnosis of death by neurological criteria is the cornerstone of DBD. This route to organ donation is only possible via individuals who have been admitted to the intensive care unit (ICU) with irreversible loss of brain function (ILBF). These individuals will have complete loss of consciousness, and their vital functions are maintained by means of mechanical ventilation and other medical interventions. As mentioned above, organs obtained from DBD are more likely to be viable than organs obtained from DCD as there has been no period of warm ischaemia. Identification of all possible organ donors with a devastating cerebral lesion in the ICU is critical to achieving a good donation rate(3). The concept of brain death was formalised in 1968 in the landmark report by Harvard Medical School entitled 'A definition of irreversible coma'(11), and since this time has gradually become universally medically accepted. The UK National Health Service (NHS) organ donation and transplantation website describes circumstances for the use of neurological criteria to confirm or diagnose death as follows:

> *'Where brain injury is suspected to have caused irreversible loss of the capacity for consciousness and irreversible loss of the capacity for respiration before terminal apnoea has resulted in hypoxic cardiac arrest and circulatory standstill.'(12)*

Many different pathologies can lead to ILBF. Brain death may be the consequence of intracranial pathology such as massive haemorrhage or trauma, or the intracranial consequence of extracranial events such as circulatory arrest due to myocardial infarction. Irrespective of the aetiology, ILBF is the result of interruption to the cerebral circulation as a consequence of brain injury, and the resultant oedema and raised intracranial pressure. This leads to coning of the brain through the foramen magnum and irreversible damage to the brain stem and its blood supply. The brain and brain stem become necrotic, and it is important to emphasise that these patients have no prospect of ever regaining consciousness or the ability to breathe without assistance. Modern techniques in the form of mechanical ventilation and skilled medical intervention have permitted us to keep the hearts of these patients beating for some time. However, without the control of the brain and brain stem, the body gradually deteriorates, and is no longer able to maintain homeostasis. Loss of regulation from the hypothalamus, pons and medulla lead to haemodynamic and thermal instability, gross neuro-endocrine disturbances and release of chemokines and cytokines. This is often accompanied

by a sympathetic storm as a result of instability of the autonomic nervous system. Despite various medical interventions, the heart may stop beating after a number of days. These physiological changes can cause considerable end-organ damage, but skilled management of potential donors by intensivists can mitigate this damage to some extent.

The diagnosis of brain death is now widely accepted by the medical community. However, it remains poorly understood by the lay community, and is often at odds with human expectations of death, and religious and culturally accepted rituals around death and dying. Given these circumstances, it is essential that there is clear and comprehensive national legislation and guidance regarding the diagnosis of death by neurological criteria which is in keeping with internationally accepted protocols. It is crucial that this guidance is strictly adhered to and has the support of all professionals involved in the necessary processes. The criteria used to diagnose neurological death must reliably differentiate between ILBF and states of severely impaired, but not totally irredeemable function. Efforts should be made to try to gain cultural acceptance and understanding of the concept of brain death and there must be national confidence in the set of diagnostic procedures carried out to determine this diagnosis.

Three preconditions must be met, as follows.

- An aetiology must be identified which is capable of causing sufficient damage to the brain to result in an irreversible capacity for consciousness and an irreversible capacity for respiration.
- Reversible conditions capable of mimicking or confounding the diagnosis of death using neurological criteria must be excluded, for example:
  - Hypothermia
  - Medical conditions which could influence clinical examination such as severe electrolyte, acid-base or endocrine disturbances
  - Administration/intoxication with drugs such as baclofen/central nervous system depressants/neuromuscular blocking agents
  - High spinal cord injury.
- Clinical examination of the patient must demonstrate death, by certifying absent brain stem reflexes and apnoea.

For full guidance on the clinical diagnosis of brain death we recommend referral to section 3.3 of the EDQM 7th edition Guide to the Quality and Safety of Organs for Transplantation(2).

As will be expanded on in the sections on donation below, in the case of DBD it is very important that the diagnosis of death is made by different personnel from those who approach the family and loved ones regarding the possibility of organ donation. The diagnosis of death and the communication of this diagnosis should be the remit of the intensivists in charge of the ICU. Any conversations regarding donation should be separate and are the remit of the donation coordinator, unless the relatives raise this topic spontaneously.

There are numerous internationally accepted and validated guidelines for the diagnosis of death using neurological criteria.

Recommended references include:

Academy of Medical Royal Colleges: A code of practice for the diagnosis and confirmation of death(13)

World Health Organisation, International Guidelines for the Determination of Death, 2012 Montreal Forum Report(14)

UK Donation Ethics Committee, Academy of Medical Royal Colleges. An ethical framework for donation after confirmation of death using neurological criteria (DBD) 2016(15)

Donation after circulatory death

DCD relates to persons who have been declared dead following circulatory arrest. Unlike DBD, there are various clinical scenarios in which this can occur. Internationally recognised are the four categories described by the Maastricht criteria(16).

Table 1. The Maastricht criteria for DCD

Maastricht category		Definition
I	Ia – out of hospital	Sudden unexpected cardiac arrest Found dead in or out of hospital – no attempt at resuscitation
	Ib – in hospital	
II	IIa – out of hospital	Sudden unexpected and irreversible cardiac arrest in or out of hospital Unsuccessful resuscitation
	IIb – in hospital	
III (Controlled DCD)		Planned cardiac arrest awaited after withdrawal of life-sustaining treatments (WLST) in patients who are not brain dead
IV (Controlled or uncontrolled)		Sudden or planned cardiac arrest after diagnosis of brain death

The legislation and guidance surrounding the diagnosis of death by circulatory criteria varies from country to country. Due to the potentially reversible nature of circulatory arrest, and the resultant ethical concerns that arise, it is essential that guidance and legislation in this area is clear, explicit and professionally acceptable. One aspect which varies considerably between jurisdictions is the no-touch time. This is the minimum time period which must elapse from the confirmation of death as a result of cessation of cardiopulmonary function (according to national guidelines) to the commencement of measures to preserve organ viability. This period varies from five minutes (UK/Spain) to 20 minutes (Italy). Shorter no-touch times clearly

maximise the potential for organ viability, but may not be considered ethically acceptable. There are also variations in the legislation and guidance regarding the initiation of ante-mortem procedures to maximise organ viability, for example the administration of heparin or cannulation of the large vessels in anticipation of extra-corporeal membrane oxygenation.

In the eventuality of potential DCD following withdrawal of life saving treatment (WLST), a potential donor may become ineligible because death by circulatory failure does not occur within a time frame which allows for organ recovery. Organ recovery under these circumstances is only possible if cardio-respiratory arrest occurs soon after WLST. During the agonal phase between the WLST and cardiac arrest there may be prolonged hypotension and hypoxia leading to severe end-organ damage. In many countries the time limit is set to two hours, but some have extended this to increase the organ donor pool, and in the UK it is now three to four hours.

Families and loved ones of patients on ICU may find it difficult to accept the diagnosis of brain death, and wish to witness the cessation of the heart-beat and of breathing. In the UK there is a relatively high rate of controlled DCD following WLST(9), and it is possible that this is a reflection of these sentiments. However, the UK success in this respect is underpinned by many years of professional, legal and ethical collaboration to overcome the obstacles to this route of organ donation.

Recommended references include:

British Transplantation Society and the Intensive Care Society, Consensus Statement on Donation after Circulatory Death 2010(17)

British Transplantation Society. Transplantation from deceased donors after circulatory death. 2013(18)

UK Donation Ethics Committee. An ethical framework for controlled donation after circulatory death. 2011(19)

Uncontrolled donation after circulatory death: European practices and recommendations for the development and optimization of an effective programme(20)

2.2 Living donation

Background

In many countries living donation (LD) provides a very important source of organs, and in order to achieve national self-sufficiency in organ donation and transplantation deceased donation (DD) and LD should be seen as complementary(2,3,21). It is extremely important to recognise that, in the case of renal failure, pre-emptive transplant (prior to the need for dialysis) from a live donor is the treatment of choice and has many advantages: reduced ischaemic time, better graft survival and a decreased incidence of delayed graft function. The recipient is in better

health when transplanted and avoids the risks associated with dialysis. It is worth noting that the ERA-EDTA report demonstrates an adjusted five-year survival on dialysis of 45.5% compared with 94.5% after first transplant from a living donor (2007–11 cohort)(22). In the United States the USRDS report shows an adjusted five-year survival of 43.3% on dialysis, compared with 85.3% after first transplant from a living donor (latest available data 2012).(23) A wealth of international evidence clearly shows the excellent short- and long-term outcomes in LD, from both clinical and quality of life perspectives(24–26).

With respect to livers, as there is no alternative to transplantation in the case of liver failure, fulminant hepatic failure can lead to death in a matter of days. Therefore, a LD is life-saving if it negates the need to wait. This can be especially pertinent in paediatric cases where it can be more difficult to source a good match from a deceased donor(27).

Living donation currently constitutes around 35% of all transplantation activity worldwide(2). The majority of LDs are renal transplants and to a lesser extent liver transplants. There are also a small number of lung, intestine and pancreas segment transplants. In 2018 Turkey had one of the highest rates of LD kidney transplant in the world at 36.8 pmp. Other examples of countries with a high contribution include the Netherlands and the UK at 24.6 pmp and 15.5 pmp respectively(28).

Legislation and protection of living donors

There are important ethical issues around living donation which must be specifically addressed by national legislation, regulation and guidance. Safety and protection of potential LDs is a key component. It is imperative that there is legislation in place which acts as a robust safeguard to shield those offering organs for donation from exploitation, trafficking or other unethical practices. There must be no suspicion of coercion of any kind, financial or other gain, and donation must be motivated entirely by altruism. The WHO Guiding Principles on Human Cell, Tissue and Organ Transplantation(1), the Declaration of Istanbul(29) and The Council of Europe Convention against Trafficking in Human Organs(30) all provide standards and guidance, and recommend criminalisation of activities which violate the basic principles of altruism and autonomy intrinsic to LD. Preferably, trained independent living donor advocates should be engaged to uphold the rights of the LD in each case; this is a system which has worked well in the United States, a country with good rates of LD(28,31). Living donor advocates must be fully autonomous and not share interests with any party.

Education and raising awareness

As detailed in the section below, Awareness, knowledge and attitudes, raising public awareness and dispelling myths and misconceptions are of great importance to the donation and transplantation system as a whole, and these issues are addressed in detail in our sections on ‘Public support’ and ‘Raising public awareness’. As pre-emptive renal transplant from a LD is the treatment of choice in end-stage renal disease (ESRD), it is especially important that the subject of living donation is given particular prominence in any public awareness campaigns and in educational programmes.

An effective mechanism for the promotion of living donation should be in place in all hospitals with a transplant programme(3). An LD register is absolutely essential (this should be part of the national transplantation registry managed by the national transplantation organisation and should have capacity to register potential donors and record follow-up, outcomes and other key quality indicators. If the register is of sufficient quality in terms of data collection, it can also facilitate participation in national and international kidney exchange schemes.

Poor communication and limited partnerships between referring specialists and the transplant programme can pose a major barrier. Relationships must be built to help specialists understand more about the referral and assessment process. This is particularly important in relation to nephrologists who are responsible for the care of patients in receipt of dialysis. These clinicians have good knowledge of their patients, their family and social circumstances, and have an invaluable part to play in the referral and assessment for living donation(32,33).

Reimbursement of costs

With the exception of Iran, it is illegal in almost every country to offer any direct financial reward for LD, and this is almost universally viewed as unethical. Countries with successful LD schemes offer at least partial reimbursement of expenses incurred by LDs. Ideally the process should be cost-neutral, and mechanisms should be in place to compensate donors for any financial or other losses resulting from donation. This may include any direct expenses incurred (such as travel, accommodation and medical expenses) and any loss of income due to time off work. Where relevant, it may also cover future medical expenses occurring as a direct result of donation, or any increase in medical insurance premiums. Incentives are sometimes offered such as prioritisation on the waiting list should the donor require a transplant in future, tax breaks or credits, and discounts on the cost of medical insurance.

Table 2. Examples of comprehensive arrangements for the reimbursement of LDs

United Kingdom	Travel expenses (including any tolls or charges) Loss of earnings, employed (including over-time) or self-employed Loss of any state benefits Accommodation Childcare or care of other dependents Any medical expenses incurred not otherwise covered Backfill cover for business Donation related prescription costs(34)

Table 2 (continued). Examples of comprehensive arrangements for the reimbursement of LDs

Israel	Loss of earnings, up to 40 days equivalent to a person serving in reserve duty Travel expenses, up to a fixed sum (no need for receipts) Psychological treatment Recovery leave – refund for a vacation in a hotel of up to 7 days up to a fixed value Insurance refunds Prioritisation regarding future transplant needs Refund or exemption from paying health tax for 36 months following donation(35)
Netherlands	Travel expenses Accommodation Loss of earnings (special subsidy for the self-employed) Childcare or care of other dependents Any additional care costs Any medical costs not covered by insurance(36,37)

Assessment and consent

LD may be via related (genetically or emotionally), or unrelated donors. This could include exchange programmes and altruistic or anonymous donations. Whatever the case, scrupulous selection criteria must be in place, evaluation of suitability of the LD should be carried out by an appropriately qualified panel, and there should also be a full psychosocial evaluation for suitability which takes into account past and current mental health, resilience and the risks of future psychological and emotional consequences. This assessment also needs to incorporate an assessment of any factors which might constitute coercion or pressure from family or friends. LDs must be fully informed of the risks and possible adverse consequences of donation, deemed to be competent and acting of their own free will. Full information includes ensuring that the LD understands the economic, social and occupational implications, and conveying comprehensive information regarding the risks of surgery as well as the potential long-term health risks and the possible adverse outcomes in the recipient.

In the case of LD there is usually a more generous time frame available for assessment than in DD. In terms of transmissible neoplasms or infectious agents the same principles generally apply to both, but more detailed assessment is likely to be feasible in LD. Both the donor and the recipient should be counselled and consented as to the fact that, particularly from the perspective of infections, these could be acquired in the interim between testing and donation. The possibility of graft failure should also be acknowledged and discussed. A specific consent form must be devised for LDs, detailing the possibility of intra- and post-operative

complications, both in donor and recipient. This must include provision for the unlikely, but possible eventuality of something untoward occurring to the recipient during the procedure (such as a myocardial infarction). The recipient must decide what their wishes would be under these circumstances; would they like the graft to be donated to another person, to be returned to them, or discarded?

There are a number of internationally recognised documents which give detailed guidance on the assessment of living donors(38–40).

Kidney exchange schemes

Up to 40% of recipients will discover that their intended donors are incompatible with them(41). These individuals can greatly increase their chance of achieving a living donation if they become part of a kidney exchange scheme in which they become part of a larger network of donors and recipients so that recipients can swap donors, forming part of a chain which benefits everyone. The UK, the Netherlands and Spain all have successful living kidney donor exchange schemes.

In order to set up such a scheme a well-designed and regularly updated living donor registry is crucial (see section on Databases, Registries and IT).

Risks to the living kidney donor

Although there are clearly risks associated with a donor nephrectomy, the majority of live donations now performed via laparoscopic nephrectomy which has substantially reduced the risks and length of hospital stay(33). In the short term the risks of donation are comparable to those of any major surgery, in particular the risks of undergoing a general anaesthetic, and surgical complications such as bleeding and infection. However, in a modern surgical context these risks can be considered to be low and the vast majority of donors make an excellent recovery from the donation procedure.

It is important to emphasise that a number of studies from around the world have shown that living donors are at no greater risk of premature death or ESRD than the general population. In fact, some have shown that living donors live longer and have a lower risk of ESRD than the population they originate from(42–49). However, potential donors are a self-selected group with better initial health than the general population, and donors have legitimate concerns that donation will have long-term consequences for their health. Research has shown a slightly higher risk of ESRD, hypertension and cardiovascular mortality in living kidney donors when matched with comparably healthy controls(50,51). However, methodological concerns around the control group sizes and composition, and genetic susceptibility (the majority of live donors are genetically related to the recipient) may have skewed the results of these studies(39). Additionally, a very large study from the USA showed that when compared with matched healthy nondonors, although kidney donors had a slightly increased lifetime risk of ESRD, the magnitude of risk increase was small and remained lower than that of the general population. The risks were found to be higher for black donors(52), and has also been shown to be greater for those who are obese(53).

Another legitimate concern regards the risks of pregnancy following kidney donation. Although there is a paucity of literature on this topic, a number of studies show that when compared to the general population there is a small increased risk of pre-eclampsia and gestational hypertension in women who have donated a kidney, but no other increase in adverse pregnancy outcomes (such as pre-term birth, still birth, neonatal mortality or low birth weight) (54–56).

Careful assessment of potential living donors mitigates the risks of long-term complications, and there are international guidelines which give detailed advice on assessment of living donors to ensure that they are suitable candidates in terms of physical and psychological health(38,39).

Follow-up of living donors is addressed in section 5: Post-transplant follow-up.

Recommended references include:

Amsterdam Forum on the Care of the Live Kidney Donor(57)

British Transplantation Society. Guidelines for Living Donor Kidney Transplantation(39)

British Transplantation Society. Living Donor Liver Transplantation(40)

KDIGO Clinical Practice Guidelines on the Evaluation and Care of Living Kidney Donors(38)

LIDOBS Recommendations for High Quality Practices in Living Donation(59)

Vancouver Forum on the Care of the Live Organ Donor(58).

2.3 Awareness, knowledge and attitudes

It is generally accepted that implementing public education and campaigns to raise public awareness is essential to ensure a sufficient supply of organs for transplant. There is often a natural reluctance to discuss death and end-of-life wishes, and national programmes should seek to dispel myths and misconceptions, and promote principles of social solidarity and altruism. However, such initiatives need to be thoughtfully planned and executed, and be respectful of local cultural norms and practices if unintended adverse consequences are to be avoided. Although most world religions are supportive of the concept of organ donation and transplantation(60–63), it is advisable that religious leaders are consulted as some factors, such as the diagnosis of brain death, can be a contentious issue. Carefully constructed publicity and media programmes are thought to have modest impact in increasing the number of people on the organ donor registry (ODR) and in the donation rate(64,65), although the manner in which the topic is framed may alter the impact. Some research suggests that stories which emphasise the perspective of the recipient whose life has been saved are more effective than those which concentrate on the deceased donor(66). Promoting discussions amongst family and loved ones is thought to be especially important. UK data shows that when a person is on the ODR and their loved ones are aware of their wishes, more than 90% will support their

decision. However, if their wishes have not been explicitly discussed, the family consent and authorisation rate drops to below 50%.

Young people may have a key role to play in stimulating family debate and reflection around organ donation and end-of-life wishes. The Madrid Resolution on Organ Donation and Transplantation(5) highlighted the necessity for normative change to support the principles of organ donation, and proposed that public education should start in school, promoting ethical values such as solidarity and reciprocity. Indeed, many countries with successful programmes have included organ donation and transplantation in their educational curriculum. In Italy the National Transplant Centre in collaboration with the Italian Ministry of Health runs an educational programme targeting children and adolescents called 'A gift worth a lifetime' (Salvo e Gaia) which provides education about the human body and includes the subject of organ donation and transplantation(67). In the UK this topic is addressed in the 'personal, social, health and economic education' classes which commence towards the end of primary school and continue into secondary education. Evidence from the UK suggests that education from school age can increase awareness, change attitudes and boost the number of registrants on the ODR(68).

The country profiles suggest that in some jurisdictions personal stories can be a very helpful strategy to increase support and drive change. Personal accounts are a potent mix of tragedy and joy, and tend to capture the hearts and minds of the population. Many of those bereaved have reported that the knowledge that their tragedy has saved the lives of others is a source of much comfort. In the UK it is possible for transplant recipients to anonymously write to the loved ones of the donor via National Health Service Blood and Transplant (NHSBT) if they wish to do so.

An important caveat to bear in mind is that public programmes to educate and raise awareness may not have the intended effect on everyone in the population. There will always be some individuals who have personal reasons for refusing consent for organ donation and will steadfastly maintain this position(69). Even though this standpoint may be difficult for clinicians and others to comprehend, it must be respected. If the organ donation programme is seen to be coercing citizens or their families into donation this will create mistrust and damage its reputation.

2.4 Documentation and consent policy

A secure and confidential database of people who have recorded a decision to donate (or not donate) is a vital requirement. This register must be easily accessed by the general population and easy to use. It must also be quick and simple to access by clinical staff involved in organ donation.

Many countries have now adopted an opt-out policy, whereby consent for donation is presumed unless the individual has taken the time to register their objection on the national Organ Donor Register (ODR). Opt-out can be 'hard' (the family is not consulted) or 'soft' (the

family is consulted and can over-ride the wishes of the potential donor). In practice, in most jurisdictions, no matter what the law, a soft approach is adopted and the family and loved ones are almost always consulted. The added distress caused by going against the wishes of family at such a painful time would be substantial. However, appropriately trained clinical staff should always be on hand to seek to persuade families who are not consenting to give permission if they know that the potential donor did not opt out.

There is a widespread belief that an opt-out policy (in contrast to an opt-in policy whereby people have to actively register their wishes with the national organ donation organisation) is one of the key components of a successful programme. However, the evidence suggests that opt-out policies are only effective when nested within a comprehensive embedded system with clear clinical roles and commitments and effective media and educational campaigns(70). There is evidence that, in the absence of other supporting structures, an opt-out policy can have little effect. This highlights the importance of entire system change. It is notable that in Spain, the improvements in donation rates were not realised until the establishment of the comprehensive national transplantation organisation 10 years after opting out was introduced(71). It is thought that in other countries, such as Wales, where an opt-out policy has been adopted as part of a whole system approach, this strategy has had moderate success in boosting rates of donation and family consent(72).

Perhaps more important than any other factor is public trust in the system. Donation is a voluntary act, and is dependent on the goodwill of the population as a whole. If there is widespread doubt that the system in place is ethical and fair then the rate of consent is likely to be low. High levels of trust and confidence can be achieved by implementing a system which is transparent, accountable, and maintains high standards of good practice(2).

Further technical issues regarding consent are discussed in the section on legislation below.

3 National regulation, strategy and coordination

3.1 National body

One of the important features of successful donation and transplantation systems has been the establishment of a national transplant organisation (NTO), responsible for donation and transplantation activities in the field of organs, tissues and cells. The NTO must have overarching responsibility for the entire process from donor selection to long-term follow-up. The complex nature of donation and transplantation, and the degree of collaboration and consensus that is required to achieve successful outcomes necessitate high level coordination. Current international guidance on national strategy advises that an adequately funded and resourced single public body referred to as a National Transplant Organisation should be established(2,5). The critical role of such an organisation is clearly demonstrated by all the country profiles. In many jurisdictions there is a three-tier structure; a central office providing oversight to regional offices which are in turn responsible for local activities. Regular formalised collaboration between the different tiers of the system is essential in order for this structure to function effectively. This involves regular operational and educational meetings, submission and collation of data and other reports, exchange of information and collaboration on projects including quality improvement initiatives, audit and research. On an international scale Eurotransplant, which collaborates with the NTOs of eight European countries, offers an example of excellent structure, governance and collaboration and has online systems in place to track the process of donation and transplantation from the moment a potential donor is identified until an organ is transplanted.

The NTO should have clearly established roles, and be easily available via a central hub 24 hours a day every day of the year. Essential functions include those listed below:

- The process of donation, from registration of potential donors to organ retrieval
- Maintenance of transplant waiting lists (there must be nationally agreed rules for admission to the waiting list)
- Ensuring that organs are allocated according to nationally agreed rules; these should ensure equal access, be based on ethical norms and structured according to nationally agreed and transparent criteria
- Coordinating the results of tissue matching and screening from donor to recipient teams

- Ensuring sufficient laboratory capacity for Human Leukocyte Antigen (HLA) and immune-compatibility testing, and ensuring regular maintenance and updates of the data required for tissue matching
- Responsibility for all information technology (IT) infrastructure and data handling required for maintenance of the organ donor list, transplant waiting lists, follow-up and outcome data
- Ensuring the confidentiality of donors and recipients is respected and upheld
- Ensuring that transport arrangements are in place that will enable rapid and safe transfer of organs from the donor hospital to the transplant unit
- Making sure that there are robust traceability mechanisms for transplanted organs in place to facilitate bio-vigilance and quality assurance processes
- Ensuring full transparency and accountability for the donation and transplantation system
- Responsibility for establishing quality assurance systems which are based on international standards and which address all parts of the donation and transplantation process
- Providing accurate, up-to-date information on organ donation and transplantation and promoting public and professional awareness and education.

There are some other functions which would ideally be included in the remit of the NTO, but which could be fulfilled in close collaboration with other agencies:

- Setting or reviewing criteria and standards
- Recruiting, training and appointing donor and transplant coordinators, organ retrieval teams and other professionals intimately involved in the system
- Analysing data, coordinating audits and research
- Accreditation, licensing and inspection of facilities and equipment
- Investigating serious adverse incidents or breaches of the law

This list is not exhaustive, and we would recommend referring to the EDQM's very comprehensive list of essential and additional functions for a NTO in their 2018 7th Edition Guide to the quality and safety of organs for transplantation(2).

3.2 Authorisation and inspection

As with any health-related activity, it is vital that there are appropriate and nationally recognised procedures in place for the authorisation, licensing and regular inspection of all facilities, equipment and personnel involved in organ donation and transplantation. This is crucial to ensure high-quality care within the system and to maintain professional and public confidence. Establishments involved in any part of the organ donation or transplantation process should have adequate, regularly maintained equipment and materials available. All personnel involved should have the requisite knowledge and skills, and be in receipt of regular updates and training.

There should be appropriate schedules in place for regular inspection of premises and equipment, and capacity to undertake impromptu unannounced visits for purposes of inspection. All personnel should receive regular appraisal in accordance with nationally set professional standards and be able to demonstrate participation in mandatory training, a commitment to continuing professional development and up-to-date knowledge and competency in their field of work. In the eventuality that facilities, equipment or personnel do not meet the expected standards, there must be protocols in place to address this and to facilitate improvement over an agreed timescale.

Standards should be set according to internationally recognised guidelines and protocols. These functions could be the remit of the NTO, but could also be carried out by closely affiliated organisation(s), provided there are clear procedures in place for communication and cooperation. These could be institutions such as scientific societies, or statutory bodies. For example, in the UK the Human Tissue Authority (HTA) works closely with NHS Blood and Transplant and is responsible for a number of regulatory activities including inspecting, auditing and licensing organisations involved in organ procurement and transplantation and units involved in the storage of human tissue.

At European level the Directorate General (DG) Sante of the European Commission sets high expectations for quality and safety. The DG Sante has laid down legislation defining standards for organ donation and transplantation under the European Organs Directive, 2010/53/EU(73), and directive 2012/25/EU(74) which provides a further legal framework regarding the exchange of organs between member states. The Council of Europe's Directorate for the Quality of Medicines and Healthcare (EDQM) has a Steering Committee on Organ Transplantation (CD-P-TO) which performs many functions including collecting data, monitoring practice, issuing guidance and fostering links between experts and organ exchange organisations(75). Together the DG Sante and the CD-P-TO assist national authorities in implementing the requirements of the legislation and in adhering to the recommendations in the guidelines. Regular meetings are held to which representatives of all national competent authorities are invited.

3.3 Reimbursement

Transplantation has been shown to be highly cost effective in the long run(76). However, the processes of organ donation and transplantation are expensive and resource-intensive in the immediate term. An appropriate reimbursement framework is therefore essential in order to ensure that, at system level, there are no financial barriers to organ donation or transplantation. The most appropriate mechanism by which a reimbursement framework should operate will depend on the existing financial structures and funding arrangements in place across the health system. Many different providers will be involved in the chain of events from donation to transplantation to aftercare, and careful consideration will be needed to ensure that each provider is reimbursed adequately. Financial or other incentives may be useful, but will need to be carefully designed and consistently implemented. Financial flows should be absolutely clear, and nationally agreed, so that there are no disputes which could undermine the functioning of the system.

It should also be recognised that the work associated with both donation and transplantation often occurs at antisocial hours, and frequently involves long, intense periods which are both cognitively and emotionally challenging. In order to adequately staff rotas and ensure full staffing 24/7 most personnel will have to be prepared to work on a shift basis and cover national holidays, nights and weekends. The remuneration provided for these posts must reflect the intense nature and often antisocial hours of the work involved. In Croatia, for example, flexible schedules for medical students and interns were incorporated into this model of 24-hour coordination to circumvent the challenges of non-competitive salaries, unusual working hours and the inability to financially incentivise and reward employees.

The country profiles give some examples of different reimbursement mechanisms which have worked well in their individual settings.

3.4 Staffing and training

There must be an adequate supply of appropriately trained staff available at all steps of the donation and transplantation process. A national workforce strategy must be devised which takes account of both supply and demand-side factors. The run-in time for training will need to be taken into account, and this will differ for the various professionals involved. It is vitally important that this aspect is thought through carefully in order to mitigate against shortages of staffing in one or more disciplines, which could lead to system failure.

A staffing structure and mechanisms for supervision and accountability must be established. It is well recognised that the central role of the organ donation coordinator has been the key to success in many countries, and an organ donation coordinator should be allocated to every hospital which has an ICU (please see the section on donation below for further details on the requirements for the organ donation coordinator). Ideally recruitment, training and appointment of organ donation coordinators and clinical leads should be by the NTO.

In terms of training of transplant professionals, the Division of Transplantation of the European Union of Medical Specialists (UEMS) aims to guarantee the best standards of care and training in organ donation and transplantation and works closely with the European Society of Organ Transplantation (ESOT). The UEMS sets the standards of training in all transplant disciplines as well as the standards of training within transplant centres. This is combined with robust assessment processes, accreditation of transplant professionals and centres and the organisation of educational events. The strength of the UEMS projects (supported by ESOT) is the fact they are the result of the combined work of 40 countries in Europe and beyond and they have the approval and support of their relevant national scientific societies as well as their national medical associations. In the context of Greece, these are the Hellenic Transplantation Society and the Panhellenic Medical Association. The UEMS training standards and assessments in the field of organ donation and transplantation are most comprehensive and serve as the benchmark of quality in training for organ donation and transplantation in Europe and beyond. Furthermore, ESOT provides a multitude of opportunities for learning and professional development, including support with research, and awards of grants and fellowships. It also provides the opportunity to build a comprehensive educational portfolio with participation in a wide range of live and online learning.

