Factors Influencing the Implementation of Social Determinants of Health Screening and Referral Processes in Pediatric Settings Serving Medically Complex Patients

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Acknowledgements

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INTRODUCTION

Social factors that contribute to inequitable healthcare outcomes, also known as social determinants of health (SDOH), account for up to 60% of the determinants of human health.[1,2] In pediatric populations, these factors include but are not limited to food insecurity,[3-8] poor housing quality and housing instability,[9,10] limitations in access to transportation,[11] and lack of social support. For medically complex children and adolescents, defined as those with one or more chronic health conditions, the presence of adverse social factors creates additional challenges for patients and their family that have been found to lead to increased emergency department (ED) utilization,[12] preventable readmissions,[13] and access to healthcare.[10]

Addressing SDOH across a range of medically complex pediatric patients is important, as this patient population encounters unique barriers to care. Primary caregivers of medically complex children report that healthcare systems are fragmented and difficult to navigate.[14,15] In addition, on average, 54% of medically complex children's caregivers stop working because of their child's healthcare needs.[16] This disrupts a family's financial stability, leading to challenges in timely insurance and medical payments.[22] Moreover, children with unpredictable symptoms contribute to more parental distress in both married and single-parent households compared to those with more predictable symptoms.[17,18] As the medically complex pediatric population continues to increase,[19] innovative solutions are needed to simultaneously address their medical care and health-related social needs to maximize optimal health outcomes.

Health systems are increasingly recognizing the impact of patients' social environment on medical outcomes. The American College of Physicians,[20] National Academy of Medicine,[21,22] and the U.S. Preventive Services Task Force[23] all recommend routine SDOH screening as a standard part of preventive care. Several randomized control trials have shown success in implementing system-level SDOH interventions within pediatric primary care.[24,25] However, SDOH implementation and dissemination research in specialty clinics remains understudied due to an added layer of complexity-vulnerability of patients due to parental dependence. Children lack the autonomy and decision-making capacity, relying on parents to prioritize and address (or not address) these competing demands.

Thus, in May 2019, North Texas' most extensive pediatric health system, Children's Health, initiated a 3-pronged SDOH, quality improvement project, including 1) baseline and ongoing clinical care team training; 2) implementation of an electronic health record (EHR)-embedded 9-item SDOH screening tool; and 3) patient referrals to community resources in 3 inpatient hospital units and 1 outpatient specialty clinic.

The purpose of this study was to identify hospital unit/clinic-level implementation factors associated with an SDOH screening tool uptake, measured by screening and referral rates, newly introduced across a range of areas at Children's Health serving medically complex pediatric patients.

METHODS

Study Design

A mixed-methods descriptive study was conducted in 2019. The Institutional Review Board at The University of Texas Health Science Center at Houston approved this study protocol (IRB# HSC-SPH-19-0190).

Setting

Children's Health is the 8th largest pediatric health care provider in the nation, with 1310 physicians, more than 20,000 admissions, 375,000 outpatient visits, and 167,000 ED visits a year.

Four Children's Health patient populations were selected for this project: (1) pediatric intensive care unit (PICU); (2) acute, long-term (15 days or more) hospitalized patients (LTP); (3) inpatient multispecialty step-down facility serving children with special healthcare needs (SHCN); and (4) cystic fibrosis (CF) outpatient clinic. Collectively, these 4 locations treat approximately 2000 unique patients annually. These areas were selected based on service variation (inpatient, outpatient, critical care), size (small, medium, large), and staffing (social worker, nurse, case manager) availability to administer a SDOH screening tool. In addition, practice leadership for those areas were committed to the project. Patient eligibility for SDOH screening was dependent on the specific clinics and their preferred workflows. Table 1 outlines the inclusion and exclusion criteria for each clinic as well as workflow for screening for SDOH.

