

Patient and caregiver priorities for outcomes in chronic kidney disease: a multinational nominal group technique study

Authors full names and highest degree

Andrea Matus Gonzalez, BSc(Nutr)^{1,2}, Talia Gutman, MPH^{1,2}, Pamela Lopez-Vargas, PhD^{1,2}, Samaya Anumudu, MD³, Cristina M. Arce, MD⁴, Jonathan C. Craig, PhD⁵, Louese Dunn, MPH⁶, Kai-Uwe Eckardt, MD⁷, Tess Harris, MA⁸, Andrew S. Levey, MD⁹, Liz Lightstone, PhD¹⁰, Nicole Scholes-Robertson, BAppSc^{1,2}, Jenny I. Shen, MD¹¹, Armando Teixeira-Pinto, PhD^{1,2}, David C. Wheeler, MD¹², Dave White¹³, Martin Wilkie, MD⁶, Michel Jadoul, MD¹⁴, Wolfgang C. Winkelmayer, MD, Sc.D³, Allison Tong, PhD^{1,2}

Institution of each author

¹Sydney School of Public Health, The University of Sydney, Sydney, NSW, Australia

²Centre for Kidney Research, The Children's Hospital at Westmead, Westmead, NSW, Australia

³Selzman Institute for Kidney Health, Section of Nephrology, Baylor College of Medicine, Houston, Texas, United States

⁴Dallas Renal Group, Dallas, TX, United States

⁵College of Medicine and Public Health, Flinders University, Australia

⁶Sheffield Kidney Institute, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK

⁷Department of Nephrology and Medical Intensive Care, Charité – Universitätsmedizin Berlin, Berlin, Germany

⁸Polycystic Kidney Disease International, London, UK

⁹Division of Nephrology, Tufts Medical Center, Boston, MA, United States

¹⁰Centre for Inflammatory Disease, Faculty of Medicine, Imperial College London, London, United Kingdom

¹¹Division of Nephrology and Hypertension, Harbor-UCLA Medical Center, Torrance, CA, United States

¹²Centre for Nephrology, University College London, London, United Kingdom and George Institute for Global Health, Sydney

¹³Center for Health Action and Policy, The Rogosin Institute, New York, NY, United States

¹⁴Department of Nephrology, Cliniques universitaires Saint-Luc, Université catholique de Louvain, Brussels, Belgium

Address correspondence to:

Andrea Matus González

Centre for Kidney Research, The Children's Hospital at Westmead, Westmead, NSW 2145, Sydney, Australia

Email: andrea.matusgonzalez@sydney.edu.au Phone: +61 404 159 166.

Word count (Abstract): 259

Word count (Body): 3577

Short title: Patient-important outcomes in CKD

ABSTRACT

Rationale and objective: Patients with chronic kidney disease (CKD) are at an increased risk of premature death, cardiovascular disease, and burdensome symptoms that impair quality of life. We aimed to identify patient and caregiver priorities for outcomes in CKD.

Study Design: Focus groups with nominal group technique

Setting and Participants: Adult patients with CKD (all stages) and caregivers in the United States, Australia, and United Kingdom.

Analytical Approach: Participants identified, ranked and discussed outcomes that were important during the stages of CKD prior to kidney replacement therapy. For each outcome, we calculated a mean importance score (scale 0-1). Qualitative data were analyzed using thematic analysis.

Results: Sixty-seven (54 patients, 13 caregivers) participated in 10 groups and identified 36 outcomes. The five top ranked outcomes for patients were: kidney function (importance score = 0.42), “end-stage kidney disease” (ESKD) (0.29), fatigue (0.26), mortality (0.25) and life participation (0.20); and for caregivers the top five outcomes were: life participation (importance score = 0.38), kidney function (0.37), mortality (0.23), fatigue (0.21) and anxiety (0.20). Blood pressure, cognition and depression were consistently ranked in the top ten outcomes across role (patient/caregiver), country and treatment stage. Five themes were identified: re-evaluating and reframing life, intensified kidney consciousness, battling unrelenting and debilitating burdens, dreading upheaval and constraints, and taboo and unspoken concerns.

Limitations: Only English-speaking participants were included

Conclusions: Patients and caregivers gave highest priority to kidney function, mortality, fatigue, life participation, anxiety and depression. Consistent reporting of these outcomes in research may inform shared decision-making based on patient and caregiver priorities in CKD.

Introduction

Globally, the prevalence of chronic kidney disease (CKD) ranges from 8 to 16%¹. CKD is associated with an increased risk of mortality, cardiovascular events, hospitalization, and progression to kidney failure requiring kidney replacement therapy²⁻⁶. Cognitive impairment, depression, fatigue, and reduced physical function are also common in patients with CKD^{1,7-11}. The management of CKD can be challenging because patients' symptoms and prognosis are highly variable and follow uncertain trajectories¹².

As such, there is recognition of the need for informed shared decision-making that explicitly considers the preferences and goals of patients^{12,13}. This requires evidence on the impacts of disease and treatment that are important to patients. Prevention of progression of kidney disease, survival, and symptoms and side effects including fatigue, cramping, depression, pruritis, headaches, dizziness, and mood are some of the outcomes that have been identified as important by patients with CKD and their caregivers¹⁴⁻¹⁸. However, trials do not always measure or report outcomes that are meaningful to patients^{7,19}. In particular, patient-reported outcomes that reflect how patients feel and function are frequently omitted^{20,21}.

