ORIGINAL RESEARCH

Developing Electronic Health Record (EHR) Strategies Related to Health Center Patients' Social Determinants of Health

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Background: **"Social determinants of heath" (SDHs) are nonclinical factors that profoundly affect health. Helping community health centers (CHCs) document patients' SDH data in electronic health records (EHRs) could yield substantial health benefits, but little has been reported about CHCs' development of EHR-based tools for SDH data collection and presentation.**

Methods: **We worked with 27 diverse CHC stakeholders to develop strategies for optimizing SDH data collection and presentation in their EHR, and approaches for integrating SDH data collection and the use of those data (eg, through referrals to community resources) into CHC workflows.**

Results: **We iteratively developed a set of EHR-based SDH data collection, summary, and referral tools for CHCs. We describe considerations that arose while developing the tools and present some preliminary lessons learned.**

Conclusion: **Standardizing SDH data collection and presentation in EHRs could lead to improved patient and population health outcomes in CHCs and other care settings. We know of no previous reports of processes used to develop similar tools. This article provides an example of 1 such process. Lessons from our process may be useful to health care organizations interested in using EHRs to collect and act on SDH data. Research is needed to empirically test the generalizability of these lessons. (J Am Board Fam Med 2017;30:428–447.)**

Keywords: **Community Health Centers, Data Collection, Electronic Health Records, Primary Health Care, Referral and Consultation, Social Determinants of Health**

Numerous health outcomes are influenced by the social and physical characteristics of patients' lives. These "social determinants of heath" (SDHs) can affect health via diverse mechanisms (eg, chronic stress, hampering patients' ability to follow care recommendations).[1] This impact is so great that addressing SDHs may improve health as much as addressing patients' medical needs.[2–21]

The Institute of Medicine (IOM) recommended that 10 patient-reported SDH domains (and 1 neighborhood/community-level domain) be documented in electronic health records (EHRs)[22,23] (Table 1). These domains were selected based on evidence of their health impacts; their potential clinical usefulness and ability to put into action; and the availability of valid measures. Some of these domains (eg, race/ethnicity) are already regularly collected by federally funded clinics; others (eg, social isolation, financial resource strain) are not. The Centers for Medicare & Medicaid Services intended that the IOM's report inform stage 3 meaningful use EHR incentive program requirements. Related to this, the Medicare Access & CHIP Reauthorization Act of 2015 and Centers for

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Table 1. Institute of Medicine Phase 2 Report: Summary of Candidate Domains for Inclusion in All Electronic Health Records

Race/ethnicity*
Education
Financial resource strain
Stress
Depression*
Physical activity
Nicotine use/exposure*
Alcohol use*
Social connections/social isolation
Exposure to violence: intimate partner violence
Neighborhood characteristics (eg, median income within census tract)

*Already routinely captured in electronic health records.

Medicare & Medicaid Services' 2016 Quality Strategy both emphasize care providers identifying and intervening in SDH-related needs. In addition, the Health Resources and Services Administration and the Office of the National Coordinator for Health Information Technology have both indicated that SDH data collection should continue to expand as part of federally qualified health center reporting, and may become required for EHR certification.[24–29]

Systematically documenting patients' SDH data in EHRs could help care teams incorporate this information into patient care, for example, by facilitating referrals to community resources to address identified needs. This could be especially useful in "safety net" community health centers (CHCs), whose patients have higher health risks than the general US population.[23,30–39] Many CHCs already try to address patients' SDHs, but their approaches to doing so have historically been manual and ad hoc.[40–44]

EHRs present an opportunity to standardize the collection, presentation, and integration of SDH data in CHCs' clinical records.[45] Toward that end, a national coalition of CHC-serving organizations created the "Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences" (PRAPARE), which included a preliminary SDH data collection tool informed by the IOM's phase 1 report.[45] PRAPARE includes most of the IOM-recommended domains and a few additional questions specific to CHC populations. Building on PRAPARE and the IOM recommendations, our study team asked CHC stakeholders about their opinions on how to optimize SDH data collection, documentation, and presentation in CHCs' EHRs, and on how they would like to use EHR tools to act on identified SDH-related needs, for example, by making referrals to community resources. This article describes our process and its results. We know of no previously published reports of processes used to develop EHR-based SDH data collection, summary, and referral tools, and therefore we present this article as an example that may inform others.

Methods

This work was conducted at OCHIN, a nonprofit community-based organization that centrally hosts and manages an Epic© EHR for >440 primary care CHCs in 19 states; it is the nation's largest CHC network on a single EHR system. Socioeconomic risks of patients in OCHIN member CHCs are clear from SDH data that are already collected: 23% are uninsured and 58% are publicly insured, 25% are nonwhite, 33% are of Hispanic ethnicity, 28% are primarily non–English speakers, and 91% are from households living <200% below the federal poverty level (among patients with available data).

The processes described here constituted the first phase of a pilot study designed to develop EHR-based tools that CHCs could use to systematically identify and act on their patients' SDH-related needs. We call these the "SDH data tools."

With the goal of creating SDH-related workflows that parallel clinical referral processes, we began with the assumption that addressing patients' SDH needs require 5 key steps: (1) collecting SDH data; (2) reviewing patients' SDH-related needs; (3) identifying referral options to address those needs; (4) ordering referrals to appropriate services; and (5) tracking outcomes of past referrals. This assumption was based on team members' knowledge of the CHC workflows used to refer patients to specialty medical care.

We also considered the following factors:

- CHCs are federally required to collect certain SDH measures from the IOM list, including race/ethnicity, tobacco/alcohol use, and depression. Our SDH data tools had to incorporate these data, without requiring duplicate data entry.

