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ADVANCES IN PHARMACY PRACTICE

"Positive Kidney Health": Implementation and design of a pharmacist-led intervention for patients at risk for development or progression of chronic kidney disease

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ABSTRACT

Background: Patients with early chronic kidney disease (CKD) or underlying risk factors are often unaware of their kidney test results, common causes of CKD, and ways to lower risk of disease onset/progression.
Objective: To test feasibility of a pharmacist-led intervention targeting patient education and risk factors in patients with early CKD and those at risk for CKD.
Practice description: Ambulatory care pharmacists in community-based primary care clinics delivered kidney health education, ordered labs, and recommended medication adjustments.
Practice innovation: We identified patients with a moderate rate of decline ($\geq$2 mL/min/1.73 m^2 per year) in estimated glomerular filtration (eGFR) at-risk for CKD or early stage CKD. An interactive workbook was designed to teach patients about kidney test results and self-management of risk factors including hypertension, type 2 diabetes, cigarette smoking, and chronic oral nonsteroidal anti-inflammatory drug use.
Evaluation methods: Outcomes included visit uptake, completion of annual albuminuria screening, and initiation of guideline-directed medications for CKD. Patients were surveyed pre- and post-intervention for kidney health knowledge and perceptions regarding pharmacist-provided information.
Results: Our sample of 20 participants had a mean eGFR of 59 mL/min/1.73 m^2 and the mean eGFR decline was −4.6 mL/min/1.73 m^2 per year. There were 47 visits during the pilot period from February 2021 to October 2021. Thirteen patients were missing albuminuria screening within 12 months; 2 of 9 patients with resulting labs had new microalbuminuria and were started on renoprotective medications. Patients had improved understanding of their kidney function test results and most did not consider the information scary or confusing.
Conclusion: Barriers to enrollment included fewer participants with multiple risk factors for CKD. The pharmacists were able to engage patients in learning the importance of monitoring and self-management of kidney health. A collaborative practice agreement may enhance a similar intervention that includes initiation of renoprotective medications.

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Key Points

Background:

- Risk factors for the development or progression of CKD include HTN, T2DM, use of chronic NSAIDs, and cigarette smoking.
- Patients have low awareness of early CKD and microalbuminuria, screening to optimize renoprotective medication therapy is not prioritized for all patients at risk.
- Ambulatory care pharmacists are well-trained to improve clinical outcomes, patient adherence, and knowledge of multiple disease states that contribute to CKD development and progression.

Findings:

- Pharmacists improved patients' understanding of kidney test results and ordered UACR screening for many patients who did not have recent UACR measurements, leading to appropriate renoprotective medication initiation.
- Primary care physicians may benefit from more education around SGLT2i and their kidney benefits since full adoption of SGLT2i for diabetic kidney disease is not optimal.
- Pharmacists can identify candidates for renoprotective medications, and implementing collaborative practice agreements may facilitate more uptakes of these newer evidenced-based treatments, when indicated, to help prevent progression of CKD.

Background

The chronic kidney disease (CKD) burden in the United States continues to rise even though CKD onset and progression can be attenuated by optimal risk factor control and initiation of guideline-directed medical therapies.[1-3] Type 2 diabetes mellitus (T2DM) and hypertension (HTN) are the leading causes of CKD, but many patients with these comorbidities skip routine screening for kidney complications and as many as 9 out of 10 individuals with CKD are unaware of their diagnosis.[1-4] Low CKD awareness can be attributed to lack of symptoms in early stages and the lack of unified and comprehensive CKD-specific patient education in primary care practice.[5-9] Various models of interdisciplinary care have been proposed to improve the detection, monitoring, and management of CKD, with pharmacists, nurse practitioners, health coaches, or other health care team members as care champions.[10-17]