It is essential that the entire donation and transplantation system is adequately staffed and ready to respond 24 hours a day, every day of the year. This will require sufficient trained clinical personnel to cover antisocial hours, weekends and holidays, and round the clock access to IT systems, databases and laboratory facilities. If this is not achieved then many opportunities for donation and transplantation will be lost. It is also desirable that when on-call for the donation and transplantation system clinical staff do not have other responsibilities, as this will lead to unnecessary delays and may compromise the viability of organs offered for transplant.

Evaluation and selection of donors, whether living or deceased, must be undertaken by a panel of experts according to nationally and internationally agreed guidelines and protocols. Any trainees taking part in such evaluations must be supervised by a suitably qualified senior member of staff (please see section 3 for further details).

It is important to recognise that there are many complex administrative tasks involved in organ donation and transplantation. Support from a well-trained and experienced administrative team is essential, as is support from IT and data experts. Ideally these functions should be centralised under the remit of the NTO.

The table 3 shows key staff roles across the donation and transplantation system.

Table 3. Key staff roles and functions in donation and transplantation

Organ donation coordinator (ODC)	Identification of potential deceased donors Approaching families and loved ones and facilitating consent Overseeing the entire practical and administrative process of donation Mobilising the local or regional retrieval teams Coordinating distribution and transportation of organs and tissues Monitoring and updating local data on organ procurement Providing local teaching and training Ensuring that protocols and guidance are up to date and readily accessible Regularly audit activity and highlight successful paradigms and areas of challenge (See also further details in the donation section below)
Living donor coordinator (LDC)*	Provides impartial support and information to potential living donors and their families Coordinates and oversees the process of living donation from identification of potential donors to transplantation to follow-up Promotes living donation in their locality
Transplant recipient coordinator (TRC)*	Coordinates the transplantation end of the process Provides support and information to potential organ recipients from referral for assessment for the waiting list through to the process of transplantation and follow-up Facilitates the work-up of potential transplant recipients Coordinates the transplant operation Responsible for ensuring ongoing monitoring of patients on the waiting list, and removing from the list if no longer fit for surgery
Organ retrieval teams	Dedicated specialist accredited surgical teams led by a senior surgeon and available 24/7, 365 day a year Operate on an on-call basis without other clinical commitments while on duty. Allocated to each retrieval by a centralised system.
Transplant teams	Dedicated surgical teams based at hospitals with the appropriate licensing and training to perform the required transplant operation

Table 3 (continued). Key staff roles and functions in donation and transplantation

Histocompatibility and immunogenetics laboratories	Dedicated specialist immunologists and laboratory technicians, accredited by the European Federation of Immunogenetics (EFI), and available on a 24-hour, 365 day a year basis. Staff must have continuous training in histocompatibility and immunogenetics (EFI educational programs), and the laboratory director must have an EFI diploma. Collaborate with the NTO, transplant and donor centres FUNCTION: Recipient and donor HLA typing Periodic assessment of the alloantibody status for patients on the waiting list Definition of acceptable and unacceptable HLA for the highly sensitised patients Pre-transplant evaluation for the immunological risk with a specific donor Immunological follow-up post-transplant
Laboratory support	Pathological laboratory to perform biopsies Blood centre to determine blood groups Microbiology laboratory to check for infectious disease markers
IT/database and back office support	IT and data engineers with expertise in managing complex medical databases Trained administrative staff with thorough knowledge of the system and who can provide the requisite back office support Trained administrative staff who can provide support to clinical staff in coordinating the donation and transplantation process
Central coordination hub	Trained and experienced staff with expert knowledge of the system who can provide round the clock support and advice throughout the process
ICU, A&E and other hospital staff	There should be regular training and education of all hospital staff who work in specialities where potential deceased donors might present
Regional leads, offices, and committees	Provide support and supervision to the donation coordinators, living donation coordinators and transplant coordinators. Should have regular scheduled meetings and facilitate opportunities to share learning
National leads, offices and committees	Provide national oversight and leadership. Should have regular meetings with regional leads and provide overall vision and direction

* In most European countries apart from the UK the role of LDC and TRC is not specifically designated, and these functions are the remit of the surgeons and clinical staff involved in preparing the donors and recipients. In the USA the LDC is known as an independent living donor advocate, and this offers another model for safeguarding of patient autonomy, readiness, and informed consent(31).

3.5 Organ retrieval and allocation

Once a deceased donor has been identified and family consent obtained, arrangements for organ retrieval, allocation and transport must be swift and seamless. From this point there is a limited time frame in which the organs will remain viable for transplantation. The organ donation coordinator (ODC) will be primarily responsible for making and coordinating all these arrangements. However, the central office of the NTO should provide a 24/7 service offering support and advice on any difficult issues. As the NTO should be the guardian of all databases containing information regarding potential donors and recipients, it will be primarily responsible for allocation of the retrieved organs according to nationally agreed criteria. In collaboration with the organ donation coordinator it should also facilitate safe and fast transport of the organs to the recipient's transplant unit, including arranging authorisation for air travel if necessary.

There must be staff on hand who have the requisite knowledge and experience for supporting the donor in order to maximise the viability of their organs so that they remain suitable for transplant. In most circumstances this is likely to be the physicians and other staff on the ICU. Organ retrieval should be undertaken by dedicated and accredited mobile surgical teams who should be allocated by the central office of the NTO based on proximity and availability. Everything the team needs for organ removal and preservation must be immediately available. In order to prevent delays in retrieval it is very important that these teams do not have other clinical commitments when they are on-call. This could lead to delays and compromise the viability of donated organs.

Organ allocation is a complex decision-making process involving many different factors. As the supply of organs never meets the demand, this may mean that some difficult decisions need to be made. The guiding principles of the WHO state that rules for allocation must be 'equitable, externally justified and transparent'(1). The task of deciding on national allocation rules should be delegated to committees comprising medical, public health and ethics experts. It is essential that cultural and community values are taken into account and that there should be no discrimination on the basis of a recipient's race, religion or gender. Tissue type and antibody matching are clearly crucial elements, but other factors such as equity, utility, benefit and fairness are usually taken into account. Different rules are required for different types of transplant. For example, in some instances of liver disease patients may die within a few days of organ failure, with transplant being the only effective treatment. Conversely, most cases of kidney failure can be maintained for a period of time on dialysis. Some jurisdictions such as Israel and the USA give priority to those who have been previous living donors, or who have previously given permission for the organs of their loved ones to be donated. However, this kind of priority listing could raise some difficult ethical dilemmas.

3.6 Traceability

All organs and tissues retrieved from each donor must be traceable from its original source to its final destination, and this should be facilitated by using a unique identifier. It should also be possible to identify the retrieving and transplanting surgeons, and the recipient and the recipient's transplant unit. It may be desirable to record other clinical data, and there should be national agreements as to what degree of detail is appropriate and useful. The storage and maintenance of this data should be the remit of the NTO and there must be agreement as to the minimum period of time that these records be kept.

3.7 Confidentiality

Other than in the case of living donation from a relative or friend where confidentiality is clearly not possible, it is of paramount importance that the identity of donors and recipients is strictly confidential. This offers some protection from feelings of guilt or obligation. Mechanisms can be put in place for recipients to write to their donor or donor's loved ones via the NTO, thus ensuring continued protection of identity. In the UK this is facilitated by the specialist nurses in organ donation, should the recipient wish to express their gratitude(77). Research suggests that donor families may have a stronger desire to make contact than recipients, and that both donors and recipients appreciate the role that the relevant organisations can take in facilitating and supporting decisions to make anonymous contact(78).

3.8 Transparency

A comprehensive report should be drawn up on an annual basis. This should include details of the activities of all organisations involved in procurement or transplantation of organs. The report should be compiled and disseminated by the NTO, and all licensed donation and transplantation units will be expected to provide the required information. As a minimum the report should detail the number and type of organs donated and successfully transplanted; survival rates; the mode of donation; family consent rates; data on missed potential donors; details of organs offered but not subsequently used and the reasons given; demographics of donors and recipients; the numbers of registrants (or number opting out) on the ODR; the number of people awaiting a donation, broken down by type; and the number who die every year whilst on the waiting list.

This report should be publicly available and easily accessible.

3.9 Legal framework

A clear legislative framework is required, and these laws must be respected and enforced. This is an essential component to establishing public trust in the system. The laws should help to guide and facilitate, and not be an undue impediment to organ donation or transplantation(79). There are many difficult ethical issues surrounding organ donation and transplantation, and legislation should be in keeping with the prevalent culture and be drawn up with input from expert clinicians and experts in clinical ethics. Legislation should cover all possible modes of donation: DBD, DCD and LD. In the case of deceased donation, every effort must be made to ensure that the deceased donor's wishes are respected, and the deceased-donor rule should always apply – that is, that the individual must be officially certified dead according to national law prior to procurement of organs.

Critical care clinicians play a vital role in facilitating organ donation, and should be well versed in legal definitions of death, the diagnosis of death by neurological criteria (see section 1.1), and in the laws around organ donation and transplantation. However, there should be national efforts to disseminate an understanding of the legal and ethical issues to all clinicians working in areas where there may be potential donors, or where donation and transplantation activities are being carried out.

Laws will need to cover a number of different aspects of donation and transplantation. The following list is illustrative rather than exhaustive:

- Type of consent policy, that is opt-in/opt-out and whether this should be 'soft' (needing family authorisation) or 'hard' (no family authorisation needed)
- Whether consent needs to be in writing and physically recorded in some manner, or if this can be oral
- Specific issues pertaining to consent for children and infants
- Specific issues pertaining to consent for those who lack capacity
- Specific issues pertaining to consent for foreign nationals
- The criteria needed for declaration of death
- Specific requirements for DBD, in particular the diagnosis of brain stem death using neurological criteria
- Specific requirements for DCD. For example; best interest decisions, the withdrawal of life-saving treatment, no-touch times, the ethical tensions of taking measures to enhance organ viability prior to death
- Specific requirements for LD – in particular laws protecting living donors from exploitation or coercion and laws criminalising any trafficking in human organs or tissue

- Laws dictating the proper procedures for the removal, storage and transportation of human organs and tissue
- Specifying who is qualified to participate in donor selection and evaluation
- Protecting against conflicts of interest – for example; the team involved in the diagnosis of death should be different from the organ donation or transplantation team
- Allocation and prioritisation of organs
- Minimum requirements for staffing and facilities
- Minimum standards for inspection and regulation.

3.10 Quality assurance, safety and vigilance

The transplant system needs to be committed to a culture of continual quality assurance and improvement. There also needs to be a commitment to vigilance, and transparency around any serious untoward incidents or areas of concern. A quality and safety framework which covers every step of the processes involved in donation and transplantation is essential, and is a requirement of the EU directive 2010/53/EU on the standards of quality and safety of human organs intended for transplantation(80). All health care professionals involved in the many processes of organ donation and transplantation are responsible for maintaining quality and contributing to the quality management system.

The quality and safety framework should follow a recognised quality management and monitoring scheme, and it should be devised and maintained by a dedicated competent authority, with the advice and support of experts in the field. It is important that it has an integrative function, promotes continuous improvement and is not so onerous as to impede efficiency in the system. The framework should be complementary to and supported by national legislation.

Standard operating procedures and protocols drawn up in accordance with internationally recognised best practice should be in place, and must be implemented in every organisation with a role in donation or transplantation. It is important that programmes are consistent and compatible at national and international level to allow for comparisons between regions and comparable countries.

There are a number of fundamental structures required in order to establish an effective framework for quality and safety. The EDQM states that the following elements are essential:(2)

- An NTO with responsibility for overall oversight of the system
- An established and professionally supported system for the authorisation, audit and inspection of procurement and transplant organisations

- A nationally agreed and regularly reviewed organ allocation system with guarantees for quality, efficiency and transparency
- Traceability arrangements with unique identifiers for each donor so that all organs and tissues can be traced from donor to recipient
- A comprehensive quality and safety framework which covers all aspects from donation to transplantation, accompanied by nationally implemented standard operating procedures and standard documentation
- A vigilance system able to react rapidly to adverse events, both in terms of investigation, dissemination of information and fully transparent reporting; it is important that there is a system in place to report both incidents and near misses, and that a culture of shared learning is promoted, rather than a culture of blame
- Where appropriate, and in circumstances where it may be difficult to source organs nationally, an established system to facilitate exchanges with other countries which meet the same high standards of quality and safety
- Systems to ensure confidentiality and protection of data
- Systems to ensure appropriate qualifications and training, and arrangements to ensure senior supervision of key tasks (e.g. donor selection and evaluation); these systems should also be tasked with ensuring that staff are able to access and attend appropriate training
- Systems to collect and analyse follow-up and outcome data including: primary non-function, delayed graft function, re-transplantation and death-related survival rates
- Nationally and internationally compatible quality assurance programmes in the deceased donation process to address performance and areas for improvement.

Specific aspects of quality assurance related to donation and transplantation are addressed in detail in the sections below. We would also recommend referral to the ODEQUS manual on quality criteria and quality indicators(3) which makes a number of detailed recommendations on quality criteria and indicators across the three different modes of donation (DCD, DBD and LD) and covering structures, procedures and outcomes.

3.11 Infrastructure

There must be sufficient infrastructure to support the organ donation and transplantation system. It will be necessary to estimate the requirements of the system, and for this calculations based on current demand and projected future demand will need to be made. It is essential to have an appropriate number of establishments with regulatory approval for organ procurement and transplantation, and these must be available and prepared to provide a 24/7,

365 days a year service. There must be adequate operating theatre capacity and appropriate equipment to hand for the surgical teams to carry out their duties safely, effectively, and efficiently. This will include everything needed to facilitate organ retrieval, preservation, transportation and transplantation as is appropriate. The distribution of the organisations will need to be considered, particularly in view of the time-limited nature of organ donation and transplantation, and the travel times required to transport organs from one site to another.

The organ donation and transplantation system does not operate in isolation from the rest of the health care system. Particularly important is the role of the ICU. The number of ICU beds varies widely across countries(81), and the ICU bed requirement of any hospital will depend on the specialities served, the number of acute beds and the demographics of the local population. However, research from the European Society of Intensive Care Medicine has shown average figures in Europe of 5% of all hospital beds and up to 10% in university hospitals(82). In many jurisdictions the majority of organ donors are patients on ICU who have suffered a catastrophic brain injury. Therefore, ICU capacity and the inclusion of intensive care clinicians in system planning, implementation and development are key factors in improving organ procurement rates. The identification and maintenance of possible donors, and referral to the ODC should be regarded as an integral part of the work of ICU specialists and their staff(83,84).

It is essential that there are an adequate number of laboratories furnished with regularly maintained and updated equipment to handle the required immuno-genetic testing, and other tests which may be required at short notice. These facilities must be able to respond rapidly when testing of a donor or recipient is required. The laboratory staff must be able to communicate seamlessly via a nationwide, regularly maintained database, which will hold the details of all waiting list patients, potential donors, and follow-up and outcome information. There must be sufficient IT infrastructure to support this database, to ensure that it functions smoothly, is secure, and easily accessible to relevant clinical staff when they need to use it.

As with any large national organisation, the NTO will need the backing of a significant number of administrative support staff. The NTO is tasked with overall coordination of the system and must have the equipment and premises necessary to facilitate the provision of this role.

The transport of organs and/or recipients around the country also needs to be considered, and systems need to be in place to facilitate safe transit by the quickest feasible route. Each country has its own particular challenges in how to meet the needs of rural or remote locations, and consideration will need to be given as how to facilitate air transport of organs and/or recipients.

System governance has already been extensively addressed, but deserves a further mention here. In addition to those organisations with regulatory oversight, all the bodies contributing to the system will have a role in governance. In order to ensure good governance of the system there will need to be regularly maintained IT systems in place and sufficient administrative and office support for inspectors and regulators to carry out their roles. Policies and protocols need to be up to date and easily accessible, and any facilities and equipment necessary for teaching, training, audit and research must also be made available.

3.12 The role of scientific associations and professional societies

All fields of modern clinical practice are associated with a number of scientific associations and professional societies. These vary widely in size and in the degree of influence they have over their related field. Membership of these organisations may be determined by professional status, or by field of practice. Most members will pay a fee to benefit from the services offered by the association, although some prestigious figures will have honorary membership. These organisations have many potentially important roles, and need to be recognised as an important source of expert advice, opinion and support. They may be a helpful resource in many different matters ranging from devising clinical guidelines to resolving difficult ethical or legal issues to liaising with the press and the public. They also provide an essential forum in which related professionals can meet, collaborate and exchange ideas.

Some of the functions of scientific associations are listed below:

- Devising and funding research initiatives and awarding grants and fellowships
- Collecting, collating and publishing evidence from research in their field of interest
- Dissemination of the results of scientific research to the wider community
- Devising and publishing best practice guidelines and standards
- Providing expert opinion and support in difficult ethical issues
- Setting up and running educational and accreditation programmes for professionals
- Setting standards and codes of conduct for professionals
- Running national or international events with a role in education or professional collaboration; meetings, conferences, congresses
- Issuing awards and prizes for contributions to the field of interest
- Collaboration with relevant government departments, providing a source of expert opinion in relation to regulation and legislation
- Engaging with the media and the public
- Support with devising and running publicity campaigns.

A few examples of scientific associations of importance to the organ donation and transplantation system are as follows:

- The European Society for Organ Transplantation (ESOT)
- The European Renal Association (ERA-EDTA)
- The Transplantation Society (TTS).

4 Organisation: donation

The donation of organs involves a series of events which unavoidably occur at a highly emotional time, and which are severely time-limited. The framework sets out in detail the key features of the donation process which are necessary for a successful system.

4.1 Functional organisation, facilities and equipment

Every establishment with a potential role in donation needs to be on standby and ready to start the necessary chain of events at all times of the day and night. Regularly updated protocols and processes covering every step of the chain need to be in place and must be readily accessible. Donor hospitals must be serviced by adequately staffed donation teams – in particular, organ donation coordinators, trained ICU staff and organ retrieval teams. All staff potentially involved in organ donation should have received training in following the relevant protocols. There must be access to sufficient ICU facilities, laboratories with specialist testing capacity and operating theatres.

Maximising the proportion of potential donors who become actual donors is a key priority. This requires proactive identification and referral of possible donors, and is a process which must be regarded as always ongoing. The organ donation coordinator has a central function in this activity, and should be easily contacted whenever a situation which might lead to organ donation arises. All personnel working in areas where there may be potential donors should receive regular training to ensure that they are alert to such circumstances and aware that they must make contact with the organ donation coordinator in a timely manner. ICU staff are a priority in this regard, but staff working in the emergency department should also be targeted for training as should staff working in acute medical settings.

Due to the unique considerations implicit in the case of infant or paediatric donation it is important that there are specific, nationally approved guidelines and protocols in place. In the UK, in recognition of the fact that while deceased donation rates in adults have been steadily rising, paediatric donations have remained fairly static, NHSBT has recently drawn up strategic plans for both neonatal and paediatric donation(85).

4.2 The organ donation coordinator and the donation team

The role of the organ donation coordinator (ODC) cannot be emphasised strongly enough. All hospitals with a role in donation should have ODCs identified, and crucially there should be sufficient numbers to comfortably cover a 24/7 rota and any leave periods. The amount of

time that each ODC is expected to dedicate to organ donation must be clearly specified, and measures taken to ensure that this time is not taken over by other pressing clinical needs in the general hospital. ODCs must receive appropriate training, for example in bereavement counselling and empathetic and sensitive family approaches. They must be fully informed regarding the national system for organ donation and transplantation, be able to give families and loved ones all the information they need and answer any questions.

ODCs must have clear lines for supervision and reporting, and should have an identified senior clinical lead to whom they are accountable. This would usually be the head of their establishment. The ODC will be responsible for implementing a quality assurance and improvement programme in their locality, and they must submit periodic reports to their clinical lead, which will then be submitted to the NTO and collated with reports submitted from other institutions.

In addition to their direct roles in organ donation, ODCs should also be instrumental in setting up and implementing ongoing local training and education on organ donation and transplantation in their hospital. This should be accessible to all staff with a potential role in the chain of events.

The hospital donation team must have their own dedicated office space with all the necessary equipment they need to discharge their duties. This office should be clearly identified and easy for other clinicians to locate.

4.3 Education, training and research

All staff involved in donation activities including the donation team, retrieval team, ICU, emergency department, medical unit and laboratory staff must have targeted training relevant to donation which is appropriate to their roles, and this should be part of their continuous professional development (CPD) programmes. Of particular importance is training in identifying potential donors, the correct procedures for referral to the ODC, diagnosis of death, relevant legislation and breaking bad news. There is evidence that regular training of hospital staff is an important lever in increasing the rates of deceased donation(86,87), and ODEQUS suggest that at a seminar on organ donation should be organised at least once a year(3).

Audit and research are vital components of any successful organ donation and transplantation system. These aspects should be ongoing and continually evolving to aid in the improvement of current practice and future implementation of innovative developments. Any research protocols must be approved by established research ethics committees through a centralised system. The organ donation coordinators, clinical leads in organ donation and other staff directly involved in the process will have a key role in implementing research projects and completing audit cycles. There must be regular academic meetings arranged both to disseminate the results of any audit or research projects and to discuss any forthcoming proposals.

4.4 The donor

Registries

In accordance with Directive 2010/53/EU(88) and Directive 2012/25/EU(74), a secure registry with the details of all possible donors, living and deceased, must be established by the NTO. This registry should link to the hospital databases, should be readily accessible by all ODCs or other members of the donation team and must be intuitive and easy to use. The registry needs to be devised with input from IT specialists with expertise in medical databases, and must facilitate documentation of all stages of the donation process including identification of possible donors, diagnosis of death, donor evaluation, retrieval and organ destination. Where donor evaluation reveals contra-indications to using all or some of a potential donor's organs the reasons should be documented. There must be a national, legally defined agreement as to an appropriate length of time to keep these records. The UK keeps records for a minimum period of 30 years(89).

Identification

Every end-of-life care pathway should include consideration of possible organ donation. Although there are conditions which preclude organ donation, it is preferable that, when in doubt, medical staff who are not specialised in organ donation refer to the ODC for their opinion. Advanced age in particular does not necessarily mitigate the potential for donation, and Spain has had significant success in implementing programmes which age match older donors with older recipients(90). ICU and emergency department (ED) staff will have a key role in identifying possible donors and referring to the ODC for ongoing monitoring, and this should be considered part of their clinical roles.

Evaluation

The evaluation of deceased donors must be undertaken by trained specialists or under the supervision of a trained specialist. The purpose of evaluation is to determine the suitability of the deceased person generally, and the suitability of specific organs. There are specific absolute exclusion criteria for organ donation, in particular active malignant neoplasia with spread to multiple organs and severe systemic infections that are untreated or of unknown origin. Apart from these eventualities, many conditions will not necessarily be a complete contraindication, and evaluation will involve an assessment of acceptable risks. Suitability will need to be considered on a case-by-case basis, and decisions will have to be made regarding what constitutes an appropriate amount of evaluation. The tight time frames inherent in organ donation may preclude exhaustive testing, and more specialised tests may not be available on-site. The reasons for rejecting any donors or specific organs should be documented.

Evaluation will include a number of different steps, for which there should be standardised questionnaires and protocols in place. These steps will include an assessment of the past personal, behavioural and medical history, a full physical examination including size measurements, laboratory tests, and other investigations such as imaging. Interviews with family and friends should be conducted (although they may not be aware of some personal

habits), and all medical records retrieved. Particular attention should be given to lifestyle factors which might be of importance. The recent clinical history will be very pertinent to organ viability, key factors here will include haemodynamic state, hypotensive episodes, resuscitation attempts and recent drug administration.

During organ retrieval the retrieval team should carefully inspect the organs and abdominal/cardiothoracic cavity for any unexpected masses or other suspicious findings. Should there be an unexpected discovery this should be appropriately investigated and the results recorded in the donor documentation. It is desirable that there should be a network of experts available 24/7 to facilitate the assessment of any unexpected findings. This would include: accredited pathologists to assess biopsies from organ donors, both to characterise malignancies and assess the quality of organs; oncologists; immunologists; and experts in infectious diseases.

Evaluation criteria and protocols should be regularly assessed and updated according to national and international best practice guidelines. We would recommend referring to chapters 6–10 of the EDQM guide to the quality and safety of organs for transplantation which gives detailed guidance and recommendations regarding specific clinical scenarios(2).

In the case of living donation there is usually a more generous time frame available. In terms of transmissible neoplasms or infectious agents the same principles generally apply, but more detailed assessment is likely to be feasible. Both the donor and the recipient should be counselled and consented as to the fact that, particularly from the perspective of infections, these could be acquired in the interim between testing and donation. In addition to physical assessment of LDs, there should be a full psychosocial assessment for suitability which takes into account past and current mental health, resilience and the risks of future psychological and emotional consequences. This assessment also needs to incorporate an assessment of any factors which might constitute coercion or pressure from family or friends.

Donor management

Donor management protocols and organ preservation techniques will be dependent on the circumstances – that is, whether the donation is occurring following brain death or circulatory death, and whether this was controlled or uncontrolled. It is clear that early identification of potential donors and aggressive donor management techniques greatly enhance the viability of organs for donation(91).

The pathophysiological changes that occur following brain death can cause severe end-organ damage. The latest techniques proven to mitigate against this damage must be initiated as soon as possible once it is established that the patient is a potential donor. Guidance on the management of deceased donors in the ICU is available from organisations such as the European Society of Intensive Care Medicine(92) and the American Society of Critical Care Medicine(93). Donor maintenance should take place in the ICU, and it is important that there are clinicians available with experience of managing DBD donors to supervise the necessary procedures. In situ organ preservation involves normothermic or hypothermic reperfusion techniques, the choice of which will depend on:

(a) the organs to be retrieved

(b) the type of donation (DBD/DCD)

(c) the overall status of the donor with special attention to extended criteria donors.

To facilitate prompt and effective initiation of donor support protocols it is imperative that there is clear legislation and guidance around the declaration of brain death. There must be sufficient staff available who are experienced and approved to undertake the required tests, so that brain death can be recorded promptly. These staff should not have any conflict of interest, and they must not be a member of the donation or transplantation team. As detailed in section 1.1 brain death should be diagnosed according to a comprehensive and nationally approved methodology and recorded in a standardised format.

In the case of donation after controlled and uncontrolled circulatory death (cDCD and uDCD), specific legislation and protocols must be in place. Nationally and clinically acceptable standards are vital. Clear guidance around end-of-life care and withdrawal of life-saving treatment must be established and widely available.

4.5 Consent and family support

The diagnosis of death must be uncoupled from any assessment around eligibility for donation, and conversations about death with the family and loved ones must be separate from conversations about donation. Additionally, these tasks should be performed by different members of staff without a vested interest in each other's remit. It is vital that a good relationship is established with the family and/or loved ones before the question of organ donation is raised with them, and that they have understood the inevitability of death. It is likely that multiple conversations will need to take place, with time in between to allow for information to sink in, and for families to confer amongst themselves.

Conversations around death and donation are highly emotional and stressful for all involved – family, friends and staff. If these conversations are to be successful in facilitating consent for donation, they must be conducted in the most sensitive and empathetic manner possible. Staff must receive regular tailored training in communication skills, family support and bereavement, and they must also have detailed knowledge of national legislation and the processes involved all along the donation/transplantation chain. They need be able to answer detailed questions clearly and accurately. The ODC will need to take a leading role in these difficult discussions and is likely to have to commit a considerable amount of time to them. Evidence suggests that involvement of a ODC in the process of gaining consent is one of the most important elements in boosting the donation rate(94,95).

The different circumstances surrounding DBD, cDCD and uDCD clearly necessitate different approaches. In the case of DBD the declaration of death must be made promptly, and this information communicated to the relatives with compassion and empathy. When the diagnosis of brain death has been accepted conversations around donation can follow. In the case of cDCD there may be difficult decisions regarding the WLST to be made, and it is vital that these

decisions are independent from any plans around donation. Unless the topic is raised by the relatives, donation should not be discussed until decisions about WLST have been made. These should be based on the best interests of the patient and clinical judgement regarding the futility of ongoing treatment. There must be no conflict of interest. In uDCD death is often unexpected, therefore there may be more intense emotional reactions to manage, but for many the diagnosis of death may be easier to accept (in comparison to DBD) as it fits with traditional conceptions. In both cDCD and uDCD the likelihood of successful donation and transplantation are somewhat reduced compared to DBD, and it is important that the family and loved ones are aware of this.

There must be a private, quiet and comfortable space available, near to, but away from the busy and intimidating environment of the Intensive care unit or emergency department. It should be possible to provide a means of communication, tissues, water or other necessary sustenance and there should be minimal interruptions. People may have many doubts, fears, and questions to ask. Various expressions of grief and other intense emotions such as rage, anger and disbelief must be expected and managed on a case by case basis. Families should be provided with appropriate practical, psychological or spiritual support to meet their needs and there should be the skills and capacity to interact with families from diverse cultural backgrounds. Suitable interpreting services need to be easily accessible so discussions can be conducted in a family's native language if desired.

Prior to any conversation about donation the ODC should have checked the national ODR to establish whether the potential donor has recorded any will or opposition to donation (this might include a willingness to donate some organs, but not others). Depending on the national method of registration, it may be useful to also check the personal effects of the person for an organ donor card. The outcome of these checks may serve as an opening to the discussion if, for example, the person has recorded a positive desire to donate on their death. It is very important to reassure families and loved ones that the dignity of their relative will always be prioritised, and that their body and organs will be handled with the utmost care and respect. Any misconceptions around funeral arrangements or being able to hold an open casket funeral must be addressed.

In the case of refusals, it may be helpful to establish if this is a unanimous choice or if there are key people/persons amongst the group of loved ones who are driving this decision. If it appears that there is a split in the group decision-making process it may be helpful to have a separate discussion with those who are unsure or refusing to determine their reasons and see if their worries can be addressed. Refusals may be driven by, for example, fear of disfigurement of the body or an aversion to donating particular organs. A delicate balance must be struck under circumstances of doubt or refusal, even where there is a record of a will to donate. Families and loved ones should never feel coerced into donation, as this could lead to great emotional distress and damage the reputation and trust in the organ donation system.

If they wish, families should be informed of which organs have been removed and whether they have been successfully transplanted. This process should always respect confidentiality on the part of both the donor and the recipient.