Table 2. Options Considered for Addressing Each of the Five Steps Involved in Using Social Determinants of Health Data in Community Health Centers

Step	Options	Description
1. Collecting SDH data	Flowsheet	Groups of related data can be collected in a given EHR "flowsheet." Flowsheets are commonly used for collecting screening data, such as depression screenings, so users may also be comfortable using them for SDH documentation.
	Patient portal	In the EHR patient portal, patients sign up for an account. This lets them access selected data from their medical record and E-mail their care teams. Questionnaires and surveys can also be sent to be completed and returned by patients through the portal.
	Paper version	Patient-reported data are often collected on hard-copy printouts. These data must subsequently be entered into the EHR by a care team member.
2: Reviewing SDH needs	Reports	Summaries of selected patient data can be created in the EHR in the Synopsis function, or in Patient-Level Reports.
5: Tracking past referrals	Rosters	The EHR's panel management tool lets users sort patient panel data for myriad purposes. Rosters and registries can be built so that updated data sets are easily reproduced; experienced users can create customized searches. Rosters can be used to identify patients with specific diseases or risks for use in tasks such as targeted outreach or for identifying the needs of scheduled patients (ie, chart "scrubbing"). They can be used to track referrals made over a given period in order to support follow-up by the care team.
	Alerts	Two EHR-based alert/reminder functions are available. Best Practice Advisories identify needed care steps, drug allergies or other safety warnings, and other point-of-care needs. Health Maintenance alerts notify team members when a patient is due for preventive care; at OCHIN, these include recommendations with a US Preventive Services Task Force A/B rating.[46]
3: Identifying referral options	Preference lists	Preset lists of specified kinds of orders can be built to expedite ordering procedures, medications, and referrals. They are maintained by a clinic staff member.
4: Ordering referrals	Look-up tables	These tables could be created with an initial set of local resources.
	Linkages to websites	These linked websites might list community social services (eg, United Way 2-1-1, Purple Binder, Health Leads), in general or for a specific SDH need, within the patient's zip code.
	Lists of search terms	Lists could be created to enable effective Internet searching for local resources (eg Google) in a wiki-style document with vetted search terms and suggestions for how to use Google Maps to locate services.
	A wiki-style document	Lists of local resources familiar to CHC staff could be added to the EHR and updated as needed.

CHC, community health center; EHR, electronic health record; SDH, social determinant of health.

- CHCs have varying staffing structures, resources, and workflows. To accommodate this, SDH data tools should be accessible to various team members (eg, front desk, medical assistants, community health workers, behavioral health staff).
- SDH tools should use existing EHR-based functionalities to facilitate their adoption. Table 2 describes the options we initially considered to address each of these 5 steps.
- Many CHCs already identify or address SDH needs using ad hoc methods. Some may already have mechanisms for tracking local resources, such as a 3-ring binder or files on a shared drive; some use online resources (eg, United Way 2-1-1, local department of human services). We sought to incorporate existing resources into our SDH referral tools.

We recruited 3 OCHIN CHCs in Oregon and Washington as pilot sites and project partners. We also engaged OCHIN's Clinical Operations Review Committee (CORC)—a group of CHC clinicians who collectively review proposed changes to their shared EHR—in all process steps. We conferred with leaders from PRAPARE, Kaiser Permanente (KP), Epic, and other national SDH experts (see the Acknowledgments). These stakeholders were asked to discuss 3 overarching questions.

1. Which SDH Domains Should be Included?

The CORC reviewed the IOM-recommended SDH domains and the wording for each domain, additional questions or alternate wording from PRAPARE and KP's SDH screening tools, and other domains currently collected in OCHIN's

EHR that were not in the IOM/PRAPARE recommendations. Based on these options, they chose which patient-reported SDH measures to include and the specific wording for each included domain. Geocoded domains were not considered, as the CORC felt they were not readily actionable. The pilot CHCs were present at most of the SDH-related CORC meetings.

2. How Do Care Teams Want to Collect, Review, and Act on Data on Patients' SDH Needs within the EHR?

We asked CORC members whether and how their clinics monitor patients' SDHs and what the SDH-related EHR tools should include. We presented options for how the SDH data could be collected and summarized using existing EHR structures, and we considered how existing tools aligned with the 5 key steps described above. We then mocked up a set of SDH data EHR tools and proposed workflows for using them. We presented the mock-ups and draft training materials to the CORC over multiple meetings, and to each of the pilot CHCs at staff meetings. We asked diverse CHC staff for critical feedback on the draft tools, suggestions for and potential barriers to collecting and acting on SDH data using the tools, and how best to train CHC staff in their use. Our team's Epic programmer attended these meetings to provide real-time input about the technical feasibility of any suggestions. The SDH data tools were revised based on the feedback received, and the pilot CHCs' various workflows and staff structures were considered. The revised tools were presented to the CORC (in person) and the study sites (via webinar) to verify that the revisions addressed requested changes.

This review and refinement process aligns with best practices for technology development,[47] for example, user participation and prototyping.[48–55] Evidence shows that for technology to be used effectively and as intended, end users must find it easy to use and must perceive that the technology will improve efficiency.[56–58] Therefore, we sought input from end users in order to increase the probability that the tools would be used.[47] The EHR tools were then built in OCHIN's testing environment, an off-line, internal "copy" of the EHR, and tested by an OCHIN quality assurance analyst.

3. How Can Care Teams Ensure That Patients Receive Up-to-Date Referrals?

The CHCs hoped to avoid referring patients to local resources that were not currently accepting new clients (service agencies sometimes close enrollment because of demand) or that had limitations about who could be assisted (eg, some services are not open to persons with past felonies). We discussed the options and approaches for identifying resources described above. We also conferred with colleagues at KP who were considering similar choices, and we spoke with representatives from organizations that create databases of community resource information (eg, United Way 2-1-1, Health Leads, and Purple Binder) to understand those options. The 3 pilot clinics then identified 3 to 5 prioritized SDH domains for which they wanted a list of community resources; based on these preferences, we provided lists of local resources for housing, food, transportation, social isolation, and intimate partner violence.

Participants

Participants from our study clinics consisted of primary care providers (n = 3), medical assistants (n = 5), clinic managers (n = 3), community health workers (n = 4), behavioral health staff (n = 2), nurses (n = 5), referral specialists (n = 3), EHR specialists (n = 3), and medical directors (n = 2).

Timeline

The development process took 10 months. Five 1-hour meetings with the CORC were held over the course of 6 months in order to reach consensus on which SDH domains to include and how the tool would function. The pilot sites were then given 6 weeks to test the tools for functional errors.

Results

Which SDH Measures?

