

Increasing access to integrated ESKD care as part of Universal Health Coverage

David C.H. Harris+, MD, Centre for Transplantation and Renal Research, Westmead Institute for Medical Research, University of Sydney, Sydney, New South Wales, Australia

Simon J. Davies+, FRCP, Faculty of Medicine and Health Sciences, Keele University, Keele, United Kingdom

Fredric O. Finkelstein+, MD, Department of Medicine, Yale University, New Haven, Connecticut, United States of America

Vivekanand Jha+, MD, George Institute for Global Health India, New Delhi, India and University of Oxford, Oxford, United Kingdom

Jo-Ann Donner, MLT, International Society of Nephrology, Brussels, Belgium

Georgi Abraham, MD, Nephrology Division, Madras Medical Mission Hospital, Pondicherry Institute of Medical Sciences, Chennai, India

Aminu K. Bello, PhD, Department of Medicine, University of Alberta, Edmonton, Alberta, Canada

Fergus J. Caskey, MD, UK Renal Registry, Learning and Research, Southmead Hospital, Bristol, United Kingdom and Population Health Sciences, University of Bristol, Bristol, United Kingdom and The Richard Bright Renal Unit, Southmead Hospital, North Bristol NHS Trust, Bristol, United Kingdom

Guillermo Garcia Garcia, MD, Servicio de Nefrologia, Hospital Civil de Guadalajara Fray Antonio Alcalde, University of Guadalajara Health Sciences Center, Hospital 278, Guadalajara, JAL, Mexico

Paul Harden, MD, Oxford Kidney Unit, Oxford University Hospitals NHS Foundation Trust, Oxford, United Kingdom

Brenda Hemmelgarn, MD, Departments of Community Health Sciences and Medicine, University of Calgary, Calgary, Alberta, Canada

David W. Johnson, PhD, Centre for Kidney Disease Research, University of Queensland, Brisbane, Australia and Translational Research Institute, Brisbane, Australia and Metro South and Ipswich Nephrology and Transplant Services (MINTS), Princess Alexandra Hospital, Brisbane, Australia

Nathan W. Levin, MD, Mount Sinai Icahn School of Medicine, New York, New York, United States of America

Valerie A. Luyckx, MBBCh, Institute of Biomedical Ethics, University of Zurich, Zurich, Switzerland

Dominique E. Martin, PhD, School of Medicine, Deakin University, Melbourne, Victoria, Australia

Mignon I. McCulloch, MBBCh, Paediatric Intensive and Critical Unit, Red Cross War Memorial Children's Hospital, University of Cape Town, Cape Town, South Africa

Mohammed Rafique Moosa, MD, Division of Nephrology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Academic Hospital, Cape Town, South Africa

Philip J. O'Connell, MBBS, Renal Unit, University of Sydney at Westmead Hospital, Sydney, NSW, Australia and Westmead Clinical School, The Westmead Institute for Medical Research, Westmead, New South Wales, Australia

Ikechi G. Okpechi, PhD, Division of Nephrology and Hypertension, University of Cape Town, Cape Town, South Africa and Kidney and Hypertension Research Unit, University of Cape Town, Cape Town, South Africa
Roberto Pecoits Filho, MD, School of Medicine, Pontificia Universidade Catolica do Paraná, Curitiba, Brazil
Kamal D. Shah, B.Tech, NephroPlus Dialysis Centres, Hyderabad, India
Laura Sola, MD, Dialysis Unit, CASMU-IAMPP, Montevideo, Uruguay
Charles Swanepoel, MBChB, Division of Nephrology and Hypertension, Department of Medicine, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa
Marcello Tonelli, MD, Department of Medicine, University of Calgary, Calgary, Alberta, Canada
Ahmed Twahir, MD, Parklands Kidney Centre, Nairobi, Kenya and Department of Medicine, The Aga Khan University Hospital, Nairobi, Kenya
Wim van Biesen, PhD, Nephrology Department, Ghent University Hospital, Ghent, Belgium
Chih-Wei Yang, MD, Kidney Research Center, Department of Nephrology, Chang Gung Memorial Hospital, Chang Gung University College of Medicine, Taoyuan, Taiwan
Carlos Zuniga, MD, School of Medicine, Catholic University of Santisima Concepción, Concepcion, Chile

On behalf of the ISN's 2nd Global Kidney Health Summit participants*

+co-chairs of the ISN's 2nd Global Kidney Health Summit on behalf of the International Society of Nephrology

*Members of the Working Groups listed in the Supplement

The views expressed in this commentary are solely the responsibility of the authors and they do not necessarily reflect the views, decisions, or policies of the institutions with which they are affiliated.

Correspondence to:

Professor David Harris
Centre for Transplantation and Renal Research
Westmead Institute for Medical Research
University of Sydney
Westmead, New South Wales 2145
Australia
david.harris@sydney.edu.au

Short title: Global access to ESKD care

Keywords: ESKD (end-stage kidney disease), UHC (universal health coverage), dialysis, transplantation, conservative care, advocacy, training, funding

Classification: global kidney health

Abstract

The global nephrology community recognizes the need for a cohesive strategy to address the growing problem of end-stage kidney disease (ESKD). In March 2018, the International Society of Nephrology hosted a summit on integrated ESKD care, including 92 individuals with diverse expertise and professional backgrounds from around the globe. The attendees were from 41 countries, including 16 participants from 11 low- and lower-middle-income countries. The purpose was to develop a strategic plan to improve worldwide access to integrated ESKD care, by identifying and prioritizing key activities across eight themes: Estimates of ESKD Burden and Treatment Coverage; Advocacy; Education and Training/Workforce; Financing/Funding Models; Ethics; Dialysis; Transplantation; and Conservative Care. Action plans with prioritized lists of goals, activities, and key deliverables, and an overarching performance framework were developed for each theme. Examples of these key deliverables include: improved data availability, integration of core registry measures and analysis to inform development of healthcare policy; a framework for advocacy; improved and continued stakeholder engagement; improved workforce training; equitable, efficient and cost-effective funding models; greater understanding and greater application of ethical principles in practice and policy; definition and application of standards for safe and sustainable dialysis treatment and a set of measurable quality parameters; and integration of dialysis, transplantation, and comprehensive conservative care as ESKD treatment options within the context of overall health priorities. Intended users of the action plans include clinicians, patients and their families, scientists, industry partners, government decision makers, and advocacy organizations. Implementation of this integrated and comprehensive plan is intended to improve quality and access to care and thereby reduce serious health-related suffering of adults and children affected by ESKD worldwide.

Word count: 270

Introduction

Kidney disease is recognized as a global public health problem, a risk multiplier for many other conditions, and for its association with cardiovascular disease (CVD), diabetes, and infections. Chronic kidney disease (CKD) progresses to end-stage kidney disease (ESKD) which requires kidney replacement therapy (KRT; dialysis or kidney transplant) or comprehensive conservative care (non-dialytic care) (Box 1 and Figure 1). The prevalence of KRT for ESKD is rising worldwide, and the fastest growth is occurring in low-income countries (LICs) and lower-middle-income countries (LMICs).¹

Soon after it became clear that dialysis could be performed as a chronic therapy in the 1960s, insufficient funding emerged as the major barrier to accessing treatment. The presumption that funding for dialysis would allow relatively young, employed, taxpaying members of society with ESKD to be rehabilitated and return to work led to a public debate that culminated in passing of the Social Security Amendment by the Congress of the United States of America (USA)² in 1972. Removal of financial barriers laid the foundation for rapid expansion of dialysis programs in the USA and later in the rest of the developed world – to the extent that access to dialysis is now used globally as a benchmark for societal willingness to pay for medical care.³

As the magnitude of ESKD burden became apparent, with its financial consequences to the health system, the need to prioritize prevention was realized^{4,5} (Figure 1). Directing resources to prevention of CKD and ESKD is much more cost-effective than to provision of ESKD care. However, even optimal prevention and treatment of kidney disease will not obviate the need for KRT. It is estimated that in 2010, 2.62 million people were receiving KRT worldwide for ESKD, and that a further 2.3 to 7.1 million, mainly in LMICs, required KRT but died for want of it.¹ Dialysis, in particular haemodialysis (HD), is commonly considered to be the default treatment for ESKD, but not all patients are suitable or will benefit from it. Furthermore, several large registry studies and systematic reviews have confirmed that in appropriate patients, transplantation provides survival advantage, better quality of life, and is more cost effective than dialysis.⁶⁻⁹ Hence, in the absence of resource

constraints, ESKD care should ideally be available as an integrated mix of peritoneal dialysis (PD), HD, transplantation, and conservative care (non-dialytic care), and patients should be able to choose and transition between the different modalities (Figure 1). Non-resource determinants of choice of modality for ESKD care include age, comorbidity, life expectancy, and lifestyle considerations. For suitable candidates, kidney transplant is the best form of KRT, and amongst the rest, a significant proportion are best treated with conservative care. In 2015, 84,347 kidney transplants were performed worldwide (1,950 were paediatric, i.e., < 15 years old), representing an increase of 5.5% over 2014.¹⁰ However, the number of transplants falls far short of the current global demand.

Healthcare professionals and administrators must balance their responsibilities to the healthcare system with those to the individual patient. In LMICs with limited resources, prioritization of KRT must be balanced against other pressing societal needs such as sanitation, clean water, prevention and treatment of infectious diseases and non-communicable diseases (NCDs) (including diabetes, hypertension, CVD, and CKD itself), and reproductive and paediatric health. Thus, how ESKD care is provided for an individual patient will be decided based not only on their own health condition, their family, and their social and financial resources, but also by the healthcare setting in which they receive care.

End-stage kidney disease (ESKD):

- The last stage of chronic kidney disease (CKD) and when kidney replacement therapy (KRT; hemodialysis, peritoneal dialysis or kidney transplant) could be considered to improve longevity or quality of life.

Supportive care:

- Involves services aimed at improving the health related quality of life (HRQoL) of patients with established CKD.
- It is based on the principles of **palliative care**, which is defined by the World Health Organization as an approach that improves the HRQoL of patients and their families facing problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other physical, psychosocial, and spiritual problems.

Conservative care can be an alternative to KRT and delivered in one of two settings:

- As ‘comprehensive conservative care’, where conservative care is either chosen or medically advised. This is planned, holistic, person-centred care that includes the following:
 - Interventions to delay progression of kidney disease and minimize risk of adverse events or complications
 - Shared decision making
 - Active symptom management
 - Detailed communication including advance care planning
 - Psychological support
 - Social and family support
 - Cultural and spiritual domains of careOf note, comprehensive conservative care does not include dialysis.
- As ‘choice-restricted conservative care’, where resource constraints have prevented or limited access to KRT and therefore, while not chosen, is preferable to no care at all.

Box 1. Definitions of ESKD, supportive care, and comprehensive conservative care
Modified from Davison et al.¹¹

Brief Methods

In view of the need for a cohesive plan to address the challenge of ESKD, especially in emerging economies, the International Society of Nephrology (ISN) organized a summit in Sharjah, United Arab Emirates, in March 2018. The summit was co-chaired by Drs. Simon Davies, Fred Finkelstein, David Harris, and Vivekanand Jha, and participants from around the globe included 92 individuals with diverse expertise (administrators, clinicians, clinical and translational researchers, epidemiologists, industry scientists, nurses, nurse practitioners, paediatric nephrologists, an ethicist, a health economist, a patient, and a representative from the World Health Organization (WHO)). The attendees were from 41 countries, including 16 from 11 LICs and LMICs. The purpose of the meeting was to develop a roadmap to improve worldwide access to integrated ESKD care. Steps in achieving this goal include understanding current global differences in ESKD care; considering ethical, technological, human resource, financial, and cultural issues involved in the expansion of ESKD care; and supporting development of all aspects of just and equitable ESKD care provision in LMICs. The meeting provided opportunities to define and design concrete strategies to fill gaps in knowledge and practice, and to create a performance framework to evaluate progress over time.

Participants met for 2.5 days to develop the plan, which was based on 8 themes pre-defined by the 4 co-chairs (Panel), under the overarching domains of advocacy, sustainability, equity, and integration. All delegates participated in two out of eight working groups, each of which addressed a single area of focus. Pre-work for the meeting consisted of identification of key issues, supporting literature searches, and facilitated discussion. Using an iterative process, each group produced a prioritized list of key issues, goals, activities, and deliverables.

Panel. ESKD Summit Themes and Areas of Focus

Theme	Area of Focus
Estimates of ESKD Burden and Treatment Coverage	Explain the reasons for and monitor global differences in the incidence and prevalence of ESKD, ESKD care, and chosen modality of ESKD care
Advocacy	Develop an approach to advocate for integrated ESKD care in LMICs
Education and Training/Workforce	Develop locally appropriate strategies to enhance health workforce capacity
Financing/Funding Models	Develop financial strategies and funding models to ensure equitable integrated ESKD care
Ethics	Enunciate ethical principles surrounding ESKD care
Dialysis	Define, recommend, apply, and develop a monitoring framework for minimum and optimal safety and quality standards for peritoneal dialysis and haemodialysis
Transplantation	Define the key considerations for expansion of kidney transplantation as a component of integrated ESKD care
Conservative Care	Define the key considerations and development of conservative care as a component of integrated ESKD care

The themes and areas of focus are discussed in the following sections, noting the gaps in knowledge and practice, and listing activities recommended to address the gaps. The performance framework is designed to track activity progress over time. Recognising the diversity of healthcare systems in LMICs, the participants emphasized the need to individualize and tailor the implementation of proposed action steps according to local needs, culture, geo-political climate, and available resources. Participants also stressed the value of sharing experiences in platforms such as the summit to evaluate progress and make course correction. Participants agreed that what is important for the patient would be a key determinant of any such plan.

THEME 1: ESTIMATES OF ESKD BURDEN AND TREATMENT COVERAGE

Explain the reasons for and monitor global differences in the incidence and prevalence of ESKD, ESKD care, and modality of ESKD care

Known KRT prevalence varies more than 1000-fold across the globe from close to zero per million population (pmp) in parts of the Pacific Islands and Africa (e.g. Rwanda 2.8 pmp) to over 2000 pmp in parts of North and East Asia (e.g. Taiwan 3317 pmp, Japan 2529 pmp), suggesting large inequities in global access to KRT.¹²⁻¹⁴ Four fifths of all patients with ESKD treated with KRT reside in North America, Japan, or Europe.^{12,15,16}

Inequities are also evident in the relative availability of different forms of KRT (Figure 2 and Supplementary Tables S1 and S2). For example, PD, useful for adults but particularly appropriate for children, is available in only 29% of LICs.^{13,14} HD services may vary in different regions of the same country and also between rural and urban areas. The quality of delivered dialysis varies widely, as will be discussed below, but its assessment is difficult and unreliable. Kidney transplantation, which for suitable candidates provides the best survival, quality of life, and is most cost-effective,¹⁷ is available in only 36% of African countries and worldwide in only 12% of LICs.^{13,14} In those that do provide kidney transplantation, rates vary from <1 pmp in Bangladesh to 71 pmp in the Jalisco state of Mexico.¹² There are significant differences in transplantation rates even within countries falling in the same income category. Living donor transplantation is the most common type of transplantation available in LMICs.

Socio-economic factors are the major drivers of the observed differences in the epidemiology of ESKD, in particular ESKD care. KRT prevalence is highly correlated with national wealth^{1,16} (Figure 2 and Supplementary Tables S1 and S2). Approximately 93% of individuals receiving KRT in 2010 resided in high-income countries (HICs) or upper-middle-income countries (UMICs), such that there was a 70-fold greater prevalence in the rates of KRT in these countries compared with their LMIC counterparts.^{1,18,19} The most important barrier to KRT in LICs and LMICs is the high cost, which the patients have to pay from their own resources. The annual costs of dialysis have been reported to be 7-

to 48-fold higher than average annual incomes.²⁰ The high cost leads to premature withdrawal of KRT, premature death, and severe financial debt for surviving family members, particularly in LICs.^{21,22}

Other factors influencing the epidemiology of ESKD care are summarised in Figure 3. Patient characteristics, such as female gender, older age, indigenous racial origin, socio-economic status, poor health literacy, and high burden of comorbidities have all been associated with reduced access to and/or use of KRT.^{12,23-25} In most African and South and South-east Asian countries, children's access to dialysis is severely restricted.^{25,26} Even amongst and within HICs, there are wide variations in the incidence and prevalence of ESKD treated with KRT, not explained by differences in national income and in part related to the cause and severity of disease and age of the patients.^{1,27}

The highly variable availability, coverage, and quality of ESKD registries prevents proper understanding of the epidemiology of ESKD and ESKD care around the world. This is particularly true in LICs where non-dialysis CKD, dialysis, and kidney transplant registries are available in only 6%, 18%, and 0% of countries, respectively.^{13,14,28} African (35%) and South Asian (40%) countries have the lowest frequencies of dialysis registries and are also the areas where the gaps between treated and untreated ESKD are highest.^{13,14} Similarly, only 19% of African countries and 40% of South Asian countries have a transplant registry.^{13,14} Strategies to address this gap are discussed below and summarized in Table 1.

Improve estimates of the incidence and prevalence of ESKD and ESKD care, including capturing KRT modality and outcomes

A cornerstone of understanding the global ESKD treatment gap is establishing robust health information systems in each country as a means to define CKD and ESKD burdens, guide resource allocation to areas of need, identify barriers to accessing KRT, capture costs of treatment, and monitor KRT health outcomes, thereby informing KRT service planning and enabling policy development (including CKD prevention and control). A number of LMICs are in the process of setting up national dialysis registries;

the ISN is supporting these efforts through the SharE-RR project (<https://www.theisn.org/advocacy/share-rr>), which will develop a resource that supports establishment of a renal registry to support advocacy, quality assurance, and research. This project will facilitate sharing of a data dictionary, registry policies, procedures, governance structures, databases, datasets, technology platforms, files, and consent processes. Surveys of existing registries will inform the establishment of a minimum dataset to permit benchmarking between registries and to monitor the quality of care and outcomes. A minimum dataset will (a) help healthcare professionals and people with ESKD make better informed treatment decisions; and (b) capture serious health-related suffering in people with ESKD for inclusion in global health reports.

Renal registries in countries and regions with low or relatively limited resources, such as Chad, Guinea, Niger, Tunisia, South Africa, Thailand, Malaysia, and several countries in Latin America (Bolivia, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Rep Dominicana, Venezuela) have demonstrated the potential of registries to highlight inequitable KRT access and help support policy decisions in favour of providing additional resources for ESKD care.^{13,14,29-34} For instance, the huge gap in access to KRT between the private and public sectors demonstrated by the South Africa Renal Registry³⁵ is being used to advocate for increased access to KRT in the public sector in South Africa. These experiences should be drawn upon to help establish successful registries in other resource-limited countries.

Another possible strategy is incorporating data from resource-limited countries into existing registries, as has happened on occasion with North African countries contributing to the European Renal Association – European Dialysis and Transplant Association (ERA-EDTA) Registry^{30,33} and the United States Renal Data System (USRDS) registry.¹² The increasing number of countries included in the Latin American Registry of Dialysis and Transplantation (currently collecting information on 20 countries of the region) is another example of the incorporation of resource-limited countries into existing registries.³⁴ Pacific Island countries, e.g., Fiji, could leverage the infrastructure and collaborative expertise of the Australian and New Zealand Dialysis and Transplant

(ANZDATA) Registry. Recently, agreement was reached between the African Association of Nephrology and the African Paediatric Nephrology Association to establish the African Renal Registry, which will use the shared web-based technology platform and common data dictionary of the South African Renal Registry.³⁰

Registry data could be linked with geographic information systems to identify ESKD “hot spots” and areas where there are major mismatches between KRT supply and demand.³⁶ Registry data should be further enhanced by linkages with country population data, death registries, and other mortality datasets (e.g. Global Burden of Disease data), where possible. Registry output and reports should also be freely accessible online to maximize reach, transparency and impact.^{30,37}

Benchmarking will be facilitated by developing standardised definitions and terminology (data dictionary) for registries and also by the establishment of a minimum dataset to be collected by all renal registries. For example, ESKD is variously defined around the world, ranging from absolute requirement for KRT to estimated glomerular filtration rate $<15\text{mL}/\text{min}/1.73\text{ m}^2$.³⁸ This definition and other important variables collected in registries need to be harmonised. Defining conservative care for capture by registries has proven challenging, with limited data available on numbers treated conservatively (non-dialysis care) and the components and quality of conservative care. It is necessary to define the initiation of conservative care if registries are to measure it and report on quality. For similar reasons, it is necessary to agree on a definition for discontinuation of dialysis.

The prime focus of renal registries should shift from being modality-centred to person-centred KRT so that the journeys of patients with ESKD can be followed, monitored, and mapped along the continuum of ESKD care. Key patient-centred performance indicators should be captured to measure quality of care, including conservative care which is often recorded poorly or not at all. In the same vein, registries should be integrated within countries and regions, such that paediatric and adult registries are combined and all forms of ESKD care (including dialysis, transplantation, comprehensive conservative care and choice-restricted conservative care) are captured. Scholarship opportunities to

specifically provide registry training and experience could help in the development and implementation of local registries as had been demonstrated by previous Latin American Society of Nephrology and Hypertension (SLANH)-European Renal Association-European Dialysis and Transplant Association (ERA-EDTA) fellowships in epidemiology and registries.

The scope of data that should be collected and collated is more than can be captured routinely by registries alone. Multiple sources of data, some of which can be linked to registry data, can be obtained during care of individual patients and from health systems. Examples include routinely collected clinical data and data obtained from dialysis machines and other equipment. Such data can be used to evaluate ESKD care at multiple levels, including that of the individual patient, kidney unit, and geographic region.

THEME 2: ADVOCACY

Develop an approach to advocate for integrated ESKD care in LMICs

Countries are responding to the challenge of kidney disease/failure in different ways,³⁹ with variable provision of the components of a kidney care strategy (prevention, supportive care, conservative care, kidney transplantation, and an appropriate mix of dialysis modalities). The variability in approaches may be due to differences in the burden of disease, available human or financial resources, cost structures (e.g. relative cost of labour vs. supplies), cultural/religious considerations, political context, and competing interests from other stakeholders (including governments, other payors, patients/families, drug and device companies, dialysis providers, nephrologists, and other healthcare workers).⁴⁰ Decisions to establish dialysis services without sufficient consideration of the other components of a kidney care strategy are of particular concern -- and are often made without effective representation and guidance from the kidney-care community.