There is a need to ascertain a comprehensive and prioritized set of outcomes during the stages of CKD prior to the need for kidney replacement therapy, that are meaningful and relevant to patients and their caregivers. The aim of this study was to identify and prioritize outcomes important to patients and their caregivers for research in CKD, and to describe the reasons for their choices. This may inform the choice of outcomes for research to support shared decision-making in patients with CKD.

METHODS

This study was conducted as part of a broader study on patient and caregiver perspective on nomenclature for kidney health and outcomes in CKD. This paper is specifically focused on the identification, prioritization and discussion of outcomes important for research in CKD. We included health outcomes including clinical, biochemical, and patient-reported (outcomes that reflect how patients feel and function^{22,23}). We used the Consolidated Criteria for Reporting Qualitative Studies (COREQ) to report this study²⁴.

Participant selection

Adult patients aged 18 years or over, with any stage of CKD (Stage 1-5 including those receiving dialysis (5D) and kidney transplant recipients (5T), and the caregivers (family member or support person involved in the patient's care), English-speaking, and able to provide informed consent, were eligible. Participants receiving kidney replacement therapy at the time of the study were included because they are able to reflect on relevant experiences prior to the need for dialysis or transplant. Participants were recruited from the Standardized Outcomes in Nephrology (SONG) Initiative Network using a standardized invitation email, and also by recruiting clinicians across four centers in the United States (Houston, Dallas), Australia (Sydney, Armidale), United Kingdom (London, Sheffield). Baylor College of Medicine, The University of Sydney, Imperial College Healthcare NHS Trust, and the University of Sheffield provided ethics/governance approval, and all participants provided written informed consent. We used a purposive sampling approach to ensure a diverse range of demographic (age, gender), and clinical (cause and stage of CKD) characteristics as was feasible. We provided participants a reimbursement of \$50 USD (equivalent in local currency) to cover travel expenses.

Data Collection

We used the nominal group technique²⁵ embedded in focus groups to identify and rank outcomes important for research in CKD, and to discuss reasons for their choices. The nominal group technique is a structured method for group brain storming that encourages contribution from all group members, and facilitates consensus through prioritization and discussion of ideas^{25,26}. The two-hour groups were convened in centrally located venues external to clinical settings from March to May 2019. We developed the question guide based on previous studies on identifying priority outcomes in patients on kidney replacement therapy²⁷⁻²⁹. (Supplementary Table 1) A single facilitator (AT, TG) moderated the group, and a co-facilitator (LD, JS, NSR, PLV, AB) recorded field notes. Participants were asked to: i) discuss their experiences and the impact of CKD and treatment prior to kidney replacement therapy; ii) identify outcomes they believed were important to assess in research; iii) to review a list of outcomes (initially 26 outcomes from selected systematic reviews of trials in CKD and to add additional outcomes as relevant (the facilitator also added outcomes identified from part i and ii of the discussion); see Supplementary Table 1); iv) rank the top 10 in order of importance; and v) discuss the reasons for their choices, focussing on the top three. We convened groups until data saturation, defined as when no new outcomes or concepts (reasons) were identified by subsequent groups. We audio-taped and transcribed all sessions.

Data Analysis

Nominal Group Ranking

The importance score for each outcome was computed as the average of the reciprocal rankings²⁹. It incorporates the consistency of being nominated and the rankings given by the participants. The importance score (IS) for each outcome was computed as the average of the reciprocal rankings. The reciprocal ranking was defined as 1 over the ranking assigned by each participant to each outcome. For example, if mortality is ranked first by one participant and third by another, the reciprocal rankings will be 1 and 1/3, respectively. If the outcome was not ranked by the participant, it was given a 0 as the reciprocal ranking. A higher reciprocal ranking indicates higher priority of the outcome. This score takes into account the importance given to the outcome by the ranking and the consistency of being nominated by the participants. We used Stata/SE version 14.0 (StataCorp. College Station, TX) and the R version 3.2.3 (R Foundation for Statistical Computing, Vienna, Austria) to analyze the data.

Qualitative Analysis

We entered transcripts into HyperRESEARCH software (ResearchWare Inc. Version 3.7.3, Randolph, MA). Using thematic analysis with constant comparison, we inductively identified themes that reflected the reasons for the identification and prioritization of outcomes. Author A.M.G reviewed the transcripts line by line, assigned codes to meaningful segments of text, and compared the concepts within and across each focus/nominal group to develop preliminary themes. To ensure the themes captured the diversity depth of data, three investigators (AT, TG, PLV) read the transcripts and reviewed and discussed the themes with A.M.G until consensus was reached³⁰.

RESULTS

Participant Characteristics

Across the 10 focus groups, the 67 participants included 54 patients and 13 caregivers; 43 (64%) were female. We conducted three groups in the United States (n=21), four groups in Australia (n=28), and three groups in the United Kingdom (n=18). (Table 2, Supplementary Table 2). At the time of the study, 16 patients were not on kidney replacement therapy and 38 patients were on kidney replacement therapy (hemodialysis, n=14; peritoneal dialysis, n=4, kidney transplant n=20).