Many pharmacist interventions related to medication management and patient education have demonstrated beneficial clinical outcomes compared with usual care for chronic conditions including T2DM and HTN.[17,18] Yet, comprehensive medication management to optimize patients with CKD has yielded variable success for outcomes such as blood pressure (BP), albuminuria/proteinuria screening rates, and improved estimated glomerular filtration rate (eGFR).[19-24] For example, when a pharmacist provided medication management in an interdisciplinary team consisting of a nephrologist, dietician, social worker, and nurse, there was a statistically significant reduction in the rate of eGFR decline compared to a historical control group.[23] However, Diamantidis et al.[13] concluded that a 3-year multicomponent pharmacist intervention that delivered telephonic educational modules to patients with T2DM and uncontrolled BP and teaching self-management, including medication adherence, BP self-monitoring, and smoking cessation did not slow the rate of eGFR decline among participants with diabetic kidney disease compared to a control group. Their recommendations for developing similar randomized control trials (RCTs) are to conduct pilot studies focused on enrollment before scaling the intervention, plan meaningful subpopulation analyses to account for heterogeneity of effects, and anticipate how the study can be integrated in the local context of a dynamic health system.[13,24]

This report describes the design, implementation, and process outcomes of a pharmacist-led pilot intervention ("Positive Kidney Health") targeting multiple risk factors in patients at risk for CKD with moderately declining eGFR and patients with early CKD (Stages 1, 2, and 3a). We chose to identify a heterogeneous sample of patients, some with CKD and some not yet diagnosed with CKD, to evaluate the feasibility of developing a future pragmatic RCT on reducing development or progression of CKD by engaging patients in disease education, laboratory monitoring, and self-management of comorbidities. Both our study and the one by Diamantidis et al.[13] utilize pharmacists to provide evidence-based comprehensive medication management for kidney health but our study expands the target population to earlier stages of CKD and quantifies the rate of eGFR decline in patients at risk for CKD. Additionally, we gave patients an educational workbook to facilitate active learning and goal setting during the series of intervention visits. We used a pragmatic approach to implement the intervention, which was led by pharmacists already practicing team-based care with physicians.

Objectives

We aimed to test the feasibility of a pharmacist-led intervention targeting patient education and risk factor control in patients with early CKD and those at-risk for CKD.

Practice description

Pharmacist roles in the primary care network

University of California, Los Angeles Health (UCLA) employs 6 residency-trained, board-certified clinical pharmacists embedded in 23 selected primary care clinics, who practice chronic disease management in collaborative team care with primary care physicians (PCPs). On a referral basis, the pharmacists provide in-person and telehealth patient consultations to assess adherence barriers and optimize medication use for chronic disease control. Pharmacists provide recommendations on pharmacotherapy selection and titration, and can initiate and adjust medications under the PCP's verbal or electronic authorization. The Positive Kidney Health

intervention leverages this existing service to extend PCP care by providing a comprehensive, structured program that educates patients on reducing the risk of CKD onset or progression with self-management and medication adherence. This project was approved by the UCLA Institutional Review Board (#19-001475).

Practice innovation

Participant identification and recruitment

Patients from primary care clinics with embedded pharmacists were invited to participate in the pilot study. Patients were initially targeted for inclusion through an electronic health record (EHR) query to identify either early CKD (Stages 1, 2, and 3a based on eGFR values) or declining eGFR, but without a CKD diagnosis. We calculated eGFR decline (mL/min/1.73 m^2 per year) for each individual, defined as the difference between the reference eGFR value (average of all values within 1 year of the first recorded EHR value) and preintervention (i.e., baseline) value (average of all values within 1 year of the study recruitment date) divided by the years of follow-up from the first eGFR measurement to the last. If patients did not have a CKD diagnosis, a rate of decline >2 mL/min/1.73 m^2 per year was eligible for study inclusion. Additionally, all participants were initially required to have $\geq$2 of the following CKD risk factors: 1) HTN with recent clinic BP readings above 140/90 mm Hg, 2) T2DM, 3) current cigarette smoker, or 4) active nonsteroidal anti-inflammatory drug (NSAID) prescription for chronic use (>3 months). Patients who met these inclusion criteria were screened by the research team to confirm eligibility through chart review. During chart review, patients with underlying conditions such as human immunodeficiency virus nephropathy or cancer undergoing active treatment with chemotherapeutic agents that could cause or accelerate CKD were excluded, since our intervention was not designed to address those risk factors. For patients who met criteria based on HTN, we also excluded those with white coat HTN for whom the PCP felt that antihypertensive pharmacotherapy was not indicated, as documented in the physician's progress note. We also excluded patients with HTN that was refractory to 4 or more antihypertensive medications or patients with HTN being managed by a specialist, such as a nephrologist, since the pharmacists work primarily with PCPs. We excluded patients without visits completed in our health system during the past 2 years.

