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Multidisciplinary proactive e-consults to improve guideline-directed medical therapies for patients with diabetes and chronic kidney disease: an implementation study

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ABSTRACT

Introduction We hypothesized that multidisciplinary, proactive electronic consultation (MPE) could overcome barriers to prescribing guideline-directed medical therapies (GDMTs) for patients with type 2 diabetes (T2D) and chronic kidney disease (CKD).

Research design and methods We conducted an efficacy-implementation pilot study of MPE for T2D and CKD for primary care provider (PCP)–patient dyads at an academic health system. MPE included (1) a dashboard to identify patients without a prescription for sodium-glucose cotransporter-2 inhibitors (SGLT2i) and without a maximum dose prescription for renin–angiotensin–aldosterone system inhibitors (RAASi), (2) a multidisciplinary team of specialists to provide recommendations using e-consult templates, and (3) a workflow to deliver timely e-consult recommendations to PCPs. In-depth interviews were conducted with PCPs and specialists to assess feasibility, acceptability, and appropriateness of MPE and were analyzed using an iterative qualitative analysis approach to identify major themes. Prescription data were extracted from the electronic health record to assess preliminary effectiveness to increase GDMT.

Results 20 PCPs agreed to participate, 18 PCPs received MPEs for one of their patients with T2D and CKD, and 16 PCPs and 2 specialists were interviewed. Major themes were as follows: appropriateness of prioritization of GDMT for T2D and CKD, acceptability of the content of the recommendations, PCP characteristics impact experience with MPE, acceptability and appropriateness of multidisciplinary collaboration, feasibility of MPE to overcome patient-specific barriers to GDMT, and appropriateness of workflow. At 6 months postbaseline, 7/18 (39%) patients were newly prescribed an SGLT2i, and 7/18 (39%) patients were either newly prescribed or had increased dose of RAASi.

Conclusions MPE was an acceptable and appropriate health system strategy to identify and address gaps in GDMT among patients with T2D and CKD. Adopting MPE could enhance GDMT, though PCPs raised feasibility concerns which could be improved with program enhancements, including follow-up e-consults for reinforcement, and administrative support for navigating system-level barriers.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Proactive e-consults are a novel strategy to implement guideline-directed medical therapy; however, they have not been tested for patients with type 2 diabetes (T2D) and chronic disease, which requires complex medical decision-making and benefits from input from multiple specialists.

WHAT THIS STUDY ADDS

⇒ Evidence that multidisciplinary, proactive e-consults can be implemented to collaboratively manage a population of patients with complex needs in a way that is acceptable and appropriate for primary care providers and specialists.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

⇒ Health systems could adopt multidisciplinary proactive e-consults as a population health strategy to close quality gaps for complex chronic disease management such as T2D and chronic kidney disease.

INTRODUCTION

In patients with type 2 diabetes (T2D) and chronic kidney disease (CKD), the early use of sodium-glucose cotransporter-2 inhibitors (SGLT2i) and renin–angiotensin–aldosterone system inhibitors (RAASi) reduces progression of CKD, cardiovascular mortality, and healthcare utilization.[1–3] Despite international guidelines recommending their use, there are gaps in prescriptions for RAASi and SGLT2i in patients with T2D and CKD particularly in early stages of CKD, with inequities related to race and ethnicity.[1 4–9] The majority of patients with early stages of CKD are cared for by primary care providers (PCPs).[10 11] Barriers to early initiation of these medications in the primary care setting include competing patient care priorities, lack of identification

or prioritization of CKD, complexity of prescribing due to concerns for polypharmacy and side effects, formulary restrictions, and fragmented care coordination between primary and specialty physicians.[11–16] We hypothesized that multidisciplinary, proactive electronic consultation (MPE) could overcome many of these barriers to improve guideline-directed medical therapies (GDMTs) for patients with T2D and CKD.[17]

