

Assessment of Global Kidney Health Care Status

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IMPORTANCE Kidney disease is a substantial worldwide clinical and public health problem, but information about available care is limited.

OBJECTIVE To collect information on the current state of readiness, capacity, and competence for the delivery of kidney care across countries and regions of the world.

DESIGN, SETTING, AND PARTICIPANTS Questionnaire survey administered from May to September 2016 by the International Society of Nephrology (ISN) to 130 ISN-affiliated countries with sampling of key stakeholders (national nephrology society leadership, policy makers, and patient organization representatives) identified by the country and regional nephrology leadership through the ISN.

MAIN OUTCOMES AND MEASURES Core areas of country capacity and response for kidney care.

RESULTS Responses were received from 125 of 130 countries (96%), including 289 of 337 individuals (85.8%, with a median of 2 respondents [interquartile range, 1-3]), representing an estimated 93% (6.8 billion) of the world's population of 7.3 billion. There was wide variation in country readiness, capacity, and response in terms of service delivery, financing, workforce, information systems, and leadership and governance. Overall, 119 (95%), 95 (76%), and 94 (75%) countries had facilities for hemodialysis, peritoneal dialysis, and kidney transplantation, respectively. In contrast, 33 (94%), 16 (45%), and 12 (34%) countries in Africa had facilities for hemodialysis, peritoneal dialysis, and kidney transplantation, respectively. For chronic kidney disease (CKD) monitoring in primary care, serum creatinine with estimated glomerular filtration rate and proteinuria measurements were reported as always available in only 21 (18%) and 9 (8%) countries, respectively. Hemodialysis, peritoneal dialysis, and transplantation services were funded publicly and free at the point of care delivery in 50 (42%), 48 (51%), and 46 (49%) countries, respectively. The number of nephrologists was variable and was low (<10 per million population) in Africa, the Middle East, South Asia, and Oceania and South East Asia (OSEA) regions. Health information system (renal registry) availability was limited, particularly for acute kidney injury (8 countries [7%]) and nondialysis CKD (9 countries [8%]). International acute kidney injury and CKD guidelines were reportedly accessible in 52 (45%) and 62 (52%) countries, respectively. There was relatively low capacity for clinical studies in developing nations.

CONCLUSIONS AND RELEVANCE This survey demonstrated significant interregional and intraregional variability in the current capacity for kidney care across the world, including important gaps in services and workforce. Assuming the responses accurately reflect the status of kidney care in the respondent countries, the findings may be useful to inform efforts to improve the quality of kidney care worldwide.

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Kidney disease is a substantial worldwide clinical and public health problem.¹⁻³ Acute kidney injury (AKI) and chronic kidney disease (CKD) are linked to high health care costs, poor quality of life, and serious adverse health outcomes (including cardiovascular disease, kidney failure requiring kidney replacement therapy, infection, depression, and mortality).³⁻⁷ However, despite the burden and population health effect of kidney diseases, AKI and CKD are often not included in the major chronic disease control strategies. As an example, the World Health Organization's (WHO's) *Global Status Report on Noncommunicable Diseases 2014*⁸ makes almost no mention of kidney disease. This presents an obstacle for engaging with various governments in addressing AKI and CKD.

The Closing the Gaps initiative is led by the International Society of Nephrology (ISN) and aims to define the current state of kidney care (for AKI and CKD) worldwide, including policy recommendations for improvement. As part of this initiative, a global survey, the Global Kidney Health Atlas (GKHA) Project, was conducted to collect information on the current state of readiness, capacity, and competence for the delivery of kidney health care in each country and region.

Methods

Design and Participants

The GKHA Project was a multinational survey conducted by the ISN to assess current capacity for kidney care across the world. The survey was administered electronically to individuals in 130 countries with ISN affiliate societies through the ISN's 10 regional boards (Africa, Central and Eastern Europe, Latin America, Middle East, North America, North and East Asia, Oceania and South East Asia [OSEA], newly independent states and Russia, South Asia, and Western Europe). The project was approved by the University of Alberta Research Ethics Committee (protocol number PRO00063121). All individual participants provided written informed consent.

Purposive sampling was undertaken to include at least 3 key stakeholders per country (national nephrology society leadership, health policy makers, and patient organization/foundation/advocacy representatives), each of whom was identified as being knowledgeable about their country's kidney care status and nominated by the country and regional nephrology leadership through the ISN. In some cases, country stakeholders had a dual role (eg, both nephrology leader and policy maker) or particular stakeholders (eg, consumer organization representative) were unable to be identified, such that some countries were represented by fewer than 3 key stakeholders. The key representatives were sent a letter of invitation to participate that included a link to the survey's online portal (an electronic questionnaire via SurveyMonkey [<https://www.surveymonkey.com/>]). Respondents were asked specifically about important within-country heterogeneity on kidney care funding and delivery and to identify other potential key respondents, increasing the likelihood

Key Points

Question What is the status of kidney health care across the world?

Findings In a survey of 125 (96%) of 130 International Society of Nephrology–affiliated countries (representing an estimated 93% of the world's population) with a response rate of 85.8% (289 of 337 individuals surveyed), the findings identified major variation in reported service delivery, funding mechanisms for kidney replacement therapy, and available technologies, such as facilities for kidney disease detection and management (eg, serum creatinine and proteinuria assessments).

Meaning These findings on the status of global kidney care may inform efforts by governmental and nongovernmental groups to improve the quality of kidney care worldwide.

that relevant information would be widely captured. The survey was conducted from May to September 2016. During this period, follow-up was conducted by email and telephone to ISN regional leaders and country leadership to facilitate completion and timely responses. During the survey period, each survey respondent who had not yet returned their survey received a personalized email reminder every 2 to 3 weeks up to a maximum of 3 attempts.

Development and Validation of Survey Instrument

The design of the GKHA questionnaire was meant to collect information about nations' capacities and responses about noncommunicable disease prevention and control. The survey development process considered a number of documents, including WHO's *Universal Health Coverage: Supporting Country Needs*, the ISN's AKI "0 by 25" project, WHO *Noncommunicable Disease Surveys* (2000, 2005, 2010, and 2013), the World Heart Federation's "25 by 25" goal, the International Diabetes Federation's *Global Diabetes Atlas*, and WHO's *Global Atlas on Cardiovascular Disease Prevention and Control*, as well as multiple United Nations policy documents on strategies, and policies for noncommunicable diseases.⁹⁻¹⁴ The initial survey questions were further developed through a series of reviews with relevant experts, the ISN Executive Committee, and regional leaderships.

The questionnaire was reviewed by the GKHA steering committee (scientific experts) and ISN regional leaders for content validity and comprehensiveness. The questionnaire was piloted across the 10 ISN regional board memberships to identify any logistical and feasibility issues (eg, need for translation). The format and content of the questionnaire (eAppendix 1 in the [Supplement](#)) were finalized based on feedback and identified issues, including translating the original English-language survey instrument into French and Spanish by certified translators. The French and Spanish surveys were checked by relevant regional boards and were back-translated into English.

The questionnaire was designed in 2 sections that addressed the core areas of country and regional capacity for kidney care delivery. The first section comprised 6 modules assessing country and regional profile for readiness,

Table 1. Countries and Populations

	Total No. of Countries Recognized by UN	Total Population in All UN-Recognized Countries, in Millions	Total No. of Countries Receiving Survey	Total Population in Countries Receiving Survey, in Millions	No. (%) of Countries Completing Survey ^a	Total Population in Countries Completing Survey, in Millions	% of Population in Countries Receiving Survey ^b	% of Population in all UN-Recognized Countries ^c
Overall	200	7248	130	6778	125 (96)	6754	99.6	93
ISN regions								
Africa	54	1156	37	969	35 (95)	964	99	83
Middle East	14	225	13	223	13 (100)	223	100	99
Latin America	25	608	18	571	17 (94)	560	98	92
North and East Asia	7	1602	6	1577	6 (100)	1577	100	98
South Asia	8	1707	5	1673	5 (100)	1673	100	98
OSEA	25	671	13	661	13 (100)	661	100	99
East and Central Europe	20	209	19	207	17 (89)	199	96	95
NIS and Russia	11	281	6	223	6 (100)	223	100	79
Western Europe	22	429	11	318	11 (100)	318	100	74
North America	14	362	2	356	2 (100)	356	100	398
World Bank income groups								
Low	31	631	18	405	18 (100)	405	100	64
Lower middle	52	2862	35	2789	34 (97)	2786	99.9	97
Upper middle	53	2370	35	2313	32 (91)	2293	99	97
High	63	1386	41	1271	40 (98)	1270	99.9	92
Not classified	1	0.02	1	0.02	1 (100)	0.02	100	100

Abbreviations: ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia; UN, United Nations.

^a The percentage was calculated as total No. of countries that completed the survey/total No. of countries that received the survey.

^b The proportion was calculated as total population for countries that completed the survey/total population for countries that received the survey.

^c The proportion was calculated as total population for countries that completed the survey/total population in all UN-recognized countries.

Table 2. Respondent Affiliations Included in the Survey

	Total No. of Respondents ^a	No. of Respondents Per Country, Median (Interquartile Range) ^c	Respondent Affiliation, No. (%)			
			Nephrologists	Other Physicians	Administrators/Policy Makers	Other ^b
Overall	289 ^d	2 (1-3)	247 (85)	10 (3)	16 (6)	16 (6)
ISN regions						
Africa	58	1 (1-2)	42 (73)	4 (7)	6 (10)	6 (10)
Middle East	32	3 (2-3)	29 (91)	1 (3)	1 (3)	1 (3)
Latin America	50	2 (1-3)	50 (100)	0	0	0
North and East Asia	31	6 (2-8)	29 (94)	0	1 (3)	1 (3)
South Asia	12	2 (2-3)	10 (84)	1 (8)	1 (8)	0
OSEA	39	2 (1-4)	31 (79)	2 (5)	3 (8)	3 (8)
East and Central Europe	27	1 (1-2)	26 (96)	1 (4)	0	0
NIS and Russia	12	1.5 (1-2)	7 (59)	0	4 (33)	1 (8)
Western Europe	21	2 (1-3)	17 (81)	1 (5)	0	3 (14)
North America	7	3.5 (3-4)	6 (86)	0	0	1 (14)
World Bank income groups						
Low	30	2 (1-2)	22 (73)	4 (13)	2 (7)	2 (7)
Lower middle	68	2 (1-3)	50 (73)	4 (6)	10 (15)	4 (6)
Upper middle	83	2 (1-3)	76 (92)	1 (1)	4 (5)	2 (2)
High	107	2 (1-3.5)	98 (92)	1 (1)	0	8 (7)
Not classified	1	1 (1-1)	1 (100)	0	0	0

Abbreviations: ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia.

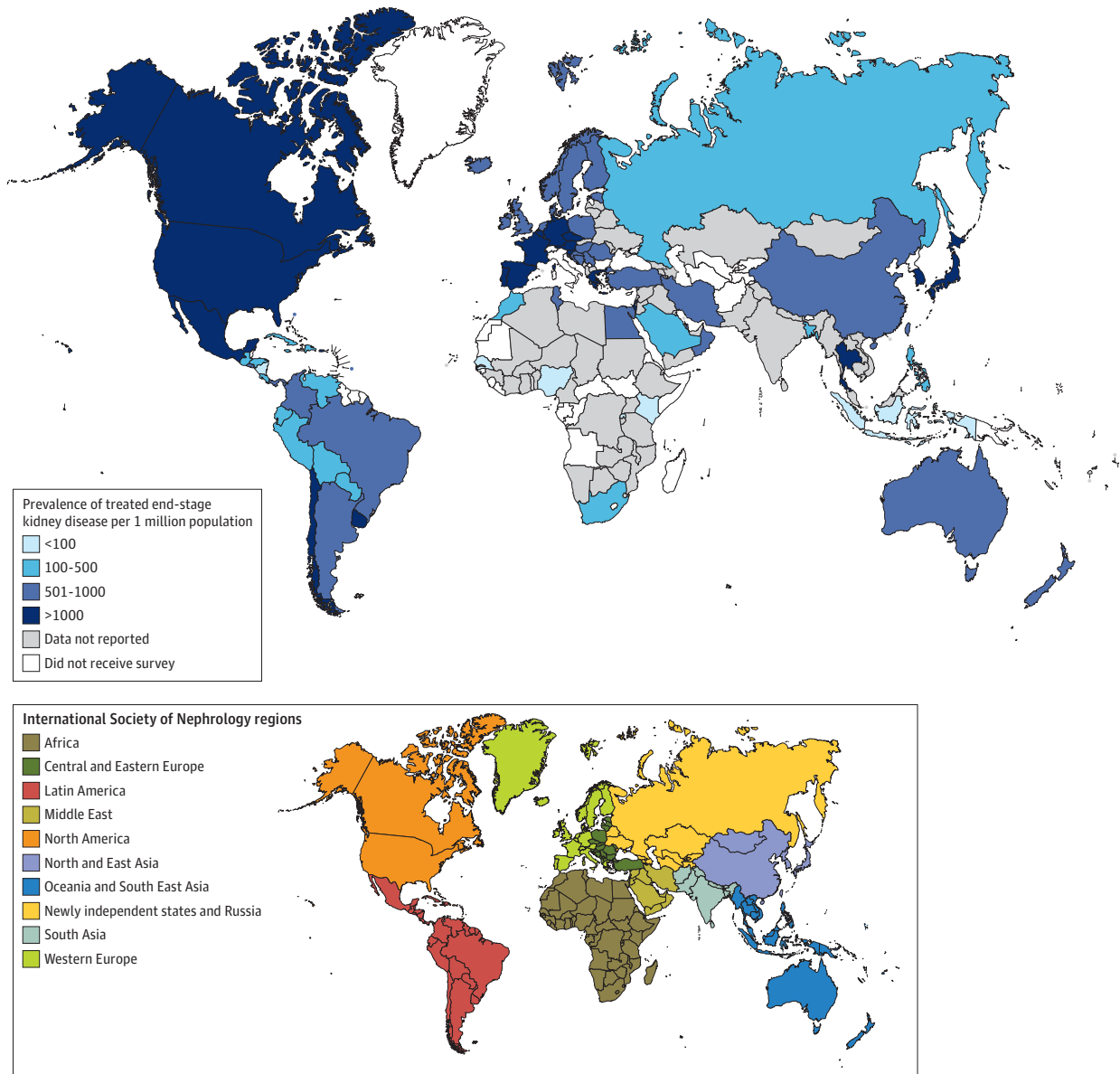
^a Total number of respondents to the survey, overall and by ISN regions and World Bank income groups.

^b Other types of stakeholders (eg, nurses, community health officers).

^c Median and interquartile range of respondents per country.

^d Overall number of individual respondents among 337 contacted (individual response rate of 85.8%).

Figure 1. Global Prevalence of Treated End-Stage Renal Disease Per 1 Million Population



The map depicts the prevalence of treated kidney failure per 1 million population based on individual country data. Data not available indicates that data were either not known or not provided on the questionnaire for countries that received the survey.

capacity, and response to CKD and AKI premised on the 6 health system building blocks (access to essential medicines and technologies, health systems financing, health service delivery, health workforce, health information systems, and leadership and governance).¹⁵ The second section contained questions that assessed response of the nephrology community (including care guidelines, position papers, service frameworks, and advocacy initiatives) and capacity for research and development.

Data Handling, Analysis, and Reporting

To facilitate data collation, responses to the French and Spanish surveys were first converted to English by certified

translators. Data from all individual questionnaires were subsequently automatically extracted and checked for inconsistencies, missing data, duplications, and formatting errors. The data were then merged into a single file to create the global database. This was housed in a secured centralized computer system with automated backups.

Liaison with ISN regional leaders was undertaken to ensure that collated data were consistent with their understanding and were of high quality. Each of 10 regional boards reviewed their output to clarify any ambiguity or inconsistencies. Any major inconsistencies that remained following the reviews were systematically addressed by follow-up of individuals who responded to the survey.