Table 1: Sample Description, by Clinic/Hospital Unit				
Clinic	*Inclusion*	*Exclusion*	*Administered tool*	*Data entry into EHR*
PICU	Any patient, regardless of diagnosis	--Child Protective Service and foster care patients	RN	RN
LTP	Admitted to hospital for at least 15 days, regardless of diagnosis	--Child Protective Service and foster care patients	Case worker	Case worker
SHCN	Any patient, regardless of diagnosis	--Child Protective Service and foster care patients --Admitted for "observation," a designation of emergency department overflow at the main hospital	Social worker	Social worker
CF	Any patient seen in clinic for a 3-month "routine follow-up"	--Child Protective Service and foster care patients --All sick visits and sick-visit follow-up appointments	Medical assistants	RN or medical assistant

Intervention. The intervention included a three-pronged SDOH protocol, implemented over a 3-month period at each clinic:

Clinical care team training. Supported by an initial didactic presentation on the importance of SDOH to patient health outcomes, healthcare team (ie, nurses and social workers) training included strategies for efficient administration of the SDOH screening tool, electronic documentation of SDOH screening results, and selection of appropriate

resources (eg, food pantry, housing assistance) for patient's families from the EHR database.

SDOH screener. The SDOH screening tool was created by a collaborative team consisting of physicians, nurses, social workers, case managers, a medical-legal partnership attorney, researchers, and community relations experts. The final version of the tool has 9 items addressing 6 SDOH domains: food insecurity, housing (insecurity and quality), financial insecurity, health literacy, social support, and transportation. The questions were used from pediatric tools or adapted from adult, standardized tools.[26,27] Table 2 displays the SDOH constructs. A printed version of the SDOH screening tool was distributed to families by clinical team members. Once families completed the screener, responses were entered into the social history section of the EHR, visible at a patient level, and the results automatically displayed with a level of risk in the patient's plan of care. For example, if a family answered "yes" to any question, a flag indicating "high-risk" was indicated in the child's chart.

Table 2: EHR-Embedded SDOH Screener and Community Resources		
SDOH	*Screening question*	*Community resource*
Transportation	1. In the past 12 months, has your child missed healthcare appointments because you didn't have a way to get there? 2. In the past 12 months, did your child go without medicine because you didn't have a way to pick it up?	Medicaid Transportation; Dallas Area Rapid Transit
Financial insecurity	3. In the past 12 months, has your utility company shut off your service for not paying your bills? (electricity, gas, water, phone, etc.)	North Dallas Shared Ministries; Metrocrest Services; Irving Cares; Assistance Center of Collin County
Housing	4. Are you worried that in the next 2 months you may not have stable housing?	Metro Dallas Homeless Alliance; North Dallas Shared Ministries; Irving Cares; Assistance Center of Collin County
	5. Do you have problems in the place where you live like mice, bugs, mold, water leaks, or heating/cooling that doesn't work?	Code Compliance or Code Enforcement Department
Food insecurity	6. In the past 12 months, we worried whether our food would run out before we got money to buy more. 7. In the past 12 months, the food we bought just didn't last and we didn't have the money to get more.	North Texas Food Bank
Social support	8. Do you have someone you can call when you need help with your child?	No community resources provided
Health literacy	9. Do you ever need help to read health information or fill out medical forms?	No community resources provided

Patient referrals to community resources. If a family screened positive for at least one SDOH domain (excluding social support or health literacy), the clinical team provided families with a one-page sheet containing contact information for community-based resources (see Table 2 for further details). Social support and health literacy were

excluded from community resource referrals because no community-based organizations in the intervention area provided resources for those needs.

Data Collection, Study Population, and Measures

EHR were extracted for all patients eligible for SDOH screening during the 90-day study period. The purpose of data extraction was to provide systematic data for the following process measures: 1) proportion of families screened for SDOH by clinical care teams; 2) proportion of families that screened positive for at least one SDOH; and 3) proportion of families that were provided a community resource from the EHR database. A total of 506 patient records were extracted for analyses.

Surveys were distributed to clinical care teams currently employed at each clinic. Eligibility for the survey included registered nurses, patient navigators, social workers, physicians, and other clinical staff with direct patient care. The survey included validated constructs[28] to measure confidence to discuss SDOH or health-related social needs, knowledge of SDOH, and knowledge for advising families on community resources. The survey was collected at baseline (prior to clinical care team training), 1 month, and 3 months post-implementation. Across all clinics, 59 (100%) team members participated at baseline, 35 (59%) participated at 1 month, and 22 (37%) participated at 3 months. Specific measures, response options, and ranges are included in the Appendix. Demographic data was not collected.

