BMJ Open

Optimising transitions of care for acute kidney injury survivors: protocol for a mixed-methods study of nephrologist and primary care provider recommendations

Heather Personett May ,[1] Abby K Krauter,[1] Dawn M Finnie,[2] Rozalina Grubina McCoy ,[3] Kianoush B Kashani,[4,5] Joan M Griffin,[2,6] Erin F Barreto,[1] For the ACT Study Group

To cite: May HP, Krauter AK, Finnie DM, *et al*. Optimising transitions of care for acute kidney injury survivors: protocol for a mixed-methods study of nephrologist and primary care provider recommendations. *BMJ Open* 2022;**12**:e058613. doi:10.1136/bmjopen-2021-058613

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2021-058613).

Received 28 October 2021
Accepted 19 May 2022

For numbered affiliations see end of article.

Correspondence to
Dr Heather Personett May; may.heather@mayo.edu

ABSTRACT

Introduction Acute kidney injury (AKI) affects nearly 20% of all hospitalised patients and is associated with poor outcomes. Long-term complications can be partially attributed to gaps in kidney-focused care and education during transitions. Building capacity across the healthcare spectrum by engaging a broad network of multidisciplinary providers to facilitate optimal follow-up care represents an important mechanism to address this existing care gap. Key participants include nephrologists and primary care providers and in-depth study of each specialty's approach to post-AKI care is essential to optimise care processes and healthcare delivery for AKI survivors.

Methods and analysis This explanatory sequential mixed-methods study uses survey and interview methodology to assess nephrologist and primary care provider recommendations for post-AKI care, including KAMPS (kidney function assessment, awareness and education, medication review, blood pressure monitoring and sick day education) elements of follow-up, the role of multispecialty collaboration, and views on care process-specific and patient-specific factors influencing healthcare delivery. Nephrologists and primary care providers will be surveyed to assess recommendations and clinical decision-making in the context of post-AKI care. Descriptive statistics and the Pearson's χ^2 or Fisher's exact test will be used to compare results between groups. This will be followed by semistructured interviews to gather rich, qualitative data that explains and/or connects results from the quantitative survey. Both deductive analysis and inductive analysis will occur to identify and compare themes.

Ethics and dissemination This study has been reviewed and deemed exempt by the Institutional Review Board at Mayo Clinic (IRB 20–008 793). The study was deemed exempt due to the sole use of survey and interview methodology. Results will be disseminated in presentations and manuscript form through peer-reviewed publication.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The sampling frame for both the quantitative and qualitative strands broadly represents the spectrum of post-AKI care providers, enhancing the generalisability of findings.
⇒ Iterative qualitative data collection and analysis and inclusion of an inductive analytic approach will facilitate adaptation of the sampling approach and interview guide over the course of the study and allow for exploration of new or unanticipated themes.
⇒ Integration of data among and between both strands to explore concordance or discordance enhances the veracity and internal validity of study findings.
⇒ Non-response bias is a concern with survey research and therefore some basic demographic information will be collected for the entire invited sample (including non-responders) to assess and describe this.
⇒ This survey measures provider recommendations through a small number of simulated cases and results may not accurately reflect real-time decisions made in practice; therefore, clinician views are explored in greater detail through qualitative interviews.

INTRODUCTION

Acute kidney injury (AKI) affects nearly 20% of all hospitalised patients[1] and the 80%–90% who survive hospitalisation are at higher risk for poor long-term outcomes compared with those discharged free from AKI. These complications, which include a 1.5–2.5-fold higher risk of chronic kidney disease (CKD), a 1.9-fold higher risk of cardiovascular disease[2–7] and frequent rehospitalisations,[2] decrease the quality of life for AKI survivors and strain healthcare resources.[8–10]

This significant risk of poor outcomes can be partially attributed to gaps in kidney-focused care and education during transitions. A minority of AKI survivors receive dedicated kidney health follow-up after discharge and prescription of potentially nephrotoxic