Table 3. Funding for Chronic Kidney Replacement Therapy Provision, Overall and by ISN Regions and World Bank Income Groups

	No. (%) of Responding Countries						
	No. of Responding Countries	Publicly Funded by Government Free at the Point of Delivery	Publicly Funded by Government But With Some Fees at the Point of Delivery	Mix of Public and Private Funding Systems	Solely Private and Out of Pocket	Solely Private Through Health Insurance Providers	Multiple Funding Systems ^a
Hemodialysis							
Overall	118	50 (42)	14 (12)	41 (35)	2 (2)	0	11 (9)
ISN regions							
Africa	33	10 (30)	7 (21)	12 (37)	1 (3)	0	3 (9)
Middle East	13	9 (69)	1 (8)	1 (8)	0	0	2 (15)
Latin America	15	3 (20)	0	11 (73)	0	0	1 (7)
North and East Asia	6	0	3 (50)	2 (33)	0	0	1 (17)
South Asia	5	0	1 (20)	3 (60)	0	0	1 (20)
OSEA	13	1 (8)	2 (15)	7 (54)	1 (8)	0	2 (15)
East and Central Europe	16	14 (87)	0	2 (13)	0	0	0
NIS and Russia	6	4 (66)	0	1 (17)	0	0	1 (17)
Western Europe	9	7 (78)	0	2 (22)	0	0	0
North America	2	2 (100)	0	0	0	0	0
World Bank income groups							
Low	17	3 (18) ^b	4 (24)	6 (34)	2 (12)	0	2 (12)
Lower middle	32	7 (21)	6 (19)	14 (44)	0	0	5 (16)
Upper middle	31	18 (59)	0	11 (35)	0	0	2 (6)
High	38	22 (58)	4 (11)	10 (26)	0	0	2 (5)
Peritoneal Dialysis							
Overall	95	48 (51)	11 (12)	28 (29)	1 (1)	0	7 (7)
ISN regions							
Africa	17	6 (35)	4 (24)	6 (35)	0	0	1 (6)
Middle East	11	7 (64)	2 (18)	0	1 (9)	0	1 (9)
Latin America	15	4 (27)	0	11 (73)	0	0	0
North and East Asia	6	0	4 (66)	1 (17)	0	0	1 (17)
South Asia	5	1 (20)	1 (20)	2 (40)	0	0	1 (20)
OSEA	9	1 (11)	0	6 (67)	0	0	2 (22)
East and Central Europe	15	14 (93)	0	1 (7)	0	0	0
NIS and Russia	6	5 (83)	0	0	0	0	1 (17)
Western Europe	9	8 (89)	0	1 (11)	0	0	0
North America	2	2 (100)	0	0	0	0	0
World Bank income groups							
Low	6	0	2 (33)	3 (50)	0	0	1 (17)
Lower middle	22	6 (27)	3 (14)	10 (45)	1 (5)	0	2 (9)
Upper middle	29	17 (58)	2 (7)	8 (28)	0	0	2 (7)
High	38	25 (66)	4 (11)	7 (18)	0	0	2 (5)
Kidney Transplantation							
Overall	93	46 (49)	10 (11)	28 (30)	1 (1)	0	8 (9)
ISN regions							
Africa	12	4 (33)	1 (8)	4 (33)	1 (8)	0	2 (18)
Middle East	13	6 (46)	4 (31)	0	0	0	3 (23)
Latin America	15	2 (13)	0	12 (80)	0	0	1 (7)
North and East Asia	6	0	5 (83)	0	0	0	1 (17)
South Asia	5	0	0	5 (100)	0	0	0
OSEA	9	3 (33)	0	5 (56)	0	0	1 (11)
East and Central Europe	16	16 (100)	0	0	0	0	0
NIS and Russia	6	5 (83)	0	1 (17)	0	0	0
Western Europe	9	8 (89)	0	1 (11)	0	0	0
North America	2	2 (100)	0	0	0	0	0

(continued)

Table 3. Funding for Chronic Kidney Replacement Therapy Provision, Overall and by ISN Regions and World Bank Income Groups (continued)

	No. (%) of Responding Countries						
	No. of Responding Countries	Publicly Funded by Government Free at the Point of Delivery	Publicly Funded by Government But With Some Fees at the Point of Delivery	Mix of Public and Private Funding Systems	Solely Private and Out of Pocket	Solely Private Through Health Insurance Providers	Multiple Funding Systems ^a
World Bank income groups							
Low	2	1 (50)	0	1 (50)	0	0	0
Lower middle	24	4 (17)	3 (13)	13 (53)	1 (4)	0	3 (13)
Upper middle	29	15 (52)	2 (7)	9 (31)	0	0	3 (10)
High	38	26 (69)	5 (13)	5 (13)	0	0	2 (5)

Abbreviations: ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia.

^b Low-income countries offering long-term hemodialysis free of cost were Chad, Gambia, and Guinea.

^a Involving government, nongovernmental organizations, and communities.

Further validation was carried out at country and regional levels by triangulation of the findings with published literature and other sources of information (government reports and other sources provided by the survey respondents). For example, among the responses for New Zealand, 2 indicated that there was an official registry for dialysis and transplantation, whereas 1 indicated that there was not an official registry. The existence of a New Zealand dialysis registry was subsequently confirmed by cross-checking with the OSEA Regional Board and the Australian and New Zealand Dialysis and Transplant Registry (<http://www.anzdata.org.au/>). Similarly, 2 Kenyan respondents indicated that there was a nephrology training program in Kenya, whereas 1 respondent said there was not a nephrology training program but also indicated only moderate certainty of the answer. Telephone discussion with the African Regional Board confirmed that a nephrology training program did exist in Kenya.

The framework developed by WHO (Assessing National Capacity for the Prevention and Control of Noncommunicable Diseases) was leveraged in the approach to the statistical analysis of the collated data.¹⁶ The analysis was conducted using Stata version 13 software (Stata Corp). The unit of analysis was responding country, and results were stratified by ISN region (n = 10) and World Bank country classification (n = 4) as low-, lower middle-, upper middle-, and high-income nations. Responses were summarized based on the key questionnaire domains using a descriptive statistical approach and reported as counts and percentages or medians and interquartile ranges, as appropriate. Nonquantitative data (text response items of the questionnaire) were thematically analyzed using a standard approach.¹⁷ The results were examined with an emphasis on identification of key gaps and challenges across the various domains based on the pre-existing protocol and reported according to the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) statement.¹⁸

Results

Response Rate

Responses were received from 125 (96%) of 130 countries, including 289 (85.8%) of 337 individuals (median of 2

respondents per country [interquartile range, 1-3]) representing an estimated 93% (6.8 billion) of the world's population of 7.3 billion (Table 1). Responses were received from 100% (18/18), 97% (34/35), 91% (32/35), and 98% (40/41) of low-income, lower middle-income, upper middle-income, and high-income countries, respectively (Table 1). The respondent countries were representative of the countries in each region by population size (Table 1). The survey respondents consisted of nephrologists (247 [85%]), other physicians (10 [3%]), administrators/policy makers (16 [6%]), and others (16 [6%]) affiliated with kidney disease patient advocacy (Table 2).

Country Readiness, Capacity, and Response to CKD and AKI Access to Essential Medicines and Technologies

There were variations across ISN regions (n = 10) and World Bank income groups (n = 4) in the prevalence of treated end-stage renal disease represented by kidney replacement therapy (kidney replacement therapy: hemodialysis, peritoneal dialysis, and kidney transplantation), with the highest prevalence in developed regions in comparison with developing nations (Figure 1). The reported availability and access to essential medicines for CKD care and technologies also showed significant variations across regions and countries (eAppendix 2 in the Supplement). Among all countries (n=125 responding), 119 (95%), 95 (76%), and 94 (75%) had facilities for hemodialysis, long-term peritoneal dialysis, and kidney transplantation, respectively; 100% of high-income countries had such facilities. In contrast, 33 (94%), 16 (45%), and 12 (34%) countries in Africa had facilities for hemodialysis, long-term peritoneal dialysis, and kidney transplantation, respectively (eAppendix 2).

Health Systems Financing

The number of countries (n=118 responding) that reported complete public funding (completely free care at the point of delivery covered by the government) for chronic hemodialysis, long-term peritoneal dialysis, and kidney transplantation were 50 (42%), 48 (51%), and 46 (49%), respectively (Table 3). Overall, 45 (39%) and 34 (49%) countries reported complete public funding for hemodialysis and peritoneal dialysis, respectively, in the acute setting (Table 4). The public funding structures for all forms of

Table 4. Funding for Acute Kidney Replacement Therapy Provision, Overall and by ISN Regions and World Bank Income Groups

	No. (%) of Responding Countries						
	No. of Responding Countries	Publicly Funded by Government Free at the Point of Delivery	Publicly Funded by Government But With Some Fees at the Point of Delivery	Mix of Public and Private Funding Systems	Solely Private and Out of Pocket	Solely Private Through Health Insurance Providers	Multiple Funding Systems ^a
Acute Hemodialysis							
Overall	116	45 (39)	22 (19)	41 (35)	1 (1)	0	7 (6)
ISN regions							
Africa	32	10 (32)	9 (28)	9 (28)	1 (3)	0	3 (9)
Middle East	13	6 (46)	1 (8)	4 (31)	0	0	2 (15)
Latin America	15	2 (13)	0	13 (87)	0	0	0
North and East Asia	6	0	4 (66)	1 (17)	0	0	1 (17)
South Asia	5	0	1 (20)	4 (80)	0	0	0
OSEA	13	2 (15)	4 (31)	6 (46)	0	0	1 (8)
East and Central Europe	16	14 (88)	1 (6)	1 (6)	0	0	0
NIS and Russia	5	3 (60)	1 (20)	1 (20)	0	0	0
Western Europe	9	7 (78)	1 (11)	1 (11)	0	0	0
North America	2	1 (50)	0	1 (50)	0	0	0
World Bank income groups							
Low	16	4 (25) ^b	5 (32)	5 (31)	1 (6)	0	1 (6)
Lower middle	32	5 (16)	10 (31)	14 (44)	0	0	3 (9)
Upper middle	30	16 (53)	1 (3)	11 (37)	0	0	2 (7)
High	38	20 (52)	6 (16)	11 (29)	0	0	1 (3)
Acute Peritoneal Dialysis							
Overall	70	34 (49)	11 (16)	19 (27)	3 (4)	0	3 (4)
ISN regions							
Africa	11	3 (27)	2 (18)	4 (37)	1 (9)	0	1 (9)
Middle East	7	5 (72)	1 (14)	0	0	0	1 (14)
Latin America	14	4 (29)	1 (7)	7 (50)	2 (14)	0	0
North and East Asia	4	0	4 (100)	0	0	0	0
South Asia	5	1 (20)	0	4 (80)	0	0	0
OSEA	6	1 (17)	2 (33)	2 (33)	0	0	1 (17)
East and Central Europe	11	10 (91)	1 (9)	0	0	0	0
NIS and Russia	4	4 (100)	0	0	0	0	0
Western Europe	6	5 (83)	0	1 (17)	0	0	0
North America	2	1 (50)	0	1 (50)	0	0	0
World Bank income groups							
Low	4	0	0	3 (75)	1 (25)	0	0
Lower middle	17	7 (41)	3 (18)	5 (29)	0	0	2 (12)
Upper middle	22	13 (59)	2 (9)	6 (27)	1 (5)	0	0
High	27	14 (51)	6 (22)	5 (19)	1 (4)	0	1 (4)

Abbreviations: ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia.

^bLow-income countries offering acute hemodialysis free of cost were Chad, Gambia, Mozambique, and Tanzania.

^aInvolving government, nongovernmental organizations, and communities.

kidney replacement therapy (hemodialysis, peritoneal dialysis, and kidney transplantation) were less common in the low- and lower middle-income countries (Table 3 and Table 4). There was significant variation across regions in access to medications for kidney care. For instance, no country from the low-income and lower middle-income categories reported complete public funding for medications for nondialysis CKD care (including angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, other antihypertensive agents, statins, and glucose-lowering

agents) (Table 5 and eAppendix 2 in the Supplement). In contrast, 12 (32%) and 10 (32%) high- and upper middle-income nations reported complete public funding for medications in nondialysis CKD care (Table 5).

Health Service Delivery

Globally, infrastructure available for kidney care was reported to be good/above average in 48 (39%) and excellent in 11 (9%) countries for AKI. For CKD, 46 (38%) countries were rated good/above average and 9 (7%) were rated excellent

Table 5. Access to Medications and Reimbursement Plans, Overall and by ISN Regions and World Bank Income Groups

	No. (%) of Responding Countries						
	No. of Responding Countries	Publicly Funded by Government Free at the Point of Delivery	Publicly Funded by Government But With Some Fees at the Point of Delivery	Mix of Public and Private Funding Systems	Solely Private and Out of Pocket	Solely Private Through Health Insurance Providers	Multiple Funding Systems ^a
Nondialysis Chronic Kidney Disease							
Overall	118	22 (19)	22 (19)	51 (42)	9 (8)	1 (1)	13 (11)
ISN regions							
Africa	32	1 (3)	8 (25)	12 (37)	6 (19)	0	5 (16)
Middle East	13	3 (23)	2 (15)	5 (39)	1 (8)	0	2 (15)
Latin America	16	2 (13)	0	12 (75)	0	1 (6)	1 (6)
North and East Asia	6	1 (17)	2 (33)	2 (33)	0	0	1 (17)
South Asia	5	0	0	4 (80)	0	0	1 (20)
OSEA	13	1 (8)	2 (15)	8 (62)	2 (15)	0	0
East and Central Europe	16	11 (69)	4 (25)	1 (6)	0	0	0
NIS and Russia	6	1 (17)	0	3 (50)	0	0	2 (33)
Western Europe	9	2 (22)	4 (45)	2 (22)	0	0	1 (11)
North America	2	0	0	2 (100)	0	0	0
World Bank income groups							
Low	17	0	3 (18)	5 (29)	5 (29)	0	4 (24)
Lower middle	32	0	7 (22)	15 (46)	4 (13)	1 (3)	5 (16)
Upper middle	31	10 (32)	2 (6)	17 (56)	0	0	2 (6)
High	38	12 (32)	10 (26)	14 (37)	0	0	2 (5)
Dialysis							
Overall	118	26 (22)	29 (25)	46 (38)	8 (7)	1 (1)	8 (7)
ISN regions							
Africa	32	2 (6)	9 (28)	11 (34)	6 (19)	0	4 (13)
Middle East	13	5 (39)	4 (31)	2 (15)	0	0	2 (15)
Latin America	16	3 (19)	0	12 (75)	0	1 (6)	0
North and East Asia	6	0	3 (50)	2 (33)	0	0	1 (17)
South Asia	5	0	0	4 (80)	1 (20)	0	0
OSEA	13	0	4 (30)	8 (62)	1 (8)	0	0
East and Central Europe	16	12 (75)	4 (25)	0	0	0	0
NIS and Russia	6	1 (17)	0	4 (66)	0	0	1 (17)
Western Europe	9	3 (33)	5 (56)	1 (11)	0	0	0
North America	2	0	0	2 (100)	0	0	0
World Bank income groups							
Low	17	0	4 (24)	6 (35)	5 (29)	0	2 (12)
Lower middle	32	0	7 (22)	18 (57)	3 (9)	1 (3)	3 (9)
Upper middle	31	13 (42)	4 (13)	12 (39)	0	0	2 (6)
High	38	13 (34)	14 (37)	10 (26)	0	0	1 (3)
Kidney Transplantation							
Overall	118	35 (30)	22 (18)	35 (30)	18 (15)	1 (1)	7 (6)
ISN regions							
Africa	32	5 (16)	3 (9)	6 (19)	14 (43)	0	4 (13)
Middle East	13	7 (54)	3 (23)	0	0	0	3 (23)
Latin America	16	4 (25)	0	11 (69)	0	1 (6)	0
North and East Asia	6	0	3 (50)	3 (50)	0	0	0
South Asia	5	0	0	4 (80)	1 (20)	0	0
OSEA	13	1 (8)	2 (15)	7 (54)	3 (23)	0	0
East and Central Europe	16	13 (81)	3 (19)	0	0	0	0
NIS and Russia	6	4 (66)	1 (17)	1 (17)	0	0	0
Western Europe	9	1 (11)	7 (78)	1 (11)	0	0	0
North America	2	0	0	2 (100)	0	0	0

(continued)

Table 5. Access to Medications and Reimbursement Plans, Overall and by ISN Regions and World Bank Income Groups (continued)

	No. (%) of Responding Countries						
	No. of Responding Countries	Publicly Funded by Government Free at the Point of Delivery	Publicly Funded by Government But With Some Fees at the Point of Delivery	Mix of Public and Private Funding Systems	Solely Private and Out of Pocket	Solely Private Through Health Insurance Providers	Multiple Funding Systems ^a
World Bank income groups							
Low	17	0	1 (6)	3 (18)	10 (58)	0	3 (18)
Lower middle	32	6 (19)	4 (13)	12 (37)	7 (22)	1 (3)	2 (6)
Upper middle	31	15 (49)	3 (10)	11 (35)	1 (3)	0	1 (3)
High	38	14 (37)	14 (37)	9 (23)	0	0	1 (3)

Abbreviations: ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia.

^a Involving government, nongovernmental organizations, and communities.

(eTable 1 in the [Supplement](#)). Reports of extremely poor or poor/below average infrastructure for AKI and CKD care were highest in Africa and South Asia and lowest in Western Europe and North America (eTable 1). Pertaining to services used for monitoring CKD, measurement of serum creatinine reported with estimated glomerular filtration rate (eGFR) was described as always or usually available at the primary and secondary care levels in only 21 (18%) or 23 (19%) and 43 (40%) or 25 (23%) countries, respectively (Table 6, Table 7, and eAppendix 3 in the [Supplement](#)). Pathological services for renal biopsy were always available at the secondary care level for 27 (23%) countries but were otherwise rarely or never available in 28 (24%) and 16 (14%) countries, respectively (Table 7 and eAppendix 3).

Health Workforce

Respondents from countries were asked to provide estimates of the number of trained nephrologists, as defined by the relevant regulatory authorities, and provide an opinion regarding shortage (yes/no) of the workforce required for kidney care delivery. There was a low reported nephrology workforce density (≤ 10 per 1 million population) for several countries in the Africa, North and East Asia, and South Asia regions as well as in parts of Latin America (Figure 2). There were also wide disparities in the number of nephrologists across countries and regions. For instance, 9 of the 10 countries with the lowest numbers of nephrologists were in sub-Saharan Africa (eFigure 1A in the [Supplement](#)), whereas the countries with the highest number of nephrologists were from several regions, with Lithuania, Taiwan, and Japan reporting the highest numbers of nephrologists per 1 million population (eFigure 1B in the [Supplement](#)). Overall, there were frequent reported shortages of the various categories of other health care workers. Most countries had reported shortages of vascular access coordinators, transplant coordinators, social workers, renal pathologists, nurse practitioners, nephrologists, dietitians, dialysis technicians, dialysis nurses, and counselors and psychologists (Figure 2C). In contrast, fewer countries reported shortages of pharmacists, laboratory technicians, and primary care physicians (Figure 2C). By region, shortages of other health care clinicians were more common in Africa, the Middle East, Latin America, South Asia, North and East Asia, OSEA, and

East and Central Europe (eTable 2 in the [Supplement](#)). For example, 28 (85%) countries in Africa had reported shortages of nephrologists compared with only 2 (20%) countries in Western Europe with reported shortages of this category of workforce (eTable 2).