4.6 Organ retrieval, preservation and packing, transportation and sharing

There must be structured arrangements in place for organ retrieval so that it takes place in an efficient and timely manner. Retrieval should be achieved by a dedicated specialist team including surgeons, anaesthetists and nurses with specific and accredited knowledge and expertise and according to nationally approved protocols. These teams should be available 24/7 and able to convene at the donor hospital in as short a time frame as possible. There must be operating theatre capacity to accommodate them, and all the equipment they need at hand. The NHS in the UK has set up a dedicated National Organ Retrieval Service(96) comprising several specialist thoracic and abdominal teams at different locations around the UK. These teams operate on an on-call basis (during which time they have no other clinical duties) and are coordinated by NHSBT's central hub when an ODC (known as a specialist nurse in organ donation – SN-OD in the UK) contacts them about an imminent retrieval. This system has mitigated against delays and confusion when deciding who is responsible for retrieval.

In the time between brain death and organ retrieval there can be significant damage to organs, compromising their viability for transplant. Retrieval is a delicate and highly skilled process which may take several hours, depending on how many, and which, organs are to be retrieved. Ongoing skilled management of the donor is required during this process to minimise the damage incurred by the pathophysiological responses to brain death and organ retrieval.

During retrieval the team will perform a full inspection of the organs to be transplanted and of the thoracic and abdominal cavities. They will make an assessment of the quality of the retrieved organs, and will be vigilant to observe and record any unexpected findings – in particular, evidence of undiagnosed malignancy or infection. Once the procedure is finished, they will ensure that there is timely and cosmetically acceptable surgical closure of the donor. All aspects of retrieval must be conducted in a respectful manner which preserves the dignity of the deceased.

The organ retrieval team need to be supported by personnel who have the necessary skills and equipment available for organ preservation and storage. There are a variety of different preservation solutions available, and the choice of appropriate solution should be nationally agreed. The merits of different techniques of organ preservation are still to be fully determined, and trials and evaluations comparing various approaches are ongoing(2). A detailed description of the different options available is beyond the remit of this report, but they include:

- Static cold storage
- Normo-thermic machine perfusion with oxygenation
- Hypo-thermic machine perfusion with or without oxygenation.

Machine perfusion can be continued throughout transport if desired, and specialist equipment is available for this purpose. Modern organ perfusion systems are designed to attempt to mimic physiological conditions, delivering oxygen and nutrients and removing waste products and toxins. These systems aspire to improve the condition of marginal organs and optimise the quality of standard criteria donor organs.

Machine perfusion can also be used as a method of reconditioning organs prior to transplant. This is especially pertinent for organs which have been kept in static cold storage. Different approaches have been used for different organs, and reconditioning using machine perfusion also permits administration of medications which may aid the process. There is still much experimentation with different methods of reconditioning, and a need to expand the evidence base. However, successful techniques promise to deliver improvements in graft survival time, immediate and long-term function.

Histopathology has an important role to play in the assessment of organs. There will need to be adequate pathology support to provide an urgent biopsy service on a 24/7 basis. Urgent biopsies may be necessary to ascertain the nature of any unexpected lesions discovered during the retrieval process, and also to determine the quality of organs. This is particularly important due to the increasing use of 'expanded criteria' donors in order to expand the donor pool. Expanded criteria donors include those who are over the age of 60 and those who are not in optimal health, for example who have a diagnosis of hypertension, atherosclerosis or diabetes. It is important that recipients are counselled as to the risks of accepting an organ of sub-optimal quality, and are included in the decision-making process of whether to accept the transplant. This process which will weigh up various factors such as the urgency of receiving a transplant, the associated risks and the likelihood of finding another good match.

Storage of organs for transport should be undertaken according to standardised procedures using nationally approved preservation materials. Protocols must be in place to ensure appropriate verification checks on the contents of transport containers, and to ensure that all the necessary documentation is available. Documentation must include details of the retrieval team, important donor characteristics (e.g. time of death/blood group), details of the retrieval process, information regarding any damage incurred during the retrieval, details of the fluids used or other technique employed for preservation and ischaemic times (in the case of DCD, warm ischaemic time). This list is not exhaustive. Transport boxes must be securely fastened to prevent accidental or unauthorised opening.

Although it is not yet clear exactly which method of organ preservation is most effective, what is generally agreed is that minimising total ischaemic time is important in regard to organ function(97,98). Therefore, it is recommended that transportation of organs is carried out by the swiftest possible route. Cold preservation and/or machine perfusion must be carefully maintained during transit. Occasionally organs will be transplanted in the donor hospital, but many may need to travel a considerable distance to the recipient hospital, and travel times may limit the viability of some organs, in particular hearts and lungs. The arrangements for transport should be carried out by an identified person, most likely the ODC. It is important that all transport times can be approximated and planned for, and there should be nationally

and locally agreed provider organisations. These providers must be able to guarantee that they have the capacity to maintain the integrity of organs during transportation. In view of the time constraint, air transport may be necessary and there should be special arrangements in place to facilitate this.

Organ sharing between units and regions should be dictated by nationally agreed rules and criteria. These rules should be compatible with the national schedule for organ prioritisation. The regional offices of the NTO should be responsible for coordinating organ sharing and matching, under supervision of the NTO itself. The regional office should be contacted by the ODC as soon as a donor is identified. There are a number of international organisations that facilitate organ sharing, such as Eurotransplant, and it may be advantageous to seek membership of one of these exchanges schemes as a means of increasing the potential pool of suitable organs.

It must be ensured that traceability is maintained at all times during the retrieval, packing and transportation process, while at the same time maintaining the confidentiality of the donor and recipient.

4.7 Quality evaluation, documentation and protocols

A set of quality indicators in organ donation must be established and agreed upon nationally. Indicators should be devised to provide information about the most critical components of the donation process, and a standardised system established for documentation and regular collection of data. Every unit should participate in regular audit cycles which should be set at a national level and represent an ongoing process contributing to the quality improvement process. Data from individual units needs to be collected and collated nationally so that the NTO can compile a comprehensive picture of performance across the system. This can be used for benchmarking and for a process of continual quality improvement at all levels of the system. The combination of audit cycles and collection of quality indicators should facilitate identification of areas of concern, or in need of improvement, and there should be established mechanisms for implementing corrective measures and feeding back after an agreed period of time.

It is important to take care, however, that whilst quality indicators and audit are used to highlight areas of concern, they do not come to be regarded as a punitive process, or they will lose their value. It is vitally important that data collected is used in a constructive manner to consider ways in which improvement may be achieved, and it can also be used to celebrate excellence and examples of good practice and outstanding achievement. It is also important to consider the number of quality indicators; there must be sufficient indicators to establish a coherent picture, but not so many that collection and recording becomes overly onerous and therefore counter-productive.

It is suggested that annual objectives should be set both at national and individual unit level. Possible quality indicators are set out in table 5, in the annex to this appendix, and suggested key areas for quality evaluation are as follows:

- Monitoring the composition and availability of the donation team
- Monitoring and analysing donor losses
- Monitoring of outcomes for patients on the ICU with devastating brain injury
- Recording and analysis of adverse events
- Regular assessment of professional competence of all staff involved in donation
- Donor family satisfaction surveys.

4.8 Promotion and education

It is crucial that organ donation and transplantation are included as compulsory modules in medical and nursing school curricula. ODCs should play an integral role in providing this training, and student placements could be offered. ODCs and other staff directly involved in organ donation must also be involved in planning and delivering regular seminars and teaching programmes aimed at disseminating the basic concepts around donation and transplantation to clinical staff in all parts of the health care system.

It is desirable that the promotional and educational role of the hospital donation team should extend beyond the clinical environment to the local community. ODCs, clinical leads and members of clinical committees on organ donation are uniquely equipped to educate the lay community about issues around organ donation and transplantation, and dispel myths and misconceptions. Each regional team should collaborate with other public bodies to devise a variety of means via which they can promote a culture of donation and engender trust and confidence in the system. This might involve activities such as participation in media events and public conferences or visiting schools and other educational institutions.

5 Organisation: transplantation

As with the donation part of the process, successful transplantation requires close collaboration and cooperation between a wide range of different professionals, each with their own unique skills. Transplantation is also severely constrained by the need to act as swiftly as possible in order to preserve organ function and increase the likelihood of success both in the short- and long-term. Here the framework sets out the key features of the transplantation end of the system which are essential for a successful programme.

5.1 Functional organisation, facilities and equipment

In order to function smoothly it is essential that there is a well-established organisational hierarchy, and that all roles in the transplant team are recognised and respected by the rest of the general hospital staff. Functional management positions should be created and filled with appropriate specialist personnel, and there should be a lead role established for quality improvement. As with the donation side of the system, it is vital that time paid for transplantation duties is heavily protected and that staff do not find themselves redeployed to other tasks in the busy hospital setting. Transplant units must be adequately staffed to respond rapidly at all times, including weekends, holidays and the middle of the night. As with all stages of the donation–transplantation process this will require the establishment of carefully designed on-call rotas to be agreed with all personnel.

All transplant units must be capable of mobilising their transplant teams 24/7, 365 days of the year. As with donation, there must be regularly reviewed and updated protocols in place to cover every step of the transplantation process. These need to be easily accessible to all who might need to refer to them, and systems must be in place to ensure that all personnel involved in transplants are well versed in these protocols and made aware of any changes over time. Staff must have had appropriate training in their area of expertise, and be in receipt of regular training updates (see section 5.2 below).

As mentioned above, the smooth functioning of the transplant end of the system requires the coordination of many different roles and responsibilities. This is where the role of the transplant recipient coordinator (TRC) is crucial. TRCs should be distinct from ODCs, as their role is to coordinate the transplant processes, and support the recipients and their loved ones through their transplant journey. Dual function would create conflicts of interest. TRCs should be the first point of contact following referral for assessment, and their task will be to ensure that the many processes necessary for a successful transplantation are completed in a seamless and timely fashion, and to organise and coordinate follow-up and support thereafter.

In the UK the NHSBT defines the following responsibilities for the TRC:(99)

- Discussing the referred patient at an multidisciplinary team (MDT) meeting
- First telephone contact with the patient
- Visiting the local dialysis units to deliver one to one or group sessions
- Gathering information ready for the patient's assessment
- Organising the transplant assessment
- Talking to and educating the patient and their family about transplantation
- Collating the results from assessment investigations
- Being a point of contact for the patient at all stages of the assessment
- Being present at the consent consultation
- Preparing the patient for listing
- Listing the patient on the transplant waiting list
- Monitoring the patient whilst listed
- Suspending the patient from the waiting list when necessary
- Co-ordinating the transplant operation
- Post-transplant education before discharge from the hospital
- Preparing the recipient and their family for discharge
- Telephone advice post-transplant
- Monitoring the recipient in clinic post-transplant.

Besides the TRC, transplantation involves a large MDT drawn from diverse professional backgrounds. These include specialist surgical teams comprising surgeons with expertise in the transplant of particular organs; experienced surgical assistants; anaesthetists and their supporting staff; and nursing teams to monitor patients in the immediate post-surgical recovery period. However, the transplant unit has many other vital functions to perform besides the immediate transplant surgery. There must be capacity to assess potential recipients, monitor them at regular intervals whilst awaiting transplant, provide pre- and post-operative care and long-term follow-up. These functions will require appropriately trained physicians with expertise in immunosuppressive therapy, infectious disease specialists, diabetologists, specialist nursing staff, pharmacists, radiologists, dieticians, physiotherapists and any necessary psychological or social support. Follow-up needs to be sustainable long-term, to ensure the survival of transplants, monitor the response to and side-effects of any immunosuppressive medications, and optimise the physical and mental well-being of transplant recipients. The entire transplant team must be supported by an adequate

administrative and secretarial support staff. There should be regular formal operational and educational meetings arranged which all transplant team staff should attend to foster a culture of collaboration, continual learning, service development and quality improvement.

All units involved in transplantation activities should be accredited by the approved national body, and subject to periodic inspection and assessment. There must be nationally agreed processes in place to facilitate improvement in the event of concerns being raised following inspection. In terms of facilities, it is essential that adequate operating theatre time is available for transplant procedures, and it must be possible to make operating theatres available at short notice. They need to be well stocked with the necessary equipment for different transplant procedures, and there must be adequate anaesthetic equipment and facilities for monitoring patients post-transplant. Immediate access to ICU and high dependency unit (HDU) beds for those who might need them is essential. The transplant unit will require adequate ward capacity to accommodate patients stepped down from ICU/HDU prior to discharge home. The transplant team will also need to have adequate office space for themselves and their administrative staff, and space and equipment available for running follow-up clinics.

As detailed previously, there may be a need to perform biopsies prior to transplant in order to determine organ quality, or to elucidate the nature of any unexpected findings. This will require access to urgent histopathology services, which therefore need to be available at all times. Transplant units also need comprehensive laboratory support for the ongoing monitoring and assessment of patients pre- and post-transplant to assess their physical state and immune status. This medical laboratory support must be approved and regulated via a nationally agreed body.

Transplant units must have excellent communication systems in place with donor hospitals, and this should be facilitated via the NTO. There must be protocols in place governing the process of offering and formal acceptance of organs for transplant, and it is particularly important that the ODCs and TRCs are in close communication when organs are offered. The national database containing all the details of those waiting for a transplant, their blood group, HLA phenotype, immune status and other details which are part of the national system for prioritisation of organs will be crucial in this aspect. Donor units and transplant units must be fully integrated with this system, and the NTO must provide guidance and oversight in order to optimise organ matching and compliance with the nationally agreed criteria for prioritisation. This process needs to be done as swiftly as possible so that allocated organs can begin their journey to the recipient transplant unit.

5.2 Education and training

As with donation, all staff involved in transplantation activities must have targeted training relevant to transplantation and appropriate to their roles. Training requirements should be informed by regular review of competencies, regular survey of personnel, patient and family feedback/complaints and any new developments. All staff should have a CPD portfolio in which to record training activities, and personal development plan. All staff must be involved in and committed to playing a role in continual quality improvement and service development.

New staff must be carefully integrated into the unit and the transplantation team, and processes must be in place to ensure that they are properly inducted and made aware of all the protocols and procedures relevant to their area of work. There must be systems in place to ensure that all staff have access to supervision, mentoring and any other support they might need.

Internationally respected training and accreditation of transplant specialists and other supporting staff is available. Here we would particularly refer to the training requirement and accreditation processes in organ donation and transplantation offered by the European Union of Medical Specialists (UEMS) and the extensive educational portfolios and support offered by the European Society for Organ Transplantation (ESOT).

In common with donation activities, audit and research are vital to quality improvement, service development and the development of innovative practices and procedures. All centres should participate in internal and external audits and ensure that these cycles are completed and repeated in order to ensure that they are of value. Research protocols must be approved by established research ethics committees through a centralised system. Transplant coordinators, clinical leads and all other staff involved in transplantation will have a central role in ensuring that audit cycles achieve their objectives, and in the successful implementation of research protocols, especially the recruitment of willing participants. Regular academic meetings must be arranged both to disseminate the results of any audit or research projects and to discuss any forthcoming proposals.

5.3 Assessment, consensus and management of the waiting list

As things stand, across all nations the demand for organs always exceeds the supply. The result of this is that there will always be a waiting list. In order that organs should be allocated in a fair and equitable manner it is vitally important that this waiting list is managed according to strict, nationally agreed criteria and protocols. There are two possible approaches: the first is include everyone in need of an organ transplant on the list, and the second is to restrict the list based on a set of criteria drawn up by a specialist advisory panel.

Listing everyone in need of a transplant would better reflect the level of need and the extent and impact of a shortage of organs. However, if everyone is listed, irrespective of their physical and mental state or any contra-indications, then many of these individuals will never have a realistic chance of receiving a transplant. This will engender false hopes, and could undermine confidence in the system as a whole. Most countries choose to restrict their transplant waiting lists to those who fulfil minimum listing criteria. The difficulty lies in deciding what criteria should be used, and how potential recipients should be prioritised. The guiding principles of the WHO state that rules for allocation must be 'equitable, externally justified and transparent'(1), and decisions should be based on principles of clinical compatibility, equity, utility, benefit and fairness(100). Although clinical compatibility is a matter of scientific fact, there may be different views between jurisdictions regarding principles of equity, utility, benefit and fairness. Issues such as whether paediatric transplants should be prioritised, or whether time on the waiting list should be considered over and above clinical severity will be a matter for debate. Prevalent cultural norms and religious sensitivities will have an impact on these how these delicate issues are resolved. It is therefore recommended that the advisory panel include not only medical and scientific experts, but also experts in medical ethics, lay members and representatives from donor and recipient organisations.

Different criteria will need to be devised and applied to different organs, and it is suggested that there should be separate advisory groups for each. This is due to the differing levels of urgency implicit in the failure of different organs and the availability of alternative treatment. For example, renal failure can be treated with dialysis for a significant period, whilst fulminant liver failure may result in death in a matter of days and can only be treated with a transplant. The factors which determine the survival of graft and recipient also differ between different organs, as do methods of determining prognostic scores. Logistical factors will also inevitably play a role, particularly in the case of organs with a short period of viability in terms of ischaemic time. This may mean that, especially in the case of hearts and lungs, proximity and travel time may be the deciding factor in allocation.

As patients are competing for life-saving or life-enhancing organs it is vital that eligibility requirements and prioritisation criteria are complied with by all transplant assessment centres. This is essential to ensure that organs are allocated in a fair manner according to the objective scientific and ethical principles set by the nationally appointed panels of experts. Consideration should be given as to whether to participate in international organisations and exchange schemes such as Eurotransplant. Participation in international organisations will require clear agreements to be drawn up, and the standards of the national programme will have to be compliant with internationally recognised quality and safety expectations.

Patients are usually referred from specialist centres to transplant units for assessment. In the UK professional bodies such as the British Transplantation Society (BTS) and the Renal Association provide guidelines to help decide who should be sent for an assessment and how these assessments should be performed(101). The assessment should be undertaken in a timely way without unnecessary delay. As noted above, the TRC will have a key role in arranging the assessments necessary for listing, and supporting potential recipients and the families through this process. There must be clear protocols, pathways and procedures in

place for making a listing request and the relevant forms and guidance must be easily available to all who need them. Comprehensive information should first be given to the patient and their families, and it should be ascertained that they have understood this information before proceeding with further assessment.

The MDT should be involved from the outset. There should be regular team meetings to discuss new referrals for assessment, those who have recently completed an assessment, and any problematic issues. The MDT should be involved in the decision to make a request to the NTO to place a patient on the waiting list. The TRC will have the responsibility for making this request, and the NTO should retain the right to check that the information supplied by the TRC is complete and that the request is in keeping with the nationally set waiting list criteria. All decisions must be recorded in a standardised fashion and the recipient and their relatives should be involved throughout the process. Any outcomes should be communicated to the patient in a timely manner. Listing criteria and reasons for listing or not listing must be completely transparent and fully discussed. Clear reasons must given in the event that a decision is made not to include a patient on the waiting list, and there should be provision made for individuals to seek a second opinion if they wish to do so.

The full assessment is likely to take a number of days, and can be undertaken on an outpatient or inpatient basis. It will involve a comprehensive medical and psychosocial assessment and numerous tests and interviews with different professionals. Throughout the assessment the main questions will be:

- Does the patient meet the minimum eligibility requirements?
- Do they have a full understanding of the implications of the transplant, the associated risks and possible benefits?

If these questions are satisfactorily answered, and a request is to be made to the NTO to place the patient on the transplant waiting list, then fully informed consent for the transplant must be obtained and recorded using specifically designed consent forms. It is recommended that discussions around deciding to accept organs with specific risks should be undertaken prior to listing and not delayed until a donor becomes available as this could then cause delays and compromise the viability of organs. There should be a separate consent form regarding the willingness to accept such organs. This would include organs from expanded criteria donors, persons whose medical history is not clear or cannot be obtained, or donors at high risk of HIV, hepatitis or other infections. These decisions should be recorded with meticulous detail, and the potential recipient must be fully counselled and have capacity to weigh up the risks involved.

Provisions should be made for cases of extreme urgency in, for example, acute liver or heart failure, where there may not be time to go through the full formal processes of MDT assessment, discussions and the subsequent listing request. It is recommended that there are provisions made to allow for these circumstances, and that there is a fast-track system in place with clear criteria established.

The TRC and the MDT will also frequently be responsible for assessing patients for a re-transplant. Unfortunately, in the case of re-transplant due to failure of a graft it is often more difficult to find an organ that is likely to be tolerated by the recipient's immune system. This is largely due to sensitisation of the recipient immune system to donor antigens present on the previous graft. This needs to be made very clear to recipients and their families, and the national policies and procedures ensuring eligibility, fitness and understanding must be followed as with the first transplant. There should be a specific consent process and form for recording the discussion and understanding of the risks of sensitisation.

In the case of renal transplant, pre-emptive transplant (prior to the need for dialysis) from a living donor is the treatment of choice. Outcomes from pre-emptive transplant have consistently shown better results than transplant occurring after dialysis has commenced(102). The National Health Service in the UK recommends listing a patient for transplant at least six months prior to their anticipated dialysis start date in order to maximise their chances of a pre-emptive transplant. Early discussions with and assessment of potential living donors is encouraged(103).

There are many considerations to take into account when deciding if a person is eligible to be included on the waiting list. Some contra-indications to transplantation will be complete (for example, the patient is not likely to survive surgery) and others will be relative (for example, a recent history of malignancy). Other considerations may include age, current drug or alcohol abuse, the level of social support, the likelihood of adherence to immune-suppressive agents and other follow-up, important comorbidities likely to impact on the success of transplantation, severe psychiatric illness (which could preclude the ability to comply with follow-up), and nutritional state (which is frequently poor in those with organ failure).

Physical assessment will include items such as: determining blood group, HLA typing and antibody testing, a virologic screen, height and weight, a cardiovascular assessment, and an assessment to exclude malignancy (especially in older patients). An appraisal of the likelihood of recurrence of the underlying disease (for example auto-immune diseases) should also be made. Assessments will be tailored to the organ in question for transplant, to the individual patient, the underlying cause of their organ failure and any comorbidities. Reassessments will be necessary at regular intervals to establish ongoing physical and immunological status and fitness for surgery. There must be national guidelines and protocols specifying the frequency of reassessment. There should also be an educational, physical and psychological support programme to ensure that patients are in the best possible physical and psychological shape prior to surgery.

In the case of temporary suspension from the list (for example due to transient infection), or removal (for example due to reduced likelihood to survive surgery), the reasons given must be clear, transparent and according to the nationally set criteria. They must be fully discussed with the patient and their family, and recorded in a standardised fashion. Any decisions should be taken in collaboration with the MDT, and it will be the responsibility of the transplant coordinator to inform the NTO. Deaths whilst on the waiting list must be reported to the NTO promptly by the TRC and cause of death documented for national data purposes.

5.4 Perioperative management

Transplant units must take an active role in procuring organs from donor units, and there should be close collaboration of TRC and ODCs with support and advice available 24/7 from the NTO. Donor and transplant units should have easy channels established for communication and exchange of information. Clear protocols and standardised processes need to be drawn up for ensuring the suitability and validity of organs offered for transplant. Provisions must be in place for discussing the logistics of transport and receipt of organs, and a trained member of staff must be designated to receive the organs from the approved courier at an agreed time and place. This member of staff will be responsible for the handover of the organs, and checking that they have been maintained in an appropriate manner during transport (for example, cold static storage/machine perfusion). The member of staff will need to verify that the organs have arrived in good condition, appropriately labelled with all packaging intact and necessary documentation provided. Transport time should be noted, and verification of the identity of the courier service. Any issues of concern must be documented.

The NTO and national database should coordinate the correct allocation of organs to the most appropriate recipient on the waiting list. However, difficult choices regarding multiple possible recipients may still need to be made, and these choices should be informed by the national guidelines regarding prioritisation. The NTO should be available 24/7 for advice on such matters. Accepting sub-optimal organs from expanded criteria donors or high-risk donors must be considered on a case by case basis weighing in the balance the many different important factors which inform such decisions. Any refusal, and the reasons for refusal should be carefully recorded.

As it is very difficult to predict when a suitable organ will become available for transplant there must be arrangements in place to call in waiting recipients at short notice and transport them promptly to the transplant unit. During the transplant assessment, the TRC and the recipient should have agreed on the best method of contact, and they should also have discussed and made plans for travel and who will accompany them. Recipients must be aware of the time constraint, and be advised to have a bag packed and ready so that they can leave promptly at any time of the day. Distance from the transplant unit and likely transport times must be known, as this will impact on the viability of certain organs, especially hearts and lungs.

As mentioned in the section above, optimisation of recipient health whilst waiting for a transplant is vitally important. In addition to the widespread physiological and metabolic changes caused by organ failure, transplant recipients often have other comorbidities including diabetes (type 1 or 2), hypertension and cardiovascular disease (CVD). Recipients are frequently in poor health and taking multiple different medications, and this presents significant challenges to anaesthetists and surgeons.

Once the patient arrives at the transplant unit it is essential that members of the transplant team are ready to receive them and promptly commence a pre-operative work-up so that the transplant surgery can commence as soon as possible. The work-up is to ensure that there have been no significant changes since the last assessment which could preclude fitness for

anaesthetic and surgery. It will include items such as a full physical examination, bloods for biochemistry and haematology, a repeat immune-compatibility screen, a group and save, chest x-ray and electrocardiogram (ECG). There needs to be a full assessment of cardio-pulmonary fitness by the anaesthetic team. There should be a review of current medication and consideration of what may need to be stopped following the procedure and what will need to continue. In the case of renal transplant patients, it may be desirable for the patient to receive dialysis prior to surgery, and it must be possible to facilitate this if necessary. Comprehensive laboratory and radiology support needs to be available 24/7 to assist in the pre-operative work-up.

There is a different spectrum of challenges particular to each type of transplant, and to each individual patient. A few of the common considerations are as follows:

- Managing diabetes perioperatively, type 1 and 2
- Managing cardio-pulmonary instability (especially in liver transplant patients)
- Assessing and managing fluid and electrolyte balance – especially the presence of fluid overload in renal patients
- Deep vein thrombosis (DVT) prophylaxis (and assessment of coagulopathies in liver patients)
- Use of induction immunosuppression – during or prior to surgery
- Prophylaxis of infection – Is there a history of prior or recurrent infection, or suspicion of occult infection? Is there risk of transfer of infection from the donor?
- Medication management – what can be stopped and what needs to be continued?
- Measures taken in the operating theatre to try to maximise organ function.

It is important to recognise that the perioperative management of transplant patients necessitates input and expertise from a diverse array of professionals including surgeons, physicians, anaesthetists, intensivists and others. National protocols covering perioperative care will need to be decided and agreed on. Guidelines should be devised and followed consistently. A standardised means of recording the pre-, post- and intra-operative progress should be available, and any surgical complications or unexpected anatomical challenges should be carefully noted.

The perioperative management of transplant patients is a complex and intricate matter. However, it is beyond the remit of this document to describe this in more detail, or to describe the surgical procedures involved in transplanting organs.

5.5 Post-transplant hospitalisation

The transplant unit must have sufficient ICU capacity to accommodate patients in the immediate post-surgical period, when they will require a period of intense monitoring prior to step-down to a general ward pre-discharge. A bed must be identified for the patient prior to the start of the procedure so that they can be promptly transferred from the operating theatre. There must be good communication between operating theatre staff and staff on the ICU/ward, and there should be a comprehensive verbal and written handover between surgical staff and staff on the ICU/ward. Any complications or unexpected issues that arose during surgery must be discussed.

There is a diverse array of possible complications and monitoring requirements in the period immediately following transplant surgery, depending on which organ(s) has been transplanted and the nature of the individual's underlying illness and comorbidities. Post-surgical complications may include issues such as bleeding, infection (which can be difficult to detect in immunosuppressed patients), anastomotic leak and arterial thrombosis. Fluid management and correction of any metabolic, biochemical or haematological derangements will be

Table 4. Types of organ rejection

Hyperacute rejection	Caused by pre-existing host serum antibodies specific for antigens on the graft or by blood group incompatibility. Leads to thrombosis of vessels, ischaemia and necrosis of graft.
Occurs within the first 24 hours of transplantation (now very rare)	No treatment possible – organ must be removed.
Acute rejection	Alloimmune responses activated under immunosuppression are directed against foreign graft alloantigens.
Begins days to weeks following transplantation	T cell inflammation due to cytotoxic allogeneic T cells cause reversible damage to renal tubular epithelium. Alloantibodies against graft foreign molecules cause severe damage to the vascular endothelium.
	Treatment involves higher doses or changes to immunosuppressive treatment, and plasmapheresis in the cases of antibody mediated rejection.
Chronic rejection/ Chronic allograft nephropathy	Chronic rejection due to immunological mechanisms is caused by both antibody and cell-mediated immune response by the recipient immune system.
Occurs months to years post-transplant	No specific treatment. Preventative measures include optimising matching and preventing episodes of acute rejection.

necessary. DVT prophylaxis is essential. In addition to providing post-operative care to recipients, arrangements must also be in place for providing care to living donors, and attending to any complications which may arise as a consequence of donation.

Immunosuppressive therapy is tailor-made for the individual patient, and there will need to be close monitoring for side effects or toxicity and adjustments made as necessary. Although modern techniques of determining donor-specific antibodies have made hyper-acute rejection a very rare event, early acute rejection remains a concern. Incidence rates in renal transplantation range from 7–25% and are dependent on the level of immunological risk and choice of induction immunosuppressive therapy(104). The patient will need to be monitored for signs of early organ rejection and for signs of delayed graft function. Delayed graft function is a relatively common complication of renal transplant, affecting kidneys from deceased donors to a much greater degree than those from living donors(105). The most important factors contributing to delayed graft function have been shown to be long duration of CIT, older donors and acute kidney injury prior to organ retrieval(106). Continuation of dialysis may be necessary for a period, and recipients must be made aware of this possibility prior to surgery. It must be possible to arrange timely investigations to determine the cause of poor or delayed function of a transplant. This may include repeat blood tests, doppler ultrasound, nuclear imaging and biopsy.

5.6 Quality evaluation and documentation

The same principles of quality evaluation and documentation pertain to transplantation as to donation. A set of nationally agreed quality indicators providing information on the most important ingredients of the transplantation end of the system must be drawn up along with a standardised system for data collection. Regular local and national audits must be performed, and these should be ongoing and seen as part of a process of continual quality improvement. There should be systems in place for data reporting at a local and national level so that the NTO and individual providers can build up a picture of national and regional performance which can inform future development and areas in need of further investment. Where there are areas of concern, there should be established mechanisms in place to assist in implementing improvements and in arranging for reassessment after an agreed period of time.

