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Research and Applications

Partner-developed electronic health record tools to facilitate social risk-informed care planning

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ABSTRACT

Objective: Increased social risk data collection in health care settings presents new opportunities to apply this information to improve patient outcomes. Clinical decision support (CDS) tools can support these applications. We conducted a participatory engagement process to develop electronic health record (EHR)-based CDS tools to facilitate social risk-informed care plan adjustments in community health centers (CHCs).

Materials and Methods: We identified potential care plan adaptations through systematic reviews of hypertension and diabetes clinical guidelines. The results were used to inform an engagement process in which CHC staff and patients provided feedback on potential adjustments identified in the guideline reviews and on tool form and functions that could help CHC teams implement these suggested adjustments for patients with social risks.

Results: Partners universally prioritized tools for social risk screening and documentation. Additional high-priority content included adjusting medication costs and changing follow-up plans based on reported social risks. Most content recommendations reflected partners' interests in encouraging provider–patient dialogue about care plan adaptations specific to patients' social needs. Partners recommended CDS tool functions such as alerts and shortcuts to facilitate and efficiently document social risk-informed care plan adjustments.

Discussion and Conclusion: CDS tools were designed to support CHC providers and staff to more consistently tailor care based on information about patients' social context and thereby enhance patients' ability to adhere to care plans. While such adjustments occur on an *ad hoc* basis in many care settings, these are among the first tools designed both to systematize and document these activities.

Key words: social determinants of health, social risk, health information technology, participatory design, hypertension, diabetes mellitus

INTRODUCTION

Background and significance

Social, economic, environmental, and policy factors that impact health outcomes are called “social determinants of health.” For

individual patients, adverse social determinants shape specific social risks, including food, transportation, and housing insecurity.^{1–5}

Given the compelling evidence that social risks influence health, many professional organizations now recommend that social risk

screening be integrated into health care delivery.^{3,6-8} A 2019 National Academies of Sciences, Engineering, and Medicine (NASEM) report on integrating social and medical care describes a framework for the multiple ways social risk data can be used in clinical settings.⁹ As health care teams increasingly collect information about patients' social risk(s) (the NASEM framework refers to social risk screening as "awareness" activities) and social risk data become more widely available in electronic health records (EHRs), care teams have more opportunities to use this information to improve patient outcomes, which might reduce health inequities.⁹⁻¹³ Multiple studies have shown improved clinical outcomes when care plans are "adjusted,"¹⁴⁻¹⁸ a term used in the NASEM framework to refer to adapting care plans to account for patients' reported social risks. However, such "adjustments" are made inconsistently: changes to care based on information about patients' social conditions are made in <25% of clinical encounters,^{12,19,20} even when social risk information is shared directly with clinical providers.¹⁹⁻²¹

Social risk data may be more likely to influence care when accompanied by specific recommendations about how to use them²²; providing this type of support to clinical teams may be necessary to ensure that social risk-informed care plan adjustments are made. One potential source of such support is clinical decision support (CDS) tools, which have been shown to facilitate other practice changes by presenting provider-facing reminders about overdue screenings, summarizing a patient's health risks, and providing guideline-based care recommendations.²³⁻³⁹ To understand how CDS tools might support social risk-informed decision-making at the point of care, we conducted an engagement process that included individuals who may be impacted by or have an interest in these tools (hereinafter referred to as "partners"). The process was designed to inform the development of a suite of EHR-based CDS tools that could help care teams use social risk information to improve care for patients with hypertension and/or type 2 diabetes mellitus (T2DM) in primary care community health centers (CHCs).

MATERIALS AND METHODS

Systematic scoping reviews of clinical guidelines

We conducted systematic scoping reviews of care guidelines from professional organizations on the treatment and management of (1) T2DM and (2) essential hypertension. The guidelines were searched to identify all instances of recommended care plan adaptations based on social context (eg, recommended modification of antihypertensive medication orders based on cost). Detailed methods and findings are described elsewhere.⁴⁰⁻⁴² Review findings were used as the foundation for the partner-driven process described below.