Table 1 Components of kidney follow-up care

K	**K**idney function assessment with laboratory testing
A	**A**wareness and education
M	**M**edication reconciliation and review
P	Individualised blood **P**ressure monitoring
S	**S**ick day education

medications occurs commonly in AKI survivors.[11 12] The Acute Disease Quality Initiative, an internationally recognised group of experts in kidney health, recommends a multidisciplinary approach to post-AKI care that includes implementation of the KAMPS framework (table 1) and encourages follow-up with a nephrology specialist for those with severe and/or prolonged AKI.[13] Each KAMPS element is designed to minimise AKI complications and promote patient engagement with kidney health. We previously demonstrated that 1 in 5 AKI survivors fail to receive a serum creatinine assessment (the 'K' in KAMPS) within 30 days of discharge. Incidence of a kidney function assessment and a healthcare visit (a necessary step to achieve the other KAMPS elements including education, medication review, blood pressure individualisation and counselling) was only 70% at 30 days.[14] Evidence describing the optimal processes for achieving of these objectives has yet to be elucidated. The limited reports of existing post-AKI care models describe routine incorporation of laboratory monitoring, patient education and medication review.[15–18] These models primarily rely on nephrologists to oversee all elements of kidney health follow-up and education, however only a small portion of AKI survivors engage in this follow-up. Studies demonstrate that individuals at highest risk for poor outcomes, such as those with AKI requiring dialysis, pre-existing CKD, and minimal kidney function recovery at the time of hospital dismissal, are seen by a nephrologist in only 36%–43% of cases[19 20] and the overall incidence of nephrology follow-up in AKI survivors may be as low as 8%.[14 21] Additionally, concerns have been raised regarding the accessibility and scalability of AKI survivor care models dependent solely on nephrologists. Specifically, limitations include lack of access to nephrology specialty care, particularly in low-income and rural areas, patient reluctance to add more doctors to their healthcare team, and the inability of nephrology practices to meet the growing demand for their services.[17 22 23] For these reasons, the broad implementation of AKI survivor care and components of the KAMPS framework cannot rely solely on nephrology specialists. Thus, there is a critical need to develop new pathways for delivery of key elements of post-AKI care and prioritise referral to nephrology specialty care for those highest risk patients who stand to benefit most.

Building capacity across the healthcare spectrum by engaging a broader network of providers to facilitate follow-up care represents a key mechanism to address these needs.[24] Primary care providers (PCPs) play an integral role in facilitating continuity of care during transitions from the hospital to a community setting, often using established transition models to reduce emergency department visits, rehospitalisations, costs, and improve quality of life and self-rated health.[25–29] These cost-effective, team-based strategies could be successfully leveraged to deliver better care for AKI survivors, as PCPs and nephrologists frequently and collaboratively care for patients with kidney disease.[22 30–32] To optimise cooperative care processes and healthcare delivery for AKI survivors, additional study is needed to understand how nephrologists and PCPs approach post-AKI care after hospitalisation, including implementation of the KAMPS framework.

This manuscript presents a mixed-methods protocol for a study to answer the research question: how do PCPs' and nephrologists' recommendations for post-AKI care compare? We will explore methods for implementing KAMPS elements, multispecialty collaboration, and care process-specific and patient-specific factors influencing healthcare delivery.

METHODS AND ANALYSIS

Overview and design

We will perform an explanatory sequential mixed-methods study to assess PCP and nephrologist recommendations for kidney follow-up care in the context of AKI survivorship during transitions of care (figure 1). The quantitative strand will be guided by a postpositivism worldview to assess clinical decision-making using case-based scenarios. Qualitative research will employ a realism framework to explain differences and further explore the perspectives of the two groups. This study was reviewed, deemed 'exempt' due to the sole use of survey and interview procedures, and approved by the Institutional Review Board (20–0 08 793) at Mayo Clinic on 21 October 2020, and data collection is currently ongoing. All research will be conducted during the global COVID-19 pandemic and is anticipated to conclude in 2022.