The current approach to kidney disease in many countries is neither sufficient (in terms of providing equitable access to high quality care) nor sustainable (for the patient, health system, economy, and society) and demands the urgent attention of governments, policy

makers, and the medical community.

There is currently no agreed global framework or approach that LMIC governments can use to establish and/or scale up programs to prevent and treat CKD. Many of the existing WHO Best Buys for NCDs⁴¹ will help to prevent progressive loss of kidney function and thus the burden of ESKD. However, there is no agreed “Best Buy” list of diagnostic tests or treatments for kidney diseases. Moreover, the CKD burden in many geographic areas is not explained by the commonly recognized risk factor clusters against which the current NCD Best Buys have been developed. This information would be useful to governments and health authorities that seek to develop integrated kidney care programs. In addition, there is a lack of information on how to successfully implement such programs. Case studies that summarize lessons learned from the global experience with kidney care programs would be a useful advocacy tool and are being developed. If selected carefully, such tools could be used by stakeholders to advocate for an integrated approach to kidney care (including ESKD) within a context of universal health coverage (UHC) and with an emphasis on preventive care. Activities to advocate for integrated ESKD care are discussed below and summarized in Table 2.

Develop a framework that LMIC governments can use to establish and/or scale up programs for preventing CKD and providing ESKD care

The high cost of dialysis and the morbidity and mortality associated with ESKD emphasize the high value of primary and secondary prevention. The expertise, medications, and diagnostic tests required to slow or prevent progressive kidney function loss are relatively inexpensive and could be scaled and spread in conjunction with other public health programs for prevention and control of chronic diseases.⁴² Given that the cost per quality-adjusted life year (QALY) associated with providing such preventive care is markedly more favourable than dialysis care,⁴² it is rational to prioritize publicly funded preventive care rather than publicly funded KRT. The ISN therefore accords the highest priority to prevention and all capacity building programs of the ISN and its partners are predicated on the requirement that there be a focus on prevention and other early interventions. Similarly, since not all patients with ESKD will benefit from and/or have access to KRT,

expanded access to comprehensive conservative care (see Theme 8) will improve patient outcomes and the experience of patients and families – and providing access to publicly funded comprehensive conservative care should receive priority.

When KRT is contemplated, kidney transplantation offers for suitable patients the best outcomes at lowest cost, compared to dialysis, at least when provided in the right conditions.⁶ Although HD is often considered first by countries seeking to develop a dialysis program, PD usually offers similar outcomes at lower costs to the healthcare system.^{43,44} PD is especially appropriate for adolescents, children, and infants. Assuming that a well-run dialysis program can be established, the choice to favour PD over HD or to allow free choice by the patient should be supported by robust local health economic studies (Theme 4).

Although these general principles for resource allocation (summarized in Box 2) are widely accepted, there are some practical barriers to their application. First, kidney transplantation requires multiple ancillary components (e.g. surgical expertise and facilities, access to tissue typing laboratories) that may be difficult for LMIC to develop and sustain.⁴⁵ Since these services all involve certain fixed costs that are amortized across the total number of transplants done, the cost per transplant can be unreasonably high in settings where programs are new and/or perform low numbers of transplants. One option for countries in this position could be to partner with countries with more established programs which will allow for shared resources, access to specialized training, and a pathway to improve local capacity. This assumes that adequate postoperative and chronic follow-up can be done locally. Second, patients whose transplants experience primary non-function or eventually fail will die of ESKD without dialysis support. Therefore, even in settings where kidney transplantation is successfully implemented as the preferred mode of KRT, dialysis capacity will be required. Third, although PD is generally less expensive than HD, there are settings where this is not the case – especially those where PD fluids and supplies are expensive (e.g. due to tariffs or lack of competition), or where skilled labour is relatively cheap (favouring HD since nursing care is a key driver of costs for this therapy but is not much needed to provide

PD).⁴⁶ Therefore, flexibility is needed in applying these principles in different settings.

1. Interventions to slow or prevent progression of kidney disease to ESKD are effective, highly cost-efficient, have synergies for the prevention and management of diabetes and vascular disease, and are easily integrated with other programs aimed at NCD prevention and control. Such preventive care should be the highest priority for kidney care programs in LMICs.
2. Supportive care and comprehensive conservative care programs should be established in parallel with preventive care programs. For LMICs, there is a need to agree on an essential package of resources and interventions for people with CKD and ESKD required to minimise the burden of serious (kidney) health-related suffering.
3. Among KRT modalities, kidney transplantation in suitable patients is associated with the best clinical outcomes at the lowest cost.
4. PD is associated with outcomes that are similar to those for HD. For LMICs that are contemplating chronic dialysis programs, whether PD should be prioritized over HD or free choice is allowed should be based on cost evaluation. Local manufacture of PD solutions may help to realize the potential economic benefits of PD.

Box 2. Principles of establishing a comprehensive kidney care program

ESKD=end-stage kidney disease; NCD=non-communicable disease; LMICs=lower-middle-income countries; CKD=chronic kidney disease; KRT=kidney replacement therapy; PD=peritoneal dialysis; HD=haemodialysis

The four principles (in Box 2) are supported by evidence, but such evidence is not always summarized in a format that is useful to decision makers, may not apply to all LMIC settings and may not have been recently updated. To be maximally useful to decision makers in LMICs, new evidence summaries (rapid reviews, systematic reviews, economic analyses) are required that will provide updated and accessible information to support decision-making on kidney care programs. In addition, data that facilitate application of general principles in real world settings would be beneficial. For example, identifying the threshold cost for PD fluids at which PD becomes more expensive than HD would help to identify settings in which principle #4 (Box 2) may not apply. Similarly, local information on the incremental cost of PD compared to HD would help decision makers to understand the net financial costs of a “free choice” strategy to dialysis modality selection. Therefore, there is an urgent need to produce and disseminate these summaries in partnership with

end-users.

There are several models that could be considered for organizing and funding kidney care programs, each with their own advantages and disadvantages. A summary of these models would be a useful adjunct to the summary of evidence related to the clinical services that should be provided and should be developed and disseminated in parallel with the former. Box 3 indicates a potential pathway for countries to develop a model of integrated kidney care, based on the experience of successful initiatives in countries such as Taiwan and Japan.

Pathways	Partners	Actions
Understand ESKD burden at national and local level	National health administration National nephrology society	CKD/ESKD registry Epidemiology studies Risk factor identification Target population definition
CKD/ESKD Committee at National or Nephrology Society level	National health administration National nephrology society Nephrologist as core leadership Patient organizations	CKD prevention program Multidisciplinary care program Replacement therapy quality control Renal transplantation promotion
Standardization for integrated CKD/ESKD care	National health administration National nephrology society International societies (ISN, regional societies, WHO, etc.)	CKD Guideline Dialysis Guideline Transplantation Guideline
Implementation of integrated CKD/ESKD care system	Primary and secondary care physicians Multidisciplinary healthcare teams Patient organizations	Multidisciplinary and multi-professional care approaches
Sustainability and quality improvement	National health administration Social scientists, health economists, industry	Funding assurance and healthcare coverage, bulk buying dialysis supplies

		and immunosuppressive therapy
Outcome measures	National health administration National nephrology society	Annual report and outcome assessment
Box 3. Suggested pathways and strategies for developing integrated CKD/ESKD care		

CKD=chronic kidney disease; ESKD=end-stage kidney disease; ISN=International Society of Nephrology; WHO=World Health Organization

Decision makers in LMICs would benefit from a tool which describes and justifies the principles behind establishing a national kidney care program, including the two forms of evidence summarised above. This tool should present the four principles (in Box 2), and identify the preparatory work that countries must do before applying the principles (e.g. assess burden of kidney disease and ESKD, identify existing human capacity and relevant infrastructure, consider and agree on health policy priorities). The tool should also make explicit the above-mentioned factors that may prevent a country from developing kidney care services in the order implied by the four principles, as well as suggesting metrics that help to inform countries when offering a more sophisticated kidney care program (e.g. what proportion of the population should have reasonable access to preventive services and supportive care before a kidney transplantation program is implemented, developing equitable and transparent rationing policies for access to dialysis). Care needs to be taken to ensure that supportive/palliative care is seen as an essential, integral component of comprehensive ESKD care, as it is with oncology and acquired immune deficiency syndrome (AIDS) care. Priorities for spending on KRT programmes need to be agreed upon by patient groups, the public, healthcare professionals, and policy makers.

Support stakeholders in advocating for integrated kidney care programs within their countries

From an advocacy perspective, current global efforts to establish UHC and the focus on NCDs are useful opportunities in making a case for change in kidney care.⁴⁷ In this context, there is a specific opportunity to set out what an essential package of health services might look like for kidney care under UHC – and to emphasize that treatments

for preventing and managing will often help to prevent and treat other NCDs such as diabetes and vascular disease. In such a fully integrated, people-centred health system, people with ESKD need the education and support to choose from the range of available care modalities – optimally each of HD, PD, transplantation, and comprehensive conservative care – and have their health-related quality of life (HRQoL) and well-being optimised on that modality. Potential stakeholders in this objective include health facilities, patient organizations, and national/regional nephrology societies. These stakeholders would benefit from toolkits and education that support them to advocate for rational kidney care programs. The tools would need to acknowledge and respond to the highly variable contexts, health systems, and large number of stakeholders that are involved within and across the different LMIC audiences.

It would be critical to ensure that these advocacy tools are aligned with the messaging for decision makers (above), as well as with the messaging in other relevant documents from key stakeholders such as ISN, Kidney Disease: Improving Global Outcome (KDIGO),⁴⁰ WHO and the HEARTS technical guidance initiative.⁷

Develop country-specific patient engagement strategies

Adults and children with advanced CKD experience high symptom burden and have complex health and social care needs.⁴⁸⁻⁵¹ Involvement of patients and caregivers is critically important to ensuring that planning of ESKD care, within the overall context of healthcare, meets consumer need and is appropriately prioritized. Patient involvement in research priority setting is increasing in frequency but still relatively rare,⁵² and it is not currently known to what extent patients participate in, and influence ESKD care planning in different countries around the world. This knowledge gap could be addressed through surveys and grey literature review, supplemented by qualitative research in patients and caregivers to identify barriers and enablers of ESKD care in different countries. Patient involvement, such as in the CAN-SOLVE-CKD Network,⁵³ would also help to improve transparency in different countries regarding criteria for patient access to KRT. Additionally, initiatives such as Standardised Outcomes in Nephrology (SONG) have

involved patients as important stakeholders in the definition of relevant clinical outcomes for research purposes in ESKD.⁵⁴

In relation to transplantation, patient involvement can help build community support for deceased organ donation and promote transparency in allocation of kidneys and acceptance of patients onto waiting lists. Closely aligned with this is community engagement and education. Promoting the community's understanding of the concepts of death determination and the benefits of organ donation will be a benefit to society. In many societies, it would be essential to involve local religious, traditional, and cultural leaders in the development of patient education and awareness programs.

THEME 3: EDUCATION AND TRAINING / WORKFORCE

Develop locally appropriate strategies to enhance health workforce capacity

As stated in Theme 1, there are important gaps in the organization, knowledge, and practice of the health care workforce in ESKD care around the world -- from the standpoint of physicians, nurses, and technicians. This is particularly true in LMICs where there is often a lack of adequate education and training programs and funding. Adequate care for patients with ESKD (dialysis, transplantation, and conservative care) is not possible without a sufficiently trained, and appropriately distributed workforce.⁵⁵ Activities to evaluate and enhance the nephrology workforce are discussed below and summarized in Table 3.

Evaluate workforce and its training

If sustainable ESKD care programs are to be developed, an initial, important first step is to collect accurate information about the number, competence, knowledge, and distribution of the existing workforce. The second step is to evaluate the available education and training programs and perform a needs assessment by identifying the barriers and facilitating factors that would inform development of appropriate training modules to provide and augment the basic and ongoing education of the workforce. The third step is to estimate the workforce and educational needs to support the expansion of

ESKD care services. Learning from the experience of other specialties in providing creative workforce and educational models should be explored. It is essential to focus attention not just on the nephrologists, but on primary care physicians and non-physician workers, such as nurses, technicians, nutritionists and social workers.⁵⁶⁻⁵⁸ Since LMICs generally have limited personnel to provide ESKD care, nurses (registered and practical), technicians, and all-purpose assistants can be recruited and trained.^{59,60} Similarly, limited availability of nephrologists requires engaging primary care physicians and general surgeons for management of various aspects of ESKD care. Special mention should be made of the need of healthcare workers to manage children with ESKD.

International education and training programs, available through international organizations and global health programs of universities of other countries can be helpful. While training in the local environment is ideal, organizations like ISN, International Society for Peritoneal Dialysis (ISPD), International Paediatric Nephrology Association (IPNA), and the Transplantation Society (TTS) have supported nephrologist/specialist training through their programs that permit those from LMICs to travel to training programs in HICs for varying durations (see Supplementary Table S3). Despite the risk of brain-drain, recent data from these organizations indicate that the vast majority of trainees from LMICs who receive training in HICs, return to their country of origin.⁶¹ However, unless it is targeted to specific needs, training in HICs may not lead to accrual of knowledge relevant for practice and needs in LMICs. Short training periods focused on specific aspects of ESKD care, particularly involving hands-on care, can be useful. For example, focused hands-on training for both nurses and physicians to learn the basic principles of PD, techniques of PD catheter placement, and/or training algorithms for PD have been accomplished with short term grants for physicians and nurses from LMICs visiting well established dialysis centres.⁶²

Develop strategies to enhance health workforce capacity

Exploring the use of newer technologies to enhance training is essential. Telemedicine health support systems, web-based education programs, webinars, ready availability of international guidelines with adaptation tools, web posting of a wide variety of educational

materials (e.g., on ISN Academy, <https://www.theisn.org/education-external/isn-academy>), and online consultations and support can all help to support the education of personnel involved in ESKD care.^{63,64} Examples of such programs include some of the educational initiatives instituted by the ISN, ISPD, and SLANH utilizing web-based education programs.

Renal workforce shortages are exceedingly common, particularly in LICs. For example, nephrologist densities vary over 1000-fold across the globe, averaging 0.32 pmp in LICs and 28.52 pmp in HICs.^{13,14} Expanding the roles of available workforce could permit rapid expansion of ESKD care. Well-trained technicians, with appropriate education and supervision, could undertake many of the duties related to dialysis care.⁶⁵ For example, the expansion of PD in some HICs has been assisted by the use of technicians to provide support for patients at home (so called “assisted PD”). Furthermore, primary care health workers with appropriate training can play an important role in the basic management of ESKD (Antwi S, unpublished data).

The development of regional and local training programs focusing on locally relevant skills has the potential to increase access to, and improve the quality of ESKD care. For example, the Red Cross War Memorial Children’s Hospital in Cape Town, South Africa, has created a “kidney program” which trains teams of doctors and nurses in hands-on skills to manage patients with acute kidney injury (AKI) in an intensive 1-week course, trains pediatricians from Africa for 1 and 2 years in nephrology, and trains adult nephrology fellows in paediatrics for one month. It is hoped that the latter will allow the trainees to at least address the basics of kidney disease in children upon their return to their local sites. The East African Renal Institute has recently been established in Nairobi to help train nephrology fellows from the region. The African Population and Health Research Centre (APHRC) in Kenya is working to encourage research into local issues in Africa, including a focus on chronic disease management.⁶⁶ The centre has made it possible for doctoral training at African universities via the Consortium for Advanced Research Training in Africa (CARTA).⁶¹ Regional training networks need to be developed for support, training, and continuing education of the ESKD workforce.

The importance of the involvement of dialysis facility providers in supporting the education of technicians, nurses, and physicians needs to be emphasized. This is the case whether the facility is developed by the government, hospital, physicians, or public-private partnerships (PPP) or investments (PPI). There needs to be assurances that this training conforms to international standards. Appropriate oversight of such training, therefore, needs to be organized based on approved criteria, such as those developed by the Board of Nephrology Examiners Nursing Technology (BONENT) in the USA and used in other countries such as India .

Facilitate ESKD care-specific training to increase nephrology workforce

Adequate education and training of the workforce requires that specific skill sets to cover all dimensions of ESKD care be defined. For example, for HD, training needs include concentrate chemistry, accurate weighing of patients, volume control, infection control, indications for vaccination of patients and staff, indications for patient isolation, risks and benefits of dialyzer reuse, and responses to intradialytic complications. For PD, specific educational dimensions that need to be addressed include the kinetics of PD, how the PD prescription is determined, how to deal with catheter infections and mechanical problems, how to manage other dialysis-related infections, and when to transfer patients to HD. Dietitians and social workers are often not part of the healthcare team for dialysis patients in LMICs. Dietitians should be trained through local institutions, and when not available, nephrologists, nurses, primary care physicians, and technicians should be educated to discuss nutrition issues with patients.

Transplantation is a highly skilled, multidisciplinary procedure and requires a specialized workforce with the appropriate qualifications. In addition to transplant surgeons and nephrologists skilled at managing transplant patients, it requires anaesthetists, nurses, pharmacists, histopathologists, laboratory technicians, and scientists to run a human tissue typing laboratory and dialysis backup. Training in supportive and conservative is often lacking, even in HICs. Clinician (nurse, physician, and allied health personnel) training in symptom assessment, communication skills, advance care planning,

supportive care, and the use of prognostic models needs to be developed. Of particular importance is additional training of those caring for children and young people in LMICs where ESKD care options are limited.

THEME 4: FINANCING / FUNDING MODELS

Develop financial strategies and funding models to ensure equitable integrated ESKD care

There is compelling evidence to show that the availability, reach and quality of ESKD care is directly linked to the wealth of a country and the proportion of resources spent on healthcare.²⁷ In a recent survey designed by ISN to collect information related to KRT in LICs and LMICs, government funded KRT was associated with a higher access to dialysis and transplantation, when compared to self-funded out-of-pocket (OOP) models of reimbursement (unpublished observation from the ISN Kidney Collection; <https://www.theisn.org/news/item/3282-presenting-the-kidney-collection-survey>).

Therefore, development of locally appropriate financing models is key to establishment of sustainable KRT programs throughout the world.

In affluent countries, dialysis is generally available to everyone who has the potential to benefit from it. On the other hand, as an expensive and cost-inefficient public health intervention, dialysis has been rated by the WHO to be low priority for governments with limited resources.⁶⁷ Despite this, as documented by the GKHA,^{13,14} HD is currently available in all countries of the world, including those that are unable to finance even basic healthcare services. Public funding for dialysis is available in 71% of countries, including 73% of LMICs and 44% of LICs.¹⁴ Free dialysis at the point of care is available to some proportion of the population in 63% of countries.¹⁴ However, the extent of the coverage is widely variable. An increasing number of countries are including coverage of dialysis in their UHC agenda under the Sustainable Development Goals.

The decision to provide public funding for KRT is often driven by political rather than medical or economic factors, and is influenced by the perceived need and requirements

of societies based on inputs from stakeholders in the overall context of values, human rights, equity and self-determination by governments.⁶⁸ Each country selects an acceptable amount of KRT funding as a proportion of the overall healthcare budget. Given that chronic dialysis is so costly, universal coverage is not sustainable for most LMICs. Therefore, locally acceptable rationing criteria with transparent methods for their application need to be developed alongside sustainable funding models.^{69,70}

Two general principles related to financing of healthcare^{71,72} can be applied to dialysis: efficiency (optimal use of resources to minimize avoidable losses) and progressivity (making the service available in an equitable manner to the rich and the poor, such that those with unequal ability to pay do pay differentially). The latter is directly linked to UHC, which stipulates that people should be able to access dialysis without risking financial ruin or impoverishment. In practice, however, there are significant departures from these principles in both HICs and LMICs. In particular, within many LMIC, salaried workers in the private and government sectors, as well as wealthy patients, are able to access dialysis that is not available to the rest of the population.^{73,74}

Evidence of efficiency should come from health technology assessment (HTA), which evaluates the clinical effectiveness and cost-effectiveness of available ESKD treatment alternatives (HD, PD, transplant, and conservative care). Acting as a bridge between evidence and policy-making, HTA helps in efficient allocation of resources and discourages use of interventions whose cost is too high compared with benefits.⁷⁵⁻⁷⁸

PD is often promoted where dialysis is primarily funded by the government. For example, the government of Thailand conducted an HTA and determined that PD was the more cost-effective option while providing acceptable level of clinical effectiveness.^{20,78,79} This prompted the adoption of a 'PD-first' policy in which all eligible patients are offered PD, with the more expensive HD restricted only to those with a medical indication, or those with private insurance. Similar policies operate in Hong Kong. Others (Mexico, Guatemala, Canada, Spain, China, Taiwan) have adopted a less strict 'PD preferred' policy.⁸⁰ In some LICs however, the delivery of PD is expensive⁴⁶ because of the need to

import supplies, the imposition of additional taxes and duties, and transportation costs. Finally, lack of well-designed health economic studies from a health system or societal perspective has prevented accurate costing of competing KRT options in LMICs, leading to unfounded assumptions. For example, a recent study from India⁸¹ showed that when the complete economic health system costs of HD including personnel salaries, capital infrastructure (building and equipment) and basic medical supplies were estimated, the cost to the system was found to be 4-8 times higher than estimated previous reports. This makes HD far more expensive than PD, contrary to the currently accepted narrative that PD is more expensive than HD in India.

Despite the superiority of transplantation for suitable subjects in terms of cost-effectiveness as well as clinical benefits, public financing of transplantation is not uniformly provided in LMICs. According to GKHA, public funding for transplantation was available in only 25% of LICs and 52% of LMICs.¹³ This creates an anomaly where a patient may choose to receive dialysis rather than a transplant just because the former is free at the point of care whereas the patients have to pay out of their pockets for immunosuppressive drugs. Similarly, conservative care rather than dialysis may be more appropriate for certain patients¹¹ but is not supported by public funding because it is not perceived as a form of active care, but rather an admission of defeat. Activities to develop financial strategies and funding models to ensure equitable integrated ESKD care are discussed below and summarized in Table 4.