Health Information Systems

Countries were asked to provide data on the availability of registries (surveillance and monitoring systems) for kidney replacement therapy and nondialysis CKD and AKI. The prevalence of treated end-stage renal disease was comparatively low in some regions compared with others (Figure 1). For instance, Africa, the Middle East, and South Asia had low prevalence of treated end-stage renal disease in comparison with North America and Western Europe (where the prevalence was generally above 1000 per 1 million population) (Figure 1). Overall, only 9 (7.7%) and 8 (6.8%) countries reported having registries for nondialysis CKD and AKI, respectively (eFigure 2 and eAppendix 3 in the [Supplement](#)). There was wide variation in the presence of kidney replacement therapy registries across regions, with most countries reporting having dialysis registries and fewer reporting having kidney transplant registries, particularly in Africa, the Middle East, and South Asia (eFigure 2 and eAppendix 3). Dialysis and kidney transplant registries were most commonly available in Western Europe, North and East Asia, North America, and East and Central European countries (eFigure 2 and eAppendix 3).

Leadership and Governance

Specific national strategies for improving the care of patients with CKD were reported as present in only 19 countries (17%) (eTable 3 in the [Supplement](#)). There were variations in the availability of 1 or more of the various strategies (national position paper, identification tools, incentives, etc) for improving identification of AKI across regions; 59 countries (51%) had none of these strategies (eTable 4 in the [Supplement](#)).

Response of the Nephrology Community (Guidelines and Advocacy for Kidney Care)

The majority of countries reported access predominantly to international guidelines compared with national guidelines.

Table 6. Availability of Services for Chronic Kidney Disease Monitoring and Management at Primary Care Level

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
Blood Pressure					
Overall	119	75 (63)	40 (34)	4 (3)	0
ISN regions					
Africa	33	15 (45)	16 (49)	2 (6)	0
Middle East	13	9 (70)	2 (15)	2 (15)	0
Latin America	16	12 (75)	4 (25)	0	0
North and East Asia	6	1 (17)	5 (83)	0	0
South Asia	5	3 (60)	2 (40)	0	0
OSEA	13	8 (62)	5 (38)	0	0
East and Central Europe	16	14 (87)	2 (13)	0	0
NIS and Russia	6	4 (67)	2 (33)	0	0
Western Europe	9	7 (78)	2 (22)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	8 (47)	8 (47)	1 (6)	0
Lower middle	33	16 (49)	15 (45)	2 (6)	0
Upper middle	31	23 (74)	8 (26)	0	0
High	38	28 (73)	9 (24)	1 (3)	0
Blood Glucose					
Overall	119	48 (40)	50 (42)	19 (16)	2 (2)
ISN regions					
Africa	33	9 (27)	10 (30)	12 (37)	2 (6)
Middle East	13	6 (46)	6 (46)	1 (8)	0
Latin America	16	7 (44)	7 (44)	2 (12)	0
North and East Asia	6	0	6 (100)	0	0
South Asia	5	1 (20)	2 (40)	2 (40)	0
OSEA	13	4 (31)	8 (61)	1 (8)	0
East and Central Europe	16	10 (63)	5 (31)	1 (6)	0
NIS and Russia	6	2 (33)	4 (67)	0	0
Western Europe	9	8 (89)	1 (11)	0	0
North America	2	1 (50)	1 (50)	0	0
World Bank income groups					
Low	17	4 (24)	3 (18)	8 (46)	2 (12)
Lower middle	33	9 (27)	16 (49)	8 (24)	0
Upper middle	31	12 (39)	17 (55)	2 (6)	0
High	38	23 (60)	14 (37)	1 (3)	0
Serum Creatinine					
Serum creatinine with eGFR reporting					
Overall	119	21 (18)	23 (19)	48 (40)	27 (23)
ISN regions					
Africa	33	1 (3)	4 (12)	15 (46)	13 (39)
Middle East	13	1 (8)	3 (23)	7 (54)	2 (15)
Latin America	16	2 (13)	4 (25)	7 (43)	3 (19)
North and East Asia	6	0	2 (33)	3 (50)	1 (17)
South Asia	5	1 (20)	0	3 (60)	1 (20)
OSEA	13	2 (15)	3 (23)	6 (47)	2 (15)
East and Central Europe	16	8 (49)	3 (19)	3 (19)	2 (13)
NIS and Russia	6	0	1 (17)	2 (33)	3 (50)
Western Europe	9	5 (56)	2 (22)	2 (22)	0
North America	2	1 (50)	1 (50)	0	0

(continued)

Table 6. Availability of Services for Chronic Kidney Disease Monitoring and Management at Primary Care Level (continued)

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
World Bank income groups					
Low	17	0	0	7 (41)	10 (59)
Lower middle	33	3 (9)	2 (6)	18 (55)	10 (30)
Upper middle	31	4 (13)	9 (29)	12 (39)	6 (19)
High	38	14 (36)	12 (32)	11 (29)	1 (3)
Serum creatinine without eGFR reporting					
Overall	119	31 (26)	46 (39)	32 (27)	10 (8)
ISN regions					
Africa	33	5 (15)	10 (30)	12 (37)	6 (18)
Middle East	13	5 (38)	5 (38)	3 (24)	0
Latin America	16	4 (25)	9 (56)	3 (19)	0
North and East Asia	6	0	5 (83)	1 (17)	0
South Asia	5	1 (20)	1 (20)	2 (40)	1 (20)
OSEA	13	3 (23)	3 (23)	5 (39)	2 (15)
East and Central Europe	16	7 (44)	4 (25)	4 (25)	1 (6)
NIS and Russia	6	1 (17)	5 (83)	0	0
Western Europe	9	5 (56)	2 (22)	2 (22)	0
North America	2	0	2 (100)	0	0
World Bank income groups					
Low	17	1 (6)	4 (24)	5 (29)	7 (41)
Lower middle	33	5 (15)	13 (40)	13 (39)	2 (6)
Upper middle	31	9 (29)	18 (58)	4 (13)	0
High	38	16 (42)	11 (29)	10 (26)	1 (3)
Radiology Services					
Overall	119	17 (14)	38 (32)	48 (41)	16 (13)
ISN regions					
Africa	33	5 (15)	5 (15)	14 (43)	9 (27)
Middle East	13	1 (8)	3 (23)	6 (46)	3 (23)
Latin America	16	3 (19)	3 (19)	9 (56)	1 (6)
North and East Asia	6	1 (17)	1 (17)	4 (66)	0
South Asia	5	1 (20)	1 (20)	3 (60)	0
OSEA	13	0	6 (46)	6 (46)	1 (8)
East and Central Europe	16	3 (19)	9 (56)	3 (19)	1 (6)
NIS and Russia	6	1 (17)	3 (50)	2 (33)	0
Western Europe	9	2 (22)	5 (56)	1 (11)	1 (11)
North America	2	0	2 (100)	0	0
World Bank income groups					
Low	17	1 (6)	1 (6)	8 (47)	7 (41)
Lower middle	33	4 (12)	8 (24)	18 (55)	3 (9)
Upper middle	31	6 (19)	10 (32)	11 (36)	4 (13)
High	38	6 (16)	19 (50)	11 (29)	2 (5)
Urinalysis (Qualitative Assays)					
Overall	119	26 (22)	54 (45)	32 (27)	7 (6)
ISN regions					
Africa	33	5 (15)	11 (33)	13 (40)	4 (12)
Middle East	13	2 (15)	10 (77)	1 (8)	0
Latin America	16	3 (19)	6 (38)	6 (37)	1 (6)
North and East Asia	6	0	4 (67)	2 (33)	0
South Asia	5	2 (40)	2 (40)	1 (20)	0
OSEA	13	2 (16)	5 (38)	5 (38)	1 (8)
East and Central Europe	16	7 (44)	7 (44)	1 (6)	1 (6)
NIS and Russia	6	1 (17)	2 (33)	3 (50)	0
Western Europe	9	4 (44)	5 (56)	0	0
North America	2	0	2 (100)	0	0

(continued)

Table 6. Availability of Services for Chronic Kidney Disease Monitoring and Management at Primary Care Level (continued)

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
World Bank income groups					
Low	17	3 (18)	4 (24)	7 (41)	3 (18)
Lower middle	33	5 (16)	13 (39)	13 (39)	2 (6)
Upper middle	31	4 (13)	18 (58)	7 (23)	2 (6)
High	38	14 (37)	19 (50)	5 (13)	0
UACR or UPCR Measurement					
Overall	119	9 (8)	29 (24)	52 (44)	29 (24)
ISN regions					
Africa	33	0	4 (12)	11 (33)	18 (55)
Middle East	13	0	6 (46)	6 (46)	1 (8)
Latin America	16	3 (19)	5 (31)	5 (31)	3 (19)
North and East Asia	6	0	0	6 (100)	0
South Asia	5	0	1 (20)	4 (80)	0
OSEA	13	1 (8)	3 (23)	7 (54)	2 (15)
East and Central Europe	16	2 (13)	2 (13)	9 (55)	3 (19)
NIS and Russia	6	0	1 (17)	3 (50)	2 (33)
Western Europe	9	3 (33)	5 (56)	1 (11)	0
North America	2	0	2 (100)	0	0
World Bank income groups					
Low	17	0	0	3 (18)	14 (82)
Lower middle	33	1 (3)	4 (12)	18 (55)	10 (30)
Upper middle	31	3 (10)	8 (26)	16 (51)	4 (13)
High	38	5 (13)	17 (45)	15 (39)	1 (3)

Abbreviations: eGFR, estimated glomerular filtration rate; ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia; UACR, urine albumin:creatinine ratio; UPCR, urine protein:creatinine ratio.

Access to international CKD and AKI management guidelines was reported in 60 (52%) and 52 (45%) countries, respectively (eTable 5 in the [Supplement](#)). Thirty-one countries (27%) reported availability of national guidelines for CKD (eTable 5). In contrast, only 8 countries (7%) reported access to national guidelines for AKI. Presence of CKD and AKI advocacy groups were limited in most regions and were more common for CKD than for AKI (eFigure 3 and eAppendix 3 in the [Supplement](#)).

Capacity for Research and Development

Respondents rated their involvement with different phases of clinical trials and observational research studies (available infrastructure, trained workforce, ethical frameworks, etc). Low capacity for participation in different aspects of clinical trials was frequently reported, especially in developing countries and regions (eAppendix 3 in the [Supplement](#)). For example, only 33 (28%) and 46 (40%) countries overall could participate in phase 1 and phase 2 clinical trials, respectively (eTable 6 and eAppendix 3 in the [Supplement](#)). Western Europe and North America reported the highest capacity to participate in all phases of clinical trials (eTable 6 and eAppendix 3). For instance, all countries in these 2 regions reported capacity to participate in phase 3 and 4 trials in contrast to only 5 (17%) and 4 (13%) in Africa, respectively (eTable 6). Although most countries described some capacity to conduct or participate in observational cohort studies, Africa and Middle East countries reported no capacity to participate in transplantation cohort studies (eTable 6). Institutional ethics approval was the most com-

mon study approval type in most countries overall and across most regions (eTable 6).

Discussion

To our knowledge, this is the first systematic assessment of the global capacity for kidney care in terms of the key building blocks of a functional health system and readiness of countries and regions to enhance such care. There were significant gaps reported in services, facilities, and workforce in some countries and regions. Most countries in Africa described no facilities for peritoneal dialysis or kidney transplantation. Few countries reported complete public funding for kidney replacement therapy services and medications for CKD care (including dialysis and transplantation); there was a large private contribution toward payment for kidney replacement therapy services and medications reported particularly in countries across the Africa, South Asia, and OSEA regions. Even though the infrastructure available for AKI and CKD care was mostly rated as average or above average, survey responses suggested that measurement of serum creatinine with eGFR was common at the primary care level in only a few countries. Availability of pathological services for kidney biopsy was described as very low. Overall, there was a reported shortage of nephrology workforce and other workforce categories in many settings. There was limited availability of health information systems (renal registries), particularly for nondialysis CKD and AKI. National or regional strategies for improving CKD

Table 7. Availability of Services for Chronic Kidney Disease Monitoring and Management at Secondary or Tertiary Care Levels

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
Blood Pressure					
Overall	119	106 (89)	13 (11)	0	0
ISN regions					
Africa	33	27 (82)	6 (18)	0	0
Middle East	13	13 (100)	0	0	0
Latin America	16	15 (94)	1 (6)	0	0
North and East Asia	6	3 (50)	3 (50)	0	0
South Asia	5	5 (100)	0	0	0
OSEA	13	12 (92)	1 (8)	0	0
East and Central Europe	16	16 (100)	0	0	0
NIS and Russia	6	5 (83)	1 (17)	0	0
Western Europe	9	8 (89)	1 (11)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	14 (82)	3 (18)	0	0
Lower middle	33	28 (85)	5 (15)	0	0
Upper middle	31	29 (94)	2 (6)	0	0
High	38	35 (92)	3 (8)	0	0
Blood Glucose					
Overall	119	83 (70)	35 (29)	1 (1)	0
ISN regions					
Africa	33	18 (55)	14 (42)	1 (3)	0
Middle East	13	12 (92)	1 (8)	0	0
Latin America	16	14 (87)	2 (13)	0	0
North and East Asia	6	1 (17)	5 (83)	0	0
South Asia	5	4 (80)	1 (20)	0	0
OSEA	13	7 (54)	6 (46)	0	0
East and Central Europe	16	15 (94)	1 (6)	0	0
NIS and Russia	6	3 (50)	3 (50)	0	0
Western Europe	9	7 (78)	2 (22)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	10 (59)	7 (41)	0	0
Lower middle	33	17 (52)	15 (45)	1 (3)	0
Upper middle	31	25 (81)	6 (19)	0	0
High	38	31 (82)	7 (18)	0	0
Serum Creatinine					
Serum creatinine with eGFR reporting					
Overall	108	43 (40)	25 (23)	25 (23)	15 (14)
ISN regions					
Africa	33	7 (21)	6 (18)	8 (24)	12 (37)
Middle East	13	5 (38)	5 (38)	3 (24)	0
Latin America	5	2 (40)	1 (20)	1 (20)	1 (20)
North and East Asia	6	1 (17)	4 (66)	1 (17)	0
South Asia	5	0	2 (40)	2 (40)	1 (20)
OSEA	13	6 (46)	3 (23)	4 (31)	0
East and Central Europe	16	11 (68)	2 (13)	2 (13)	1 (6)
NIS and Russia	6	2 (33)	1 (17)	3 (50)	0
Western Europe	9	7 (78)	1 (11)	1 (11)	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	2 (12)	1 (6)	3 (18)	11 (64)
Lower middle	29	5 (17)	9 (31)	13 (45)	2 (7)
Upper middle	27	10 (37)	10 (37)	5 (19)	2 (7)
High	35	26 (75)	5 (14)	4 (11)	0

(continued)

Table 7. Availability of Services for Chronic Kidney Disease Monitoring and Management at Secondary or Tertiary Care Levels (continued)

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
Serum creatinine without eGFR reporting					
Overall	117	68 (58)	40 (34)	7 (6)	2 (2)
ISN regions					
Africa	32	9 (28)	19 (60)	3 (9)	1 (3)
Middle East	13	13 (100)	0	0	0
Latin America	16	10 (62)	6 (38)	0	0
North and East Asia	6	3 (50)	3 (50)	0	0
South Asia	5	3 (60)	2 (40)	0	0
OSEA	12	6 (50)	5 (42)	1 (8)	0
East and Central Europe	16	12 (75)	2 (13)	1 (6)	1 (6)
NIS and Russia	6	5 (83)	1 (17)	0	0
Western Europe	9	5 (56)	2 (22)	2 (22)	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	2 (12)	12 (70)	2 (12)	1 (6)
Lower middle	31	16 (52)	13 (42)	2 (6)	0
Upper middle	31	24 (77)	7 (23)	0	0
High	38	26 (68)	8 (21)	3 (8)	1 (3)
UACR or UPCR Measurement					
Overall	118	32 (27)	47 (40)	28 (24)	11 (9)
ISN regions					
Africa	32	2 (6)	8 (25)	14 (44)	8 (25)
Middle East	13	5 (38)	8 (62)	0	0
Latin America	16	4 (25)	10 (62)	2 (13)	0
North and East Asia	6	1 (17)	4 (66)	0	1 (17)
South Asia	5	0	3 (60)	2 (40)	0
OSEA	13	4 (31)	4 (31)	5 (38)	0
East and Central Europe	16	7 (44)	4 (25)	4 (25)	1 (6)
NIS and Russia	6	1 (17)	3 (49)	1 (17)	1 (17)
Western Europe	9	6 (67)	3 (33)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	0	1 (6)	10 (59)	6 (35)
Lower middle	33	3 (9)	15 (46)	13 (39)	2 (6)
Upper middle	30	9 (30)	14 (47)	4 (13)	3 (10)
High	38	20 (52)	17 (45)	1 (3)	0
Radiology Services (Ultrasound)					
Overall	119	68 (57)	45 (38)	6 (5)	0
ISN regions					
Africa	33	13 (39)	16 (49)	4 (12)	0
Middle East	13	12 (92)	1 (8)	0	0
Latin America	16	8 (50)	8 (50)	0	0
North and East Asia	6	3 (50)	3 (50)	0	0
South Asia	5	3 (60)	2 (40)	0	0
OSEA	13	5 (38)	6 (47)	2 (15)	0
East and Central Europe	16	12 (75)	4 (25)	0	0
NIS and Russia	6	4 (67)	2 (33)	0	0
Western Europe	9	6 (67)	3 (33)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	5 (29)	9 (53)	3 (18)	0
Lower middle	33	15 (45)	16 (49)	2 (6)	0
Upper middle	31	19 (62)	11 (35)	1 (3)	0
High	38	29 (76)	9 (24)	0	0