As with donation it is suggested that annual objectives should be set both at national and individual unit level. There are a number of areas of key importance for quality evaluation in transplantation and possible quality indicators are listed in table 5:

- The education and training of all transplant professionals
- Monitoring the quality of evaluation of potential transplant recipients
- The management of the waiting list
- Perioperative management of transplant patients
- Monitoring of the in-patient post-operative phase
- Monitoring of the long-term follow-up phase.

6 Post-transplant follow-up

Following a successful organ transplantation procedure, the priority is to maximise the outcomes in the long-term, and optimise graft function and survival. This requires a holistic approach, taking into consideration multiple factors and with the aim to maximise patient survival and quality of life, and minimise the possible complications in the short-, medium- and long-term.

Follow-up can be thought of in terms of an early post-operative phase involving preventing acute rejection, optimising graft function and preventing opportunistic infections, and a later phase involving preserving graft function, ensuring adherence to medication, and monitoring for the long-terms effects of immunosuppression(107) which may lead to infection, malignancies and cardiovascular disease. This should initially be provided by the surgical transplant team. They will need to review their patients soon after discharge to ensure that there are no complications to surgery which have not been detected during the in-patient phase, to ensure that healing is satisfactory and that there is no evidence of acute infection. Thereafter comprehensive MDTs will be responsible for the long-term follow-up of patients, and care may be transferred to their local services under a shared-care protocol.

There are a number of internationally-recognised documents providing guidance as to the ideal follow-up arrangements post-transplant. These guidelines provide specific recommendations regarding renal (107–110), liver (111–113), and heart/heart-lung (114,115) transplantation. They provide comprehensive and detailed organ-specific advice as to the management of transplant recipients from perioperative care through to the long-term. There are a number of common clinical themes running through all of these guidelines as follows:

- Optimising immunosuppressive therapy is a key concern. All guidelines discuss induction, maintenance, monitoring and optimisation of immunosuppression. Nationally agreed protocols for immunosuppressive therapy are advisable, and regimes need to be tailored to the particular clinical characteristics of each patient. Protocols should cover induction immunosuppression, the immediate post-operative period, long-term immunosuppressive therapy and the measurement of serum medication levels.
- Medication adherence and strategies to optimise adherence are of great importance (with particular attention to children and adolescents). Compliance with medication must be regularly monitored, and suitable support offered if adherence is problematic. Open discussions with the patient (and carers) about medication, possible side-effects and the importance of adherence are important in maximising adherence to immunosuppressive regimes.
- Identifying and managing the complications of chronic immunosuppression is a core component of post-transplant care and the risks and benefits of long-term immunosuppression must be carefully balanced. The most common complications include infection, new malignancies, cardiovascular disease and renal dysfunction (many patients

surviving long-term present with some degree of impaired kidney function in part due to use of the immunosuppressive calcineurin inhibitors: cyclosporine, tacrolimus and related molecules).

- Addressing drug interactions.
- Minimising and managing complications related to transplant surgery both in the short and long-term. For example; anastomotic leaks or stenosis, vascular issues, biliary tract complications (in liver transplant), cardiac arrhythmias and cardiac allograft vasculopathy (in heart transplant).
- The detection, diagnosis and treatment of acute rejection.
- The detection, diagnosis and treatment of chronic rejection.
- Indications for biopsy.
- Screening and management of comorbid disease. This includes any new conditions and also those which caused the necessity for transplant in the first place such as cardiovascular disease, hypertension, diabetes (pre-existing and post-transplant), dyslipidaemia, obesity, inflammatory disorders, infections (in particular hepatitis B and C in liver transplant) and malignancy.
- The treatment of any infections: bacterial, viral and fungal.
- The detection, diagnosis and treatment of bone and joint disease such as osteoporosis and gout.
- The detection, diagnosis and treatment of haematological complications such as anaemia and polycythaemia.
- Vaccination.
- Maximising social outcomes and providing social, dietary and lifestyle advice are of particular importance. It is advised that there should also be access to services to help with returning to work and/or education, and with family life. This support must involve the recipient's wider network of carers, family and friends as seems appropriate.
- Mental health issues such as depression and anxiety are common and psychological support should be readily available.
- Support must be available for smoking cessation, alcohol use and any illicit drug use.
- Reproductive and sexual health including pregnancy.
- Growth and development in children and adolescents.

On an operational level, there are many issues which must be taken into consideration:

- Comprehensive organ-specific follow-up must be offered at nationally agreed time intervals. Some guidelines make suggestions as to desirable time intervals in uncomplicated patients(107,112).

- There must be MDTs formed with expertise in each type of transplant. This team should be led by senior physicians with organ-specific expertise and expertise in immunosuppressive therapy. Every team member should have dedicated clinical time for follow-up activities and there should be regular clinical and operational meetings to discuss patients, difficult issues, protocols and strategy. There must be close collaboration with staff involved in the perioperative transplant processes. Staffing should include (or there should be rapid access to):
  - Specialist nurses
  - Specialist pharmacists
  - Dieticians
  - Diabetologists
  - Physiotherapists
  - Psychologists
  - Psychiatrists
  - Social workers.

- There must be dedicated clinical space with appropriate equipment available for conducting follow-up reviews.

- There must be rapid and efficient access to specialist laboratory, pathology, microbiology and imaging services to perform all necessary investigations and formal mechanisms in place to facilitate prompt reporting and review of results by the relevant clinicians. This includes:
  - Blood tests for biochemistry, haematology and medication serum levels
  - Urine specimens
  - Biopsies
  - Radiology
  - Ultrasound
  - Nuclear imaging techniques.

- If, for geographical or other reasons, some aspects of care are transferred outside of the transplant centre there must be a designated primary provider named to avoid any confusion. A shared-care protocol should be adopted, and a clear list of surveillance guidance and recommendations should be given to primary providers so that they know when to consult with the transplant centre for specialist support.

- Virtual follow-up clinics/telemedicine technology should be considered for those living in remote areas in collaboration with local health providers.
- Special protocols should be in place for children and adolescents, and their parents or guardians, and there must be pathways in place to facilitate transfer of young recipients from paediatric care to adult care when they reach the appropriate age.
- All follow-up clinics will need to have a standardised and easily accessible method of recording outcomes and quality standards which can then be collated at local and national level.
- Development of electronic records shared between different disciplines and accessible to patients is recommended to facilitate communication, patient engagement, compliance with medication and enhance safety.

6.1 Organ-specific guidance

The different types of transplant each present a different spectrum of challenges, possible complications, and approaches to management and treatment. We recommend referral to the documents referenced above for detailed guidance.

6.2 Living donor follow-up

Living donors require special mention, and it is essential that they also receive comprehensive long-term follow-up. Life-long follow-up is desirable, not just from an individual perspective, but also to add to the research base regarding the long-term sequelae of living donation.

There are a number of internationally recognised guidelines which provide advice on the care of living donors(38–40,59). It is of note that Article 15 of Directive/2010/53/EU requires member states to establish a national living donor registry to which transplant centres need to submit data on all donors pre-and post-donation in order to inform and refine quality in all aspects of living donor practice(88,116).

The guidelines referred to above all recommend that follow-up of LDs should include early post-operative follow-up, including monitoring of wound healing, infection and renal/hepatic function for the first few months following surgery, and this care should ideally be provided by the transplant centre. Subsequent care will entail a longer-term schedule of regular assessments of health and well-being, including psychological and social issues. Where feasible these assessments should be offered for the rest of the donor's life. As with transplant recipients, it is likely that in many cases longer-term care will be transferred to an appropriate local provider. Under these circumstances it is essential that there are mechanisms in place to communicate information on outcome back to the transplant centre and the NTO, and to provide additional specialist support if required.

7 Databases and information technology

The donation and transplantation programme must be supported by a sophisticated information technology system in order to ensure maximal efficiency and effectiveness. This system should be overseen by the NTO and will include the organ donor registries (including a living donor register), the organ specific waiting lists (regularly updated) and all information pertinent to organ donation and transplantation including long-term outcome data. This system plays a vital role in organ matching and allocation, and in the smooth function of the entire programme.

The NTO should have a chief digital and information technology officer, and design, implementation maintenance and regular updates of the system should be undertaken with the input of experts in complex medical databases and medical information technology. The exact nature of data to be collected should be in keeping with the data requirements of international organ exchange schemes.

It is vital that all staff involved in donation and/or transplantation are able to easily access the IT system from their place of work, and that they have access to the information pertinent to their specialism. The system should be intuitive to use, and not require extensive training. Information must be easy to upload and available in real time to facilitate swift organ matching and allocation. Information governance, data protection and patient confidentiality are key priorities, and staff should not be able to access data in excess to that required for their role. It is desirable that the IT system has a mechanism for connectivity with the systems of international organ exchange schemes.

There are a number of good international examples of IT systems in organ donation and transplantation. These include that of NHSBT in the UK, UNOS in the United States, and the ENIS system of Eurotransplant.

8 Person-centred care

Person-centred care (or patient-centred care) is a broad concept which has many definitions(117–121). However, all of these definitions encompass a number of core concepts. These include:

- Providing collaborative, personalised and well-coordinated care
- According people dignity, compassion and respect
- Respect of individual choices and preferences, values, culture, and religious beliefs
- Inclusion of family and loved ones in the care pathway and in decision making
- Taking account of emotional, social and practical issues in all decision-making processes
- Making decisions with patients, not for them; mutual agreement on goals and expectations
- Ensuring prompt, full and transparent sharing of information
- Improving health literacy, thus facilitating shared decision making.

There are many potential benefits to taking a person-centred approach. Evidence shows that building collaborative relationships between the providers and recipients of care improves clinical outcomes, especially in long-term, chronic conditions. It also may enhance medication compliance, reduce emergency hospital admissions, improve resource allocation, and increase patient satisfaction(117,122–125).

Patient satisfaction has in turn been shown to be related to positive measures of quality and safety(126,127), and staff working in environments which actively promote person-centred care report enhanced morale, less burn-out and greater productivity(128,129). Finally, a person-centred approach has also been shown to build public trust and confidence in health care providers(130,131), and involvement of patients and their families in all aspects of service development, including the development of professional curricula, will help to create user-friendly services and enhance relationships between providers and patients.

There are many different ways in which health systems have sought to achieve person-centred care.

8.1 Clinical

- Providing tailor-made, holistic and multidisciplinary support for all patients and families, including psychological and social care
- The development of shared, interactive and easily accessible electronic health records(132)

- The development of telemedicine technology for follow-up of those in remote locations(133)
- Regular surveys of patient and carer experience. These should inform plans for future service development, and become part of an ongoing and evolving learning system. For example NHSBT have devised a Donor Reported Outcome Measure, a 20-point questionnaire survey to capture self-reported outcomes from living donors(134,135)
- Ensuring transparency and clear lines of accountability throughout the system.

8.2 Operational

- Involvement of patients, carers, and patient and carer organisations throughout the system
- Appointing person-centred care champions at a high level, for example creating leadership roles for patient and carers, and providing appropriate training for these roles(136)
- Ensuring that there is patient and carer input to decisions around service planning and development
- Making person-centred care an integral part of the educational curriculum for all health care staff from undergraduate level upwards; this also includes staff without professional qualifications, such as health care assistants
- Involving patients, carers, patient advocates and patient and carer organisations in the development of health care curricula(137).

A person-centred approach has many potential benefits in the context of organ donation and transplantation. Of key importance is the impact on donation rates, both live and deceased, where a person/family-centred approach has been shown to have a dramatic positive effect(138,139). Adopting this approach will help to prepare patients for transplant, aid understanding of the processes involved and the possible short- and long-term risks. Collaborative discussions about medication, possible side-effects and the rationale behind any changes may enhance compliance with treatment regimes. It will also help patients to understand the need for various investigations and promote shared decision making in the event of graft dysfunction or failure. It will help to ensure inclusion of the person's wider social support system at all steps of the journey and promote self-management in terms of monitoring of symptoms (and reporting any changes to clinicians), and making behavioural changes in respect to lifestyle choices such as diet, exercise, weight loss, smoking and drug or alcohol use(122).

9 Research and development

Health care research is of high worth to society, and has driven the remarkable progress which has been made in all fields of medicine, surgery and public health over the past century. Research can help us to understand diverse issues including the changing trends in diseases and the associated risk factors, the efficacy (or otherwise) of different treatments and interventions, the impact of public health campaigns and the economic effect of different health programmes. Research efforts are vital to the discovery and assessment of new medicines and other therapeutics, and essential in determining their safety, efficacy and effectiveness(140).

The WHO states that(141):

'Research for health spans 5 generic areas of activity:

- *measuring the magnitude and distribution of the health problem;*
- *understanding the diverse causes or the determinants of the problem, whether they are due to biological, behavioural, social or environmental factors;*
- *developing solutions or interventions that will help to prevent or mitigate the problem;*
- *implementing or delivering solutions through policies and programmes; and*
- *evaluating the impact of these solutions on the level and distribution of the problem.'*

Many of the achievements in organ donation and transplantation over the past few decades can be attributed to the extraordinary research efforts of many pioneering clinicians and scientists such as Thomas Stazl and Jean Dausset(142–144), and their dogged determination to discover ways of overcoming some of the most difficult obstacles in transplantation medicine and surgery. However, much still remains to be done, and research will continue to provide invaluable information and insights into all aspects of organ donation and transplantation. Just as effective organ donation and transplantation comprise a very diverse range of activities, so must research in this field encompass a wide range of disciplines including social and political science, psychology, anthropology, ethics and law, and medical, surgical and related sciences.

An effective research and development programme in organ donation and transplantation should comprise the following:

- Local and national audit and research activities. Audit and research should be an integral part of the work of all participating units, and an expected part of the training and professional development of all staff working in the system. National collaborations will enhance the utility of outcome data and better inform national strategy.
- A programme of approved national audit cycles which are ongoing and used to inform improvements to services. For example, NHSBT runs an annual potential donor audit to which all regions and hospitals submit data(145).

- Collaboration with international research programmes such as Eurotransplant(146). This is particularly important for countries with relatively small populations, and also in the case of less frequently performed transplants such as pancreas and small bowel where the pooling of data is especially valuable.

- Clear, nationally approved arrangements for ethical approval. All research must be approved by established research ethics committees, and there should be nationally approved arrangements for this process via a centralised system. For example, in the UK all research must be approved by the Health Research Authority (HRA). Dedicated HRA staff make an assessment of governance and legal compliance, with the support of an independent research and ethics committee provided via the UK Research Ethics Service(147).

- A research division in the NTO. This helps to ensure that appropriate research activities are promoted and supported. In the UK NHSBT has a dedicated research and development division, which works in close collaboration with the organ-specific advisory groups(148).

- Funding of research initiatives and awarding grants and fellowships. This might involve participation in international schemes such as ESOT(149) or partnerships with private organisations and other innovative mechanisms for funding.

- Publication and dissemination of results to all stakeholders locally, nationally and internationally. This is essential if the results of research are to become part of the formulation of national policy and lead to improvements in national strategy and clinical practice. There are many ways in which results can be disseminated including publications, presentations, lectures and participation and representation at national and international conferences.

Table 5. Suggested quality indicators

The suggested indicators for supply of organs and for donation are drawn from the excellent work of ODEQUS(3), and those for transplant from the work of the EDQM(2).

SUPPLY OF ORGANS FOR TRANSPLANT	
	The number of altruistic transplantations performed/population
	The conversion rate in DBD donors, that is: Number of DBD donors × 100 / Number of eligible DBD donors
	Family refusal rates – to be broken down into refusals when the deceased person's wishes were not known, and refusals occurring despite registration with the ODR. Reasons for refusal should be recorded.
	Number of DCD transplantations/population
	Number of LD transplantations/population
	Population attitudes to organ donation – via periodic survey
DONATION	
Key donation person	Donation coordinator with ≥10 hours/week (Yes/100% or No/0%)
Donation team	Availability of the donation team 24/7. (Yes/100% or No/0%)
	Number of physicians and nurses of the donation team with ICU background x 100/ Number of physicians and nurses in the donation team
Training and Research	Number of organ donation seminars organised per year
	Number of procedures performed at the Centre per year per organ (last 10 years)
	Patient and graft survival at 1 year and 5 years
Donor identification	Existence of proactive donors identification protocol. (Yes/100% or No/0%)
	Number of comatose patients with devastating cerebral lesion admitted to the ICU who are referred to the Donation Team × 100 / Number of comatose patients with devastating cerebral lesion admitted to the ICU
	Number of possible deceased DBD donors referred to the donation team × 100 / Total number of possible deceased DBD donors
	Number of deaths of patients with DCIL (devastating cerebral lesion) declared brain dead × 100 / total number of Deaths of patients with DCIL

Table 5 (continued). Suggested quality indicators

Donor evaluation	Number of discarded organs that have been properly documented × 100/ Number of discarded organs
	Number of patients declared brain dead who have been evaluated as organ donors × 100 / Total number of patients declared brain dead
	Number of donors correctly evaluated × 100 / Number of donors evaluated
Donor maintenance	Number of no oppositions × 100 / Number of families interviewed
Documentation and protocols	Existence of protocols and procedures (and documentation) for all relevant steps of the donation process (Yes /100 % or No / 0%)
	Number of referred failed donors in which the cause of no donation is properly documented x 100 / Number of referred failed donors
TRANSPLANTATION	
Education and training	Courses, lectures and other teaching initiatives in the last 5 years
	Number of trained surgeons for a minimum time period of one year in the last 10 years (trainee surgeons, PhD students, fellows, visitors (min 1 year), other visitors
	Outcome at 1 year of patients transplanted by trainees
	All donor hospitals should know how to contact their Coroner/Medical Examiner or equivalent on a 24/7 basis to be able to discuss consent to organ donation
Assessment and consensus	Number of patients with evaluation completed (waiting list/ not) within 30days of request for appointment × 100 / Number of patients referred for transplant evaluation
	Number of full reports sent to the committee in a given period / Total reports sent to the committee in the same period × 100.
Management of waiting list	Number of patients on the waiting list seen in visits in a given period at a frequency of more than 60, 90, 120 days (as applicable) / Total number of patients on the waiting list × 100
	Number of patients excluded from the waiting list in a given period (because of death or disease progression) / Total number of patients placed on the waiting list in the same period × 100.

Table 5 (continued). Suggested quality indicators

Perioperative management	Number of deaths during the first 24 hours of transplantation / Total number of transplant patients for the same period × 100
	Number of transplant patients in a given period who develop 'primary graft dysfunction' causing re-transplantation or death / Total number of transplant patients × 100
	Number of organs in a given period preserved by cold ischaemia for more than 3, 5, 10, 15 and 20 hours (as applicable) / Total number of organs transplanted in the same period × 100
	Number of non-transplanted organs after acceptance in a given period/Number of transplanted organs (based on applicable national acceptance criteria for deceased donors) in the same period × 100
Post-transplant hospitalisation	Number of transplant patients who died within the first 24 h and up to 30 days post-transplantation / Number of transplant patients × 100, for the same period.
	Number of transplant patients in a given period undergoing re-operation in the first 15 days / Number of transplant patients in the same period × 100
	Number of transplant patients who died during post-transplant hospitalisation with normal transplanted organ function / Number of transplant patients × 100, for the same period.
Post-transplant follow-up	Number of re-transplants in a given period / Total number of transplants in the series × 100
	Number of transplant patients alive at the time of each threshold or analysis (1, 3, 5 and 1 years) / Number of transplant patients at the beginning of the period
	Number of functioning organs at the time of each threshold or analysis (1, 3, 5 and 10 years) / Number of grafts transplanted at the beginning of the period
	Number of transplant patients who died with normal transplanted organ function / Number of transplant patients × 100, for the same period
	Overall measurement of user satisfaction after scoring each item on the survey
REDUCING DEMAND FOR TRANSPLANTS	
Prevention policies	Mortality of kidney disease
	Prevalence of kidney disease

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Appendix 2

Case study – Croatia

LIST OF TABLES & FIGURES

Introduction: national context

The Republic of Croatia, located in Southeast Europe, has a population of 4,130,000(1). Croatia joined the EU in 2013 as its 28th member state. Despite its classification as a high-income country by the World Bank, Croatia has a relatively poor economy in comparison with other European Union (EU) member states(1,2). Croatia was particularly affected by the 2008 economic crisis that resulted in high unemployment rates and a fall in its gross domestic product (GDP) by 12%(1). As a result, health expenditure per capita, at €1,272, was among the lowest in the EU in 2017, where the average was €2,884. Croatia devotes 6.8% of its GDP to the health system, compared to the EU average of 9.8%. Nevertheless, the share of public expenditure, at 83%, is above the EU average. Croatia's health system is based on a system of compulsory health insurance, managed by the Croatian Health Insurance Fund (CHIF) that has the position of sole insurer and main purchaser of health services (1). Employed citizens pay 16.5% of their payroll income to cover themselves and their families, while various vulnerable groups are excluded from this deduction. The benefits package is relatively broad, covering most types of health services. In 2003, cost sharing (co-payment) was introduced, reducing the depth of the benefit package. However, co-payment exemptions are given for certain vulnerable groups (e.g. children, students, and people with disabilities and those with low incomes). Complementary health insurance, mainly to cover co-payments for services in the benefits package, is voluntary. It can be purchased individually from either the CHIF (main provider) or a private insurer; over 60% of the population has this additional insurance(1,3,4). Overall, out-of-pocket payments, excluding voluntary health insurance, accounted for 10.5% of health expenditure.

In 2012, the CHIF's expenditure accounted for more than 91% of public health expenditure, while more recently, the budget of the Ministry of Health accounts for 8.7% of the total health care budget. With regard to paying for hospital care, Croatia uses a modified version of the Australian Refined-DRG (AR-DRG) system, which was fully implemented on 1 January 2009 (replacing fee-for-service (FFS) payments). The budget of the Ministry of Health is mainly used for funding investments and public health programmes(1).

In light of its socioeconomic situation, Croatia demonstrates poorer health outcomes than the EU average. Life expectancy is 75.1 years for males and 81.5 years for females (average 78.3 years compared with the EU average of 80.9 years) with 19.6% of the population being over the age of 65 years old(1,4). Mortality from preventable and treatable causes is high compared to most other EU countries(1).

Of greater concern is the recent trend in chronic diseases, as compared to the early 2000s: Croatia is experiencing increasing mortality from diabetes and chronic obstructive pulmonary disease, although there has been no change in mortality from leading cancers and only minimal decreases in mortality rate from ischaemic heart disease(1). The age standardised prevalence rate of chronic kidney disease (CKD) in Croatia is 7,779 per 100,000 persons, higher than most Western European countries(5,6). Approximately 65% of older adults report at least one chronic condition with disparities across gender groups, education levels and socioeconomic

status (SES)(1). One critique of the Croatian healthcare system is the limited impact of policies for prevention of the underlying determinants of illnesses. It is estimated that behavioural risk factors account for half of all deaths in Croatia(1). In comparison to the EU average, Croatia has higher prevalence of smoking in adults (25%) and teenagers (33%), as well as higher rates of obesity (18%) and deaths from alcohol-related causes and transport accidents(1).

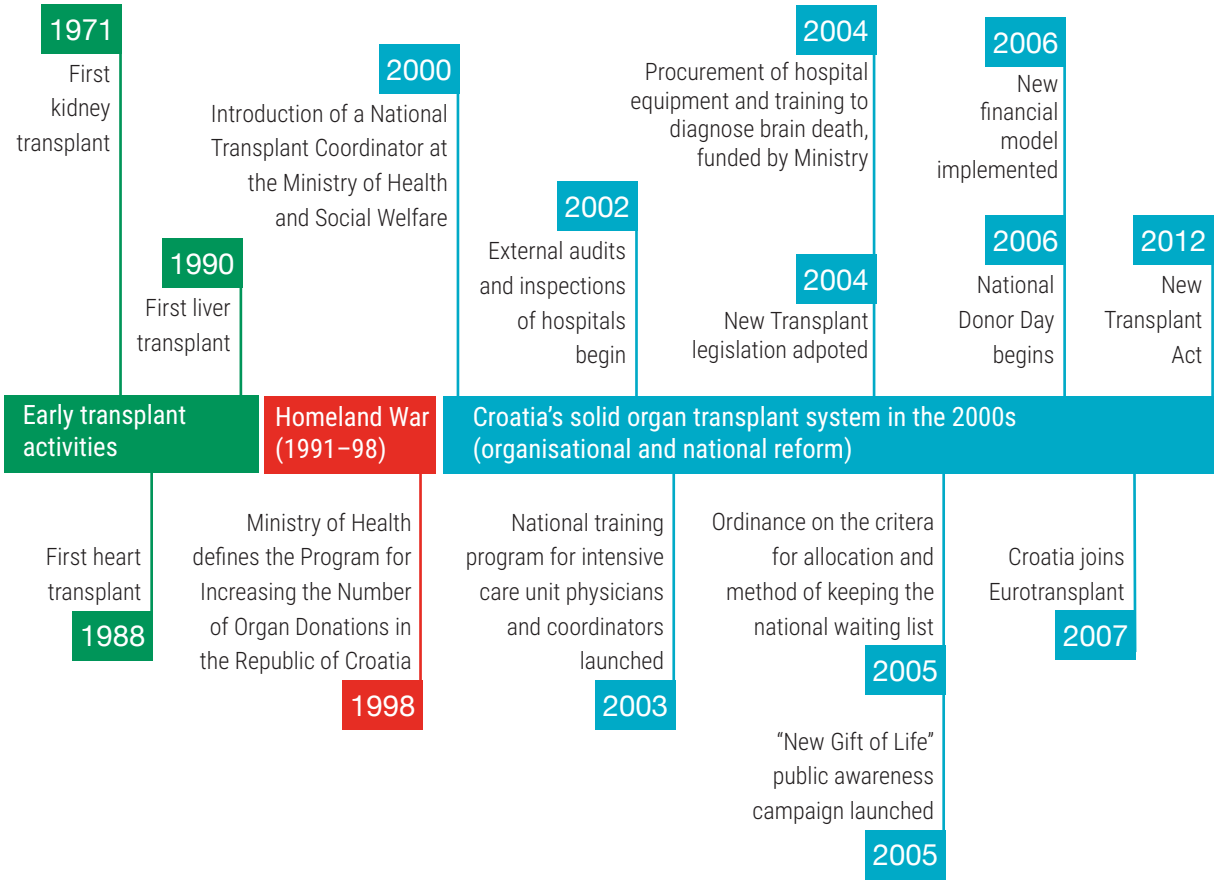
Croatia adopted a National Programme for Road Safety for 2011–2020, with a range of measures to combat road accident fatalities(1). Additionally, the Ministry of Health has attempted to implement primary prevention and secondary prevention strategies. The first cancer screening programme (for breast cancer) was introduced in 2006, with screening programmes for colorectal and cervical cancer introduced in 2007 and 2012, respectively. A new national cancer plan was launched in 2019. The Living Healthy campaign was launched to address poor habits and lifestyle, aiming to reduce chronic diseases through educational initiatives addressing nutrition and exercise in schools and workplaces(7).

Unfortunately, there is poor intersectoral collaboration and a lack of political motivation at a national level to improve the environmental and social determinants that lead to chronic diseases. The Croatian Ministry of Health is, however, a partner in an EU-funded project called EDITH (as evaluator leader). EDITH is an interdisciplinary initiative focusing on differing CKD treatment modalities, organ donation, transplantation practices, and their impact on health expenditures and patient outcomes. In particular, among the European member states, there is an enormous variability in the overall management of CKD and end-stage kidney disease that can be attributed to various factors that require investigation(8).

The Croatian transplantation system and current performance

Despite well-developed transplantation techniques (1971–1998), two decades ago the Croatian transplantation programme was greatly challenged by a shortage of organs and under-development of transplant infrastructure. Prompted by unmet patients' needs and poor access to transplantation treatment, the Croatian Ministry of Health launched a set of organisational reforms (2000–2010). These reforms have resulted in improved performance in deceased organ donation and raised deceased donor and transplantation rates to 40 and 93 per million population (pmp) respectively, in 2015(9–11).

Figure 1. A brief overview of Croatia's transplantation history



The Croatian organ donation and transplantation programme relies on the highest professional and ethical standards that both positively reflect Croatian health care standards and social values(9,10).

In 2018, the actual deceased donor rate in Croatia(24) was more than double the European average (table 1). Accordingly, the total transplantation rate was significantly higher in Croatia (84 pmp) compared to the European average (56.1 pmp). Kidney, heart and liver transplant rates were all significantly above the European average, with the only exception being living donor kidney transplant rate (1.2 pmp) which is lower than the European average (9.9 pmp).

Internationally, Croatia is among the countries with the highest capacity in terms of provision for organ donation and transplantation services(21), with the second highest actual deceased donor rate in 2018 (figure 2)(22,23).

The highly sophisticated transplantation service is provided only in five university hospitals, which were granted authorisation for a total of 10 transplant programmes (four kidney, two liver, one pancreas, two heart, one paediatric). Tissue typing labs affiliated with the transplant centres are European Federation of Immunogenetics (EFI) accredited.