Patient and public involvement

No patient or member of the public was directly involved in the study design. The research question and outcome measure(s) in both quantitative and qualitative strands were informed by patients' priorities, experiences and preferences sourced from published data from clinical trials, qualitative patient interviews and patient-inclusive workshops and focus groups.[16 17 33 34]

Phase 1—quantitative strand

Survey development

A survey instrument was developed with the objective to assess provider recommendations and clinical decision-making in the context of post-AKI care (online supplemental appendix 1). Survey questions were developed using an emerging contextual framework, KAMPS, for construct validity. The KAMPS framework is derived

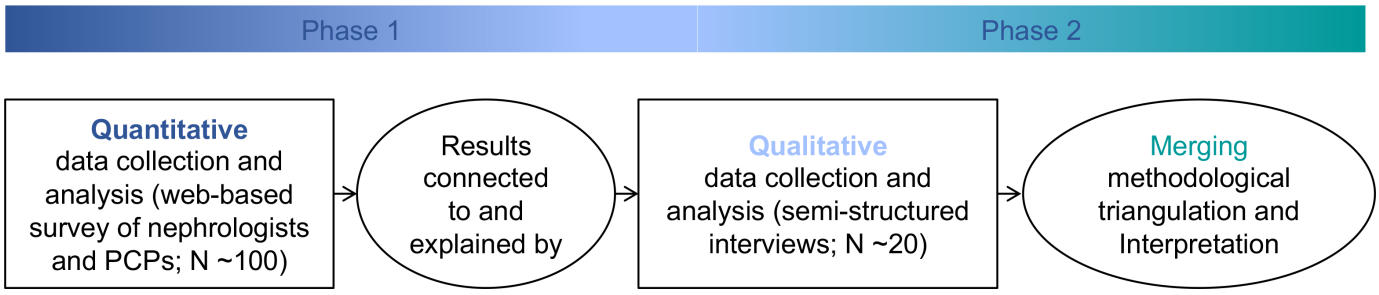

Figure 1 Explanatory sequential mixed-methods study design.

from expert recommendations for components of kidney follow-up care.[13] The survey measures behaviour related to kidney function monitoring, recognition of CKD, comorbid disease management, medication and lifestyle modification, and nephrology specialist referral through fictitious, case-based questions. The KAMPS framework primarily addresses what components of care should be delivered but not how to meet those goals. After construction by select study team members (HPM, AKK, EFB), cases were pilot tested and reviewed by board certified physicians in nephrology and primary care (KBK, RGM), study team members with >5 years of postgraduate experience in AKI survivorship care. Additional pilot testers were then recruited from among trainees in nephrology and primary care. Respondent debriefings were conducted with pilot testers to assess the content and face validity of the survey, and results used to iteratively refine the items. Construct validity is derived from comparison to KAMPS criteria, case review by study team members internationally recognised as experts in AKI care quality (KBK, EFB),[13] and existing literature demonstrating these specific gaps in post-AKI transitions of care.[14 17 35–37]

Sample and study setting

The sampling frame will include physicians and advanced practice providers (APPs; nurse practitioner or physician assistant) within the Divisions of Nephrology and Primary Care who provide posthospital care for AKI survivors at Mayo Clinic in Rochester, Florida, Arizona and the Mayo Clinic Health System. The Mayo Clinic Health System includes clinics, hospitals and other healthcare facilities across southern Minnesota, western Wisconsin and northeastern Iowa.[38] Facilities include large regional medical centres, community hospitals and rural primary care clinics that collectively offer over 100 medical and surgical services and specialties that serve patients in their communities. Resources are shared across the Mayo Clinic Enterprise, including Florida, Arizona and the Health System. This sampling approach targets individuals affiliated with both academic and community or rural settings, and individuals with patients from a variety of sociodemographic backgrounds. Members of the Division of Nephrology at Mayo Clinic in Rochester provide specialty services to patients within the Mayo Clinic Health System on a referral basis through in-person appointments at multiple health system sites, including outreach clinics in rural areas. Additional nephrology physicians and APPs are employed by individual health system sites. Availability and provider experience with telemedicine increased prior to the study period due to the COVID-19 pandemic. Within the Mayo Clinic Enterprise, telemedicine is employed by multiple disciplines (eg, medicine, nursing, pharmacy) when clinically appropriate and as supported by state and federal governments. Transitional and in-home primary care programmes were implemented in select locations within the Mayo Clinic Enterprise prior to the pandemic.[29 39] In 2021, a new transitional post-AKI care programme was piloted in primary care in Rochester.[40] No formal changes were made to nephrology or primary care posthospital follow-up practices and new patient capacity was unchanged. Email addresses will be obtained from departmental contact lists. Respondents must certify they have been in practice a minimum of 1 year following terminal postgraduate medical training, practice in an outpatient clinic setting a minimum of ½ day per week, and have experience caring for patients recently discharged from the hospital. Remuneration will not be offered for completing the survey.