In collaboration with endocrinologists and nephrologists, we designed an MPE program for patients with T2D and CKD to improve GDMT by PCPs. With conventional e-consults, PCPs with patient care inquiries request advice from a specialist, who then offers the necessary guidance. With proactive e-consults, specialists initiate the process to address gaps in GDMT. This innovative strategy, also termed Targeted Automatic e-Consults (TACo) or reverse e-consults, has been described by other research teams but is not widely adopted.[18–20] Relying on individual PCPs to implement GDMT for individual patients is prone to variation due to competing priorities, knowledge, and implicit bias. MPE uses the electronic health record (EHR) to create a dashboard to systematically identify patients meeting specific criteria which enhances institutional capacity for efficient, targeted population health management.[18 21] Practical considerations need to be addressed to ensure sustainability and scalability of MPE, including feasibility; acceptability of timing, tone, content of recommendations; and appropriateness of patients and PCPs targeted.

In this pilot, we studied the implementation and preliminary efficacy of MPE for patients with T2D and CKD at a large, academic integrated health system that primarily serves a medically complex and socially vulnerable population. We expected the program to be feasible, accepted, and appropriate for PCPs and specialists while increasing GDMT.

METHODS

Study design, setting, and participants

We conducted a pilot study of MPE for patients with T2D and CKD as part of a quality improvement initiative at an integrated, academic health system with 20 primary care locations in the northeast serving a predominantly low-income, publicly insured, diverse population disproportionately affected by T2D and CKD.[22–26] The study used a Hybrid Type 2 effectiveness-Implementation design and was conducted between July 21, 2022, and March 24, 2023.[27]

MPE was pilot-tested at five sites: one teaching practice, three community-based practices affiliated with the health system, and one primary care practice for patients with HIV. The program was introduced to PCPs by the study investigators during routine primary care practice meetings and PCPs were recruited to participate through e-mails following the meetings. We aimed to recruit 20 PCPs and deliver MPE to 20 PCP–patient dyads. Each participating PCP received a proactive e-consult for their patient with T2D and CKD with an upcoming appointment. In addition to the PCPs, 1 nephrologist and one endocrinologist were recruited to participate as e-consult providers, based on recommendations from division leaders and prior experience with e-consults. The nephrologist and endocrinologist were asked to complete a proactive e-consult for PCP–patient dyads assigned to them by study staff. Informed consent was obtained from PCPs. Informed consent was waived for patients as they were not study subjects and their data were collected as part of routine care.

Implementation strategies

We held four focus groups with primary care, nephrology, endocrinology, and clinical pharmacy providers to identify barriers to GDMT. Insights from these sessions were used to refine the implementation strategies to overcome known barriers to GDMT by (1) allowing the health system to proactively identify patients with gaps in prescription of RAASi and SGLT2i, (2) prioritizing T2D and CKD management in a primary care setting, (3) increasing knowledge of evidence-based management of T2D and CKD, and (4) increasing multidisciplinary collaboration. The strategies were further refined by incorporating feedback from the nephrology and endocrinology e-consult providers during weekly debriefing sessions during program implementation.

MPE for patients with T2D and CKD consisted of bundle of three implementation strategies. Strategy 1 used EHR data to create a dashboard to identify eligible patients with T2D and CKD who did not have a prescription for SGLT2i and did not have a prescription for maximum tolerated dose of RAASi.[7] Criteria for inclusion in the dashboard were (a) diagnosis of T2D, (b) presence of CKD with albuminuria as evidenced by either 2+ on a spot urinalysis or >30 mg/g and <5000 mg/g on a quantified urine sample in the last 18 months; or latest estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m^2 and ≥30 mL/min/1.73 m^2 (eGFR caclulated with the CKD Epidemiology Collaboration equation: CKD-EPI 2021),[28] or both, and (c) an appointment with a PCP in the last 12 months. The dashboard also included last blood pressure and hemoglobin A1C, quantified urine albumin, eGFR, and current medications. Strategy 2 provided specialist recommendations via a standardized e-consult note template. First, a nephrologist provided recommendations about RAASi intensification, hypertension, and CKD management, then an endocrinologist provided recommendations about SGLT2i and T2D management. The templates included three sections: (a) the purpose of the e-consult to improve GDMT for patients with T2D and CKD, (b) relevant patient information including lab values, vital signs, current medications, and preferred medications for a patient's insurance plan, and (c) patient-specific recommendations for medication management based on their review of the patient's history (see online supplemental appendix 1 for e-consult note templates). Strategy 3 developed a workflow