Partner-driven CDS development process

Results from the systematic reviews informed a participatory engagement process⁴³⁻⁴⁷ involving staff and patients from CHCs that are members of OCHIN, Inc. OCHIN is a nonprofit health care innovation center that provides a shared instance of Epic EHR to nearly 1000 CHCs across the US.

We developed a committee composed of 12 CHC provider and staff partners recruited to represent diverse geographic regions and primary care clinical roles (including 5 advanced practice providers or physicians, 1 nurse, 1 patient navigator, 1 pharmacist, 1 behavioral health provider, 1 social services manager, 1 quality improvement specialist, and 1 social determinant of health screening program director). Committee members were first given the results

of the scoping reviews described above, which consisted of summaries of the adjustments found in the guideline review, organized by key themes and condition. The intent of sharing these guidelines was to help ground the consensus process in the evidence base and guide content-related discussions. We then conducted one-on-one interviews with each committee member to solicit ideas about the CDS tools. Interview guides included short clinical vignettes that were used to encourage committee members to think about clinical care adjustments rather than ways to connect patients with social services (Supplementary Appendix SI). While social services are part of social care, the CDS tools were intended to support functionalities related to adjustments to the clinical care plan. We met with the committee in 5 monthly sessions to solicit input on the ideas generated both from the scoping review and interviews. Committee members were asked to focus on tool content (topics), functions (eg, alerts, reminders of overdue screenings), and form (appearance and placement in the EHR) of recommended CDS tools.

All interviews and committee meetings took place via video teleconferencing. Both were audio recorded. Interviews were professionally transcribed verbatim; detailed notes were taken during each meeting and audio recorded as a secondary measure to capture the feedback. To facilitate participation in the meetings, real-time polling, teleconference chat functions, invitations to provide additional feedback, tool and workflow mock-ups, and ad hoc surveys were used during and after each meeting. Survey questions, administered via an online survey platform, were designed both to elicit further feedback on items discussed in the meetings and to assess majority opinion about preferences.

The topical focus of each of the 5 meetings is presented in Figure 1. In brief, over the first 3 meetings committee members were presented with potential CDS content options suggested either by the scoping reviews or partner interviews, and asked to review, provide feedback, and prioritize these proposed content elements. At subsequent meetings, the committee was asked to comment on the function and form of the tools initially developed to reflect content preferences. The CDS functions continued to be revised based on prior input and re-presented to the partners for additional feedback over the course of the meeting series.

Throughout this process, the multidisciplinary research team met regularly to discuss and interpret all input by rapidly analyzing committee meeting notes and reviewing the technical feasibility of building specific tool functions in the EHR. Over the course of the 5 committee meetings, these interpretations were shared for member checking, and the committee proposed additional tool changes to accommodate feasibility barriers. The interviews were exploratory in nature and served to stimulate discussion and expand understanding of the factors and interactions to consider when developing the CDS tools. Transcripts were analyzed by the study's qualitative team using a rapid analytic approach and a findings summary informed content and form discussions in the committee meetings.

We presented the proposed suite of tools to OCHIN's Patient Engagement Panel, an established group of CHC patients and caregivers from across the US who meet regularly to provide input on research-related EHR changes, some of whom may experience social risks or manage chronic conditions described in this study.⁴⁸ Patients and caregivers were asked for feedback on when and how they would like providers to discuss care adjustments based on their socioeconomic circumstances. We also solicited specific feedback on the proposed patient-facing language shown in EHR tools designed to serve as conversation prompts, and in the patient's after-visit summary (AVS). The proposed tools were also presented to