(continued)

Table 7. Availability of Services for Chronic Kidney Disease Monitoring and Management at Secondary or Tertiary Care Levels (continued)

	No. of Responding Countries	Availability, No. (%) of Responding Countries			
		Always	Usually	Rarely	Never
Pathology Services (Renal Biopsy)					
Overall	118	27 (23)	47 (39)	28 (24)	16 (14)
ISN regions					
Africa	32	1 (3)	6 (19)	13 (40)	12 (38)
Middle East	13	4 (31)	8 (61)	1 (8)	0
Latin America	16	2 (13)	11 (68)	2 (13)	1 (6)
North and East Asia	6	1 (17)	3 (50)	2 (33)	0
South Asia	5	0	4 (80)	1 (20)	0
OSEA	13	3 (23)	3 (23)	5 (39)	2 (15)
East and Central Europe	16	9 (56)	4 (25)	2 (13)	1 (6)
NIS and Russia	6	0	4 (67)	2 (33)	0
Western Europe	9	5 (56)	4 (44)	0	0
North America	2	2 (100)	0	0	0
World Bank income groups					
Low	17	0	3 (18)	5 (29)	9 (53)
Lower middle	32	1 (3)	12 (37)	15 (47)	4 (13)
Upper middle	31	3 (10)	18 (57)	7 (23)	3 (10)
High	38	23 (60)	14 (37)	1 (3)	0

Abbreviations: eGFR, estimated glomerular filtration rate; ISN, International Society of Nephrology; NIS, newly independent states; OSEA, Oceania and South East Asia; UACR, urine albumin:creatinine ratio; UPCr, urine protein:creatinine ratio.

and AKI care were present in only a few countries, with wide variations across regions on the reported availability and access to care guidelines. The presence of CKD and AKI advocacy groups was reported as limited in most regions and was more common for AKI than for CKD, with more than two-thirds of countries reporting absence of capacity to participate in clinical research.

The status of kidney health care as suggested by this study indicates that the health systems of many countries face substantial challenges in closing the large gaps that are reported to currently exist in meeting the health needs of people with AKI and CKD around the world.^{1,19} First, the reported limited availability of and public funding for AKI and CKD care (kidney replacement therapy technologies, essential medicines, service delivery and infrastructures, kidney disease detection), particularly in low- and lower middle-income countries, call for strategies at global, regional, and national levels to make these care components accessible and affordable to the burgeoning populace with kidney disease.²⁰⁻²³ While community-based kidney disease prevention, identification, and treatment programs represent an important low-cost strategy with the potential for significant public health benefits,^{24,25} the present study found that most countries reported inadequate CKD detection and surveillance systems to achieve this goal. For example, the ability to quantitatively measure serum creatinine with eGFR reporting and proteinuria even at secondary care levels was “always” possible in only 7 (21%) and 2 (6%) African countries, respectively. Furthermore, peritoneal dialysis tended to be relatively underutilized in resource-poor countries, even though this mode is generally considered a less expensive and technically less demanding form of kidney replacement therapy²⁶ that is particularly suited to low- and lower-middle income countries challenged by limited finances, limited nephrol-

ogy workforce, and geographical barriers.²¹ Developing low-cost kidney disease detection programs (integrated with other noncommunicable disease strategies) and low-cost dialysis programs in resource-limited settings requires building partnerships among industry, international health agencies, and governments,²² as occurred with the establishment of low-cost chronic disease management programs in Africa.^{22,27-29}

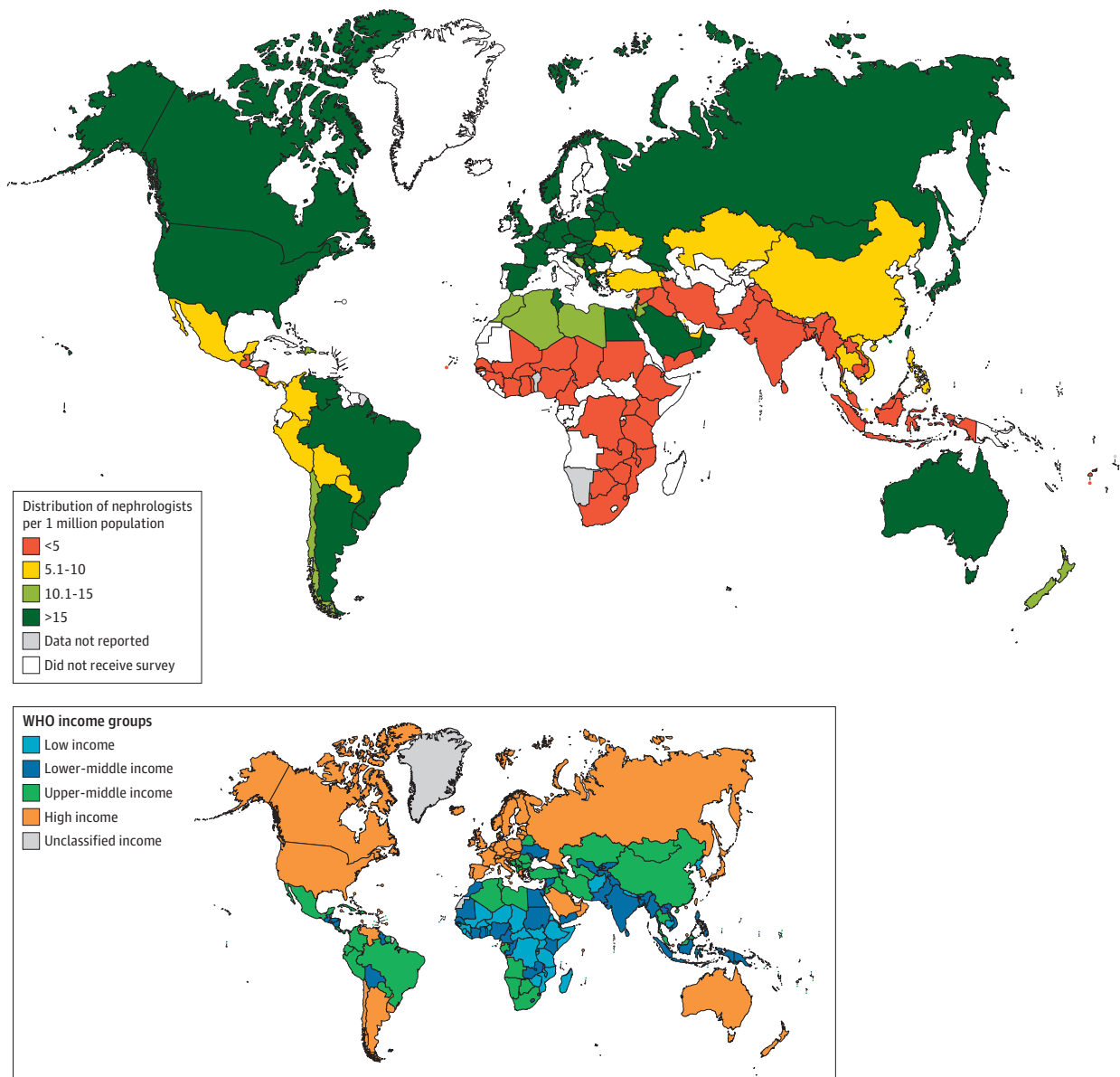
A second challenge is the limited availability of reliable surveillance systems reported for both AKI and CKD across countries and regions, which is a major impediment to designing and implementing effective interventions to close the identified gaps in infrastructures and services.³⁰ Policy decisions at national and international levels are required to support development of functional information systems across the broad spectrum of kidney diseases and to track and monitor burden, treatment, and related outcomes.^{29,30}

A third key challenge is the limited workforce capacity reported in most countries and regions, especially dialysis nurses, laboratory workers, dietitians, transplant coordinators, and nephrologists. Because health care workforce availability is a prerequisite for effective AKI and CKD management programs and policies,²⁹ the challenge of health care professional shortages will require a concerted response from major national and international stakeholders.^{11,27}

Fourth, the limited capacity reported in most regions and countries to undertake clinical research calls for more investment and a targeted research agenda to improve understanding of kidney disease burden, process of care, outcomes monitoring, and testing of novel interventions, particularly in low- and lower middle-income countries.²⁷

The key strengths of the GKHA Project were the development of the study protocol and survey instrument, which followed a well-validated conceptual framework

Figure 2. Global Distribution of Nephrologists Per 1 Million Population



The map depicts global distribution of nephrologists per 1 million population by country and region. Data not available indicates that data were either not known or not provided on the questionnaire for countries that received the survey.

assessing capacity for other chronic diseases based on the widely applied WHO health system building blocks.¹⁵ The survey had high external validity, involving 125 countries and including very good coverage across regions and income levels. Data were reviewed for accuracy and validity by regional and national stakeholders knowledgeable of the local context across regions and countries. Furthermore, the findings were corroborated and validated via triangulation with secondary data sources based on a review of published and other literature at country levels (provided by survey respondents and other sources). In addition,

a future survey using similar methods may provide assessments of improvements or declines in global kidney health care status.

The GKHA Project and this study also have several limitations. The use of a questionnaire survey, although an important source of information, was potentially subjective and highly dependent on the knowledge, expertise, and perceptions of the respondents. Furthermore, there are no internationally agreed on or recommended benchmarks for health care workforce densities, and therefore, precise definition of what constitutes a health worker shortage is likely

to vary considerably between different countries. The survey questions were limited to only face validity and were reliant on respondents answering fairly and representing the status of services in their country accurately. To address these potential problems, respondents with a range of kidney care knowledge, expertise, and regional representation were carefully selected in liaison with the ISN regional boards. There was potential for social desirability bias to have influenced some responses, which was mitigated by corroborating findings with regional leaders as well as secondary data sources. The study also did not take into account some important dimensions of health systems, such as quality, efficiency, accessibility, geographic distribu-

tion, and within-country heterogeneity (particularly between urban and rural regions).

Conclusions

This survey demonstrated significant interregional and intraregional variability in the current capacity for kidney care across the world, including important gaps in services and workforce. Assuming the responses accurately reflect the status of kidney care in the respondent countries, these findings may be useful to inform efforts to improve the quality of kidney care worldwide.

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Supplementary Online Content

Bello AK, Levin A, Tonelli M, et al. Assessment of global kidney health care status. *JAMA*.
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eFigure 1. Global Availability of Nephrology Workforce

eFigure 2. Availability of Renal Registries by Region

eFigure 3. Presence of Advocacy Group for Kidney Care

eTable 1. Assessment of Healthcare Infrastructure Available for Providing Kidney Care

eTable 2. In Your Opinion, Is There a Shortage of Any of the Following Providers in Your Country?
(By Region)

eTable 3. Does Your Country Have a National Strategy for Improving the Care of CKD Patients?

eTable 4. Does Your Country Have a National Strategy for Improving the Identification of AKI?

eTable 5. Access to Clinical Practice Guidelines for Kidney Care

eTable 6. Capacity and Availability of Regulatory Framework for Clinical Research

eAppendix 1. Study Questionnaire

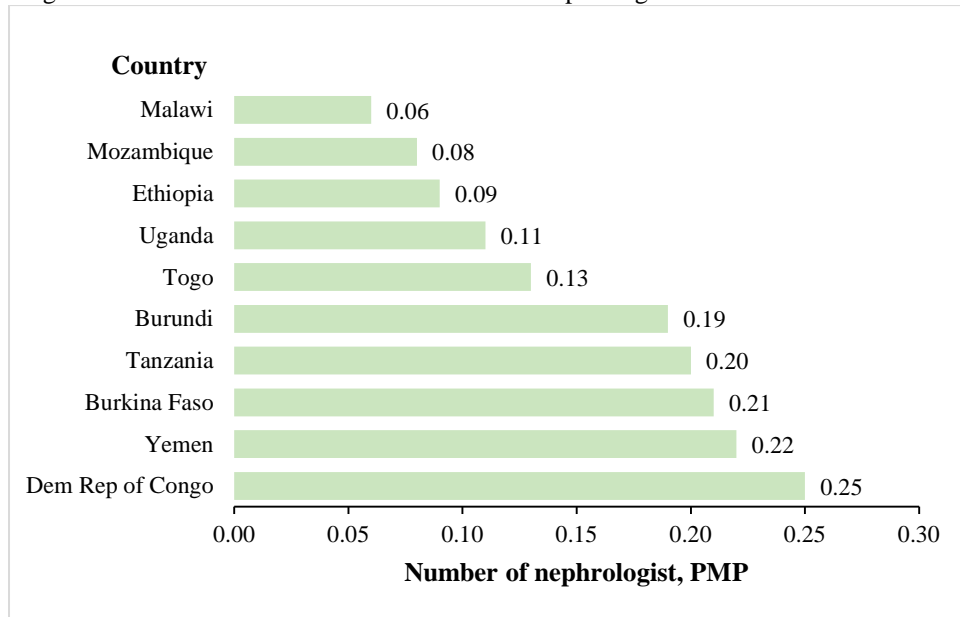
eAppendix 2. Access to RRT, Medication Funding and Workforce Capacity

eAppendix 3. Services for CKD Care, Information Systems, Advocacy Structures, and Capacity for
Clinical Trials

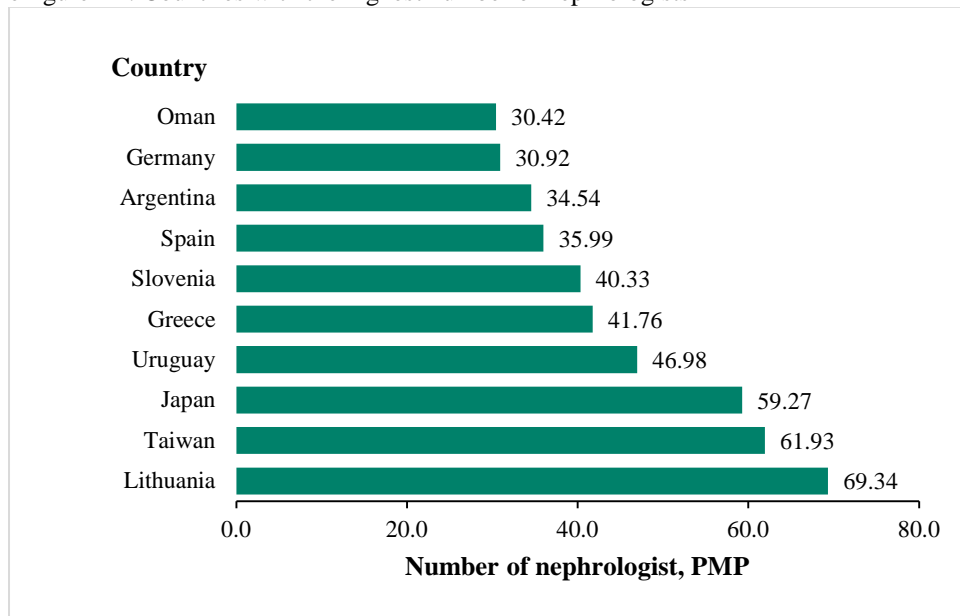
This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure 1. Global availability of nephrology workforce