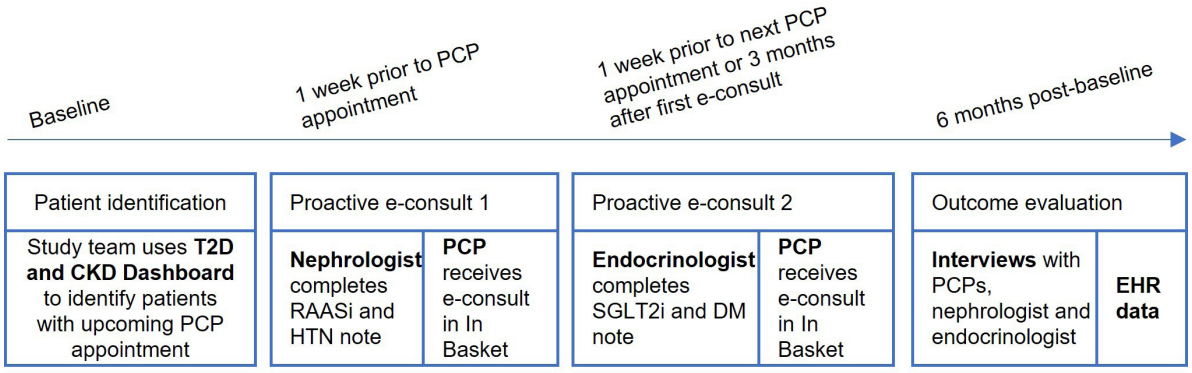

Figure 1 Multidisciplinary, proactive e-consult workflow and study timeline. CKD, chronic kidney disease; DM, diabetes mellitus; EHR, electronic health record; HTN, hypertension; PCP, primary care provider; RAASi, renin–angiotensin–aldosterone system inhibitors; SGLT2i, sodium-glucose cotransporter-2 inhibitors; T2D, type 2 diabetes.

for delivering the two e-consults, specifically, timing the delivery of the nephrology e-consult into the PCP's EHR In Basket the week before an upcoming patient's PCP appointment, and timing the endocrinology e-consult with the patient's next primary care appointment or 3 months after the first e-consult, whichever occurred first (figure 1).

Outcome measures and data sources

We used The Taxonomy of Implementation Outcomes[29] to guide our selection of implementation outcomes, specifically adoption, acceptability, and appropriateness. Adoption was defined as the proportion of PCPs who read the e-consults assessed in the EHR. To test appropriateness, acceptability, and feasibility, in-depth interviews were conducted with participating PCPs, nephrologists, and endocrinologists by a study team member with training in qualitative research. The Consolidated Framework for Implementation Research was used to inform the interview guides.[30] For example, appropriateness focused on suitability of patients identified using the T2D and CKD dashboard; acceptability asked about content and tone of the e-consult note; feasibility addressed workflows for sending and receiving the e-consults (see online supplemental appendix 2 for interview guide). We also interviewed the two specialists to assess their perception of workflow feasibility, appropriateness of dashboard, and acceptability of the e-consult program. Interviews were digitally recorded and transcribed using Microsoft Teams. The transcripts were then entered into Dedoose for data management and analysis.[31] To assess preliminary efficacy, we used PCP-initiated change in SGLT2i and/or RAASi prescription at 3 and 6 months postbaseline, after the receipt of each of two MPEs.