Our stakeholders asked that the SDH tools include all the patient-reported IOM-recommended domains, made minor adaptations to the wording on some of these domains, and added a few questions (Tables 1 and 3). For example, the IOM's single question on financial resource strain asks, "How hard is it for you to pay for the very basics like food, housing, heating, medical care, and medications?" (not hard at all, somewhat hard, very hard). Because CHCs treat low-income patients, many of whom

Table 3. Social Determinant of Health Domains and Measures Included in the ASSESS Tool and Overlap with Institute of Medicine–Recommended Domains and Measures

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
Alcohol use*†	AUDIT-C (3Q) How often do you have a drink containing alcohol? (never/monthly or less/2–4 times a month/2–3 times a week/≥4 times a week) How many standard drinks containing alcohol do you have on a typical day? (1 or 2/3 or 4/5 or 6/7–9/≥10) How often do you have ≥4 drinks on one occasion? (never/less than monthly/monthly/weekly/daily or almost daily)	Not included	Already included in OCHIN EHR How many (and what type of) drinks do you have per week? (cans of beer/glasses of wine/shots of liquor/standard drinks or equivalent; all nos.)	Refer to addiction services
Race/ethnicity*†	US Census (2Q) What is this person's race? (white; black, African American, or Negro; American Indian or Alaska Native; Asian Indian/Chinese/Filipino/Japanese/Korean/Vietnamese/Other Asian/Native Hawaiian/Guamanian or Chamorro/Samoan/other Pacific Islander/some other race) Is this person of Hispanic, Latino, or Spanish origin? (no/yes, Mexican, Mexican American, Chicano/yes, Puerto Rican/yes, Cuban/yes, another Hispanic, Latino, or Spanish origin)	Which race(s) are you? Check all that apply. (American Indian or Alaskan Native/Asian/black or African American/Native Hawaiian/Pacific Islander/white/other) Are you Hispanic or Latino? (yes/no/unreported or refused)	Already included in OCHIN EHR Race: Alaskan Native/American Indian/Asian/black/Native Hawaiian/Pacific Islander/patient refused/unknown/white) Ethnicity: Hispanic/non-Hispanic/patient refused/unknown)	
Tobacco use and exposure*†	NHIS (2Q) Have you smoked at least 100 cigarettes in your entire life? (yes/no/refused/don't know) Do you *now* smoke cigarettes every day, some days, or not at all? (every day/some days/not at all/refused/don't know)	Not included	Already included in OCHIN EHR Smoking status: current smoker, everyday/current smoker, some days/former smoker/heavy tobacco smoker/light tobacco smoker/never assessed/never smoker/passive smoke exposure, never smoker/smoker, current status unknown/unknown if ever smoked)	Refer to quit services

Table 3. Continued

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
			Smokeless tobacco: current user/former user/never used/unknown)	
Depression*†	PHQ-2 (2Q) Over the past 2 weeks, how often have you been bothered by any of the following problems: Little interest or pleasure in doing things (not at all/several days/more than half the days/nearly every day) Feeling down, depressed, or hopeless (not at all/several days/more than half the days/nearly every day)	Not included	Already included in OCHIN EHR; same as IOM	Refer to mental health services
Education*	What is the highest level and years of school completed? (elementary/high school/college/graduate or professional—check years completed) What is the highest degree you earned? (high school diploma/GED/vocational certificate/associate degree [occupational, technical, or vocation program]/associate degree [academic program]/bachelor's degree/master's degree/professional/doctorate)	What is the highest level of school that you have finished? (less than high school/high school diploma or GED/more than high school/I choose not to answer this question)	Adapted IOM wording to be aligned with PRAPARE and more relevant to safety net populations	Identify patients who need more intensive care management, targeted forms of outreach, or for whom teams should consider "teach-back" methods, tailored handouts, etc. Refer to education services (GED/skills training)
Exposure to violence: IPV*	HARK (4Q)	In the past year, have you been afraid of your partner or ex-partner? (yes/no)	Per the recommendations of our stakeholder group, we included a more general question on violence that is aligned with Kaiser Permanente's YCLS questionnaire Have you ever been physically or emotionally hurt or threatened by a spouse/partner or someone else you know? (yes/no)	Refer to IPV intervention services

Table 3. Continued

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
	Within the past year, have you been: • Humiliated or emotionally abused in other ways by your partner or ex-partner? • Afraid of your partner or ex-partner? • Insult or talk down to you • Raped or forced to have any kind of sexual activity with your partner or ex-partner? (yes/no) Within the last year, have you been kicked, hit, slapped, or otherwise physically hurt by your partner or ex-partner? (yes/no)	Do you feel physically and emotionally safe where you currently live? (yes/no)	In addition, the CORC opted to include the 4-item validated HITS (Hurt-Insult-Threaten-Scream) domestic violence screening tool[59,60] in the OCHIN EHR. This question will not be part of the SDH flowsheet, but positive responses will be pulled into the SDH summary and synopsis. How often does your partner: • Physically hurt you • Threaten you with harm • Scream or curse at you (never/rarely/sometimes/fairly often/frequently)	
Physical activity*	Exercise Vital Signs (2Q) On average, how many days per week do you engage in moderate to strenuous exercise (like walking fast, running, jogging, dancing, swimming, biking, or other activities that cause a light or heavy sweat)? On average, how many minutes do you engage in exercise at this level?	Not included	Same as IOM	Refer to local physical activity resources (eg, YMCA, Parks and Recreation services)
Social connections and social isolation*	NHANES III Are you married or living together with someone in a partnership? (married or domestic partner/living with partner in committed relationship/in a serious or committed relationship, but not living together/single/separated/divorced/widowed)	How often do you see or talk to people that you care about and feel close to? (for example, talking to friends on the phone, visiting friends or family, going to church or club meetings) (less than once a week/1 or 2 times a week/3–5 times a week/>5 times a week/I choose not to answer this question)	Same as IOM; plus, per the recommendation of our stakeholders, we added an additional response to the NHANES question on weekly social contacts to encompass alternative forms of communication	Refer to community resources/support groups/group activities/volunteer services Provide more intensive case management Develop an emergency action plan