Data collection

Demographic data collected includes sex, specialty, degree, practice location (Mayo Clinic Rochester, Mayo Clinic Arizona, Mayo Clinic Florida or the Mayo Clinic Health System), location of medical training (yes/no to any completed at a non-Mayo Clinic site) and years in practice. The invitation to participate in the study will be extended via email and the survey will be administered using RedCap survey technology. The survey will be active for a period of 3 weeks before a reminder email will be distributed to all individuals who have not yet completed the survey. The outcomes measured will be the survey answers selected by respondents.

Analysis

Descriptive statistics will be used for demographic variables in both groups. The Pearson's χ^2 or Fisher's exact test for categorical variables will be used to compare results for each question between groups. Select questions (see online supplemental appendix 1) with a 'best answer' (eg, based on guideline recommendations, package insert guidance for drug dosing in kidney dysfunction) will be scored, with 1 point assigned for each best answer

selected and 0 points assigned for incorrect answers, for a maximum total of 5 points. In cases where a 'best answer' cannot be determined, differential responses will be described and compared between groups. Mean scores will be compared between groups using the students t-test. We will use a connecting and merging approach for mixed-methods data integration and results from the survey will inform the sample for the qualitative strand.

Detecting a mean between-group difference (nephrologist vs PCPs) of 2 points, assuming a SD of 2, with 80% power and using an alpha 0.05 will require 18 participants per group. Departmental contact lists indicate 61 providers employed within the included Divisions of Nephrology and over 700 PCPs employed by Mayo Midwest Primary Care. A response rate of 3% (for PCPs) to 29% (for nephrologists) will make it feasible to meet our recruitment targets.

Phase 2—qualitative strand

Sample

Purposeful sampling of survey responders will be used to recruit up to 20 providers, who routinely care for AKI survivors in the postdischarge setting, for semistructured interviews. The final number of participants will be guided by thematic saturation.[28] Participants from the quantitative strand will be sampled for variation on key factors including sex, specialty, provider type (physician or APP), and practice setting to provide insight from the breadth of providers represented in the sampling frame and explain survey results that are of greatest interest. Additional individuals will be recruited from among the sampling frame identified in the quantitative strand, if needed to achieve thematic saturation. Data collection and analysis will be iterative and additional interviews will be added if other important viewpoints are revealed. This will facilitate the selection of information-rich cases while capturing significant variations of experience.

Data collection

An open-ended question guide was developed using a pragmatism approach to gather rich, qualitative data on provider views on timing and implementation of KAMPS elements, multispecialty collaboration for post-AKI care, influential patient-specific factors, and challenges and methods to facilitate care improvements for these patients (online supplemental appendix 2). It will also be informed by emerging themes from quantitative data analysis, including differences between groups based on specialty and/or other key demographics. Interviews will be conducted by a consistent member of the study team who is an expert in the field of qualitative research (DMF) for optimal dependability. They will be carried out via phone and will be recorded and transcribed verbatim with permission from the participants. The interviewer will record field notes following the conclusion of each interview and reflexivity will be acknowledged through reflective journaling to enhance neutrality.

