

Prevalence of Social Risks on Inpatient Screening and Their Impact on Pediatric Care Use

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ABSTRACT

OBJECTIVES: Screening for social determinants of health in the inpatient setting is uncommon. However, social risk factors documented in billing and electronic medical record data are associated with increased pediatric care use. We sought to describe (1) the epidemiology of social risks and referral acceptance and (2) association between social risks identified through routine inpatient screening and care use.

METHODS: Parents of children ages 0 to 18 admitted to a general pediatric floor at an academic children's hospital completed a psychosocial screening survey from October 2017 to June 2019. The survey covered the following domains: finances, housing, food security, medications, and benefits. Patient characteristics and care use outcomes were abstracted from the electronic medical record and compared by using Pearson's χ^2 or the Wilcoxon rank test and logistic regression analyses.

RESULTS: Of 374 screened families, 141 (38%) had a positive screen result, of whom 78 (55%) reported >1 need and 64 (45%) accepted a community resource. In bivariate analyses, patients with a positive screen result had higher 30-day readmission (10% vs 5%; $P = .05$), lower median household income (\$62 321 vs \$71 460; $P < .01$), lower parental education ($P < .01$), public insurance (57% vs 43%; $P < .01$), lived in a 1-parent household (30 vs 12%; $P < .01$), and had a complex chronic condition (35% vs 23%; $P = .01$) compared with those with a negative screen result. There was no difference in care reuse by screening status in adjusted analyses.

CONCLUSIONS: Social risks are common in the pediatric inpatient setting. Children with medical complexity offer a good target for initial screening efforts.



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Social determinants of health (SDOH), defined as “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life,”¹ have a significant impact on every individual’s health. Social risk factors, such as food insecurity, homelessness, and parental unemployment, negatively impact the socioemotional and cognitive development of children as well as outcomes of acute and chronic illnesses.^{2–6} Although the majority of physicians feel that social conditions are an important contributor to poor health,⁷ challenges such as lack of staff time, infrastructure and knowledge necessary to address social problems^{8–11} have limited the introduction of routine SDOH screening in many clinical settings.

Over the past decade, the American Academy of Pediatrics, Institute of Medicine, and Centers for Medicare and Medicaid Services have highlighted the need for routine social risk factor screening in the clinical setting.^{12–14} In response, routine SDOH screening efforts have been implemented in a growing number of outpatient settings. More than one social risk among the majority of patients screened has been identified by using these interventions.^{15,16} Screening also increased referrals and enrollment in new resources,^{16,17} and addressing identified social needs resulted in improved parent-reported child health.¹⁸ Additionally, parents reported being receptive to this form of screening in a medical setting.¹⁵

The prevalence of social risks in the pediatric inpatient setting and the impact of SDOH on pediatric care use is less well understood. Lower socioeconomic status is associated with an increased inpatient cost and mortality in several common pediatric conditions.^{19,20} Additionally, the adult literature reveals that vulnerable families are at risk for higher care use because of difficulty transitioning from the hospital to home.²¹ *International Classification of Diseases* (ICD) codes associated with social risk factors are associated with a long length of stay,²² and adjustment for SDOH variables extracted from administrative data (ie, race and payer) are associated

with a risk of readmission.^{23,24} However, social ICD codes are only documented in a small fraction of the inpatient population,^{22,25} and ICD codes, in general, are specific but not sensitive,²⁶ likely resulting in significant underrepresentation of the social burden of hospitalized children. Analysis of SDOH metrics obtained from directly surveying families is needed to more accurately characterize this relationship.

In this study, we aimed to describe the epidemiology of social risk factors and referral acceptance within an academic children’s hospital. As a secondary aim, we explored the association between families’ social risks identified during routine inpatient screening and hospital length of stay (LOS) and 30-day care reuse. We hypothesized that children with a social need identified on screening would have a longer LOS and increased risk of unplanned care reuse.

METHODS

Setting

This study was conducted in a tertiary academic children’s hospital that serves a 7-state catchment area in the west. Social workers, health navigators, and case managers serve as an integral part of inpatient care teams. The primary hospital site is surrounded by a network of care (NOC) consisting of urgent care (UC), emergency department (ED), and inpatient sites located throughout the metro area and surrounding suburbs where patients may also seek care. SDOH screening is conducted routinely at well-child visits at the institution’s primary care clinics.

Survey Development

The psychosocial screening survey was developed in 2015 by a multidisciplinary group composed of representatives from the case management, clinical psychology, health literacy, primary care, process improvement, and social work departments. The core team spent >1 year researching existing tools,^{18,27–35} published reports,¹⁴ and internal tools.³⁶ The resulting 14-question survey was pilot tested for readability, understandability, and test-retest reliability before initial deployment in the primary care clinics. The survey used in outpatient

primary care clinics was adapted into an 8-question survey that was focused on the issues most relevant to the inpatient setting. Survey domains included needs related to finances, housing, food security, prescriptions and medications, and benefits experienced in the past 3 months (see Pilot Inpatient Psychosocial Screener in the Supplemental Information).