Nominal Group Ranking

In total, 36 unique outcomes were identified and prioritized. Overall, the top ten based on the importance score were: kidney function (importance score = 0.32), “end-stage kidney disease” ESKD (0.21), fatigue (0.20), mortality (0.19), life participation (0.19), blood pressure (0.14), cognition (0.10), and anxiety (0.08). (Figure 1). The top 10 for patients were kidney function (0.42), ESKD (0.29), fatigue (0.26), mortality (0.25), life participation (0.20), blood pressure (0.17), cognition (0.13), infection (0.10), pain (0.09), and cardiovascular disease (0.08). For caregivers, the top 10 were life participation (0.38), kidney function (0.37), mortality (0.23), fatigue (0.21), anxiety (0.20), depression (0.19), blood pressure (0.17), sleep (0.16), cognition (0.15), and ESKD (0.13). (Figure 1)

Both groups (patient not receiving and receiving kidney replacement therapy) ranked kidney function, mortality, fatigue, blood pressure, ESKD, cognition and life participation in the top seven. This was followed by pain, infection, anxiety among patients not on kidney replacement therapy; and infection, cardiovascular disease, and depression for patients receiving kidney replacement therapy. (Supplementary Table 3) Comparing by sex, the top five for women were kidney function (0.41), mortality (0.29), life participation (0.28), fatigue (0.24), and ESKD (0.21). The top five for men were kidney function (0.41), ESKD (0.34), fatigue (0.27), blood pressure (0.18), and mortality (0.17).

Across the three countries, seven outcomes were consistently among the top 10, kidney function, ESKD, mortality, fatigue, life participation, blood pressure and cognition. The top five ranked by participants in the United States were: ESKD (0.39), kidney function (0.31), mortality (0.24), fatigue (0.20), and life participation (0.18); in Australia were: kidney function (0.40), fatigue (0.31), life participation (0.30), mortality (0.21), and cognition (0.18); and in the UK were: kidney function (0.54), ESKD (0.13), mortality (0.31), blood pressure (0.24), and fatigue (0.24).

Themes

We identified five themes that explained participants' choices and prioritization of outcomes. The description of the themes in the following section applied to both patients and caregivers unless otherwise specified. Supporting quotations for each theme are provided in Table 2. A thematic schema to show the conceptual links among the themes and ranking of outcomes is provided in Figure 2.

Re-evaluating and reframing life

Despair in being confronted with death: Upon being diagnosed, some participants initially believed that CKD was terminal. They felt confronted by their mortality and risk of death, and thus gave higher importance to mortality – *"But when you're in early stage, you would want to know. That was the first question, am I going to die?"* Patients considered the importance of outcomes based on their perceived associated risk with mortality. For example, they believed declining kidney function increased their risk of death. They worried about losing time with their *family* – *"Mortality. I have young children now. I started crying, my children are young."*

Making the most of life left: After the initial shock of receiving their diagnosis, some patients strived to make the most of the situation – *“Getting sick has made me appreciate things more, and I’m actually doing more with myself now. I’m more active, I’m more positive, and it took getting sick to do it so.”* They gave higher priority to outcomes that enabled them to maintain their quality of life (e.g. life participation) and live as well as they could in the time they had left – *“I’m still living. I get out of bed, and I’m still living and still breathing. As long as I can do that, I’m going to carry on and be positive because life is short.”*

Intensified kidney consciousness

Fear of needing dialysis: Participants feared the need for dialysis because it meant losing opportunities in life such as travelling. For this reason, some ranked kidney function, ESKD, anxiety and life participation highly – *“You’re going to have to go do dialysis at some point...you watch the numbers go down. Can you think of a guillotine swinging? Getting lower and lower and lower and lower. (Anxiety)* Another patient stated, *“I watched dialysis break [my mum’s] body down. I was determined not to be in that condition or those same issues once I went on dialysis.”*

Enabling self-management to prevent disease progression: Knowledge of their kidney function enabled them to monitor their kidney health and take action to manage their condition and slow its progression, and thus it was highly prioritized – *“I was told I would be on dialysis in three years. But if I did this and that and not that, I could stretch it out a bit. Well, it stretched out for 17 years.”* Monitoring kidney function felt like a “waiting game.”

Repercussions on cardiovascular health: Some participants were aware that blood pressure was associated with kidney disease, and that blood pressure and kidney disease increased their risk of cardiovascular events – *“The fluid build up around your heart can put too much stress on your*

heart.” However, some participants assigned lower importance to these outcomes because they believe that could control the risk by taking medications.

Battling unrelenting and debilitating burdens

Impairing life activities and goals: The ongoing symptoms of kidney disease affected participants’ abilities to do activities of daily living. Some experienced debilitating fatigue that prevented them from being able to do or finish simple daily tasks and lead a normal life – *“No matter how much sleep or rest or holiday, you still wake up feeling as tired as or tireder in the morning than you felt when you went to bed.”* Some focussed on outcomes that were threats to personal goals, for example, achieving parenthood – *“I didn't care about the kidney function, as long as they said I could still go ahead and fall [become] pregnant.”*

Mentally and emotionally incapacitated: Mental health and cognitive impairment were difficult to manage and interfered with daily living, including work – *“I asked my boss from our previous company to fire me because I made a mistake, I was like, how could I have done this? I must've just been absent mentally or just not been able to think about it when I was doing it. There were things that I was just like, I know this word, or I lose things.”* Some expressed feeling depressed, grief, and in denial because of the diagnosis of CKD – *“It [CKD] is not happening now, not happening to me. My family used to call me the queen of denial! It is grief. Is it not?”* Some felt that these struggles were hidden – *“...you present yourself as healthy to the world. Yet, you really have all these struggling underneath it all,”* and not discussed in clinic – *“you don't tend to talk about your lack of cognition. You don't tend to talk about your depression, the feeling of isolation.”*