Semistructured focus groups were conducted with clinical care team members at all 4 areas to ascertain level of implementation and changes in clinical practice 3 months post-implementation. Focus groups followed a semistructured guide that assessed overall satisfaction with the SDOH screening implementation, integrated care workflows and tasks within the screening areas, and culture of clinical organization.[29] All clinical care team members at each clinic were invited to participate. Each focus group lasted 60 minutes during participants' lunch breaks. The focus group at PICU included 15 participants; at LTC, 4 participants; at SHCN, 2 participants; and at CF, 10 participants. Participation rates reflected the relative size of each hospital unit.

Data Analysis

Descriptive statistics (tabulations, percentages, means, and standard deviations) were used to describe process outcomes throughout the implementation period (3 months). Clinical care team surveys were descriptively analyzed by examining response frequency distributions. When specific survey items were not answered, respondents' items were excluded from analyses. Bivariate statistics (Fisher's exact and chi-square) were used to evaluate whether EHR process measures were statistically different across hospital units.

Focus groups were recorded and professionally transcribed. A multidisciplinary team used a 3-step approach to analyze qualitative data. First, the research team

collectively read transcripts collected from each focus group to develop a deeper understanding of the group discussion. Through this process, a deductive codebook was created to label text. We used these codes in group analysis sessions until we reached stability. Second, text was coded by the research team. We grouped emerging findings into categories of themes using an immersion-crystallization approach,[30] which included inductive thematic identification. Third, transcripts were read by a second coder, and coding inconsistencies were discussed and resolved by consensus.

After completing analyses, qualitative and quantitative findings were integrated at the practice level using data-triangulation techniques. We used the Consolidated Framework for Implementation Research (CFIR)[31] constructs to guide data triangulation[30] and to conduct an in-depth comparative analysis across the hospital units. After considering all 39 CFIR constructs, 10 relevant CFIR constructs were mapped to 3 domains (ie, outer setting, inner setting, and individual characteristics). An in-depth analysis was conducted to identify how these domains influenced implementation.

RESULTS

EHR

Table 3 displays the sociodemographics for the pediatric patients whose families were eligible and screened for SDOH across all 4 hospital areas. There were no significant sociodemographic differences between eligibility and screening. The majority of the sample was non-Hispanic White (54%), spoke English as a primary language (90%), were commercially insured (47%), and male (57%).

Table 3: Description of the Patient Population

	Eligible (n=506) N (%)	Screened (n=375) N (%)
Race/ethnicity		
Hispanic	129 (25.5)	103 (27.5)
Non-Hispanic White	272 (53.8)	198 (52.8)
Non-Hispanic Black	75 (14.8)	54 (14.4)
Other race/ethnicity	14 (2.8)	11 (2.9)
Unknown race/ethnicity	16 (3.2)	9 (2.4)
Language		
English	453 (89.5)	334 (89.1)
Spanish	50 (9.9)	39 (10.4)
Other languages	3 (0.6)	2 (0.5)
Insurance type		
Commercial	237 (46.8)	176 (46.9)
Medicaid	222 (43.9)	165 (44.0)
Other	47 (9.3)	34 (9.1)
Age group (y)		
0-1	107 (21.1)	81 (21.6)
2-5	110 (21.7)	82 (21.9)
6-10	101 (20.0)	72 (19.2)
11-15	117 (23.1)	83 (22.1)
>15	71 (14.0)	57 (15.2)
Gender		

Male	286 (56.5)	212 (56.5)
Female	220 (43.5)	163 (43.5)

Figure 1 depicts screening outcomes for the pooled population. Among eligible families, 74% were screened for SDOH, and 42% reported at least one SDOH need. Of the families that screened positive, 62% were provided a community resource.