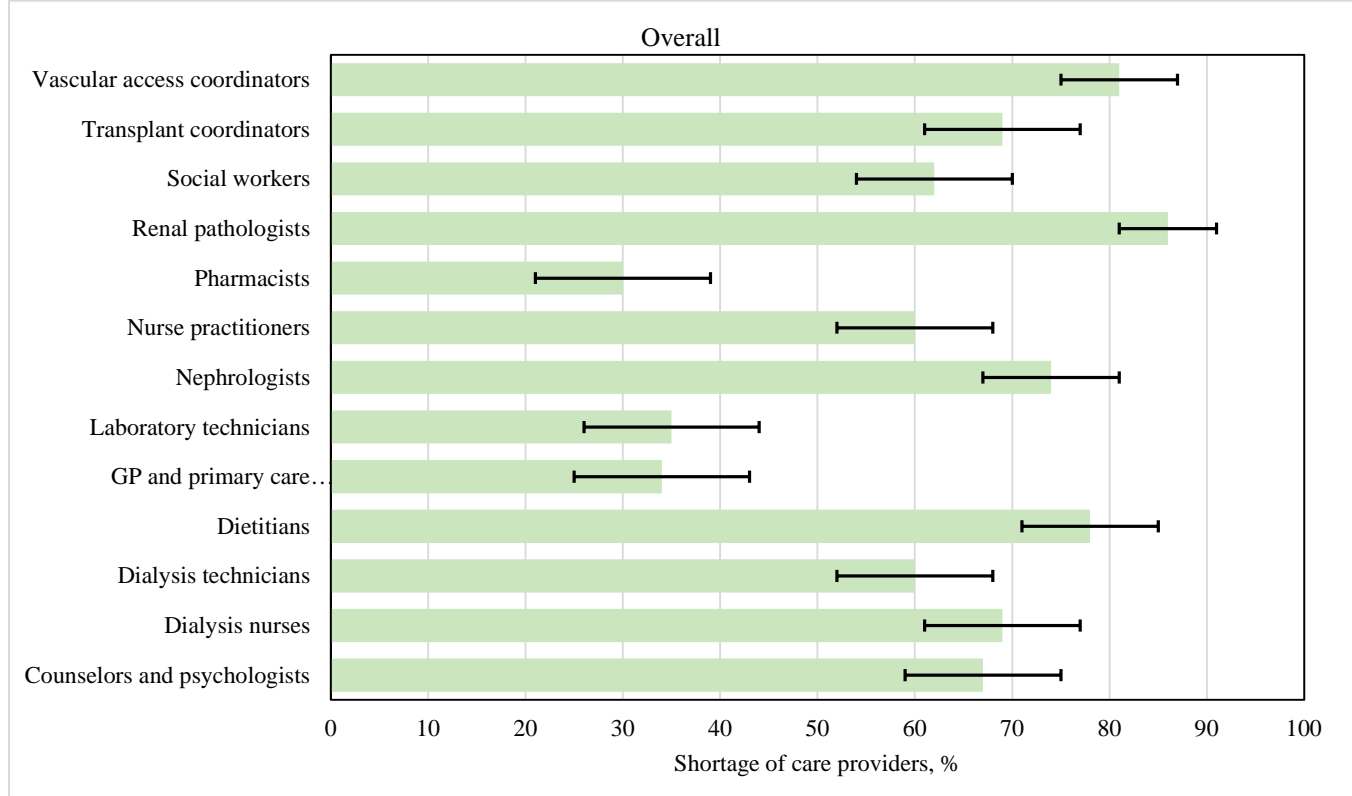
eFigure 1A. Countries with the lowest number of nephrologists



eFigure 1B. Countries with the highest number of nephrologists



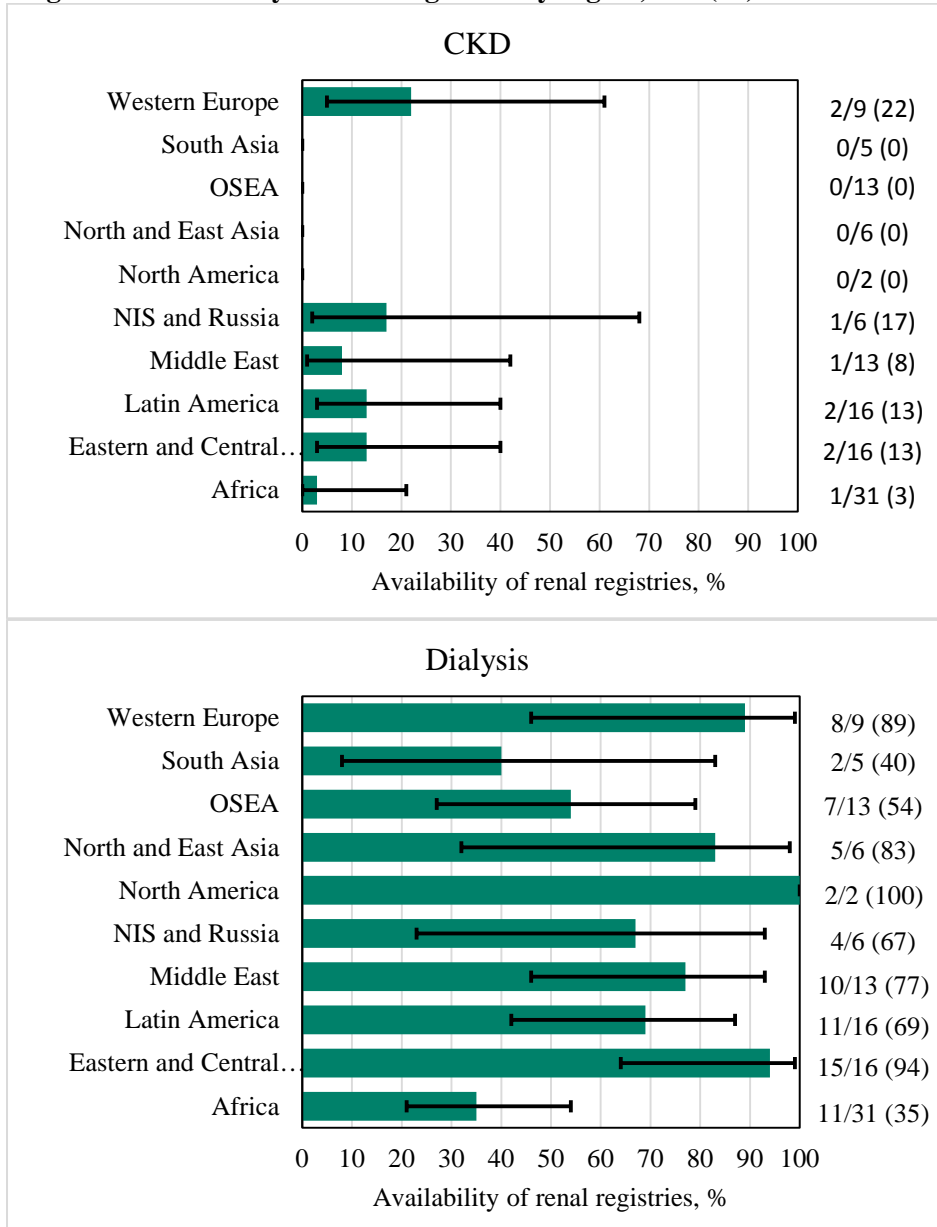
eFigure 1C. In your opinion, is there a shortage of any of the following care providers in your country? Overall “yes” response, %



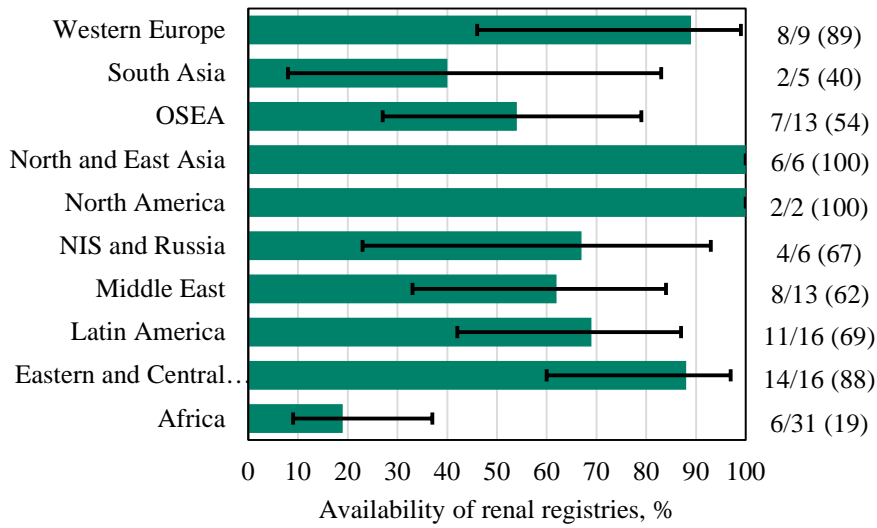
Total number of responding countries = 121.

Abbreviations: GP – General practitioners; PMP – per 1 million population.

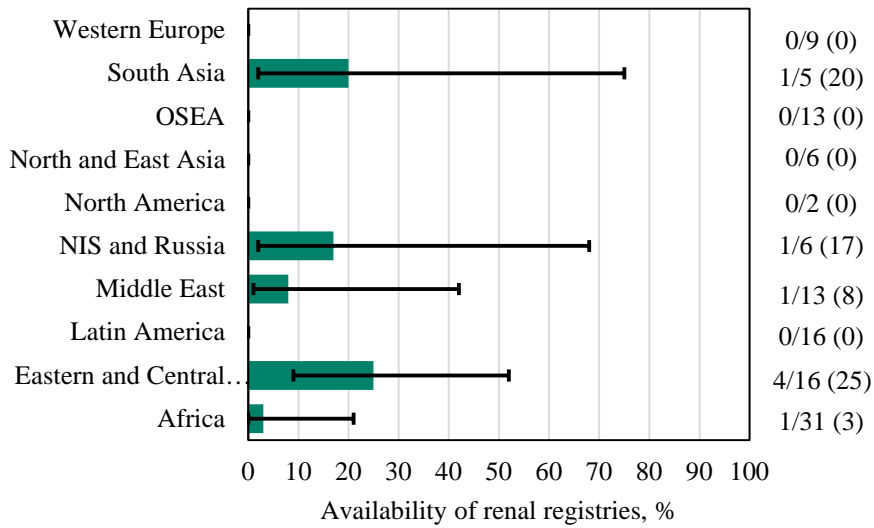
eFigure 2. Availability of renal registries by region, n/N (%)



Transplant



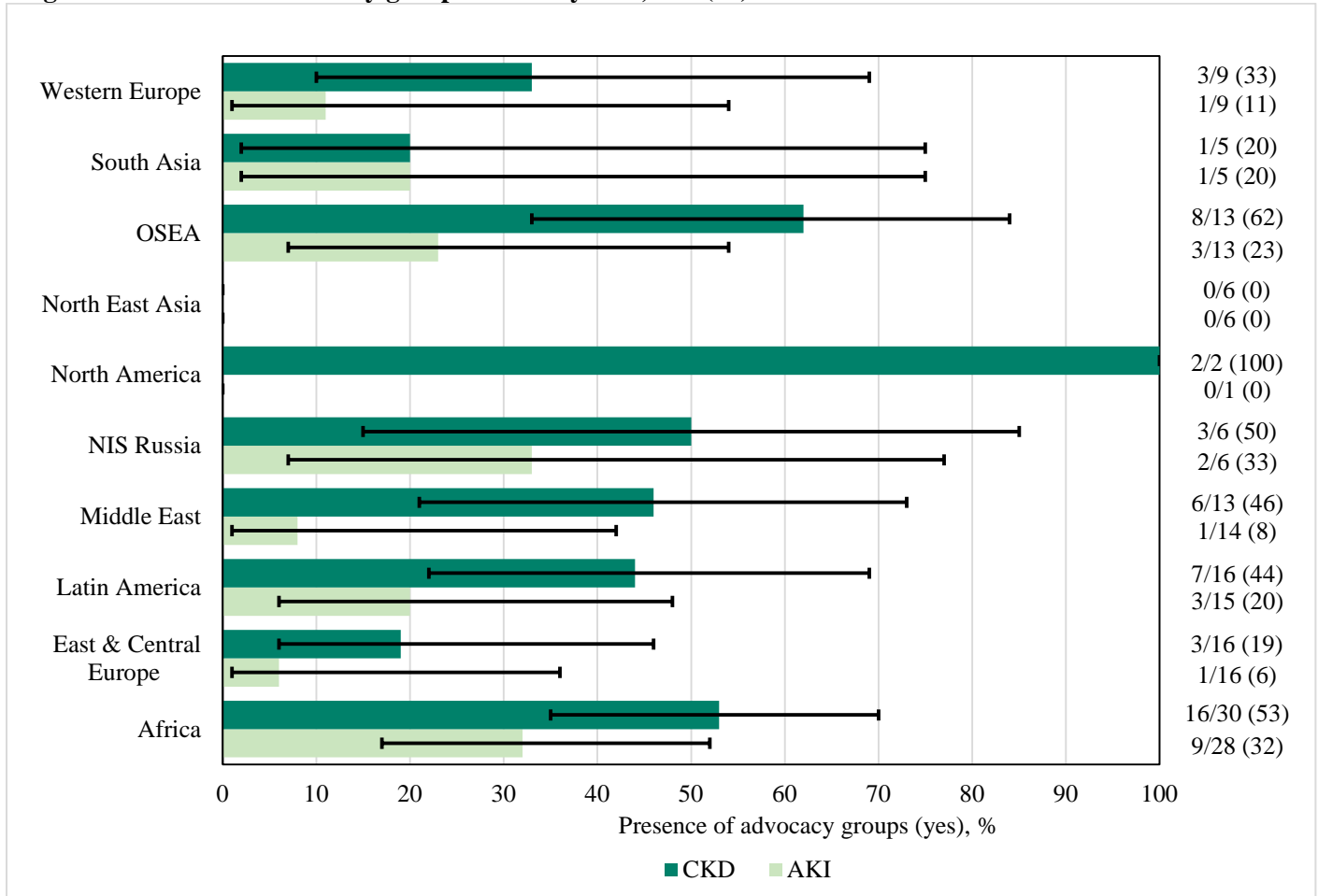
AKI



n/N (%): n = Number of countries; N = Total countries in region

Abbreviations: NIS – Newly Independent States; OSEA - Oceania and South East Asia

eFigure 3. Presence of advocacy group for kidney care, n/N (%)



n/N (%): n = Number of countries; N = Total countries in region

Abbreviations: AKI – acute kidney injury; CKD – chronic kidney disease; NIS – Newly Independent States; OSEA - Oceania and South East Asia

eTable 1. Assessment of healthcare infrastructure available for providing kidney care (n, %)

	Infrastructure for AKI						Infrastructure for CKD					
	No. of responding countries	Extremely poor	Poor / below average	Fair / average	Good / above average	Excellent	No. of responding countries	Extremely poor	Poor / below average	Fair / average	Good / above average	Excellent
Overall	122	8(7)	17(14)	38(31)	48(39)	11(9)	122	4(3)	18(15)	45(37)	46(38)	9(7)
ISN regions:												
- Africa	34	6(18)	11(32)	9(26)	8(24)	0(0)	34	4(12)	11(32)	13(38)	6(18)	0(0)
- Middle East	13	1(8)	1(8)	4(31)	7(53)	0(0)	13	0(0)	1(8)	6(46)	6(46)	0(0)
- Latin America	16	1(6)	2(13)	7(44)	6(37)	0(0)	16	0(0)	1(6)	7(44)	8(50)	0(0)
- North & East Asia	6	0(0)	0(0)	2(33)	3(50)	1(17)	6	0(0)	1(17)	1(17)	3(49)	1(17)
- South Asia	5	0(0)	0(0)	3(60)	2(40)	0(0)	5	0(0)	1(20)	2(40)	2(40)	0(0)
- OSEA	13	0(0)	2(15)	4(31)	5(39)	2(15)	13	0(0)	2(15)	4(31)	5(39)	2(15)
- East & Central Europe	17	0(0)	0(0)	6(35)	9(53)	2(12)	17	0(0)	1(6)	7(41)	7(41)	2(12)
- NIS & Russia	6	0(0)	1(17)	2(33)	2(33)	1(17)	6	0(0)	0(0)	4(67)	2(33)	0(0)
- Western Europe	10	0(0)	0(0)	1(10)	6(60)	3(30)	10	0(0)	0(0)	0(0)	7(70)	3(30)
- North America	2	0(0)	0(0)	0(0)	0(0)	2(100)	2	0(0)	0(0)	1(50)	0(0)	1(50)
World Bank Groups:												
- Low income	17	3 (18)	6 (35)	3 (18)	5 (29)	0 (0)	17	2 (12)	5 (29)	6 (35)	4 (24)	0 (0)
- Lower-middle income	34	3 (9)	7 (21)	14 (41)	9 (26)	1 (3)	34	1 (3)	7 (21)	18 (52)	8 (24)	0 (0)
- Upper-middle income	32	2 (6)	4 (13)	13 (40)	12 (38)	1 (3)	32	1 (3)	6 (19)	15 (47)	9 (28)	1 (3)
- High income	39	0 (0)	0 (0)	8 (21)	22 (56)	9 (23)	39	0 (0)	0 (0)	6 (15)	25 (64)	8 (21)

Ratings were based on a Likert scale: 1 (extremely poor), 2 (poor/below average), 3 (Fair/average), 4 (good/above average), and 5 (excellent).