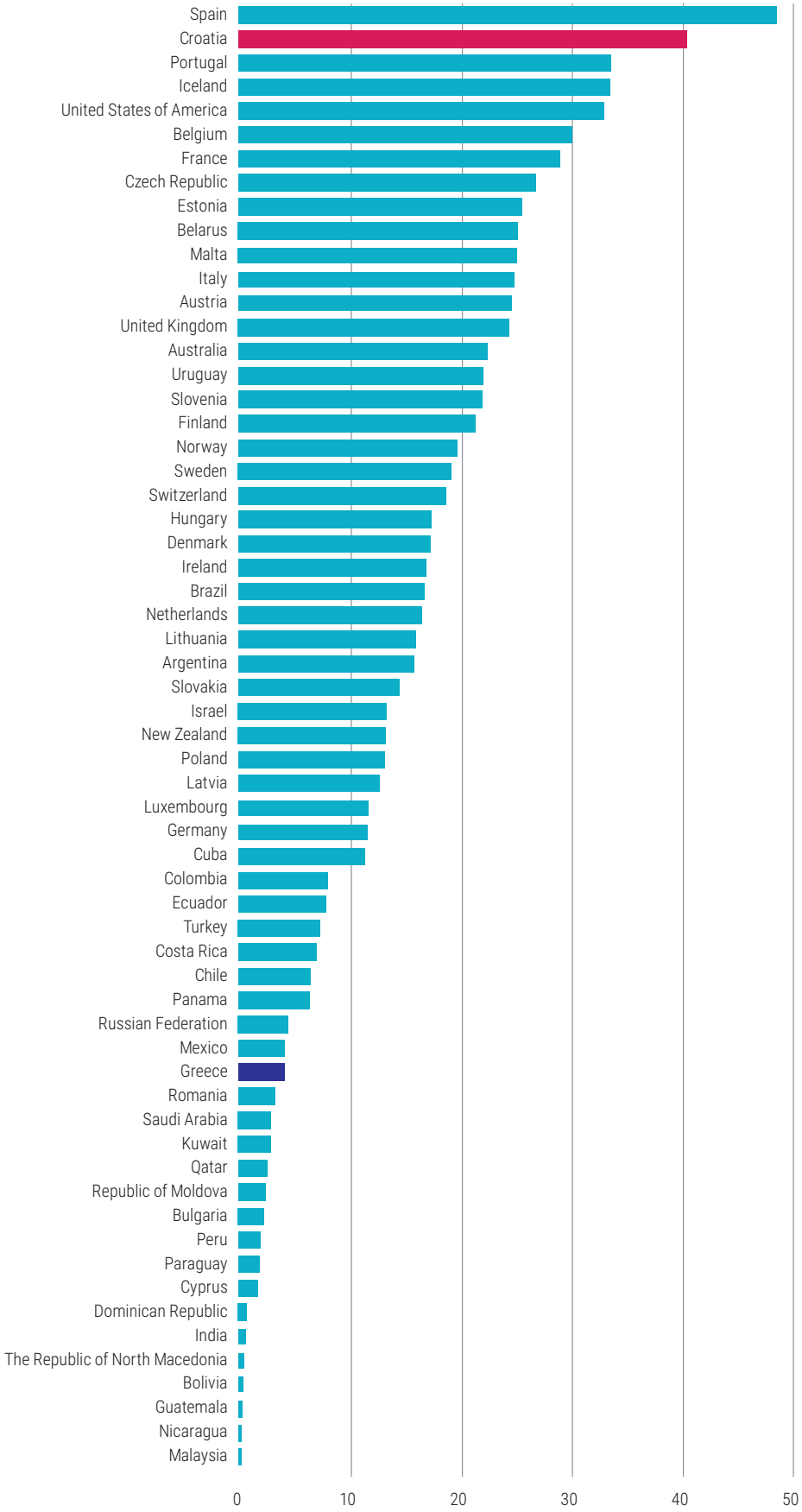
Table 1. Organ transplants and donors in Croatia and comparison with Europe (2018)

	Croatia (absolute)	Croatia (pmp)	Europe (absolute)	Europe (pmp)
Population (millions)	4.2		789.5	
TOTAL Actual DD	169	40.2	13,226	16.8
Actual DBD	169	40.2	11,370	14.4
Actual DCD	0	0.0	1,856	2.4
TOTAL Kidney Tx	183	43.6	27,917	35.4
DD Kidney Tx	178	42.4	20,097	25.5
LD Kidney Tx	5	1.2	7,820	9.9
TOTAL Liver TX	133	31.7	10,520	13.3
DD Liver Tx	132	31.4	8,911	11.3
LD Liver Tx	1	0.2	1,584	2.0
Total Transplants	353	84.0	44,283	56.1

Data are based on the Global Observatory on Donation and Transplantation (GODT) data, produced by the WHO-ONT collaboration.

Note: DD = deceased donor/donation, DBD = donation after brain death, DCD = donation after circulatory death, LD = living donor/donation, Tx = transplant

Figure 2. International actual deceased organ donor (DBD and DCD) rates (pmp), 2018(22)



Key elements of the transplantation system

There are several key elements common to all successful transplantation programmes worldwide encompassing:

- Ethical principles
- Legislative framework and national policy
- Ministry of Health's accountability and governance capacities
- Technical capacities for (deceased) organ donation and transplantation
- Deceased and living organ donation pathways
- Monitoring hospital performance and transplantation outcomes
- Allocation policy and (inter)national collaboration
- Training and education
- Funding

Those key elements, if properly balanced and efficiently coordinated, can help the transplantation programme boost its self-sufficiency. Croatia has successfully implemented the key elements in a step-by-step approach, in a manner adapted to the local health care system's realities(9,10). Enhanced governance and clinical leadership, provided in conjunction with organisational measures, have effectively enabled the Croatian transplant programme to approach self-sufficiency(10,21).

1 Transplant programme development

The Croatian transplantation programme has a 50-year history. It began in 1971 with a kidney transplantation carried out in the University Hospital Centre Rijeka(12). Additional surgical techniques for the single (heart, liver) and multi-organ transplantation were subsequently developed in the period from 1988 to 1998. The lung transplantation programme, piloted in 2002, has yet to be implemented in Croatia(9,13). Meanwhile, Vienna's transplant centre (AKH) has become a collaborative and trusted partner in providing lung transplantation treatment to Croatian citizens (2009–today).

Additionally, cross-border collaboration, based on solidarity, has been established with international paediatric centres in Graz, Padua and Lyon to address the needs of the most vulnerable paediatric patients.

2 Legal Framework and policy

The Resolution on Fostering Organ Transplantation in the Republic of Croatia 1999, adopted by the Croatian parliament, represents the key policy document that outlined nine priority actions to be undertaken for the development of a sustained national transplantation system and its effective governance(14–16). In the light of EU accession, the Transplant Act (2004) aligned the system with the EU Directives' requirements (2010/45, 2012/25). Thus, the new Transplant Act (2012) amended the safety and quality standards of organs for transplantation. The 'soft' presumed consent policy and guiding ethical principles (outlined in the WHO Resolution 63.2 and the additional protocol to the Oviedo Convention) remained a constant throughout the process of legislation updates.

3 Strengthening ICU capacities for deceased organ donation

Appointment of a key donation person (team) in each of the 32 public hospitals was the key turning point in addressing the (sub)optimal medical practice and negative attitudes towards deceased organ donation. Key donation persons, recruited from the most skilled intensivists, represent the backbone of the Croatian organ donation programme. They are additionally trained to provide clinical leadership and professional guidance in all critical steps along the deceased donation pathway. With time, this practical approach has ensured that the potential for organ donation (in the context of brain death) is recognised in time, properly managed and not missed. Nowadays, deceased organ donation is a routine procedure in all public hospitals with critical care capacities performed under the shared responsibility of the critical care team and the key donation person(9,10,14,15).

4 Governance model (organisational structure)

Unlike many European countries whose transplantation programmes are governed by a designated national transplant agency, the Croatian transplant programme is governed, coordinated and overseen by the Ministry of Health directly. The Croatian transplantation system operates through the countrywide Transplant Network comprised of:

1. National transplant coordinator/team (one, in the MoH)
2. Key donation persons/teams (in 32 public hospitals)
3. Transplant programme directors/teams (in five university hospitals)
4. Tissue typing affiliated labs (two)

They all provide a round-the-clock service under their full capacities and defined responsibilities, at donor hospital level (KDP), transplant centre level (transplant director) and competent authority level(9,10,17,18).

5 Public awareness and media campaigns

Effective public awareness and media campaigns have fostered a favourable attitude towards donation entrenched in civil solidarity and responsibility. The Ministry of Health, Croatian Donor Network, Croatian Transplant Association, and Croatian Society of Nephrology, Dialysis and Transplantation all work together to promote ongoing national campaigns, the use of donor cards and various educational activities(15). The first coordinated national public awareness campaign was launched in 2005. The following year, the Parliament of Croatia instituted a National Donor Day. European Donor Day has been celebrated since 2010 in Croatia with press conferences, expert panels, and general public awareness events(19,20).

6 Organ allocation policy and international collaboration

Croatia joined Eurotransplant in 2007. Eurotransplant membership has provided a fine-tuned allocation system with a balanced exchange of organs between eight Eurotransplant member countries (Austria, Belgium, Croatia, Germany, Hungary, Luxembourg, the Netherlands and Slovenia). The highly sophisticated computerised allocation system has ensured optimal donor–recipient matching, more efficient management and the reduced loss of donated organs (9,10,14,15).

Following the success of the Croatian Model, the Republic of Croatia has become a leader in the South-Eastern Europe Health Network (SEEHN). Established in 2011, Bosnia and Herzegovina, Macedonia, Moldova, Montenegro and Romania have seen improvements in their transplant activities as a result of this collaboration spearheaded by the Regional Health Development Centre on Organ Donation and Transplant Medicine (RHDC) led by Croatian transplant experts.

7 Funding

Croatia operates a social health insurance system based on the principles of inclusivity, continuity and accessibility that are all well represented in organ donation and transplantation services. Organ transplantation treatment (including both living and deceased donation), and life-long immunosuppressive therapy are all funded by the public health system within the basic health coverage. Since 2006 the DRG (diagnostic related group) system has been complemented by codes assigned for deceased donor management-related costs to enable the reimbursement of deceased donation-related costs outside of a hospital's regular limits(10,14). Such reimbursement has made deceased organ donation a financially neutral clinical procedure, and not a financial burden. The National Transplant Programme, in terms of its training costs, the national waiting list management fee, IT logistics and organ procurement transportation costs, is funded by the Ministry of Health budget, directly.

The Ministry of Health has issued instructions for the payment of key donation persons/teams and procurement and transplantation teams. The payment for key donation persons is provided by the hospital from the reimbursed fee received for donor management-related costs.

9 Challenges and opportunities

Donation after brain death (DBD) has been so far the only clinical pathway for deceased donation in Croatia. Donation after confirmed death following cardio-respiratory arrest, known as donation after circulatory death (DCD), represents an opportunity for expanding the organ pool, along with a better utilisation of organs from non-standard donors(25). In addition, national data for long-term outcomes following transplantation is not systematically available and the establishment of the national transplantation registry is needed.

Key lessons

Dr Mirela Bušić was appointed as a national transplant coordinator in 2001 to provide national guidance and facilitate the reform of the Croatian transplantation system. Based on her 20 years' experience as national coordinator, she summarised the key messages that reflect her personal view of 'lessons learned' as follows:

- Development of a country-tailored framework for organ donation and transplantation system requires a regulatory framework, clear organisational structure, enhanced governing and hospital-based capacities and well-defined roles/responsibilities in running programmes for deceased donation and transplantation, together with sound accountability mechanisms.

- Good governance and leadership at political and clinical levels were essential for the development of such a sustained framework in Croatia. Dr Bušić elaborated the working pathway and strategies she applied during her professional carrier to address identified challenges in organ donation and transplantation.

- Poor performance of public hospitals in deceased organ donation was the major concern when Dr Busic started this job. In that regard, engagement of critical care community, information flow, trusted interactive collaboration and established partnership with the most experienced intensivists (key donation persons), helped Dr Busic identify major barriers and challenges in the hospital setting. A sound insight of the major factors influencing (sub) optimal medical practice and performance in DOD has enabled Dr Busic to define corrective strategies tailored to each hospital's specific needs, and to enhance its implementation in a stepwise approach. Along those hospital-specific strategies, training and monitoring of performance have been commonly applied to all critical care units countrywide. In that regard, she has been able to exercise political strength and authority of the ministry of health to direct implementation of needed reforms, in partnership with professional community and patients' associations. In such way, there was smoother guidance and more efficient reform execution. Additionally, all other technical, legal and socio-medical aspects of organ donation and transplantation had to be properly and timely balanced.

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Appendix 3

Case study – Italy

LIST OF TABLES & FIGURES

Introduction: national context

The population of Italy is 59.3 million(1). Health care is provided by the Italian National Health Service (Servizio Sanitario Nazionale – SSN), which established a tax -based universal health care system in 1978(2). The national government distributes tax-generated revenue to 19 regional governments and two autonomous provinces, which maintain relative independence in delivering a national statutory benefits package to every Italian resident(2). Delivery of health services is commissioned by local health units and public and private hospitals(3). Publicly financed health services include primary care, hospital care, outpatient specialist care, public health initiatives and health care related to social care(2). In 2017, Italy spent €2,523 per capita on health care (purchasing power standard, €2,483). This represented 8.8% of gross domestic product (GDP). Of this spend, 73.7% was from government schemes, 0.2% was from compulsory schemes and savings accounts, and the remaining 26.1% from other financing agents. To put this in context, the average spend on health care in the European Union (EU) in 2017 was 9.9% of GDP, or €2,887 per capita(4). Spending on health care in Italy decreased in 2009 with the economic recession and residual economic effects but has since then grown by 0.2% per year from 2010 to 2017(3).

Italy has the second highest life expectancy in Europe, at 83.0 years. However, there is a significant discrepancy between the sexes, and women can expect to live to 85.2 years and men to 80.8 years(5). Italians with greater education live longer lives, and the Italians with higher socioeconomic status (SES) live longer as well. This latter point often plays out geographically where northern regions in Italy experience better health outcomes than less affluent regions in the south(3).

Similar to the demographic changes occurring in most high-income countries, the Italian population is ageing. Currently, one out of every five citizens is over the age of 65 years old(3). As a consequence, one of the main drivers of morbidity and mortality in the Italian population is attributable to the high burden of cardiovascular diseases (CVD), although this statistic is close to the EU average. The prevalence rate of cardiovascular disease is 5,099 per 100,000 persons for men and 3,975 per 100,000 persons for women in 2015(6). The approximate population prevalence of the metabolic syndromes are: hypertension, 52% for men and 38% for women; dyslipidemia, 35% for men and 37% for women; and diabetes, 12% in men and 8% in women(7). The prevalence of chronic kidney disease (CKD) is recorded by the Italian Registry of Dialysis and Transplantation (RIDT) and is discussed below. Smoking, dietary behaviours, alcohol consumption and low physical activity are key health risk factors in Italy. In particular, smoking in Italy (approximately 25% of men and 15% of women) is above the EU average for adults and for adolescents. Once again, these risk factors are associated with low education levels and lower SES(3).

The Italian transplantation system and current performance

The Spanish system has arguably served as the blueprint for the Italian transplantation system(8,9). Beginning in the 1990s, the Northern Italy Transplant programme and the region of Tuscany established connections with Spanish transplantation specialists. Key elements of the Spanish model, including a communication strategy targeting the media, a three-level organisational structure, the national transplant organisation acting as a support agency, extensive training capacities, and a well-established transplantation coordinator programme, can also be found within the Italian system(9).

Italy has one of the top organ transplantation systems in Europe(10,11). Table 1 shows the absolute number and rate per million inhabitants (pmp) of total transplantations in Italy(14) in comparison to European aggregated data(1). Internationally, the Italian Transplant Network shows above average rates of total organ transplants (24.6 pmp), largely due above average numbers of DBD donors (figure 1).

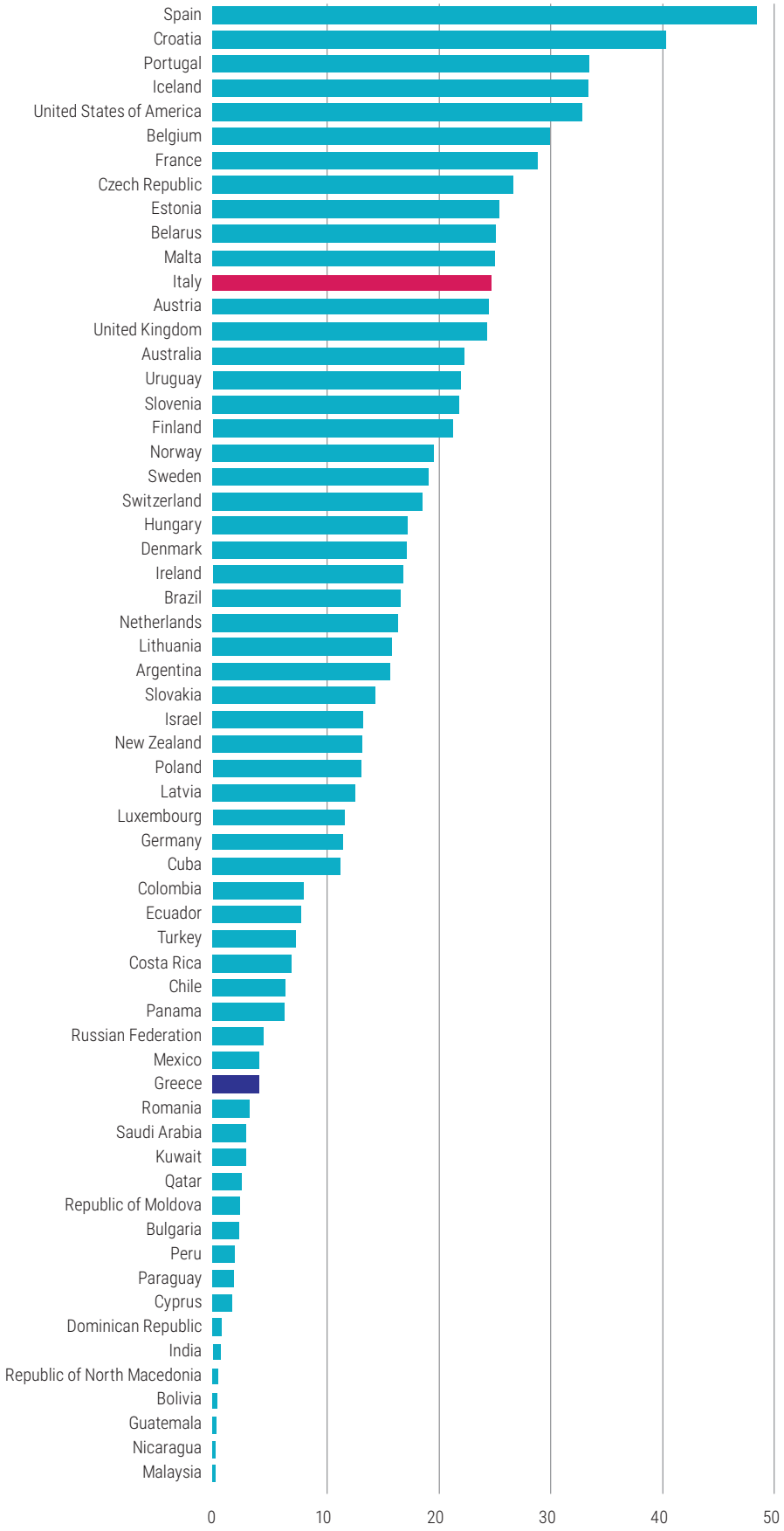
Table 1. Organ transplants and donors in Italy (2019) and comparison with Europe (2018)

	Italy (absolute)	Italy (pmp)	Europe (absolute)	Europe (pmp)
Population (millions)	60.8		789.5	
TOTAL Actual DD	1,495	24.6	13,226	16.8
Actual DBD	1,415	23.3	11,370	14.4
Actual DCD	80	1.3	1,856	2.4
TOTAL Kidney Tx	2,137	35.1	27,917	35.4
DD Kidney Tx	1,797	29.6	20,097	25.5
LD Kidney Tx	340	5.6	7,820	9.9
TOTAL Liver TX	1,302	21.4	10,520	13.3
DD Liver Tx	1,278	21.0	8,911	11.3
LD Liver Tx	24	0.4	1,584	2.0
Total Transplants	**3,813**	**62.7**	**44,283**	**56.1**

Data for Italy are drawn from the 2019 transplantation activity report(14).

Note: DD = deceased donor/donation, DBD = donation after brain death, DCD = donation after circulatory death, LD = living donor/donation, Tx = transplant

Figure 1. International actual deceased organ donor (DBD and DCD) rates (pmp), 2018(31)



The following types of solid organ transplants are performed in Italy: donation after brain death (DBD), donation after circulatory death (DCD), living donation (LD) and altruistic LD. The majority of donations are DBD; 3.6 organs are procured from a DBD donor in comparison to 2.1 organs from a DCD donor(12). Donations from LD remain low in Italy; however, in 2018, Italy participated in its first kidney exchange programme (KEP) in coordination with Spain(13). Donations after circulatory death are also less common but are an area of experimentation in Italy. This is due to the fact that Italy is one of the few countries (along with Spain, Norway and Malta) where the majority of the organs come from donors over the age of 60 years old(11). Thus, in 2007, Pavia became the first city in Italy to begin a programme of using uncontrolled DCD organs. The 'Alba programme' requires a coordinated system of emergency and first aid responders, a dedicated DCD task force and specialised training in extra-corporeal membrane oxygenation (ECMO) but has been slowly increasing availability of kidney donors(12).

Key features of the transplantation system

1 The National Transplant Centre (CNT)

Solid organ transplantation in Italy is coordinated by the National Transplant Centre (Centro Nazionale Trapianti – CNT), a technical and scientific organisation of the Ministry of Health (Istituto Superiore di Sanita – ISS) working within the SSN. The CNT coordinates the National Transplant Network (Rete Nazionale Trapianti) that is the organisational model designed to promote the 'efficient and effective management of the donation of organs, tissues and cells, [and] the quality and safety of clinical, organisational and managerial processes, of information and training of operators'(15). The main role of the CNT is to issue guidelines, organise training and guarantee safety and quality surveillance. The CNT also directly manages the organ donation and transplantation process in specialised areas: emergencies, paediatrics, subgroups of wait-listed patients and the national reallocation of suboptimal organs(13). The CNT provides a national allocation office, available 24/7, to support the detection and referral of possible donors(16,17).

2 Hospitals and transplantation facilities

Organs can be donated from any public hospital intensive care unit (ICU) involved in one of the 96 organ transplantation programmes. As of 2017, organs have been donated from 370 hospitals. Of the total organs procured, 20% are used nationally for CNT subspecialty populations and the remaining are allocated to the regions where the donation came from(13). There are 43 centres in Italy that are authorised to perform solid organ transplantation with most centres located in Northern Italy(13,15).

3 Hospital procurement coordinators

Also called the organ donation coordinator (ODC). The ODC is a physician supported by an in-house team of other physicians or nurses, and is responsible for ensuring correct declarations of neurological or circulatory death, excluding organs that have absolute medical contraindications and verifying consent from personal records or family members(13). Historically, transplantation success has favored early adopters (Northern Italy and Tuscany) of the Spanish model. One possible explanation has pointed towards the organisational structure and the hospital coordinator role in particular. In some centres, the hospital procurement coordinator is also the resuscitation physician and only dedicates part of their time to transplantation activities; these centres have smaller numbers of organ donations than centres that have dedicated and full-time coordinators(10). The ODC are often recruited early in their career and are required to undergo proper training.

The CNT organises bi-annual training courses for the transplant coordinators (TPM)(17). In 2020, in conjunction with the University of Padua and Veneto Regional Transplant Centre, the CNT had planned to host its ninth international donor-training course. This course is designed for transplant surgeons to gain mastery in organ procurement, is endorsed by the European Society for Organ Transplantation (ESOT) and is free of charge to successful applicants(17). Additional courses, for the purposes of organ coordination and improving critical conversations, are held regionally(17).

4 Safety, quality assurance & risk management

Regulation and quality assurance in Italy is of utmost importance. The quality and safety procedures in the Italian transplantation system have been extensively studied due to a 2007 incident in which three patients received organs from a donor who was human immunodeficiency virus (HIV)-positive. In the aftermath, the CNT organised a formal committee that produced recommendations on safety, quality assurance and risk management procedures to avoid future incidents(18). As a result, each regional transplantation or coordination centre undergoes periodic audits with special attention to safety protocols. Additionally, resources were poured into a team of experts composed of medical doctors from the transplantation network, an infectious disease expert, a pathologist, a critical care specialist and a clinical immunology expert who are available via the CNT's national allocation office for a second opinion at all times(18). Besides adhering to international and European standards (such as the European Union directive on quality and safety of organs for transplantation, 2010/S3/EU), Italy has been known to take the lead on safety-related initiatives in international collaborations (e.g. Alliance O)(13,18). In practice, the CNT is responsible for issuing the quality regulations and guidelines and conducting safety checks while the regional centres run quality programs(13). Audits of each transplant centre take place every three to five years; while this process can be resource consuming, it ensures that Italy maintains the highest standards of safety and quality possible.

See Table 2 for a summary of the national, regional and local governance structures and responsibilities(15).

Table 2. Structure of the Italian Transplant Network

NATIONAL

National Transplant Centre (CNT)	Authority for the donation and transplantation of organs, tissues and cells
	Organisation of training for transplant specialists
Permanent technical consultation for transplants	Consultative body, prepares the technical and operational guidelines for the donation and transplantation of organs, tissues and cells

REGIONAL

Regional or Inter-regional Transplant Centres (CRT)	Public structures that coordinate procurement, donation and transplant activities at the regional level and proceed with the assignment of organs

LOCAL

Hospital coordination	Structures and clinical teams that ensure the immediate communication of donor data to the CRT and CNT, coordinate the administrative documents relating to the withdrawal operations, take care of relationships with donor families and collect data on transplants
Withdrawal facilities	Public health facilities where organ, tissue and haematopoietic stem cells are collected for transplantation purposes.
Transplant structures	Public hospitals with authorised transplant teams
Tissue institutes	Tissue banks to process, conserve, store and distribute human tissues and cells

5 National Transplantation Information System

Italy's policy on donation consent follows the opt-out strategy of the Spanish model. Italians register with the National Transplant Information System (Sistema Informativo Trapianti – SIT), a combined registry that captures information about positive or negative consent to organ donations(19). Registration can be made at the office of health authorities, through voluntary donor associations (i.e. Associazione Italiana per la Donazione di Organi) or, since 2013, at the renewal or first issue of the identification card(16,20). As of October 2018, 2,508,158 people have registered with SIT: 1,835,613 expressing positive consent (73.2%) and 672,545 expressing negative consent (26.8%)(16). Southern Italy has a higher refusal rate (40%) in comparison to the best-performing regions in Tuscany or Northern Italy that have a refusal rate of 20%(13). Besides the living and deceased donor registry, the SIT also functions to collect data on the activity of donation, collection and transplantation, follow-up of all patients who receive an organ transplant and as a reporting system for serious adverse events and reactions(19).

6 Legislation

Three regulations have shaped the Italian organ donation and transplantation system. First, Law 458/1967 made living donations legal. Second, Law 578/1993 defined brain death as 'irreversible loss of all cerebral functions and death certification by neurological (independent council of three specialists with a six-hour observation time) or cardiac criteria (20 minutes of electrocardiogram (ECG) with no cardiac activity)'(13). Finally, Law 91/1999 led to the founding of the CNT, the National Technical Transplant Council, the Regional Transplant Coordinating Centres and the hospital procurement coordinator (a team of clinicians to identify potential donors in intensive care units, emergency departments or stroke units)(13). Additional legislation, Law 483/1999, addressed consent for partial liver donation for living donors. This legislation enshrines in law the Italian organ donation system and coordination networks and contributes to the success of Italy's transplantation system.

7 Public awareness and media campaigns

Around the same time that Italy began transforming its transplantation system, a young American tourist, Nicholas Green, was killed in an attempted car robbery in southern Italy(16). His family's decision to donate the child's organs in Italy sparked l'Effetto Nicholas ('the Nicholas effect'). While this campaign is often sentimentally credited for increasing national donation rates, it is difficult to distinguish its effect independent of the concurrent reforms at turn of the century. Nevertheless, l'Effetto Nicholas continues to be associated positively with organ donation and is said to represent the national consciousness Italy now exhibits in solidarity for organ donations(17,21).

Since then and in accordance with the Spanish model, Italy has consistently invested in media campaigns to encourage awareness and discussion of the topic of organ donation and transplantation supported by the Ministry of Health and CNT. At a European level, the CNT has 'coordinated one project (COORENOR-2010/2012), a Joint Action (FOEDUS-2014/2016) and is part of the EUDONORGAN which aimed, among other things, to increase public awareness in the country'(9).[1] In October 2014, Italy organised the European Organ Donation Day (EODD) in partnership with the Council of Europe. Nationally, the CNT has annual campaigns such as Diamo il Meglio di Noi ('we give the best of us') (for organ tissue and cell transplantation) and Match it Now (for bone marrow). The CNT also targets children and adolescents at primary and secondary school; for example, Salvo e Gaia ('a gift worth a lifetime') is a national campaign that educates children on the human body and includes the subject of organ donation in its educational objectives(22).

8 Prevention of kidney disease to prevent cardiovascular disease

Prevention of end organ disease is an integral part of any solid organ transplantation system. Italy is unique in that the prevalence of chronic kidney disease (CKD) is relatively lower than in other European countries, but with a contrasting higher CVD and smoking risk profile in the

[1] FOEDUS = Facilitating Exchange of Organs Donated in EU Member States COORENOR = Coordinating a European Initiative Among National Organization for Organ Transplantation, EUDONORGAN = name of project aimed at increasing organ donation rates in Europe

overall population. The estimated prevalence of chronic kidney disease ranges from 5.7% to 12.7% of the population(23,24). The most recent study estimates the prevalence of CKD to be 7.5% in men and 6.5% in women with higher prevalence of CKD stages 1–2 than 3–5(16). Thus, the prevention of CKD is recognised by the Italian Ministry of Health as a way of mitigating the interdependent metabolic syndromes (i.e. diabetes, hypertension, heart disease etc).

Primary prevention strategies in Italy are aimed at reducing all cardiovascular (CV) metabolic syndromes through common non-medical strategies such as promoting increased exercise and improved diet choices. These manifest as public health campaigns: for example, Gaining Health: making healthy choices easy (Prime Ministerial Decree of 4 May 2007) and participating in the World Action on Salt, Sugar & Health programme(16). Secondary prevention initiatives to prevent the transition from early CKD to end-stage renal disease (ESRD) are also noted in Italy, including the renal screening and early detection programmes in patients who are at risk or are medically frail.

9 International collaborations to improve organ donation systems

As previously mentioned, pioneers of the Italian Transplant Network established close relationships with their Spanish colleagues early in the development of the transplantation system. Retrospectively, key features that helped with the adoption of the Spanish model included a similar universal health system with low private funding, a relatively large number of physicians with low basic pay but the potential to increase salary linked to objectives, and a ratio of nurses to acute public beds that enabled them to act as coordinators and carers for potential donors(9). This collaboration eventually developed into the South Alliance for Transplant (SAT) network which allows for knowledge sharing, training collaborations and enlargement of the donor pool as exemplified by the second international Kidney Exchange Programme undertaken between Spain and Italy in 2018.

The CNT is also actively involved in European and International research projects and registries. ‘Since 2001, CNT and the Italian Transplant Network have engaged in bi- and multilateral agreements for international organ exchanges’(13). In collaboration with the WHO, the CNT launched Project NOTIFY, ‘a global interface for the vigilance and surveillance of substances of human origin’ that documents adverse events and reactions for donor and recipient safety(25). Italy is one of the few countries who publish all transplantation data publicly in the hope of creating transparency in organ allocation and management(10).