Dreading upheaval and constraints

An uncertain and precarious trajectory: Some participants found it difficult to predict the course of their kidney disease, which was challenging to cope with. They felt their health was in constant danger and this contributed to and exacerbated their anxieties – *“This is a game where you do not get to know the rules until you start playing.”*

Trauma of hospitalization: Participants who had been hospitalized described the pain, treatment and overall experience as frustrating and traumatizing, and some continued to feel distress after their discharge – *“I’ve really struggled with hospitals because I got stuck in the hospital for six months while they were trying to sort out a range of things. And it was just horrible.”* Some felt disorientated and confused whilst in hospital as they did not feel completely aware of the situation – *“Any time I hear the word hospitalization, it’s just like, okay, something serious is going on.”*

Resigned to a bleak future: Some resigned themselves to the reality that their health could only deteriorate toward “end-stage of kidney disease” and realized they would eventually require kidney replacement therapy– *“It [my kidney] can never go back to its normal self. It’s always going to be sick. Whereas your liver, it grows back or whatever but, the kidney, once you have this disease, there’s no going back to 100%.”*

Taboo and unspoken concerns

Enduring embarrassing issues: Some patients identified that certain outcomes were difficult to broach in the clinical setting, such as sexual function – *“intimacy suffers because kidney disease, that’s the last thing you want to think about when you’re feeling sick”*. They felt doctors were reluctant to discuss such issues that were important to them – *“I was 23 and my husband was interested in sex. I’m anemic. So it’s like, okay, I’ll just lay there honey, I’m sorry, you know? No, honestly, that is something that is not addressed.”*

Problems unaddressed in time-limited consultation: Most participants felt frustrated that the questions about their health, in particular kidney function, were not discussed or explained adequately by clinicians – *“He just didn’t explain anything to me, he thought that I didn’t need to know what my kidney function is, he had it under control and that’s all that mattered”*. Some patients felt helpless – *“When you go see your specialist, here’s your levels; here’s your hat, you’ve had your 20 minutes.”*

Vague implications of biochemical parameters: Some patients felt that they did not understand the biochemical parameters their doctors spoke about during their consultations. – *“The specialists walk in; they say a list of numbers, okay this number does that, that means you do this, that means you do that, goodbye.”* They felt uncertain and lost without knowing the implications of these biochemical results on their physical and emotional health, symptoms, and prognosis – *“When you’ve just got a bunch of numerals there, you’re like oh, okay. What does it refer to? What stage is it? What does that stage mean? It’s not something any of us would just walk into an office and understand.”*

DISCUSSION

The outcomes of high priority to patients and caregivers for research in the stages of CKD prior to kidney replacement therapy were kidney function, life participation, mortality, fatigue, and ESKD. This was followed by blood pressure and outcomes related to mental health including anxiety, cognition, and depression, which were prioritized higher compared with clinical outcomes of cardiovascular disease and hospitalization. This prioritization was underpinned by a number of reasons. The shock of the diagnosis and potential need for kidney replacement therapy prompted patients to re-evaluate their life and indicated mortality and life participation as high priorities so

they could live as well as they could whilst they were still alive and prior to receiving dialysis.

Some become focussed on maintaining kidney health and slowing the progression of the disease (maintaining kidney function), and minimizing the risks of life-threatening comorbidities including cardiovascular disease. Some outcomes were highly prioritized because they disrupted daily living and threatened life goals, were overlooked by clinicians, or because they caused or exacerbated uncertainty, trauma, and distress.

There were some differences in the prioritization of outcome by patients and caregivers, CKD treatment stage, and by country. Based on the mean importance scores, caregivers gave higher priority to outcomes related to mental health and cognition. It is possible that the impact of depressive symptoms or anxiety in patients is apparent and also challenging for caregivers. Pain and anxiety were unique to the top 10 prioritized outcomes by patients not receiving kidney replacement therapy. This is perhaps expected as patients expressed strong anxieties about their diagnosis, progression of disease, and fear of dialysis. Of note, there appeared to be a predominant focus on death and dialysis in prioritizing outcomes, with relatively little reference to transplantation. This may be because some participants were not eligible for or could not access transplantation or had overriding fears about mortality and dialysis. It may also suggest the need for patient and caregiver education to emphasize transplantation as an option to minimize or avoid the need for dialysis.

Cardiovascular disease and depression appeared in the top 10 for patients who were on kidney replacement therapy. It may be that they had more time to become aware about the risks of comorbidities. Most of the top ranked outcomes were the same across the United States, Australia and United Kingdom. Cardiovascular disease and hospitalization were unique to the top 10 in the United States and ESKD was the top priority in the United States, compared with Australia and the United Kingdom where ESKD was ranked eight based on importance scores. A possible explanation is that universal health coverage is not provided in the United States and patients may

be concerned about the financial consequences in accessing healthcare for these major medical outcomes. Anxiety and depression were in the top in Australia, perhaps because more caregivers were present. In the UK, pain and fluid/weight were in the top 10.

Other studies in the CKD population have also found that survival, slowing the progression of CKD, depression, cardiovascular disease, symptoms (fatigue, cramping, headaches, pruritis), and side-effects of medications are important to patients¹⁴⁻¹⁸. Having to adapt and cope with the uncertainty and unpredictability of the disease and the impact it also has on the family have also been noted in prior studies in CKD³¹. Comparison across treatment stage, the high priority given to the outcomes of mortality, life participation, fatigue, depression and anxiety, and cardiovascular disease are generally consistent with patient priorities identified in dialysis and kidney transplantation^{27-29,32,33}. However, kidney function and cognition appear to be of higher priority in CKD. For patients, kidney function is an important indicator of kidney health, prognosis – including the need to start dialysis, and to inform and motivate self-management.