Data analysis and integration

Interview transcripts will be uploaded into NVivo software, a qualitative data analysis tool. NVivo aids investigators by facilitating coding of source data, data sorting and identification of concepts indicative of themes. Codes assign meaning to pieces of data or text and facilitate organisation, categorisation and interpretation. Both deductive analysis (a priori codes related to the KAMPS framework domains) and inductive analysis (identification of emerging themes) will occur. Emerging themes will be discussed by content experts (HPM, EFB) and the qualitative data analyst (DMF) to ensure they capture the full range and depth of interview data, and a preliminary codebook will be developed. This codebook will then be applied to all source data. Themes identified by nephrology specialists and PCPs will be compared. The quantitative and qualitative data will be integrated using joint display tables organised according to KAMPS domains as well as highlight areas of complementarity (eg, domains describing different facets of the larger phenomenon of care transitions in AKI survivors), concordance and discordance (similarities or differences between nephrologists and PCPs, location of primary practice site, and/or between quantitative and qualitative datasets). Divergence will be addressed through reconciliation, which will include careful examination of existing biases, reviewing data with a deliberate focus on understanding divergent results, and formation of hypotheses about divergence and why it occurred. These can be explored through further data collection or as a part of future research efforts. Investigators will examine and disclose important changes or new discoveries that have occurred in the evolving field of post-AKI care to promote dependability of study findings.

DISCUSSION

Integrating PCPs into the AKI survivor care pathway represents an important strategy to address the limitations of existing practices that rely primarily on nephrologists. AKI survivors express concerns about increasing the number of specialists involved in their outpatient care and the travel time required to reach tertiary care centres where specialists are located.[17 41] Providing core components of post-AKI care in the patients' home of primary care may increase the frequency and timeliness of kidney follow-up in this population. Uncovering a deeper understanding of PCPs' and nephrologists' existing beliefs and approaches to post-AKI care is critical to optimising cooperation and communication between disciplines. This information will also assist in identifying opportunities to improve implementation of best practices, such as the KAMPS framework. Results from this study will describe contemporary recommendations for post-AKI care from a diverse group of providers involved in AKI survivor care transitions, with a focus on best practices, multispecialty collaboration and healthcare delivery processes. Future research can include validation of these findings in other

health systems and practitioners operating in unique settings.

Author affiliations
[1]Department of Pharmacy, Mayo Clinic, Rochester, MN, USA
[2]Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery, Mayo Clinic, Rochester, MN, USA
[3]Division of Community Internal Medicine, Mayo Clinic, Rochester, MN, USA
[4]Division of Nephrology and Hypertension, Department of Medicine, Mayo Clinic, Rochester, MN, USA
[5]Division of Pulmonary and Critical Care Medicine, Department of Medicine, Mayo Clinic, Rochester, MN, USA
[6]Division of Health Care Delivery Research, Mayo Clinic, Rochester, MN, USA

Contributors HPM, EFB, AKK designed and revised the survey instrument; HPM conducted pilot testing of the survey instrument; RGM, ADR, KBK, JMG reviewed and revised the survey instrument; HPM, EFB, DMF, JMG conceived the methods for the qualitative strand, including sampling approach, data collection and analysis. All authors reviewed and approved the final version of the study protocol, as well as this manuscript submission.

Funding This work was supported in part by the Mayo Midwest Pharmacy Research Committee, Mayo Midwest Clinical Practice Committee Innovation Award, American College of Clinical Pharmacy, the National Institute of Allergy and Infectious Diseases under award number K23AI143882 (PI; EFB), and the Agency for Healthcare Research and Quality HS028060-01 (PI; EFB). The funding sources had no role in study design, data collection, analysis or interpretation, writing the report or the decision to submit the report for publication. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data publically available for this protocol.