Healthcare financing models and their applicability to KRT

Healthcare financing models can be tax-based, insurance-based (social or private) or as OOP payments.⁸³ All three models are used to fund dialysis, with the first one being most prevalent throughout rich countries. Even in countries such as USA where general healthcare financing is done through insurance, dialysis is unique in being funded by general revenue. On the other hand, OOP is the most common of financing of dialysis in LMICs, which can lead to catastrophic healthcare expenditure and distress financing.^{81,82} The model of funding and organization impacts on equity, irrespective of the budget available. For example, Colombia with a gross domestic product per person (GDPc) of

US\$7,500 has a public health expenditure of 4.5% of GDP, whereas Mexico, with a GDPc over US\$10,000 spends only 3% of GDP on health, resulting in an OOP expenditure of 25% vs 50% respectively.⁸³⁻⁸⁵ However, Colombia has universal access to KRT and Mexico does not. In India, even short periods of dialysis while awaiting kidney transplantation in a public-sector hospital caused catastrophic healthcare expenditure in over 80% of the population.⁸²

Financing choices affect both efficiency and progressivity. Optimal design of dialysis financing cannot be isolated from the rest of healthcare in a welfare state, however. Even when providing dialysis to the poor from public funds is prioritised in principle, it has proven to be difficult to implement in practice. Experience from some jurisdictions that have introduced state-funded dialysis show that other components of dialysis delivery that result in OOP (no matter how small their contribution) culminate in catastrophic healthcare expenditure and premature withdrawal from dialysis, thereby preventing attainment of equity.⁸⁶ Recognizing the need for reform, the government of Andhra Pradesh (India) provides a monthly grant of INR 2500 (US\$35) through direct cash transfer to offset OOP expenses incurred on dialysis.⁸⁷ Many countries have several different reimbursement schemes to fund KRT, which also diminish progressivity and perpetuate inequities in access to and outcomes of KRT.

Disparate financing models also create perverse incentives. For example, in some systems, nephrologists are paid per HD session, and hence stand to earn more from this modality, leading to disincentivising of other KRT modalities. Preferential referral by nephrologists to HD units in which they have a financial stake constitutes additional financial conflict.⁶⁹ In view of this, many countries that fund dialysis through tax revenues have made nephrologist reimbursement uniform for both forms of dialysis.

Anecdotal reports have described informal insurance mechanisms such as charity, informal credit, and micro-financing for funding KRT.⁸⁸ While they reduce some of the financial burdens, they may not fully address all of these costs, and might add to inequity.

The policy implications of such informal mechanisms for funding ESKD care needs to be clearly understood.

Additional barriers are faced by some populations that are culturally deprioritized in some societies, such as women, children, and the elderly. Medical care for the primary breadwinners (usually men) is prioritized when there is a cap to the coverage amount. In a state-funded dialysis scheme in India, the female to male ratio was 1:3.5.⁸⁶

Countries that have committed to supporting broad-based dialysis programs are likely to experience increase in demand as the financial barrier is removed, which will force identification of new revenue sources (taxes), or disinvestment in other services. Alongside financing issues, governance and organisational factors need to be taken into account to optimize equitable use of limited resources when providing expensive ESKD care.²¹

The biennial GKHA surveys^{13,14} should be refined to evaluate affordability, accessibility, and quality of ESKD care within and between countries. This information should be supplemented by a comprehensive review of published and grey literature. Data pertaining to ESKD care financing in LMICs can be extracted from the ISN Kidney Collection; (<https://www.theisn.org/news/item/3282-presenting-the-kidney-collection-survey>).

Compare impact of different models of provision and funding - Public Private Partnerships (PPP)

Governments may enter into agreements with the private sector to finance, build, and operate dialysis units for an agreed return on investment. The rationale for using PPPs emerges from the gaps in dialysis delivery and private investment in areas where there are limited public providers. Many LMICs that are developing dialysis as part of their UHC agenda are doing so through PPP. PPP offers innovation opportunities, such as implementation of uniform protocols across a large number of units, reduced costs through strategic purchasing, better outcomes and service quality tracking through

information technology services, and tying service delivery with requirements for workforce capacity-building and ancillary programs. For example, the PPP model in Colombia has been tied to promotion of kidney health, CKD prevention, free choice of KRT, and mandatory reporting.⁸⁹ Examples of PPP programs are to be found in India,⁹⁰ Russia,⁹¹ Mexico,⁹² and Swaziland.

While PPPs have permitted ESKD care services to expand,⁸⁶ there are few studies that have evaluated their ability to deliver efficiency gains in countries where access and equity are major concerns. The function of PPPs in LMICs can be further hampered by lack of strong governance and monitoring mechanisms, misbehaviour of market forces, contract disputes, and lack of dispute resolution mechanisms. Further, the contractual workforce in PPPs may face lower pay and poor working conditions.⁹³ In some regions, PPP resulted in a decrease in PD utilization, with a significant increase in total dialysis expenditure.^{74,92,94} We need more data on the performance of PPPs in dialysis delivery in different countries.

Advocate for universal access to essential drugs and dialysis components for patients with ESKD

While developing financing strategies for KRT, many countries omit coverage for ancillary medical needs.⁸⁶ As a result, patients end up incurring OOP for medical expenses (antihypertensive medicines, erythropoiesis-stimulating agents for dialysis, vaccinations against Hepatitis B, and immunosuppressive drugs for transplant), dialysis access procedures, and additional hospitalizations. A holistic approach to universal coverage of drug treatment and comprehensive patient care is required. Use of generic medicines and development of strategic central purchasing policies have the potential to reduce costs.

Economic and societal return on investment

The economic and societal return on investment in ESKD care can also be measured in terms of monies saved when the most appropriate KRT model was implemented, jobs created (both for healthcare professionals and for patients), and skills, trade, and

knowledge generated that can be leveraged to increase equitable access to healthcare. In terms of societal returns, part of the costs of ESKD care flow back to the community as they pay for nurses and technicians and allow ESKD patients to remain economically productive. This approach also allows development of tools to measure return on investment in economic terms, rather than only deaths and disability-adjusted life years (DALYs) averted.

As emphasized in Themes 1 and 3, ESKD funding systems should allocate resources towards registries and workforce training. Finally, any responsible model to fund KRT must be coupled with population-based programs to detect early stages of CKD so that evidence-based public health interventions can be implemented to prevent or retard the progression to ESKD.⁴ Such an approach has been adopted in many countries and is leading to either an arrest or even decline^{27,88} in the incidence of new patients with ESKD.

THEME 5: ETHICS

Enunciate ethical principles surrounding ESKD care

Ethical challenges in ESKD care are encountered at all levels from policy development and administration, to clinical practice. Questions at policy level such as prioritization of CKD prevention versus treatment of advanced disease, equitable access to care for those with ESKD, rationing of resources (e.g., dialysis and transplantation), and decisions to initiate or continue KRT, are relevant in all countries, but are especially challenging in LMICs^{21,95,96} (see Theme 2). For clinicians, decisions regarding starting and/or continuing dialysis may present multiple ethical dilemmas.⁹⁷ Many patients, especially the elderly, have multiple comorbidities and psychosocial complexities that complicate the qualitative assessment of potential treatment benefits. Decision-making is further complicated by diverse spiritual, cultural, religious and socioeconomic backgrounds. In LMICs, the ethical complexity of bedside decision-making about ESKD is exacerbated by constraints in availability of treatment, financing of care, quality of treatment delivered, as well as

corruption in some settings, leading to moral distress among patients, families, and healthcare workers.²¹

Despite early work on the ethics of dialysis,⁹⁸ ethics has been a neglected discipline in nephrology with the exception of kidney transplantation, which remains a popular topic for inter-professional research, commentary, and guideline development⁹⁹ (see Theme 7). Limited ethical analysis and guidance relating to provision of integrated KRT, including dialysis, means that there are multiple gaps relating to the ethics of ESKD care.^{21,69,100}

Work is needed to ensure a considered approach to the planning and delivery of ESKD care, to provide information and expert opinion to assist policy makers in deliberations concerning fairness in priority setting and resource allocation; and to promote shared and informed decision making about management of kidney failure and provision of KRT in the context of health systems - including provision of appropriate supportive care for all patients, whether or not they receive dialysis.^{70,101-103} Sensitivity to global diversity in culture; consideration for special groups such as the underserved, indigenous populations, migrants and refugees;¹⁰⁴ and use of reliable evidence of kidney disease burden and capacity of health systems are imperative to inform ethical decision-making.¹⁰⁵

Evaluating practical issues identified above through an ethical lens is necessary to inform development of ethical frameworks to support decision-making, and to ensure that practical solutions are consistent with the values and preferences of the communities they are intended to benefit, as well as those responsible for their implementation. Exploration of the ethical aspects of ESKD care should build on past and current ethics work, not only in nephrology, but also in the context of public health, critical care, chronic disease management, and transplantation (Figure 4). Activities to enunciate ethical principles surrounding ESKD care are discussed below and summarized in Table 5.

Develop an international professional statement articulating core ethical principles and values to guide policy and practice in ESKD care

Specific ethical dilemmas relating to provision of ESKD care require elaboration at the local level or in the context of specific issues under the framework provided by the

overarching principles and values regardless of diversities in environments. Health is a globally valued good, as is the right to be included in decision-making about matters concerning individuals and communities. Together, they provide the foundation for a common ethical framework to guide policy and practice in ESKD care around the world.

The development and communication of an international professional ethics statement addressing the spectrum of ESKD care, such as service planning, choice of type of KRT, and conservative care is needed to clarify the standards and goals of the global community of kidney care professionals. Such a statement would serve to inform development of local policy and practice, highlighting the importance of addressing equity concerns and optimization of access to kidney care in the context of local standards of care.^{106,107} The availability of ethical guidance should enhance and promote equity in the quality of care for patients and their families, for example by assisting healthcare workers to advocate with and on behalf of patients and their families and communities. It could also reduce moral distress for healthcare workers confronting ethical issues in ESKD care, for example when burdened with the responsibility for making rationing decisions in the absence of ethical or institutional guidance or when required to implement policies or work under circumstances which may be inconsistent with their own ethical values.^{21,108}

Raise awareness and understanding of ethical aspects of ESKD care among health professionals

Moral distress among healthcare workers can lead to demoralization, regret of choice of profession, feeling “burnt out”, and contribute to brain drain from LMICs.^{108,109} Distress may come from a lack of guidance for clinical practice regarding access to KRT, limited or non-availability of palliative and supportive care, and having to deliver care inconsistent with one’s own values. Examples include deciding whether or not a family bread-earner should receive potentially lifesaving KRT because of lack of health system or patient resources, or when patients/families insist on likely futile KRT simply because it is available. Physicians often feel powerless to advocate against restrictions imposed by the system, and lack of awareness of guidance¹¹⁰ regarding ethical withholding or withdrawal of care may exacerbate moral distress.

In order to stimulate theoretical and applied work on the ethics of ESKD care, and to promote ethical practice in the delivery of ESKD care, health professionals must be able to recognize, understand, and appreciate the importance of ethical concerns that may arise in policy or practice, critically evaluate policies and practices from an ethical perspective, and contribute to actions aimed at addressing ethical concerns. Tools to approach ethical aspects of ESKD care, facilitate working through and articulating moral dilemmas at the bedside, and foster mutual support to reduce moral distress should be included in education and training activities to build skills and knowledge among the nephrology workforce. Ethical challenges should be explored in professional forums such as academic conferences and in academic publications, so as to stimulate discussion and encourage engagement with opportunities for collaboration.

Increase inter-professional research, discussions, and interventions on ethical issues in ESKD care

Development of effective and ethical solutions to the multidimensional challenges of providing appropriate ESKD care to all requires inter-disciplinary research. Determining the fairest way to distribute treatment resources requires knowledge of the local health economics relating to KRT, the healthcare system infrastructure, population disease burdens, and community values and preferences.¹¹¹⁻¹¹³ Capacity building among researchers in local contexts is a prerequisite to support relevant and meaningful studies. Clinicians, researchers, ethicists, and health administrators must engage with community stakeholders, civil society, industry, policy makers, and those involved in advocacy and care delivery for related communicable and NCDs.¹¹⁴

The development of a strategic plan for research in the ethics of ESKD care at international and national levels will help to establish priorities for multinational and multidisciplinary collaborative research.¹¹⁵ This is particularly important given the global shortage of ethicists currently working on issues in nephrology and the limited ethics expertise available in some countries. A strategic plan will also help to inform research funding decisions by those seeking to invest in the ethics of ESKD care, and to guide the development of regional and national research activities.

Develop issues papers and guidelines addressing specific ethical issues in ESKD care

As Jha and colleagues and others have highlighted,^{21,69,116} and the deliberations of ISN's 2nd Global Kidney Health Summit in 2018 have made evident, several ethical issues in ESKD care require urgent attention. In some countries, issues relating to end-of-life decision-making may be most acute, whereas in others, especially those with limited health resources, issues relating to justice in the distribution of resources may be prioritized. In addition, conflicts of interest – particularly financial ones – may inappropriately influence decision-making about many aspects of ESKD care if they are unrecognized and/or not managed appropriately.

The development and promulgation of papers exploring such issues and review of existing guidelines providing recommendations for ethical practice in ESKD and relevant conditions will enhance awareness and improve the quality of care received by patients and their families, reduce inconsistencies in policy and practice, improve fairness and efficiency; and reduce anxiety and distress that professionals, patients and other decision-makers may experience when grappling with ethical uncertainty or unethical practices. Highlighted here are examples of two priority areas for more focused ethical work.

1. Challenges in resource allocation are particularly acute and ethically complex in resource-limited settings.^{21,96,116,117} The provision of ESKD care should aim to promote equity of access, such that criteria used to allocate public funding for ESKD care, or to determine eligibility for KRT, are primarily based on evidence-based medical parameters, not socio-economic status.¹¹⁸⁻¹²⁰ However, in the absence of guidelines to govern resource allocation, the ability to pay for care is often the most influential, or the only factor determining access to care. The extent to which funding issues may justifiably influence resource allocation decisions in provision of ESKD care, if at all, is a topic deserving of substantial further work.
2. While dialysis (or transplantation) may be life-saving, it may also impose significant burdens – economic, clinical, and social – on patients and their families and has

important implications for the broader community.^{21,69} Thus, even when there are few resource constraints directly influencing access to ESKD care, the potential benefits of various care modalities must be evaluated in comparison with the potential burdens and considered in the context of broader personal and societal goals.^{77,103} Determining who should be involved in making such evaluations and how individuals or groups should be involved in decision-making requires careful ethical deliberation. Respect for autonomy is a widely accepted ethical norm in the context of healthcare delivery. However, operationalizing this may be complicated in some sociocultural and healthcare environments, and in the context of specific decision-making dilemmas.^{121,122}

THEME 6: DIALYSIS

Define, recommend, apply, and develop a monitoring framework for minimum and optimal safety and quality standards for peritoneal dialysis and haemodialysis

The quality of dialysis delivered to patients varies from country to country, region to region, and facility to facility. This is particularly so in countries without universal standards of care and governmental (or other organizational) oversight, including audits of quality of care. This can result in suboptimal or poor quality of care.¹²³ Oversight of dialysis care occurs in all HICs, usually based on adherence to standardized, evidence-based guidelines, tracking of outcome measures (e.g., mortality, hospitalizations, etc.), commercial oversight, and inputs of regulatory organizations, such as healthcare commissioners, insurance providers, and those dealing with technical specifications for machines, dialyzers, water, and dialysate purity. Many LMICs appear to have no or limited organized oversight systems to ensure that safe and effective care is provided.

Guidelines for HD and PD have been produced for more than 20 years in HICs. A wide range of guidelines have been developed in Europe, Australia, USA, and Canada. Comprehensive PD guidelines have been published dating back to 1998 by ISPD.¹²⁴ In addition to the national guidelines, nephrology societies, government (both national and regional) health departments, and dialysis facility owners have developed guidelines to

reduce practice heterogeneity and improve quality and safety standards. The application of such standards and guidelines in LMICs is uncertain since the implementation of these guidelines generally assumes sufficient workforce and financial resources to support these levels of care and safety practices. It is important to understand how these standards can then be reasonably adapted and applied in LMICs which often have limited workforce (Theme 3) and financial resources (Theme 4). Certainly, if standards from HICs are to be applied in LMICs, then the nephrology community in the country or region should appropriately modify the guidelines.

A major challenge that faces LMICs is maintaining safety and good quality of care in a financially responsible way.²⁰ For example, it is worth noting that some ESKD services in LMICs are provided by small companies, particularly in smaller towns. This has permitted an expansion of ESKD care services to patients who otherwise would not have access to care. Overview of these organizations by government or national nephrology organizations to ensure the adherence to appropriate standards of care is important and can facilitate the expansion of ESKD care services to these more remote areas. As already mentioned, some countries, such as Thailand,¹²⁵ have achieved cost reduction by means of a PD-First Policy. This has been adopted as a governmental policy and has made universal KRT coverage possible. PD has a number of features that should be attractive to LMICs, including lower expense (depending on local manufacturing and/or low import duties and taxes), fewer technical demands, greater feasibility of use in remote regions, reduced need for trained staff, and fewer management challenges in the setting of natural disasters.¹²⁶⁻¹²⁸ Practical problems in expanding PD programs include the training of individuals to insert catheters, the potential risk of infection, and the ability to obtain dialysate at an acceptable cost. While the latter problem could be ameliorated by local manufacture of PD solutions, this has been difficult to realize. Furthermore, the costs of distribution of supplies has limited the availability of PD in many LMICs.^{24,129} It is important to note that provision of PD involves not only the provision of dialysis solutions but also the availability of satisfactory connection ports between PD solutions and the catheter and appropriate support systems. In addition, it needs to be appreciated that 10-

15% of PD patients transfer to HD each year because of various complications; thus, having a HD facility available to help manage these patients is essential.

An important focus of the international nephrology community in supporting ESKD care in LMICs should be on the application of well researched guidelines which are adapted to the resources and funding available in each country, using validated tools like ADAPTE¹³⁰ to ensure that safe, reasonably good quality care is provided. Examples include incremental HD and PD programs, with initiation of dialysis with less than thrice a week HD or reduced numbers of PD exchanges in patients with modest residual renal function.¹³¹⁻¹³⁵ This approach is important since it can lead to expanded care of patients with ESKD. However, careful attention to the amount of dialysis provided and the maintenance of basic standards of care remains critically important since limited dialysis will, in general, provide suboptimal dialysis in patients with no residual renal function.

New and innovative technology that reduces the cost of KRT and enhances access to and quality of KRT should be explored and remain a focus. Activities to define safe and minimum standards of dialysis and possible innovative approaches are summarized in Table 6.

Define safe and minimum standards for sustainable dialysis treatment

To define safe and minimum standards for sustainable dialysis treatment, existing established guidelines such as Kidney Disease Outcomes Quality Initiative (KDOQI), KDIGO, European Renal Best Practices, Caring for Australasians with Renal Impairment (CARI), Canadian Society of Nephrology, SLANH, National Institute for Health and Care Excellence (NICE), etc., should be adapted to focus on their applicability to countries with limited resources in the context of availability of financial and workforce support. Documents that have been utilized in LMICs, such as Indian Guidelines,¹³⁶ as well as various hospital, academic, and commercial provider recommendations, such as those identified in the ISN Collection, provide additional guidance. Critical vetting and eventual acceptance of these approaches in individual countries or regions should involve the local

nephrology community, patients, industry, and government and global healthcare organizations. Broad dissemination of the proposals is essential.

Define safety standards for paediatric facilities

PD is the preferred KRT modality in paediatrics, when transplantation is delayed or impractical, because it permits more flexibility of therapy. However in some countries, such as South Africa, if children with ESKD are judged not to be suitable for transplant, chronic dialysis is not undertaken as there is no positive end point and the family may be put in a financially challenged state. Linking an adult and paediatric unit together may enhance sustainability. Paediatric-specific equipment may be difficult to source for stand-alone units but could be more easily purchased when linked to a larger adult unit (with increased numbers of patients).

THEME 7: TRANSPLANTATION

Define the key considerations for expansion of kidney transplantation as a component of integrated ESKD care

Transplantation is the preferred modality of care for ESKD in suitable subjects,^{6,8} including for children because of the better quality of life and long-term survival.¹³⁷ However, there are wide disparities in access and use and substantial risks to both donors and recipients associated with poor practices. According to the Global Observatory on Donation and Transplantation (GODT), 111 of the 192-member states of the WHO provided data on transplantation activity to the global registry. Kidney transplants were performed in 102 of the 111 countries.¹³⁸ Living donor kidney transplants were performed in 98 countries and deceased donor transplants in 76. Figure 5 shows the distribution of kidney transplant rates around the world. Kidney transplantation is non-existent in some parts of the world including much of Africa and parts of South East Asia, reflecting both cultural preferences and resource limitations. In particular, Africa has a very low transplant rate with only 488 kidney transplants performed (0.4 pmp) in 2015 with a very variable distribution as many countries have no transplantation programs.¹³⁸ The majority of transplants occur in HICs and these regions generally have higher rates of deceased

donation. In LMICs, deceased donors are poorly utilized because of an ineffective organ procurement network, lack of facilities for pre-transplant investigation, taking care of potential donors, and poor public education.¹³⁹

To achieve expansion, ideally transplantation services should be integrated into every national program of ESKD treatment as stated earlier (Box 2). As several HICs have shown that up to 50% of the ESKD population are treated by transplantation,¹⁴⁰ this can be seen as a potential national benchmark for eligible patients. All these countries have national healthcare schemes and strong deceased kidney donor programs. For LMICs, an incremental objective relative to the development and sophistication of their health system needs to be developed. In addition, efforts should be undertaken to establish regional children transplant centres to optimize the use of scarce resources. Nearly all newly established ESKD care programs start with dialysis and have no transplantation. A policy focused solely on dialysis will be costly and may result in patients seeking transplantation in an unregulated environment, creating a market for organ trafficking. Activities to develop transplantation in LMICs are discussed below and in Table 7. Substantial initial investment is required, but this is more than offset by lower cost of ongoing treatment and financial returns to the society as a result of improved rehabilitation. Workforce and training are discussed in Theme 3 and finance issues/funding models discussed in Theme 4.

