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Availability, accessibility, and quality of conservative kidney management worldwide

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Abstract

Background: People with kidney failure typically receive kidney replacement therapy (KRT) in the form of dialysis or transplantation. However, studies have suggested that not all patients with kidney failure are best suited for KRT. Additionally, KRT is costly and not always accessible in resource-restricted settings. Conservative kidney management is an alternate kidney failure therapy, which focuses on symptom management, psychological health, spiritual care and family and social support. Despite the importance of conservative kidney management in kidney failure care, several barriers exist that impact its uptake and quality.

Methods: The Global Kidney Health Atlas is an ongoing initiative of the International Society of Nephrology (ISN), which aims to monitor and evaluate the status of global kidney care worldwide. This study reports on findings from the 2018 Global Kidney Health Atlas survey, specifically addressing the availability, accessibility, uptake and quality of conservative kidney management.

Results: Respondents from 160 countries completed the survey and 154 answered questions pertaining to conservative kidney management. Of these, 124 (81%) stated that conservative kidney management was available. Accessibility was low worldwide, particularly in low-income countries. Less than half of countries utilized multidisciplinary teams (46%), shared decision-making (32%), or provided psychological, cultural, or spiritual support (36%). One quarter provided relevant healthcare providers with training on conservative kidney management delivery.

Conclusions: Overall, conservative kidney management is available in most countries; however, it is not optimally accessible or of the highest quality.

Introduction

The default medical decision for people with kidney failure (an estimated glomerular filtration rate (eGFR) less than 15mL/min/1.73m²) is to offer them kidney replacement therapy (KRT), either dialysis or kidney transplantation. However, dialysis does not always improve outcomes, has several limitations, and may not be desirable for some patients, particularly older adults¹. Similarly, kidney transplantation is not always feasible or optimal for patients.

Even for those whom would benefit most from KRT, this treatment is not always an option. Organ shortage and limitations in resources required for surgery or post-operative care (for example, immunosuppressants) often limit access to kidney transplantation. Dialysis is also an expensive modality and may not be widely available or accessible either because a country or region is unable to cover the costs to offer the service, or because individuals are unable to pay the accompanying out of pocket expenses. Limitations in other economic and social resources required for dialysis such as transportation fees, may further impose barriers on the accessibility of treatment for patients, possibly more common among older adults.

Therefore, selecting the most appropriate treatment for kidney failure requires careful consideration of the individual patient's conditions, social circumstances, wishes, preferences, and life goals. Conservative kidney management focuses on supporting the needs of patients through symptom management, psychological therapy, or family and social support² and is an alternative to patients unlikely to benefit from KRT (i.e., chosen or

medically advised) or unable to access KRT (i.e., choice-restricted). Recommendations on how to optimally deliver conservative kidney management, focused on the patient's values and preferences, minimizing symptoms due to disease, and improving comfort and quality of life, are available to help guide practice^{3,4}.

Despite the potential of conservative kidney management as a therapy for kidney failure, its utilization across the globe is unknown. Limited evidence on health outcomes makes decision-making for nephrologists a challenge⁵ and may result in the exclusion of conservative kidney management from kidney care policies. Additionally, as the awareness of conservative kidney management is relatively low, limited healthcare provider training, public expectations of what is considered more active care, and remuneration for care may impede its adoption⁶.

Our objective for this study was to identify the current availability and accessibility of conservative kidney management worldwide. Additionally, we were interested in the quality of delivery in countries that do offer conservative kidney management. We leveraged data from the second Global Kidney Health Atlas (GKHA) survey⁷, which focused on kidney failure care including KRT and conservative kidney management.

Methods

As described elsewhere⁷⁻⁹, the GKHA is a project of the International Society of Nephrology (ISN) targeted at improving the global capacity of kidney care through an international survey of stakeholders. Details on the survey development and validation have previously

been published^{8,9}. To date, two iterations of the survey have been conducted (2016 and 2018)¹⁰. Survey items pertaining to conservative kidney management were not included in the 2016 survey but were added to the second iteration. Here, we utilize the 2018 version to report on items specific to conservative kidney management (Supplementary Item S1).