November 2020	December 2020	January 2021	February 2021	March 2021	April 2021
<p>Committee meeting 1</p> <ul style="list-style-type: none"> Content: build rapport; set context; define common language <p>1:1 committee member interviews</p> <p>Completion of systematic scoping guideline review</p>	<p>Committee meeting 2</p> <ul style="list-style-type: none"> Content: reminder of definitions; discussion of care plan adjustments; shared initial list of ideas generated from scoping review <p>Completion of 1:1 committee member interviews</p>	<p>Committee meeting 3</p> <ul style="list-style-type: none"> Content: repeat key takeaways from prior meeting to ensure shared understanding; discussion of 3 areas related to care adjustments (i.e., medications, communication, care plan development) Adjustment ideas for this meeting were generated from scoping review and prior meeting 	<p>Committee meeting 4</p> <ul style="list-style-type: none"> Content: repeat key takeaways from prior meeting to ensure shared understanding; walkthrough workflow using tool mock-ups to enable easier visualization and spark brainstorming Adjustment ideas for this meeting were generated from scoping review, 1:1 interviews, and prior meeting 	<p>Committee meeting 5</p> <ul style="list-style-type: none"> Content: repeat key takeaways from prior meeting to ensure shared understanding; introduce concept of medical red flags; discuss CDS systems in cases where social risk is unknown; brainstorm how to use the EHR to support patient conversations about adapting care based on unique social context 	<p>Committee member survey</p> <ul style="list-style-type: none"> Content: lingering tool content/form questions <p>Patient Engagement Panel</p> <ul style="list-style-type: none"> Content: set context; elicit feedback on how and in what circumstances patients would feel comfortable adjusting care plans based on unique social context <p>Clinical Operations Review</p> <ul style="list-style-type: none"> Content: elicit feedback on content and form of tools
<p>The research team met weekly throughout the partner-led process to interpret and distill feedback, which informed subsequent meeting content.</p>					

Figure 1. Timeline of activities.

OCHIN’s Clinical Operations Review Committee, comprised of clinical leaders from across OCHIN’s CHCs who provide input on all proposed EHR changes.^{49,50} The Kaiser Permanente Northwest Institutional Review Board reviewed this study, which was determined to be exempt from IRB oversight.

RESULTS

Tool content

Nineteen content recommendations were initially presented to the committee based on scoping reviews or one-on-one interviews. Table 1 represents all considered adjustments, the intended purpose of each adjustment, and the partners’ suggestions about whether to include related content in the suite of CDS tools. The adjustments are organized into categories aligned with common clinical activities.

The committee suggested 15/19 recommendations would be feasible to implement. Reasons that 4 adjustments were not considered feasible are described in Table 1. Of these 15, partners universally prioritized tool content specific to social risk screening and documentation. Additional high-priority content related to adjusting medication costs and changing follow-up visit plans were developed based on reported social risks. The majority of other high-priority content recommendations reflected partners’ interest in encouraging more dialogue between providers and patients about care plan accommodations specific to patients’ reported social needs. Priorities varied regarding the specificity of tool content. State and payer laws influenced priorities (eg, partners in states allowing 90-day prescriptions wanted 90-day prescription defaults), as did local context (eg, CHCs with onsite pharmacies providing federally discounted prescription medications were less interested in referrals to pharmacies providing medication delivery services). Tool content dependent on state, payer, or local context, therefore, was designed as elective

(ie, CHCs could opt into it) to accommodate regional and clinic-specific needs. The flexibility to customize the tools to local context was of high importance to the partners.

CDS tools: form and function

As consensus developed regarding the content for the CDS tools, the partners considered specific form and functions for presenting this content in the EHR. These included determining when in the primary care visit workflow the CDS tools would appear (eg, rooming, encounter documentation, follow-up); the logic triggering their appearance (eg, for patients with T2DM being prescribed a new medication vs all patients with T2DM); where they would appear (eg, multiple locations in the EHR vs only at point of prescribing); and the degree of customization needed (eg, prescribing 90-day supply depending on state and payer laws).

Tool form

Based on the results of these discussions, the CDS tools were built primarily into SmartSets and Best Practice Advisories, which are commonly used EHR tools (see Supplementary Appendix SII for examples). Most of the related adjustment recommendations are suggested in both formats. SmartSets provide a standardized way to place orders, document diagnoses, and write progress notes for patients with a given medical condition. A range of adjustment recommendations was embedded within SmartSets. Each appears as a selectable option and means care can be adjusted with one mouse click. The social risk-informed care recommendations were incorporated into 4 SmartSets; 3 were inserted into existing EHR SmartSets (Hypertension, Diabetes, Care Gaps) and one was developed specifically for this study (Social Needs and Care Planning). Since not all providers regularly use SmartSets for charting, however, Best Practice Advisories—which provide a visual reminder intended to guide clinical decision-making and care provision—offered an alternative