Our recruitment period spanned from February 2021 to October 2021. Early on, it became clear that recruitment was proceeding more slowly than anticipated due to low numbers of eligible patients after manual chart verification of risk factors and exclusion criteria. We subsequently broadened the inclusion criteria to enroll patients who had only one CKD risk factor. Following eligibility, a secure message was sent to the patient's PCP introducing the Positive Kidney Health study and our intent to recruit the patient. The message allowed PCPs an opportunity to decline patient participation for any reason. Unless the PCP declined inclusion within five business days, we mailed each eligible patient a recruitment letter, signed electronically on behalf of the PCP. A research team member then called the patient to schedule the first study visit. We provided study incentives—a gift card valued at $10—for completing each visit for up to 3 visits.

Developing an education tool: "Positive Kidney Health" workbook

We developed a CKD-specific educational resource through collaboration between patient education specialists at the Terasaki Institute for Biomedical Innovation and our research team at UCLA. A health communication company (Health Literacy Media) provided consulting services on graphic design and plain language editing to make the health messages clear and effective. The Positive Kidney Health workbook created the framework for establishing CKD knowledge and included chapters for each of the 4 targeted risk factors: T2DM, HTN, cigarette smoking, and NSAID use. The learning objectives for the visit and samples of the workbook's interactive prompts that patients used for journaling and tracking health goals are shown in Figures 1 and 2.

Pharmacist training and details of the intervention

Pharmacists participated in trainings led by research team nephrologists and PCPs on evidence-based management of CKD, T2DM in CKD, HTN, and smoking cessation. There were 3 1-hour trainings for pharmacists to review disease state management and participate in case discussions. Additionally, pharmacists participated in 2 1-hour trainings to review encounter documentation and study protocols, including a mock patient consult. Pharmacists reviewed algorithms developed by the multidisciplinary research team with guidance on treatment recommendations based on the most recent clinical guidelines, as shown in Appendix A-D (online supplemental material). The pharmacists used a progress note template with checklists and text prompts for entering notes to support clinical reasoning. The research team reviewed notes on an as-needed basis for fidelity checks.

At the first intervention visit, patients were seen in-clinic with the pharmacist to obtain face-to-face informed consent and receive the educational workbook. Each visit allotted up to 60 minutes to complete medication review, finish one workbook chapter, and administer patient surveys. At the first visit, pharmacists explained general kidney health and patient-specific laboratory results, and ordered urine albumin-creatinine ratio (UACR) laboratory assessments if they were missing. Patients with multiple risk factors were encouraged to partner in the decision-making process and prioritize which risk factor would be reviewed at each subsequent visit in 2 or 4 weeks by clinic visit, or by video visit. Each subsequent visit would discuss another chapter of the workbook, and the pharmacist reviewed the patient's adherence to the treatment goals documented from the prior visit. If the visits focused on HTN and the patient did not have a BP monitor, an Omron Series 3 BP monitor was provided to the patient for home use.