10 Adoption of the Spanish model

‘Italy has probably been the country that has adopted more elements of the Spanish model and worked more seriously in this direction… Not unexpectedly, Italy has been together with Spain, the country with the greatest increase in organ donation in the last 10 years’(26). Besides identifying and implementing the key features of the Spanish model described above, there are a variety of other factors that are important for successful adoption:

- Public health system and availability of resources – ‘The development of a national program like the Spanish one needs a public health background’(26). While transplantation itself may be conducted in private health settings, public health systems

are especially important for procurement of organ donation, public trust and positive attitudes towards donation(27). Public health facilities are also necessary for access to critical care beds, nursing support, imaging modalities and neurosurgery facilities(9). Italy met this requirement of universal health coverage prior to its transplantation system reform.

- Reimbursement scheme and availability of medical personnel – the Spanish model developed in a health care system with many physicians per capita, but relatively low basic pay(9,26). While not essential to success, a variable (compared to fixed) reimbursement scheme that allows for financial incentives to hospitals and health care professionals who undertake organ donation and transplantation activities is favoured in the Spanish model(27). Italy's health care system had shown similar patterns, allowing the adoption of similar reimbursement patterns.

- Baseline organ donation potential – the Spanish model is one that allows for integration of all types of donation (DBD, DCD, LD and altruistic) as well as acceptance of more complex organ donors and trends towards recipients of an older age in comparison to global averages(27). For example, due to Spain's ageing population and acceptance of kidneys from elderly donors, there is often a shortage of acceptable kidneys for younger recipients; hence it may not be appropriate for a country that is younger in demographics to adopt all features of the Spanish organ donor criteria(27). Prior to adopting this model, it was important for Italy to consider its own population's age distribution, waiting lists, and patterns of mortality (e.g. annual rate of motor vehicle accidents).

Future developments

1 Potential to increase organ donor pools from DCD organs

Italy is unique because, despite its successes with solid organ transplantations, the national DCD criteria require a no-touch period of 20 minutes (significantly longer than most other countries that adhere to a five-minute interval of monitoring prior to declaration). This has historically discouraged the use of DCD in Italy due to concerns with warm ischaemic time and inferior graft survival(12). However, in 2007, the first pilot project using normothermic regional perfusion (NRP) was successful in performing a kidney transplant. Since then, Italy has developed protocols to procure organs from uncontrolled DCD with prolonged ischaemic time; they have been experimenting with various strategies using mechanical ventilation, hypothermic oxygenated machine perfusion, and abdominal NRP for organ viability and preservation. These organ preservation techniques have had positive results allowing for increased use of DCD donor organs such that De Carlis and colleagues have concluded, 'DCD in Italy is inseparable from NRP'(28). Since the no-touch period can be an obstacle to increasing donor pools, increased investment in health promotion is necessary to convince the public and legislature of the benefits of organ donation.

2 Organ transplantation for end-stage renal disease

The Italian Ministry of Health has conducted cost analyses that suggest that organ transplantation for end-stage renal disease would result in national health savings. It is estimated to cost approximately €34,072 per patient on dialysis per year in Italy and the social costs of CKD have been estimated at €1,809,552,398 representing 0.11% of GDP or 1.8% of the total health care budget annually(29,30). In comparison, the costs of transplantation are estimated to be €52,000 in the first year and €15,000 thereafter, suggesting that transplantation is a cost-effective alternate therapy(16).

3 Remaining challenges

Besides maintenance of the existing system in the face of current economic and demographic realities, other significant challenges remain within the Italian transplantation system(13):

- Reducing discrepancy in the prevention of transplantable conditions and in access to transplantation services between Italy's geographic and socioeconomic strata.
- Promotion and implementation of living donor programmes and international collaborations.
- Utilisation of existing donor organs, including innovation of DCD and ex situ perfusion techniques.

Key lessons

Italy is a country with a very similar culture and lifestyle to Greece that has managed to translate the Spanish model step-by-step to suit its particular circumstances. The key lessons to learn from this example follow.

Successful adaptation of the Spanish model in another country

The Italians have successfully taken the Spanish transplantation model and adapted it to suit the Italian context, where it has become one of the most productive transplantation systems internationally. Italy has reaffirmed that a three-level organisational structure, including a national governance body, regional coordination centres and local hospital ODCs, is effective and efficient. A national transplantation agency is a must to guarantee quality, safety, monitoring and equitable allocation of organs. To some degree, it reflects the importance of a health system that prioritises and appropriately resources transplantation; that governance and vision should come from a top-down approach in a publicly financed health system.

Learn from tragedies and use them to strengthen the existing system.

Italy has transformed tragedies into opportunities for improvement. Specifically, Italy has shown high productivity in response to emergency situations that have propelled its organ transplantation system forward during subsequent periods of calm. The way in which l'Effetto Nicholas increased organ donation suggests that specific stories resonate with the population when advertised and marketed in appropriate ways. Advocates must be vigilant in using these policy windows to humanise and promote the benefits of organ transplantation systems. Italy also responded to the misfortune of HIV-positive transplantations by driving themselves to become leaders in quality and safety measures for organ transplantations, looking both internally and externally for support. Internally, the CNT has support from the ISS and the local media who 'communicated the facts in an honest and accurate way. These actions reassured the reliability of the Italian population in the reliability of the transplantation network'(18). During this time, the CNT retained support from expert foreign transplantation systems. This – combined with Italy's subsequent involvement in the European and international transplantation networks – has contributed to the current collaborations that Italy shares with various other countries.

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Appendix 4

Case study – Portugal

LIST OF TABLES & FIGURES

Introduction

1 National context

Portugal has a population of 10.3 million and a gross domestic product (GDP) per capita below European Union (EU) average (€23,000). Life expectancy is slightly above EU average and has been continuously improving over the last two decades. Men can expect to live 78.4 years, and women 84.6 years(1). However, with a growing proportion of people over the age of 65, substantial time is lived with disability and about 50% of people over the age of 65 suffer from at least one chronic condition. Cardiovascular diseases (CVD) as well as cancer are leading causes of death and high diabetes mortality rates have become a major public health concern(2).

Behavioural risk factors substantially contribute to the overall burden of disease. Whereas smoking rates have been decreasing and are below the EU average, binge drinking rates are higher than the EU average. Low levels of physical activity and rising obesity in all age groups are additional concerns(2).

2 Health system

The Portuguese health system is organised in three major systems: a national health service (NHS); a set of special public and private health insurance schemes based on occupation; and voluntary private health insurance. The NHS is the main component of the health system incorporating five regional health administrations. The ministry of health is responsible for central planning and regulation, whereas regional health administrations manage the NHS locally.

Total spending on health declined after the economic crisis and has been recovering since 2018. In 2017, Portugal spent €1,695 per capita on health care (purchasing power standard, €2,028). This represented 9.0% of GDP. To put this in context, the average spend on health care in the EU in 2017 was 9.9% of GDP, or €2,887 per capita. Of Portugal's total health care spend, 65% was government funding, mostly via general taxation; 1.3% was from compulsory schemes and savings accounts, and the remaining 33.7% from other financing agents including out-of-pocket payments (OOP)(3). OOP payments in Portugal are driven by co-payments to a large extent and are above EU average contributing to catastrophic health expenditure(2).

Portugal has a relatively low number of hospital beds and with 4.2 beds per 100,000 inhabitants the lowest number of critical care beds in Europe(4). There is an above-average number of physicians but below-average number of nurses.

There is a mix of public and private providers in Portugal. Whereas primary and hospital care is mainly provided by public entities, private providers tend to offer rehabilitative care, laboratory and imaging services as well as dialysis care.

A strong primary health care system and health promotion efforts have led to low rates of avoidable and preventable mortality, indicating health system effectiveness. Even though the NHS provides a universal and comprehensive benefit package, high OOP payments lead to inequitable access to care. In general, efficiency gains have been achieved in recent reform efforts as indicated by an increase in day surgery rates and generic prescription rates(2,5).

3 Addressing chronic kidney disease

Chronic kidney disease (CKD) is a public health challenge in Portugal. Whereas prevalence of CKD is similar to other Western countries, Portugal has among the highest prevalence and incidence of patients with end-stage renal disease (ESRD) seeking renal replacement therapy (RRT) in Europe(6,7). Multiple factors explain these high rates. First, an ageing population brings with it an increased prevalence of diabetes and hypertension, both risk factors for kidney disease. Second, higher survival rates of patients with cardiovascular and neoplastic disease go along with higher rates of renal failure. Third, there is universal access to dialysis through the NHS. Fourth, due to the success of kidney donation programmes, Portugal has among the highest number of patients living with a kidney transplant worldwide. This leads to better survival of patients that continue to be classified as ESRD patients(8).

Besides kidney transplantation, RRT in Portugal is focused around haemodialysis(8). Haemodialysis treatment is mostly in the hands of private providers which were paid for on a fee-for-service basis until 2008(2,9).

To address the resulting health and financial challenges, Portugal substantially restructured dialysis care in 2008. Essentially, the fee-for-service scheme was replaced with a capitated prospective payment and an information and monitoring system. Under the new system, providers receive a comprehensive bundle payment covering the costs of dialysis per patient per week. This payment is combined with monitoring a set of quality criteria, some of which are obligatory for payment. The set of indicators includes process measures (e.g. a minimum of three sessions of dialysis per week) as well as outcome measures (e.g. annual mortality). Information about clinical parameters is complemented by a patient survey covering the following: ‘patient information about different treatment modalities’, ‘patient involvement in clinical decision making’, ‘dialysis facility infrastructure’ and ‘general quality of life’. Patient data is reported and collected in a central online information system. In addition, a National Dialysis Monitoring Commission was established. The commission is formed by representatives of professional, patient and hospital associations as well as government officials including the national transplant organisation (Instituto Portugues do Sangue e da Transplantação – IPST). It monitors provider performance as well as general trends in patients with ESRD. Over time, it has developed a more strategic role in shaping a combined policy response to address ESRD. In addition, while travel costs continue to be supported by the

health care system, co-payments have been reduced and barriers to specialists or family physician referral have been removed in order to improve access and coordination between different providers(9).

According to an evaluation by the Portuguese ministry of health, the programme has been a success. The evaluation reports that costs have been contained, with a simultaneous improvement in quality. Improvements in quality were indicated by a decrease in patient mortality and an improvement of laboratory results and overall patient satisfaction(9).

The transplantation system and current performance

Table 1. Main developments in the transplant system in Portugal

1993	Establishment of legislation for procurement and transplantation and the national transplant body, Organizacao Portuguesa de Transplantação, including five regional coordination offices
1994	Establishment of legislation for brain death certification and national registry for non-donors
1996	Introduction of regional procurement and transplantation coordination officers at a regional level, responsible for coordination of organ retrieval and allocation across hospitals
2007	Establishment of a new national body, the Autoridade para os Servicos de Sangue e da Transplantação (ASST) and adaptations in transplantation legislation
2007	Introduction of transplantation coordinators at hospital level
2008	Introduction of professional training programs
2008	Implementation of the disease management programme for ESRD
2009	Public awareness campaigns
2009–11	Participation in the European collaborative partnership on organ donation
2011	Restructuring of the ministry of health
2012	Third reform of the national body as part of a wider administration reform. Merging of the Portuguese blood institute with the ASST and creation of the Instituto Portugues do Sangue e da Transplantação (IPST)
2013	Transposition of the Directive 2010/53/UE – Law 36/2013 defining norms that aim to guarantee the quality and safety of human organs intended for transplantation(10).

Table 2. Organ transplants and donors in Portugal and comparison with Europe, 2018

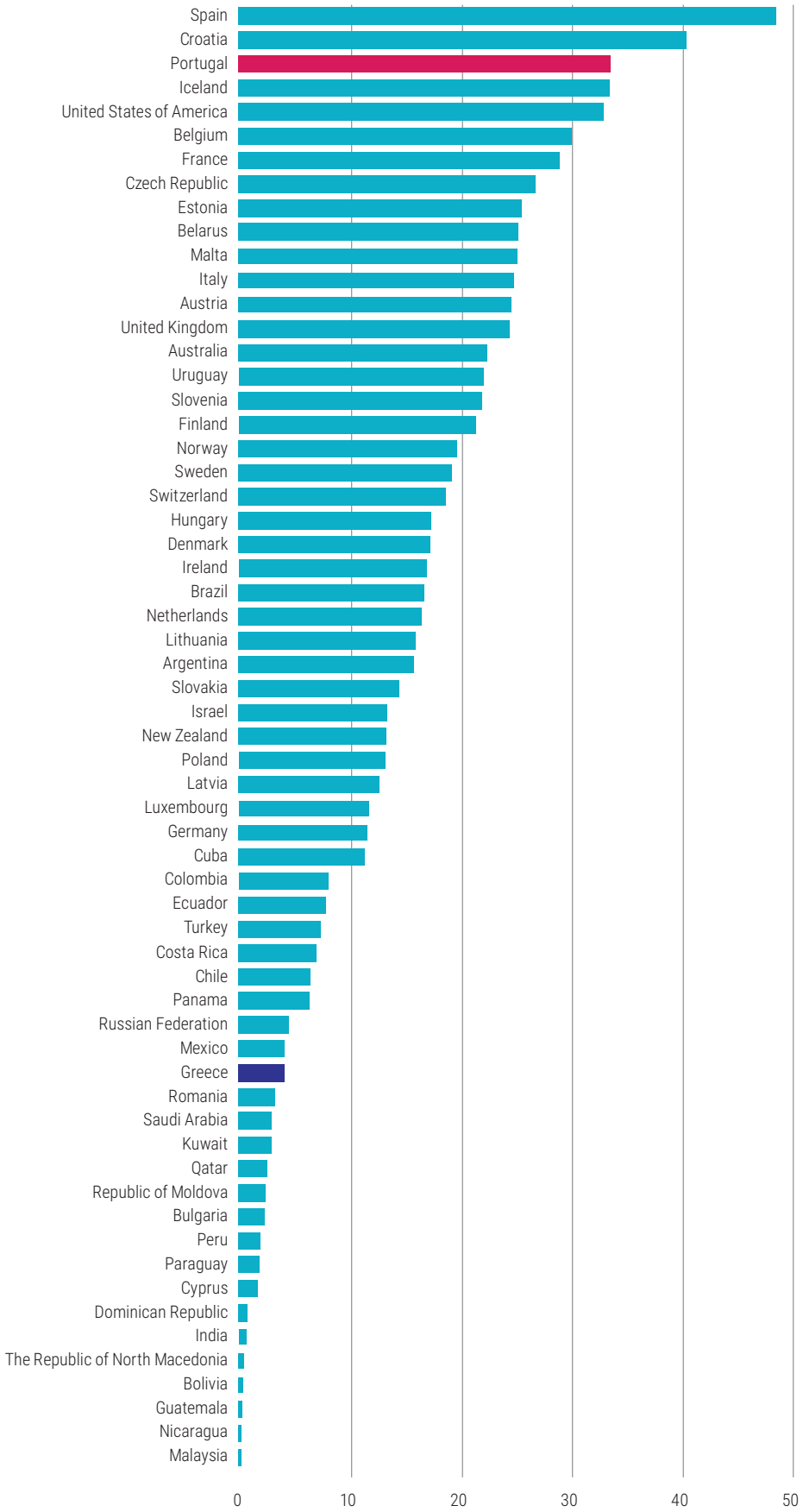
	Portugal (absolute)	Portugal (pmp)	Europe (absolute)	Europe (pmp)
Population (millions)	10.3		789.5	
TOTAL Actual DD	344	33.4	13,226	16.8
Actual DBD	316	30.7	11,370	14.4
Actual DCD	28	2.7	1,856	2.4
TOTAL Kidney Tx	502	48.7	27,917	35.4
DD Kidney Tx	443	43.0	20,097	25.5
LD Kidney Tx	59	5.7	7,820	9.9
TOTAL Liver TX	232	22.5	10,520	13.3
DD Liver Tx	219	21.3	8,911	11.3
LD Liver Tx	1	0.1	1,584	2.0
Total Transplants	829	80.5	**44,283**	**56.1**

Data are based on the Global Observatory on Donation and Transplantation (GODT) data, produced by the WHO-ONT collaboration(12)

Note: DD = deceased donor/donation, DBD = donation after brain death, DCD = donation after circulatory death, LD = living donor/donation, Tx = transplant

As shown in figure 1, Portugal ranks third in the world in terms of overall donations from deceased donors (DD)(11). The majority of donors are received after brain death, whereas donations after circulatory death (DCD) only make up a small percentage of donations. Living donations (LD) make a small but significant contribution to overall donation rates.

Figure 1. International actual deceased organ donor (DBD and DCD) rates (pmp), 2018(11)



Key features of the transplantation system

1 Legislation

Definition of brain death

In Portugal, brain death is defined as complete and irreversible cessation of brain stem functions as opposed to the additional requirement of cerebral brain death in other European countries. Regulations on the procedures of brain death diagnoses are further regulated in guidelines by the Portuguese Medical Association(13).

Donation after circulatory death

Only uncontrolled donation after circulatory death (uDCD) is legally permitted in Portugal. Programmes for controlled donations after circulatory death are being prepared but are not pursued due to the legal situation at the moment. As a result, uDCD programs account for all donations after circulatory death in Portugal.

Co-existence of uDCD and extracorporeal cardiopulmonary resuscitation

In 2018, a research group from the University of Porto pioneered the use of a clinical protocol that included both advanced resuscitation techniques using an extra-corporeal membrane oxygenation (ECMO) device for cardiopulmonary resuscitation (CPR), as well as uDCD. Patients that were considered to have a potentially reversible cause of cardiac arrest and had received high-quality CPR up until the point of decision received the advanced resuscitation intervention. In patients that did not fit inclusion criteria, CPR was stopped after the recommended time, death was declared and patients were considered for uDCD. Patient outcomes after extra-corporeal cardiopulmonary resuscitation as well as donation outcomes were both comparable to international results(14).

Consent policy

Portugal has a system of ‘soft’ presumed consent legislation combined with a non-donor registry. Patients can object to organ donation in general, exclude certain organs from organ donation and state their willingness to donate for scientific or transplantation purposes. Forms to do so are available in local health centres and non-donors receive a certification of non-donation after completing the process. Documentation requires authorisation via a unique identifier from the citizen’s card.

Once a potential donor is identified by hospital donation coordinators, regional transplantation coordinators check the national registry for documentation of the potential donor’s will. This step is mandatory and legally required by article 15 of Decree -Law No. 244 / 94. In case there

is no registration, families are being consulted to obtain the potential donor's wishes. Although not mandated by law, family objection will typically end the donation process.

However, in cases where there is an urgent organ request, organ donation can be pursued without consulting the family provided there is no documentation of non-donation in the national registry.

This system applies to Portuguese adult citizens and residents that have stayed in Portugal for over five years. Non-residents are treated according to the legislation of their home country and national authorities are consulted in each case in order to follow the appropriate regulations. A strong family role persists and presumed consent legislation is only executed in the case of an urgent organ request(13,15).

Living donation

In Portugal, directed and undirected living donations are legally permitted. Since 2007, directed living donations do not require a genetic relation between donor and recipient. A kidney exchange programme (KEP) has been initiated and the first transplants were performed in 2013. In 2018, a total of 59 living kidney transplantations were performed in Portugal (12,13,15,16).

2 Governance

National Transplant Organisation

The national transplant body, Instituto Portugues do Sangue e da Transplantação (IPST), regulates and coordinates the donation and transplantation of organs, blood, tissues and cells. This work includes coordinating the collection, analysis and processing of organs, maintaining registers, managing waiting lists and the selection of recipient donors according to expert consensus. IPST also provides training for health care personnel, pursues transplantation-related research in collaboration with national research institutions and is responsible for international collaborations and representation.

Additionally, the IPST is responsible for monitoring activities of organ procurement and leading the strategic development of organ donation by proposing political and legislative reform and implementing it in cooperation with hospital donor coordinators(17).

Regional organ procurement offices

Regional organ procurement offices are responsible for the coordination of organ retrieval, allocation and transportation. While following national guidelines from the IPST, they are autonomous institutions based in university hospitals. They incorporate the role of transplantation coordinators who are health professionals with expertise in the field of organ donation and special training in the field of organ retrieval coordination. Working closely together with hospital coordinators, they are responsible for checking the national non-donor registry, the coordination of donor assessment in cooperation with histocompatibility centres,

the allocation of organs according to national guidelines and the organs' transportation to transplant units. In doing so, they collaborate with the air force as well as the police who undertake the transportation of organs depending on the distances that need to be covered. This includes organ transit from Madeira.

3 Hospital donor coordinators

Following the Spanish Model and recommendations made in the EU action plan, Portugal has introduced hospital donor coordinators into every hospital in order to facilitate the organ donation process. Hospital donor coordinators identify potential organ donors, carry out the family consultations, overview legal requirements and promote organ donation in the hospital they are located in. As part of the ICU staff, they closely cooperate with intensive care physicians for donor maintenance and train collaborating staff in the process of organ donation. Additionally, they closely cooperate with regional transplantation coordinators for procurement and allocation of organs to transplant centres.

There currently is at least one organ donation coordinator located in each of the 45 participating hospitals in Portugal. Additionally, there are five regional transplantation coordinators and one transplantation coordinator at the national level. Organ donation coordinators are required to be physicians and are mostly intensivists and emergency or internal medicine specialists(13,15).

4 Training

The IPST provides training opportunities for coordinators and other health care professionals in collaboration with the internationally recognized Spanish training institution TPM-DIT which is supported by the University of Barcelona. Training sessions not only serve the purpose of professional development but also provide an unique opportunity to build networks within the organ donation community that help to strengthen awareness and cooperation within the system.

5 Quality assurance programme

Similar to the Spanish national transplant organisation, the Portuguese authorities have established a quality assurance programme which aims to identify and benchmark potential for organ donation. In audits, death statistics are reviewed, and feedback is given to hospitals on their potential for organ donation at regular meetings. Indicators for benchmarking are based on the European ODEQUS project.

6 Hospital compensation

In general, public hospitals are paid in prospective global budgets that are based on case-mix and outpatient volume(5). For donation purposes, hospitals that perform an organ procurement receive a fee that includes compensation for the hospital donor coordinator's commitment in donor detection and maintenance, as well as for ICU staff, procurement and assessment of transplants. General budgets include funding for 10 hours per week of a hospital donor coordinator that is part of the general staff. Additionally, €500–€1,000 per month are provided for out-of-hours consultations by donor coordinators to ensure availability of organ donation expertise at all times.

Transplant centres receive funding for the regional transplantation coordination office. Transplantations are paid for based on activity.

Histocompatibility laboratories are part of the national transplant organisation and are paid based on activity.

7 Public awareness campaigns and communication

Public awareness campaigns were launched in 2009 and regular meetings with journalists established. Selected journalists are also invited to join professional training sessions that include specific workshops for journalists. Each year 20 July is promoted as the national day of organ donation in Portugal. Transplantation authorities prepare special presentations on organ donation in schools and are working together in community events with stakeholders such as the Catholic Church and patient organisations. Recent attempts to promote organ donation fall in line with broader attempts to ensure patient participation in the health care system. Programmes to improve knowledge and communication skills in health care professionals dealing with organ donation are in place.

8 Bilateral and international collaborations

In addition to participation in multiple EU-funded programmes in the field of organ donation during the last parliamentary term, there is a bilateral cross-country exchange cooperation with Spain. If an organ from a Portuguese donor cannot be allocated to a suitable recipient, the organ is offered to the Spanish system. Portuguese patients are also eligible to join the Spanish waiting lists for lung transplants. Similarly, patients that need a liver donation urgently can also join the Spanish allocation list if no organ can be found within Portugal(13,15).

9 Digital donation and transplantation registry

Supported by EU-funding, the Portuguese authorities set up a digital donation and transplantation registry in 2014. After a trial period that included the training of hospital donor coordinators and transplantation coordinators, the programme officially started in 2016. The secure IT system is maintained by the Ministry of Health and allows digital access by transplantation professionals across the country on multiple devices.

The registry includes clinical donor information (HTLA matching, serology, photographs, biopsy results etc.), a real-time workflow (from procurement to patient follow-up), waiting lists, documentation of non-donation intent, reimbursement information and a data visualisation tool.

This system serves multiple purposes. First, it allows for precise communication between different professionals (e.g. when discussing suitability of organs for transplantation). Second, it supports a standardised workflow from donation to transplantation by automatically setting a timeline for different parts of the donation and transplantation process. Third, the standardised data collection simplifies the audit and quality assurance system of the Portuguese authorities so helping to identify areas of improvement and inform national strategies. Fourth, the system ensures traceability of organs and builds a biovigilance system that detects and documents adverse events and can send out alerts to the professionals involved. Finally, it can be used for the purposes of research in the field of organ donation and transplantation.

Key Lessons

Portugal is a country which has managed to implement the Spanish model to suit its own particular circumstances, and which is almost identical to Greece in terms of size, population and financial resources. A number of key lessons can be drawn from this example.

A set of basic reforms can have an immediate and substantial impact

A set of reforms in the late 2000s included the reorganisation of the national transplant organisation, the implementation of transplantation coordinators, training efforts and public campaigns. These reforms were based on adapting the Spanish model of organ donation and transplantation and were mostly aimed at increasing DBD donations. As a result, donation rates substantially increased before stabilising at a comparatively high level of around 30 per million population (pmp). This shows that health reforms based on the Spanish model can lead to measurable improvements in donation rates within a comparably short period of time. Also, reforms did not include the more advanced policies of the Spanish system but still achieved substantial results.

Continuous financial support is crucial in ensuring consistent donation rates

In line with the above mentioned reforms, financial support for organ donation was increased in 2007. After high levels of donation were achieved, subsequently a slow downwards trend was observed. This downwards trend was exacerbated when financial support was reduced by 50% in 2011 following the economic crisis. This put the donation and transplantation system under enormous pressure and significantly reduced the morale of the professionals involved. As a lesson, continuous and sufficient reimbursement for performing organ donation and transplantation is crucial in achieving successful structural reforms.

A national IT system supporting complex workflows

The Portuguese organ donation and transplantation registry is a successful example of implementing digital infrastructure in the health sector. The online system supports precise communication, transparency and standardised workflows across the different steps of the organ donation and transplantation pathway.

Drawing Strength from Collaborations

Portugal has managed to effectively use European resources to support its national reforms. Reforms such as the implementation of a quality insurance program were promoted by the EU-action plan on organ donation. The work on quality indicators and end-of-life care at the European level (ODEQUS, ACCORD) has helped the Portuguese authorities to set up the auditing and quality assurance processes required.

Portugal has also benefited from the cooperation in the field of professional training. Training is supported by the expertise from the Spanish educational institution TPM-DTI and cooperation in the European project Train the Trainers ensured high-quality training for local professionals.

Even under challenging circumstances, Portugal has managed to take opportunities. After the financial crisis, supervised by the European 'troika', the Portuguese authorities successfully restructured the existing fee-for-service scheme in dialysis care and managed to reduce expenditure while maintaining quality.

These collaborations illustrate how cooperation on a bilateral or European level can drive national progress and can compensate for limited national resources.

Actively including state institutions and civil society in the process of organ donation reform

Efforts by the Portuguese authorities to include the public as well as actors from civil society can be seen as a promising way to sustainably raise awareness for organ donation and ensure acceptance for donation reform. Involving the police and military forces in the process of organ transportation can increase the visibility of organ donation, and including religious groups is a promising approach to tackling the ethical and secular dimensions of organ donation.

Targeting demand: the need for preventative policies addressing chronic kidney disease

Efforts to reform the care of chronic kidney disease illustrate the importance to put focus on reducing the demand for organ transplants. Preventative policies aimed to reduce cardiovascular risk factors, an efficient financing arrangement for dialysis care and a focused approach to manage care for patients suffering from CKD can help reduce wasteful spending and reduce the number of patients that are in need for an organ transplant.

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Appendix 5

Case study – Spain

LIST OF TABLES & FIGURES

Introduction: national context

The Spanish health system provides universal access to healthcare for its 47 million people. The system is tax funded and structured into national and regional authorities. Planning and regulation is coordinated at the national level, whereas resource allocation, purchasing and provision of healthcare services are carried out by 17 decentralised regional authorities.

In 2017, Spain spent €2,221 per capita on health care (purchasing power standard, €2,371). This represented 8.9% of gross domestic product (GDP). To put this in context, the average spent on health care in the European Union (EU) in 2017 was 9.9% of GDP, or €2,887 per capita. Of the Spanish spending, 66.5% was from government schemes, 4.1% was from compulsory schemes and savings accounts, and the remaining 29.4% from other financing agents(1).

Despite a lower-than-EU-average spend on health care, Spain has comparably low rates of preventable and treatable mortality, arguably due to a well-functioning system of primary care and effective public health programmes. At 83.4 years, life expectancy in Spain is the highest in Europe. However, there is a large discrepancy between the sexes, with life expectancy for women being 86.1 years, and for men 80.6 years(2).

However, the health system faces challenges such as dealing with the high number of chronic conditions in an ageing population, increasing rates of obesity and retaining a sustainable health care workforce in the future. Spain has a chronic kidney disease prevalence(CDK) of 15.1% which is higher than that of other European countries(3). There have been efforts to decrease cardiovascular (CV) risk factors, which play an important role in the development of kidney disease. Currently, there is no specific policy addressing tertiary prevention of CDK(4).