Key kidney care stakeholders (nephrology leaders, consumers, healthcare policy makers) were invited to participate based on their knowledge of kidney care and ability to accurately represent their country. In total, 2-3 representatives of 182 countries received an invitation to participate in the survey. We administered the survey online via REDCap Cloud (www.redcapcloud.com) from July to September 2018. We stored data in a centralized database and checked for inconsistencies within country responses. We asked ISN regional leaders to clarify discrepancies and subsequently updated the database. We imported the database into Stata 15 software (Stata Corporation, 2017). We analyzed data using descriptive statistics and reported findings as an overall aggregate score, stratified by ISN region¹¹, and by World Bank income group. Country was the unit of analysis. The chi-squared (χ^2) test was used to examine differences in conservative kidney management accessibility and quality in this study.

A definition of conservative kidney management was provided in the survey (Supplementary Item S1), following the Kidney Disease Improving Global Outcomes (KDIGO) recommendations. Conservative kidney management was defined as “planned, holistic, patient-centered care for patients with chronic kidney disease (CKD) stage 5, that includes interventions to delay progression of kidney disease and minimize complications

but focuses predominantly on symptom management and psychological, social, cultural and spiritual support but does not include dialysis” according to KDIGO². It was further described that conservative kidney management could be administered as a chosen or medically advised treatment (i.e., an appropriate treatment modality for patients who choose not to initiate KRT) or as a choice-restricted treatment (i.e., in whom resource constraints prevent or limit access to KRT).

Respondents were asked to report whether conservative kidney management was available in their country (yes/no/unknown) and for those with conservative kidney management, the availability of chosen or medically advised and choice-restricted care. Further, respondents were asked to rank its accessibility across settings (for example, home, hospital, hospice, and nursing home). Lastly, respondents were asked to rate the quality of conservative kidney management, as measured by the general availability of the following five domains: i) multidisciplinary team approaches, ii) tools for shared decision-making (i.e., practice guidelines for providers or patient decision aids), iii) systematic active recognition and management of symptoms associated with kidney failure, iv) psychological, cultural, and spiritual support, and v) additional training to healthcare providers for conservative kidney management (Supplementary Item S1).

The University of Alberta Research Ethics Committee approved this project (Protocol number: PR000063121) and all participants provided implied consent.

Results

Survey response rate

Of the 182 countries that received an invitation to participate in the 2018 survey, respondents from 160 (88%) participated. Of these, 311 respondents from 154 (96%) countries answered the survey item related to conservative kidney management availability (Supplementary Item S1; C.6.1). Of the 311 respondents, 82% were nephrologists, 7% were non-nephrologist physicians, 5% were administrators or policymakers, 2% were non-physician healthcare providers, and 4% reported another profession. Countries across all income groups were represented: 22 of the 23 (96%) low income countries responded to the survey question about conservative kidney management, as did 35/38 (92%) of lower-middle, 41/41 (100%) of upper-middle, and 56/58 (97%) of high income countries.

Conservative kidney management availability and accessibility

Overall, respondents from 124/154 countries (81%) stated that conservative kidney management was available (Table 1). Income level was not associated with its availability . Of the 124 countries offering conservative kidney management, hemodialysis was available in all. Twenty-five countries (21%) do not have peritoneal dialysis available and 34 (27%) do not have kidney transplantation available. Eighteen countries (15%) have neither peritoneal dialysis nor transplantation available: 14 in Africa, one in Latin America, 2 in Oceania and South East Asia, and one in North America and the Caribbean (Supplementary Table S1).

Respondents from 28 of the 154 countries reported that conservative kidney management was not available (Table 2). Of these 28 countries, all provided hemodialysis services, 23 (82%) offer peritoneal dialysis, and 21 (75%) offer kidney transplantation. The majority of countries that lacked conservative kidney management, fund KRT either exclusively by the government with no fees (n=10) or through a mix of public and private sources (n=10) (Table 2). Four countries funded KRT through the government, with some fees at the point of delivery. Two countries funded KRT exclusively through private (i.e., out-of-pocket). One country funded KRT through multiple sources (i.e., programs provided by government, non-government organizations, and communities). One country selected 'Other' as the funding structure for KRT.