Table 3. Continued

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
	In a typical week, how often do you: • Talk with family, friends, or neighbors by phone? • Get together with family, friends, or neighbors? (never/once a week/2 days a week/3–5 days a week/nearly every day) How often do you: • Attend church or religious services • Attend meetings of the clubs or organizations you belong to? (never/once a year/2–3 times a year/≥4 times a year/at least once a week)		In a typical week, how often do you: • Use email, text messaging, or Internet to communicate with family, friends, or neighbors? Our stakeholders also recommended including 2 more general questions on social isolation that are part of the Kaiser Permanente YCLS questionnaire How often do you feel lonely or isolated from those around you? (never/rarely/sometimes/often/always) Do you have someone you could call if you needed help?‡ (yes/no)	
Stress*	Stress means a situation in which a person feels tense, restless, nervous, or unable to sleep at night because his/her mind is troubled all the time. Do you feel this kind of stress these days? (not at all/a little bit/somewhat/quite a bit/very much)	Stress is when someone feels tense, nervous, anxious, or can't sleep at night because their mind is troubled. How stressed are you? (not at all/a little bit/somewhat/quite a bit/very much/I choose not to answer this question)	We used the PRAPARE version of the question because of difficulties obtaining copyright	Refer to stress management programs Advise closer monitoring of blood pressure, cholesterol
Financial resource strain*	How hard is it for you to pay for the very basics like food, housing, heating, medical care, and medications? (not hard at all/somewhat hard/very hard)	In the past year, have your or any family members you live with been unable to get any of the following when it was really needed? Check all that apply. (food/transportation/clothing/child care/utilities/medicine or medical care/rent or mortgage/phone/health insurance/other/I choose not to answer this question)	Same as IOM, plus an additional follow-up question if they answered somewhat hard or very hard that is used in the Kaiser Permanente YCLS What is hard to pay for? (food/utilities food, utilities, transportation, medicine or medical care, health insurance, clothing, rent/mortgage, child care, phone)	Assess food/housing insecurity Refer to relevant social and legal services

Table 3. Continued

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
Housing	Not included in the final list of IOM-recommended domains	What is your housing situation today? (I have housing/I do not have housing [staying with others, in a hotel, on the street, in a shelter])/I choose not to answer this question)	In the past month, have you slept outside, in a shelter, or in a place not meant for sleeping? (yes/no) In the past month, have you had concerns about the conditions and quality of your housing? (yes/no) In the past 12 months, how many times have you moved from one home to another?	
Food	Not included in the final list of IOM-recommended domains	Not included	USDA Household Food Security Survey Module Which of the following describes the amount of food your household has to eat? (enough of the kinds of food we want to eat/enough but not always the kinds of food we want/sometimes not enough to eat/often not enough to eat/don't know or refused) Please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months: (I/We) worried whether (my/our) food would run out before (I/we) got money to buy more. The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more. (I/we) couldn't afford to eat balanced meals.	
Sexual orientation and gender identity	Not included in the final list of IOM-recommended domains	Not included Sexual orientation (lesbian or gay/straight [not lesbian or gay]/bisexual/something else/I don't know/choose not to disclose/other sexual orientation [comment for other])	This is a required UDS data element beginning in 2016[64,65] and is slated for inclusion in MU-3 requirements	

Table 3. Continued

SDH Domain	IOM-Recommended Measure/Questions	Same in PRAPARE?	ASSESS Question (If Different from IOM)	Potential Actions
		Gender identity (female/male/transgender female [male to female]/transgender male [female to male]/other/choose not to disclose/other identity [comment for other]) Preferred pronoun (he/him, she/her, they/them, ze/zim, decline to answer, unknown)		

* IOM-recommended domain.
†Already routinely collected in electronic health record (EHR).
‡Modified from item in PROMIS Item Bank version 1.0: Emotional distress, anger, Short Form 1, and AARP overall loneliness item from AARP survey about loneliness in older adults. The original PROMIS item was written in first person. Loneliness was added to reduce literacy level.
AUDIT-C, Alcohol Use Disorders Identification Test; GED, General Equivalency Diploma; HARK, Humiliation, Afraid, Rape, Kick; IOM, Institute of Medicine; IPV, intimate partner violence; MU-3, meaningful use level 3; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; PRAPARE, Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences; PHQ-2, 2-item Patient Health Questionnaire; SDH, social determinant of health; Q, questions; UDS, Uniform Data System; YCLS, Your Current Life Situation.

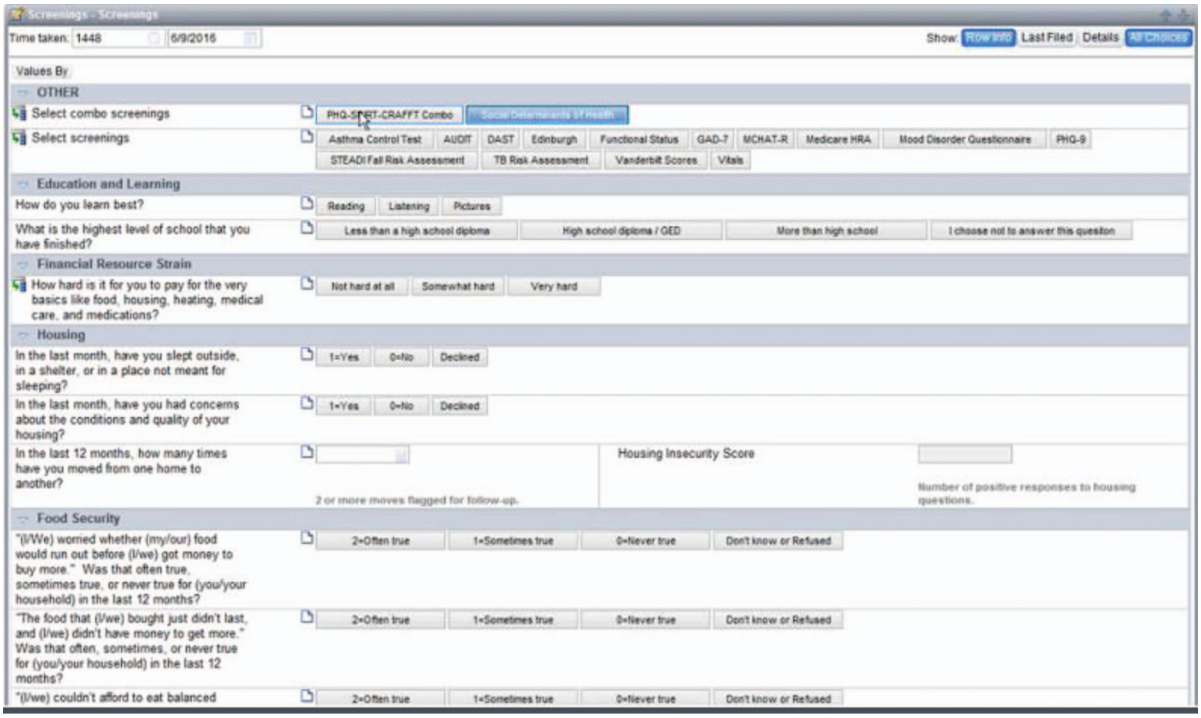
are likely to screen positive for financial hardship, the CHC stakeholders wanted to augment this broad question with more granular questions about specific areas of strain (eg, food, utilities, transportation). The hope was that this granularity would identify the specific areas in which assistance was needed. The stakeholders also preferred to not use the IOM-recommended screening tool for intimate partner violence; they considered its questions too sensitive for general SDH screening. They opted for a broader question about exposure to violence that was taken from KP's SDH questionnaire. They also opted to add 2 questions on social isolation from KP's questionnaire (eg, "How often do you feel lonely or isolated from those around you?"; "Do you have someone you could call if you needed help?"), along with the IOM-recommended questions on social isolation. They also added a question on preferred learning style (eg, reading, listening, viewing pictures).