The Spanish transplantation system and current performance

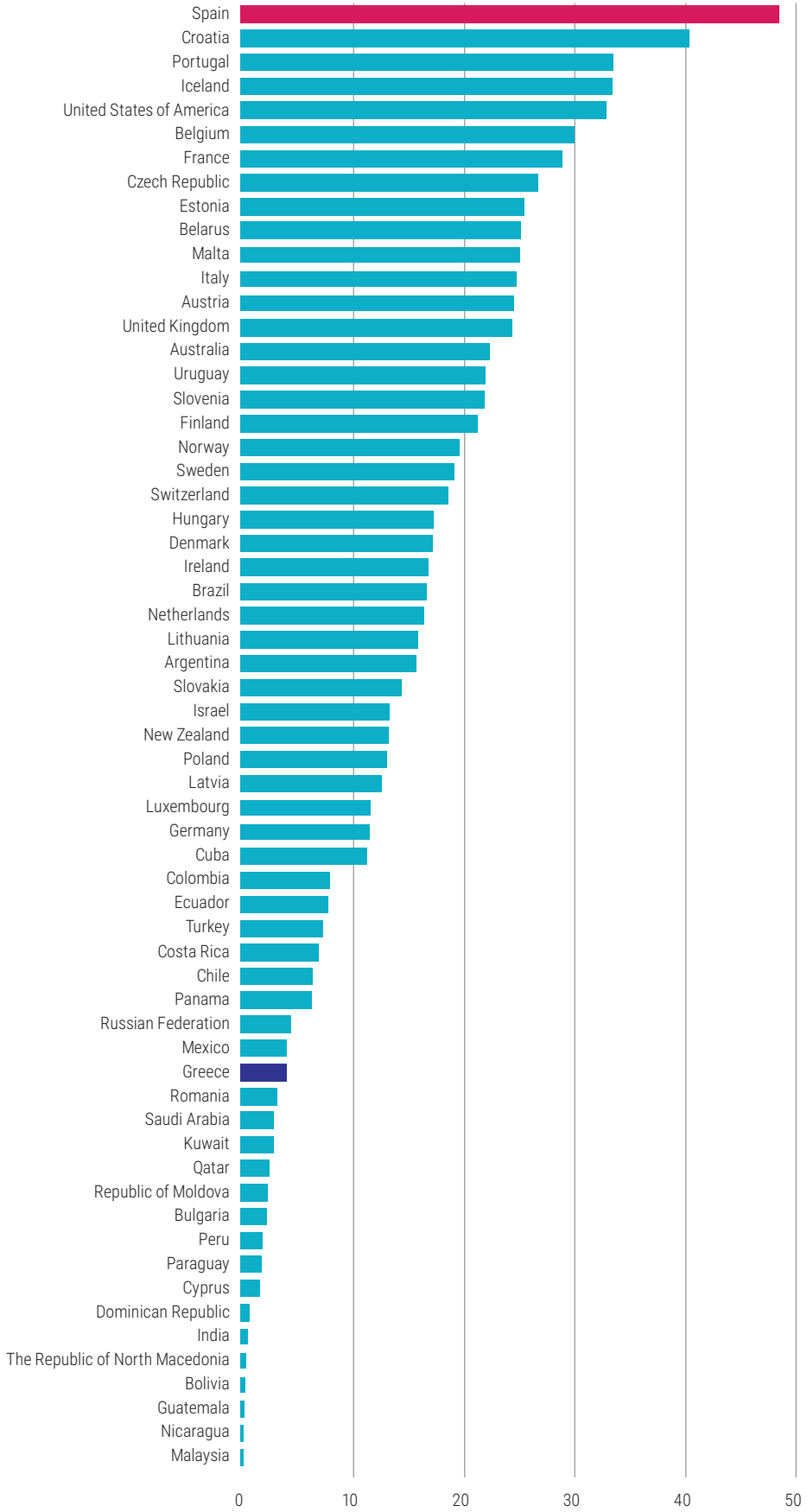
The core of the Spanish transplantation system goes back to reforms in 1989 that introduced several components: a communications strategy targeting the media; a three-level organisational structure with the national transplant organisation (NTO) acting as a support and coordination agency; a quality assurance system; extensive training capacity, a transplant coordinator programme; and hospital reimbursement for donation purposes.

These characteristic features were supplemented by the 2008 '40 Donors per million population (pmp) Plan' which adjusted the eligibility criteria for donation, shifting the focus to identifying potential donors outside of intensive care units (ICU) and permitting controlled donation after circulatory death(5).

The most recently proposed reforms to the Spanish transplantation system are documented in the '50 x 22 strategic plan'. The plan includes measures to increase living and paediatric donations, foster the donation of organs from private sector hospitals and expand the use of multiple organs from donors after circulatory death(6).

As shown in figure 1, with 49 deceased donors pmp, Spain has the highest donation rates worldwide(7). Donation rates in Spain have been steadily increasing since the 1990s. This was achieved despite a successful reduction in traffic accidents which resulted in a decline in the number of potential donors(5).

Figure 1. International actual deceased organ donor (DBD and DCD) rates (pmp), 2018(7)



In 2019, a new all-time peak was reached with a total of 5,449 organs transplanted(8). Table 1 shows the high number of donors, and organs transplanted. The majority come from donation after brain death, but donations after circulatory death have increased and now make up 32% of all donations. Because of its success in achieving high donation rates, the Spanish transplant system has served as a model for health care reforms in several countries. However, despite the high donation rates, there remain significant levels of unmet need for transplants. In 2019, a total of 4,889 patients were waiting for a transplant(8).

Table 1. Organ transplants and donors in Spain (2019) and comparison with Europe (2018)

	Spain (absolute)	Spain (pmp)	Europe (absolute)	Europe (pmp)
Population (millions)	47		789.5	
TOTAL Actual DD	2,302	49.0	13,226	16.8
Actual DBD	1,557	33.1	11,370	14.4
Actual DCD	745	15.9	1,856	2.4
TOTAL Kidney Tx	3,423	72.8	27,917	35.4
DD Kidney Tx	3,088	65.7	20,097	25.5
LD Kidney Tx	335	7.1	7,820	9.9
TOTAL Liver TX	1,227	26.1	10,520	13.3
DD Liver Tx	1206	25.7	8,911	11.3
LD Liver Tx	21	0.4	1,584	2.0
Total Transplants	**5,499**	**117.0**	**44,283**	**56.1**

Data for Spain drawn from the 2019 transplantation activity report(8)

Note: DD = deceased donor/donation, DBD = donation after brain death, DCD = donation after circulatory death, LD = living donor/donation, Tx = transplant

Key features of the transplantation system

1 Legislation

The legislative framework for solid organ donation and transplantation activities is set out in Law 30/1979 on Procurement and transplantation of organs as well as in two complementary royal decrees (2070 and 1723) passed in 1999 and 2012 respectively. The legislative framework states an opt-out consent policy, the possibility for organ donation after brain death as well as after controlled and uncontrolled circulatory death, and sets prerequisites for living donation. Living donation (LD) must be altruistic and approved by an ethics committee but does not require a family relationship. The principle of subsidiarity applies, meaning that in order to qualify for living donation there must not be a post-mortem donation available. The legal framework also regulates the activities of the organisational structures of the transplantation system(9).

2 Governance structure

Matching the overall structure of the Spanish health system, the transplantation system has three organisational levels. As a national body, the NTO makes up the first level. The 17 regional offices represent the second level. The third level is represented by hospitals participating in organ donation and their dedicated transplant coordinators. This network has expanded over the years with a total of 170 hospitals participating in 2009. The donation system is completed by transplant centres, which are responsible for the clinical process of assessing candidates, carrying out the transplants and post-transplantation follow up. Each of these elements has a characteristic profile(10).

3 The National Transplant Organisation

As the top level of the three-level organisational structure the Spanish national transplant organisation, Organización Nacional de Trasplantes (ONT), is responsible for donation and transplantation activities in the field of organs, tissues and cells.

The ONT is responsible for the management of waiting lists and registries and the transportation of organs and transplant teams. It develops and promotes training programmes for health care professionals and provides information to the public, media, patients associations and health administration. Health care professionals within the system are provided with 24-hour support on diagnosis and eligibility criteria. The overall proactive support function of the ONT is especially important for smaller hospitals with less capacity.

Finally, the ONT takes the lead in the overall strategy for donation and transplantation in Spain. It coordinates a quality improvement system that monitors and benchmarks performance within different hospitals and regions, and files statistics and official reports. It oversees the drawing up of regulations and guidelines, coordinating relevant stakeholders. It thereby acts as an intermediary between frontline health care actors and politics in the process of political reform(9,10).

4 Regional offices

Reflecting the organisation of the Spanish political system there are 17 regional offices of the national transplant organisation, each representing one of the 17 Spanish autonomous regions. Along with ONT they act as an intermediary between political decision-makers and hospital personnel. Regional offices and ONT come together in commissions to agree on policies dealing with organ donation and transplantation. They also support the coordination of organ transportation(11).

5 Transplant coordinators

The transplant coordinator[1] or key donation person is the most characteristic feature of the Spanish model. The transplant coordinators have the responsibility to coordinate the donation process 'on the ground.' This includes donor detection, evaluation and maintenance, organisational and legal matters and monitoring and reporting of donation activities. A key task is carrying out the consultation with the family to obtain consent for donation. The coordinators work closely with other personnel involved in the donation process but they answer to their hospital administration and not to transplantation teams. Transplant coordinators are recruited from in-house hospital staff. In Spain, they tend to be ICU physicians, potentially supported by nurses in bigger centres. They usually spend dedicated time on their responsibilities but keep working in their original clinical position. As a result, they work in close proximity to potential donors and can be appointed even in small hospitals(10).

6 Quality assurance

An essential part of the Spanish system is a continuous quality assurance system. Potential for organ donation is monitored and performance of hospitals is evaluated and benchmarked. Regular internal audits collect individual hospital data on deaths in ICU units, brain deaths, potential donors and actual organ donations as well as factors to account for local differences.

[1] Following the original Spanish term `coordinador hospitalario de trasplantes`, we refer to the professional role that is described above as `transplant coordinator'. This role corresponds to the term `organ donor coordinator` or `key donation person` that we use to summarise similar roles across countries in the main body of the report.

These internal audits carried out by local transplant coordinators are then complemented by external audits, usually carried out by personnel coming from a different regional office. This learning process was the basis for continuous reform. For example, the focus on medical suitability criteria was based on quality audits showing inappropriate classification of donors(5,10).

7 Reimbursement and financial incentives

Recognising the importance of reimbursement, hospitals in Spain receive an annual budget for donation purposes. Reimbursement is based on the previous year`s donation activities and compensates hospitals for the significant resources necessary for organ donation(12). Transplant professionals have individual compensation arrangements that can vary between regions and centres.

Organ donation in Spain is by law defined as a purely altruistic act, and receiving financial compensation/profit for organs is prohibited. However, some regional authorities can reimburse funeral and repatriation costs for families who do not have insurance coverage for these costs(13).

Also, some hospitals grant financial incentives for medical professionals undertaking organ donations. Even though this practice is seen as not instrumental to the success of the Spanish system in increasing donor rates, the potential effect on donation rates is acknowledged. This can lead to conflicts of interest when the transplant coordinator is responsible for the initial care of the patient, identifying them as a potential donor and approaching the family, while at the same time receiving a financial bonus for a successful organ donation. Conflicts of interest should be made transparent(13).

8 Soft opt-out consent policy

By law, if Spanish citizens do not express their refusal during their lifetime, they are considered as potential organ donors and their organs can in theory be retrieved. As there are no official donor/non-donor registries in Spain, patient preferences are investigated by checking the patient's belongings for donor cards or any other expression of the patient's will and by consultation with the family. Therefore, in theory legislation in Spain can be classified as 'presumed-consent' or 'opt-out' as opposed to an informed-consent policy in which an expression of willingness to donate is considered necessary for organ donation. This policy is often referred to as a key characteristic of the Spanish system. However, in practice if the will of the patient remains unknown and their family cannot be reached, no donation is undertaken. Also, the family plays a more prominent role than they are required to by law. Not only are they are consulted to find out the patient's wishes, but they can effectively refuse organ donation even if the patient's consent is documented. Therefore, in practice the Spanish system of consent is, in reality, a soft opt-out system.

The impact of the Spanish consent policy on donation rates in Spain is an issue of debate. Supporters of presumed consent policies argue that presumed consent legislation even when not practised can have an impact on family refusal rates and that the legislation has contributed towards today`s high donation rates in Spain. However, there is no data available directly prior and after the change in legislation and an initial increase in kidney donations from 1979 until 1986 is difficult to differentiate from a geographical expansion in the transplantation programmes at that time. Also, the initial upwards trend in donation did not continue until 1989 when major structural reforms were introduced and the continuous and exceptional increase in donation rates of the Spanish system started. Consequently, Spanish officials stated that it was unlikely that the legislation in Spain was responsible for the success of the Spanish system in achieving high donation rates. Therefore, the development of Spain as the leading nation in organ transplantation cannot be confidently attributed to its consent legislation alone(9,14–21).

9 Eligibility criteria

Spain expanded its donor base by focusing on eligibility criteria for donation in terms of age and medical suitability. Donations from higher age groups are associated with higher mortality rates and higher risk of graft failure. However, receiving a kidney from an older donor has shown lower mortality rates compared to the alternative of remaining on the waiting list and continuing dialysis treatment. Eligibility criteria were readjusted to allow for more flexibility in accepting organ donations from donors over the age of 65. These donations are age-matched and substantially contribute to kidney donation rates in Spain.

Inappropriate classification of donors as medically unsuitable was also identified as a problem. In order to prevent donors being inappropriately classified, ONT provides a 24-hour consultation service for physicians providing guidance and a second clinical opinion. In addition, national evaluation criteria for donors were established and a programme was started to foster the use of organs from non-standard risk donors (e.g. Hepatitis C (HepC) positive donors). As a result, a total of 101 transplantations were successfully performed from HepC positive donors to HepC negative recipients in 2019(5,8).

10 Donation after circulatory death

Historically, Spain focused on uncontrolled donation after circulatory death only. Due to the ethical and logistic challenges, only a limited number of specialised centres in major cities performed donation after uncontrolled circulatory death (uDCD). Nonetheless, Spain's numbers of donations after uDCD are among the highest in Europe. In recent efforts to foster uDCD donations, additional smaller hospitals have also implemented uDCD programmes.

Controlled donation after circulatory death did not play a role until 2008. Due to changes in end-of life care practices, the decision to withdraw life-sustaining treatment was made more often. Simultaneously, a decrease in donation after brain death (DBD) donors (partly due to a

reduction in fatal traffic accidents) was observed. In response, Spain shifted its focus to donation after controlled circulatory death (cDCD). Following a national consensus building process involving all relevant stakeholders, Royal Decree 1723 was passed in 2012 setting minimum requirements and allowing cDCD. The establishment of the legislative framework was accompanied by training efforts and public education. Since then, the practice has been taken up rapidly. Today, more than 120 hospitals participate in cDCD donations. In 2018, cDCD accounted for 28% of all donors.

One key aspect in achieving acceptable outcomes in uDCD that is also increasingly playing a role in cDCD is using machine perfusion technology in organ preservation protocols. Spanish researchers pioneered the setting up and expansion of these techniques to improve organ availability as well as graft and patient survival.

As a result of these measures, Spain has been successful in obtaining a substantial base of contributions from both controlled as well as uncontrolled donations after circulatory death, which together constituted 32% of all donations in 2019(5,8,22,23).

Detailed protocol: uncontrolled donations after circulatory death

In 11 national programmes, emergency service teams directly contact the transplant coordinator in charge once they have unsuccessfully performed cardiopulmonary resuscitation (CPR) for the recommended amount of time. At this point, further CPR is considered futile and treatment would usually be stopped. Instead, together with the transplant coordinator, emergency physicians make a decision as to whether the patient meets the inclusion criteria for organ donation. Once a positive decision has been made, CPR and ventilation are continued in order to protect the organ, and the patient is transported to the cooperating hospital. Meanwhile at the hospital the transplant coordinator activates a process to have a transplant team and appropriate ICU or emergency facilities ready. A physician independent from the transplant team then diagnoses death after a five minutes no-touch period in which all CPR and ventilation is stopped. CPR and ventilation are then resumed, to protect the organ. Simultaneously, consent for organ donation is obtained by consulting the family. Additionally, permission from the criminal court needs to be obtained in case the exact circumstances of death are unclear. A notice is send to the court and if no concern is expressed within 15 minutes, permission is granted.

Once consent from all sides is obtained, the retrieval and procurement procedures start using either preservation, hypothermic or normothermic perfusion protocols. Normothermic perfusion protocols have proven to be the most effective technical option and are recommended as practice of choice by national guidelines in Spain.

Overall, Spain manages to successfully implement these highly complex procedures which require multiple components: a well-functioning emergency service staffed with physicians; a transplant coordinator as well as additional human resources required for transplantation in place at hospital level; appropriate training of all actors and functioning cooperation between them; specific guidelines on how to address and obtain family consent; the existence and

following of precise guidelines concerning CPR to avoid conflicts of interest; legislation stating a definition of death allowing for organ donation after circulatory death; and effective protocols in place to deal with legal and court issues(23,24).

Detailed protocol: controlled donation after circulatory death

In order to participate in cDCD programmes, Spanish hospitals need to document an existing end-of-life care protocol as well as a cDCD protocol approved by the local ethics committee and authorisation by the regional authorities.

On hospital level, once sustaining end-of life care is deemed futile and that information has been passed on to the family, the transplant coordinator is contacted to discuss the option of organ donation. If continuing life-sustaining therapy is likely to result in brain death, this option is preferred over cDCD donation.

Technical procedures include definition of death after five minutes of no spontaneous circulation or respiration, authorised pre-mortem procedures such as heparinisation and cannulation of vessels and a rapid recovery approach complemented by experimental studies using normothermic perfusion procedures in cDCD(23).

11 Technical innovation as a driver of increasing donation rates

The use of mechanical perfusion with ECMO (extra-corporeal membrane oxygenation) devices improves organ oxygenation and allows for a better examination of organ suitability, potentially leading to better graft survival. Research in this area has significantly improved patient outcomes and has made the success of the Spanish uDCD programmes as well as the expansion of eligibility criteria possible. Mechanical perfusion techniques are now also being examined in the area of cDCD and have shown promising results. In order to allow for these procedures to take place in smaller hospitals, providing mobile ECMO devices is currently being tested.

Pre-mortem canalisation and heparinisation are additional innovations with potential to further improve patient outcomes in DCD(23).

These technical innovations have been accompanied by legislative changes that prescribe five-minute no-touch periods and legitimate pre-mortem heparinisation and cannulation.

Taken together, technical innovations in the field of organ preservation continue to contribute to exceptional Spanish donation rates by improving the quantity and quality of organs retrieved via donation after circulatory death(23).

12 Identifying potential donors outside of ICU units

In 2016, Spanish investigators conducted a study to characterise current end-of life care practices(25). The aim of the study was to evaluate potential room for improvement in organ donation. Patients that were possibly eligible for organ donation (because they had suffered from a devastating brain injury) were followed up in order to examine whether these patients actually ended up becoming donors. The investigators found that a significant proportion of patients did not become organ donors because they were not considered to be eligible for donation and the transplant coordinator was not contacted. As a potential reason, the authors discuss the fact that 28% of possible donors die outside of ICU units where awareness of the possibility of organ donation is less present than in ICU units. In order to technically facilitate organ donation from patients that are never admitted to an ICU unit, there is the possibility to start intensive care (including continuing or starting ventilation) not for therapeutic purposes but to facilitate organ donation (elective, non-therapeutic intensive care). This concept is supported by Spanish guidelines but not practised ubiquitously in Spanish hospitals. Spanish administration has put effort into creating, harmonising and implementing guidelines on this concept. Additionally, it has been integrated into the curriculum for transplant coordinators and relevant medical staff. It is estimated that 24% of donors in Spain are identified outside of ICU units and admitted for donation purposes(25).

This approach is subject to multiple challenges. Some uncertainty remains as to whether patients that are considered likely to develop brain death, will actually become brain dead and if so, within what time period. Thus, a risk of patients remaining in a persistent vegetative state remains(13). At the point admission to the ICU unit there is also uncertainty as to whether contraindications might come into play later that will prevent the patient admitted from actually becoming an organ donor. In the Spanish study, 120 out of 200 patients admitted to the ICU under this regime effectively donated organs. The remaining 80 patients did not donate because of contraindications, family refusals or because brain death was not confirmed and no donation after circulatory death was pursued. Median time spent in the ICU unit was one day(25).

This policy also illustrates ethical issues concerning end-of life care and organ donation: first, the capacity of ICU and the dilemma of prioritising admittance to ICU units; second, the challenging interrelations between end-of life practices and organ donation.

These ethical considerations must be carefully discussed and taken into account when adapting Spanish policies for end-of-life care(13).

13 Training and Accreditation

Training

Specialised training capacities are an essential part of the Spanish model and are centred around the Transplant Procurement Management organisation in Barcelona. The organisation was founded by transplantation professionals with the initial goal of training transplant coordinators. It is closely connected with the University of Barcelona and has merged with the Donation and Transplantation Institute, a non-profit organisation set up to improve organ donation in 2010. The overall goal is to provide education for medical professionals (physicians, nurses and hospital management) in the field of organ donation and transplantation. The institute aims to create a positive attitude towards organ donation in professionals, enable them to implement high-quality donation and transplantation programmes, and ultimately improve the quality and number of organ donations.

This goal is pursued by offering a variety of courses in the area of organ donation.

Teaching content covers aspects of donation, transplantation and management. Teaching formats range from short-term seminars up to a one-year master's degree and include clinical internships, online teaching as well as on-site training and blended learning formats. The institute offers courses at introductory, intermediate and advanced level and awards European Credit Transfer (ECT) credits; the tutor–student ratio is 1:1. Initially founded for training professionals in Spain, it has become the leading training institution in the field of organ donation worldwide. It now cooperates with multiple countries throughout the world in order to set up and accredit national training programmes while still sharing expertise by inviting participants for parts of their training to Spain(26,27).

A key training aspect in Spain is the family consultation. Family refusal rates dropped after the introduction of changes to training, even though general support for organ donation during that period remained unchanged. Therefore, it was concluded that training professionals how to approach families has a major impact on family consent rates(10,15).

Accreditation

Having a leading role in teaching in the field of transplant coordination, the university of Barcelona also took a prominent part in establishing the first accreditation system for transplant coordinators. In cooperation with the European Transplant Coordinators Organization, the first official accreditation programme was established in 2001 to define and certify quality standards for transplant coordinators throughout Europe. Further developed under the European Board of Transplant Coordinators (one of the four boards of the Division of Transplantation of the European Union of Medical Specialists (UEMS)), accreditation is provided based on previous experience as a transplant coordinator and an exam covering different aspects of organ donation and transplantation. Illustrating the leading role of Spain in organ donation, Spain is the leading nation in having transplant coordinators accredited(28).

14 Media campaigns and other strategies

Coming from the perspective that media coverage has a more direct impact on public opinion and donation rates than public campaigns, special emphasis in Spain is put on targeting the media. The goal is to promote an appropriate and positive image of organ donation. Therefore, ongoing meetings between journalists and transplantation experts, as well as their communication-specialist colleagues, were established for educational and relationship-building purposes. In addition, ONT is directly accessible for journalists as well as the general public via a 24-hour phone line, thereby creating a direct system of communication without any intermediaries(29).

To increase awareness and ideally willingness to donate is one of the key targets of many policies in the field of organ donation. Understanding the role of the media as well as the impact of public campaigns is crucial.

Media coverage can have both negative and positive effects on donation rates. Media coverage of transplantation scandals, whether justified or not, has been shown to substantially reduce donation rates in multiple countries.

On the other hand, positive coverage can positively influence attitudes towards donation and consequently increase donation rates. This is illustrated by the case of Nicholas Green, a boy who became a victim of a violent crime in Italy and whose parents decided to donate his organs. The positive portrait is thought to have had a long-lasting impact on Italian attitudes towards organ donation.

Public campaigns in order to achieve similar effects over the long run have, however, shown mixed results. A meta-analysis summarising the effects of public campaigns on outcomes such as intention to donate, donation rates or talks with family members showed that, taken together, an increase of about 5% is being achieved. Studies were mostly from the US. Interestingly, interventions that involved direct communication showed better outcomes than general media campaigns. Also, targeting minority groups showed better results than targeting the general public(30). A study examining the impact of interventions targeted at Hispanic Americans illustrates that combined interventions including television coverage and radio commercials as well as additional educational programmes in schools and churches can have substantial effects on intention to donate rates. Interventions were specifically designed for the target population in terms of language and cultural sensitivity as well as the site of the intervention (e.g. discussing common religious misbeliefs in religious education programmes), illustrating the importance of targeting campaigns to the specific cultural setting(31)(32).

15 Adaptations in other countries

Based on the experience of different levels of success in implementation, several factors have been identified as playing a role in the successful implementation of the Spanish system:

Resources

Financial and human resources are important factors in organ donation. A minimum level of health care resources and critical care beds per capita is considered be an important factor for success. Number of critical care beds per capita in Spain is below the EU average(4,33). In terms of its health care workforce, Spain has a high number of physicians with relatively low income, so financial incentives are considered to be beneficial for increasing donor rates(34).

Governance

Publicly-financed, non-fragmented health care systems that provide universal health coverage are considered to be most susceptible to adapting the Spanish model. Based on previous experiences in Latin America, political support and continuity are also considered to be important factors when implementing the Spanish system.

Key lessons

The Spanish transplantation system has been a model for health care reforms in several countries around the world and has been adapted in parts or almost completely. Spain pioneered the organisational model at a national, regional and, most importantly, local and hospital level for the development of organ donation and transplantation. A number of key lessons can be drawn:

Creating a positive culture for organ donation

Spain has managed to develop a sense of national pride in its achievements in the field of organ donation. Among professionals, organ donation is not only seen in light of the benefits for patients receiving a transplant but also as an opportunity to improve local expertise and professionalism in participating hospitals. Professionals and the majority of the public share an exceptionally positive image of organ donation. This includes immigrants whose donation rates are comparable to those of the native population.

Public trust is built on a transparent, public, national system and a long history of continuous improvement rather than on short-term public campaigns. The official communications strategy in Spain is focused on building a positive relationship with the mass media in order to avoid catastrophic coverage and clarify misconceptions, rather than raising general awareness about organ donation.

A three-level organisational approach is the basis for the Spanish model

Centralisation of administrative processes, coordination, strategic development and guidelines within the national transplant organisation was a key reform in the history of the Spanish system. This was achieved despite a political system of 17 autonomous regions. Regional offices reflect the political circumstances and cooperate effectively with the national organisation as well as with transplant coordinators at hospital level.

Transplant coordinators to facilitate organ donation ‘on the ground’

Transplant coordinators with dedicated time and training are fundamental to increasing donation rates. Their role in donor detection, family communication and creating a culture of organ donation within every hospital is crucial. Their common professional background in intensive care facilitates communication with fellow professionals and their commitment allows for more sophisticated approaches such as uDCD to be coordinated effectively.

A culture of continuous improvement as a key factor for sustainable success

Spanish policy in the field of organ donation can be characterised by its systematic process of evaluation and continuous search for further improvement. A quality-assurance system which benchmarks hospital performance, gives feedback and discusses results with the professionals involved helps to identify potential for improvement and create an environment of constructive competition. This process is always ongoing. Investments in research have allowed improvements in end-of life practices and make substantial technical advances in the field of organ preservation. Both efforts have shaped national strategic policy.

Sufficient hospital reimbursement

Compensating hospitals for the costs associated with organ donation and transplantation is a key aspect of the Spanish system. Organ donation requires a significant time commitment from hospital staff and ties up hospital resources such as intensive care and laboratory capacities. This is especially relevant for smaller hospitals. Additionally, compensation for transplant professionals recognises commitment outside of regular working hours. Fair financial compensation is crucial in ensuring a long-lasting commitment from hospitals and staff.

Expanding the donor pool – finding new ways to increase donation rates

Besides its effective basis and high level of routine donations after brain death, Spain has identified multiple ways to further increase donation rates. Expanding the eligibility criteria has increased donation rates while still achieving acceptable patient outcomes. Fostering donations after circulatory death (both uncontrolled and controlled) enrols new patient populations eligible for organ donation, and focusing on possible donors outside of ICU units brings in donors that would have otherwise been missed.

Ethically challenging processes are based on well-developed protocols

In their efforts to increase the donation and transplantation rates, Spanish protocols go beyond restrictions other countries have made due to ethical considerations. Donation after circulatory death in general, uDCD procedures, maintaining circulation after the no-touch period, pre-mortem cannulisation and the technical procedures used to limit brain perfusion in organ retrieval are practices that are prohibited in other countries. Guidelines always reflect cultural differences and the Spanish protocols are well justified and transparent. However, they also build upon well-developed processes in the field of organ donation. Careful consideration should be given as to whether to adapt Spanish protocols in donation systems at an earlier stage of a programme's development.

The Spanish consent policy is not responsible for the success of the Spanish system

Although an issue of heated political debate worldwide, the effect of presumed consent policy in the Spanish context is overrated. In practice, there is no opt-out system in Spain and it certainly is not among the main drivers for the exceptional achievements of the Spanish model. Not pursuing donation in the case of family objection even in the case of documented donor consent is seen as a measure to maintain public trust in the system.

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Appendix 6

Case study – United Kingdom

LIST OF TABLES & FIGURES

Introduction: national context

The National Health Service (NHS) of the United Kingdom (UK) is funded from general taxation and provides universal coverage to its 66.4 million inhabitants, largely free at point of delivery. In 2017 the UK spent €3,409 per capita on health care (purchasing power standard, €2,899). This represented 9.6% of gross domestic product (GDP). Of this spend, 78.8% was from government funding, the remaining 21.2% being from other sources. To put this in context, the average spend on health care in the European Union (EU) in 2017 was 9.9% of GDP, or €2,887 per capita(1). There are considerable differences in the organisation, provision and delivery of the NHS between the four devolved jurisdictions of the UK. However, over the past two decades organ donation and transplantation has become the remit of one UK-wide agency: NHS Blood and Transplant (NHSBT). Although a single organisation is now responsible for the coordination and promotion of organ donation and transplantation throughout the UK, there are a few notable differences between the four countries regarding legislation and rates of donation and transplantation which will be expanded upon in the sections below.

The UK has a life expectancy of 79.5 years for men and 83.1 years for women, which is slightly lower than many other comparable Organisation for Economic Co-operation and Development (OECD) countries(2). Age, obesity, diabetes and hypertension are all risk factors for end-stage organ failure, and as in many other developed nations the proportion of the elderly population is rising in relation to the working age population In 50 years' time it is estimated that there will be an additional 8.2 million citizens over the age of 65. Around one in four adults have hypertension(3), and there is a greatly increasing prevalence of type 2 diabetes with one in 10 over-40s having this condition(4). This increase is largely driven by the rising proportion of the population who are overweight or obese, which in England currently stands at around 64.3%(5).