Implement legislation for organ donation and safe transplantation in all countries

Clear, unambiguous legislation and regulation that recognizes and defines brain death and addresses commercial transplants is the foundation of a successful organ donation and transplantation system, regardless of whether deceased organ donation is occurring or not, and needs to be developed in all countries. It is essential to protect recipients and donors (from exploitation), transplant professionals, and institutions, and to eliminate organ trafficking.¹⁴¹ Since the Madrid Resolution,¹⁴¹ which built on the WHO guiding principles on human cell, tissue and organ transplantation,¹⁴² Declaration of Istanbul,¹⁴³ and the Council of Europe Convention on action against trafficking in human beings,¹⁴⁴ there has been an increase in the number of countries with appropriate legislation.

However, in parts of Asia and Africa, this essential component is lacking.¹³⁸ At present, it remains unclear how many countries lack appropriate legislation. For those with legislation there must be agreed definitions of death to enable deceased organ donation. Another limiting factor in the implementation and monitoring of the effectiveness of legislation is the lack of integration of information systems between dialysis and transplant activity. The creation and utilization of registries (see Theme 1) that enable linkage between use of dialysis and transplantation would allow the tracking and transparent reporting of transplant activity, providing a true denominator of ESKD and ESKD care as well as forming the basis of a tool to identify potential living donors involved in organ trafficking.

Integrate patient pathways that include transplantation

Extending the detailed discussion of integrated ESKD care in Theme 2, at an institutional level all patients with stage 5 CKD and ESKD should be considered as potential transplant candidates and every unit should aspire to include a structured patient referral pathway for living and, where appropriate, deceased donor transplantation. For countries that do not have a national transplant program, the initial emphasis should be on facilitating living donor transplantation. At a regional level there are opportunities to develop novel integrated models of care, for example as is proposed for the East African Kidney Institute in Nairobi, Kenya.

Promote donation

Lack of donors remains a major challenge in both LMICs and HICs. In addition to the substantial medical infrastructure required there are social, legal, and religious hurdles to overcome.¹⁴⁵ Even when legal requirements are satisfied, public health education and engagement with the community as well as guidance for health professionals and policy makers is essential. All countries need to develop pathways that allow potential donors to be identified in intensive care units and promote opportunities for donation after death, considering incorporation of presumed consent, which has been adopted with success in several European countries.¹⁴⁶ The need for advocacy is discussed in Theme 2 and workforce training in Theme 3.

THEME 8: CONSERVATIVE CARE

Define the key considerations and development of conservative care as a component of integrated ESKD care

Supportive and comprehensive conservative care are essential components of an integrated ESKD care program (Box 2). The terminology and definitions for care that optimally manage symptoms of ESKD are based on the WHO definition of palliative care,¹⁴⁷ and were agreed at the Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference in 2012^{11,148} (Box 1 and Figure 6). It is imperative that comprehensive conservative care is not viewed as a low-cost alternative to the development of KRT programmes in LMICs. If there are resource constraints on the availability of KRT, then management without KRT should be clearly identified as either choice-restricted or not, according to which applies.

Supportive care should be considered for all patients approaching ESKD as well as those already on KRT in all countries (Supplementary Table S4). Where high quality KRT can be sustained as part of UHC, it can prolong life for the majority of people with ESKD; where it cannot, the effectiveness of partially government-funded/ self-funded dialysis and kidney transplantation is likely to vary.

Even where high quality KRT is part of a UHC scheme, for some multi-morbid, older patients, observational evidence suggests dialysis may make little or no difference to survival or HRQoL compared to comprehensive conservative care.¹⁴⁹⁻¹⁵³ The same applies for very young or multi-morbid children.¹⁵⁴⁻¹⁵⁶ Very little is known about the experiences of people with ESKD who make an informed decision for comprehensive conservative care. Even less is known about experiences in LMICs where the choice of ESKD care is restricted by KRT availability and funding; in these settings, the issue is compounded by limited availability of trained staff and essential medication to optimally manage symptoms.

ESKD was one of 21 conditions considered to be contributing to global avoidable serious health-related suffering in the Lancet Commission on Palliative Care and Pain Relief,^{157,158} and its contribution will increase as populations age and the prevalence of NCD increases.¹⁵⁹ Many of the challenges outlined in the Commission are relevant to kidney disease, and some of the greatest opportunities will come from aligning the delivery of supportive care for people with ESKD, particularly those in LMICs, to the delivery of palliative care more generally (Box 4).

Challenges	Opportunities
Establishing education and supply chain infrastructures for supportive care and comprehensive conservative care.	Join existing education and supply chain infrastructures established for delivery of palliative care in other conditions, using telecommunications when relevant.
Delivering supportive care in settings where human resources with the necessary skills are limited.	Explore what tasks can be shifted to general physicians, nurses, physicians' assistants, other allied health professionals and community workers.
Training key people to deliver effective supportive care to people with ESKD.	Training materials exist, they require adapting for delivery in different settings to a range of healthcare professionals.
Recognising comprehensive conservative care as a treatment modality without undermining support for growth of KRT programmes.	Clear messaging that comprehensive conservative care should be part of an integrated, people-centred ESKD service, as set out by the WHO and achieved by other specialities.
Adapting guidance and resources to the full range of settings.	Use of the ADAPTE methodology ¹³¹ to ensure guidance and resources are tailored to available resources.
Being culturally sensitive to different attitudes regarding healthcare decision making.	The ISN has networks with experts across a diverse range of countries and includes these experts in all activities.
Box 4. Challenges and opportunities for integrating supportive care into end-stage kidney disease care.	

ESKD=end-stage kidney disease; KRT=kidney replacement therapy; WHO=World Health Organization

Activities to enhance the role of conservative care as a component of integrated ESKD care are discussed below and in Table 8.

Generate improved information on prognosis and support for people with ESKD and their families

Prognostic tools to support ESKD care decision-making are currently limited and require validation. These tools will require reliable, context-sensitive information on survival and self-reported people-centred outcomes such as HRQoL. The evidence base to support patients and their families is lacking, and requires:

- Careful, context-sensitive evaluation of the effectiveness and cost-effectiveness of ESKD treatment options
- Validation of tools for estimating prognosis (survival and HRQoL) utilizing national registries when available (see Theme 1)
- Optimisation of tools to support decision-making and advance care planning
- Development of evidence-based behavioural interventions to prevent and optimize responses to inter-current illnesses.

Make available evidence-based guidance on supportive care that is context sensitive

For LMICs, an essential package of supportive care resources and interventions should be agreed upon to minimise the burden of serious (kidney) health-related suffering in people with ESKD. This would guide policy makers in choosing interventions across different priorities, given trade-offs and budget constraints, and deciding how these should be financed. This guidance should help provide care to patients who might not meet local criteria for eligibility for dialysis so that such patients do not feel ‘abandoned’ by the healthcare systems. It must complement and integrate with all other essential packages to enable incorporation into a universal essential healthcare package (see Theme 2). The evidence base for the management of symptoms of ESKD needs to be developed and guidelines for symptomatic management that can be used by a range of healthcare workers adapted for a variety of healthcare settings. These would include the “essential bundle” of resources and interventions (country/ context specific) and recognise the particular challenges of symptom management in children and young people with ESKD.

Establish transparent, spiritually and culturally sensitive processes and metrics for monitoring equity of access to and quality of supportive and/or conservative care

See Theme 1 for discussion of definitions for conservative care and minimum dataset requirements necessary for registries. All recommendations must respect within- and between-country differences in attitudes to life, death, and medical decision-making. This includes, but is not limited to, different views held by different cultures about end of life decision making. Resources need to be developed that are culturally-specific and healthcare professionals need to be trained to be culturally sensitive and informed, i.e. “culturally safe” (see Theme 3 for discussion on training).

Communicate clearly and effectively on the role of supportive and comprehensive conservative care in advanced stages of CKD

The choice of terminology around conservative care can affect patient, public, professional, and policy maker perceptions and weaken messaging. Poor terminology could also make integration with established supply chains and care/ education infrastructure more difficult to achieve. Supportive care must be recognised as an essential, integral component of ESKD treatment and offered to all people with advanced stages of CKD, on dialysis, with a kidney transplant, or receiving comprehensive conservative care.

Integrate and align supportive and comprehensive care with existing renal and chronic disease supply chains and infrastructure

The logistical challenges (e.g., availability of drugs and health professionals) and costs associated with provision of services for supportive and comprehensive conservative care need to be recognized and addressed (see also Themes 2-4). Aligning terminology and ambitions with those of the WHO, World Bank, and academic commissions (such as the Lancet Commission)^{157,158} already working to close gaps in care should facilitate kidney health to be adopted as one of their priorities. Examples of where renal services could align include:

- The WHO’s Human Resources for Health (HRH 2030)

- The WHO's People Centred Care Framework
- The Lancet Commission on Palliative Care^{157,158}
- The Lancet Commission on Non-Communicable Diseases and Injuries Poverty (due to be published in 2018)
- The International Children's Palliative Care Network
- The United Nations Children's Fund

A number of charities and non-governmental organisations have established supply chains and care/ education infrastructures in LMICs. If renal services can partner with these it will enhance efficiencies and prevent the development of parallel structures just for people with kidney disease. Examples of where renal services could align include:

- Hospice Africa, which is already providing palliative care for oncology, AIDS, and other non-cancer end-of-life conditions (www.hospice-africa.org.uk/)
- International Association for Hospice and Palliative Care, which aims to to encourage and enable each country according to its resources and conditions to develop its own model of palliative care provision (www.hospicecare.com)
- The African Palliative Care Association, which aims to bring palliative care to all who need it in Africa through information, integration and evidence (www.africanpalliativecare.org)
- Partners in Health, which is facilitating the integration of NCD services at the district hospital level in several countries. This could be leveraged to create kidney care algorithms (www.pih.org).

Conclusions

In developing action plans to formulate a 5 -10-year strategy to improve global access to safe, sustainable, and equitable integrated ESKD care, we involved stakeholders with broad and diverse expertise and different professional, scientific, and cultural backgrounds. The content of this document, including the action plans and performance framework, was developed in a step-wise process, involving several rounds of internal review, plenary and group discussion at the summit meeting, and subsequent working group deliberations. Despite this strength, the selection of goals and activities and their priorities remains subjective, and views about several issues are likely to differ among members of the community. Proposed activities include data capture, policy creation, definition of quality standards, evidence-based guidance, capacity-building, implementation, and research. Partners in these endeavours will include patients, governmental agencies, policy makers, academic institutions, health care institutions, industry partners, research funding agencies, clinicians, and researchers.

After identification of existing gaps in knowledge, clinical practice, and access to ESKD care around the globe, action plans were developed to improve monitoring of ESKD and its therapeutic options; to advocate for expanded and equitable ESKD care appropriate to the context of local resources, health priorities and culture; to build capacity by training a diverse workforce; to define standards for safe, sustainable, and ethical ESKD care; and to establish dialysis, transplantation, and comprehensive conservative care as complementary treatment choices for patients with ESKD. These plans and associated activities will need to be adapted to the needs of individual countries, based on geographical, socioeconomic, cultural, and political considerations. Finally, the participants reiterated the need to embed improved ESKD care in the overall environment that prioritizes prevention and early treatment of kidney diseases.

Granularity within each of the activities and deliverables will be developed over the coming months in conjunction with various partners identified in the action plans, and with those partners a detailed strategic plan defined for implementation over the next 5 to 10 years. A performance measurement framework will be developed for qualitative and

quantitative assessment of progress in implementation of each component of the strategy, and to hold the nephrology community and other stakeholders to account. The performance framework is presented here at high level (Table 9), and will be fleshed out as the strategic plan is finalized. We perceive a broad recognition amongst all those involved in the care of kidney patients of the importance of improving global access to safe and sustainable integrated ESKD care, and that the inclusive involvement of all relevant individuals and groups in implementation and tracking of progress will lead to improved care and outcomes for patients with ESKD globally.

Contributions

DH, SD, FF, and VJ were responsible for conception, organisation, writing, editing, and reviewing the manuscript. JD was responsible for organisation, editing, revision, and logistic organisation, including reference management. All other authors were responsible for initial drafts of specific sections of the manuscript, review, and validation after each review.

Declarations of Interest

VJ reports grants and fees from Baxter Healthcare and NephroPlus, and grants from GSK outside the submitted work. JD reports personal fees from The International Society of Nephrology during the conduct of the study and personal fees from The International Society of Nephrology outside the submitted work. DJ reports grants and personal fees from Baxter Healthcare and Fresenius Medical Care, other from Amgen, personal fees from Astra Zeneca, grants from National Health and Medical Research Council of Australia during the conduct of the study. SD reports grants from Baxter Healthcare and National Institute of Health Research (UK). PO reports grants and other from CSL-Behring, personal fees from Vitaeris and eGenesis outside the submitted work. RPF reports grants from Baxter Healthcare and Fresenius Medical Care, and personal fees from Astra Zeneca and AKEBIA outside the submitted work. All other authors declare no competing interests.

Acknowledgements

In addition to the International Society of Nephrology, support of the Summit was provided through unrestricted grants from Baxter and BBraun. We thank Drs. John Knight and Dieter Frei for their review and comments during development of the manuscript. We also thank Mohamed Osman and Feng Ye for their assistance with figures and analyses.

Tables

Table 1. Explain the reasons for and monitor global differences in the incidence and prevalence of ESKD, ESKD care, and modality of ESKD care

Activities	Partners	Deliverables
Improve estimates of the incidence and prevalence of ESKD and ESKD care, including capturing KRT modality, and outcomes		
Establish and enable ESKD registries in all countries: <ul style="list-style-type: none"> - Make outputs, industry databases and reports freely accessible online - Integrate all aspects of ESKD care (adult and paediatric) into existing and new registries - Link with geographic information systems, death registries or other mortality datasets - Explore mobile technology to access individual data - Compare ESKD registries with national population data - Supplement with observational studies (e.g. DOPPS) - Develop a common, standardized data dictionary 	Existing renal registries, patient and parent organisations, ISN and other national and regional professional associations, local and national health service providers and funders, industry, SharE-RR committee, experts in data linkage	<ul style="list-style-type: none"> - Survey and inventory of existing renal registries (as part of GKHA and SHarE-RR projects) - ESKD Care Registry resource hub - Published map of ESKD “hot spots” within regions and countries - Collated reports of the proportion of patients dying from untreated ESKD in each country - Published factors associated with reduced access to KRT - Publicly searchable registry and database reports - Publicly available data dictionary
Improve measurements of organ donation, transplantation, and outcomes	CTS, established registries, ONT-WHO GODT	<ul style="list-style-type: none"> - All countries contributing to registries - Published annual outcome statistics of donors and transplant recipients - All member states submitting data to ONT-WHO GODT
Develop scholarships for training in epidemiology and registries	ISN and other national and regional professional associations, local and national health service providers and funders, industry	ISN and other professional association scholarships

ESKD=end-stage kidney disease; KRT=kidney replacement therapy; DOPPS=Dialysis Outcomes and Practice Patterns Study; ISN=International Society of Nephrology; CTS= Collaborative Transplant Study; ONT-WHO GODT=Spanish Transplant Organization-World Health Organization

Global Observatory on Dialysis and Transplantation, GKHA=Global Kidney Health Atlas, SharE-RR=SHARing Expertise to support the set-up of Renal Registries

Table 2. Develop an approach to advocate for integrated ESKD care in LMICs

Activities	Partners	Deliverables
Develop a framework that LMIC governments can use to establish and/or scale up programs for preventing CKD and providing ESKD care		
<ul style="list-style-type: none"> - Identify and/or produce literature syntheses to support the development of a national kidney care program - Develop a tool which describes and justifies the principles behind establishing a national kidney care program 	<p>Cochrane Collaboration, university-based research groups</p> <p>WHO, government officials, nephrology society, kidney foundations, patient groups, academia/health economists</p>	<ul style="list-style-type: none"> - Document library - Primary rapid reviews, systematic reviews, and economic analyses - Scientific publication - Brief technical report
Support stakeholders in advocating for integrated kidney care programs within their countries		
<ul style="list-style-type: none"> - Develop and disseminate an advocacy toolkit for stakeholders' use - Educate patients and families about CKD/ESKD and their rights/options in all aspects of treatment - Use World Kidney Day (WKD) to highlight education and lobby governments 	<p>ISN advocacy portfolio, patient and parent groups, kidney foundations, national and regional nephrology societies, medical communities, organ donor initiatives</p>	<ul style="list-style-type: none"> - Key messages, infographics, economic analyses, case studies - Established community groups with medical staff and families to drive treatment action campaign - Annual WKD events
Develop country-specific patient engagement strategies		

<p>- Conduct consumer engagement workshops in each country to:</p> <ul style="list-style-type: none"> • identify, promote and implement effective community involvement strategies in registries • advise strategies for converting epidemiology information into patient-centred information • determine patient relevant clinical priorities in ESKD care • determine research priorities in ESKD • define barriers to ESKD care • define enablers of ESKD care • establish patient ESKD advisory group in each country 	<p>Patient and parent organisations, ISN and other national and regional professional associations, local and national health service providers and funders, industry, governments, NGOs</p>	<ul style="list-style-type: none"> - Annual report detailing consumer engagement workshops held - Register of patient ESKD advisory groups established in each country
--	--	--

CKD=chronic kidney disease; LMICs=lower-middle-income countries; WHO=World Health Organization; ESKD=end-stage kidney disease; ISN=International Society of Nephrology; NGOs=non-government organizations

Table 3. Strategies to evaluate and expand the health workforce capacity for sustainable ESKD care programs to develop

Activities	Partners	Deliverables
Evaluate workforce and its training		
<ul style="list-style-type: none"> - Develop robust methodology to collect data, monitor, and make accurate renal workforce projections - Evaluate the following: <ul style="list-style-type: none"> • training, education, and knowledge of physicians, nurses, and technicians • how existing national training programs and training provided by international organizations 	<p>ISN, ISPD, IPNA, national and regional professional associations, local and national health service providers, dialysis providers, academic centres, health ministries</p> <p>ISN, ISPD, IPNA, WHO, academic centres, national and regional associations and societies, CME organizations, dialysis provides, national health programs, health ministries</p>	<ul style="list-style-type: none"> - Report and needs assessment detailing available resources, barriers, facilitators and projection of future needs - Guidelines for the education and training of adequate ESKD care workforce - Recommendations on the following: <ul style="list-style-type: none"> • how the international community can best help with training programs in LMICs

Activities	Partners	Deliverables
<p>and academic centres contribute to expanding the workforce</p> <ul style="list-style-type: none"> training models and the impact of accreditation; include models applied by other NCDs (e.g., AIDS, oncology, diabetes, hypertension) 		<ul style="list-style-type: none"> how education of the workforce can best be organized and coordinated training lessons learned from other programs practicability of implementing an accreditation program
Develop strategies to enhance health workforce capacity		
<ul style="list-style-type: none"> Explore use and effectiveness of newer technologies to enhance training and care including telemedicine, online/web-based education, and training tools Develop and evaluate effectiveness of regional networks for support, training, and continuing education Promote ISN and other professional organization fellowships and training Encourage PPP/PPI to support training with appropriate oversight ensuring that the right targets and messages are conveyed 	<p>International, national, and regional professional associations, local and national health service providers and funders, industry, governments, NGOs, ISN and other national/regional nephrology societies, academic centres</p> <p>Academic Centres, ISN and other international, national and regional professional associations and societies, local and national health service providers and funders, industry, governments, NGOs</p>	<ul style="list-style-type: none"> A resource hub with tools that can be adopted/ adapted by national organizations Online public health training in Nephrology Increased participation in nephrology fellowships and training Private or philanthropic support of training
Facilitate ESKD care-specific training to increase nephrology workforce		
<p>For PD and HD: Prepare specific skill sets for the delivery of dialysis utilizing various personnel including nephrologists, primary care physicians, nurses and technicians</p> <p>For Transplantation: Develop Handbook of requirements for transplant centres including transplant evaluations and longitudinal care post-transplantation</p>	<p>Professional nursing and technician organizations, national medical societies, academic centres, training centres, dialysis facilities, telemedicine</p> <p>ISN-TTS sister transplant programs and Tripartite relationships, local professional societies and colleges, ASHI</p>	<ul style="list-style-type: none"> A resource hub with tools that can be adopted / adapted by national organizations Established expertise in laboratory medicine and tissue typing Trained staff to address all requirements for a successful transplant program

Activities	Partners	Deliverables
For conservative and supportive care: Develop training in symptom assessment, communication skills, advance care planning, supportive care, and use of prognostic models	Experts in communication skills training, multi-professional experts in supportive care, advance care planning and palliative care, ISN and other national and regional professional associations, patient and parent organisations, online resources for patients with ESKD and providers, existing academic-ministry partnerships	- A resource hub with tools that can be adopted / adapted by national organisations

NCDs=non-communicable diseases; AIDS=acquired immune deficiency syndrome; ISN=International Society of Nephrology; ISPD=International Society for Peritoneal Dialysis; IPNA=International Paediatric Nephrology Association; WHO=World Health Organization; CME=continuing medical education; ESKD=end-stage kidney disease; LMICs=lower-middle-income countries; PPP=public-private partnerships; PPI=public-private investment; NGOs=Non-governmental organizations; PD=peritoneal dialysis; HD=haemodialysis; ISN-TTS=International Society of Nephrology-The Transplant Society; ASHI=American Society for Histocompatibility and Immunogenetics

Table 4. Develop financial strategies and funding models to ensure equitable integrated ESKD care