Qualitative and statistical analysis

Using an iterative qualitative analysis approach, the interviews were independently coded by three study investigators (SR, LG, and IA) using a priori primary codes that reflected implementation outcomes: acceptability, appropriateness, and feasibility. Secondary codes were added to document themes that emerged from the interviews. The study team created a preliminary set of secondary codes based on a few transcripts that were reviewed as a group. Then these preliminary set of codes were applied to all interview transcripts separately by the three study investigators. After all interviews were reviewed, a secondary codebook was created for the major emergent themes. The interviews were then divided among the three study investigators who independently applied the secondary codes.

We used descriptive analyses to report on PCP demographics, site of practice, characteristics, and MPE adoption. Preliminary effectiveness, measured as proportions of patients with prescriptions for RAASi and SGLT2i, was calculated at baseline and 3 and 6 months postbaseline.

RESULTS

A total of 20 PCPs agreed to participate, 18 PCPs received MPEs for one of their patients with T2D and CKD, and 16 PCPs and 2 specialists were interviewed. Two PCPs did not have patients who met inclusion criteria and two PCPs left the institution prior to the completion of the study. PCP characteristics are described in table 1. Participating PCPs practiced in a variety of practice types and had training in general internal medicine (GIM) or family medicine (FM) and a few had additional specialization in infectious diseases (ID). The mean (SD) self-reported year of primary care experience was 22[11] and the mean (SD) proportion of patients with T2D and CKD of total patient panel was 23% (10%). One nephrologist and one endocrinologist delivered the MPE for 18 PCP–patient pairs and both were interviewed. Patient baseline characteristics are shown in table 2.

Appropriateness of patient identification and feasibility of using T2D and CKD dashboard

The dashboard initially identified 7055 patients; however, there were challenges balancing sensitivity with specificity of the criteria used to identify CKD longitudinally. The dashboard included patients with transient proteinuria from acute illness, thus criteria were updated to include (1) two GFR lab values <60 at least 3 months

Table 1 Primary care physician, nephrology, and endocrinology provider characteristics

Participant	Practice type	Practice specialty	Years in practice	Number of patients per week	Proportion of patients with T2D and CKD
Dr A	Teaching	GIM, ID	13	25	16
Dr B	Teaching	GIM	–	–	–
Dr C	Teaching	GIM	12	14	29
Dr D	Teaching	GIM	30	60	25
Dr E	Teaching	GIM	10	40	38
Dr F	Teaching	FM	15	48	19
Dr G	Teaching	GIM	20	30	20
Dr H	Teaching	GIM and ID	10	20	25
Dr I	Community	FM	18	90	44
Dr J	Community	GIM	40	100	20
Dr K	Community	GIM	30	75	20
Dr L	Community	GIM	–	–	–
Dr M	Community	GIM and ID	2	100	30
Dr N	Community	GIM	32	90	33
Dr O	Community	GIM	–	–	–
Dr P	HIV	ID	30	85	20
Dr Q	HIV	ID	35	75	8
Dr R	HIV	ID	31	18	6
Dr S	Specialty	Endocrinology	5	40	10
Dr T	Specialty	Nephrology	2	20	10

Blank cells (–) are for PCPs that were not interviewed.
CKD, chronic kidney disease; FM, family medicine; GIM, general internal medicine; ID, infectious diseases; PCP, primary care provider; T2D, type 2 diabetes.

apart, the latest of which occurred in the last 18 months or (2) two of any of the following urine protein values at least 3 months apart, the latest of which was in the last 18 months: microalbumin/creatinine ratio >30 mg/g, total protein/creatinine ratio >50 mg/g, or total protein measured in a 24-hour urine collection >50 mg/g. The more specific dashboard initially identified 4178 patients with T2D and CKD. With this dashboard, at 3 months and 6 months, respectively, 26% and 45% of patients no longer met inclusion criteria due to lack of repeat urine protein analysis or lack of PCP follow-up, while patients newly meeting criteria entered the dashboard.

Adoption of MPE

Of the 20 MPE planned, 18 were completed. PCPs read 17/18 (94%) of the nephrology e-consults and 16/18 (89%) of the endocrinology e-consults. Nephrology and endocrinology referrals were placed for two and three patients, respectively.