Abbreviations: AKI=acute kidney injury; CKD=chronic kidney disease; NIS - Newly Independent States; OSEA - Oceania and South East Asia

The proportion was calculated as the number of countries that choose the answer divided by the total number of responding countries.

eTable 2. In your opinion, is there a shortage of any of the following providers in your country? (by region), n (%)

	Africa	Middle East	Latin America	North East Asia	South Asia	Oceania and South East Asia	East & Central Europe	NIS & Russia	Western Europe	North America
Total number of responding countries	33	13	16	6	5	13	17	6	10	2
Countries with "yes" response by provider, n (%)										
Counselors and psychologists	27 (82)	8 (62)	7 (44)	4 (67)	4 (80)	11 (85)	11 (65)	5 (83)	4 (40)	0 (0)
Dialysis nurses	25 (76)	10 (77)	13 (81)	3 (50)	4 (80)	11 (85)	10 (59)	1 (17)	5 (50)	1 (50)
Dialysis technicians	25 (76)	6 (46)	10 (63)	4 (67)	4 (80)	11 (85)	6 (35)	2 (33)	3 (30)	1 (50)
Dietitians	30 (91)	10 (77)	9 (56)	5 (83)	4 (80)	12 (92)	13 (76)	6 (100)	5 (50)	0 (0)
GP and primary care physicians	13 (39)	3 (23)	6 (38)	3 (50)	2 (40)	5 (38)	4 (24)	1 (17)	3 (30)	1 (50)
Laboratory technicians	14 (42)	3 (23)	6 (38)	1 (17)	4 (80)	8 (62)	2 (12)	2 (33)	2 (20)	0 (0)
Nephrologists	28 (85)	11 (85)	14 (88)	4 (67)	4 (80)	11 (85)	10 (59)	4 (67)	2 (20)	1 (50)
Nurse practitioners	19 (58)	8 (62)	12 (75)	5 (83)	3 (60)	12 (92)	8 (47)	3 (50)	2 (20)	1 (50)
Pharmacists	12 (36)	6 (46)	4 (25)	1 (17)	4 (80)	5 (38)	1 (6)	0 (0)	2 (20)	1 (50)
Renal pathologists	33 (100)	11 (85)	16 (100)	5 (83)	4 (80)	13 (100)	11 (65)	4 (67)	7 (70)	0 (0)
Social workers	17 (52)	9 (69)	7 (44)	6 (100)	4 (80)	11 (85)	12 (71)	4 (67)	5 (50)	0 (0)
Transplant coordinators	28 (85)	10 (77)	11 (69)	4 (67)	5 (100)	12 (92)	8 (47)	4 (67)	2 (20)	0 (0)
Vascular access coordinators	29 (88)	9 (69)	15 (94)	6 (100)	4 (80)	12 (92)	14 (82)	4 (67)	5 (50)	0 (0)

n = Number of countries

Abbreviations: GP=general practitioners; NIS= Newly Independent States

eTable 3. Does your country have a national strategy for improving the care of CKD patients? (n, %)

	No. of responding countries	Yes, a national CKD specific strategy exists	Yes, but the CKD strategy is incorporated into a NCD strategy that includes other diseases	No
Overall	109	19 (17)	29 (27)	61 (56)
ISN regions:				
- Africa	26	1 (4)	7 (27)	18 (69)
- Middle East	13	3 (23)	2 (15)	8 (62)
- Latin America	16	5 (31)	5 (31)	6 (38)
- North & East Asia	6	1 (17)	3 (50)	2 (33)
- South Asia	3	1 (33)	0 (0)	2 (67)
- OSEA	12	4 (33)	3 (25)	5 (42)
- East & Central Europe	16	2 (13)	4 (25)	10 (62)
- NIS & Russia	6	0 (0)	2 (33)	4 (67)
- Western Europe	9	2 (22)	2 (22)	5 (56)
- North America	2	0 (0)	1 (50)	1 (50)
World Bank Groups:				
- Low income	16	0 (0)	6 (38)	10 (62)
- Lower-middle income	26	6 (23)	3 (12)	17 (65)
- Upper-middle income	29	5 (17)	10 (34)	14 (49)
- High income	38	8 (21)	10 (26)	20 (53)

Abbreviations: CKD - chronic kidney disease; NCD - Non-communicable diseases; NIS - Newly Independent States; OSEA - Oceania and South East Asia.

The proportion was calculated as the number of countries that choose the answer divided by the total number of responding countries.

eTable 4. Does your country have a national strategy for improving the identification of AKI? Response, (n, %)

	No. of responding countries	National position paper on AKI	Tools available for identification of AKI	Incentives for quality care	Important regional/state level strategy or strategies	Increasing access to acute dialysis facilities	No strategies exist for AKI
Overall	116	19 (16)	37 (32)	14 (12)	12 (10)	36 (31)	59 (51)
ISN regions:							
- Africa	30	3 (10)	8 (27)	1 (3)	2 (7)	7 (23)	18 (60)
- Middle East	13	2 (15)	4 (31)	2 (15)	0 (0)	6 (46)	6 (46)
- Latin America	16	4 (25)	3 (19)	0 (0)	1 (6)	4 (25)	10 (63)
- North & East Asia	6	3 (50)	2 (33)	2 (33)	0 (0)	1 (17)	2 (33)
- South Asia	5	0 (0)	3 (60)	2 (40)	2 (40)	2 (40)	1 (20)
- OSEA	13	2 (15)	6 (46)	1 (8)	3 (23)	8 (62)	4 (31)
- East & Central Europe	16	1 (6)	5 (31)	4 (25)	2 (13)	5 (31)	9 (56)
- NIS & Russia	6	1 (17)	2 (33)	1 (17)	0 (0)	2 (33)	4 (67)
- Western Europe	9	3 (33)	3 (33)	1 (11)	1 (11)	1 (11)	5 (56)
- North America	2	0 (0)	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)
World Bank Groups:							
- Low income	17	0 (0)	5 (29)	1 (6)	2 (12)	2 (12)	11 (65)
- Lower-middle income	31	3 (10)	8 (26)	4 (13)	2 (6)	10 (32)	16 (52)
- Upper-middle income	30	7 (23)	11 (37)	3 (10)	4 (13)	15 (50)	15 (50)
- High income	38	9 (24)	13 (34)	6 (16)	4 (11)	9 (24)	17 (45)

Abbreviations: AKI - acute kidney injury; NIS - Newly Independent States; OSEA - Oceania and South East Asia

The proportion was calculated as the number of countries that choose the answer divided by the total number of responding countries.

eTable 5. Access to clinical practice guidelines for kidney care (n, %)

	CKD management and referral guidelines				AKI management and referral guidelines			
	No. of responding countries	national guidelines	major regional guidelines	international guidelines	No. of responding countries	national guidelines	major regional guidelines	international guidelines
Overall	116	31 (27)	1 (1)	60 (52)	116	8 (7)	1 (1)	52 (45)
ISN regions:								
- Africa	30	4 (13)	0 (0)	13 (43)	30	2 (7)	0 (0)	8 (27)
- Middle East	13	1 (8)	1 (8)	8 (62)	13	0 (0)	0 (0)	5 (38)
- Latin America	16	9 (56)	0 (0)	7 (44)	16	1 (6)	0 (0)	7 (44)
- North & East Asia	6	3 (50)	0 (0)	3 (50)	6	0 (0)	0 (0)	2 (33)
- South Asia	5	0 (0)	0 (0)	3 (60)	5	0 (0)	0 (0)	1 (20)
- OSEA	13	6 (46)	0 (0)	2 (15)	13	2 (15)	1 (8)	3 (23)
- East & Central Europe	16	2 (13)	0 (0)	13 (81)	16	0 (0)	0 (0)	15 (94)
- NIS & Russia	6	1 (17)	0 (0)	5 (83)	6	2 (33)	0 (0)	3 (50)
- Western Europe	9	4 (44)	0 (0)	5 (56)	9	1 (11)	0 (0)	6 (67)
- North America	2	1 (50)	0 (0)	1 (50)	2	0 (0)	0 (0)	2 (100)
World Bank Groups:								
- Low income	17	1 (6)	0 (0)	6 (35)	17	0 (0)	0 (0)	3 (18)
- Lower-middle income	31	7 (23)	0 (0)	16 (52)	31	5 (16)	0 (0)	11 (35)
- Upper-middle income	30	9 (30)	0 (0)	16 (53)	30	1 (3)	1 (3)	14 (47)
- High income	38	14 (37)	1 (3)	22 (58)	38	2 (5)	0 (0)	24 (63)

The proportion was calculated as the number of countries that choose the answer divided by the total number of responding countries.

eTable 6. Capacity and availability of regulatory framework for clinical research (n, %)

	Capacity to participate in clinical trials						Capacity to participant in observational studies								Type of ethics approval				
	No. of responding countries	Phase 1	Phase 2	Phase 3	Phase 4	Health services delivery trials	No. of responding countries	Availability of bio-banking facilities	Availability of workforce	Availability of funding	No. of responding countries	Participation in non-dialysis CKD cohort studies	Participation in dialysis cohort studies	Participation in transplant cohort studies	No. of responding countries	Institutional	Regional	National	Other*
Overall	116	33(28)	46(40)	61(53)	62(53)	67(58)	116	52(45)	99(85)	56(48)	52	29(56)	27(52)	11(21)	106	66(62)	13(12)	41(39)	13(12)
ISN regions:																			
- Africa	30	4(13)	3(10)	5(17)	4(13)	18(60)	30	7(23)	25(83)	11(37)	8	6(75)	4(50)	0(0)	26	11(42)	4(15)	12(46)	3(12)
- Middle East	13	1(8)	3(23)	4(31)	5(38)	9(69)	13	5(38)	10(77)	7(54)	5	1(20)	5(100)	0(0)	10	7(70)	2(20)	4(40)	0(0)
- Latin America	16	3(19)	3(19)	9(56)	10(63)	13(81)	16	5(31)	15(94)	3(19)	6	4(67)	3(50)	1(17)	15	12(80)	1(7)	5(33)	3(20)
- North & East Asia	6	4(67)	5(83)	5(83)	5(83)	3(50)	6	5(83)	6(100)	5(83)	6	6(100)	3(50)	1(17)	6	6(100)	1(17)	1(17)	0(0)
- South Asia	5	3(60)	3(60)	2(40)	2(40)	0(0)	5	0(0)	5(100)	4(80)	2	1(50)	0(0)	1(50)	4	4(100)	0(0)	2(50)	0(0)
- OSEA	13	5(38)	6(46)	7(54)	8(62)	10(77)	13	7(54)	11(85)	7(54)	7	2(29)	6(86)	3(43)	12	8(67)	0(0)	6(50)	2(17)
- East & Central Europe	16	3(19)	10(63)	14(88)	13(81)	4(25)	16	11(69)	12(75)	7(44)	8	3(38)	3(38)	2(25)	16	8(50)	1(6)	6(38)	2(13)
- NIS & Russia	6	1(17)	2(33)	4(67)	4(67)	0(0)	6	2(33)	4(67)	1(17)	2	0(0)	1(50)	1(50)	6	3(50)	0(0)	3(50)	1(17)
- Western Europe	9	7(78)	9(100)	9(100)	9(100)	8(89)	9	8(89)	9(100)	9(100)	6	4(67)	2(33)	1(17)	9	5(56)	3(33)	2(22)	2(22)
- North America	2	2(100)	2(100)	2(100)	2(100)	2(100)	2	2(100)	2(100)	2(100)	2	2(100)	0(0)	1(50)	2	2(100)	1(50)	0(0)	0(0)
World Bank Groups:																			
- Low income	17	3 (18)	1 (6)	0 (0)	0 (0)	13 (76)	17	1 (6)	13 (76)	4 (24)	4	3 (75)	1 (25)	1 (25)	14	5 (36)	1 (7)	8 (57)	2 (14)
- Lower-middle income	31	5 (16)	7 (23)	9 (29)	9 (29)	12 (39)	31	7 (23)	25 (81)	12 (39)	8	5 (63)	4 (50)	1 (13)	26	17 (65)	2 (8)	10 (38)	2 (8)
- Upper-middle income	30	7 (23)	10 (33)	19 (63)	20 (67)	17 (57)	30	14 (47)	25 (83)	11 (37)	11	7 (64)	7 (64)	1 (9)	28	18 (64)	2 (7)	13 (46)	6 (21)
- High income	38	18 (47)	28 (74)	33 (87)	33 (87)	25 (66)	38	30 (79)	36 (95)	29 (76)	29	14 (48)	15 (52)	8 (28)	38	26 (68)	8 (21)	10 (26)	3 (8)

*Other forms of regulatory approval framework not in conformity with the stated ones.

Abbreviations: ISN - International Society of Nephrology; NIS - Newly Independent States; OSEA= Oceania and South East Asia

The proportion was calculated as the number of countries that choose the answer divided by the total number of responding countries.

Global Kidney Health Atlas (GKHA) Questionnaire

Assessing Country and Regional Profile for Readiness, Capacity and Response to CKD and AKI

The International Society of Nephrology (ISN) plans to work collaboratively with existing organizations and initiatives at international and national levels - to promote early detection and effective treatment of kidney diseases in order to improve patient health and quality of life. Through understanding and potentially helping to shape relevant health policies, practices and infrastructure, ISN aims to facilitate the implementation of equitable and ethical care for kidney patients in all regions and countries of the world.

ISN intends to conduct a research exercise on the current status of care for kidney patients across all countries of the world. This project will determine the global status of CKD and AKI care structures and organization towards achieving universal health care (UHC), and devise policy implications for including CKD and AKI in the global health agenda.

This questionnaire is designed to address the 6 core areas which inform aspects of universal health coverage: health finance, health workforce, essential medications and health products access, health information systems and statistics, national health policy, and service delivery and safety as well as the response of nephrology community and capacity for research and development. Using this framework, we will be able to develop an appropriate global perspective on the state of kidney health and disease.

If you have any questions about completing the questionnaire please contact: Sandrine Damster (email: SDamster@theisn.org).

Thank you for your involvement and readiness to participate.

Dr. Adeera Levin, MD, FRCPC, FACP
President, International Society of Nephrology

Global Kidney Health Atlas (GKHA) Questionnaire

Questionnaire modules:

Standardized questions to allow comparisons of country capacities and readiness based on WHO six domains of UHC, and responses (based on awareness, identified barriers and capacity for research and development in nephrology community)

Assessing capacity and readiness on nations for kidney care based UHC domains

- 1. HF - Health Finance: Funding mechanism and availability**
- 2. SDS - Service delivery and safety:**
 - a. Structure and organization of care delivery for CKD**
 - b. Structure and organization of care delivery for AKI**
- 3. HW - Health workforce: Essential workforce for CKD and AKI care**
- 4. EMHPA - Essential medications and Health products access: Availability, coverage and access**
- 5. HISS - Health information systems and statistics: Databases, registries and surveillance systems**
- 6. NHP - National health policy:**
 - a. CKD policy, strategies and frameworks in the context of existing NCD programs**
 - b. AKI policy, strategies and frameworks**

Assessing response of nephrology community (awareness, identified barriers and capacity for research and development)

- a. Awareness and education on CKD**
- b. Awareness and education on AKI**
- c. Identified barriers to CKD care**
- d. Identified barriers to AKI care**
- e. Capacity for research and development**

Global Kidney Health Atlas (GKHA) Questionnaire

Assessing Country and Regional Profile for Readiness, Capacity and Response to CKD and AKI

CONTACT

* Who is the focal person completing this survey?

First Name

Last Name

Current position

* Status? (please tick all that apply)

Nephrologist

Non-nephrologist (non-physician)

Non-nephrologist (physician)

Administrator/policy maker

Other (please specify)

* In which country do you reside?

* ISN region?

* Email contact person

Telephone (optional) contact person:

Fax (optional) contact person:

Global Kidney Health Atlas (GKHA) Questionnaire

A. Health Finance, Service delivery and Safety

A.1. Description of the healthcare system

* A.1.1. In general, what best describes your healthcare system?

- Publicly funded by government and free at the point of delivery Solely private and out-of-pocket
- Publicly funded by government but with some fees at the point of delivery Multiple systems –programs provided by government, non-governmental organizations (NGOs), and communities
- A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)
- If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

A.1.2. If your healthcare system is publicly funded, (in whole or in part) is this coverage universal (ie: are all residents of your country eligible to participate?)?

- Yes, all residents are included in the coverage
- Not applicable: there is no publicly funded health care in my country
- No, not all residents are included (please specify details)

A.1.3. If your healthcare system is publicly funded (in whole or in part), which aspects of care are not included in the coverage? (please tick all that apply)

- Dialysis Early detection in individuals at risk
- Transplantation Management of AKI
- Management of CKD (Chronic Kidney Disease) complications (anemia, bone disease, malnutrition) None – all aspects funded
- Early management to reduce risk of CKD progression (risk factor control)
- Other (please specify)

* A.1.4. What best describes your healthcare system's coverage for care of patients with kidney disease (excluding medications)?

- Publicly funded for all patients with AKI
- Publicly funded for all patients with CKD
- Publicly funded for all patients on Renal Replacement Therapy (RRT) only
- Publicly funded for all patients on dialysis only
- Other (please specify)
- Publicly funded for all patients living on kidney transplant only
- Solely private and out-of-pocket for all AKI patients
- Solely private and out-of-pocket for all CKD patients

* A.1.5. We are interested in understanding within-country variation in kidney care delivery as well as between-country variation. In your opinion, is there important variation in the way that kidney care is organized or delivered between different regions/states within your country?

Yes (if possible please provide brief details)

No (please explain why)

A.2 Service delivery and safety: Structure and organization of care delivery for CKD and AKI

* A.2.1. What system best describes the oversight/direction of kidney disease care in your country?

Managed/overseen by a national body

Managed by non-governmental organizations (NGOs)

Managed/overseen by provincial/regional/state level authorities only

No organized system

Managed by individual Hospitals/Trusts/Organizations

Other (please specify)

* A.2.2. How would you rate the health infrastructure in your country, in terms of adequacy for providing CKD care on a scale of 1-5 (1=extremely poor, 5=excellent)?

* A.2.3. Apart from health infrastructure, how would you rate the availability of other types of funding in your country, in terms of adequacy for providing CKD care?

* A.2.4. How would you rate the health infrastructure in your country, in terms of adequacy for providing AKI care on a scale of 1-5 (1=extremely poor, 5=excellent)?

* A.2.5. Apart from health infrastructure, how would you rate the availability of other types of funding in your country, in terms of adequacy for providing AKI care?

Data sources for Section A

We would like you to consult as many colleagues or sources of data as needed to provide the answers that best describe nephrology care in your country.

* What is/are the sources for the data you provided above for Section A?

* On a scale of 1-5 (1 = very uncertain, 5 = very certain) how certain are you of the answers you have provided for Section A?