Collecting SDH Data

Stakeholder feedback, and our understanding that CHC workflows vary, indicated the need to enable SDH data collection by different care team members. Because EHR security measures limit which staff can access aspects of the EHR (for example, front desk staff often cannot access the problem list), we created several options for SDH data entry:

- SDH "documentation flowsheets" were accessible to front desk staff at check-in, rooming staff, or community health workers (Figure 1).
- Article versions of the SDH questions, in English or Spanish, that can be printed out and handed to the patient to complete at check-in or rooming, were provided on OCHIN's member wiki site. These data would have to be hand-entered by CHC staff into 1 of the EHR flowsheets described above.
- A questionnaire on the patient portal allowed patients who had an online portal account to be emailed and asked to enter the data online before a visit. The EHR's panel management tool can identify patients with pending visits and enable bulk secure messages to these patients. Within the portal, patients can choose navigational instructions in Spanish, but the screening questions are available only in English.

Figure 1. Social determinants of health flowsheet in EPIC.



We discussed various considerations during this process:

- Making an electronic tablet available in the clinics' waiting rooms or examination rooms, on which patients could complete their SDH screening. Two of the pilot CHCs decided it would be too complex to manage, for example, identifying who would be the tablet's "keeper," where it would be stored, and how to identify which patients should use it.
- Creating a setting on the computer in the examination room where patients could sign up for a patient portal account then complete the SDH data through the portal immediately. In the end, this proved unfeasible because the patient must be sent the questionnaire after they sign up for the portal, necessitating an impractical multistep workflow.
- Clinicians did not want to collect SDH data themselves, preferring to transfer that responsibility to another team member. Two of the pilot sites opted to use the Article forms for data collection, then have a staff person enter the data into the EHR. This approach creates potential workflow barriers to use of the SDH tools, because until the responses are manually transferred into the chart, the data will not be available to care team members to act on during the encounter.
- All options for reminding the team to conduct SDH screening were considered inadequate. Clinics said that best practice advisories (also known as alerts) are largely ignored. They preferred health maintenance advisories (HMAs), which are closely integrated into clinic workflows. However, HMAs must be standardized across all clinics using a shared EHR; because a universal HMA was not possible, HMAs were not a feasible option.
- Similar to other screening questionnaires administered in clinical settings, clinics asked that the patient-facing data collection form not include a "refuse to answer" option. The staff-entered methods did include this option.

Reviewing Data on Patients' SDH Needs

SDH data might be collected via multiple routes, and certain SDH data are already collected regularly by most CHCs. Thus, there was a need for an EHR-based summary that contains all of a patient's SDH data. We created an SDH data summary that

is automatically populated with data from any of the SDH data entry options and from SDH-related data elsewhere in the EHR. The SDH Summary also shows any SDH-related International Classification of Diseases, Tenth Revisions (ICD-10), codes from the patient's problem list and any past SDH referrals if they were associated with an SDH-related ICD-10 code (see more on this in "Tracking Past Referrals," below). "Positive screens" for SDH needs are visually highlighted. The algorithm used to identify positive screens is shown in Table 4. This summary could be accessed in 2 ways:

- An SDH Summary tab can be accessed in an open Office Visit or Patient Outreach encounter. The most recent SDH data for the patient is displayed, and the date(s) of data collection and referral are shown (Figure 2).
- A view in the EHR's Synopsis window can be accessed in a closed chart or open encounter displays a patient's SDH questionnaire responses over time, both as text and graphically (Figure 3).

For technical reasons, it was not feasible to show problem list data or referrals in the Synopsis version of the SDH Summary. Thus, each summary had information that the other lacked; that is, 1 had past referral information but only the most recent SDH data for a given patient; the other did not have past referrals but did present patients' SDH history, rather than just their most recent SDH data.

Identifying Referral Options

The pilot CHCs already had lists of SDH-related local resources in binders or on shared drives. These were not updated systematically, but rather only when someone on the team received new information and thought to update the list. The options for how CHC teams could do this systematically, using EHR-based tools, are shown in Table 2. All of them would be accessed via a hyperlink on the SDH Summary.

The preference list option was selected for several reasons. Creating linkages to an external agency's website was cost-prohibitive and required organizational contracts; thus, the study clinics might learn to rely on something that would incur costs after the study. Furthermore, some searches on these websites yielded results that were not specific to a location but rather gave statewide or nationwide data. The wiki options were rejected because users would have to leave the EHR system to access them, and the study sites were concerned about how to ensure that these documents were updated. The preference lists, however, used the same EHR function that the CHCs used for other referrals; involved discrete data fields, creating trackable data; and built on the CHC teams' local knowledge. One concern about the preference lists was that they must be updated manually. However, the study CHCs currently designate a staff member to update other preference lists (eg, for ordering laboratory tests), and the same person could be responsible for updating the SDH lists.

We helped the study clinics create "starter" preference lists for the SDH areas they prioritized (Figure 4). The resources listed in each were populated with data from each clinic's current method for keeping such information, then augmented by Web searches and reviewed by staff. The lists include names and contact information of relevant services and agencies, and include information such as "women and children only" and hours of operation, when available.