PCP perceptions of the appropriateness, acceptability, and feasibility of MPE

We identified six major themes, summarized in table 3, that reflected perceptions of the appropriateness, acceptability, and feasibility of MPE for T2D and CKD. These themes included feasibility of program workflow, acceptability of content of recommendation to help with agenda setting for patients with T2D and CKD, and timing of recommendation. Emergent themes from our analysis included how PCP characteristics impacted their perception of whether MPE achieved multidisciplinary collaboration.

Clinical prioritization

PCPs found the proactive e-consult appropriate and acceptable for prioritizing T2D and CKD management during patient visits. Some appreciated maintaining autonomy in deciding whether to implement the recommendations. Nephrology and endocrinology specialists emphasized the dashboard's role in early CKD identification.

> If I miss anything you know, then it's a reminder. So, it's always good to have somebody you know, [to remind and say] 'hey, you know this patient could benefit from this.' (Dr J, GIM)
>
> I'm familiar with the data supporting it and… I just didn't… tie the data to that particular patient. I think it made my care better. (Dr P, ID)

> The recommendations were somewhat optional as far as whether to use medication or not, but the pros and cons

Table 2 Primary care patient baseline characteristics

Variable	Mean, SD
Age	65.4, 10.9
	n, %
Sex	
Female	9, 50.0%
Male	9, 50.0%
Race	
Black or African American	10, 55.6%
White	0, 0%
Asian	0, 0%
Other, unspecified	5, 27.8%
Decline or unavailable	3, 16.7%
Ethnicity	
Hispanic or Latino	6, 33.3%
Non-Hispanic	10, 55.6%
Decline or unavailable	2, 11.1%
HbA1c	
At goal ≤ 7	8, 44.4%
Not at goal	10, 55.6%
Blood pressure	
At goal ≤130/80	5, 27.8%
Not at goal	13, 72.2%
eGFR categories	
Category 1, eGFR ≥90	3, 16.7%
Category 2, eGFR 60–89	9, 50.0%
Category 3, eGFR 30–59	5, 26.3%
Category 4, eGFR <30	1, 5.6%
Degree of proteinuria	
Moderate proteinuria	6, 33.3%
Severe proteinuria	12, 66.7%
Count of diabetes-related prescriptions*	
0	1, 5.6%
1	9, 50.0%
2	3, 16.7%
3	3, 16.7%
4	2, 11.1%
Count of hypertension-related prescriptions †	
0	6, 33.3%
1	7, 38.9%
2	3, 16.7%
3	1, 5.6%
4	1, 5.6%
Insurance type	
Medicaid	3, 16.7%
Medicare	10, 55.6%
Commercial	5, 27.8%
Uninsured	0, 0%

*Count of prescriptions in EHR-defined pharmaceutical classes: insulins, biguanides, glucagon-like peptide 1 (GLP-1) agonists, dipeptidyl peptidase 4 (DPP-4) inhibitors, sulfonylureas, thiazolidinediones, and alpha-glucosidase inhibitors; excludes SGLT2i prescription.
†Count of prescriptions in EHR-defined pharmaceutical classes: thiazide, loop and potassium-sparing diuretics, beta-blockers, calcium channel blockers, combined alpha and beta-blockers, alpha-antagonists, and hydralazine; excludes RAASi prescription.
eGFR, estimated glomerular filtration rate; EHR, electronic health record; GFR, glomerular filtration rate; HbA1C, hemoglobin A1C; RAASi, renin–angiotensin–aldosterone system inhibitors; SGLT2i, sodium-glucose cotransporter-2 inhibitors.

were presented and so then it was ultimately my decision. (Dr N, GIM)

I think this is a good way of identifying patients with diabetic kidney disease early on because most of the patient that we see are when they already have advanced CKD. (Dr T, Nephrology e-consultant)

Implementation barriers external to the implementation strategies

PCPs reported challenges outside of their control which impacted the feasibility of implementing the recommendations; these included patient missing appointments, out-of-pocket costs of SGLT2i, insurance prior authorization requirements for SGLT2i, and patient hesitation to start or change medications. Multiple PCPs highlighted how clinical pharmacists could assist with medication access.