Medication algorithms guided recommendations for suboptimal medication use in T2DM or HTN (Appendix A and B). Lifestyle counseling was individualized, particularly with the Dietary Approaches to Stop Hypertension diet for participants with HTN. For cigarette smokers, brief counseling on cessation techniques was provided. The patient was referred to behavioral treatment (1-800-QUIT-NOW, or other support programs, Appendix C), and pharmacologic cessation treatments were offered. Chronic NSAID users were assessed for potential analgesic alternatives, including topicals such as diclofenac gel

Figure 1. Excerpt of Positive kidney health interactive workbook.

(Appendix D). The pharmacist recommended medication changes through consultation with the PCP during face-to-face discussion or real-time EHR communication and through EHR messages, if needed. The PCP could agree and authorize pharmacists to carry out the recommendations or disagree with the recommendations and initiate alternative plans of care. There was no maximum number of follow-up visits, since patients could continue to see the pharmacist as part of usual care after completing the pilot study's learning objectives for relevant risk factors (Figure 2).

Evaluation methods

Demographics and baseline characteristics were obtained from chart review. We assessed feasibility by measuring visit uptake, completion of UACR orders and initiation of angiotensin-converting enzyme inhibitor (ACEi), angiotensin receptor blocker (ARB) or sodium glucose co-transporter inhibitor (SGLT2i) when indicated. We documented other medication changes the pharmacist recommended to manage comorbid risk factors. Additionally, we surveyed patients at baseline and postintervention using online Qualtrics survey tools to determine change in knowledge and perceptions. Selected items from the Kidney Knowledge Survey[25] were asked, including the multiple choice question, "What does 'GFR' stand for?" Patients rated their confidence in interpreting their kidney test results (eGFR, creatinine, UACR) on a five-item Likert scale prior to the intervention and again after the last visit. After the last visit, patients reported their perceptions of how helpful (to improve their understanding of kidney health), scary, or confusing the educational information was to them, on a five-item Likert scale. All results were summarized using descriptive statistics.

Results

Participants, baseline demographics, and clinical characteristics

With the revised inclusion criteria, there were 50 eligible patients after chart review. Eight patients were not recruited because their PCP recommended that they not participate. Twelve patients declined to participate and 10 were unreachable, so we enrolled 20 participants (Table 1). Our sample included 3 participants with 3 qualifying risk factors, 9 with 2 qualifying risk factors, and 8 with one qualifying risk factor. The average participant age was 63 years, 55% of the sample was female, and there was an even distribution of non-Hispanic White and Black participants. At baseline, participants had a mean eGFR of 59 mL/min/1.73 m^2, body mass index (BMI) of 30.7 kg/m^2, BP of 143/81 mm Hg, and a mean eGFR decline of 4.6 mL/min/1.73 m^2 per year (calculated over a median follow-up of 4.3 years). The number of eGFR values used to calculate each individual's annualized rate of decline was a median of 1.5 for reference and 2 for preintervention eGFR. There were 4 participants with pre-existing CKD 3a (from a diagnosis code or EHR problem list). Of the participants without a CKD diagnosis, 4 met the definition of CKD 3a based on at least 2 eGFR measurements below 60 mL/min/1.73 m^2 taken more than 3 months apart. Another 4 were included with an eGFR below 60 mL/min/1.73 m^2 but without subsequent labs to definitively confirm CKD. Eight were included with preintervention eGFR of 60 mL/min/1.73 m^2 or greater.

Visit uptake and completion

Uptake of the intervention was approximately 48% of eligible patients for whom the PCP approved participation. There were a