Figure 1: Consort diagram

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                          ┌─────────────────────┐
                          │   Eligible families  │
                          │      (n=506)         │
                          └─────────────────────┘
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Eligible families
(n=506)

Not screened for
SDOH
(n=131; 26%)

Screened for SDOH
(n=375; 74%)

Reasons:
-Parent/guardian refused n=6
-Missed by clinical staff; n=125

Positive screen
(n=158; 42%)

Not provided
community resource
sheet
(n=38; 38%*)

Provided community
resource sheet
(n=62; 62%*)

Reasons:
-Missed by clinical staff
-Clinical staff used other
resources different from what
was available in the EHR
-Staff did not document
resources provided in EHR
(n=38)

*Patients who screened positive for health literacy and/or social support only (no available community resources) were excluded from calculations.

Table 4 displays outcome differences by location. Screening rates significantly differed across hospital units, with SHCN having the highest rate (93%), followed by LTP (85%), CF (76%), and PICU (42%). Community resource sheets were also provided at

significantly different rates, with LTP having the highest rate (91%). Positive for at least one SDOH was not significantly different across units.

Table 4: Process Outcomes Across Hospital Areas					
	PICU N=89 N (%)	*SHCN* N=70 N (%)	*LTP* N=111 N (%)	*CF* N=236 N (%)	X^2 *or Fisher's*
Screened for SDOH	37 (42)	65 (93)	94 (85)	179 (76)	68.77*
Positive SDOH screen	9 (24)	31 (48)	46 (49)	72 (40)	7.69
Positive SDOH excluding health literacy and/or social support	5 (14)	21 (32)	35 (37)	39 (22)	
Provided community resource sheet[a]	1 (20)	11 (52)	32 (91)	18 (46)	21.59*

*p-value<0.001

[a]Excludes patients who screened positive for health literacy and/or social support only because there were no available community resources

Surveys
Table 5 displays the baseline and 3-month change in confidence to discuss, SDOH knowledge, and knowledge for advising families, stratified by clinic. At baseline, PICU clinical team members reported significantly lower confidence to discuss SDOH (mean=2.93; SD=0.95) and significantly lower knowledge of SDOH (mean=2.66; SD= 0.88) compared to other hospital units. There were no statistically significant changes across survey items 3 months post-implementation compared to baseline.

Focus Groups
Table 5 also displays a high-level summary of results from focus groups. Specifically, qualitative data found marked similarities and differences of 5 CIFR themes. The 5 themes, and their subsequent evidence, are discussed below.

Prioritization of Intervention
Focus groups indicated that all clinical areas *prioritized* the intervention with relatively low resistance because the SDOH screener brought structure to hospital unit/clinic flow. For example, one social worker stated:

> "*It was helpful to directly ask some things, because some things we kind of get around through conversation, so it was good to just directly say, you know, 'Have you been without food*?'"

Clinic Champions
In addition, all hospital units had clinical *champions* who used thoughtful planning. For example, many champions took it upon themselves to find more community-based resources for families who screened positive. One social worker reported:

"I would write extra resources at the bottom of the sheet. But I think that they appreciated that when I did it. It took me a little bit longer, (…) probably, like, 30-ish minutes to research them, and then, like, to contact a translator, if it was a Spanish-speaking family, that took at least 45 minutes to an hour."

One medical director reported, "*I would love it if we would like to continue; I don't want it to end here.*"

Intervention Adaptability

There were marked differences influencing implementation across the clinical areas. First, the intervention had varying *adaptability* across the areas. Specifically, PICU staff had difficulties remembering to screen due to the capability of implementing a pilot in only their area as opposed to system-wide. One nurse reported:

"Staff had difficulty remembering to do it, there's so many things to do in admission. And so, I reached out to the [EHR] team about including it in their required documentation on admission, so that – we get those green checkmarks, and so I was, like, 'Can we put it in the green checkmark?' and they were like, 'Sure. But it turns it on for all the intensive care units.' So we couldn't do that."