Of the 124 countries with conservative kidney management available, 47 (38%) offer services that are easily accessible across settings (for example, at the patient's home, hospital, hospice, and nursing home) (Table 1). Accessibility to conservative kidney management services was significantly different across the four income levels ($\chi^2=33.2$, $p<0.001$): high-income (32/47; 68%), upper-middle (9/33; 27%), lower-middle (6/26; 23%), and low-income countries (0/18; 0%).

Chosen or medically advised conservative kidney management

Among countries with conservative kidney management available, respondents from 77 (62%) reported that chosen or medically advised conservative kidney management was generally available. This was highest in North America (6/6) and Western Europe (18/18). Less than half of countries in South Asia (1/7), the Middle East (2/9), Latin America (3/8),

and Oceania and South East Asia (6/14) reported that it was selected by choice or following medical advice. The availability of chosen or medically advised conservative kidney management was higher with increasing income level: 33% of low, 39% of lower-middle, 64% of upper-middle, and 85% of high-income countries reported availability. Of the 77 countries that generally offered chosen or medically advised conservative kidney management, 39 (51%) funded KRT publicly with no fees to patients at the point of care delivery; 15 (19%) funded KRT publicly with some fees to patients; 16 (21%) funded KRT through a mix of public and private sources; 3 (4%) funded through multiple sources (i.e., government, nongovernment organizations, communities); 3 (4%) funded solely through private; and one country (1%) reported an 'Other' type of funding model for KRT.

Quality of conservative kidney management services

Five indicators were used to assess the quality of conservative kidney management services (Table 3). Of the countries that offered services, respondents from 57 (46%) reported that multidisciplinary teams were generally available among centers. Forty (32%) incorporated shared decision-making; 80 (65%) had processes in place to systematically recognize and manage symptoms; 45 (36%) provided psychological, cultural, or spiritual support; and 31 (25%) provided relevant healthcare providers with additional training on how to deliver conservative kidney management (Table 3). Across every indicator, high-income countries reported a greater presence of quality metrics and low-income countries reported they generally were not available, particularly for provider training (0%), shared decision-making (11%), and psychological, cultural, spiritual support (17%) (Supplementary Table S2). Among countries offering conservative kidney management,

respondents from 33 (27%) reported that no quality indicators were generally available and respondents from 26 (21%) reported that all 5 were generally available.

Of the 33 countries that did not report any quality indicators, 8 were low-income (44% of the region), 11 were lower-middle (42%), 10 were upper-middle (30%), and 4 were high-income (9%). Of the 26 countries that reported all 5 quality indicators were generally available, 0 were low-income, 3 were lower-middle (12% of region), 6 were upper-middle (18%), and 17 were high-income (36% of region). There was a statistically significant difference in quality reporting among the four income groups ($\chi^2=21.1$; $p<0.001$).

Discussion

The 2018 GKHA survey identified that most countries offer conservative kidney management in some form. However, it was not clear whether it was offered because it was medically advised or because KRT was not possible (i.e., choice-restricted). Only 38% of countries with conservative kidney management offer easily accessible services. The quality of care delivery across countries varied but was poor overall. Respondents from high-income countries reported higher quality of conservative kidney management compared to those from countries of lower economic standing. KRT was available in all 28 countries that did not offer conservative kidney management.

Understanding conservative kidney management as a treatment modality

Compared to other treatment options for kidney failure, conservative kidney management is a relatively new treatment modality and there are still several unknowns with respect to

how it should be adopted in practice and optimally delivered¹². In 2015, the KDIGO organization hosted a conference to review evidence and develop recommendations for managing advanced CKD, including addressing conservative kidney management². Only last year, the National Institute for Health and Care Excellence (NICE) published a document to expand awareness and understanding about the various components of conservative kidney management¹³. Efforts to disseminate these guidelines internationally to promote a standard practice in delivering conservative kidney management may help reduce the variability of care for people with kidney failure that do not receive KRT.