Smoking and alcohol consumption are also risk factors associated with end-stage organ failure. Fortunately, thanks to sustained public health initiatives, smoking rates have decreased steadily over the past few decades, and in 2018 only 14.7% of the adult population in the UK were current smokers(6). Levels of harmful alcohol consumption in England also seem to be decreasing(7). although there has been a rise in deaths directly attributable to alcohol consumption(7). There are wide regional and socioeconomic variations in the predictors of health in the UK and the gap in healthy life expectancy between the most and least deprived areas in England is around 19 years(8). Kidney Care UK estimates that around 3 million people in the UK have chronic kidney disease (CKD), and almost 30,000 are on dialysis(9). Rates of liver disease are rising, and liver disease is the third leading cause of premature death in the UK(10). Table 1 shows some of the common aetiologies in kidney and liver disease which may lead to organ failure and a need for transplantation.

Table 1. Common aetiologies in chronic renal failure and liver failure

Common aetiological factors in chronic renal failure	Diabetes
	Hypertension
	Obesity (increasing risk of diabetes and hypertension)
	Smoking
	Reflux nephropathy
	Glomerulonephritis – acute or chronic
	Polycystic kidney disease
	Blockages to urine flow – e.g. stones or prostate disease
	Autoimmune disorders – e.g. lupus
	Long-term use of some medicines e.g. lithium, non-steroidal anti-inflammatory drugs
Common aetiological factors in liver failure	Alcohol-related liver disease
	Non-alcoholic fatty liver disease – often due to obesity
	Cirrhosis due to viral hepatitis B or C
	Acute hepatitis – viral, alcohol-related, drug-related (e.g. paracetamol overdose)
	Metabolic disorders – e.g. Wilson's disease, hemochromatosis
	Primary biliary cirrhosis
	Autoimmune hepatitis

The UK transplant story and current performance

The UK's donation and transplantation services have been evolving steadily over the past three decades, and overall the story is a positive one, although there is still much work to be done. Table 2 shows a summary of the main developments in the organ donation and transplantation.

Table 2. Main developments in the UK over the past 25 years

1994	NHS organ donor register is set up following a long public campaign to coordinate supply and demand.
2000	UK Transplant is formed in 2000 with remit to increase organ donor numbers.
Early 2000s	First donor liaison nurses, living donor coordinators and regional transplant coordinators roles established.
2003	Transplant Framework for England published: 'Saving Lives, Valuing Donors'.
2004–05	Human Tissue Act legislation passed (2004) leading to the establishment of the Human Tissue Authority (HTA) 2005 – regulator of all organisations involved in handling human tissue (non-departmental public body of the Department of Health and Social Care).
2005	UK Transplant merges with the National Blood Service in 2005 to become NHS Blood and Transplant (NHSBT), a Special Health Authority with UK-wide remit.
2006	Human Tissue Act Scotland passed.
2006–08	Organ Donation Taskforce (ODT) investigates and publishes a detailed report. A target is set to double the deceased organ donation rate from 13pmp to 26pmp by 2020.
2010	In response to the ODT report the National Organ Retrieval service (NORS) is established as are the roles of specialist nurses in organ donation (SN-OD), clinical leads in organ donation (CL-OD) and organ donation committees, with posts funded via NHSBT.
2011	National Institute for Health and Care Excellence (NICE) guidance 'Organ Donation for Transplantation – Improving donor identification and consent rates for deceased organ donation' published (updated 2016)(13).
2014/15	Review of Organ Donation Taskforce's (ODT) recommendations published: 'Taking Organ Transplantation to 2020'.
2013	Wales passes opt-out legislation (Human Transplantation (Wales) Act 2013), implemented in 2015.
2020	England implemented opt-out legislation.

Historically the UK had one of the worst donation rates in Europe; however, this situation has been improving steadily, and over recent years the deceased donation rate has increased from 13 per million population (pmp) in 2008(11) to a more respectable 24.2 pmp in 2018/19(12) as shown in figure 1. The rate varies across the UK, and Wales currently achieves a much higher rate of 30.7 pmp.

In 2018/19 a total of 4,990 transplants were performed in the UK from living and deceased donors (table 3). The number of deceased organ transplants in the UK has been increasing steadily over the past 10 years(14), and despite a small reduction in the number of persons deemed eligible to donate organs, there were 1,600 deceased organ donors in 2018/19, the highest number achieved to date. From these deceased donors, 3,951 transplants resulted, a small drop from the previous year. There were 1,039 living donors, 39% of the total number. The vast majority of these donated a kidney, although 22 donated part of their liver(12). However, despite the marked increase in donation and transplant activity in the UK there remains a large amount of unmet need, with over 6,000 people on the waiting list for all transplants. In 2018/19 over 400 people died waiting for a transplant and a further 777 were removed from the waiting list as a result of worsening health and ineligibility for surgery. Many of these will also have subsequently died as a result of their deteriorating health(12).

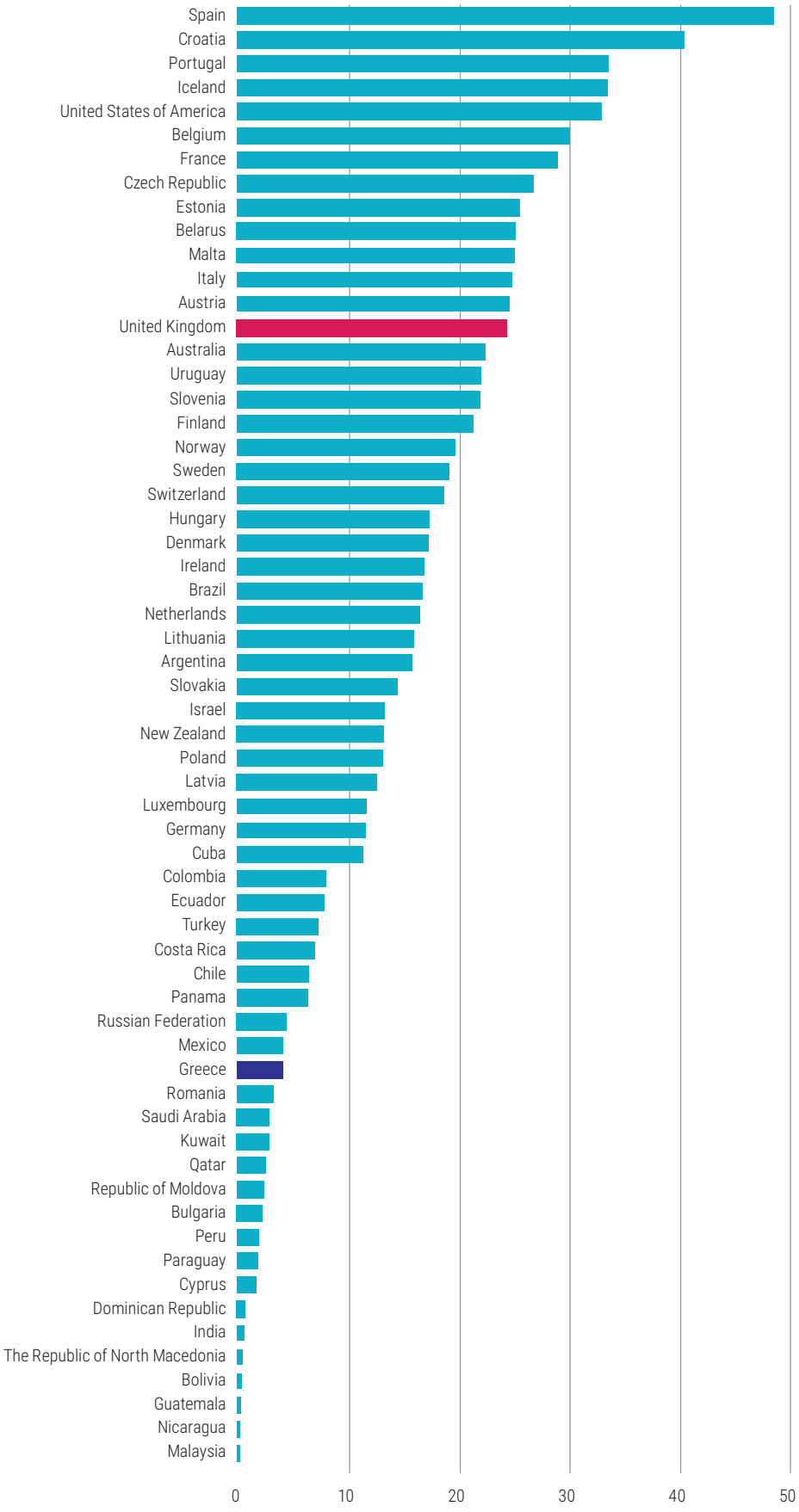
Table 3. Organ transplants and donors in the UK (2018/19) and comparison with Europe (2018)

	UK (absolute)	UK (pmp)	Europe (absolute)	Europe (pmp)
Population (millions)	66		789.5	
TOTAL Actual DD	1,600	24. 2	13,226	16.8
Actual DBD	962	14. 6	11,370	14.4
Actual DCD	638	9. 7	1,856	2.4
TOTAL Kidney Tx	3,594	54. 5	27,917	35.4
DD Kidney Tx	2,399	36. 3	20,097	25.5
LD Kidney Tx	1,017	15. 4	7,820	9.9
TOTAL Liver TX	1,010	15. 3	10,520	13.3
DD Liver Tx	972	14. 7	8,911	11.3
LD Liver Tx	21	0. 3	1,584	2.0
Total Transplants	4,990	75. 6	**44,283**	**56.1**

UK Data (2018/2019) from the annual transplantation activity report(12).

Note: DD = deceased donor/donation, DBD = donation after brain death, DCD = donation after circulatory death, LD = living donor/donation, Tx = transplant

Figure 1. International actual deceased organ donor (DBD and DCD) rates (pmp), 2018(35)



On a positive note, the proportion of adults on the UK organ donor register has increased from 29% in 2010/11 to 38% in 2018/19. However, there are regional variations in family consent and authorisation with rates of 67% in England, and a much higher figure of 77% in Wales(12), which implemented its opt-out legislation in 2015. Donation after circulatory death (DCD) provides a substantial proportion of the deceased donations in the UK, around 40% of the total, which is higher than in most other comparable countries (figure 1). Most of this contribution is via controlled DCD in an intensive care setting following decisions to withdraw life-sustaining treatments of no overall benefit to critically ill patients(15,16). UK-wide consent rates are consistently around 10% higher for donation after brain death (DBD) than for DCD(16).

As can be seen, the targets of the Organ Donation Taskforce (ODT) have not quite been achieved yet. However opt-out legislation has been active in England since April 2020 and it is hoped that this will further increase rates of deceased organ donation, as it appears to have done in Wales.

Current challenges

A significant current challenge is low rates of donation and family consent amongst black and minority ethnic (BAME) groups. Relative to the UK population as a whole, people from BAME groups are more likely to need a transplant, and one in five people who died on the waiting list in the last year were from minority ethnic backgrounds. The proportion of deceased donor transplants with a BAME recipient was 22% in 2016/17; however, the proportion of BAME deceased donors was only 6.4%(17). Although the proportion of BAME donors has been increasing year-on-year, this remains a problematic area as the best tissue matches often come from people with a similar ethnic background.

Another challenge is the relatively low number of critical care beds in the UK, and high occupancy of critical care units (CCU). Although numbers have increased over recent years, the number of UK critical care beds per 100,000 population remains consistently low in comparison to other equivalent economies(18). Unless there is an increase in capacity this may lead to a stagnation in the rates of deceased donation in future.

A recent setback to the UK donation and transplantation system has been the loss of the UK Donation Ethics Committee (UKDEC). This was established in 2009 in response to the ODT report. UKDEC played an important role in helping to address the ethical questions that arise in organ donation, issuing guidance around both DBD and DCD(19,20). It is thought to have been particularly helpful in addressing ethical dilemmas around DCD, and may have helped contribute to the increased rates of DCD in the UK(21). The committee also issued guidance and frameworks for a number of particularly difficult areas including infant and paediatric donation(22,23) and interventions prior to death to optimise organ quality(24). However, due to widespread budget cuts as a result of fiscal austerity, funding for this valuable resource was withdrawn in 2016, and work on a number of planned projects had to be abandoned.

Key features of the transplantation system

1 Governance

Donation and transplantation in the UK is the remit of one single Special Health Authority, NHS Blood and Transplant (NHSBT). NHSBT has overall responsibility for every step of the organ donation and transplantation process including maintenance of the organ donation register and national transplant database, employment and professional development of specialist nurses, clinical leads, and organ retrieval teams, and establishment of local organ donation committees. NHSBT oversees 12 regional organ donation teams which service their designated populations and cover a number of NHS Trusts and/or Boards. NHSBT is supported by eight solid organ advisory groups(25). These groups are a forum in which representatives from NHSBT, the Department of Health, commissioners of services, clinicians and scientists can come together to review activity and outcomes, discuss policy and research, and liaise with key stakeholders.

There are a number of non-statutory organisations with very important roles in donation and transplantation in the UK. One of the most important which deserves mention here is the British Transplantation Society (BTS). The BTS represents all professionals working in transplantation and aims to provide leadership, representation and guidance. It provides a means by which the voice of the many different professionals working in donation and transplantation can influence the governing bodies, and it works closely with NHSBT and the HTA, contributing to the development of policy, guidelines and protocols. The UK also has a large and vocal array of charities and patient/family associations who play an active role in raising the profile of organ donation and transplantation and raising public awareness. These networks have an important role in lobbying the relevant authorities to push through important changes to legislation and service development. Some examples of these organisations are the British Liver Trust, Kidney Care UK, The Donor Family Network and the National Kidney Federation.

A number of key features of the current structure are thought to have contributed to the improved rates of donation and successful transplantation in the UK over the past decade.

The first vital component has been the development of clear clinical roles and leadership in hospitals involved in organ donation and retrieval. The role of the specialist nurse in organ donation (SN-OD) is now well established, and SN-ODs are given detailed training in communication and family support, in particular discussions concerning end-of-life wishes. The SN-ODs provide a 24/7 service to all hospitals which are a potential source of organ donors. They have a key role in the identification of all possible donors and in facilitating the complicated processes involved in organ donation and retrieval. They try to ensure that, when appropriate, donation is part of every end-of-life conversation. In addition to their clinical role

they also provide teaching and training to colleagues and are responsible for ensuring that audits, policies and resources are up to date. SN-ODs are recruited, employed and paid by NHSBT, although they are fully embedded in their local clinical environment.

SN-ODs are supported by clinical leads in organ donation (CLODs), who are usually senior doctors specialising in intensive care or emergency medicine and have a mandate to promote and champion organ donation in their locality. By 2017, there were 240 CLODs operating in the UK and covering all acute Trusts and Boards(26). Senior clinicians are expected to commit a specified amount of time to the CLOD role and this is reimbursed by NHSBT. A network of regional CLODs has been established to promote regular professional support and development. A culture of collaboration has been encouraged to foster and promote change in hospitals, and regular regional and national meetings are held which all senior staff are encouraged to attend.

Local organ donation committees were established in every acute Trust or Board in the UK following the ODT's 2008 report. The remit of the organ donation committee is to promote and endorse deceased donation in their locality, and they are expected to focus specifically on performance, policy, education and public promotion. Each organ donation committee is expected to produce a Potential Donor Audit Report at least once a month. This report includes details such as the numbers of potential donors, numbers of utilised donors, reasons for family refusal and reasons for organs not being utilised. The organ donation committees work in close collaboration with the local CLODs and SN-ODs. Additionally, a national organ donation committee provides advice and guidance to NHSBT, and acts as the national representative body for the 12 UK regional organ donation teams. Committee members include regional clinical leads and managers as well as senior staff from the organ donation and transplantation directorate of NHSBT.

On the transplantation side of the chain, transplant recipient coordinators support potential recipients through the pathway from referral for assessment to long term monitoring and follow-up post-transplant. They have a key role in the transplant assessment process, and in placing the patient on the transplant list. They educate patients and their families, and coordinate the transplant operation. They may also be involved in suspending patients from the list if they are no longer fit for surgery.

The second key development has been the establishment of the National Organ Retrieval Service (NORS) in 2010. The NORS provides a UK-wide 24-hour service for retrieving organs from deceased donors. It is composed of a number of UK-wide regional abdominal and cardiothoracic retrieval teams which operate on an on-call basis. When on-call, team members do not have other clinical commitments which might delay their attendance at a retrieval. Retrieval teams are led by a consultant surgeon, and have the necessary complement of highly trained staff to facilitate safe and timely retrieval of organs from a donor. When a donor is identified. a team is allocated based on proximity and availability, and this allocation is determined by the central NHSBT duty office.

Thirdly, the Organ Donation and Transplantation (ODT) Hub was set up in 2017. As with the other parts of the service the ODT Hub runs 24/7 and it has a wide range of duties which

include: organ donor register (ODR) checks, matching and allocating organs, coordinating the NORS, coordinating transport, including flight authorisation, collating post-transplant outcome information and providing advice and support.

2 Legislation and regulation

Organ donation and transplantation in the UK is supported by legislation which varies slightly between the four jurisdictions. The Human Tissue Act (2004) covers England, Wales and Northern Ireland, and the Human Tissue (Scotland) Act (2006) covers Scotland. Both Acts regulate activities concerning the removal, storage, use and disposal of human tissue although they differ slightly in terminology. All legislation gives priority to the decision made by the individual, in whatever way this may have been recorded. Since 2015 Wales has been operating under the Welsh Transplantation Act 2013 which has amended the 2004 Human Tissue Act to assume consent to donation unless otherwise stated ('opt-out' legislation). However, if there is no record of a person's wishes, relatives, or those in a proven close relationship, can still refuse. In England, soft opt-out legislation was passed in 2019 and has been implemented since April 2020.

DCD has grown steadily in the UK over the past two decades. This growth is attributed to substantial effort on the part of supporting professional organisations and government departments to resolve the difficult legal and ethical dilemmas that surround controlled DCD. Important guidance includes a consensus statement authored by the British Transplantation Society and Intensive Care Society on Donation after Circulatory Death(27), and a Code of Practice for the Diagnosis and Confirmation of Death from the Academy of the Medical Royal Colleges(28). Additionally, the departments of health in England and Scotland have issued crucial guidance on legal issues(29,30).

Regulatory activities are carried out by the Human Tissue Authority (HTA), established in 2005, which regulates organ donation and transplantation UK-wide under the Quality and Safety of Organs Intended for Transplantation Regulations 2012. These regulations transferred into UK law the European Union Directive 2010/53/EU on the standards of quality and safety of human organs intended for transplantation. Both procurement and transplantation activities are covered, and the HTA inspects, audits and licenses establishments involved in organ donation and transplantation activities. The HTA also provides a platform for reporting serious incidents or reactions linked to donation or transplantation activities, and issues relevant alerts and warnings.

Table 4. Summary of the structure of the UK system

RESPONSIBLE BODY	MAIN FUNCTIONS
Legislation	
Westminster government and devolved administrations of Scotland, Wales and Northern Ireland	The Human Tissue Act (2004) (England, Wales and Northern Ireland) The Human Tissue (Scotland) Act (2006). Welsh Transplantation Act 2013
Funding	
NHS England, NHS Scotland, NHS Wales, NHS Northern Ireland	Some variations between the four jurisdictions In England renal transplantation is locally commissioned and reimbursed via the national tariff Other transplants are funded centrally by NHS England as 'specialised services'
Regulation and licensing	
Human Tissue Authority (HTA)	Operates under the remit of the Quality and Safety of Organs Intended for Transplantation Regulations 2012 Inspects, regulates and licenses all organisations that remove, store or use human tissue for any purpose
Operational responsibility, implementation of national practice and policy development	
NHS Blood and Transplant (a Special Health Authority)	Oversight of the whole system UK-wide Directly recruits and employs Specialist nurses in organ donation (SN-ODs) Appoints clinical leads in organ donation (CL-ODs), and reimburses NHS Trusts for their time Oversees 12 regional organ donation teams Supported by eight solid organ advisory groups which assist in policy development and quality improvement
Coordination and advice	
National organ donation committee	Provides advice to NHSBT, represents the 12 regional teams and the local organ donation committees Meets regularly to discuss progress, developments, strategy and policy

3 Regular audits and quality improvement

All Trusts, Boards and their constituent hospitals are required to provide regular detailed reports and updates on their activities. SN-ODs are expected to conduct regular internal audits including data on missed potential donors, and refusal rates. NHSBT regularly publishes benchmarking reports detailing the performance of individual Trusts and Boards. The pathways of all potential donor organs are recorded and charted from point of donor eligibility through to successful transplantation rates. Reasons for non-retrieval or non-use are documented. Outcome data is subsequently collected for several years post-transplant. Reports of both selected serious incidents and examples of excellence are shared to promote learning and inform changes in practice.

4 Donor registration

The NHS Organ Donor Register (ODR) records the details of everyone who has registered to be a potential organ donor. Individuals can register online or by phone, and organ donor cards are sent to everyone who registers as a donor for the first time. New cards can be printed out from the website, and the image of the card can be downloaded to be sent digitally to family and friends if desired. Since 2015 Wales has adopted soft opt-out legislation of 'deemed consent'. This means that consent is presumed unless the individual has registered their objection to donation; however, family and friends can still object. Since 2020 England and Scotland have also implemented opt-out legislation, although for now legislation in Northern Ireland remains on an opt-in basis. Although soft opt-out legislation does not compel relatives or loved ones to consent to donation, it does facilitate a different approach by the SN-OD when talking to a family. Provided that an individual has not registered their objection via the ODR, the conversation can open with an assumption that they were willing to donate.

5 Reimbursement of individuals and hospitals

Deceased organ donation in the UK is considered an altruistic act, and financial or other reward is illegal. However, living donors can be reimbursed for expenses (for example loss of earnings) via nationally agreed policies. The process of organ donation and retrieval is funded via NHSBT via the UK government. Funding arrangements differ between the four jurisdictions of the UK. However, in England reimbursements to hospital Trusts for the processes involved in renal transplantation are subject to the national tariff, with some adjustment for varying local expenses(31). The national tariff covers in detail all the different possible scenarios envisaged. Other transplantation activities are commissioned and funded centrally by NHS England as specialised services (in contrast to most health services in England which are commissioned under local agreements).

6 Media campaigns and other strategies

What follows are a few examples of recent strategies to increase the deceased organ donation rate in the UK:

Pass it On: This was a year-long public campaign conducted in England in 2019/20 prior to the implementation of the new opt-out legislation. Apart from attempting to raise awareness of the change to law, the campaign aimed to highlight the topic of organ donation and stimulate conversations between families and friends. The campaign ran digital adverts across various social media channels and included online resources and toolkits for individual supporters, community groups and partner organisations.

Words Save Lives – Say yes to organ donation: This was a campaign in London and surrounding areas, which took place during the 2019 Organ Donation Week. The campaign encouraged people to talk openly about organ donation, as UK data shows that when a person is on the ODR and their loved ones are aware of their wishes, more than 90% will support their decision. However, if they do not know their wishes, the family consent and authorisation rate drops to below 50%(32).

Government end-of-transaction websites: Following a quasi-randomised controlled trial in which the Behavioural Insights Team trialled a series of different messages at the end of driving licence applications, it was found that a sentence designed to elicit sentiments of reciprocity was most effective in prompting people to sign up to the ODR(33). Following this success anyone completing a number of online government-related transactions in the UK now has to answer a question on whether they are willing to be included on the organ donor register and this is preceded by the question “If you needed an organ transplant would you have one? If so please help others.” It has been estimated that between 2013 and 2017 this resulted in 529,000 additional new registrations to the ODR(34).

Resources for schools: Organ donation and transplantation has become a topic discussed with primary and secondary school children as part of the personal, social and health education (PSHE) and science elements of the National Curriculum.

Key lessons

The UK offers an example of a complete system with sound governance structures, and which is strongly integrated with training and research as crucial parts of the national programme. A number of key lessons can be learnt from this example.

The UK system has evolved step-by-step over a long period

Although many challenges remain, the UK is a success story and hopefully the rates of donation and transplantation will continue to improve. However, the achievements of the current system are the result of many years of tireless campaigning, public engagement, legislative changes, system reviews, adaptation and reorganisation. It has taken several decades and sustained and coordinated effort on the part of all involved to realise today's achievements.

Centralisation and coordination of all aspects of donation and transplantation

The key message of the 2008 Organ Donation Taskforce was that an integrated UK-wide service was essential to efficiently source and allocate suitable organs for those that needed them, and that this was a prerequisite in order to increase the deceased organ donation rate. NHSBT has taken on this remit and is now responsible for all aspects of donor identification, organ retrieval and allocation. This has undoubtedly improved the performance and efficiency of the whole system.

Championing of donation by clearly designated and expert clinical leadership

The firm establishment and formalisation of the roles of the SN-OD, the CLOD, and the organ donation committee in every hospital Trust have been absolutely vital in order to champion organ donation and transplantation. Dedicated and expert clinical leadership has broken down barriers, promoted awareness and fostered public acceptability. It has also facilitated crucial cohesion between the many different professionals involved in the complex pathways of organ donation and transplant. A culture of collaboration and shared vision has been promoted with regular meetings, exchange of ideas and opportunities for professional development. Importantly these roles have been centrally funded by NHSBT which has protected them from being subsumed into other areas of need in the acute care environment.

National coordination of the retrieval process

Prior to establishment of the National Organ Retrieval Service several surgical teams would often attend a single donor at once, leading to delays and confusion. On occasion other clinical commitments would delay attendance thus also compromising organ viability. The establishment of the centralised NORS, with highly skilled on-call teams available 24/7 has

greatly improved the process of retrieving organs once consent has been obtained. As with the SN-OD and CLOD roles the NORS is commissioned and funded by NHSBT, thus negating any controversy regarding reimbursement for organ retrieval.

Legislative reform resetting societal expectations

With the exception of Northern Ireland, opt-out legislation has been adopted across the UK. Wales implemented this legislation in 2015, and it appears to have had a positive effect. Rates of family consent and authorisation, and deceased donation rates in Wales are now the highest in the UK.

Media campaigns involving specific stories are helpful

The recent change to the legislation in England has become known as Max and Keira's Law after the little girl who was fatally injured in a car accident and the little boy who received her heart. With the consent of their families to use their stories, the popular press ran a prominent and successful campaign to change the law in England to opt-out legislation. Personal accounts which help the public to identify with the poignant mixture of tragedy and joy in such situations seem to have significant impact in the UK setting.

Behavioural techniques prompting individuals to consider their wishes can also help

As previously described, the UK has had some success in increasing the numbers of registered donors by compelling those completing online government-related transactions to answer a question regarding whether they are willing to be included on the ODR, and combining this with a nudge intended to elicit reciprocal behaviour.

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Appendix 7

Stakeholders consulted

Government

Mr Kyriakos Mitsotakis, Prime Minister

Mr Georgios Gerapetritis, Minister of State

Mr Vassilios Kikilias, Minister of Health

Mr Vassilios Kontozamanis, Deputy Minister of Health

Mr Theodoros Livanios, Deputy Minister of Interior

Ms Zoi Rapti, Deputy Minister of Health

Mr Ioannis Kotsiopoulos, Secretary General for Health Services

Mr Panagiotis Prezerakos, Secretary General for Public Health

Mr Marios Themistokleous, Secretary General for Primary Care

Opposition parties

SYRIZA

Mr Andreas Xanthos, Former Minister of Health

KINAL

Ms Fofi Genimmata, Party Leader

Mr Kostas Mpargiotas, Party Representative, Consultant Orthopedic Surgeon

Mr Manolis Othonas, Party Representative, former MP

Mr Stefanos Parastratidis, Party Representative, General Practitioner

Mr Andreas Poulas, MP

Mr Christos Protopapas, MP

KKE

Mr Nikos Chondropoulos, Party Representative, Thoracic Surgeon in training

Mr Giorgos Lamproulis, MP

Mr Ellias Sioras, Party Representative, Secretary General, EINAP

Elliniki Lysi

Mr Kyriakos Velopoulos, Party Leader

National Transplant Organization

Professor George Papatheodoridis, President

Ms Yiouli Menoudakou, Head of Transplant Co-ordination

Mr Fotis Antoniou, Transplant Co-ordinator, Thessaloniki

Ms Dimitra Zacharoudi, Transplant Co-ordinator, Thessaloniki

Hellenic Medical Association

Dr Athanasios Exadaktylos, President

Histocompatibility laboratories

Professor Aliki Iniotaki, former Director, Immunology laboratory and National Tissue Typing Centre, General Hospital of Athens G. Gennimatas

National Bioethics Committee

Professor Eleni Rethymiotaki

Transplant centres

Dr Stamatis Adamopoulos, Cardiologist, Onassis Cardiac Surgery Center

Dr Nikolaos Antoniadis, Transplant Surgeon, Ippokrateio General Hospital of Thessaloniki

Dr Ioannis Bokos, Transplant Surgeon, Laiko

Professor Ioannis Boletis, Nephrologist, Laiko

Professor Dimitris Goumenos, Nephrologist, University Hospital of Patras

Professor Dionysios Karavias, Transplant Surgeon, University Hospital of Patras

Dr Michail Mitsis, Transplant Surgeon, University Hospital of Ioannina

Professor George Tsoulfas, Transplant Surgeon, Ippokrateio General Hospital of Thessaloniki

Dr Vasileios Vougas, Transplant Surgeon, Evagelismos

Intensive care units

Dr Nikolaos Kapravelos, Papanikolaou General Hospital of Thessaloniki

Dr Iraklis Tsagkaris, Laiko

Scientific societies

Professor Ioannis Boletis, Hellenic Nephrology Society

Professor Anastasia Kotanidou, Hellenic Transplantation Society

Dr Anna Malisiova, Hellenic Society of Anaesthesiology

World Health Organization

Mr Stratos Chatziksiros, Member of WHO

Patients' associations

Mr Nikos Karafolas, Heart and Lung Transplant Patients' Association

Mr Grigorios Leontopoulos, Renal Transplant Patients' Association

Ms Christina Theodoridou, Liver Transplant Patients' Association

Press and media

The following list of journalists consulted is not exhaustive:

Ms Smaragda Agorogianni, ERT

Ms Penny Bouloutza – Kathimerini Newspaper

Mr Ioannis Devetzoglou – protagon.gr

Ms Dimitra Eufthimiadou, Health Report

Ms Martha Gaitanidi, Ta Nea, Vima Newspapers

Mr Demetris Karagiorgos, iatronet.gr

Ms Panagiota Karlatira, Proto Thema Newspaper

Ms Nina Komninou, 9,84 FM – City of Athens Radio

Mr Aimilios Negkis, virus.com.gr

Mr Vasilios Venizelos, Parapolitika, Athens Voice Newspapers

Ms Ntani Vergou, Efimerida Sydakton

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