

Moving Beyond Tools and Building Bridges: Lessons Learned From a CKD Decision Support in Primary Care

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The gaps in chronic kidney disease (CKD) detection and treatment have stubbornly remained wide.¹ In addition to very low awareness of CKD among affected patients,² primary care providers have cited multilevel barriers that

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impede the management of CKD and the coordination of CKD care with nephrologists and other specialists.^{3,4} Provider-level barriers include difficulty in assimilating CKD guidelines with those for other concurrent chronic conditions (eg, diabetes and blood pressure guidelines), whereas system-level barriers include limited time, a lack of standardized quality metrics, and difficulty in obtaining timely nephrology referrals.³ Primary care providers have long advocated for decision support tools and team-based care that are integrated into their clinical workflow.^{3,4}

One component of such tools that has been proposed is the Kidney Failure Risk Equation (KFRE). The KFRE accurately discriminates the risk of progression to kidney failure, defined by the initiation of dialysis or kidney transplantation, across diverse populations^{5,6} and can, thus, identify patients who are at the highest risk of CKD progression. The identification of patients who are at high risk, in turn, can inform treatment intensification and referral to nephrology care. However, more than 10 years since its introduction,⁶ the use of the KFRE remains low among primary care providers who care for the lion's share of patients with CKD. The lack of KFRE's integration into electronic health record (EHR) systems has been cited as one of the major barriers to its systemic adoption.

As reported in this issue of *Kidney Medicine*, Samal et al⁷ conducted a nonblinded, pragmatic clinical trial of a noninterruptive clinical decision support (CDS) tool within a primary care network of 11 clinics in the greater Boston area to determine whether embedding the KFRE within the EHR can improve CKD-related laboratory testing and referral of patients who are at high risk to nephrology. Patients assigned to each primary care provider were block randomized either to have the CDS banner displayed on their EHR 2 days before their primary care visit or to undergo usual care. The EHR-based CDS banner reported the patient's 5-year risk of kidney failure on the basis of the 4-variable KFRE, comprising age, sex, urine albumin-to-creatinine ratio, and estimated glomerular filtration rate.⁵ The notification also included an embedded hyperlink for a more detailed review of relevant laboratory data for KFRE calculation. Among patients with

an estimated 5-year risk of >10%, recommendations for laboratory testing and nephrology referral were displayed. For those missing KFRE data elements, low and high values were substituted to report a range of risk. For patients assigned to the intervention group, the CDS output was displayed at several visits during the 12-month intervention period. Outcomes were ascertained 6 months after a primary care visit and included completion of the laboratory tests needed for the 8-variable KFRE calculation (ie, additionally includes serum albumin, bicarbonate, phosphorus, and calcium) as the primary outcome. Secondary outcomes included urine albumin-to-creatinine ratio testing among patients who were not tested in the preceding 12 months and nephrology referral among those with an estimated 5-year risk of >10%.

In total, 2,794 and 2,796 patients were randomized to the intervention and control arms, respectively. At enrollment, the minority of patients in both arms had all the laboratory findings needed to calculate their kidney failure risk by the 4-variable KFRE. As observed consistently in the United States, only one-third had undergone urine albumin-to-creatinine ratio testing; this proportion is slightly lower than the overall national percentage of urine protein testing among persons with CKD in the United States.⁸ Consequently, for most patients in the intervention arm, the CDS tool presented a range of kidney failure risks using 2 possible values for each missing laboratory finding. During the course of the study, fewer than half of the 139 primary care providers to whom the kidney failure risk was displayed clicked on the embedded hyperlink and only 10% clicked on the hyperlink more than once. At 6 months, the proportion of patients who had undergone additional recommended laboratory testing was similar between the randomization groups. Among those with a 5-year kidney failure risk of >10% (n = 840), paradoxically, fewer patients in the intervention arm, compared with the control arm, were referred to nephrology (28% vs 38%, respectively).