Optimal conservative kidney management delivery

The quality of conservative kidney management varies not only across countries, but likely will vary within countries and even within centers depending on individual nephrologist beliefs, attitudes and ability or willingness to communicate about conservative kidney management and prognosis. Efforts to reduce this variability through appropriate guidelines, communication, and training are therefore important to ensure not only high quality but also equity of conservative kidney management care. Establishing conservative kidney management programs that address elements prioritized by patients, families, and healthcare providers¹⁴ is important to ensure patients receive the best quality of care possible.

Deciding between KRT and conservative kidney management

The decision to choose between KRT and conservative kidney management is complex for both healthcare providers and patients. A significant reason behind the difficulty in making

a decision is likely related to the limited evidence regarding whom would benefit more from, or prefer, conservative kidney management, compared to dialysis. To date, all research exploring non-dialysis care has utilized observational studies, and therefore is potentially vulnerable to performance bias, since people who opt for dialysis may have different characteristics than those who choose conservative kidney management¹².

Secondly, most studies do not report on the same outcome, and the outcomes chosen for reporting may not be those that are most important to patients¹². Most studies focus on survival as the main outcome measure, which may miss the fact that quality of life and symptom control may be more important measures from patients' point of view. Pragmatic, realist, randomized controlled trials, such as the Prepare for Kidney Care trial¹⁵ that involve a number of clinical and patient-centered outcomes, may help improve the quality of the evidence and subsequently guide healthcare providers and patients with decision-making.

Utilizing processes to support patients, families, and healthcare providers make decisions may also help patients receive the most appropriate care. Decision aids^{16, 17} that inform patients about different options for treatment of kidney failure may encourage shared decision-making and help identify the most appropriate pathway. While there are a number of decision aids targeted at KRT, few focus on the decision between dialysis and non-dialysis care¹⁸. Currently the few decision aids available with a specific focus on choosing dialysis or conservative kidney management include the Conservative Kidney Management Patient Decision Aid, the Ottawa tool, OPTIONS¹⁸ and one developed by the

Renal Team at St. George and Sutherland Hospitals in Australia¹⁹., These should offer a helpful resource for providers, patients, and families in the future.

Implications for research, policy, and practice

There are several gaps in conservative kidney management delivery worldwide. To increase the adoption of high quality care around the world, a number of actions will likely be required (Box 1).

Box 1. Recommendations for how to improve conservative kidney management accessibility and quality worldwide.*

Increase the *awareness* of conservative kidney management as a viable treatment modality among patients and families, healthcare providers, and policymakers, and clarify its definition and standard of care.

Identify the *barriers* to conservative kidney management availability, accessibility, and quality, so that strategies can be developed to increase capacity.

Develop *policies* to ensure that conservative kidney management is optimal and that conservative kidney management is not seen as solely palliative care for those that can not receive KRT.

Expand the *evidence* to provide better information regarding the outcomes associated with conservative kidney management as well as characteristics of patients who are most suitable for this treatment option.

Disseminate *guidelines* that are accessible globally and adaptable to each local context.

Support shared *decision-making* among healthcare providers, patients and families; Understand the current *barriers* that countries are experiencing with conservative kidney management delivery.

Provide *government-funded services* essential for conservative kidney management, such as healthcare provider training, symptom management and psychological support.

* Davison SN, Levin A, Moss AH, et al. Executive summary of the KDIGO Controversies Conference on Supportive Care in Chronic Kidney Disease: developing a roadmap to improving quality care. *Kidney International* 2015; 88: 447-459.

Additionally, the ISN is developing an kidney failure strategic plan as a follow-up to the Harris et al. paper on integrated kidney failure care²⁰. This 5-10 year strategy will use working groups to design activities and deliverables related to monitoring, dialysis, resources, and support²¹. More information will be available over the coming year. Additionally, the ISN is collaborating with the WHO to develop a technical package for setting up maintenance dialysis programs, suitable for low resource settings, which also includes discussion of conservative kidney management.