Inner Setting

The *inner setting*, and particularly the inpatient/outpatient unit status, influenced implementation, mainly due to time constraints. In the CF clinic, one social worker reported: "T*here's just not the time…. our patients are complex and we only have a limited time with them when they come in every quarter.*" On the other hand, LTP patients are in the hospital for, by definition, more than 15 days. This allowed case managers to change their workflow to improve screening rates. One case manager reported:

"Patients might change rooms or they might change floors, and then the paperwork gets lost, we don't get it back. Or they get discharged before we are able to go back and pick it up, and we still don't have the data. So, we decided not to leave it at the bedside, anymore. We [now] go three times, and contact mom if they're not there. But our golden rule is three, which we're going to attempt three times to get ahold of mom [to complete the screener …] Usually by the second day is when I could tell they're just not interested."

Characteristics of Team

Characteristics of the clinical care team members significantly influenced implementation. For example, PICU nurses implemented the screening tool, while in the other 3 areas, a social worker or a case manager implemented the screener and were more comfortable asking social needs questions. This is also reflected in the self-reported survey scores. A social worker reported:

"So, as far as the screening, it was fine, but to be honest, we do really in-depth assessments anyway, so we are very comfortable asking those questions. (…) It's our job, because we send such fragile children home, to help them."

On the other hand, a nurse at PICU reported:

> *"The charge nurse is really busy, and that's who we put the responsibility on, and I think we could relook at that and put it, you know, say a helper nurse could help with that, so they don't feel like they – one more thing that they're doing. (…) We do not make phone calls if you need state and federal resources. But if somebody will sit with you and say, 'Let's make this phone call, 'cause this seems like it could really help,' and an advocate that has time to sit with your person."*

In addition, due to prior experience, social workers had a much broader knowledge and a larger arsenal of community-based resources (which may or may not have matched the EHR database of resources) compared to nurses. One social worker reported:

> *"Yeah, I mean, [the community resources sheet] is fine, but I did kind of chuckle when we first met because when they showed me the resource thing, I was, like, 'So, can we add to that?' Because I know that my folks have a deeper breadth of available resources, so you kind of have a mixture of resources, here".*

Table 5: Factors Influencing Implementation Effectiveness Organized by CFIR Construct and Clinic					
CIFR Construct	*Data Source*	*Clinic*			
		PICU	*SHCN*	*LTP*	*CF*
Intervention effectiveness[a]					
% screened	EHR	Below minimum target	Higher than target	Target	Below minimum target (but close)
Prioritization					
	Focus groups	High	High	High	High
Clinic champion					
	Focus groups	Yes	Yes	Yes	Yes
Intervention characteristics					
Adaptability/compatibility	Focus groups	Low	High	High	High
Inner setting					
Unit type		Inpatient	Inpatient	Inpatient	Outpatient
Characteristics of individuals					
Licensure of implementer		Nurse	Social worker	Case manager	Nurse
Confidence to discuss	Survey				
Baseline (mean, SD)		2.93, 0.95	3.70, 1.17	4.5, 0.58	3.20, 1.01
3 mo (mean, SD)		3.42, 1.07	4.15, 0.52	-	3.09, 1.38
Change[b]		0.49	0.45	-	-0.11
SDOH knowledge	Survey				
Baseline (mean, SD)		2.66, 0.88	3.59, 1.24	4.34, 0.80	3.11, 1.16
3 mo (mean, SD)		2.97, 1.09	4.15, 0.52	-	2.95, 1.56
Change[b]		0.32	0.56	-	-0.16
Knowledge for advising families	Survey				
Baseline (mean, SD)		2.00, 0.45	1.05, 0.58	1.25, 0.5	1.67, 0.78
3 mo (mean, SD)		2.00, 0.82	1.00, 0	-	1.60, 0.55
Change[b]		0	-0.50	-	-0.07

HER = electronic health record; SD = standard deviation; PICU = pediatric intensive care unit; LTP = acute, long-term (15 days or more) hospitalized patients; SHCN = inpatient multispecialty step-down facility serving children with special healthcare needs; CF= cystic fibrosis outpatient clinic.
[a]target = 80% eligible patients screened and SDOH documented.
[b]mean difference 3 months post-implementation compared to baseline.
*p-value<0.05

DISCUSSION

This is the first study to implement and rigorously evaluate SDOH screening across a range of hospital units caring for medically complex pediatric patients. Among the pooled sample, close to half of the families reported at least one health-related social need. The prevalence of SDOH in our study is consistent with healthy pediatric populations in previous studies.[24,32] However, once stratified by clinical area, the prevalence of social needs, and screening rates, substantially varied from 24% in PICU to 50% in LTP. Variation was even more apparent among families who received the community resource sheet, ranging from 20% (PICU) to 91% (LTP). The variation could either be due to staff remembering to hand out *or* families actually needing the sheet.