As is imperative in pragmatic trials, the investigators obtained early input on the CDS tool from the target end users and enlisted a local clinical champion.⁹ However, this study also encountered challenges that are common to CDS implementation. First, whether the investigators and the primary care practices established shared prioritization of improving CKD care is unclear; primary care providers often contend with multiple medical issues in a single clinic visit, and CKD is relatively deprioritized compared to diabetes and hypertension.³ Second, although the CDS

display was noninterruptive, prior studies indicate that both repeated alerts and a higher volume of alerts can increase alert fatigue.¹⁰ Third, the informational presentations on the CDS tool were likely insufficient to overcome the primary care providers' unfamiliarity with the KFRE. Moreover, the low rates of urine albumin-to-creatinine ratio testing led to the majority of patients having a range of risks displayed, and the lack of familiarity and comfort with interpreting the KFRE results may have led providers to ignore them. Although prospective implementation studies and trials are ongoing,^{11,12} the impact of the KFRE on improving clinical outcomes beyond triaging of nephrology care remains to be determined.¹³ This lack of strong evidence and familiarity with the KFRE may have led to the primary care providers' underappreciation of the tool's potential clinical utility and relevance to their day-to-day practice. The informational presentations, in general, were also unlikely to close the CKD knowledge gap among participating primary care providers because intensive screening and education have been shown to be similarly ineffective at creating practice change for diseases with well-defined evidence in primary care, such as hypertension.¹⁴ Furthermore, the CDS recommendation for additional laboratory tests to enable a more extensive KFRE calculation rather than providing specific therapeutic changes for risk reduction may not have aligned with the primary care providers' desire for actionable steps to mitigate patients' risks, as expressed in qualitative interviews.

Although CDS can be a powerful clinical tool, the lack of efficacy of high-quality CDS interventions that remediate both identification of patients and education begs the question of whether either identification or education result from system deficits or represent key lesions in actualizing clinician behavior changes in clinical practice. We hypothesize that, at minimum, contextualization of recommendations for patients with multimorbidity and reconciling overlapping guidelines (eg, American Diabetes Association, KDIGO [Kidney Disease: Improving Global Outcomes], and American Heart Association guidelines) may improve the relevance of CDS recommendations and notifications, particularly for providers who follow field-specific guidelines closely but not others. Furthermore, even for CDS recommendations that account for multimorbidity, metrics are needed to measure a CDS intervention's benefits versus harms.¹⁵ The association of the KFRE CDS notifications in decreasing appropriate referrals from 38% in the control arm to 28% in the intervention arm highlights the importance of considering the harms of such interventions. Technology alone is unlikely to be the isolated core lesion in affecting changes in practice and may miss the root of clinical deficits entirely.¹⁶

As suggested in this article and by others,^{3,4} primary care providers are already overburdened, working with limited time, and dealing with fragmented patient care. Asking primary care providers to adopt a CDS tool may be equally impractical as asking nephrologists to care for all patients with CKD. Although the CDS tool is thought to

ultimately target individual providers, the patterned practice deficits largely stem from systemic issues. Both culture and staffing models in health systems that disincentivize strategic implementation and adoption of guideline-directed care must also be examined. As an example, in a prior large, nationwide, pragmatic trial among primary care practices, Carroll et al¹⁷ suggested that providing CDS plus practice facilitation versus CDS alone could slow CKD progression and improve diabetes control. However, this earlier study encountered operational challenges, including significant dropout of participating clinical practices because of changes in EHR systems and buyouts of smaller practices by hospitals, and sheds light on threats to the validity of findings from pragmatic trials. Nonetheless, this earlier study suggests that to be accepted by providers and be effective in changing practice, CDS interventions will need to provide a suite of practice facilitation modalities, considering everything from contextualization of multimorbidity in well-timed alerts to sufficiently supporting the workload of providers to allow time to consider changes or expansions in practice.

Although the results are frustratingly null, as in many other pragmatic trials focused on improving CKD care, studies like the trial by Samal et al⁷ are critical because they inform how we should design and implement the next interventions. As we iterate through various interventions, qualitative studies to gain feedback from all stakeholders, including primary care providers, specialists, support staff, patients, and health system leaders, offer valuable insights into the human side of implementation; these factors are as important as the quantitative clinical and operational measures in these pragmatic trials. We find ourselves in a time of fast-advancing health information technology and have amassed a wealth of health data that enable the identification of patients at high risk of CKD and CKD progression even before they undergo laboratory testing¹⁸; however, as suggested by the present study, we need to move beyond testing technological tools and, rather, test interventions that marry these tools with practice facilitation that also addresses patient and provider needs.

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