Chapter	Learning Objectives	Interactive Prompts
Learn the facts about your kidneys	· Identify different causes of kidney damage and chronic kidney disease (CKD) · Learn about kidney laboratory tests and appropriately interpret estimated glomerular function and urine albumin-creatinine ratio · Understand the progressive stages of CKD · Identify personal risk factors for declining kidney health	· Record 2 recent kidney lab results in the workbook, compare them, and explain the results in your own words · List 2 people to share the health goals you set today for better kidney health · Write your medications in the medication log and set goals for medication adherence
Manage your diabetes for better kidney health	· Recognize how CKD is a complication of uncontrolled diabetes · Demonstrate how to self-monitor blood glucose with a glucometer and appropriately interpret goal ranges · List current diabetes medication regimen correctly	· Record home blood sugar results in workbook · Set goals and write action plan for self-management of blood sugars
Manage your high blood pressure for better kidney health	· Recognize how CKD is a complication of uncontrolled hypertension · Demonstrate how to measure blood pressure properly with a home monitor and appropriately interpret goal ranges · List current blood pressure medication regimen correctly	· Record home blood pressure measurements in workbook · Set goals and write action plan for self-management of blood pressure
Smoking and your kidney health	· Recognize cigarette smoking is a risk factor for kidney disease · Review quit smoking resources for behavioral support and various types of medication treatment (varenicline, bupropion, and types of nicotine replacement therapy) · Determine if ready to set a quit date and select resources to assist with quitting	· Decide readiness to quit smoking · Follow prompts to set action plan to quit smoking, including actions to take if cravings or triggers are present
Pain medicines and your kidney health	· Recognize chronic oral nonsteroidal anti-inflammatory drug (NSAID) use is a risk factor for kidney disease · Review prescription and over-the-counter medications for any products containing NSAIDs · Reduce and avoid oral NSAIDs by choosing safer alternatives for pain relief	· List medications you currently take which contain oral NSAIDs · Use pain diary to log your response to alternatives that are recommended

Figure 2. Learning objectives and patient interactive prompts.

total of 47 visits, 31 in-clinic and 16 by video. Patients could opt for video visits if they did not demonstrate a need for in-person teaching for self-monitoring of BP or blood glucose. Half of the patients opted for at least one video visit, and patients completing video visits were more likely to stick with video visits for subsequent follow-up. Ten patients completed 3 study visits, 7 completed 2 study visits, and 3 completed one study visit. There were 2 participants with HTN as their only risk factor for whom BP was already below their individualized goal of 130/80 mm Hg at the first study visit, so it was mutually decided that they did not need a follow-up visit. One patient did not return for follow-up and was unreachable by the research team for rescheduling, and therefore completed only one study visit.

Urine albumin-creatinine ratio screening and management

Thirteen patients (65%) had not completed UACR screening within 12 months prior to the first intervention visit, including

Table 1
Baseline demographics and clinical characteristics

Baseline participant characteristics (n = 20)	
Age (years ± SD)	62.9 ± 6.1
Gender, female (n, %)	11 (55%)
Race and ethnicity (n, %)	
Non-Hispanic white	8 (40%)
Non-Hispanic Black or African American	8 (40%)
Asian/Pacific Islander	2 (10%)
Other	2 (10%)
Pre intervention eGFR (mL/min/1.73 m^2 ± SD)	58.9 ± 8.3
CKD risk category (n, %)	
CKD present in problem list or diagnosis code	4 (20%)
Meets CKD diagnosis based on labs	4 (20%)
No CKD, most recent eGFR <60 mL/min/1.73 m^2	4 (20%)
No CKD, most recent eGFR ≥60 mL/min/1.73 m^2	8 (40%)
UACR stratification (n, %)[a]	
Missing	9 (45%)
A1 (<30 mg/g)	8 (40%)
A2 (30-300 mg/g)	1 (5%)
A3 (>300 mg/g)	2 (10%)
BMI (kg/m^2 ± SD)	30.7 ± 6.3
Diabetes (n, %)	10 (50%)
HbA1c >7%	4 (40%)
HbA1c ≤7%	6 (60%)
HTN (n, %)	18 (90%)
BP ≥130/80 mm Hg	14 (78%)
BP < 130/80 mm Hg	4 (22%)
Current smoker (n, %)	2 (10%)
Medication use at baseline (n, %)	
ACEi/ARB	10 (50%)
SGLT2i	0 (0%)
GLP1ra	2 (10%)
NSAID	3 (15%)

Abbreviation used: HTN, hypertension; BP, blood pressure; eGFR, estimated glomerular filtration rate; BMI, body mass index; ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; SGLT2i, sodium-glucose cotransporter-2 inhibitor; GLP1ra, glucagon-like peptide 1 receptor agonist; NSAID, nonsteroidal anti-inflammatory drugs; HbA1c, hemoglobin A1c; UACR, urine albumin-creatinine ratio.