Ordering Referrals

The SDH referrals preference lists can be used to make internal referrals (eg, to a community health worker), have clinic staff facilitate external referrals (eg, calling an agency to schedule an appointment for the patient), or share agency information with patients at the encounter or in the after-visit summary so patients can follow up on their own. To make these easier to use, we created a new referral priority option of "no follow-up needed," which, if selected, informed CHC staff that they were not required to follow up on SDH referrals as they would for others. We also created a new referral type—"community referral, nonmedical"—so that SDH referrals would be excluded from related care quality measures. Another consideration here is that only certain care team members are authorized to make referrals of any kind; thus, support staff may need to be trained and authorized to use these tools.

Tracking Past Referrals

As described above, the SDH Summary accessed through the Summary tab (Figure 3) is automat-

Table 4. Algorithm for Identifying Positive Social Determinant of Health Screens

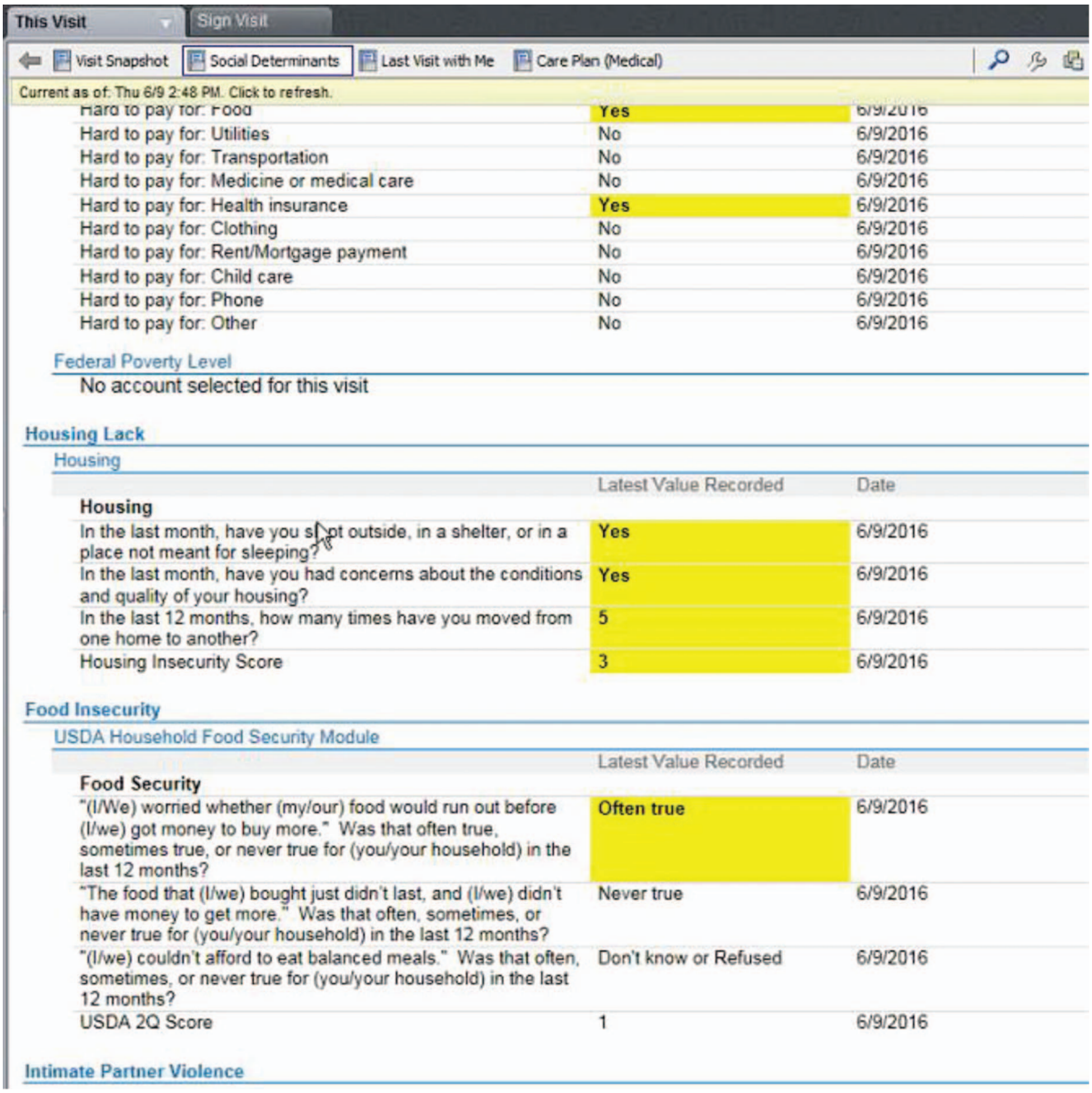
Questions*	Response Options (from Hard-Copy Version or Flowsheet)	Responses That Flags a Positive Screen
1. How do you learn best?	Reading Listening Looking at pictures	None
2. What is the highest level of school that you have finished?	Less than a high school diploma High school diploma/GED More than high school	None
3. How hard is it for you to pay for the very basics like food, housing, heating, medical care, and medications?	Not hard at all Somewhat hard Very hard	Somewhat hard or very hard
	If you answered "Somewhat hard" or "Very hard," what is it hard to pay for?	Yes to any of these
	Food, utilities, transportation, medicine or medical care, health insurance, clothing, rent/mortgage, child care, phone	
4a. In the past month, have you slept outside, in a shelter, or in a place not meant for sleeping?	Yes No	Yes
4b. In the past month, have you had concerns about the conditions and quality of your housing?	Yes No	Yes
5. In the past 12 months, how many times have you moved from one home to another?	(Patient to indicate number of times)	≥2 moves flagged for follow-up
6a. In the past 12 months, (I/we) worried whether (my/our) food would run out before (I/we) got money to buy more.	Often true Sometimes true Never true	Often true or sometimes true
6b. In the past 12 months, the food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.	Often true Sometimes true Never true	Often true or sometimes true
6c. In the past 12 months, (I/we) couldn't afford to eat balanced meals.	Often true Sometimes true Never true	Often true or sometimes true
7. In the past 12 months, have you ever been physically or emotionally hurt or threatened by a spouse/partner or someone else you know?	Yes No	Yes
8a. On average, how many: Days per week do you engage in moderate to strenuous exercise (like walking fast, running, jogging, dancing, swimming, biking, or other activities that cause a light or heavy sweat)?	(Patient to choose a number between 0 and 7)	Multiply days per week (8a) by number of minutes (8b); <150 flagged for follow-up
8b. On average, how many minutes do you exercise at this level?	(Patient to indicate number of minutes)	
9. Are you married or living together with someone in a partnership?	Married or domestic partner Living with partner in committed relationship In a serious or committed relationship, but not living together Single Separated Divorced Widowed	Questions 9–11: Composite score based on the Berkman-Syme Social Network Index Question 9: 1 point for "married or domestic partner," "living with partner in committed relations," or "in a serious or committed relationship, but not living together"