Table 1. Original list of adjustments

Adjustment-related category	Intended purpose of adjustment	Adjustment accepted for development
Increase social risk awareness, screening, and documentation		
Screen patient for social risk	Increase documentation of social risks	Yes
Document social risk in patient record (Z-codes)	Increase care team awareness of social risks	Yes
Medical red flags may indicate need for adjusting care plan	Identify patients whose social risks may be impacting health	Yes
Facilitate patient–provider discussions about social risks and document discussions		
Collaborate with patient on their social risk-informed care plan	Improve patient’s chance of care plan follow-through	Yes
Ensure patient instructions are at appropriate literacy level and language	Increase accessibility for all patients	Yes
Recommend care changes and document changes		
<i>Prescriptions</i>		
Document patient barriers to taking medications	Increase care team’s awareness of all care activities and patient’s social barriers	Yes
Prescribe less expensive medications, such as generic meds, when feasible	Lower cost of patient’s medications	Yes
Provide patient with an option to have their medication delivered to home	Minimize patient trips to pharmacy	Yes
Prescribe long acting or combination medications	Lower cost of patient’s medication; simplify medication regimen	No; Building medication algorithm too complex for scope
Prescribe a larger-than-needed dose of medication and recommend usage of a pill splitter	Lower cost of patient’s medication	No; Insurance coverage challenges, concern re: patient safety issues
Recommend the usage of a weekly pill organizer	Simplify patient’s medication regimen	No; Implementation logistics considered too burdensome for clinics; perception of limited value
Prescribe a 90-day dose of medication	Simplify patient’s medication regimen; minimize patient trips to pharmacy; lower patient medication costs	Yes
Utilize GoodRx.com to find lowest cost medications, particularly if patient is designated as self-pay	Lower cost of patient’s medication	Yes
Conversation with patient about titrating insulin; consider risk of hypoglycemia	Ensure medication safety if patient experiences food insecurity	Yes
Communicate with pharmacists about lowering medication costs	Lower cost of patient’s medication	Yes
<i>Follow-up care</i>		
Provide patient with an option of follow-up care via telemedicine	Minimize patient trips to clinic	Yes
Limit the overall number and frequency of clinic visits	Minimize patient trips to clinic	Yes
Refer to clinic-based CHW or social worker	Improve coordinated care team support	Yes
Provide patient with a home monitoring device	Minimize patient trips to clinic	No; Insurance coverage challenges

way for these providers to view the same CDS suggestions. Best Practice Advisories are in the “Rooming” and “Plan” sections of the EHR where rooming staff and providers document most encounter-related content. Interruptive popup Best Practice Advisories following social risk screening entry target users completing each part of the encounter workflow. Relevant medication-related suggestions are also embedded within Best Practice Advisories that appear when ordering prescriptions. Several committee members expressed concerns that the CDS tools could negatively interrupt clinic workflow, particularly providers for whom may see the CDS tools most frequently and emphasized the need to minimize the need for clicks or hard stops.

Tool function

A summary of the content in the suite of CDS tools is shown in [Table 2](#) and described in detail below. The tools appear to CHC staff based on patients’ clinical and social risk information. First, the CDS tools identify patients with a medical “red flag,” a term that other researchers define as a clinical cue that something might be interfering with the patient’s ability to follow the care plan.¹⁵ In this study, red flags are defined as uncontrolled hypertension (BP \geq 140/90), uncontrolled T2DM (HbA1c \geq 9.0), or in patients with either hypertension or T2DM, an appointment no-show rate of $>$ 50% of visits in the last year, all of which would have been identified in prior visits and already in the patient record. [Table 2](#) presents a