Sometimes [it is hard] to get access to the medications due to insurance issues and so having someone else there to help us navigate through that [would be helpful]. (Dr I, GIM)

Unfortunately for patients without Medicaid, the copay cost can be so high. So, it's not an option for many people in that population of patients. (Dr I, GIM)

The primary barrier that we encounter [is] an unwillingness of patients sometimes to add additional medications. (Dr K, GIM)

If they don't come in for that follow up or the follow up is delayed, then it can take some time to actually action the recommendations. (Dr A, GIM and ID)

Content of recommendation

PCPs reported that the evidence-based content of the notes was appropriate. Most PCPs reported that the length and tone were acceptable. The specialist e-consultants and PCPs both appreciated that the notes could be customized for individual patients with complex needs.

Table 3 Themes identified in qualitative interviews with primary care physicians for implementation of multidisciplinary, proactive e-consults for patients with type 2 diabetes and chronic kidney disease

Clinical prioritization	► Elevated problem that would otherwise not been prioritized ► PCP autonomy preserved for initiation of GDMT ► PCPs appreciated reminder and specialists enjoyed helping
Implementation barriers external to the implementation strategies	► Inconsistent patient visits limit initiation of GDMT ► Cost and prior authorization barriers remain a barrier ► Patient hesitancy to change medication remains a barrier ► Additional patient monitoring needed after initiation of new medications remains a barrier
Content of recommendation	► Appreciation of evidence-based and detailed note content ► PCPs used note as a reference while writing their own notes ► Appreciation of specialists' chart review and ability to adapt notes for needs of complex patients
PCP characteristics	► PCPs felt they were not always up to date on recommendations ► PCP specialization affected confidence ► PCP willingness to learn novel treatments
Multidisciplinary collaboration	► Improved PCP access to specialists ► E-consults need to balance being prescriptive and collaborative ► Added to PCP burden with no specialist follow-up
Workflow	► Timing allowed for real-time application ► Need for follow-up mechanism to ensure implementation of GDMT ► Messages may get lost in EHR inbox

EHR, electronic health record; GDMT, guideline-directed medical therapy; PCP, primary care provider.

Many PCPs indicated that they used the notes as a reference when seeing patients and some incorporated the content of the notes into their own assessment and plans.

> It was very thorough. The note that the endocrinologist wrote, you know, had different scenarios, different possibilities… They did give me some pointers on other medicines to use for her diabetes that would also preserve her kidney function. So, I thought that was helpful. (Dr R, ID)
>
> Straight to the point. It wasn't a long message… It was just bullet points. It was easy, very good actually. … so I put it as a bullet point in my plan for the patient. (Dr M, GIM and ID)
>
> If I had any concerns or felt that it may not have been the right [medications or felt] we need more information. I would just lay it out there. The note [template] is really for the guidelines. So, there was a little finessing in some instances. (Dr S, Endocrinology e-consultant)

PCP characteristics

PCP's individual characteristics influenced whether they found the proactive e-consults acceptable, appropriate, and feasible. PCPs who specialized in GIM or FM expressed baseline confidence in managing T2D and CKD. In contrast, PCPs with subspecialization in infectious diseases said that the proactive e-consults increased their confidence and awareness of T2D and CKD management. PCPs in all practice settings mentioned feeling overburdened with clinical responsibilities with a simultaneous willingness to implement new GDMT.