Table 4. Continued

Questions*	Response Options (from Hard-Copy Version or Flowsheet)	Responses That Flags a Positive Screen
10a. In a typical week, how often do you: Talk with family, friends, or neighbors by phone or video chat (e.g. Skype, Facetime)?	Never Once a week 2 Days a week 3–5 Days a week Nearly every day	Question 10a-c: 1 point if they have a total of ≥3 contacts per week.
10b. In a typical week, how often do you get together with family, friends, or neighbors?	Never Once a week 2 Days a week 3–5 Days a week Nearly every day	
10c. In a typical week, how often do you use email, text messaging, or internet (eg, Facebook) to communicate with family, friends, or neighbors?	Never Once a week 2 Days a week 3–5 Days a week Nearly every day	
11a. How often do you attend church or religious services?	Never Once a year 2–3 Times a year ≥4 Times a year At least once a month At least once a week	Question 11a: 1 point for attending church or attending church or religious services "≥4 times a year," "at least once a month," or "at least once a week"
11b. Attend meetings of the clubs or organizations you belong to?	Never Once a year 2–3 Times a year ≥4 Times a year At least once a month At least once a week	Question 11b: 1 point if attends meetings "2–3 times a year," "≥4 times a year," "at least once a month," or "at least once a week") Maximum points = 4 High risk (flagged for follow-up) = 0–2
12. How often do you feel lonely or isolated from those around you?	Never Rarely Sometimes Often Always	Often or always
13. Do you have someone you could call if you needed help?	Yes No	No
14. During the past month, how much stress would you say you experienced?	A lot of stress A moderate amount of stress Relatively little stress Almost no stress at all	A lot of stress or a moderate amount of stress

*Question sources: (1) Developed by OCHIN's Clinical Operations Review Committee. (2) Adapted from standard education questions to align with patient population of OCHIN membership. (3) Slight modification of Institute of Medicine–recommended financial hardship item (medications added to list of examples), Puterman et al,[61] and Hall et al.[62] The follow-up question, "What is hard to pay for?" was added to get more granularity and enable the care team to identify needed interventions; the question was adapted from a Kaiser Permanente social determinants of health (SDH) questionnaire, with permission. (4) and (5) Housing questions were from the Health Begins Upstream Risk Screening Tool (http://www.healthbegins.org/).[63] (6) US Department of Agriculture 18-item Household Food Security Survey. (7) Adapted from a Kaiser Permanente SDH questionnaire, with permission. (8) Exercise Vital Sign, questions 1 and 2 and Sallis RE. Developing health care systems to support exercise: exercise as the fifth vital sign. *Br J Sports Med* 2011;45:473–4. Epic already has copyright permission. (9–11) Third National Health and Nutrition Examination Survey. Epic already has permission to use this question. Scoring is based on the Berkman-Syme Social Network Index (SNI); Pantell et al. Social isolation: a predictor of mortality comparable to traditional clinical risk factors. Am J Public Health 2013;103:2056–62. Item 10c was created as a parallel to items 10a and 10b to capture social connection via newer electronic modes that were not available when the Berkman-Syme SNI was created. Frequency categories for questions 10 and 11 were slightly modified from original. Kaiser is also using this approach in their screening tool. Epic already has permission to use this question. (12) Modified from item in PROMIS Item Bank version 1.0, Emotional Distress - Anger - Short Form 1 - and AARP overall loneliness item from AARP survey about loneliness in older adults. The original PROMIS item was written in first person. Loneliness was added to reduce literacy level. (13) Your Current Life Situation Questionnaire from Kaiser Permanente. (14) 1998 Adult Prevention Module of the National Health Interview Survey.

Figure 2. Social determinants of health summary tab.



ically populated with information on past SDH-related referrals in order to enable CHC teams to track them. Referrals are shown in the SDH Summary if they are tied to a relevant ICD-10 code and/or if the SDH referral preference list was used. Presented data include the date of referral, contact information about the community resource, status of the referral, and who ordered it. Care team members authorized to edit referrals can manually update the referral status.

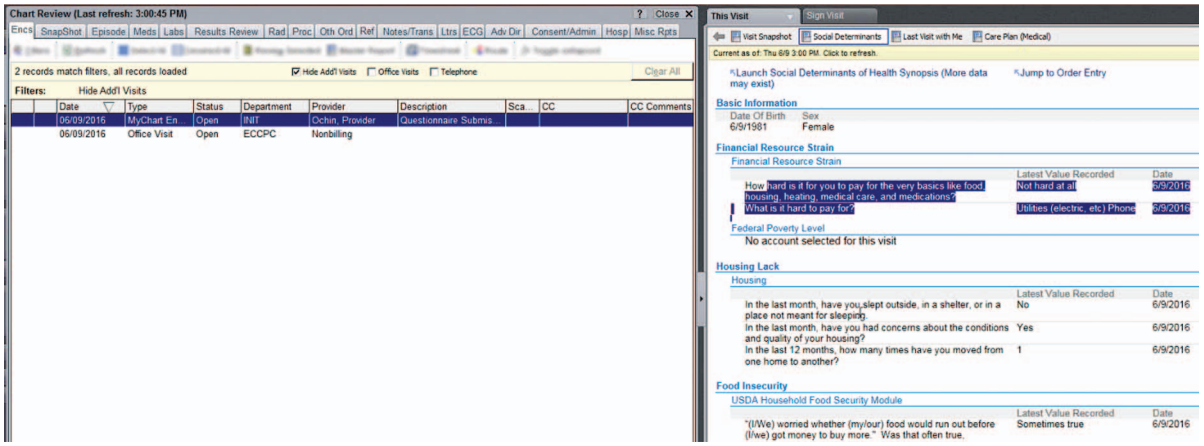
Lessons Learned

Lessons learned here may inform future efforts to build EHR tools for collecting and acting on SDH data. Because these lessons come from a pilot study conducted in 3 CHCs, we present them for consideration, not as a set of directions for SDH data tool development.