Activities	Partners	Deliverables
Healthcare financing models and their applicability to KRT		
<ul style="list-style-type: none"> - Detail country-specific ESKD healthcare financing activities - Refine GKHA instrument to assess affordability, accessibility, and quality of ESKD care within and between countries - Augment GKHA data with expanded survey and grey literature review - Revise original documents included in the ISN Collection and extract data on financing 	Patient and parent organisations, ISN and other national and regional professional associations, local and national health service providers and funders, industry, healthcare policymakers, experts in health economics	<ul style="list-style-type: none"> - GKHA special report - Systematic review of published and grey literature - ISN Collection data extract on financing in LMICs
Compare impact of different models of provision and funding including public private partnerships		

Activities	Partners	Deliverables
<p>Evaluate different ESKD care delivery models. Examine approaches to:</p> <ul style="list-style-type: none"> • marketing • tailoring services to the poor • strategic purchasing • lowering operating costs • cross-subsidization • optimizing human resources • product and process reengineering • increasing outreach • information management • integration and system stewardship 	<p>ISN, ISN regional boards, national societies, health economists, process evaluation experts, large dialysis providers</p>	<ul style="list-style-type: none"> - Case studies describing complete marketing, finance, and operations solutions - Identified opportunities for disruptive business process innovation
<p>A) Impact on Equity Survey of all countries regarding their current model in terms of funding and provision of care</p>	<p>ISN GKHA, WHO, WHO's regional offices, national/regional nephrology societies</p>	<p>Thematic summary of different models</p>
<p>B) Impact on Outcomes Determine the outcomes of these different models in terms of hard endpoints</p>	<p>ISN GKHA, WHO, WHO's regional offices, national/regional nephrology societies, USRDS, ERA-EDTA</p>	<p>Description of impact in terms of:</p> <ul style="list-style-type: none"> - Incidence/prevalence of HD, PD, TX, non-KRT initiatives - Demographics of those receiving/not receiving care - Survival/mortality - % of healthcare budget and of GDP being spent on ESKD care
<p>Advocate for universal access to essential drugs and dialysis components for patients with ESKD</p>		

Activities	Partners	Deliverables
<ul style="list-style-type: none"> - Review existing guidelines and care packages - Review drugs included in WHO strategic fund - Request WHO assistance in dealing with countries applying high fees or import duties on PD supplies 	ISN, WHO, MOH, patient organizations, industry, KDIGO and other guideline-producing bodies	<ul style="list-style-type: none"> - Best practice recommendations for dialysis practice and affordable treatment of medical problems in patients with ESKD - Essential drug list, including immunosuppressive drugs for transplantation - Strategic purchasing guidelines
Economic and societal return of investment		
Evaluate cost-effectiveness in different settings: PD vs HD vs TX vs conservative care	MOH, health economists, process analysts, nephrologists, industry	<ul style="list-style-type: none"> - Simulator tool/paper - Tools to calculate the differential costings between HD/PD/ transplantation that are region-specific and relevant for LMICs and HICs
Measure benefits to society – jobs created, skills, trade, knowledge generated, economic returns to society through better rehabilitation of patients	Health economists, process analysts, nephrologists, social scientists	<ul style="list-style-type: none"> - Position paper - Tools to track returns on investment beyond deaths and DALYs
Develop narrative case study of countries where the approach changed at some point in time, and how that impacted outcomes	Specific participants	Thematic summary of different models

KRT=kidney replacement therapy; ESKD=end-stage kidney disease; GKHA=Global Kidney Health Atlas; ISN=International Society of Nephrology; LMICs=lower-middle-income countries; WHO=World Health Organization; HD=haemodialysis; PD=peritoneal dialysis; TX=transplantation; KRT=kidney replacement therapy; GDP=gross domestic product; MOH=Ministry of Health; KDIGO= Kidney Disease: Improving Global Outcomes; USRDS=The United States Renal Data System; ERA-EDTA= European Renal Association-European Dialysis and Transplant Association; DALYs=Disability-Adjusted Life Years

Table 5. Enunciate ethical principles surrounding ESKD care

Activities	Partners	Deliverables
Develop an international professional statement articulating core ethical principles/values to guide policy and practice in ESKD care		
<ul style="list-style-type: none"> - Develop statement with key stakeholders - Promote on ISN website and in communication materials 	Consultations: WHO, patient groups, stakeholders in ISN, ASN, ERA-EDTA, and other nephrology societies, ethics experts from HICs and LMICs	<ul style="list-style-type: none"> - International professional ethics statement on ESKD care - Publication in nephrology, ethics, global health journals
Raise awareness and understanding of ethical aspects of ESKD care among health professionals		
Develop educational activities and resources relating to ethics of ESKD patient care	ISN members, professional associations (nurses, technicians, dietitians, social workers), bioethicists with an interest in nephrology, WHO, educationists	<ul style="list-style-type: none"> - Webinar(s) - Workshop(s) or special seminar(s) at nephrology conferences - Slide decks - Case library with ethical analysis for use in teaching
Develop nephrology ethics/advocacy leadership and mentorship program to increase capacity: <ul style="list-style-type: none"> - Identify potential partners, develop program, determine budget and outcomes - Implement and evaluate a pilot program 	Universities with bioethics programs	<ul style="list-style-type: none"> - Nephrology ethics/advocacy training curriculum (clinical, research, HPSR) - Pilot program - Tools to measure and reduce moral distress
Develop manuscripts on each ethical principle identified above with theory and discussion from LMIC and HIC perspectives	Clinicians in LMICs and HICs, clinical ethicists, public health ethicists	Publication in nephrology, ethics, global health journals
Encourage publications addressing ethical issues in ESKD care by increasing research and promoting awareness of such issues in the nephrology and bioethics communities	Nephrology societies, International Association of Bioethics, biomedical journals	Ethics page on the ISN website (under Advocacy) for collation of resources and promotion of opportunities for collaboration

Increase multidisciplinary research and interventions on ethical issues in ESKD care		
<ul style="list-style-type: none"> - Survey ISN members and stakeholder groups to identify common ethical issues and concerns and priorities for research - Develop a strategic plan for research in the ethics of ESKD care - Build capacity among local researchers across disciplines - Identify opportunities for funding of research in this field and develop funding applications - Identify research themes/regional gaps to be addressed by ISN nephrology ethics fellows 	Philanthropists, WHO, national ethics committees	<ul style="list-style-type: none"> - Descriptive international study evaluating common ethical issues and priorities in ESKD care - Strategic plan for research in the ethics of ESKD care - Research training focus within ethics workshops at national and international meetings and integrated into nephrology ethics fellowships
Develop issues papers and guidelines addressing specific ethical issues in ESKD care		
Form working group(s) to investigate specific issues (informed by survey planned above) and develop ethical guidelines for policy and/or practice, including the issue of priority setting and/or allocation of resources for ESKD care	Bioethicists, WHO, policy makers, national societies, ISN regional boards, public health ethicists	Publication of issues papers and guidelines

ISN=International Society of Nephrology; ASN=American Society of Nephrology, ERA/EDTA= European Renal Association – European Dialysis and Transplant Association; WHO=World Health Organization; HICs=high-income countries; LMICs=lower-middle-income countries; ESKD=end-stage kidney disease; HPSR=Health Policy and Systems Research

Table 6. Define and apply minimum and optimal safety and quality standards for PD and HD

Activities	Partners	Deliverables
Define safe and minimum standards for sustainable dialysis treatment		
<ul style="list-style-type: none"> - ISN to establish a workgroup to review existing guidelines and well-established standards of care (in both HICs and LMICs) focusing on the applicability and flexibility necessary for care in individual lower resource countries - Integrate local partners, patients, industry, and global organizations in the discussion - Disseminate the proposals at regional and national levels and through the WHO, government agencies, nephrology organizations, and dialysis providers - Define the amount of dialysis to be provided and appropriate timing for the initiation of dialysis - Consider incremental dialysis for both HD and PD as way of reducing costs and optimizing care and quality of life of patients - Consider possible PD first program if PD solutions can be obtained in a practical, cost-effective manner - Apply international standards of water treatment - Consider dialyzer reprocessing with the assurance of conforming to international standards - Ensure careful monitoring of outcomes - Establish appropriate infection control practices, applying international standards 	<p>Affordable Dialysis Project, Kidney Care Network, PD first programs, hospital programs, industry, NGOs, PPP, KDIGO, KDOQI CARI EBP, guidelines from national renal associations, ISN, AAMI water standards, international standards organizations, national societies, governments, WHO, MOH, national nephrology organizations, ISPD, ISHD, universities, USA centres for disease control (CDC), university-based global health programs, patient organizations</p>	<ul style="list-style-type: none"> - Set of recommendations adapted to local settings utilising the ADAPTE¹³⁰ framework for: <ul style="list-style-type: none"> • pre-dialysis care, dialysis initiation, dialysis frequency and dose (HD and PD) • recommendations for HD to include water treatment, dialyzer reuse, machine sterilization, monitoring and reporting safety and outcomes, infection control • recommendations for PD to include catheter placement, connection systems, infection control, and possible development of local sources of dialysate and equipment • recommendations for infection control to include prevention of access infection, infection control standards, patient isolation, vaccination of patients and staff, and careful monitoring of adverse events
Propose innovative approaches to safe and sustainable dialysis		
<ul style="list-style-type: none"> - Determine feasibility of telemedicine utilization for staff training, monitoring patients, etc. (Theme 3) - Explore innovative approaches to dialysis therapy, including creative use of solar energy, innovative and efficient water treatment, more cost-effective dialysis 	<p>International and professional educational institutions, industry, ISN/ISPD, IPNA, EuroPD, ISHD, academic medical centres</p>	<ul style="list-style-type: none"> - Telemedicine consultation for remote areas - Support of new and innovative technologies

Activities	Partners	Deliverables
machinery, inexpensive manufacture of PD solutions, and reduction in plastic waste		
Define safety standards for paediatric facilities		
Review existing guidelines	ISN, IPNA, ISPD, paediatrics societies	Recommendations for paediatric units and care

PD=peritoneal dialysis; HD=Haemodialysis; HIC=High-income countries; LMICs=lower-middle-income countries; WHO=World Health Organization; NGOs=non-governmental organizations; PPP=public-private partnerships; KDIGO=Kidney Disease: Improving Global Outcomes; KDOQI=Kidney Disease Outcomes Quality Initiative; CARI=Caring for Australasians with Renal Impairment; EBP=evidence based practice; ISN=International Society of Nephrology; AAMI=Association for the Advancement of Medical Instrumentation; MOH=Ministry of Health; ISPD=International Society for Peritoneal Dialysis; ISHD=International Society for Haemodialysis; US=The United States of America; CDC=centres for disease control; ESKD=end-stage kidney disease; IPNA=International Paediatric Nephrology Association; EuroPD=European Peritoneal Dialysis

Table 7. Define the key considerations and role of kidney transplantation as a component of integrated ESKD care

Activities	Partners	Deliverables
Implement legislation for organ donation and safe transplantation in all countries		
<ul style="list-style-type: none"> - Conduct survey to identify countries that lack or have inadequate legislation; survey state of transplant infrastructure - Identify credentialed centres; identify countries with LD TX alone and those with LD + deceased donor programs - Partner with local advocates, clinicians, patient groups to support development of legislation and lobby governments with respect to illegal practices (organ trafficking) 	WHO, ONT, local patient and support groups, local health workforce	<ul style="list-style-type: none"> - Countries identified with gaps in legislation - Existing transplant service infrastructure assessed - Implementation of legislation - 100% of countries with transplant programs with legislation for organ donation and transplantation

Activities	Partners	Deliverables
<ul style="list-style-type: none"> - Publish transparently all transplant activity in every country and integrate this information with dialysis activity - Develop guidance for ethical practice that is relevant to local resources and cultural factors 	<p>DICG, WHO, WHA, TTS, health departments</p> <p>ISODP</p>	<ul style="list-style-type: none"> - Increased global capture of activity and outcome data from integrated dialysis and transplant registries with systematic reporting of data to ONT-WHO GODT - Established ethical guidance documents that support institutional best practice
Integrate healthcare plans that include transplantation		
<ul style="list-style-type: none"> - Identify appropriate transplantation targets (% of all CKD5 and prevalent KRT patients) for each region; identify national and regional models for transplantation - Include referral pathway for transplantation where appropriate 	<p>Health departments, TTS, ISN, IPTA, IPNA, professional societies and colleges, patient groups</p>	<ul style="list-style-type: none"> - Region-specific targets for proportion of KRT patients for whom transplantation would be appropriate; description of regional models - A structured patient education and referral pathway for living and deceased donor transplantation that supports integration in each region
Promote organ donation		
<ul style="list-style-type: none"> - Develop handbook of personnel and infrastructure required for establishment of living and deceased donation – including community engagement - Develop toolkit of guidelines for minimal requirements of a deceased donor program 	<p>ISN, TTS, International Society of Organ Donation and Procurement, WHO Organ Donor Task Force</p>	<ul style="list-style-type: none"> - Document outlining the steps for establishment of deceased donation - Educational tools for health practitioners and community members

ESKD=end-stage kidney disease; LD=living donor; TX=transplantation; WHO=World Health Organization; ONT=Spanish Transplant Organization; DICG= Declaration of Istanbul Custodian Group; WHA=World Health Assembly; TTS=The Transplant Society; ISODP= International Society for Donation and Procurement; ONT-WHO GODT=Spanish Transplant Organization-World Health Organization Global Observatory on Dialysis and Transplantation; CKD5= chronic kidney disease stage 5; KRT=kidney replacement therapy; ISN=International Society of Nephrology; IPTA=International Paediatric Transplant Association; IPNA=International Paediatric Nephrology Association

Table 8. Define the key considerations and role of conservative care as a component of integrated ESKD care

Activities	Partners	Deliverables
Improve information on prognosis and support for people with ESKD and their families		
Undertake effectiveness and cost-effectiveness research and develop validated prognostic tools, relevant to a range of settings	Experts in prognostic modelling, decision making, multi-professional experts in supportive and palliative care, multi-professional experts in adult and paediatric nephrology, experts in health economics, ISN and other national and regional professional associations, patient and parent organisations, existing academic-ministry partnerships	Resource hub with tools that can be adopted/ adapted by national organisations
Make available evidence-based guidance on supportive care that is context sensitive		
Adapt guidelines for supportive and conservative management of people with advanced CKD for use by range of healthcare workers in variety of settings	Multi-professional experts in ESKD and supportive and palliative care, guideline writing experts such as KDIGO and ERBP	A set of guidelines and signposting tools utilising the ADAPTE ¹³⁰ framework for adapting to local context
Establish transparent, spiritually- and culturally-sensitive processes and metrics for monitoring equity and quality of care in advanced stages of CKD		
<ul style="list-style-type: none"> - Check WHO key performance indicators for palliative care and apply to supportive care where possible - Study role of tracking change in patient-reported outcomes over time to guide care 	Local and national health service providers and funders, national renal associations, existing renal registries	Resource hub to establish registries (see Theme 1) and use data to raise awareness of the needs of people with advanced stages of CKD
Communicate clearly and effectively on the role of supportive and comprehensive conservative care in advanced CKD		
<ul style="list-style-type: none"> - Agree on optimal terminology for engagement - Develop an effective communication strategy that can be adapted to a range of settings 	Experts in public relations and communication, multi-professional experts in supportive, palliative, and advance care planning, ISN and	An agreed terminology that works in all settings as part of a wider communication strategy

Activities	Partners	Deliverables
	professional associations, patient and parent organisations	
Integrate and align supportive/ comprehensive care with existing renal and chronic disease supply chains and infrastructure		
<ul style="list-style-type: none"> - Recognize the logistical challenges and costs associated with provision of services for supportive and comprehensive conservative care - Understand any legal / regulatory framework for providing ESKD treatment - Consider opportunities from parallel models in oncology / AIDS, recognizing differences in onset and duration 	Local and national health service providers and funders, national renal associations, existing renal registries, ministries and policy makers, existing academic-ministry partnerships	<ul style="list-style-type: none"> - Develop costing and “business case” templates - Training programmes (see Theme 3)

ESKD=end-stage kidney disease; ISN = International Society of Nephrology; CKD=chronic kidney disease; KDIGO = Kidney Disease Improving Global Outcomes; ERBP=European Renal Best Practice; WHO=World Health Organization; AIDS=acquired immune deficiency syndrome

Table 9. Performance Framework

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
1: Estimates of ESKD burden & treatment coverage	Explain the reasons for and monitor global differences in the incidence and prevalence of ESKD, ESKD care, and modality of ESKD care	Establish and enable ESKD registries in all countries: <ul style="list-style-type: none"> • freely accessible online, mobile-enabled • linked with other datasets and individual data 	Inventory of CKD and ESKD registries and their datasets Database reports of ESKD care resources	Renal registries and other data-sets, ISN SharE-RR committee
2: Advocacy	Develop an approach to advocate for integrated ESKD care in LMICs	Identify and produce literature syntheses to support the development of a national kidney care program Develop a tool which describes and justifies the principles behind establishing a national kidney care program	Document library, including primary rapid reviews, systematic reviews, and economic analyses Scientific publication Technical report	Cochrane Collaboration, university-based research groups WHO, government officials, nephrology societies, kidney

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
		<p>Develop and disseminate an advocacy toolkit for stakeholders' use, international in outlook but specialized by country</p> <p>Educate patients and families about CKD/ESKD and their rights/options in all aspects of treatment</p> <p>Use World Kidney Day (WKD) to highlight education and lobby governments</p> <p>Conduct consumer engagement workshops in each country</p> <p>Establish Patient ESKD Advisory Groups in each country</p>	<p>Key messages, infographics, economic analyses, case studies</p> <p>Established community groups with medical staff and families to drive treatment action campaign</p> <p>Annual WKD events</p> <p>Annual report detailing consumer engagement workshops held</p> <p>Register of Patient ESKD Advisory Groups established in each country</p>	<p>foundations, patient groups, academia/health economists</p> <p>ISN advocacy portfolio, patient and parent groups, national kidney foundations, national and regional nephrology societies, medical communities, organ donor initiatives, major industry leaders, governments</p> <p>Patient and parent organisations, ISN and other national and regional professional associations, local and national health service providers and funders, industry, governments, NGOs</p>

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
3: Education and Training / Workforce	Develop locally appropriate strategies to enhance health workforce capacity	<p>Develop robust methodology to collect data, monitor, and make accurate projections regarding the renal workforce</p> <p>Assess training and education needs of physicians, nurses, and technicians</p> <p>Evaluate optimal methods for delivery of education and training models and impact of accreditation (included models applied by other NCDs (e.g., AIDS, oncology))</p>	A resource hub with tools adopted/ adapted by national and regional organisations, academic centres, international organizations addressing these areas with specific recommendations of how to address the local needs with information gained locally	National and regional professional associations, governmental agencies (national and local), health care providers, international organizations, academic medical centres
4: Financing / Funding Models	Develop financial strategies and funding models to ensure equitable integrated ESKD care	<p>Enunciate healthcare financing models of ESKD around the world</p> <p>Evaluate their impact on progressivity and equity</p> <p>Evaluate the economic and social impact of ESKD treatment including return on investment</p>	<p>Detailed mapping of country-specific ESKD healthcare financing activities</p> <p>Tool to measure impact of financing models on efficiency and progressivity</p> <p>Cost-effectivity analysis toolkits developed to measure benefits to society</p> <p>Best practice recommendations for affordable treatment of medical problems in ESKD patients</p> <p>Narrative case studies showing evolution and</p>	GKHA, ESKD collection, international, regional, national societies, WHO, industry partner documents, health economic societies

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
			impact of financing models developed	
5: Ethics	Enunciate ethical principles surrounding ESKD care	<p>Articulate core ethical principles to guide ESKD policy and practice</p> <p>Raise awareness of ethical aspects of ESKD care amongst healthcare professionals</p> <p>Increase research and intervention guidelines in ethical issues</p>	<p>ESKD ethics statements with other stakeholders developed</p> <p>Educational activities and resources relating to ethics of ESKD patient care including online resources developed with universities</p> <p>Established nephrology ethics leadership, mentorship and research capacity</p> <p>Publications addressing ethical issues in ESKD care in the nephrology and bioethics communities</p> <p>Strategic plan for research in the ethics of ESKD care</p>	WHO, MSF, documents in public domain on ethical issues in healthcare, DICG documents, international, regional, national societies, national guidelines for ESKD care provision and rationing, global and national bioethics societies, international and national human rights organizations
6: Dialysis	Define, recommend, apply, and develop a monitoring framework for minimum and optimal safety and quality standards for peritoneal dialysis and haemodialysis	<p>Adaptation of existing published guidelines from HICs with focus on the applicability and flexibility necessary for lower resource countries</p> <p>Review existing documents that currently discuss standards of care from LMICs</p> <p>Consider a PD-First Program after removal of structural cost barriers</p> <p>Engage national nephrology organizations, government, local partners, patients, dialysis providers, industry, academic centres and global organizations in the discussion</p>	Set of recommendations adapted to local settings for: pre-dialysis care, dialysis initiation, dialysis frequency and dose (HD and PD), monitoring and reporting safety and outcomes, vaccination of patients and staff, infection control standards	Affordable Dialysis Project, Kidney Care Network, PD-First Programs, hospital programs, industry, NGOs, PPP, KDIGO, KDOQI Various international guidelines, governmental health care agencies, international

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
		<p>Disseminate the recommendations to all health care providers involved in dialysis care, at national and regional meetings, and to local and national health care agencies</p> <p>Define safety standards for children's facilities</p> <p>Metrics for monitoring equity and quality of access to KRT</p> <p>Explore innovative approaches to ESRD care</p>	<p>For HD, to include water treatment, dialyzer reuse, machine sterilization, universal precautions, recommendations for prevention of access infection</p> <p>For PD, to include infection control and monitoring, catheter placement, connection systems, and possible development of local sources of dialysate and supplies</p> <p>Application of telemedicine consultation for remote areas</p> <p>Support of new and innovative technologies</p>	<p>organizations, (ISN, IPNA, ISPD) academic centres, dialysis providers</p>
7: Transplantation	<p>Define the key considerations for expansion of kidney transplantation as a component of integrated ESKD care</p>	<p>Extend implementation of legislation to all countries</p> <p>Enable tracking of dialysis and transplantation activity</p> <p>Develop region-specific attainable targets of transplant activity, and how this might be affected by regional transplant networks</p>	<p>Accurate inventory of countries lacking legislation</p> <p>An integrated database of dialysis and transplant activity</p> <p>A guide to appropriate levels of transplantation to support growth</p>	<p>International registries and GKHA</p> <p>Integration of existing dialysis and transplant registries</p> <p>Cost-economic models of the investment/pay back based on LMICs data</p>