ORCID iDs
Heather Personett May http://orcid.org/0000-0001-5704-2867
Rozalina Grubina McCoy http://orcid.org/0000-0002-2289-3183

REFERENCES

1 Kashani K, Shao M, Li G, *et al*. No increase in the incidence of acute kidney injury in a population-based annual temporal trends epidemiology study. *Kidney Int* 2017;92:721–8.
2 Siew ED, Parr SK, Abdel-Kader K, *et al*. Predictors of recurrent AKI. *J Am Soc Nephrol* 2016;27:1190–200.
3 Coca SG, Singanamala S, Parikh CR. Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. *Kidney Int* 2012;81:442–8.
4 Sawhney S, Marks A, Fluck N, *et al*. Post-discharge kidney function is associated with subsequent ten-year renal progression risk among survivors of acute kidney injury. *Kidney Int* 2017;92:440–52.
5 Heung M, Steffick DE, Zivin K, *et al*. Acute kidney injury recovery pattern and subsequent risk of CKD: an analysis of Veterans health administration data. *Am J Kidney Dis* 2016;67:742–52.
6 Pannu N, James M, Hemmelgarn B, *et al*. Association between AKI, recovery of renal function, and long-term outcomes after hospital discharge. *Clin J Am Soc Nephrol* 2013;8:194–202.
7 Odutayo A, Wong CX, Farkouh M, *et al*. AKI and long-term risk for cardiovascular events and mortality. *J Am Soc Nephrol* 2017;28:377–87.
8 Rewa O, Bagshaw SM. Acute kidney injury-epidemiology, outcomes and economics. *Nat Rev Nephrol* 2014;10:193–207.
9 Villeneuve P-M, Clark EG, Sikora L, *et al*. Health-related quality-of-life among survivors of acute kidney injury in the intensive care unit: a systematic review. *Intensive Care Med* 2016;42:137–46.
10 Nisula S, Vaara ST, Kaukonen K-M, *et al*. Six-month survival and quality of life of intensive care patients with acute kidney injury. *Crit Care* 2013;17:R250–8.
11 Allen AS, Forman JP, Orav EJ, *et al*. Primary care management of chronic kidney disease. *J Gen Intern Med* 2011;26:386–92.
12 Saran R, Robinson B, Abbott KC, *et al*. US renal data system 2016 annual data report: epidemiology of kidney disease in the United States. *Am J Kidney Dis* 2017;69:A7–8.
13 Kashani K, Rosner MH, Haase M, *et al*. Quality improvement goals for acute kidney injury. *Clin J Am Soc Nephrol* 2019;14:941–53.
14 Barreto EF, Schreier DJ, May HP. Adequacy of kidney follow-up among acute kidney injury survivors after hospital discharge: a population-based cohort study. *Am J Nephrol* 2021;52:817–26.
15 Ortiz-Soriano V, Alcorn JL, Li X, *et al*. A survey study of self-rated patients' knowledge about AKI in a post-discharge AKI clinic. *Can J Kidney Health Dis* 2019;6:205435811983070–11.
16 Silver SA, Goldstein SL, Harel Z, *et al*. Ambulatory care after acute kidney injury: an opportunity to improve patient outcomes. *Can J Kidney Health Dis* 2015;2:71.
17 Silver S, Adhikari N, Bell C. Nephrologist follow-up versus usual care after an acute kidney injury hospitalization (fusion). *Clin J Am Soc Nephrol* 2021;CJN.17331120.
18 Singh G, Hu Y, Jacobs S. Post-Discharge mortality and rehospitalization among participants in a comprehensive acute kidney injury rehabilitation program. *Kidney* 2021;360:1424–33.
19 Karsanji DJ, Pannu N, Manns BJ, *et al*. Disparity between nephrologists' opinions and contemporary practices for community follow-up after AKI hospitalization. *Clin J Am Soc Nephrol* 2017;12:1753–61.
20 Harel Z, Wald R, Bargman JM, *et al*. Nephrologist follow-up improves all-cause mortality of severe acute kidney injury survivors. *Kidney Int* 2013;83:901–8.
21 Siew ED, Peterson JF, Eden SK, *et al*. Outpatient nephrology referral rates after acute kidney injury. *J Am Soc Nephrol* 2012;23:305–12.
22 Greer RC, Liu Y, Cavanaugh K, *et al*. Primary care physicians' perceived barriers to nephrology referral and co-management of patients with CKD: a qualitative study. *J Gen Intern Med* 2019;34:1228–35.
23 Parker MG, Pivert KA, Ibrahim T, *et al*. Recruiting the next generation of nephrologists. *Adv Chronic Kidney Dis* 2013;20:326–35.
24 Vijayan A, Abdel-Rahman EM, Liu KD, *et al*. Recovery after critical illness and acute kidney injury. *Clin J Am Soc Nephrol* 2021;16:1601–9.
25 Coleman EA, Parry C, Chalmers S, *et al*. The care transitions intervention. *Arch Intern Med* 2006;166:1822–8.
26 Wee S-L, Loke C-K, Liang C, *et al*. Effectiveness of a national transitional care program in reducing acute care use. *J Am Geriatr Soc* 2014;62:747–53.
27 Gardner R, Li Q, Baier RR, *et al*. Is implementation of the care transitions intervention associated with cost avoidance after hospital discharge? *J Gen Intern Med* 2014;29:878–84.
28 Takahashi PY, Naessens JM, Peterson SM, *et al*. Short-term and long-term effectiveness of a post-hospital care transitions program in an older, medically complex population. *Healthc* 2016;4:30–5.
29 McCoy RG, Peterson SM, Borkenhagen LS, *et al*. Which readmissions may be preventable? lessons learned from a posthospitalization care transitions program for high-risk elders. *Med Care* 2018;56:693–700.
30 Brimble KS, Boll P, Grill AK, *et al*. Impact of the kidneywise toolkit on chronic kidney disease referral practices in ontario primary care: a prospective evaluation. *BMJ Open* 2020;10:e032838.
31 Neale EP, Middleton J, Lambert K. Barriers and enablers to detection and management of chronic kidney disease in primary healthcare: a systematic review. *BMC Nephrol* 2020;21:83.
32 Haley WE, Beckrich AL, Sayre J, *et al*. Improving care coordination between nephrology and primary care: a quality improvement