Similar to other questionnaires, our survey has the potential for subjectivity (social desirability bias), and was highly dependent on respondents' knowledge, expertise, and perceptions. However, respondents were informed their identity would remain confidential in an attempt to reduce the potential for bias. The survey questions were assessed for face validity; however, the accuracy of our findings depends on how correctly respondents represented the status of services in their country. We therefore worked closely with the International Society of Nephrology's Regional Boards to select respondents with a range of kidney care knowledge and expertise while ensuring adequate regional representation, and corroborated findings with regional leaders. Regardless, there are risks that survey items were unclear. For example, just over 80% of countries in our survey reported that conservative kidney management was available.

Even though the survey provided a definition of conservative kidney management, it is possible that the availability of services was overestimated if conservative kidney management was understood to mean simply managing kidney failure in the absence of

dialysis or transplantation. Additionally, the type of conservative kidney management offered (i.e., choice-restricted or chosen/medically advised) was presented as independent items instead of a mutually exclusive option and therefore, was likely difficult to interpret. Lastly, only countries with available stakeholders were invited to complete the survey. It is possible that excluding countries that did not respond to the survey might have contributed to an over-estimation of capacity if the reason they did not participate was due to limited information or resources or political focus on kidney care. However, we received representation of 98% of the global population and therefore, the proportion of the global population excluded from these 36 countries was likely minimal.

Conclusions

Overall, most countries offer conservative kidney management, but it was not always clear whether it was selected because it was medically advised or because KRT was not possible (i.e., choice-restricted). Several gaps were reported across most quality indicators, including limited healthcare provider training for conservative kidney management delivery; shared decision-making; psychological, cultural, or spiritual support; and the use of multidisciplinary teams. These gaps were particularly notable in low-income countries. Efforts to increase the awareness, standardization, and uptake of practices recommended for conservative kidney management are needed to ensure high quality of care.

Author contributions

The ISN provided administrative support for the design and implementation of the study and data collection activities. The authors were responsible for data management, analysis

and interpretation, as well as manuscript preparation, review and approval, and the decision to submit the manuscript for publication.

AKB and DWJ had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. AKB, MT, AL, DCH, and DWJ contributed to the study concept and design. All the authors contributed to the acquisition, analysis, and interpretation of data and to the critical revision of the manuscript for important intellectual content. ML, AKB, and SND drafted the manuscript. ML and FY conducted the statistical analyses. AKB, AL, and DWJ obtained funding. MAO, ML, and FY provided administrative, technical, and material support. Co-chairs AKB and DWJ of the International Society of Nephrology's Global Kidney Health Atlas supervised the study. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. AKB is the guarantor.

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Supplemental Material Table of Contents

Supplementary Item S1. Survey items from the 2018 Global Kidney Health Atlas relating to Conservative Kidney Management (conservative kidney management).

Supplementary Table S1. Availability of kidney replacement therapies, and funding sources, among countries offering conservative kidney management.

Supplementary Table S2. Number of quality indicators of conservative kidney management delivery reported overall and by country income level.

References

1. Anand S, Kurella Tamura M and Chertow GM. The elderly patients on hemodialysis. *Minerva urologica e nefrologica = The Italian journal of urology and nephrology* 2010; 62: 87-101.
2. Davison SN, Levin A, Moss AH, et al. Executive summary of the KDIGO Controversies Conference on Supportive Care in Chronic Kidney Disease: developing a roadmap to improving quality care. *Kidney International* 2015; 88: 447-459.
3. Brown MA, Crail SM, Masterson R, et al. ANZSN renal supportive care 2013: opinion pieces [corrected]. *Nephrology (Carlton, Vic)* 2013; 18: 401-454.
4. Davison SN, Tupala B, Wasyluk BA, et al. Recommendations for the Care of Patients Receiving Conservative Kidney Management: Focus on Management of CKD and Symptoms. *Clinical Journal of the American Society of Nephrology* 2019; 14: 626-634. 2019/03/02.
5. Ladin K, Pandya R, Kannam A, et al. Discussing Conservative Management With Older Patients With CKD: An Interview Study of Nephrologists. *American Journal of Kidney Diseases* 2018; 71: 627-635.
6. Grubbs V, Tuot DS, Powe NR, et al. System-Level Barriers and Facilitators for Foregoing or Withdrawing Dialysis: A Qualitative Study of Nephrologists in the United States and England. *American Journal of Kidney Diseases* 2017; 70: 602-610.
7. Bello AK, Levin A, Lunney M, et al. Status of care for end stage kidney disease in countries and regions worldwide: international cross sectional survey. *BMJ* 2019; 367: l5873.
8. Bello AK, Johnson DW, Feehally J, et al. Global Kidney Health Atlas (GKHA): design and methods. *Kidney International Supplements* 2017; 7: 145-153.
9. Bello AK, Levin A, Tonelli M, et al. Assessment of Global Kidney Health Care Status. *Journal of the American Medical Association* 2017; 317: 1864-1881.
10. International Society of Nephrology. Global Kidney Health Atlas. <https://www.theisn.org/fp-tabs-left/691-global-kidney-health-atlas> Accessed August 26 2019.
11. International Society of Nephrology. Regions, <https://www.theisn.org/about-isn/regions> (accessed February 14, 2020).
12. Murtagh FE, Burns A, Moranne O, et al. Supportive Care: Comprehensive Conservative Care in End-Stage Kidney Disease. *Clinical Journal of the American Society of Nephrology* 2016; 11: 1909-1914.