Table 2. Summary of CDS tools

Adjustment-related category	Adjustment tools	Documentation tools
<p>Increase social risk screening and documentation</p> <ul style="list-style-type: none"> • Screen patient for social risk • Document social risk in patient record (Z-codes) • Consider if medical red flags may indicate need for adjusting care plan 	<ul style="list-style-type: none"> • Review summary of social risks • Review anticipated coverage level for all new medication orders • Alert that social risk screening is due with link to social risk screening interface, targeted to patients with medical red flags (eg, no screening in 12 months and either >50% missed visit in previous 12 months, HgA1c above 9.0, BP above 140/90) 	<ul style="list-style-type: none"> • Add screening-related Z-codes to problem list and/or encounter • Document social reasons for medication nonadherence (eg, not taking/taking differently than prescribed because of cost/co-pay)
<p>Facilitate patient–provider discussions about social risks and document discussions</p> <ul style="list-style-type: none"> • Collaborate with patient on their social risk-informed care plan • Ensure patient instructions are at appropriate literacy level and language 	<ul style="list-style-type: none"> • Prompt discussion regarding: (1) potential adjustments (general); (2) titrating insulin dose in patient with financial insecurity/food insecurity; (3) medication adherence for patients with new prescription for T2DM or hypertension; (4) use of GoodRx^a; (5) visit follow-up (eg, telehealth vs in person and scheduling interval)^a; (6) interest in medication home delivery^a 	<ul style="list-style-type: none"> • Document social risk-related discussions occurred in progress note (eg, SmartPhrase with option for free text) • Document social risk-related discussions and/or provide relevant instructions in AVS (click)
<p>Recommend care changes and document changes</p> <p><i>Prescriptions</i></p> <ul style="list-style-type: none"> • Document patient barriers to taking medications • Prescribe less expensive medications, such as generic medications, when feasible • Provide patient with an option to have their medication delivered to home • Prescribe a 90-day dose of medication • Utilize GoodRx.com to find lowest cost medications, particularly if patient is self-pay • Conversation with patient about titrating insulin; consider risk of hypoglycemia • Communicate with pharmacists about lowering medication costs <p><i>Follow-up care</i></p> <ul style="list-style-type: none"> • Provide patients with an option of follow-up care via telemedicine • Refer to clinic based CHW or social worker 	<ul style="list-style-type: none"> • Alert that medication is not available as generic and to consider alternative • Suggest patient talk with pharmacist about medication costs • Send note to pharmacist about medication costs • Suggest use of GoodRx^a • Consider 30- vs 90-day prescription^a • Suggest patient talk to pharmacist about medication home delivery^a • Send note to pharmacist about medication home delivery^a <ul style="list-style-type: none"> • Change mode of follow-up encounter (telehealth vs in person) and scheduling interval^a • Make one-click referral to CHW, or other role^a 	<ul style="list-style-type: none"> • Document social risk-related care changes in progress note (eg, SmartPhrase with option for free text) • Document social risk-related care changes and/or provide relevant instructions in AVS (click)

AVS: after-visit summary; BP: blood pressure; CDS: clinical decision support; CHW: community health worker; HgA1c: hemoglobin A1C; T2DM: type 2 diabetes mellitus.

^aOptional.

summary of the final CDS tools developed based on the committee's input, organized into categories aligned with common clinical activities (screening, patient–provider discussions, and care planning/follow-up).

Tools to increase screening and documentation of social risks

Certain adjustment and documentation tools are designed specifically to support providers' awareness and documentation of social risks. These were built into the EHR's best practice section for rooming staff. If a patient has a red flag and if the last recorded financial-related social risk screening occurred >12 months ago, an alert prompts rooming staff to screen for social risks, with a link to the screening form. If a patient has a documented social risk (eg, financial insecurity) when the user saves the form, an interruptive alert appears offering to add the relevant ICD-10 Z-code(s) to the

patient's problem list with one click. Adding social risk-related Z-codes to the problem list enables health care team members to systematically document ongoing issues experienced by the patient and can be important to CHCs' quality reporting and reimbursement. The rooming staff is required to accept or cancel the Best Practice Advisory before continuing. If the user accepts the suggested Z-codes, they are added to the problem list, and those Best Practice Advisories are not shown to the provider as the suggested documentation is now complete. If the Best Practice Advisories are canceled, they will appear passively when the provider opens the patient's chart.

At each visit, rooming staff in most CHCs are asked to document medication adherence for all prescriptions. Medication adherence documentation was already in the EHR; a new Best Practice Advisory appears recommending that staff conduct this assessment.