> I think that it helps because not everybody has time to know what all of the newest recommendations are and then to implement them. And sometimes it involves medical knowledge that we just don't have yet. (Dr H, GIM and ID)
>
> I mean another potential advantage of going through this is that not only will I manage one patient better, but I could sort of learn how to manage other patients better. And maybe you know, access the specialists with more expertise too. (Dr Q, ID)

> I think that could be a challenge for a lot of providers it's just we're so overwhelmed with hundreds of messages every day. And once you fall behind, it's impossible to see everything. So I think that might be a challenge with the workflow. (Dr C, GIM)

Multidisciplinary collaboration

Most PCPs and the nephrology and endocrinology specialty e-consultants believed the proactive e-consult increased multidisciplinary collaboration. A few PCPs reported that being able to tell patients that the recommendations came from a specialist improved their patient's acceptance of medication changes. Many appreciated a "second set of eyes."

> [This helps] us as we educate the patients as to why we may need to make some of these changes and it reassures the patient that the intervention is recommended by not just primary care, but you know by nephrology or endocrinology as well, which sometimes we need to reassure the patients. (Dr K, GIM)
>
> I think the idea behind it is excellent… The intervention itself is a nice way to get specialists to help the primary care out. There's a huge delay to get appointments just because of the volume of patients and the number of providers. (Dr S, Endocrinology e-consultant)
>
> I think it was excellent. You know, I think PCPs are really used to having to…go out and seek out people to get whatever recommendations or help, and sometimes that could be frustrating because you can't get to them or the appointment is 8 months away or something. So, this was nice that it was more proactive and in some cases might

address something that you didn't even know and needed to be addressed. (Dr H, GIM and ID)

However, some PCPs reported that the proactive e-consult provided unidirectional communication and was not collaborative. These PCPs felt that the burden of caring for patients with T2D and CKD remained with the PCP and the proactive e-consult added to their workload. Some suggested a follow-up workflow with the specialists for additional assistance in GDMT implementation.

> It doesn't feel multidisciplinary to me. It feels more like it's another thing that I am supposed to be doing and I feel bad when I don't. (Dr C, GIM)
>
> You can't really see any collaboration. You're just getting 2 notes from two different people, so it doesn't necessarily feel very collaborative. It's more prescriptive to a certain extent. (Dr A, GIM and ID)

Workflow

Most PCPs found the proactive e-consult workflow acceptable. However, concerns arose about overlooked recommendations if the patient missed their appointment and if PCPs were overwhelmed with the volume of messages. To address this, PCPs suggested follow-up e-consults for reinforcement in cases of missed appointments or initial implementation challenges.

> If the patient is in the office and they mentioned something, then I'll…have the note there and see what they recommend in real time. That way I can discuss it with the patient. (Dr J, GIM and ID)
>
> I think the big challenge with primary care providers is that we get is we are hundreds of messages every day that I am responsible for. (Dr C, GIM)

> Follow up would be, would be great. You know, saying, you know, how's the patient doing? Have you made these changes? …I think a follow up would be good. (Dr R, ID)

> I do wonder now about the follow up for this. I think because it wasn't in the protocol for how to check on the follow up and it's not like I had these patients saved on my own radar to follow them. We see this a lot: the PCP prescribes it, the patient never gets it. (Dr S, Endocrinology e-consultant

Preliminary efficacy

At baseline, 0/18 patients were prescribed an SGLT2i, and 1/18 patient was prescribed a maximum dose of RAASi. At 3 months postbaseline (approximately 3 months after the nephrology, proactive e-consult), 3/18 (17%) patients were prescribed an SGLT2i, and 7/18 (39%) patients were either newly prescribed or had increased dose of RAASi compared with baseline. At 6 months postbaseline (approximately 3 months after the endocrinology, proactive e-consult), 7/18 (39%) patients were prescribed an SGLT2i, and 7/18 (39%) patients were either newly prescribed or had increased dose of RAASi compared with baseline.

DISCUSSION

We successfully implemented a pilot of MPE as a population health strategy to identify and address care gaps among vulnerable patients with T2D and CKD suggesting scalability and sustainability of this approach. Adopting MPEs could enhance patient care, though PCPs raised feasibility concerns. To address these, PCPs proposed program enhancements, including follow-up e-consults for reinforcement, and administrative support for navigating system-level barriers to care. Preliminary evidence showed increased prescribing of GDMT by PCPs, suggesting effectiveness of MPE to improve GDMT.