13. National Institute for Health and Care Excellence: Clinical Guidelines. *Renal replacement therapy and conservative management*. London: National Institute for Health and Care Excellence (UK). <https://www.nice.org.uk/guidance/ng107>. Accessed September 17 2019.
14. Harrison TG, Tam-Tham H, Hemmelgarn BR, et al. Identification and Prioritization of Quality Indicators for Conservative Kidney Management. *American Journal of Kidney Diseases* 2019; 73: 174-183.
15. University of Bristol. Prepare For Kidney Care Trial. <http://www.bristol.ac.uk/population-health-sciences/projects/prepare-kc-trial/> Accessed September 17 2019.
16. Alberta Health Services. Conservative Kidney Management (CKM). <https://www.ckmcare.com> Accessed September 17 2019.
17. Fortnum D, Smolonogov T, Walker R, et al. 'My kidneys, my choice, decision aid': supporting shared decision making. *Journal of Renal Care* 2015; 41: 81-87.
18. Davis JL and Davison SN. Hard choices, better outcomes: a review of shared decision-making and patient decision aids around dialysis initiation and conservative kidney management. *Current Opinion in Nephrology and Hypertension* 2017; 26: 205-213.
19. St George and Sutherland Hospitals, Renal Department. Information for patients about advanced kidney disease Dialysis and non-dialysis treatments, 2017. [https://stgrenal.org.au/sites/default/files/upload/Predialysis/Patient information about dialysis 2018 V2.pdf](https://stgrenal.org.au/sites/default/files/upload/Predialysis/Patient%20information%20about%20dialysis%202018%20V2.pdf) (accessed February 15, 2020).
20. Harris DCH, Davies SJ, Finkelstein FO, et al. Increasing access to integrated ESKD care as part of universal health coverage. *Kidney international* 2019; 95: S1-s33.
21. Hole B, Hemmelgarn B, Brown E, et al. Supportive care for end-stage kidney disease: an integral part of kidney services across a range of income settings around the world. *Kidney international supplements* 2020; 10: e86-e94.

Table 1. Global availability and accessibility of conservative kidney management worldwide.