When documenting, rooming staff can indicate if the patient is taking a given medication differently than prescribed or not at all due to cost. Medication variance shows in the Medication & Orders section of the chart, where this information is highlighted for provider review.

Tools to facilitate and document patient–provider discussions about social risks

Both the Best Practice Advisory and SmartSet presentations of the tools include conversation prompts, which reflect suggested topics and scripts to enable patient–provider conversations about potential care plan adjustments. The SmartSet tools also include selectable actions that enable providers to document notes, orders, diagnoses, or patient instructions taken in response to the prompt. The conversation prompts include recommendations that providers discuss, for example, (1) whether social needs might influence patients' ability to act on the care plan/take medication as prescribed; (2) strategies for lowering medication costs/improve medication access by using generic medications or suggesting GoodRx,⁵¹ a free website that

provides discounts on medications; (3) considerations related to follow-up visit modality (eg, in-person vs telehealth follow-up); and (4) when relevant, risks associated with using insulin in the context of food insecurity. In the SmartSets, each conversation prompt is accompanied by an option for the provider to add text to the progress note and/or patient instructions regarding adjustments. Table 3 shows examples of conversation prompts with both the associated progress note text and patient AVS instruction text. Notably, patient–facing communication was reviewed by the study's Epic trainer to ensure a 4th grade reading level.

Tools to recommend and document care changes—Prescribing tools

When prescribing medications to patients with social needs, a Best Practice Advisory targeted to the patients' social needs/medication order will appear. As relevant, the Best Practice Advisory alerts the user that a given medication is not available as generic, to consider a 90-day prescription, and to send a note to the pharmacist to discuss options for lowering medication costs or home delivery of

Table 3. CDS conversation prompts

Adjustment tool	Conversation prompt in Best Practice Advisory/SmartSet	Templated progress note text ^a	Templated AVS text ^a
Titration insulin dose in patient with financial insecurity/food insecurity	“Discuss the risk of hypoglycemia and need to titrate insulin based on food availability.”	“Discussed with the patient how to titrate insulin dose based on food availability.”	“Access to safe and nutritious food should influence insulin dosing. You and your provider discussed when and how to adjust your insulin dose based on the availability of safe and nutritious food.”
Medication adherence for patients with new prescription for T2DM or hypertension	“Many patients have additional barriers. Consider asking the patient if anything will keep [patient's preferred pronoun] from taking medications as prescribed.”	“We discussed whether the patient's social need(s) might prevent them from acting on the care plan (Free text: describe medication-related care adjustments).”	Medication-related care adjustments included in AVS.
Prompt discussion about visit follow-up (eg, telehealth vs in person and scheduling interval)	“Consider telehealth AND/OR longer interval before the follow-up appointment. Ask the patient if a telehealth follow-up appointment is feasible and preferable to an in-person follow-up appointment. If so, confirm Internet access and required technology. Consider patient preferences and barriers when choosing follow-up appointment intervals.”	“Based on social risks, we discussed patient's preferences for follow-up timeframe and modality.”	Follow-up appointment date and modality included in AVS.
Prompt discussion about interest in medication home delivery	“Tell the patient that the pharmacist may be able to make recommendations to lower medication costs.”	“Suggested the patient talk with the pharmacist about ways to lower medication costs and home delivery.”	“Ask your pharmacist about whether there are similar lower-cost medications and/or about whether your medications can be mailed to where you live.”
Suggest use of GoodRx	“Patient may have insufficient medication coverage. The cost of medications may be a barrier. Consider suggesting GoodRx.”	“Discussed medication cost and GoodRx with the patient.”	“Consider using the discount pharmacy codes from GoodRx when purchasing your prescription to help lower your medication costs. You can apply these discounts at most major pharmacies.”

AVS: after-visit summary; T2DM: type 2 diabetes mellitus.

^aModifiable by provider.

medications. Providers have an opportunity to edit this text before signing the order.

Tools to recommend and document care changes—Follow-up care tools

The SmartSet version of the tools also enables providers to add preferred follow-up appointment modalities, such as scheduling telehealth appointments for patients who experience transportation barriers.