Considerations for Which SDH Questions to Include

Consider striking a balance between standardized SDH data collection (ie, aligned with the IOM-

Figure 3. Social determinants of health summary in Synopsis.



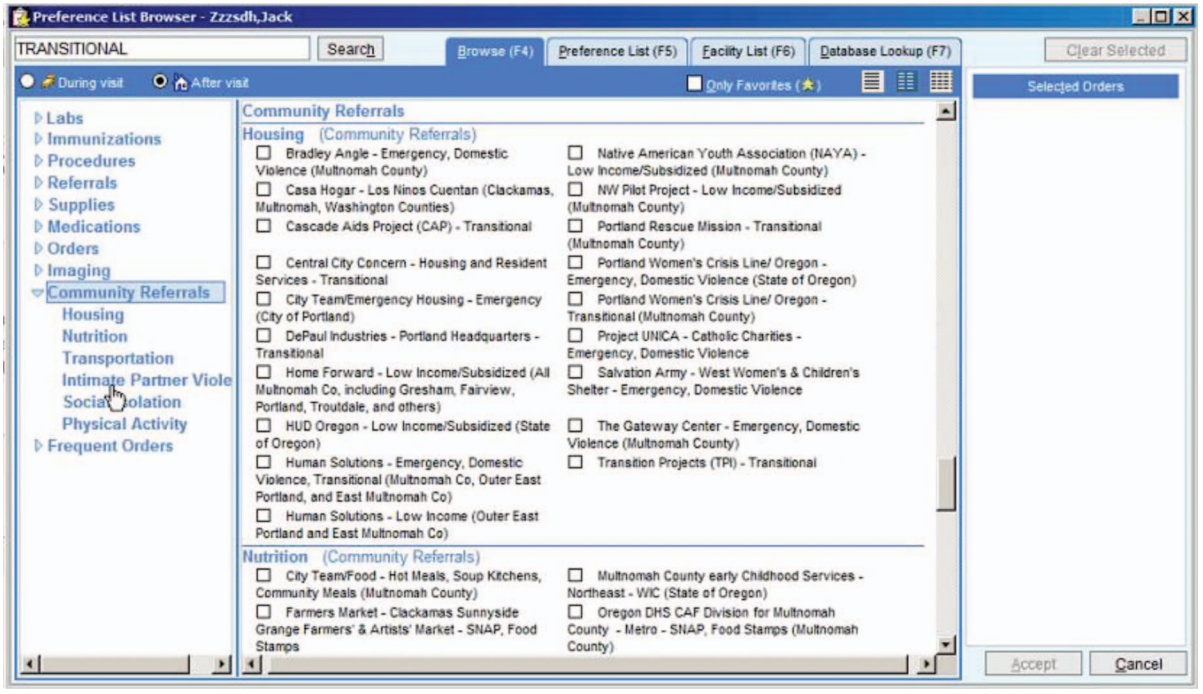
recommended measures) and the need to adapt to meet local needs, especially given that SDH data collection may become required for EHR certification and Uniform Data System reporting.

Considerations for Designing SDH Data Collection Tools

Patients may decline to answer SDH questions. Consider having SDH tools include a "patient refused to answer" option. Consider the advisability of including a "decline to answer" option on patient-facing data collection tools, which might make it too easy for patients to decline. Also, ensure that EHR-based SDH data tools do not require duplicate entry of SDH data collected elsewhere in workflows.

Patients with a positive SDH screening result may not want assistance in addressing the identified need. Consider creating EHR-based SDH data tools that include response options to indicate this preference, or to otherwise note that help was offered and declined.

Figure 4. Social determinants of health preference lists.



Considerations for Designing SDH Data Summary Tools

Carefully consider which SDH data sources should populate the SDH data summary and how to manage potentially conflicting data.

Considerations for Designing SDH Referral Tracking Tools:

Monitoring the outcomes of past SDH-related referrals is challenging, and often requires outreach calls to patients. Consider whether this ability is desired.

ICD-10 codes related to SDH needs enable the tracking of such needs, but they may add to the complexity of the problem list. Consider creating an SDH "box" within the problem list.

Considerations for Maintaining Up-to-Date SDH Referral Tools:

SDH referral tools rely on updated lists of local resources. Consider whether established processes for maintaining other referral lists can be applied to SDH tools. Consider partnering with organizations that maintain such lists.

Considerations for SDH-Related Workflows

EHR-based SDH data tools need to accommodate diverse staffing structures, resources, and workflows. Consider ensuring that the appropriate care team members are authorized to access all aspects of the tools.

To avoid overwhelming clinic staff and care teams with SDH-related work, consider limiting SDH screening to a subset of patients and ensuring that EHR-based SDH data tools enable targeting this subset. Consider creating an alert to identify overdue patients. To avoid overwhelming care teams, consider designing the EHR tools so that SDH-related referrals can be marked "no follow-up needed."

Consider using electronic tablets[66–68] to enable SDH screening at registration or upon rooming, with workflows for using and tracking them. Clinics will need wireless Internet to enable tablets to transmit SDH data to the EHR.

To use patient portals for SDH data collection, consider developing workflows for helping patients create portal accounts at registration then enter their SDH data through the portal on the spot. Tablets may be useful here as well.

Discussion

Standardized SDH data collection and presentation using EHR tools could facilitate diverse pathways to improved patient and population health outcomes in CHCs and other care settings. It could provide important contextual information to care teams, facilitate referrals to local resources, inform clinical decision making,[69] enable targeted outreach efforts, and support care coordination with community resources.[22,69,70] (We focused on how SDH data could be used to facilitate referring patients to local resources; research is needed on how else SDH data could inform clinical decisions). Such standardization will also provide data needed to document the SDH needs of CHC communities, inform policy and public health initiatives to improve health, and evaluate how addressing SDH risks affects health.

To attain these potential benefits, health care organizations need guidance on how to facilitate systematic SDH screening in primary care settings using EHR-based tools.[43,71,72] Little such guidance currently exists; we know of no previously published reports on processes used to develop EHR-based SDH data collection, summary, and referral tools. This article presents an example of a process through which stakeholder input informed the development of a preliminary set of SDH-focused EHR tools. While the results and lessons learned from our process may be useful to other organizations undertaking such efforts, they are preliminary and based on opinions from a relatively small group of stakeholders, health informaticists, and health services researchers. Extensive research is needed to empirically test the generalizability of these lessons.

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