The differential success across the clinical areas was likely due to 3 themes, which are all relevant for future implementation and dissemination efforts. First, the adaptability of the SDOH screener into EHR workflows was associated with success. The PICU was not able to integrate "hard stops" in their EHR workflow when completing admission assessments, which led team members to forget the screening for SDOH. This was ultimately reflected by PICU ranking last in screening rates, positivity rates, and community resource rates. In comparison, at SHCN, social workers consult with every patient/family admitted, so integrating the SDOH screener into their workflow was much simpler and not dependent upon "hard stops" in the EHR.

Second, the operational workflows of the clinical area influenced SDOH screening implementation. For example, this study found that the outpatient setting (ie, CF) was very different from the inpatient setting (ie, LTP, SHCN, PICU) in terms of integrating the SDOH screener during the amount of time allotted for each patient appointment. Such time constraints are not as influential in the inpatient setting.

Third, qualitatively we found that screening rates and community resource rates were significantly impacted by who was tasked with implementing the screening tool. We found that licensure of the implementer (nurse vs. social worker vs. case worker), and thus training experience, significantly influenced confidence to discuss health-related social needs and knowledge of them. This was regardless of clinical care teams receiving the same baseline SDOH training for implementation of the screener. For example, the high levels of success among SHCN was due to social workers using their experience to use the screener as a conversation guide about positive answers. In addition, implementers with a social work background also had a solid knowledge base of community-based organizations. In future dissemination efforts, evidence-based

strategies, like booster sessions, should be integrated into subsequent or follow-up trainings with nurses in particular.

Our findings are consistent with past implementation research in adult healthcare settings. For example, the success of integrating new care models has been shown to be strongly associated with the clinical care team's individual characteristics, and specifically the knowledge and attitudes toward the need of the intervention.[33] However, this is one of the first studies to evaluate which factors influence effectively integrating social needs into routine practice among medically complex patients whose families face a multitude of competing demands.[14,15,22] Future research should explore how to coordinate scale-up efforts in addressing social needs.[34] This is particularly important among large pediatric hospital systems that serve a range of diverse patients and families and whose clinical care teams are inherently different in many ways.

Results should be considered in light of limitations. It is important to note that all clinical areas were located within one pediatric healthcare system, and success is likely due to health system culture and shared hiring procedures. To deduce those and to increase generalizability, we selected a diverse set of clinics that had significant variation in patient population and ensured that the implementation was working (or not working) in a range of context and care models. Future studies should evaluate scale-up efforts across more than 4 clinics and, possibly, compare implementation efforts across systems in order to inform pediatric healthcare systems nationwide. Second, the response rate for the 3-month survey was not ideal (less than 40%). However, this is not surprising, given clinical care teams consistently reporting an overwhelming number of overall emails in their clinical inbox. Also, given the limited resources, we were unable to provide incentives. Future research should evaluate whether incentives improve response rates among clinical team members.

In conclusion, results from this study suggest that the successful implementation of a SDOH screener in pediatric healthcare settings serving medically complex patients is a multifaceted process involving multilevel factors. These findings can guide feasibility of further dissemination and scalability efforts in particular. Furthermore, future research should rigorously evaluate the percentage of patients that successfully connected to community resources and whether different modes of connection--like having the availability of a patient navigator to actively follow up with patients regarding social needs through warm handoffs[33]--improve that connection to community-based resources.

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Appendix A

Focus	Question	Response Type
Ability to discuss SDOH with families	How confident are you in your ability to discuss the following social determinants of health with families?	Range, 1-5
Knowledge about SDOH	How knowledgeable are you on the following social determinants of health?	Range, 1-5
Knowledge of SDOH related issues impacting families	How knowledgeable are you on the social, economic, and legal issues that impact the families that you care for face?	Range, 1-3