Theme	Area of Focus	Activities	Measurable Outputs	Data Sources
		Promote deceased organ donation (DOD)	A guide and set of tools that outline the steps required to establish DOD	Reported experience and barriers and resource requirements from existing programmes and LMICs that have achieved DOD
8: Conservative Care	Define the key considerations and development of conservative care as a component of integrated ESKD care	<p>Information on prognosis and support for ESKD</p> <p>Context sensitive guidance for supportive care</p> <p>Metrics for monitoring equity and quality of conservative care</p> <p>Agreed terminology that underpins communication</p> <p>Alignment of care with existing chronic disease infrastructure</p>	<p>A validated prognostic tool for dialysis and conservative care outcomes</p> <p>Guidelines that can be adapted for different resource settings</p> <p>Key performance indicators for conservative care</p> <p>Published terminology</p> <p>Collaborative partnerships to be developed and functioning</p>	<p>International registries capturing key metrics</p> <p>Multi-professional experts, patients and carers</p> <p>WHO performance indicators for palliative care, expert opinion from renal and chronic disease groups</p> <p>Sharing of knowledge, training and infrastructure</p>

ESKD=end-stage kidney disease; CKD=chronic kidney disease; ISN=International Society of Nephrology; SharE-RR= SHARing Expertise to support the set-up of Renal Registries; LMICs=lower-middle-income countries; WHO=World Health Organization; NGOs=non-government organizations; NCDs=non-communicable diseases; AIDS=acquired immune deficiency syndrome; GKHA=Global Kidney Health Atlas; MSF=Médecins Sans Frontières; DICG=Declaration of Istanbul Custodian Group; HICs=high-income countries; PD=peritoneal dialysis; HD=haemodialysis; PPP=private-public partnerships; KDIGO=Kidney Disease: Improving Global Outcomes; KDOQI=Kidney Disease Outcomes Quality Initiative; KRT=kidney replacement therapy; IPNA=International Paediatric Nephrology Association; ISPD=International Society for Peritoneal Dialysis

Figures

Figure 1. ESKD Pathways

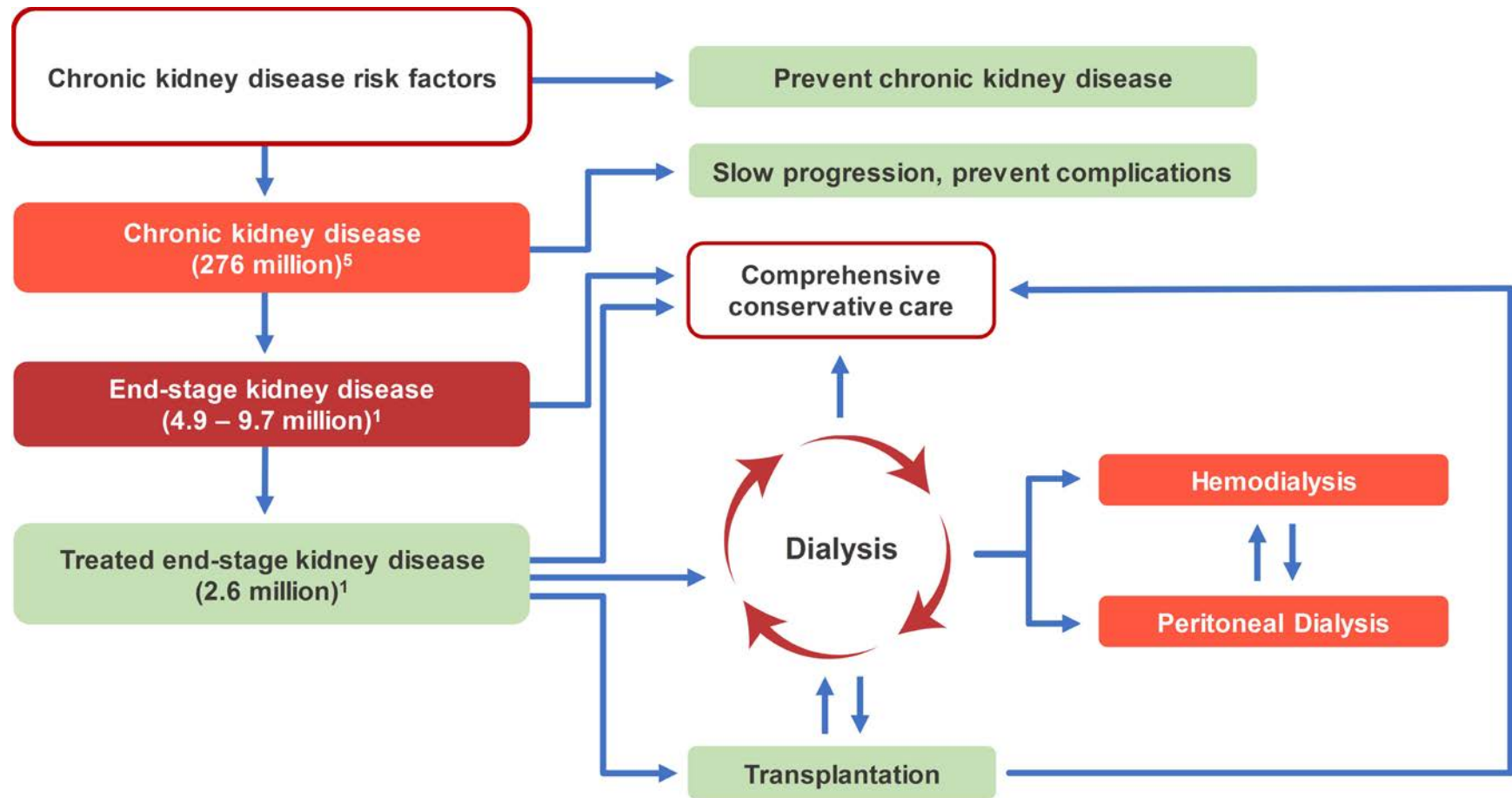
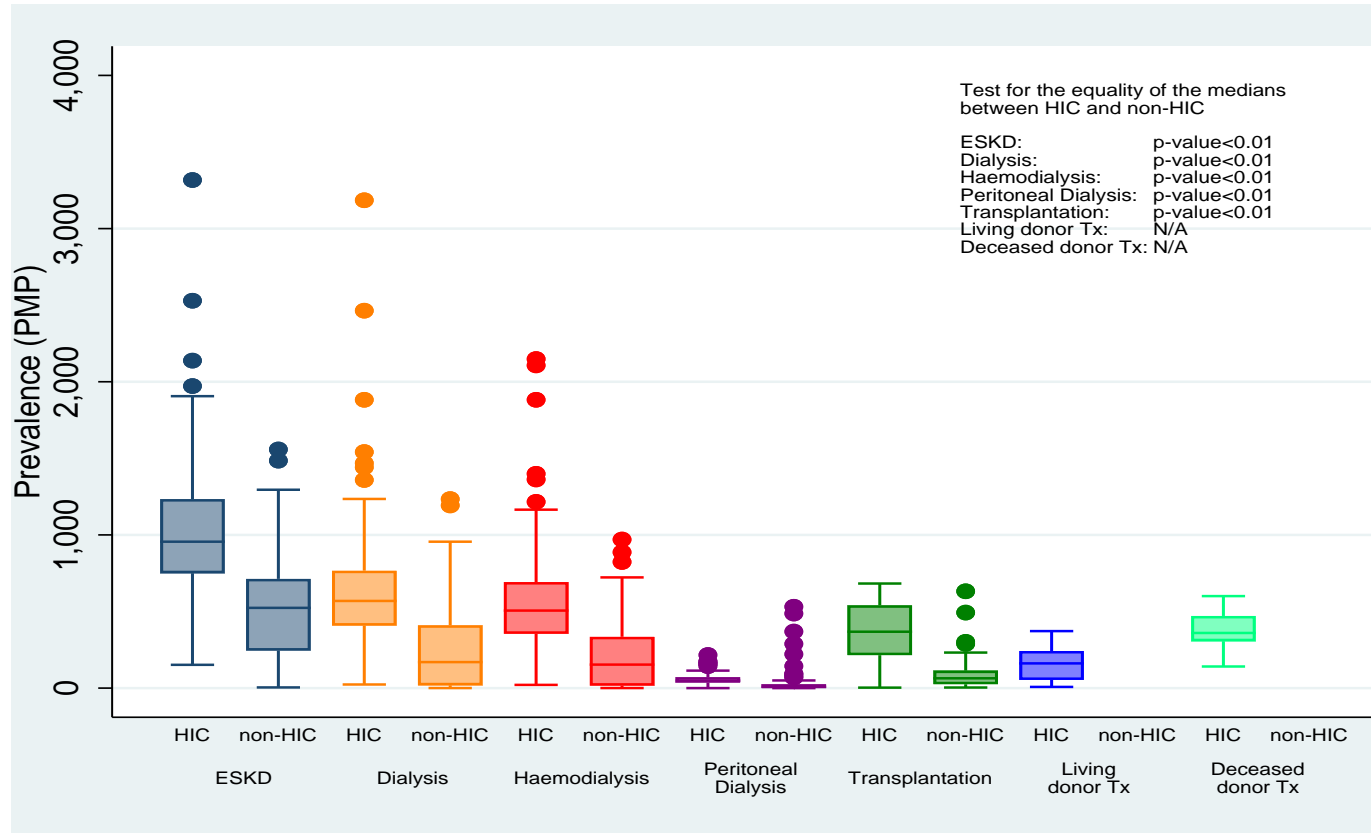


Figure 2 A. Prevalence (PMP) rates of ESKD (treated), dialysis, haemodialysis, peritoneal dialysis, kidney transplantation and donor type in HIC vs non-HIC*



*non-HIC: based on World Bank Country classification this includes 3 country groups (upper-middle-income countries [UMIC], lower-middle-income countries [LMIC], and low-income countries [LIC])

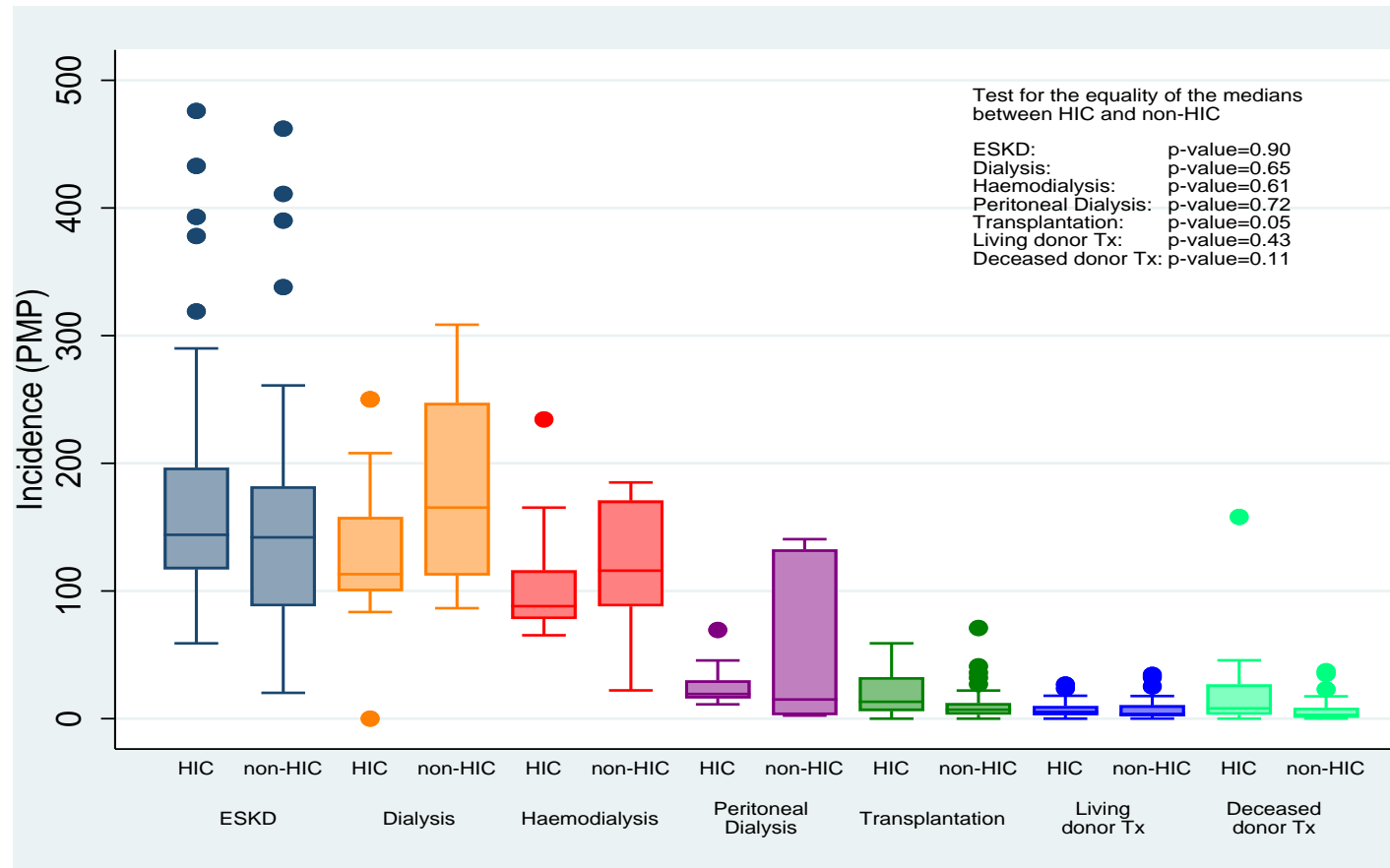
ESKD: includes all kidney replacement therapy components = dialysis + transplant

Dialysis: includes all dialysis treatment modalities = haemodialysis + peritoneal dialysis

Abbreviations: PMP=per million populations; ESKD=end-stage kidney disease; Tx=transplantation; HIC=high-income countries

Data source: Supplementary Table S2

Figure 2 B. Incidence (PMP) rates of ESKD (treated), dialysis, haemodialysis, peritoneal dialysis, kidney transplantation and donor type in HIC vs non-HIC*



*non-HIC: based on World Bank Country classification this includes 3 country groups (upper-middle-income countries [UMIC], lower-middle-income countries [LMIC], and Low-income countries [LIC])

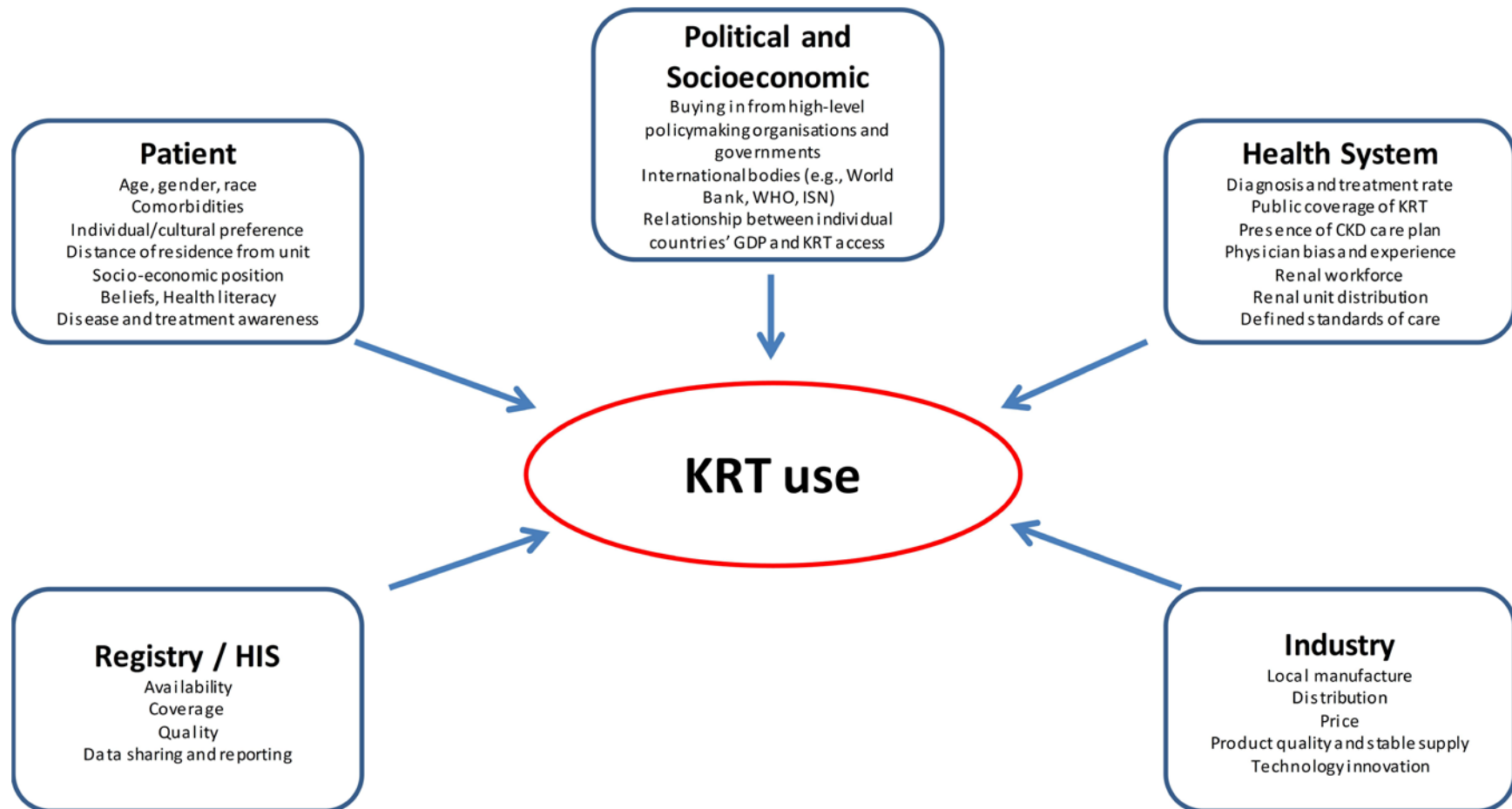
ESKD: includes all Renal replacement therapy components = dialysis + transplant

Dialysis: includes all dialysis treatment modalities = haemodialysis + peritoneal dialysis

Abbreviations: PMP=per million populations; ESKD=end-stage kidney disease; Tx=transplantation; HIC=high-income countries

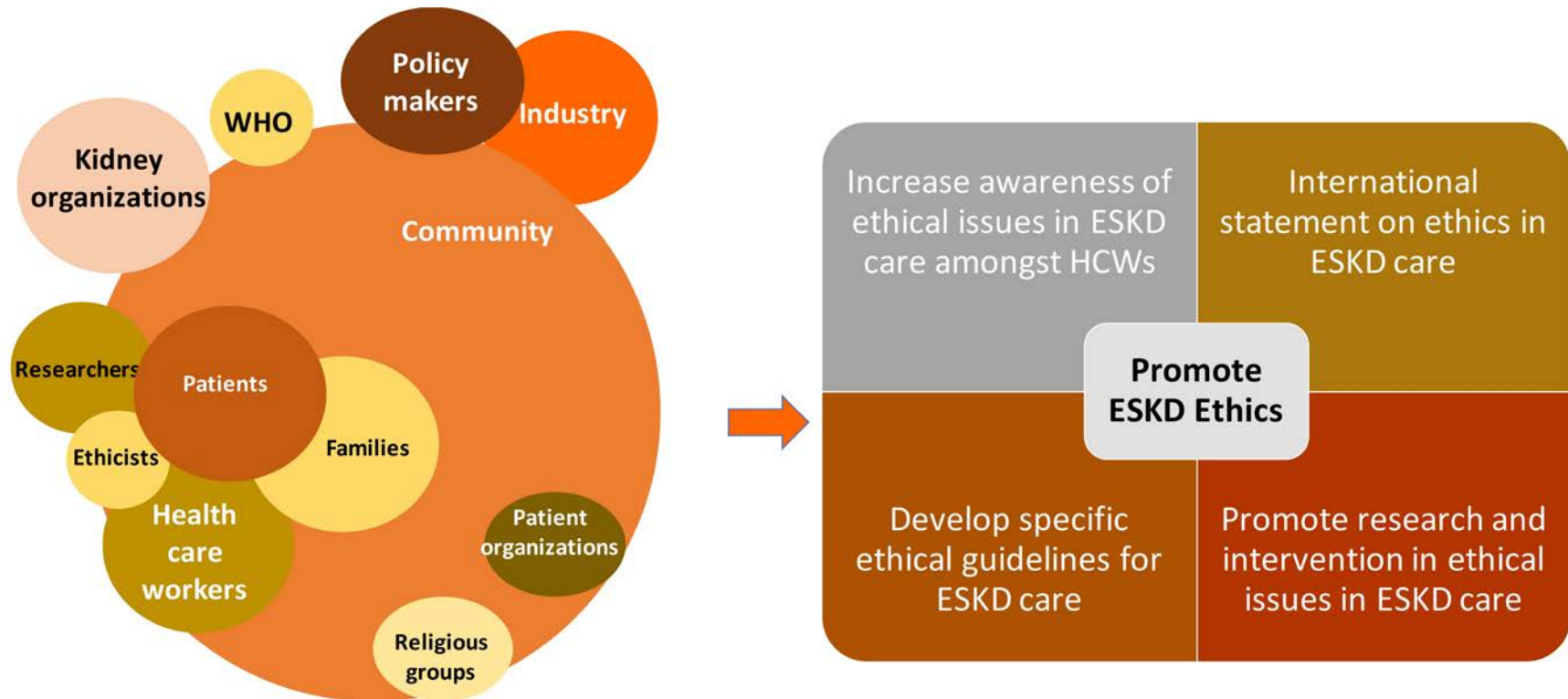
Data source: Supplementary Table S2

Figure 3. Factors related to national, regional, and global variations in the incidence of treated and untreated ESKD