Cognition was also important to patients in our study as it can interfere with work, can hamper functioning, and may not be addressed in clinical care. Cognitive impairment is common in patients with CKD³⁴. Patients even in an early stage of CKD have an increased risk of cognitive impairment, specifically in the visual-spatial organization and memory (VSOM), scanning and tracking, and language domains³⁵. Another study also found that lower eGFR is associated with worse global cognitive function and memory³⁶.

Our study involved a reasonably diverse sample of patients and caregivers from three countries. The mixed methods design using nominal group technique to identify and quantify the relative importance of outcomes, combined with focus group discussion to describe the reasons for their choices, generated comprehensive insights. However, there are some potential limitations. We took

a broad approach to CKD and did not power the study for subgroup analyses, for example, by type or cause of CKD, or by stage of CKD. The participants were heterogenous group of patients with CKD, most of whom had kidney failure requiring kidney replacement therapy. However, participants were explicitly asked to identify and prioritize outcomes for CKD prior to the need for kidney replacement therapy. Participants were not asked to self-report their stage of CKD. Patients with early stage CKD may not progress to kidney failure requiring kidney replacement therapy. We cannot determine if the importance of outcomes, for example ESKD, may differ between patients with earlier stages of CKD compared with patients at a later stage of CKD. It is possible that concerns may differ between patients with advanced CKD who received a kidney transplant and those patients with earlier stage CKD not requiring kidney replacement therapy, however this was not found in our study. Further work to assess the priorities of a larger population of patients at different stages of CKD may be able to determine differences in priorities by CKD stages. The transferability of the findings to low-income countries and non-English speaking populations is uncertain, as they were not included in our study. Finally, providing a pre-pared list of outcomes may have limited the discussion. Also, transplantation, including pre-emptive transplantation, was defined in our study as an intervention and was therefore not captured as an outcome in the context of this study. However, outcomes identified in the general discussion on the impacts of CKD and treatment were added to the list. Across the groups, 10 new outcomes were added.

Patient priorities for outcomes may not always be recognized by clinicians³⁷. A recent study comparing patient and provider perception of priorities for older adults with advanced CKD found that providers were correct only 35% of the time³⁸. We have identified patient priorities for outcomes in CKD, which can be explicitly addressed in patient education and shared decision-making to support patient-centered care. Of note, limited health literacy is recognized as a barrier to education in CKD³⁹. Cognitive function has been found to explain associations between health

literacy, physical health and depression⁴⁰. Cognition, an important outcome for patients, needs to be explicitly considered and addressed in the context of patient education and care in CKD.

The prioritization of outcomes in this study will directly inform subsequent efforts through the Standardised Outcomes in Nephrology (SONG) initiative, to establish core outcomes for trials in CKD⁴¹. Consistent reporting of outcomes that are critically important to patients, caregivers and health professionals can strengthen trial-based evidence to inform decision-making.

For patients and caregivers, kidney function, life participation, mortality, fatigue and ESKD were outcomes of highest priority in CKD. Mental health, including depression, anxiety, cognition, and comorbidities such as cardiovascular disease, and debilitating symptoms were also of importance to patients. These priorities were driven by the shock and uncertainty of the diagnosis, avoiding the need for kidney replacement therapy, being able to do daily activities and achieve life goals, and the need to bring attention to concerns that often remained unspoken and unaddressed in clinical settings. There is a need to broaden the research agenda and care in CKD to improve patient-centered outcomes in this population.

Figure legends

Figure 1. Importance scores for outcomes by patients and caregivers; ordered by the overall score.

Shown are median scores, with standard error represented by error bars.

Figure 2. Schema depicting themes underpinning the prioritization of outcomes for CKD by patients and caregivers

Supplementary Material

Supplementary Table 1: Nominal group question guide and initial list of outcomes

Supplementary Table 2: Location and number of participants in each nominal group.

Supplementary Table 3: Top ten outcomes by CKD treatment stage

Supplementary Table 4: Top ten outcomes by country

Article information

Acknowledgements:

We thank all the patients and family members who gave their time to participate in the study.

Support and financial declaration: The authors have no financial relationships relevant to this article to disclose. A.T. is supported by a NHMRC Fellowship (ID1106716). The study was funded by the NHMRC Program Grant Better Evidence and Translation in Chronic Kidney Disease (BEAT-CKD) (ID1092957). The funder had no role in the study design, data collection, analysis, reporting, or the decision to submit for publication.

Financial conflict of interest:

Andrea Matus Gonzalez	none
Talia Gutman	none
Pamela Lopez-Vargas	none
Samaya Anumudu	none
Cristina M. Arce	none
Jonathan C. Craig	none
Louese Dunn	none
Kai-Uwe Eckardt	none
Tess Harris	none
Andrew S. Levey	none
Liz Lightstone	none
Nicole Scholes-Robertson	none
Jenny I. Shen	none
Armando Teixeira-Pinto	none

David C. Wheeler	none
Dave White	none
Martin Wilkie	none
Michel Jadoul	none
Wolfgang C. Winkelmayr	none
Allison Tong	none