[a] UACR results were missing or not measured within 12 months for 13 patients; however, stratification was determined from most recent UACR result, if any was available.

9 with no prior UACR measurements. Nine of these 13 patients completed UACR tests ordered by the pharmacist, which led to identification of 2 patients with new findings of moderately increased albuminuria (30–300 mg/g). One was already taking a maximized dose of ACEi and the pharmacist recommended starting a SGLT2i for comorbid T2DM and reducing progression of albuminuria. The pharmacist recommended to start an ACEi for the second patient with newly measured microalbuminuria given this finding in the presence of elevated BP. Both recommendations were accepted and executed.

Risk factor management

The most prevalent risk factor in our sample was HTN (n = 18). In patients with HTN treated with medication(s) (n = 17), an average of 2 classes of antihypertensive medications were used. Notably, 4 patients had already achieved goal BP (<130/80 mm Hg) by their initial visit. HTN medication regimen was intensified for 4 patients (new medication or higher dose ordered). Eleven patients were given new home BP monitors.

Ten patients had a diagnosis of T2DM with an average hemoglobin A1c (HbA1c) of 8.0%, although 6 had well controlled T2DM with HbA1c less than 7.0%. These patients used 1.8 medication classes on average for T2DM. T2DM medication regimen was intensified for 3 patients, and SGLT2i initiation was recommended for 4 patients, but only 2 were subsequently initiated on SGLT2i at the time of writing.

Two patients reported current cigarette smoking; both participated in smoking cessation visits with the pharmacist and were referred to behavioral quit resources. One patient was prescribed nicotine replacement therapy and another was prescribed bupropion for smoking cessation.

Three patients were chronic NSAID users and received counseling on low-risk medications to control their musculoskeletal pain. Acetaminophen (n = 1) and topical diclofenac 1% gel (n = 2) were used to effectively switch patients off their chronic oral NSAID.

Patient surveys

Figures 3A-3C show the survey responses outlining knowledge and perceptions toward kidney health and the intervention. All patients completed preintervention surveys but only 19 completed postintervention surveys. The percentage of participants who had reported moderate or high confidence in interpreting their kidney test results (eGFR, UACR) increased from a baseline of 65% to 95% postintervention (Figure 3A). Only 45% of participants at baseline could correctly identify what the abbreviation “GFR” represented, which increased to 95% of participants correctly identifying GFR postintervention (Figure 3B). The majority of participants rated the information they received as helpful to their understanding of kidney health and did not consider the information frightening or confusing (Figure 3C).

Discussion & practice implications

The Positive Kidney Health pilot is a proof-of-concept intervention that utilizes ambulatory care pharmacists to deliver a multicomponent intervention for patients with early CKD and those at-risk for CKD. Within a small sample, pharmacists helped increase surveillance of CKD in candidates at high risk (declining eGFR trend and risk factors present) and adherence to yearly UACR screening for risk stratification in early-stage CKD, when nearly half of participants had no prior screening. This type of collaborative care is a good example of opportunities for pharmacists to lead interventions that could slow decline of eGFR, by initiating renoprotective medications and engaging patients in understanding their kidney function, test results, and important health behaviors.[20,21]