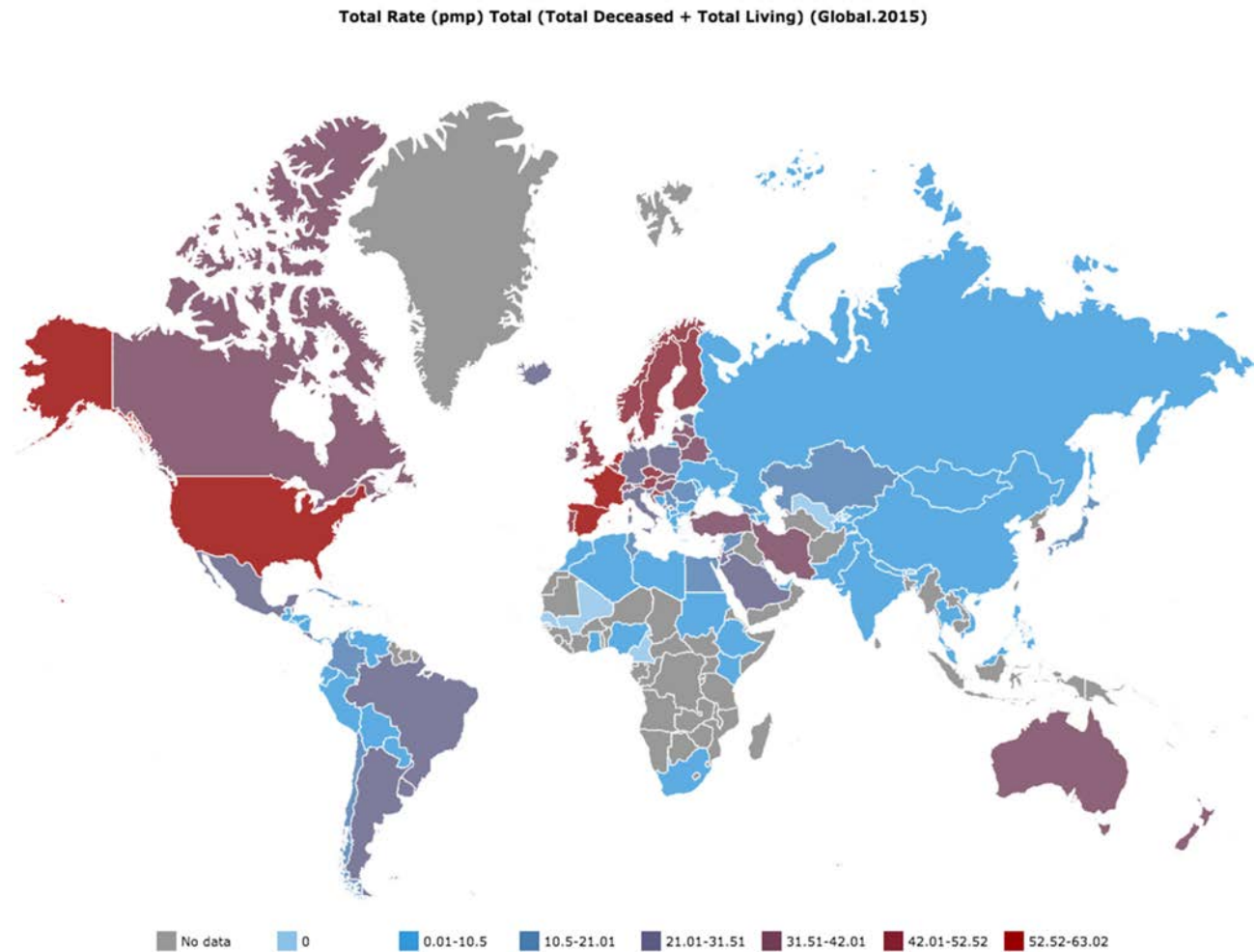
Abbreviations: ESKD=end-stage kidney disease; CKD=chronic kidney disease; HIS=health information system; KRT=kidney replacement therapy; WHO=World Health Organization; ISN=International Society of Nephrology

Figure 4. The range of stakeholders involved in ESKD care, highlighting the multi-pronged approach required to promote awareness of ethical challenges and support ethical practice pertaining to ESKD care



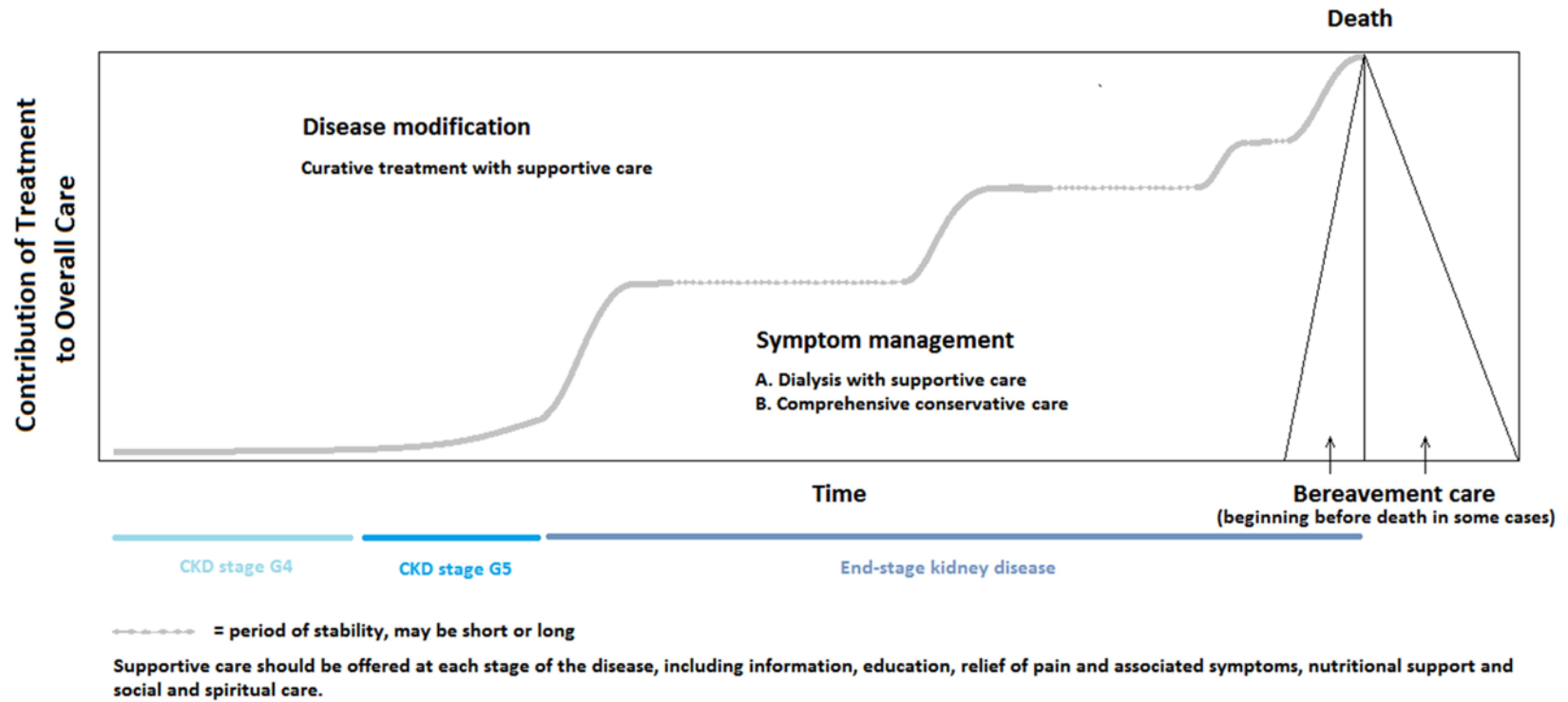
Abbreviations: WHO=World Health Organization; ESKD=end-stage kidney disease; HCWs=health care workers

Figure 5. Total rate of deceased and live donor transplants in each region. (Reproduced from Global Observatory on Donation and Transplantation (GODT) data, produced by the WHO-ONT collaboration www.transplant-observatory.org)



Abbreviation: pmp=per million population; WHO-ONT=World Health Organization-Spanish Transplant Organization

Figure 6. An overview of the contribution of supportive and comprehensive conservative care to overall care in ESKD



Abbreviations: ESKD=end-stage kidney disease; CKD=chronic kidney disease

Supplementary Material

Supplementary Table S1 A. Prevalence (PMP) rates of ESKD (treated), dialysis, haemodialysis, peritoneal dialysis, kidney transplantation and donor type comparison across all four World Bank Country classification groups (HIC, UMIC, LMIC, LIC)

Supplementary Table S1 B. Incidence (PMP) rates of ESKD (treated), dialysis, haemodialysis, peritoneal dialysis, kidney transplantation and donor type comparison across all four World Bank Country classification groups (HIC, UMIC, LMIC, LIC)

Supplementary Table S2. Data sources by country, ISN region, World Bank income classification and year

Supplementary Table S3. ISN Fellowship Program Statistics. Number of renal fellows sponsored by the ISN by home and host region

Supplementary Table S4. Framework for considering supportive care for high-income countries and low- and lower-middle-income countries

Supplementary information is available at Kidney International's website.

References

1. Liyanage T, Ninomiya T, Jha V, et al. Worldwide access to treatment for end-stage kidney disease: a systematic review. *Lancet*. 2015; 385(9981): 1975-82.
2. Rettig RA. Special Treatment — The Story of Medicare’s ESRD Entitlement. *N Engl J Med*. 2011 Feb 16;364(7):596–8.G149:G168.
3. Winkelmayr WC, Weinstein MC, Mittleman MA, Glynn RJ, Pliskin JS. Health economic evaluations: The special case of end-stage renal disease treatment. *Med Decis Making*. 2002; 22: 417–430.
4. Levin A, Tonelli M, Bonventre J, Coresh J, Donner J, Fogo AB, et al. Global kidney health 2017 and beyond: a roadmap for closing gaps in care, research, and policy. *The Lancet*. 2017; 390(10105):1888-1917.
5. Xie Y, Bowe B, Mokdad AH, Xian H, Yan Y, Li T, Maddukuri G, Tsai CY, Floyd T, Al-Aly Z. Analysis of the Global Burden of Disease study highlights the global, regional, and national trends of chronic kidney disease epidemiology from 1990 to 2016. *Kidney Int*. 2018 Sep;94(3):567-581.
6. Tonelli M, Wiebe N, Knoll G, Bello A, Browne S, Jadhav D, et al. Systematic review: kidney transplantation compared with dialysis in clinically relevant outcomes. *Am J Transplant*. 2011;11(10):2093–109.
7. World Health Organization. HEARTS Technical Package [Internet]. [cited 18th May 2018]. Available from: http://www.who.int/cardiovascular_diseases/hearts/en/
8. Wong G, Howard K, Chapman JR, Chadban S, Cross N, Tong A, et al. Comparative survival and economic benefits of deceased donor kidney transplantation and dialysis in people with varying ages and co-morbidities. *PLoS One*. 2012;7(1):e29591.
9. Rana A, Gruessner A, Agopian VG, et al. Survival benefit of solid-organ transplant in the United States. *JAMA Surg*. 2015; 150:252–259.
10. Global Observatory on Donation and Transplantation. Data produced by the WHO-ONT Collaboration. [cited 12th May 2018]. Available at www.transplant-observatory.org
11. Davison SN et al. Kidney Disease: Improving Global Outcomes. Executive summary of the KDIGO Controversies Conference on Supportive Care in Chronic Kidney Disease: developing a roadmap to improving quality care. *Kidney Int*. 2015 Sep;88(3):447-59.
12. United States Renal Data System. 2017 Annual Data Report: Epidemiology of kidney disease in the United States. [cited 10th May 2018]. Available from: <https://www.usrds.org/adr.aspx>
13. Bello AK, Levin A, Tonelli M, et al. Assessment of Global Kidney Health Care Status. *JAMA*. 2017; 317(18): 1864-81.
14. Bello AK, Levin A, Tonelli M, et al. Global Kidney Health Atlas: A report by the International Society of Nephrology on the current state of organization and structures for kidney care across the globe. Brussels, Belgium: International Society of Nephrology; 2017.
15. White SL, Chadban SJ, Jan S, Chapman JR, Cass A. How can we achieve global equity in provision of renal replacement therapy? *Bulletin of the World Health Organization*. 2008; 86(3): 229-37.

16. Schieppati A, Remuzzi G. Chronic renal diseases as a public health problem: epidemiology, social, and economic implications. *Kidney Int Suppl.* 2005; (98): S7-s10.
17. Wolfe RA, Ashby VB, Milford EL, et al. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *The New England Journal of Medicine.* 1999; 341(23): 1725-30.
18. Wetmore JB, Collins AL. Global challenges imposed by the growth of end-stage renal disease. *Renal Repl Ther.* 2016; 2:15.
19. Coresh J, Jafar TH. Disparities in worldwide treatment of kidney failure. *Lancet.* 2015; 385(9981): 1926-8.
20. Teerawattananon Y, Luz A, Pilasant S, et al. How to meet the demand for good quality renal dialysis as part of universal health coverage in resource-limited settings? *Health Res Policy Syst.* 2016; 14: 21.
21. Luyckx VA, Miljeteig I, Ejigu AM, Moosa MR. Ethical Challenges in the Provision of Dialysis in Resource-Constrained Environments. *Semin Nephrol.* 2017; 37(3): 273-86.
22. Moosa MR, Kidd M. The dangers of rationing dialysis treatment: the dilemma facing a developing country. *Kidney Int.* 2006; 70(6): 1107-14.
23. Hecking M, Bieber BA, Ethier J, et al. Sex-specific differences in hemodialysis prevalence and practices and the male-to-female mortality rate: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *PLoS Medicine.* 2014; 11(10): e1001750.
24. Li PK, Chow KM, Van de Luitgaarden MW, et al. Changes in the worldwide epidemiology of peritoneal dialysis. *Nature reviews Nephrology.* 2017; 13(2): 90-103.
25. Schaefer F, Borzych-Duzalka D, Azocar M, et al. Impact of global economic disparities on practices and outcomes of chronic peritoneal dialysis in children: insights from the International Pediatric Peritoneal Dialysis Network Registry. *Perit Dial Int.* 2012; 32(4): 399-409.
26. Ashuntantang G, Osafo C, Olowu WA, et al. Outcomes in adults and children with end-stage kidney disease requiring dialysis in sub-Saharan Africa: a systematic review. *The Lancet Global Health.* 2017; 5(4): e408-e17.
27. Jha V et al. Chronic Kidney Disease: Global Dimension and Perspectives. *Lancet.* 2013 Jul 20;382(9888):260-72. Erratum in: *Lancet.* 2013 Jul 20;382(9888):208
28. Ploos van Amstel S, Noordzij M, Warady BA, et al. Renal replacement therapy for children throughout the world: the need for a global registry. *Pediatr Nephrol.* 2018; 33(5): 863-71.
29. Counil E, Cherni N, Kharrat M, Achour A, Trimech H. Trends of incident dialysis patients in Tunisia between 1992 and 2001. *Am J Kidney Dis.* 2008; 51(3): 463-70.
30. Davids MR, Caskey FJ, Young T, Balbir Singh GK. Strengthening Renal Registries and ESRD Research in Africa. *Semin Nephrol* 2017; 37(3): 211-23.
31. Noppakun K, Ingsathit A, Pongsukul C, et al. A 25-year experience of kidney transplantation in Thailand: report from the Thai Transplant Registry. *Nephrology (Carlton).* 2015; 20(3): 177-83.

32. Lim TO, Goh A, Lim YN, Morad Z. Review article: Use of renal registry data for research, health-care planning and quality improvement: what can we learn from registry data in the Asia-Pacific region? *Nephrology (Carlton)*. 2008; 13(8): 745-52.
33. Davids MR, Eastwood JB, Selwood NH, et al. A renal registry for Africa: first steps. *Clin Kidney J*. 2016; 9(1): 162-7.
34. Cusumano AM, Rosa-Diez GJ, Gonzalez-Bedat MC. Latin American Dialysis and Transplant Registry: Experience and contributions to end-stage renal disease epidemiology. *World J Nephrol*. 2016; 5(5): 389-97.
35. Davids MR, Marais N, Jacobs JC. South African Renal Registry Annual Report 2015. *African Journal of Nephrology*. 2017; 20(1):201-213.
36. Rodriguez RA, Hotchkiss JR, O'Hare AM. Geographic information systems and chronic kidney disease: racial disparities, rural residence and forecasting. *J Nephrol*. 2013; 26(1): 3-15.
37. Liu FX, Rutherford P, Smoyer-Tomic K, Prichard S, Laplante S. A global overview of renal registries: a systematic review. *BMC Nephrol*. 2015; 16: 31.
38. Rebholz CM, Coresh J, Ballew SH, et al. Kidney Failure and ESRD in the Atherosclerosis Risk in Communities (ARIC) Study: Comparing Ascertainment of Treated and Untreated Kidney Failure in a Cohort Study. *Am J Kidney Dis*. 2015; 66(2): 231-9.
39. Stanifer JW, Muiru A, Jafar TH, Patel UD. Chronic kidney disease in low- and middle-income countries. *Nephrol Dial Transplant*. 2016; 31(6):868–74.
40. Jha V et al. Understanding kidney care needs and implementation strategies in low-and middle-income countries: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney Int*. 2016 Dec;90(6):1164-1174.
41. World Health Organization. NCDs | Tackling NCDs [Internet]. [cited 18th May 2018]. Available from: <http://www.who.int/ncds/management/best-buys/en/>
42. Couser WG, Remuzzi G, Mendis S, Tonelli M. The contribution of chronic kidney disease to the global burden of major noncommunicable diseases. *Kidney Int*. 2011; 80(12):1258–70.
43. Pike E, Hamidi V, Ringerike T, Wisloff T, Klemp M. More Use of Peritoneal Dialysis Gives Significant Savings: A Systematic Review and Health Economic Decision Model. *J Clin Med Res*. 2017;9(2):104–16.
44. Liu FX, Quock TP, Burkart J, Noe LL, Inglese G. Economic evaluations of peritoneal dialysis and hemodialysis: 2004-2012. *F1000Research* [Internet]. 2013 Dec 16 [cited 2018 May 18]; Available from: <http://f1000research.com/articles/2-273/v1>
45. Ready AR, Nath J, Milford DV, Adu D, Jewitt-Harris J. Establishing sustainable kidney transplantation programs in developing world countries: a 10-year experience. *Kidney Int*. 2016;90(5):916–20.
46. Karopadi AN, Mason G, Retorre E and Ronco C. Cost of peritoneal dialysis and haemodialysis across the world. *Nephrol Dial Transplant*. 2013; 28:2553-2569.
47. Tonelli M et al. How to advocate for the inclusion of chronic kidney disease in a national noncommunicable chronic disease program. *Kidney Int*. 2014 June; 85(6): 1269-74.