Contributions: Research idea and study design: AMG, TG, PLV, SA, CA, JCC, LD, KE, TH, ASL, LL, NSR, JIS, ATP, DCW, DW, MW, MJ, WCW, AT; data acquisition: AMG, TG, PLV, LD, NSR; data analysis/interpretation: AMG, TG, PLV, SA, CA, JCC, LD, KE, TH, ASL, LL, NSR, JIS, ATP, DCW, DW, MW, MJ, WCW; supervision or mentorship: AT, PLV, JCC, ATP. Each author contributed important intellectual content during manuscript drafting or revision and agrees to be personally accountable for the individual's own contributions and to ensure that questions pertaining to the accuracy or integrity of any portion of the work, even one in which the author was not directly involved, are appropriately investigated and resolved, including with documentation in the literature if appropriate

REFERENCES

1. Jha V, Garcia-Garcia G, Iseki K, et al. Chronic kidney disease: global dimension and perspectives. *Lancet*. 2013;382(9888):260-272.
2. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu CY. Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. *N Engl J Med*. 2004;351(13):1296-1305.
3. Drawz P, Rahman M. Chronic kidney disease. *Ann Intern Med*. 2015;162(11):ITC1-16.
4. Grams ME, Sang Y, Ballew SH, et al. Predicting timing of clinical outcomes in patients with chronic kidney disease and severely decreased glomerular filtration rate. *Kidney Int*. 2018;93(6):1442-1451.
5. Thomas B, Matsushita K, Abate KH, et al. Global cardiovascular and renal outcomes of reduced eGFR. *J Am Soc Nephrol*. 2017;27(7):2167-2179.
6. Saunders MR, Cifu A, Vela M. Screening for chronic kidney disease. *J Am Med Assoc*. 2015;314(6):615-616.
7. Uhlig K, Levey AS. Developing outcomes for chronic kidney disease: we should include all of the outcomes. *Ann Intern Med*. 2012;156(8):599-601.
8. Palmer S, Vecchio M, Craig JC, et al. Prevalence of depression in chronic kidney disease: systematic review and meta-analysis of observational studies. *Kidney Int*. 2013;84(1):179-191.
9. Cabrera VJ, Hansson J, Kliger AS, Finkelstein FO. Symptom management of the patient with CKD: the role of dialysis. *12*. 2017;4(687-93).
10. Artom M, Moss-Morris R, Caskey F, Chilcot J. Fatigue in advanced kidney disease. *Kidney Int*. 2014;86(3):497-505.
11. Roshanravan B, Gamboa J, Wilund K. Exercise and CKD: skeletal muscle dysfunction and practical application of exercise to prevent and treatment physical impairments in CKD. *Am J Kidney Dis*. 2017;89(6):837-852.
12. Eckardt KU, Bansal N, Coresh J, et al. Improving the prognosis of patients with severely decreased glomerular filtration rate (CKD G4+): conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney Int*. 2018;93(6):1281-1292.
13. Teasdale EJ, Leydon G, Fraser S, Roderick P, Taal MW, Tonkin-Crine S. Patients' experiences after CKD diagnosis: a meta-ethnographic study and systematic review. *Am J Kidney Dis*. 2017;70(5):656-665.
14. Tong A, Lopez-Vargas P, Howell M, et al. Consumer involvement in topic and outcome selection in the development of clinical practice guidelines. *Health Expect*. 2012;15(4):410-423.
15. Manns B, Hemmelgarn B, Lillie E, et al. Setting research priorities for patients on or nearing dialysis. *Clin J Am Soc Nephrol*. 2014;9(10):1813-1821.
16. Tong A, Sainsbury P, Carter SM, et al. Patients' priorities for health research: focus group study of patients with chronic kidney disease. *Nephrol Dial Transplant*. 2008;23(10):3206-3214.
17. Hemmelgarn BR, Pannu N, Ahmed SB, et al. Determining the research priorities for patients with chronic kidney disease not on dialysis. *Nephrol Dial Transplant*. 2017;32(5):847-854.
18. Tong A, Crowe S, Chando S, et al. Research priorities in CKD: report of a national workshop conducted in Australia. *Am J Kidney Dis*. 2015;66(2):212-222.
19. Levey AS, Inker LA, Coresh J. Chronic kidney disease in older people. *J Am Med Assoc*. 2015;314(6):557-558.
20. Chong K, Unruh M. Why does quality of life remain an under-investigated issue in chronic kidney disease and why is it rarely set as an outcome measure in trials in this population? *Nephrol Dial Transplant*. 2017;32(S2):ii47-52.