Global Kidney Health Atlas (GKHA) Questionnaire

B. Health workforce for nephrology care

B1. Existing manpower capacity

* B.1.1. Who bears primary responsibility for the delivery of CKD care in your country (please tick all that apply)?

Nephrologists

Multidisciplinary teams

Primary care physicians

Health officers/extension workers

Nurse practitioners or specialized nurses

Other specialists? (please specify)

* B.1.2. Who bears primary responsibility for the delivery of AKI care in your country (please tick all that apply)?

Nephrologists

Nurse practitioners or specialized nurses

Intensive care specialists

Health officers/extension workers

Primary care physicians

Technicians

Other specialists? (please specify)

* B.1.3. How many nephrologists are there in your country, and how many nephrology trainees?

Nephrologists

Nephrology trainees

* B.1.4. In your opinion, is there a shortage of any of the following providers in your country (please tick all that apply)?

Nephrologists

Vascular Access Coordinators

Dialysis nurses

Dietitians

Nurse Practitioners

Dialysis technicians

Social workers

Counselors/Psychologists

General practitioners/primary care physicians

Pharmacists

Transplant Coordinators

No shortage of any of the staff mentioned above

B2. Training capacity

* B.2.1. Is there a nephrology training program in your country?

Yes

No

* B.2.2. How long is the training in nephrology (years)?

* B.2.3. How is the training in nephrology structured?

Following general internal medicine

A mix of 1 & 2 depending on region and/or training centre

Solo training after basic qualification as medical doctor

Other (please specify)

Data sources for Section B

We would like you consult as many colleagues or sources of data as needed to provide the answers that best describe nephrology care in your country.

* What is/are the sources for the data you provided above for Section B?

* On a scale of 1-5 (1 = very uncertain, 5 = very certain) how certain are you of the answers you have provided for Section B?

C. Essential medications and health products access

C1. Identification and Management of CKD

* C.1.1. Indicate the availability of the following services for CKD monitoring and management at PRIMARY care level in your country; where: If generally available = >50% of healthcare facilities; if generally not available = <50% of healthcare facilities

	Available	Not Available
Blood pressure measurement		
Height and weight measures to calculate	<input type="radio"/>	<input type="radio"/>
		body mass index
Serum glucose measurement		
HbA1C test	<input type="radio"/>	<input type="radio"/>
		Serum cholesterol measurement
Serum creatinine measurement without automated eGFR reporting		
Serum creatinine measurement with automated eGFR reporting		
Urinalysis using test strips for albumin/protein (qualitative assays)		
Urinalysis using test strips for albumin/protein (quantitative assays)		
Urine albumin: creatinine ratio (ACR) or protein: creatinine (PCR) measurements		

* C.1.2. Indicate the availability of the following services for CKD monitoring and management at SECONDARY OR TERTIARY care level in your country; where: Generally available = >50% of healthcare facilities; if generally not available = <50% of healthcare facilities

	Available	Not Available
Blood pressure measurement	<input type="radio"/>	<input type="radio"/>
Height and weight measures to calculate <input type="radio"/> body mass index	<input type="radio"/>	
Serum glucose measurement	<input type="radio"/>	<input type="radio"/>
HbA1C test	<input type="radio"/>	<input type="radio"/>
Serum cholesterol measurement	<input type="radio"/>	<input type="radio"/>
Serum creatinine measurement without automated eGFR reporting	<input type="radio"/>	<input type="radio"/>
Serum creatinine measurement with automated eGFR reporting	<input type="radio"/>	<input type="radio"/>
Renal biopsy	<input type="radio"/>	<input type="radio"/>
Urinalysis using test strips for albumin/protein (qualitative assays)	<input type="radio"/>	<input type="radio"/>
Urinalysis using test strips for albumin/protein (quantitative assays)	<input type="radio"/>	<input type="radio"/>
Urine albumin: creatinine ratio (ACR) or protein: creatinine (PCR) measurements	<input type="radio"/>	<input type="radio"/>

C2. Capacity for chronic RRT service provision

* C.2.1 Is chronic hemodialysis available in your country?

Yes

No

C.2.1.1 If yes, how is chronic hemodialysis funded in your country?

Publicly funded by government and free at the point of delivery

Publicly funded by government but with some fees at the point of delivery

A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)

Solely private and out-of-pocket

Multiple funding sources – government, non-governmental organizations (NGOs), and communities

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

* C.2.2 Is chronic peritoneal dialysis available in your country?

C.2.2.1 If yes, how is chronic peritoneal dialysis funded in your country?

Publicly funded by government and free at the point of delivery

Solely private and out-of-pocket

Publicly funded by government but with some fees at the point of delivery

Multiple funding sources – government, non-governmental organizations (NGOs), and communities

A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

* C.2.3 Is kidney transplantation available in your country?

C.2.3.1 If yes, how is kidney transplantation funded in your country?

- Publicly funded by government and free at the point of delivery
- Publicly funded by government but with some fees at the point of delivery
- A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)
- Solely private and out-of-pocket
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

C3. Capacity for acute

* C.3.1 Is acute hemodialysis available in your country?

C.3.1.1 If yes, how is acute hemodialysis funded in your country?

- Publicly funded by government and free at the point of delivery
- Solely private and out-of-pocket
- Publicly funded by government but with some fees at the point of delivery
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities
- A mix of publicly funded and private systems (please explain)

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

* C.3.2 Is acute peritoneal dialysis available in your country?

C.3.2.1 If yes, how is acute peritoneal dialysis funded in your country?

- Publicly funded by government and free at the point of delivery
- Solely private and out-of-pocket
- Publicly funded by government but with some fees at the point of delivery
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities
- A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

C4. Access to Medications and reimbursement plans

* C.4.1 For all CKD patients: How are medications funded?

- Publicly funded by government and free at the point of delivery
- Publicly funded by government but with some fees at the point of delivery
- A mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems (please explain)
- Solely private and out-of-pocket
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

* C.4.2 For all dialysis patients: How are medications funded?

- Publicly funded by government and free at the point of delivery
- Publicly funded by government but with some fees at the point of delivery
- A mix of publicly funded and private systems (please explain)
- Solely private and out-of-pocket
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

* C.4.3 For all transplant patients: How are medications funded?

- Publicly funded by government and free at the point of delivery
- Publicly funded by government but with some fees at the point of delivery
- A mix of publicly funded and private systems (please explain)
- Solely private and out-of-pocket
- Multiple funding sources – government, non-governmental organizations (NGOs), and communities

If a mix of publicly funded and private systems (please explain) or "Other" (please specify)

Data sources for Section C

We would like you to consult as many colleagues or sources of data as needed to provide the answers that best describe nephrology care in your country.

* What is/are the sources for the data you provided above for Section C?

* On a scale of 1-5 (1 = very uncertain, 5 = very certain) how certain are you of the answers you have provided for Section C?

Global Kidney Health Atlas (GKHA) Questionnaire

D. Health information systems & statistics

D1. Availability of registry

* D.1.1. Is there an 'official' registry in your country for?

	Yes	I don't know-Information not available	No
CKD			
Dialysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transplantation			
AKI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D.1.1.1. If yes [CKD], how is the registry run?

- Voluntary
- Mandatory
- I don't know/Information not available

D.1.1.2. If there is a CKD registry for patients who do not require RRT, what does this registry cover (please tick all that apply)?

- The whole spectrum of CKD (Stages 1-5)
- Advanced CKD only (Stages 4/5)
- The whole country
- Specific regions only (please name)

D.1.1.3. If yes [Dialysis], how is the registry run?

- Voluntary
- Mandatory
- I don't know/Information not available

D.1.1.4. If yes [Transplantation], how is the registry run?

- Voluntary
- Mandatory
- I don't know/Information not available

D.1.1.5. If yes [AKI], how is the registry run?

- Voluntary
- Mandatory
- I don't know/Information not available

D2. Burden of CKD (CKD incidence and prevalence)

* D.2.1. Are there data on the prevalence of CKD in your country?

Yes

No

D.2.1.1. If yes there are data on the prevalence of CKD in my country, please provide figures if known. Please enter NA for "not available" figures

All CKD (non-dialysis)

Stage 1

Stage 2

Stage 3

Stage 4

Stage 5 (Not on RRT)

On HD

On PD

With a kidney transplant

* D.2.2. Are there data on the incidence of CKD in your country?

Yes

No

D.2.2.1. If yes there are data on the incidence of CKD in my country, please provide figures if known. Please enter NA for "not available" figures

All CKD (non-dialysis)

Stage 1

Stage 2

Stage 3

Stage 4

Stage 5 (Not on RRT)

On HD

On PD

With a kidney transplant

D3. Identification of CKD

* D.3.1. For which of the following high-risk groups do practitioners in your country routinely offer testing for CKD?

- Those with hypertension
- Those with diabetes
- Those with cardiovascular disease (Ischaemic heart disease, stroke, PVD, heart failure)
- Those with autoimmune/multisystem diseases (SLE, Rheumatoid arthritis)
- The elderly
- Those with urological disorders (structural, stone diseases)
- Chronic users of nephrotoxic medications
- Members of high-risk ethnic groups (Aboriginal, Africans, Indo-asians)
- Those with a family history of CKD

* D.3.2. In your country, are there ethnic groups considered to be at increased risk for CKD?

- No
- Yes (please specify)

* D.3.3. In your country, is there an active CKD detection program based on national policy and/or guidelines?

-
- Yes
- No

C.3.3.1. If yes, how is this program implemented (please tick all that apply)?

- Reactive approach - cases managed as identified through practice
- Active screening of population at-risk through specific screening processes
- Active screening of population at-risk through routine health encounters
- Other (please specify)

D4. Burden of AKI (incidence and prevalence)

* D.4.1. Does your country have the ability to determine the prevalence of AKI not requiring dialysis?

Yes

Don't know/info not available

No

* D.4.2. Does your country have the ability to determine the incidence of AKI not requiring dialysis?

Yes

Don't know/info not available

No

* D.4.3. Does your country have the ability to determine the prevalence of AKI requiring dialysis?

Yes

Don't know/info not available

No

* D.4.4. Does your country have the ability to determine the incidence of AKI not requiring dialysis?

Yes

Don't know/info not available

No

D5. Identification of AKI

* D.5.1. In your country, are there specific groups considered to be at increased risk for AKI?

- No
- Yes (please specify)

* D.5.2. In your country, is there an active AKI detection program based on national policy and/or guidelines?

- Yes
- No

D.5.2.1. If yes, how is this program implemented (please tick all that apply)?

- Reactive approach- cases managed as identified through practice
- Active screening of population at-risk through specific screening processes
- Active screening of population at-risk through routine health encounters
- Other (please specify)

Data sources for Section D

We would like you to consult as many colleagues or sources of data as needed to provide the answers that best describe nephrology care in your country.

* What is/are the sources for the data you provided above for Section D?

* On a scale of 1-5 (1 = very uncertain, 5 = very certain) how certain are you of the answers you have provided for Section D?

E. National Health Policy

E1. CKD advocacy

* E.1.1. In your opinion, is CKD recognized as a health priority by the government in your country?

Yes (please provide details)

No (please explain why)

* E.1.2. Is there an advocacy group at the higher levels of government (ie: a Parliamentary committee) or an NGO to raise the profile of CKD and its prevention?

Yes (please provide details)

No (please explain why)

E2. AKI advocacy

* E.2.1. Is there an advocacy group at the higher levels of government (ie: a Parliamentary committee) or an NGO to raise the profile of AKI and its prevention?

Yes (please provide details)

No (please explain why)

E3. CKD & Noncommunicable chronic (NCD) disease policy and strategy

* E.3.1. Does your country have a national noncommunicable chronic disease strategy?

Yes (please provide details)

Yes, under development (please provide details)

No (not detail needed)

* E.3.2. Does your country have a national strategy for improving the care of CKD patients?

Non-dialysis dependent CKD Kidney transplantation Chronic dialysis

Yes, a national CKD-specific strategy exists for the following populations (please tick all that apply):

Yes, but the CKD strategy is incorporated into a NCD strategy that includes other diseases. The CKD strategy applies to the following populations (please tick all that apply):

No

* E.3.3. If your country does not have a national strategy for improving the care of CKD patients, are there other initiatives that identify CKD as a health care priority in your country (please tick all that apply)?

- National position paper on CKD care
- Incentives for providing quality care to CKD patients
- Provider incentives for identifying CKD
- Important regional/state level strategy or strategies (please provide details)
- If Important regional/state level strategy or strategies or Other (please specify)

E4. CKD specific policies, guidelines and/or service frameworks

* E.4.1. Are there available CKD management & referral guidelines in your country?

- Yes, national guidelines Yes, uses or adopt the existing international guidelines (eg KDIGO)
- Yes, major regional guidelines No

E.4.1.1. If yes, what do these management & referral guidelines cover (please tick all that apply)?

- Identification of CKD Progression Risk factor management
- Timing and Urgency for Nephrology Referral Management of Complications (Cardiovascular Disease, Hematologic and Bone disorders, Malnutrition)
- Multidisciplinary Care Approach

E.4.1.2. If ticked "yes" above: On a scale of 1 to 5, please rate the awareness of the CKD guideline among non-nephrologists in your country (1=very low, 5=very high)

E.4.1.3. If ticked "yes" above: On a scale of 1 to 5, please rate the adoption (application in clinical practice) of the CKD guideline among non-nephrologists in your country (1=very low, 5=very high)

E.4.1.4. If ticked "yes" above: On a scale of 1 to 5, please rate the awareness of the CKD guideline among nephrologists in your country (1=very low, 5=very high)

E.4.1.5. If ticked "yes" above: On a scale of 1 to 5, please rate the adoption (application in clinical practice) of the CKD guideline among nephrologists in your country (1=very low, 5=very high)

E5. AKI specific policy and strategy

* E.5.1. Does your country have a national strategy for improving the identification of AKI, are there other initiatives that identify AKI as an important health care priority in your country (please tick all that apply)?

- National position paper on AKI identification and care
- Tools available for identification of AKI
- Incentives for providing quality care to AKI patients
- If Important regional/state level strategy or strategies or Other (please specify)
- Important regional/state level strategy or strategies (please provide details)
- Increasing access to acute dialysis facilities
- No strategies exist for AKI

* Additional details on important regional/state level strategy or strategies important regional/state level strategy or strategies (5 lines):

E6. AKI specific policies, guidelines and/or service frameworks

* E.6.1. Are there AKI management & referral guidelines in your country?

- Yes, national guidelines Yes, uses or adopt the existing international guidelines (eg KDIGO)
- Yes, major regional guidelines No

E.6.1.1. If yes, what do these management & referral guidelines cover (please tick all that apply)?

- Identification of AKI in outpatient settings Access to dialysis treatment(s)
- Identification of AKI in in-patient settings Protocols for mitigating risk of AKI in specific situations?
- Timing and Urgency for Nephrology Referral

E.6.1.2. If ticked "yes" above: On a scale of 1 to 5, please rate the awareness of the AKI management guideline among non-nephrologists in your country (1=very low, 5=very high)

E.6.1.3. If ticked "yes" above: On a scale of 1 to 5, please rate the ADOPTION (application in clinical practice) of the AKI management guideline among non-nephrologists in your country (1=very low, 5=very high)

E.6.1.4. If ticked "yes" above: On a scale of 1 to 5, please rate the awareness of the AKI management guideline among nephrologists in your country (1=very low, 5=very high)

E.6.1.5. If ticked "yes" above: On a scale of 1 to 5, please rate the ADOPTION (application in clinical practice) of the AKI management guideline among nephrologists in your country (1=very low, 5=very high)

Data sources for Section E

We would like you to consult as many colleagues or sources of data as needed to provide the answers that best describe nephrology care in your country.

- * What is/are the sources for the data you provided above for Section E?

- * On a scale of 1-5 (1 = very uncertain, 5 = very certain) how certain are you of the answers you have provided for Section E?

Assessing response of nephrology community: awareness, identified barriers and capacity for research

- ° **Awareness and education about CKD**
- ° **Awareness and education about AKI**
- ° **Identified barriers to kidney disease care**
- ° **Capacity for research and development**

1. Awareness and education about CKD

* 1.1. On a scale of 1-5 (1=poor, 5=excellent). Please rate the typical level of CKD awareness among non-nephrologist specialists.

* 1.2. On a scale of 1-5 (1=poor, 5=excellent). Please rate the typical level of CKD awareness among primary care physicians (GPs)

2. Awareness and education about AKI

* 2.1. On a scale of 1-5 (1=poor, 5=excellent). Please rate the typical level of AKI awareness among non-nephrologist specialists.

* 2.2. On a scale of 1-5 (1=poor, 5=excellent). Please rate the typical level of AKI awareness among primary care physicians (GPs)

3. Barriers to optimal kidney disease care

* 3.1. Barriers to optimal kidney disease care: Are there specific barriers to optimal kidney disease care in your country (please tick all that apply)?

- Geography (distance from care or prolonged travel time)
- Number of nephrologists per capita
- Physician (availability, access, knowledge, attitude)
- Healthcare system (availability, access, capability)
- Patient (knowledge, attitude)
- Other

* 3.2 Barriers to optimal RRT provision: Are there specific barriers to optimal RRT care in your country (please tick all that apply)?

- Geography (distance from care or prolonged travel time)
- Number of nephrologists per capita
- Physician (availability, access, knowledge, attitude)
- Healthcare system (availability, access, capability)
- Patient (knowledge, attitude)

4. Capacity for research and development

* 4.1. Is there a national agency responsible for funding clinical trials in your country?