initiative using the renal physicians association toolkit. *Am J Kidney Dis* 2015;65:67–79.
33 Siew ED, Liu KD, Bonn J, *et al*. Improving care for patients after hospitalization with AKI. *J Am Soc Nephrol* 2020;31:2237–41.
34 Silver SA, Siew ED. Follow-Up care in acute kidney injury: lost in transition. *Adv Chronic Kidney Dis* 2017;24:246–52.
35 Kurani S, Hickson LJ, Thorsteinsdottir B, *et al*. Supplement use by US adults with CKD: a population-based study. *Am J Kidney Dis* 2019;74:862–5.
36 Kurani S, Jeffery MM, Thorsteinsdottir B, *et al*. Use of potentially nephrotoxic medications by U.S. adults with chronic kidney disease: NHANES, 2011-2016. *J Gen Intern Med* 2020;35:1092–101.
37 Teaford HR, Barreto JN, Vollmer KJ, *et al*. Cystatin C: a primer for pharmacists. *Pharmacy* 2020;8:35.
38 Kurani SS, Lampman MA, Funni SA, *et al*. Association between area-level socioeconomic deprivation and diabetes care quality in US primary care practices. *JAMA Netw Open* 2021;4:e2138438–14.
39 Takahashi PY, Chandra A, McCoy RG, *et al*. Outcomes of a nursing home-to-community care transition program. *J Am Med Dir Assoc* 2021;22:2440–6.
40 Barreto EF, May HP, Schreier DJ, *et al*. Development and feasibility of a multidisciplinary approach to AKI survivorship in care transitions: research letter. *Can J Kidney Health Dis* 2022;9:205435812210812.
41 Silver SA, Saragosa M, Adhikari NK, *et al*. What insights do patients and caregivers have on acute kidney injury and posthospitalisation care? A single-centre qualitative study from Toronto, Canada. *BMJ Open* 2018;8:e021418.