21. Selewski DT, Thompson A, Kovacs S, et al. Patient-reported outcomes in glomerular disease. *Clin J Am Soc Nephrol*. 2017;12(1):140-148.
22. Dawson J, Doll H, Fitzpatrick R, Jenkinson C, Carr AJ. The routine use of patient reported outcome measures in healthcare settings. *BMJ*. 2010;340:c186.
23. Ju A, Tong A. Considerations and challenges in selecting patient-reported outcome measures for clinical trials in nephrology. *Clin J Am Soc Nephrol*. 2017;12(11):1882-1884.
24. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-357.
25. Jones J, Hunter D. Consensus methods for medical and health services research. *BMJ*. 1995;311(7001):376-380.
26. Manera KE, Hanson CS, Gutman T, Tong A. Chapter 42. Consensus methods: nominal group technique. In: Liamputtong P, ed. *Handbook of Research Methods in Health Social Sciences*. Singapore: Springer Nature 2019.
27. Urquhart-Secord R, Craig JC, Hemmelgarn B, et al. Patient and caregiver priorities for outcomes in hemodialysis: an international nominal group technique study. *Am J Kidney Dis*. 2016;68(3):444-454.
28. Howell M, Tong A, Wong G, Craig JC, Howard K. Important outcomes for kidney transplant recipients: a nominal group and qualitative study. *Am J Kidney Dis*. 2012;60(23):186-196.
29. Manera KE, Johnson DW, Craig JC, et al. Patient and caregiver priorities for outcomes in peritoneal dialysis. *Clin J Am Soc Nephrol*. 2019;14(1):74-83.
30. Giacomini MK, Cook DJ. Users' guides to the medical literature: XXIII. Qualitative research in health care A. Are the results of the study valid? Evidence-Based Medicine Working Group. *JAMA*. 2000;283(3):357-362.
31. Schipper K, Abma TA. Coping, family and mastery: top priorities for social science research by patients with chronic kidney disease. *Nephrol Dial Transplant*. 2011;26(10):3189-3195.
32. Evangelidis N, Tong A, Manns B, et al. Developing a set of core outcomes for trials in hemodialysis: an international Delphi survey. *Am J Kidney Dis*. 2017;70(4):464-475.
33. Flythe JE, Hilliard T, Castillo G, et al. Symptom prioritization among adults receiving in-center hemodialysis: a mixed methods study. *Clin J Am Soc Nephrol*. 2018;13(5):735-745.
34. Van Sandwijk MS, Ten Berge IJ, Majoie CB, et al. Cognitive changes in chronic kidney disease and after transplantation. *Transplant*. 2016;100(4):734-742.
35. Torres RV, Elias MF, Seliger S, Davey A, Robbins MA. Risk for cognitive impairment across 22 measures of cognitive ability in early-stage chronic kidney disease. *Nephrol Dial Transplant*. 2017;32(2):299-306.
36. Weiner DE, Gaussoin SA, Nord J, et al. Cognitive function and kidney disease: baseline data from the systolic blood pressure intervention trial (SPRINT). *Am J Kidney Dis*. 2017;70(3):357-367.
37. Tonelli M. The roads less traveled? Diverging research and clinical priorities for dialysis patients and those with less severe CKD. *Am J Kidney Dis*. 2014;63(1):124-132.
38. Ramer SJ, McCall NN, Robinson-Cohen C, et al. Health outcome priorities of older adults with advanced CKD and concordance with their nephrology providers' perceptions. *J Am Soc Nephrol*. 2018;29(12):2870-2878.
39. A. N, Norton JM, Bouleware LE. Educating patients about CKD: the path to self-management and patient-centered care. *Clin J Am Soc Nephrol*. 2016;11(4):694-703.
40. Serper M, Patzer RE, Curtis LM, et al. Health literacy, cognitive ability, and functional health status among older adults. *Health Serv Res*. 2014;49(4):1249-1267.
41. Tong A, Manns B, Wang AYM, et al. Implementing core outcomes in kidney disease: report of the Standardized Outcomes in Nephrology (SONG) implementation workshop. *Kidney Int*. 2018;94(6):1053-1068.

Table 1. Characteristics of participants (N=67)

Characteristics	n (%)
Role	
Patient	54 (81)
Caregiver	13 (19)
Sex	
Male	24 (36)
Female	43 (64)
Country	
United States (3 groups)	21 (31)
Australia (4 groups)	28 (42)
United Kingdom (3 groups)	18 ((27)
Ethnicity^a	
White	46 (69)
African American	11 (16)
Asian	4 (6)
Other*	6 (9)
Age (years)	
18-30	4 (6)
31-40	8 (12)
41-50	12 (18)
51-60	23 (34)
61-70	15 (22)
>70	5 (8)
Marital status	
Single/widowed	18 (27)
Married/Partnered	39 (58)
Divorced/separated	10 (15)
Number of children	
0	18 (27)
1-2	32 (48)
3 or more	17 (25)
Employment	
Full time	24 (36)
Part time/casual	11 (16)
Student	3 (5)
Not employed/disability	13 (19)
Retired	16 (24)
Education	
Before 10th grade before 16 yrs	4 (6)
Completed 10 th grade 16 yrs	5 (7)
Completed 12 th grade 17/18 yrs	7 (11)
Professional certificate	11 (16)
Undergraduate degree	22 (33)
Postgraduate degree	18 (27)
Age at time of diagnosis*	
<18	5 (9)
18-30	11 (20)
31-40	10 (19)
41-50	13 (24)
>50	14 (26)
Time since diagnosis of CKD (years)	
<1	5 (9)
1-5	15 (28)
6-10	11 (20)
11-15	8 (15)

>15	14 (26)
Cause of kidney disease*	
Diabetes	9 (17)
Hypertension	19 (35)
PKD	7 (13)
Glomerulonephritis	19 (35)
Infection	2 (4)
Immune/autoimmune	7 (13)
Reflux nephropathy	1 (2)
Unknown/don't know	3 (6)
Other ^c	6 (11)
Type of kidney replacement therapy (current)*	
None	16 (30)
Hemodialysis	14 (26)
Peritoneal dialysis	4 (7)
Kidney transplant	20 (37)
Duration of kidney replacement therapy (current)*	
Less than 12 months	4 (7)
1-3 years	13 (24)
4-6 years	7 (13)
More than 6 years	15 (28)

^aHispanic/Latino (n=1), Aboriginal Australian (n=1), Pakistani (n=2), Middle Eastern (n=1), Indian (n=1); **Patients only (may include missing data if patients did not respond to the question)