Observations from our experience in conducting this pilot will inform the design of future projects. Barriers to enrollment resulted in a small sample size, which was a major limitation. Overall, the challenge to identify eligible patients suggests that our health system has many patients who have achieved guideline-directed HTN and glycemic goals and that smoking rates and chronic NSAID use are low in our target population. Fewer than anticipated eligible patients also led Diamantidis et al.[13] to loosen the criteria for inclusion after recruitment had started for their study. Even with our expanded cohort of patients in comparison (including patients not diagnosed with CKD), we had a similar issue. When we reduced the number of required risk factors for study

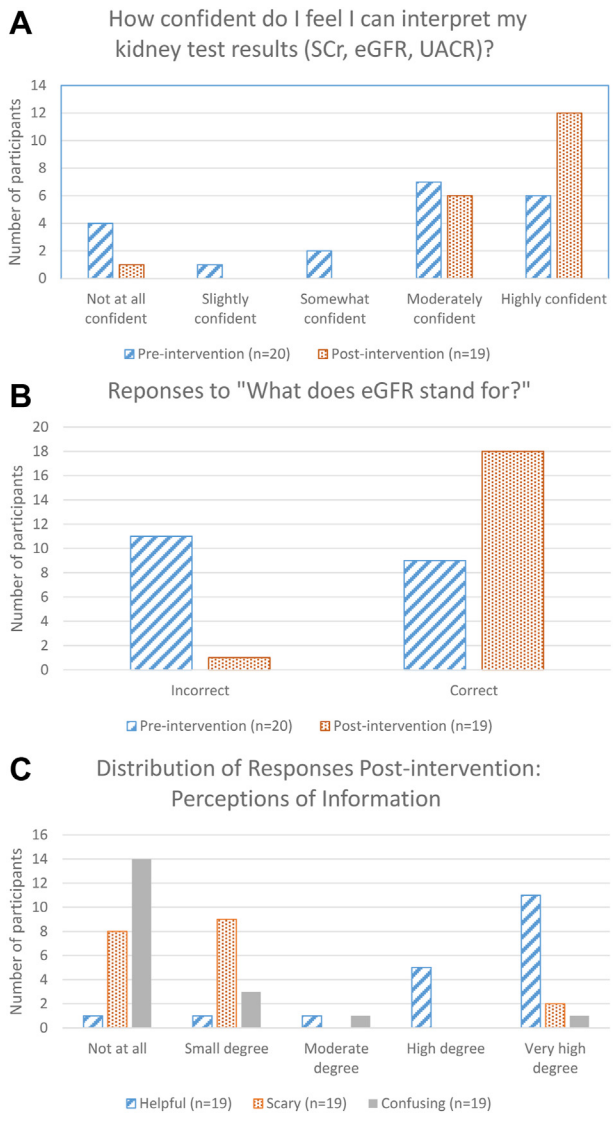

Figure 3. A-C. Survey responses.

inclusion, patients enrolled had fewer required follow-up visits, which could potentially dilute the effect of the pharmacist-led intervention, especially for long-term outcomes of interest. We believe that improving medication adherence and supporting behavioral modifications could be enhanced with more pharmacist follow-up, since more time spent with patients can lead to stronger trust-building, motivational interviewing, and patient engagement. However, we may still need to consider enrolling patients with only one risk factor in the future for practical reasons and adding a reasonable amount of routine follow-up visits to help ensure that patient health behaviors are sustained.

Of patients meeting study criteria, PCPs recommended that several not be recruited to participate. Although not all reasons for this were documented, one case was notable because the physician discussed concern that a particular patient had appropriate age-related eGFR decline that did not need intervention. This suggests that including formal provider education could be useful to reduce therapeutic inertia and help align the goals of team-based care in patients at-risk for CKD onset or progression. Moreover, some patients declined to participate despite receiving study information alerting them about their risks; targeting this population that is likely more vulnerable may require more intensive recruitment efforts. One suggestion may be to invite the PCP to speak to study candidates about participating, since we noted that some patients preferred to hear from their PCP directly before joining the study. Similarly, since we targeted less medically optimized patients, this group could present with challenging case management of social issues. Providing social work, behavioral health specialists, and other disciplines in patient-centered care and coordination may be critical to support participation and ensure long-term outcomes. For example, some patients expressed interest in being referred to a dietitian for intensive counseling. Targeting patients with out-of-control risk factors also may select a nonadherent cohort of patients who are more susceptible to be lost to follow-up or resistant to treatment recommendations. From this pilot, we noted that attending return visits to complete the 2 or 3-visit educational series was a challenge for some participants, since the research team often had to reschedule no-show visits. However, telehealth options provided convenience for some who were able to connect through an online video visit.