The major facilitator for implementing proactive e-consults is the acceptability of using EHR data to identify and deliver timely recommendations that may otherwise not be prioritized during a PCP visit. Other multilevel initiatives that included a platform to proactively identify patients with T2D and gaps in prescriptions for GDMT resulted in an increase in GDMT.[32 33] Through small-scale testing, we iteratively refined the T2D and CKD dashboard criteria and identified a future target for intervention: timely repetition of urine protein testing for patients with CKD. Dashboard refinement further provided insights into implementation strategies from key stakeholders for better management at the early stages of T2D and CKD. Other studies testing this approach emphasized buy-in from both the specialists and primary teams for targeted conditions and cautioned that the strategy may not be effective if overused.[18 19] MPE is particularly important for CKD which is often not recognized at early stages but has the potential to be controlled with the optimization of GDMT.[34–37] A recent publication described the protocol for the Kidney Coordinated HeAlth Management Partnership trial which will test the effectiveness of proactive e-consults sent from nephrologists and clinical pharmacists to PCPs for primary care patients with CKD.[38] Preliminary data from our study and others suggest that this strategy can be scaled to implement other high-impact guidelines at institutional and national levels to close practice and care gaps.[18 21]

We found that PCPs and specialists valued multidisciplinary collaboration; however, some PCPs felt that MPE felt more prescriptive than collaborative. Like traditional e-consults, MPE increases access to specialty expertise which is critical given challenges such as limited supply of specialists and specialty appointments.[39 40] Negotiating the balance between the opportunity for improved population health management and the impact on PCP workload and autonomy is important to consider as health systems test proactive e-consults.[19] Multidisciplinary care models, particularly those that include clinical pharmacists, have shown to delay the progression of CKD in adults, and reduce hospitalizations and cardiovascular events.[41–43] Ensuring that the content and tone of the e-consult notes are professional and not condescending is important for acceptability. An alternative population health strategy that has been described is to proactively identify patients with T2D and CKD who would benefit

from an MPE while maintaining PCP autonomy would give PCPs an option to order the e-consult.[44] However, this approach requires an additional step which may limit feasibility and acceptability. To improve multidisciplinary collaboration, an adjunct strategy is for the specialists to pend orders for the medications and/or laboratory tests for the PCPs to review and sign if appropriate.[19] This may improve the perception of multidisciplinary task sharing and enhance the effectiveness of MPE.

This study had important limitations. The small scale of the study limits the generalizability of the implementation data and inference from the preliminary effectiveness data. The observed increasing trend in use of these agents with time may be a reflection of penetration of guideline recommendations into practice independent of the proactive e-consult recommendation. Future studies are needed to evaluate the efficacy of MPE compared with usual care for increasing GDMT. Scalability and financial sustainability of the approach are uncertain as current insurance reimbursements require a request for consultation.[18] E-consult billing codes could be used; however, the patient would need to be made aware of the e-consult. Value-based care initiatives that capitate payments, but incentivize coordination and efficient collaboration, may provide sustainability options for proactive e-consults. An alternative and more cost-effective population health strategy, which has been shown to be effective in increasing GDMT for heart failure, is to use real-time, targeted, and tailored EHR-based alerting systems.[45 46] However, the complexity of comorbidity management, alert fatigue, and lack of specialist collaboration may limit the utility of this approach among persons with T2D and CKD.

MPE for T2D and CKD is an acceptable and appropriate way for nephrology and endocrinology specialists to share their expertise with PCPs who currently manage most patients with T2D and early CKD. Based on lessons learned from this implementation and preliminary efficacy study, we will refine and enhance multidisciplinary proactive e-consult program for a future trial designed to evaluate patient outcomes including progression of CKD and surrogate outcomes for cardiovascular disease such as hypertension and diabetes control. Proactive e-consults are a novel strategy for implementing evidence-based care, this study adds to the literature supporting their use for population health management and generalizability at US institutions experiencing gaps in GDMT.

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