Table 2: Illustrative quotes

Theme	Illustrative quotations
RE-EVALUATING AND REFRAMING LIFE	
Despair in being confronted with death	<p>"And the first thing you think of is, dang, I'm going to die! You know? It's end stage. My kidney's going to stop working. I could wake up tomorrow and my kidney could be, you know? You could get hit with all that." (Female, US, CKD).</p> <p>"It's kind of a scary thing because when you have a kidney disease, you know that if your kidneys aren't functioning you're going to die. You just know that you're going to go to dialysis and you're going to die." (Female, UK, CKD)</p> <p>"But when you're in early stage, you would want to know. That was the first question, am I going to die?" (Female, UK, Tx).</p>
Making the most of life left	<p>"I want to live as long as I can, because I've got two grandchildren and three children and I want to see them for as long as I can. That's why I'm here." (Female, UK, CKD).</p> <p>"I'm not going to let this disease beat me. I am going to be on top of this. If it does, well I've done a lot of things in my life that I don't regret" (Female, Australia, HD)</p> <p>"So, it doesn't actually really matter what the numbers say, and some of my numbers should have suggested that I should be feeling a lot worse than what I actually was, it's about how much I feel I can do and participate in my life and feel normal". (Female, Australia, CKD)</p> <p>"I'm really keen on living well. Looking at the future, my decisions of what will really help me to live well and to feel well, that will guide my decision-making at all stages of it". (Female, UK, CKD).</p>
INTENSIFIED KIDNEY CONSCIOUSNESS	
Fear of needing dialysis	<p>"It's kind of a scary thing because when you have a kidney disease, you know that if your kidneys aren't functioning you're going to die. You just know that you're going to go to dialysis and you're going to die" (Female, UK, CKD)</p> <p>"Basically, when you hit level five [CKD Stage 5], it's time to either plan to meet your maker or go on dialysis. (Male, Australia, caregiver)</p>
Enabling self-management to prevent disease progression	<p>"How much of the responsibility is ours in terms of, we have this disease whether we like it or not and we have to accept it. How much of that responsibility is to find out about it, to understand it, to educate ourselves, because it's my disease and I need to manage it because I'm the best person to do that, and how much of it should be the hospital's responsibility or physician's responsibility or GP's responsibility, at least to provide the right information? (Male, UK, HD)</p>
Repercussions on cardiovascular health	<p>"For the kidney to be silent and long-term, but for blood pressure I feel it is more active and it can kill within no time." (Male, UK, CKD)</p> <p>"He [the patient] is all the time, saying, "Oh, it is my heart, it is my heart, it is my heart!"(Female, Australia, HD)</p>
BATTLING UNRELENTING AND DEBILITATING BURDENS	
Impairing life activities and goals	<p>"I still want to be able to do what I've always done and I can't". (Female, Australia, CKD)</p> <p>"Fatigue was her number one thing. She was going to school full time, I don't know how she managed that. She'd go to school and come home and sleep the whole day." (Female, US, caregiver)</p> <p>"I got frustrated because of the medications that they put you on. And I couldn't function on the court because it was messing with my vision and doing different things in my body that I'd never experienced before".(Female, US, Tx)</p>
Mentally and emotionally incapacitated	<p>"You have to realize that the other 35% of those toxins are still running around in your body. And they affect not only your, your organs, but they affect your brain, which affects your cognition, your emotions and all of that. I would find myself just snapping at my husband for just no reason at all. I mean, there are reasons I would just be, I wake up in the morning, just be irritated. I didn't want to be talked to, I didn't want to be bothered" (Female, US, HD).</p> <p>"Just in terms of with any kind of disease and particularly since we're here discussing this there is a mental and emotional impact, finding out you have this, stages of grief and then there's things that you go through" (Female, Australia, caregiver)</p>

DREADING UPHEAVAL AND CONSTRAINTS	
An uncertain and precarious trajectory	"It's like knowing but not knowing, you sort of know what sort of track you're going down but you don't know what's on the way, or if you're going to stay on the way." (Female, UK, HD)
Trauma of hospitalization	"When I go the hospital, my mom will come, and she'll immediately tell them, you better do something to sedate her, because she will, every 10 minutes, fight with you to leave here. If you want her to be here for any amount of time to help her, you need to give her something to calm her down, because after day one or two, I'll start demanding to leave" (Female, US, Tx).
Resigned to a bleak future	"I'll start. I'm first thing that comes to mind when I hear kidney disease is "no cure" (Female, US, Tx)
TABOO AND UNSPOKEN CONCERNS	
Enduring embarrassing issues	"You will go to your doctor and you will talk about your levels, you talk about your itchy skin. You don't talk about your sex drive". (Male, Australia, PD)
Problems unaddressed in time-limited consultation	<p>"Because the point is, from their perspective, what are they doing? They're monitoring us, they're managing us medically, they're worried about the GFR, they're worried about the medical aspect of the treatments" (Male, Australia, PD)</p> <p>"When it started with me, there was only the specialist, and the GPs don't want to say too much. I would've liked to have been able to talk to someone...somebody that you can talk to about what is wrong with you" (Male, Australia, PD)</p> <p>"I needed to know exactly where I was at with my kidney function" (Female, Australia, Tx)</p>
Vague implications of biochemical parameters	<p>"If they're talking to us about symptoms, they'd manage the symptoms and how we felt more than focusing on the numbers." (Female, Australia, Tx)</p> <p>"Because when they were talking to my family about the different stages, they said well, okay well stage two, stage two out of what? Three? Ten? What?" (Female, Australia, Tx)</p>

CKD, chronic kidney disease (not receiving kidney replacement therapy), HD, hemodialysis, PD, peritoneal dialysis, Tx, transplant