There was attrition when patient's risk factors were not clearly outside the target range at the first visit (i.e., BP and/or HbA1c were at goal). Two patients had elevated BPs from the last clinic visit documented in the EHR that flagged them for inclusion but at the first study visit, home readings and clinic readings were at goal. Confirming patient eligibility with assessments before enrollment will be key in future studies to keep patients from dropping out prematurely if no intervention is warranted. Diamantidis et al.[13] also found that enrolled patients often had better control of HTN than expected from EHR screening of recent BP readings. The authors suggested the clinic-measured BPs that were reviewed for screening may be different from a more controlled, standardized study-measured BP.[24] However, we found this effect was present even when our pilot did not use standardized study-measured BP. Our study participants presented to their usual primary care office for the initial study visit, and they had vitals taken by clinic staff as if it was their usual office visit.

Another limitation was the restriction on interventions that the pharmacist could complete without a collaborative practice agreement (CPA). For example, one class of particular interest during this pilot was SGLT2i, which are now recommended as first line following ACEi/ARBs in patients with concurrent T2DM and CKD for protection against renal disease progression and as an emerging therapeutic for patients with CKD but without T2DM.[1,26,27] The pharmacists identified study patients with T2DM for whom SGLT2i are indicated and communicated this information to providers, emphasizing the role of these medications in reducing kidney disease progression. However, at the time of writing, only half of patients for which SGLT2i were recommended had started the medication. The reasons for this were not identified but we believe it may be due to limited PCP clinical experience with SGLT2i and lower comfort level with initiating the medications, particularly when glycemic control is at goal, although patients with normoglycemia can still benefit from the renoprotective properties of SGLT2i.

Reluctance for some providers to start SGLT2i may also demonstrate the need to develop more targeted provider-directed education to increase uptake of evidence-based recommendations in the management of early CKD.[28] Additionally, it is possible that different practice and communication styles between pharmacists could alter how providers interpret the level of importance of the recommendations received. This particular issue could be mitigated by developing a CPA so medications can be initiated in real time when clinically appropriate in the scope of the agreement. It is feasible for pharmacists to identify candidates and monitor adherence, safety, and tolerability of SGLT2i therapy, which may require many medication adjustments in patients' current regimens.[29,30] Models proposing protocols for SGLT2i initiation also highlight the role of pharmacists in access to medications, since cost is a barrier and a reason for discontinuation in many patients.[30,31] Specific outcomes of CPAs that include initiation of SGLT2i are a potential area for further study, not only to measure direct impact in increasing appropriate utilization of these new treatments but also to determine possible changes in physician prescribing when pharmacists are practicing with CPAs in this area of interest.[32]

Conclusion

Pharmacists can play an important role in comprehensive disease education, medication management, and counseling for self-management of risk factors related to CKD, offloading this time-intensive process from the PCP. Creating increased awareness about early monitoring and screening for CKD onset and progression is the first step in removing barriers to starting disease-modifying treatments such as ACEi/ARB and SGLT2i. We think a strategy for increasing use of renoprotective medications such as SGLT2i, when indicated, would be best supported by a CPA. At our institution, we plan to develop future work to implement pharmacist involvement in reducing CKD onset or progression for individuals with low socioeconomic status to close the gap in health disparities among those at risk for CKD development or progression.

Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.japh.2022.11.007.

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