DISCUSSION

Through a participatory engagement process, we designed a suite of CDS tools intended to help primary care teams document and apply information about patients' social risks as part of hypertension and T2DM care. The tools' content originated from T2DM and hypertension care guidelines and from CHC staff and patients and was reviewed by partners for anticipated usefulness and feasibility in practice. The tools are intended to support care teams to identify and document social risks, prompt providers to discuss potential care changes based on those risks with their patients, and then to document any care changes that are made.

In other contexts, CDS tools have been shown to improve patient outcomes and cost of care,^{23,52–54} but to our knowledge they have not yet been designed specifically to enhance clinical decision-making by providing relevant information about patients' social context and/or to recommend strategies to decrease the influence of social adversity on care plan adherence. Ideally, these new tools could support patients and providers to work together to adjust care in ways that will maximize care adherence and subsequently both improve outcomes and decrease inequities. Though this study focused on clinical care adjustments, other initiatives that use social risk information to inform referrals to government and community-based resources are needed; these also should be developed to meet the needs and priorities of different partners.

In fall 2021, a 1-year pilot of this suite of CDS tools began in 3 CHCs. During and after the pilot, tool users will be asked to provide recommendations on needed tool content, form, and usability revisions. Committee members in the development phase suggested that we also monitor pilot CHCs for alert fatigue and ask specifically about the relevance of each tool component in different regions. Based on pilot findings, tools and associated training materials subsequently will be modified to address all learnings from this process in preparation for formal testing in a subsequent clinical trial; the protocol for this trial is described elsewhere.⁴¹

Limitations

Tool development should be reviewed in light of several study limitations. First the clinical partners on the committee that provided input on the tools' content, form, and function were intentionally recruited to reflect regional and staff member diversity within CHCs. Nonetheless, a different group of partners might have led us to develop a different suite of tools. Another challenge was that the suggestions for social risk-related care adjustments included in professional disease management and treatment guidelines often differed from our partners' priorities. In the final suite of tools, we limited content abstracted from the professional guidelines to topics on which the majority of partners agreed. As both professional guidelines and EHRs evolve, it may be worthwhile to repeat this kind of review and partner engagement process to elicit new ideas

about meaningfully incorporating social risk information to improve care and again assess the feasibility of incorporating these suggestions into tool updates. In addition, this work focuses on the development of EHR-based CDS tools for T2DM and hypertension management; future research would be warranted to adapt such tools to support caring for patients with social risks and other chronic conditions. Finally, several partners noted that potential provider burdens of CDS. Though we developed tools to minimize time and efficiency burdens, future research will need to focus on the extent of this burden and weigh tool benefits against costs.

CONCLUSION

We used partner input to develop a suite of CDS tools intended to support clinical providers to tailor care decisions based on patients' social circumstances. While such care plan adjustments currently occur on an *ad hoc* basis in many care settings serving vulnerable patients, these are among the first EHR-based tools designed to systematize and document social care adjustments.

HUMAN INVESTIGATIONS

The Institutional Review Board at Kaiser Permanente Northwest reviewed this study and determined it exempt from IRB oversight.

PRIOR PRESENTATIONS

Results of this study were presented on November 22, 2021, at the virtual 49th North American Primary Care Research Group Annual Meeting and on December 12, 2022, at the 15th Annual Conference on the Science of Dissemination and Implementation in Health Conference in Washington, DC.

TRIAL REGISTRATION

Clinical Trials registration title: COHERE—COntextualized care in cHcs' Electronic health Records NCT05022316 registered August 25, 2021.

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AUTHOR CONTRIBUTIONS

LG, RG, AB, EC, and DH created the study design. AB and KD conducted interviews. All authors contributed equally to the conception of the manuscript; the analysis and interpretation of data; the drafting and revision of the manuscript and the final approval of the version to be published and are accountable for all aspects of the work.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Journal of the American Medical Informatics Association* online.

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CONFLICT OF INTEREST STATEMENT

The authors have no competing interests to declare.

DATA AVAILABILITY

The data underlying this article will be shared on reasonable request to the corresponding author.

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