	Availability <i>Is conservative kidney management available in your country?</i>				Accessibility <i>Easy access to conservative care across settings</i>					
	Yes N (%)	No N (%)	Unknown N (%)	Total ¹	Generally available N (%)	Generally not available N (%)	Never N (%)	Unknown N (%)	No response N (%)	Total countries with CKM available
Overall	124 (81)	28 (18)	2 (1)	154	47	54	14	0	9	124
ISN regions:										
Africa	33 (80)	8 (20)	0 (0)	41	5 (15)	16 (48)	8 (24)	0 (0)	4 (12)	33
E & C Europe	18 (95)	1 (5)	0 (0)	19	8 (44)	10 (56)	0 (0)	0 (0)	0 (0)	18
Latin America	8 (44)	10 (56)	0 (0)	18	0 (0)	7 (39)	1(13)	0 (0)	0 (0)	8
Middle East	9 (82)	2 (18)	0 (0)	11	3 (33)	4 (44)	0 (0)	0 (0)	2 (22)	9
NIS & Russia	4 (57)	3 (43)	0 (0)	7	1 (25)	3 (75)	0 (0)	0 (0)	0 (0)	4
NAC	6 (67)	3 (33)	0 (0)	9	5 (83)	0 (0)	1 (17)	0 (0)	0 (0)	6
N & E Asia	7 (100)	0 (0)	0 (0)	7	1 (14)	6 (86)	0 (0)	0 (0)	0 (0)	7
OSEA	14 (93)	1 (7)	0 (0)	15	7 (50)	3 (21)	4 (29)	0 (0)	0 (0)	14
South Asia	7 (100)	0 (0)	0 (0)	7	1 (14)	3 (43)	0 (0)	0 (0)	3 (43)	7
Western Europe	18 (90)	0 (0)	2 (10)	20	16 (89)	2 (11)	0 (0)	0 (0)	0 (0)	18
World Bank Income Group:										
Low	18 (82)	4 (18)	0 (0)	22	0 (0)	10 (56)	5 (28)	0 (0)	3 (17)	18
Lower-middle	26 (74)	9 (26)	0 (0)	35	6 (23)	12 (46)	4 (15)	0 (0)	4 (15)	26
Upper-middle	33 (80)	8 (20)	0 (0)	41	9 (27)	18 (55)	5 (15)	0 (0)	1 (3)	33
High	47 (84)	7 (13)	2 (3)	56	32 (68)	14 (30)	0 (0)	0 (0)	1 (2)	47

¹Total countries that responded to questions related to conservative kidney management (160 in total responded to the 2016 GKHA questionnaire).

CKM = conservative kidney management; E & C Europe = Eastern and Central Europe; NAC = North America and the Caribbean; NIS = newly independent states; N & E Asia = North and East Asia

Row % totals may not sum to 100% due to rounding.

Table 2. Availability of kidney replacement therapies, and funding sources, among countries reporting an absence of conservative kidney management.

ISN Region	Country	World Bank income group	Hemodialysis	Peritoneal Dialysis	Kidney Transplantation	KRT Funding
Africa	Botswana	Upper-middle	✓	✓	X	Mix (govt + private)
	Ethiopia	Low	✓	✓	✓	Mix (govt + private)
	Mauritania	Lower-middle	✓	X	X	Govt (no fees)
	Sierra Leone	Low	✓	X	X	Other
	Sudan	Lower-middle	✓	✓	✓	Multiple
	Swaziland	Lower-middle	✓	✓	X	Govt (some fees)
	Tanzania	Low	✓	X	✓	Mix (govt + private)
	Zimbabwe	Low	✓	✓	X	Govt (some fees)
Eastern and Central Europe	Lithuania	High	✓	✓	✓	Govt (no fees)
Latin America	Bolivia	Lower-middle	✓	✓	✓	Mix (govt + private)
	Brazil	Upper-middle	✓	✓	✓	Govt (no fees)
	Chile	High	✓	✓	✓	Govt (some fees)
	El Salvador	Lower-middle	✓	✓	✓	Mix (govt + private)
	Guatemala	Lower-middle	✓	✓	✓	Mix (govt + private)
	Mexico	Upper-middle	✓	✓	✓	Govt (some fees)

	Peru	Upper-middle	✓	✓	✓	Mix (govt + private)
	Puerto Rico	High	✓	✓	✓	Mix (govt + private)
	Uruguay	High	✓	✓	✓	Mix (govt + private)
	Venezuela, RB	Upper-middle	✓	✓	✓	Govt (no fees)
Middle East	Syrian Arab Republic	Lower-middle	✓	✓	✓	Govt (no fees)
	West Bank and Gaza	Lower-middle	✓	✓	✓	Govt (no fees)
NIS and Russia	Belarus	Upper-middle	✓	✓	✓	Govt (no fees)
	Kazakhstan	Upper-middle	✓	✓	✓	Govt (no fees)
	Russian Federation	Upper-middle	✓	✓	✓	Govt (no fees)
North America and the Caribbean	Antigua and Barbuda	High	✓	X	✓	Govt (no fees)
	St. Kitts and Nevis	High	✓	✓	X	Private
	Trinidad and Tobago	High	✓	✓	✓	Mix (govt + private)
Oceania and South East Asia	Cambodia	Lower-middle	✓	X	X	Private