48. Murphy EL, Murtagh FE, Carey I, Sheerin NS. Understanding symptoms in patients with advanced chronic kidney disease managed without dialysis: use of a short patient-completed assessment tool. *Nephron Clin Pract.* 2009;111(1):c74-80.
49. Murtagh FE, Addington-Hall JM, Edmonds PM, Donohoe P, Carey I, Jenkins K, et al. Symptoms in advanced renal disease: a cross-sectional survey of symptom prevalence in stage 5 chronic kidney disease managed without dialysis. *J Palliat Med* 2007;10(6):1266-76.
50. Murtagh FEM, Murphy E, Sheerin NS. Illness trajectories: an important concept in the management of kidney failure. *Nephrol Dial Transplant.* 2008;23(12):3746-8.
51. Maddalena V, O'Shea F, Barrett B. An Exploration of Palliative Care Needs of People With End-Stage Renal Disease on Dialysis: Family Caregiver's Perspectives. *J Palliat Care.* 2018;33(1):19-25.
52. Tong A, Chando S, Crowe S, et al. Research priority setting in kidney disease: a systematic review. *Am J Kidney Dis.* 2015; 65(5): 674-83.
53. Levin A, Adams E, Barrett BJ, et al. Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease (Can-SOLVE CKD): Form and Function. *Can J Kidney Health Dis.* 2018; 5: 2054358117749530.
54. Tong A, Craig JC, Nagler EV, Van Biesen W. Composing a new song for trials: the Standardized Outcomes in Nephrology (SONG) initiative. *Nephrol Dial Transplant.* 2017; 32(12): 1963-6.
55. Osman MA, Alrukhaimi M, Ashuntantang GE, et al. Global Nephrology Workforce: Gaps, threats, and opportunities towards sustainable provision of workforce for kidney care. *Kidney Int Suppl.* 2018; 8: 52-63.
56. Cueto-Manzano AM, Martinez-Ramirez HR, Cortes-Sanabria L. Comparison of primary health-care models in the management of chronic kidney disease. *Kidney Int Suppl* 2013; 3: 210–214.
57. Cueto-Manzano AM, Martinez-Ramirez HR, Cortes-Sanabria L. Management of chronic kidney disease: primary health-care setting, self-care and multidisciplinary approach. *Clin Nephrol.* 2010; 74 (Suppl 1): S99–S104.
58. Cortes-Sanabria L, Cabrera-Pivaral CE, Cueto-Manzano AM, et al. Improving care of patients with diabetes and CKD: a pilot study for a cluster randomized trial. *Am J Kidney Dis* 2008; 51:777–88.
59. Crabtree JH, Chow KM. Peritoneal Dialysis Catheter Insertion. *Semin Nephrol.* 2017 Jan;37(1):17-29
60. Yousif KI, Abu-Aisha H, Abboud OI. The Effect of an Educational Program for Vascular Access Care on Nurses' Knowledge at Dialysis Centers in Khartoum State, Sudan Saudi J Kidney Dis Transpl. 2017;28(5):1027-1033
61. Harris D. C. H., Dupuis S., Couser W. G., Feehally, J. Training nephrologists from developing countries: does it have a positive impact? *Kidney Int. Suppl.* 2, 275–278 (2012).
62. Abdou N et al. Peritoneal Dialysis to Treat Patients with Acute Kidney Injury-The Saving Young Lives Experience in West Africa: Proceedings of the Saving Young Lives Session at the First International Conference of Dialysis in West Africa, Dakar, Senegal, December 2015. *Perit Dial Int.* 2017 Mar-Apr;37(2):155-158.
63. Vachharajani TJ, Phoon KS, Harris DCH. A global curriculum for training the next generation of Nephrologists. Chapter in *Oxford Textbook of Clinical Nephrology.*

- 4th edition. Edited by Turner, Lameire, Goldsmith et al. Oxford University Press. 2015.
64. Cueto-Manzano AM, Martínez-Ramírez HR, Cortés-Sanabria L, Rojas Campos E. CKD Screening and Prevention Strategies in Disadvantaged Populations. The Role of Primary Health Care Professionals. In: García-García G, Agodoa LY, Norris KC (editors). *Chronic Kidney Disease in Disadvantaged Populations*. Elsevier Inc., London, 2017: pp 329-335.
 65. Reddy YN. An Indian model for cost-effective CAPD with minimal man power and economic resources. *Nephrol Dial Transplant*. 2011;26(10):3089-91.
 66. Green A. World report. Research Focus: The African Population and Health Research Centre. *Lancet*. October 28, 2017; 390(10106); [https://doi.org/10.1016/S0140-6736\(17\)32735-6](https://doi.org/10.1016/S0140-6736(17)32735-6)
 67. World Health Organization. Making fair choices on the path to universal health coverage. Final report of the WHO Consultative Group on Equity and Universal Health Coverage. [cited 26th May 2018]. Available at http://www.who.int/choice/documents/making_fair_choices/en/
 68. Teerawattananon Y, Russell S. The greatest happiness of the greatest number? Policy actors' perspectives on the limits of economic evaluation as a tool for informing health care coverage decisions in Thailand. *BMC Health Serv Res*. 2008 Sep 26; 8:197.
 69. Jha V, Martin DE, Bargman JM, Davies S, Feehally J, Finkelstein F, et al. Ethical issues in dialysis therapy. *Lancet*. 2017;389(10081):1851-6.
 70. Moosa MR, Maree JD, Chirehwa MT, Benatar SR. Use of the 'Accountability for Reasonableness' Approach to Improve Fairness in Accessing Dialysis in a Middle-Income Country. *PloS One*. 2016; 11(10): e0164201.
 71. Asante A, Price J, Hayen A, Jan S, Wiseman V. Equity in Health Care Financing in Low- and Middle-Income Countries: A Systematic Review of Evidence from Studies Using Benefit and Financing Incidence Analyses. *PLoS One*. 2016 Apr 11;11(4):e0152866.
 72. Yu CP, Whynes DK, Sach TH. Equity in health care financing: The case of Malaysia. *Int J Equity Health*. 2008 Jun 9; 7:15.
 73. Kumar V, Jha V. End-stage renal disease care in South Asia: demographics, economics, and opportunities. *Clin Nephrol*. 2016; 86 (Suppl 1): S23-S26.
 74. Garcia-Garcia G, Garcia-Bejarano H, Breien-Coronado H, Perez-Cortes G, Pazarin-Villaseñor L, De la Torre-Campos L, et al. End-Stage Renal Disease in Mexico. In: Garcia-Garcia G, Agodoa L, Norris K, editors. *Chronic Kidney Disease in Disadvantaged Populations*. New York: Elsevier; 2017. p. 77-82.
 75. European Patients' Academy. Health Technology Assessment process: Fundamentals. [cited 26th June 2018]. Available at eupati.eu/health-technology-assessment/fundamentals-of-health-technology-assessment-process/
 76. Glied SA. Health care financing, efficiency, and equity. Working paper 13881. National Bureau of Economic Research, USA. [cited 26th June 2018]. Available at <http://www.nber.org/papers/w13881>
 77. Teerawattananon Y, Mugford M, Tangcharoensathien V. Economic evaluation of palliative management versus peritoneal dialysis and hemodialysis for end-stage

- renal disease: evidence for coverage decisions in Thailand. *Value Health*. 2007 Jan-Feb;10(1):61-72.
78. Afiatin et al. Economic evaluation of policy options for dialysis in end-stage renal disease patients under the universal health coverage in Indonesia. *PLoS One*. 2017 May 18;12(5):e0177436.
79. Tantivess S, Werayingyong P, Chuengsamarn P, Teerawattananon Y. Universal coverage of renal dialysis in Thailand: promise, progress, and prospects. *BMJ*. 2013 Jan 31; 346:f462.
80. Liu FX, Gao X, Inglese G, Chuengsamarn P, Pecoits-Filho R, Yu A. A Global Overview of the Impact of Peritoneal Dialysis First or Favored Policies: An Opinion. *Perit Dial Int*. 2015 Jul-Aug;35(4):406-20.
81. Kaur G, Prinja S, Ramachandran R, Malhotra P, Gupta KL, Jha V. Cost of hemodialysis in a public-sector tertiary hospital of India. *Clinical Kidney Journal* sfx152, Published Ahead of Print 25 January 2018
82. Ramachandran R, Jha V. Kidney transplantation is associated with catastrophic out of pocket expenditure in India. *PLoS One*. 2013; 8(7): e67812.
83. PAHO Health Economics and Financing (HEF). Health Care Expenditure and Financing in Latin America and the Caribbean (Fact Sheet) 2012. [cited 12th May 2018]. Available from:
http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&gid=20057&Itemid=2518 (=en
84. Lopera-Medina MM. La enfermedad renal crónica en Colombia: necesidades en salud y respuesta del Sistema General de Seguridad Social en Salud. *Rev. Gerenc. Polít. Salud*. 2016; 15(30): 212-233. <http://dx.doi.org/10.11144/Javeriana.rgyps15-30.ercc>.
85. Instituto Mexicano del Seguro Social Dirección de Finanzas Coordinación de Administración de Riesgos Institucionales. Evaluación de los Riesgos Considerados en el Programa de Administración de Riesgos Institucionales 2007. [cited 22nd May 2018]. Available at:
<http://www.imss.gob.mx/sites/all/statics/pdf/estadisticas/PARI/parievaluacion2007.pdf>
86. Shaikh M et al. Utilization, costs, and outcomes for patients receiving publicly funded hemodialysis in India. *Kidney Int*. 2018 Sep; 94(3): 440-445.
87. State govt. mulling pension for kidney patients. In *The Hindu*, Vishakhapatnam. June 15, 2018. [cited 26th June 2018]. Available at
<http://www.thehindu.com/todays-paper/tp-national/tp-andhrapradesh/state-govt-mulling-pension-for-kidney-patients/article19052757.ece> A
88. Hwang SJ, Tsai JC, Chen HC. Epidemiology, impact and preventive care of chronic kidney disease in Taiwan. *Nephrology (Carlton)*. 2010 Jun;15 Suppl 2:3-9.
89. Cuenta de Alto Costo Bogota: Fondo Colombiano de Enfermedades de Alto Costo. [cited 12th May 2018]. Available from:
<https://cuentadealtocosto.org/site/index.php/normatividad>.
90. Vijayan M, Ravi R, Abraham G et al. Chronic Kidney Disease, a Herculean Task: are there effective means of engagement in alleviating the burden? *The Open Urology & Nephrology Journal*. 2014; 7, 56-59.

91. Tomilina NA, Andrushev AM, Peregudova MB, Shinkarev MB. Renal replacement therapy for end-stage renal disease in Russian Federation 2010-2015. Registry report. Part 1. (2017)
92. Mendez-Durán A, Ignorosa-Luna MH, Perez-Aguilar G et al. Current status of alternative therapies renal function at the institute Mexicano del Seguro Social. *Rev Med Inst Mex Seguro Soc.* 2016;54(5):588-93.
93. Ruckert A, Labontéb R. Public–private partnerships (PPPs) in global health: the good, the bad and the ugly. *Third World Quarterly.* 2014; 35(9): 1598–1614.
94. Rosa-Diez G, Gonzalez-Bedat M, Ferreiro A, García-García G, Fernandez-Cean J, Douthat W. Burden of end-stage renal disease (ESRD) in Latin America. *Clin Nephrol.* 2016, 13:29-33.
95. Kher V. End-stage renal disease in developing countries. *Kidney Int.* 2002; 62(1): 350-62.
96. Etheredge H, Fabian J. Challenges in Expanding Access to Dialysis in South Africa-Expensive Modalities, Cost Constraints and Human Rights. *Healthcare (Basel).* 2017; 5(3).
97. Moosa MR, Wearne N. Invited Commentary Should We Be Rationing Dialysis in South Africa in the 21st Century? *Perit Dial Int.* 2018;38(2):84-88. doi: 10.3747/pdi.2017.00179
98. Butler CR, Mehrotra R, Tonelli MR, Lam DY. The Evolving Ethics of Dialysis in the United States: A Principlist Bioethics Approach. *Clin J Am Soc Nephrol.* 2016; 11(4): 704-9.
99. Danovitch GM, Chapman J, Capron AM, et al. Organ Trafficking and Transplant Tourism: The Role of Global Professional Ethical Standards-The 2008 Declaration of Istanbul. *Transplantation.* 2013; 95(11): 1306-12.
100. Kahrass H, Strech D, Mertz M. The Full Spectrum of Clinical Ethical Issues in Kidney Failure. Findings of a Systematic Qualitative Review. *PLoS One.* 2016; 11(3): e0149357.
101. Davison SN. The Ethics of End-of-Life Care for Patients with ESRD. *Clin J Am Soc Nephrol.* 2012; 7(12): 2049-57.
102. Bates MJ, Chitani A, Dreyer G. Palliative care needs of patients living with end-stage kidney disease not treated with renal replacement therapy: An exploratory qualitative study from Blantyre, Malawi. *Afr J Prim Health Care Fam Med.* 2017; 9(1): e1-e6.
103. Anderson RE, Grant L. What is the value of palliative care provision in low-resource settings? *BMJ Glob Health.* 2017; 2(1): e000139.
104. Van Biesen W, Vanholder R, Hernandez T, Drewniak D, Luyckx V. Caring for Migrants and Refugees with End-Stage Kidney Disease in Europe. *Am J Kidney Dis.* 2018 May;71(5):701-709.
105. Francis ER, Allen AK, Herrera-Anazco P, et al. Establishing a higher priority for chronic kidney disease in Peru. *Lancet Glob Health.* 2016; 4(1): e17-8.
106. Findlay MD, Donaldson K, et al. Factors influencing withdrawal from dialysis: a national registry study. *Nephrol Dial Transplant.* 2016; 31:2041-2048.
107. Watson A.R., Shooter M. (2004) The ethics of withholding and withdrawing dialysis in children. In: Warady B.A., Schaefer F.S., Fine R.N., Alexander S.R. (eds) *Pediatric Dialysis.* Springer, Dordrecht

108. Defaye FB, Desalegn D, Danis M, et al. A survey of Ethiopian physicians' experiences of bedside rationing: extensive resource scarcity, tough decisions and adverse consequences. *BMC Health Serv Res.* 2015; 15: 467.
109. Kafiriri L, Martin DK. Bedside rationing by health practitioners: a case study in a Ugandan hospital. *Med Decis Making.* 2007; 27(1): 44-52.
110. Galla JH. Clinical practice guideline on shared decision-making in the appropriate initiation of and withdrawal from dialysis. The Renal Physicians Association and the American Society of Nephrology. *J Am Soc Nephrol.* 2000; 11(7): 1340-2.
111. Benatar SR, Daar AS, Singer PA. Global health challenges: the need for an expanded discourse on bioethics. *PLoS Medicine.* 2005; 2(7): e143.
112. Chakraborti C. Systemic Negligence: Why It Is Morally Important for Developing World Bioethics. *Dev World Bioeth.* 2015 Dec; 15(3):208-13.
113. Hyder AA, Dawson L. Defining standard of care in the developing world: the intersection of international research ethics and health systems analysis. *Developing World Bioethics.* 2005; 5(2): 142-52.
114. King KF, Kolopack P, Merritt MW, Lavery JV. Community engagement and the human infrastructure of global health research. *BMC Medical Ethics.* 2014; 15: 84.
115. Hofmeyer A, Scott C, Lagendyk L. Researcher-decision-maker partnerships in health services research: practical challenges, guiding principles. *BMC Health Serv Res.* 2012; 12: 280.
116. Obrador GT, Rubilar X, Agazzi E, Estefan J. The Challenge of Providing Renal Replacement Therapy in Developing Countries: The Latin American Perspective. *Am J Kidney Dis.* 2016; 67(3): 499-506.
117. Goudge J, Gilson L, Russell S, Gumede T, Mills A. Affordability, availability and acceptability barriers to health care for the chronically ill: longitudinal case studies from South Africa. *BMC Health Serv Res.* 2009; 9: 75.
118. Daniels N, Sabin JE. *Setting Limits Fairly. Learning to Share Resources for Health.* 2 ed. New York: Oxford University Press; 2008.
119. Gibson JL, Martin DK, Singer PA. Evidence, economics and ethics: resource allocation in health services organizations. *Healthc Q.* 2005; 8(2): 50-9, 4.
120. Marckmann G, Schmidt H, Sofaer N, Strech D. Putting public health ethics into practice: a systematic framework. *Front Public Health.* 2015; 3: 23.
121. Gandjour A. Resource allocation in health care and the role of personal autonomy. *Gesundheitswesen.* 2015; 77(3): e44-50.
122. Azetsop J, Rennie S. Principlism, medical individualism, and health promotion in resource-poor countries: can autonomy-based bioethics promote social justice and population health? *Philosophy, ethics, and humanities in medicine: PEHM.* 2010; 5: 1.
123. Prasad N, Jha V. Hemodialysis in Asia. *Kidney Dis.* 2015; 1:165–177
124. Bernandini J, Price V, Figueireido A. Peritoneal Dialysis Patients Training. *Perit Dial Int.* 2006; 26: 625–632.
125. Chuengsaman P, Kasemsup V. PD First Policy: Thailand's Response to the Challenge of Meeting the Needs of Patients with End-Stage Renal Disease. *Semin Nephrol.* 2017 May;37(3):287-295
126. Mehrotra R, Devuyst O, Davies SJ, Johnson DW. The Current State of Peritoneal Dialysis. *J Am Soc Nephrol.* 2016; 27(11): 3238-52.

127. Karopadi AN, Mason G, Rettore E, Ronco C. The role of economies of scale in the cost of dialysis across the world: a macroeconomic perspective. *Nephrol Dial Transplant*. 2014; 29(4): 885-92.
128. Wang V, Maciejewski ML, Coffman CJ, et al. Impacts of Geographic Distance on Peritoneal Dialysis Utilization: Refining Models of Treatment Selection. *Health Services Research*. 2017; 52(1): 35-55.
129. Palmer D, Lawton WJ, Barrier C, Jr., Fine BD, Jr., Hemphill H, Nyah NN, et al. Peritoneal Dialysis for AKI in Cameroon: Commercial vs Locally-Made Solutions. *Perit Dial Int*. 2018;38(4):246-50.
130. Fervers B, Burgers JS, Voellinger R, Brouwers M, Browman GP, Graham ID, et al. Guideline adaptation: an approach to enhance efficiency in guideline development and improve utilisation. *BMJ Quality & Safety*. 2011 Mar;20(3):228-36.
131. Chin AI, Appasamy S, Carey RJ and Madan N. Feasibility of Incremental 2-Times Weekly Hemodialysis in Incident Patients with Residual Kidney Function. *Kidney Int Reports*. 2017; 2, 933–942.
132. Obi Y, Streja E, Rhee CM, Ravel V, Amin AN, Cupisti A, Chen J, Mathew AT, Kovesdy CP, Mehrotra R, and Kalantar-Zadeh K. Incremental Hemodialysis, Residual Kidney Function, and Mortality Risk in Incident Dialysis Patients: A Cohort Study. *Am J Kidney Dis*. 2016; 68(2):256-265.
133. Zhang M, Wang M, Li H, Yu P, Yuan L, Hao C, Chen J, Kalantar-Zadeh K. Association of Initial Twice-Weekly Hemodialysis Treatment with Preservation of Residual Kidney Function in ESRD Patients. *Am J Nephrol*. 2014; 40:140–150.
134. Casino FG, Basile C. The variable target model: a paradigm shift in the incremental haemodialysis prescription. *Nephrol Dial Transplant*. 2017;32(1):182-90.
135. Casino FG, Basile C. A user-friendly tool for incremental haemodialysis prescription. *Nephrol Dial Transplant*. 2018; 33(6):1046-1053.
136. Indian Society of Nephrology. Guidelines for Maintenance Hemodialysis in India. [cited May 4, 2018]. Available from: <http://www.imanhb.org/pdf/standards-hemodialysis.pdf>
137. Richards C. Pediatric Renal Transplantation. *Nephrol Nurs J*. 2016 Jan-Feb;43(1):35-7; quiz 38.
138. Muller E. Transplantation in Africa - an overview. *Clin Nephrol*. 2016;86 (13):90-5.
139. Jha V. Current status of end-stage renal disease care in South Asia. *Ethn & Dis*. 2009; 19(1 Suppl 1): S1-27-32.
140. Robinson BM, Akizawa T, Jager KJ, Kerr PG, Saran R, Pisoni RL. Factors affecting outcomes in patients reaching end-stage kidney disease worldwide: differences in access to renal replacement therapy, modality use, and haemodialysis practices. *Lancet*. 2016;388(10041):294-306.
141. The Madrid resolution on organ donation and transplantation: national responsibility in meeting the needs of patients, guided by the WHO principles. *Transplantation*. 2011;91 Suppl 11: S29-31.
142. Sixty-Third World Health Assembly WHO. Human organ and tissue transplantation. Resolution WHA 63.22 of the Sixty-Third World Health Assembly. *Cell Tissue Bank*. 2010;11(4):411-2.

143. Steering Committee of the Istanbul S. Organ trafficking and transplant tourism and commercialism: the Declaration of Istanbul. *Lancet*. 2008;372(9632):5-6.
144. Council of Europe. Council of Europe Convention against Trafficking in Human Organs, CETS No. 216. [cited 22nd April 2018]. Available from: <https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/216>.
145. Garcia-Garcia G, Harden PN, Chapman JR. The Global role of kidney transplantation. *The Lancet*. 2012;379:e36-e38. ISSN 0140-6736, [https://doi.org/10.1016/S0140-6736\(12\)60202-5](https://doi.org/10.1016/S0140-6736(12)60202-5).
146. Bilgel F. The impact of presumed consent laws and institutions on deceased organ donation. *Eur J Health Econ*. 2012 Feb;13(1):29–38.
147. World Health Organisation. WHO Definition of Palliative Care [cited 5th April 2018]. Available from: <http://www.who.int/cancer/palliative/definition/en/>.
148. Murtagh FE, Burns A, Moranne O, Morton RL, Naicker S. Supportive Care: Comprehensive Conservative Care in End-Stage Kidney Disease. *Clin J Am Soc Nephrol*. 2016 Oct 7;11(10):1909-14.
149. Murtagh FE, Marsh JE, Donohoe P, Ekbal NJ, Sheerin NS, Harris FE. Dialysis or not? A comparative survival study of patients over 75 years with chronic kidney disease stage 5. *Nephrol Dial Transplant*. 2007 Jul;22(7):1955-62.
150. Hussain JA, Mooney A, Russon L. Comparison of survival analysis and palliative care involvement in patients aged over 70 years choosing conservative management or renal replacement therapy in advanced chronic kidney disease. *Palliat Med*. 2013 Oct;27(9):829-39.
151. Brown L, Gardner G, Bonner A. A comparison of treatment options for management of End Stage Kidney Disease in elderly patients: A systematic review protocol. *The JBI Database of Systematic Reviews and Implementation Reports*. 2013;11(4):12.
152. Verberne WR, Geers AB, Jellema WT, Vincent HH, van Delden JJ, Bos WJ. Comparative Survival among Older Adults with Advanced Kidney Disease Managed Conservatively Versus with Dialysis. *Clin J Am Soc Nephrol*. 2016 Apr 07;11(4):633-40.
153. Foote C, Kotwal S, Gallagher M, Cass A, Brown M, Jardine M. Survival outcomes of supportive care versus dialysis therapies for elderly patients with end-stage kidney disease: A systematic review and meta-analysis. *Nephrology (Carlton)*. 2016 Mar;21(3):241-53.
154. Chesnaye NC, Schaefer F, Bonthuis M, Holman R, Baiko S, Baskin E, et al. Mortality risk disparities in children receiving chronic renal replacement therapy for the treatment of end-stage renal disease across Europe: an ESPN-ERA/EDTA registry analysis. *Lancet*. 2017 May 27;389(10084):2128-37.
155. McDonald SP, Craig JC, Australian, New Zealand Paediatric Nephrology A. Long-term survival of children with end-stage renal disease. *N Engl J Med*. 2004 Jun 24;350(26):2654-62.
156. Zurowska AM, Fischbach M, Watson AR, Edefonti A, Stefanidis CJ, European Paediatric Dialysis Working G. Clinical practice recommendations for the care of infants with stage 5 chronic kidney disease (CKD5). *Pediatr Nephrol*. 2013 Sep;28(9):1739-48.

157. Knaul FM, Farmer PE, Bhadelia A, Berman P, Horton R. Closing the divide: the Harvard Global Equity Initiative-Lancet Commission on global access to pain control and palliative care. *Lancet*. 2015 Aug 22;386(9995):722-4.
158. Knaul FM, Farmer PE, Krakauer EL, De Lima L, Bhadelia A, Jiang Kwete X, et al. Alleviating the access abyss in palliative care and pain relief-an imperative of universal health coverage: the Lancet Commission report. *Lancet*. 2017 Oct 11.
159. Neuen BL, Chadban SJ, Demaio AR, Johnson DW, Perkovic V. Chronic kidney disease and the global NCDs agenda. *BMJ Global Health*. 2017;2(2):e000380.