Yes

No

* 4.2. Does your country participate in clinical trials in kidney disease? (Tick all that apply)

Phase 1

Phase 4

Phase 2

Health service delivery trials

Phase 3

* 4.3. Does your country have formal training for physicians in clinical trial conduct?

Yes

Don't know/info not available

No

4.3.1. If yes, is it mandatory?

Yes

Don't know/info not available

No

* 4.4. Does your country have formal training for non-physicians/ research assistants and associates in clinical trial conduct?

Yes

Don't know/info not available

No

4.4.1. If yes, is it mandatory?

Yes

Don't know/info not available

No

* 4.5. Does your country have biobanking facilities?

Yes

Don't know/info not available

No

* 4.6. Does your country have the capacity (trained workforce) to conduct observational cohort studies?

Yes

Don't know/info not available

No

* 4.7. Does your country usually have resources (funding) to conduct observational cohort studies?

Ye
s
No

Don't know/info not available

* 4.8. Is your country involved in any observational cohort studies in CKD?

Ye
s
No

Don't know/info not available

4.8.1. If yes, where?

In non dialysis CKD populations
In dialysis populations

In transplant populations

* 4.9. Is Ethical approval in your country mandatory for observational cohort studies in CKD?

Ye
s
No

Don't know/info not available

* 4.9.1. If yes, is the Ethical approval

Institutional
Regional

National

* 4.10. Which regulatory agencies oversee clinical trials in your country? Please list if known

* 4.11. Are there challenges in getting timely regulatory approvals in your country?

Often
Sometimes

Occasionally
No

4.11.1. If yes, please list any common issues you are aware of

* 4.12. Are there academic centres that co-ordinate and monitor sites involved in renal clinical trials in your country?

Yes
No

Don't know

4.12.1. If so, please list any you are aware of, and if possible provide website links and/or contact details

* 4.13. In what proportion of sites in your country is there capacity for storing clinical trial medications?

All

Most

Some

Few

None

Unknown

Definition of Terms

Action plan: A scheme of course of action, which may correspond to a policy or strategy, with defined activities indicating who does what (type of activities and people responsible for implementation), when (time frame), how and with what resources to accomplish an objective AKI or CKD care.

Appropriate referral and management: Availability of an organized system and/or structures to ensure that people with CKD who may benefit from specialist care are referred for specialist assessment appropriately.

Capacity: The ability to perform appropriate tasks effectively, efficiently and sustainably.

Guidelines: A recommended evidence-based course of action for prevention and/or management of AKI or CKD.

Identification and early detection: Availability of an organized system and/or structures for identification of people with risk factors for CKD (hypertension, diabetes, cardiovascular diseases [ischemic heart disease, heart failure, peripheral vascular disease and stroke], urological problems [structural renal tract disease, kidney stones, prostatic disorders], multisystem diseases (systemic lupus erythematosus, rheumatoid arthritis, infective endocarditis, etc) family history of kidney disease.

Identification: Measures performed in at-risk population in order to identify individuals who have risk factor or early stages of disease, but do not yet have symptoms.

Monitoring of complications, risk factor control and disease progression Availability of an organized system and/or structures to ensure that people with established CKD are:

NGO: Nongovernmental organization

Noncommunicable diseases (NCDs): Cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes.

Policy: A specific official decision or set of decisions designed to carry out a course of action endorsed by a government body, including a set of goals, priorities and main directions for attaining these goals. The policy document may include a strategy to give effect to the policy.

Programs: A planned set of activities or procedures directed at a specific purpose.

Registry: A systematic collection of data about CKD or AKI.

RRT availability: Availability of an organized system and/or structures deliver dialysis and/or kidney transplant when and where needed:

Standard care plan: Availability of an organized system and/or structures to ensure that people with CKD have a current agreed care plan appropriate to the stage and rate of progression of CKD. This means those with early stages are being monitored appropriately at the primary care level and those in need of specialist care have access to it.

Strategy: a long term plan designed to achieve a particular goal for AKI or CKD care.

Under development: Something which is still being developed or finalized and is not yet being implemented in the country.

Global Kidney Health Atlas (GKHA) Questionnaire

THANK YOU

Thank you very much for taking the time to respond to this survey!

Your active participation in helping ISN develop an appropriate global perspective on the state of kidney health and disease is greatly appreciated.

The Global Kidney Disease Atlas (GKHA) Questionnaire team

eAppendix 2. Access to RRT, medication funding and workforce capacity

Green and red boxes indicate that the survey participants answered **Yes** and **No**, respectively. Grey boxes indicate **no data** were provided.

Universal coverage for RRT refers to publicly funded by the government and free at the point of delivery.

Availability of PD (peritoneal dialysis) and Tx (transplantation) refers to the availability of chronic peritoneal dialysis and transplantation.

Adequacy of workforce component: is No if the respondent reported a national shortage of health care providers of the specified type, and Yes otherwise.

Funding for CKD medications component refers to medication funding for non-dialysis dependent chronic kidney disease.

Abbreviations: CKD = chronic kidney disease, RRT = renal replacement therapy, NIS & Russia= Newly Independent States and Russia.

Pub Free = publicly funded by government and *free* at the point of delivery, **Pub \$** = publicly funded by government but *with some fees* at the point of delivery, **Mix PP** = a mix of publicly funded (whether or not publicly funded component is free at point of delivery) and private systems, **Priv OOP** = solely private and out-of-pocket, **Priv HI** = solely private through health insurance providers, **Multi Sys** = multiple systems – programs provided by government, nongovernmental organizations, and communities.

Pub Free	Pub \$	Mix PP	Priv OOP	Priv HI	Multi Sys
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Countries	Universal coverage for RRT					Availability of PD and Tx		Adequacy of workforce component								Funding for CKD		
	Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	Acute hemodialysis	Acute peritoneal dialysis	Chronic peritoneal dialysis	Kidney transplantation	Nephrologists	Dietitians	Renal pathologists	Laboratory technicians	Social workers	Pharmacists	Vascular access coordinators	Transplant coordinators	Dialysis nurses	Dialysis technologists	Funding for CKD medications
Africa																		
Algeria	Green	Green	Green	Green	Red	Green	Green	Red	Red	Green	Red	Green	Red	Red	Red	Red	Red	Green
Benin	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Botswana	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Blue
Burkina Faso	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Green
Burundi	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Orange
Cameroon	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red
Cape Verde	Green	Red	Red	Green	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Green
Chad	Green	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Congo, Republic	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Cote d'Ivoire	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Green
Djibouti	Green	Red	Red	Green	Red	Red	Red	Red	Green	Red	Red	Green	Red	Red	Red	Red	Red	Grey
Egypt	Green	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Green
Ethiopia	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Gambia	Green	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Ghana	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Green	Green	Green	Red	Red	Red	Red	Green
Guinea	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Green
Kenya	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Libya	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Green	Green	Red	Green	Green	Green	Green	Green
Malawi	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Mali	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Green	Red	Red	Red	Red
Morocco	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Mozambique	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Green	Green	Red	Green	Green	Green	Green
Namibia	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey

Countries	Universal coverage for RRT					Availability of PD and Tx		Adequacy of workforce component								Funding for CKD			
	Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	Acute hemodialysis	Acute peritoneal dialysis	Chronic peritoneal dialysis	Kidney transplantation	Nephrologists	Dietitians	Renal pathologists	Laboratory technicians	Social workers	Pharmacists	Vascular access coordinators	Transplant coordinators	Dialysis nurses	Dialysis technologists	Funding for CKD medications	
Niger	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red
Nigeria	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red
Senegal	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red
South Africa	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Sudan	Red	Green	Red	Red	Red	Green	Red	Red	Green	Red	Green	Green	Red	Red	Red	Green	Green	Red	Red
Swaziland	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Tanzania	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Togo	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Red	Red	Green	Red	Red	Red
Tunisia	Green	Green	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Uganda	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Zambia	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red
Zimbabwe	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red
Eastern & Central																			
Albania	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Bosnia and Herzegovina	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Croatia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Czech Republic	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Estonia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Hungary	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Latvia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Lithuania	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Macedonia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Moldova	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Montenegro	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Poland	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Romania	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Serbia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Slovakia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Slovenia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Turkey	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Latin America & the																			
Anguilla	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Argentina	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Bolivia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Brazil	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Chile	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Colombia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Costa Rica	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red

Countries	Universal coverage for RRT					Availability of PD and Tx		Adequacy of workforce component								Funding for CKD		
	Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	Acute hemodialysis	Acute peritoneal dialysis	Chronic peritoneal dialysis	Kidney transplantation	Nephrologists	Dietitians	Renal pathologists	Laboratory technicians	Social workers	Pharmacists	Vascular access coordinators	Transplant coordinators	Dialysis nurses	Dialysis technologists	Funding for CKD medications
Dominican Republic	Red	Red	Red	Red	Red	Green	Green	Green	Green	Red	Green	Green	Green	Green	Green	Green	Green	Green
El Salvador	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Guatemala	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Green	Green	Red	Red	Red	Green	Green	Green
Mexico	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Nicaragua	Red	Green	Red	Red	Green	Green	Green	Red	Green	Red	Green	Green	Red	Red	Red	Red	Red	Red
Panama	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Green	Red	Green	Green	Blue
Paraguay	Red	Red	Red	Red	Red	Green	Green	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Green
Peru	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Uruguay	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Venezuela	Green	Green	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Middle East																		
Bahrain	Green	Green	Green	Green	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Iran	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Iraq	Green	Green	Red	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Jordan	Green	Green	Red	Red	Green	Green	Green	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Orange
Kuwait	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Lebanon	Green	Red	Red	Red	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Oman	Red	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Qatar	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Saudi Arabia	Red	Red	Red	Red	Red	Green	Green	Red	Green	Green	Green	Green	Red	Red	Red	Red	Red	Orange
Syria	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
United Arab Emirates	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
West Bank & Gaza	Green	Red	Green	Green	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Yemen	Green	Red	Red	Green	Green	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
NIS & Russia																		
Armenia	Green	Green	Red	Red	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Belarus	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Georgia	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Kazakhstan	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Russia	Red	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Ukraine	Red	Red	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
North America																		
Canada	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
United States	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
North and East Asia																		
China	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Hong Kong	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Japan	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue

Countries	Universal coverage for RRT					Availability of PD and Tx		Adequacy of workforce component								Funding for CKD		
	Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	Acute hemodialysis	Acute peritoneal dialysis	Chronic peritoneal dialysis	Kidney transplantation	Nephrologists	Dietitians	Renal pathologists	Laboratory technicians	Social workers	Pharmacists	Vascular access coordinators	Transplant coordinators	Dialysis nurses	Dialysis technologists	Funding for CKD medications
Korea, South	Red	Red	Red	Red	Red	Green	Green	Green	Red	Red	Green	Red	Green	Red	Green	Green	Green	Green
Mongolia	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Green	Red	Green	Red	Red	Green	Red	Green
Taiwan	Red	Red	Red	Red	Red	Green	Green	Green	Green	Green	Green	Red	Green	Red	Green	Green	Green	Green
Oceania & South East																		
Australia	Green	Green	Green	Green	Red	Green	Green	Green	Red	Red	Red	Red	Green	Red	Red	Red	Red	Green
Burma	Red	Red	Red	Red	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Cambodia	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Green	Green	Red
Fiji	Red	Red	Red	Green	Red	Red	Red	Red	Green	Red	Red	Green	Red	Red	Red	Red	Red	Green
Indonesia	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Laos	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Green	Red	Red	Red	Green	Green
Malaysia	Red	Red	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
New Zealand	Red	Red	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Philippines	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red
Samoa	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Green	Red	Red	Green	Green	Green	Green
Singapore	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Green
Thailand	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Green	Red	Red	Red	Red	Red	Red	Green
Vietnam	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Green
South Asia																		
Bangladesh	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
India	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Nepal	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Pakistan	Red	Red	Red	Red	Green	Green	Green	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	Green
Sri Lanka	Red	Green	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Western Europe																		
Andorra	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Belgium	Grey	Grey	Grey	Grey	Grey	Green	Green	Red	Green	Green	Green	Green	Green	Green	Red	Green	Green	Grey
Denmark	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
France	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Germany	Red	Red	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Greece	Red	Green	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Blue
Israel	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Orange
Netherlands	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Norway	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
Spain	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green
United Kingdom	Green	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green

eAppendix 3. Services for CKD care, information systems, advocacy structures, and capacity for clinical trials
 Green and red boxes indicate that the survey participants answered **Yes** and **No**, respectively. Grey boxes indicate **no data** were provided.

*Advocacy group refers to the presence of a mechanism at the higher levels of government or a non-governmental organization to raise the profile of the condition and its prevention.

Abbreviations: AKI = acute kidney injury, CKD = chronic kidney disease, eGFR = estimated glomerular filtration rate, UACR = urine albumin to creatinine ratio, UPCR = urine protein to creatinine ratio, NIS & Russia= Newly Independent States and Russia.

Countries	Availability of services for CKD monitoring and management at primary care level					Availability of services for CKD monitoring and management at secondary or tertiary care level					Availability and type of registry				Advocacy group		Capacity to participate in clinical trials						
	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	Urinalysis (qualitative assays)	UACR or UPCR measuring	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	UACR or UPCR measuring	Radiology services (ultrasound)	Pathology services (renal biopsy)	CKD	Dialysis	Transplantation	AKI	CKD	AKI	Phase 1	Phase 2	Phase 3	Phase 4	Health services	
Africa																							
Algeria																							
Benin																							
Botswana																							
Burkina Faso																							
Burundi																							
Cameroon																							
Cape Verde																							
Chad																							
Congo, Republic																							
Cote d'Ivoire																							
Djibouti																							
Egypt																							
Ethiopia																							
Gambia																							
Ghana																							
Guinea																							
Kenya																							
Libya																							
Malawi																							
Mali																							
Morocco																							
Mozambique																							
Namibia																							
Niger																							
Nigeria																							
Senegal																							
South Africa																							
Sudan																							
Swaziland																							
Tanzania																							
Togo																							
Tunisia																							
Uganda																							
Zambia																							

Countries	Availability of services for CKD monitoring and management at primary care level					Availability of services for CKD monitoring and management at secondary or tertiary care level					Availability and type of registry				Advocacy group		Capacity to participate in clinical trials					
	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	Urinalysis (qualitative assays)	UACR or UPCR measuring	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	UACR or UPCR measuring	Radiology services (ultrasound)	Pathology services (renal biopsy)	CKD	Dialysis	Transplantation	AKI	CKD	AKI	Phase 1	Phase 2	Phase 3	Phase 4	Health services
Zimbabwe																						
Eastern & Central																						
Albania																						
Bosnia and																						
Croatia																						
Czech Republic																						
Estonia																						
Hungary																						
Latvia																						
Lithuania																						
Macedonia																						
Moldova																						
Montenegro																						
Poland																						
Romania																						
Serbia																						
Slovakia																						
Slovenia																						
Turkey																						
Latin America &																						
Anguilla																						
Argentina																						
Bolivia																						
Brazil																						
Chile																						
Colombia																						
Costa Rica																						
Dominican																						
El Salvador																						
Guatemala																						
Mexico																						
Nicaragua																						
Panama																						
Paraguay																						
Peru																						
Uruguay																						
Venezuela																						
Middle East																						
Bahrain																						
Iran																						
Iraq																						

Countries	Availability of services for CKD monitoring and management at primary care level					Availability of services for CKD monitoring and management at secondary or tertiary care level					Availability and type of registry				Advocacy group		Capacity to participate in clinical trials							
	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	Urinalysis (qualitative assays)	UACR or UPCR measuring	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	UACR or UPCR measuring	Radiology services (ultrasound)	Pathology services (renal biopsy)	CKD	Dialysis	Transplantation	AKI	CKD	AKI	Phase 1	Phase 2	Phase 3	Phase 4	Health services		
Jordan																								
Kuwait																								
Lebanon																								
Oman																								
Qatar																								
Saudi Arabia																								
Syria																								
United Arab Emirates																								
West Bank & Gaza																								
Yemen																								
NIS & Russia																								
Armenia																								
Belarus																								
Georgia																								
Kazakhstan																								
Russia																								
Ukraine																								
North America																								
Canada																								
United States																								
North and East																								
China																								
Hong Kong																								
Japan																								
Korea, South																								
Mongolia																								
Taiwan																								
Oceania & South																								
Australia																								
Burma																								
Cambodia																								
Fiji																								
Indonesia																								
Laos																								
Malaysia																								
New Zealand																								
Philippines																								
Samoa																								
Singapore																								
Thailand																								
Vietnam																								

Countries	Availability of services for CKD monitoring and management at primary care level					Availability of services for CKD monitoring and management at secondary or tertiary care level					Availability and type of registry				Advocacy group		Capacity to participate in clinical trials						
	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	Urinalysis (qualitative assays)	UACR or UPCR measuring	Blood pressure	Serum creatinine without eGFR reporting	Serum creatinine + eGFR reporting	UACR or UPCR measuring	Radiology services (ultrasound)	Pathology services (renal biopsy)	CKD	Dialysis	Transplantation	AKI	CKD	AKI	Phase 1	Phase 2	Phase 3	Phase 4	Health services	
South Asia																							
Bangladesh																							
India																							
Nepal																							
Pakistan																							
Sri Lanka																							
Western Europe																							
Andorra																							
Belgium																							
Denmark																							
France																							
Germany																							
Greece																							
Israel																							
Netherlands																							
Norway																							
Spain																							
United Kingdom																							