✓ = Available X = Not Available

Govt (no fees) = Government (no fees at point of delivery)

Govt (some fees) = Government (some fees at point of delivery)

Mix (govt + private) = Mix of government (public) and private

Private = Private (solely out-of-pocket)

Multiple = Multiple sources (programs provided by government, non-government organizations, and communities)

Other = Other funding sources

E & C Europe = Eastern and Central Europe; ISN = international society of nephrology; KRT = kidney replacement therapy (dialysis and transplantation, excludes conservative kidney management); NAC = North America and the Caribbean; NIS = newly independent states; N & E Asia = North and East Asia

8 countries, that do not have conservative kidney management available, also do not offer peritoneal dialysis: Ethiopia (Africa), Mauritania (Africa), Sierra Leone (Africa), Tanzania (Africa), Syrian Arab Republic (Middle East), West Bank and Gaza (Middle East), Antigua and Barbuda (North America and the Caribbean), and Cambodia (Oceania and South East Asia).

7 countries, that do not have conservative kidney management available, also do not offer kidney transplantation: Botswana (Africa), Mauritania (Africa), Sierra Leone (Africa), Swaziland (Africa), Zimbabwe (Africa), St. Kitts and Nevis (North America and the Caribbean), and Cambodia (Oceania and South East Asia).

Table 3. Number of countries with conservative kidney management available and components of care that are generally available.

	Countries with conservative kidney management available (N)	Quality indicators*				
		Multidisciplinary teams N (%)	Shared decision-making N (%)	Symptom management N (%)	Psychological, cultural, spiritual support N (%)	Healthcare provider training N (%)
Overall	124	57 (46)	40 (32)	80 (65)	45 (36)	31 (25)
ISN regions:						
Africa	33	11 (33)	9 (27)	17 (52)	7 (21)	4 (12)
E & C Europe	18	9 (50)	6 (33)	14 (78)	6 (33)	6 (33)
Latin America	8	3 (34)	0 (0)	4 (50)	1 (13)	0 (0)
Middle East	9	2 (22)	1 (11)	7 (78)	1 (11)	1 (11)
NIS & Russia	4	2 (50)	1 (25)	2 (50)	2 (50)	1 (25)
NAC	6	5 (83)	4 (67)	6 (100)	3 (50)	2 (33)
N & E Asia	7	5 (71)	1 (14)	5 (71)	2 (29)	1 (14)
OSEA	14	7 (50)	5 (36)	6 (43)	7 (50)	6 (43)
South Asia	7	0 (0)	0 (0)	2 (29)	4 (57)	1 (14)
Western Europe	18	13 (72)	13 (72)	17 (94)	12 (67)	9 (50)
World Bank Income Group:						
Low	18	4 (22)	2 (11)	9 (50)	3 (17)	0 (0)
Lower-middle	26	6 (23)	7 (27)	12 (46)	8 (31)	6 (23)
Upper-middle	33	16 (48)	8 (24)	18 (55)	10 (30)	7 (21)
High	47	31 (66)	23 (49)	41 (87)	24 (51)	18 (38)

*Davison SN, Levin A, Moss AH, et al. Executive summary of the KDIGO Controversies Conference on Supportive Care in Chronic Kidney Disease: developing a roadmap to improving quality care. *Kidney International* 2015; 88: 447-459.

Generally available means in 50% or more centres (hospitals or clinics). Other response options (not shown) included: Generally not available (in less than 50% of centres), never, or unknown.

CKM = conservative kidney management; E & C Europe = Eastern and Central Europe; NAC = North America and the Caribbean; NIS = newly independent states; N & E Asia = North and East Asia

Row totals may not sum to 100% due to rounding.