Survey Administration

English- or Spanish-speaking families admitted to a general pediatric floor at the institution’s primary site were approached as part of a quality improvement pilot study testing implementation of inpatient SDOH screening on a general inpatient unit from October 2017 to June 2019. Screening was conducted during business hours on Monday through Friday.

Families were excluded from inpatient screening if they did not speak English or Spanish or if the patient was >18 years of age, admitted for psychiatric causes or self-harm, had an active relationship with the social work team, completed a psychosocial screening survey in the past 6 months as part of an inpatient or outpatient visit, or did not live in-state (to ensure ability to provide resources in response to identified needs).

A professional research assistant (PRA) provided the survey for the patient’s legal guardian to complete and returned later to collect the survey and address reported needs. Because of limited available PRA time, it was not feasible to screen every patient admitted to the targeted floor during the study period. A random sample of patients was selected weekly for screening by using a random numbers generator. If the family was not present at the patient’s bedside on initial approach, additional attempts were made to complete the survey if possible until discharge. Pilot testing was completed with the first 20 families to test the feasibility of providing the screener on the inpatient floors. In response to feedback received during pilot testing, patients managed by social work were excluded moving forward to avoid duplication of work; however, no changes were made to the screener itself, and these families were included in the final analysis.

In response to a reported need, referrals to relevant community resources (ie, Supplemental Nutrition Assistance Program, Temporary Assistance for Needy Families [TANF], etc) were offered by the PRA or a health navigator (Table 1), and resource acceptance was documented.

To verify that the screened population was representative of the overall general inpatient population, we created a 2:1 matched cohort of unscreened families admitted to the general pediatrics floor during the same week of admission of each screened patient. Patients were matched on age in months and admit date within 1 week.

Demographic information, clinical characteristics, and care use outcomes (LOS and 30-day care reuse) were extracted from the electronic health record (EHR). All data, including survey responses and extracted EHR data, were stored and managed by using the research electronic data capture electronic database (REDCAP) hosted at the University of Colorado.³⁷ This study was approved by the Colorado Multiple Institutional Review Board (number 18-1899).

Exposure and Outcome Measures

A positive screen result, defined as report of at least 1 social risk on the survey, is the primary exposure in this study. We also assessed how many families accepted resources. The independent variables examined include patient age, sex, race, ethnicity, primary language spoken, parental education level, number of parents in the home, insurance status, and zip code–based median income.³⁸ Clinical variables included a documented primary care physician (PCP) in the EHR and the presence of a complex chronic condition (CCC).³⁹

The primary outcome studied is any 30-day care reuse (ED or UC visit or unplanned readmission⁴⁰) at any hospital within the NOC.

Statistical Analysis

Bivariable analyses were used to compare clinical and demographic characteristics between groups: positive versus negative screen results, screened versus control, readmissions versus no readmissions, and received resources versus not received.

Wilcoxon rank tests were used to compare the median values of continuous variables, and χ^2 was used to compare proportions for categorical variables.

Variables with $P < .2$ in bivariable analysis for care reuse, our primary outcome, were considered for a multivariable model.

Multivariable analysis was performed by using logistic regression to calculate odds ratios (ORs), comparing explanatory variables to care-reuse status after adjusting for all other included variables. Age and sex were identified a priori for inclusion.

TABLE 1 Resources Offered in Response to Positive Psychosocial Screen Results

	Resource(s) Offered
Concerns about making ends meet?	
Rent and/or mortgage	County or city human services or housing coalition United Way 311 (inclusive online resource database by zip code)
Formula and/or diapers	WIC
Child care	Colorado Shines (database for affordable and vetted child care) CCAP
Gas and/or transportation	Veyo Social work consult for transportation vouchers and/or gas cards
Paying utilities	LEAP (emergency financial assistance)
Concerns about managing child's health care?	
Job	Situation dependent; commonly referred to Goodwill job training
Insurance	Situation dependent; commonly referred to financial assistance or given Medicaid officer contact information
Money	TANF
Relationship difficulties	Information on locating therapist near patient's home Social work referral if more severe situation
Chronic illness	Situation dependent
Legal problems	Social work referral for assistance
Concerns about filling child's prescriptions?	GoodRx.com Prescription discount card Information about nearby pharmacies
Concerns about food running out?	Hunger Free Colorado referral Information about food banks in family's neighborhood Social work referral for cafeteria or supermarket vouchers
Concerns about benefits?	
Enrolled patients	Contact information for benefit program
Unenrolled patients	Informational Web site on how to apply and check eligibility Referral to financial assistance
Concerns about housing?	Referral to local housing coalition or human services Referral to 311 United Way or TANF for emergency assistance

CCAP, Child Care Assistance Program; LEAP, Low Income Home Energy Assistance Program; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children

Data were analyzed by using SAS version 9.4 software (SAS Institute, Inc, Cary, NC). All statistical tests were performed with a level of significance of $\alpha = .05$.

RESULTS

Screening Results

Of 374 families that completed the screening survey, 141 (38%) had a positive screen result, and 64 (45%) families with a positive screen result accepted a community resource. Financial concern was the most common social risk factor identified (72%), followed by difficulty making health care appointments (37%) and concerns about benefits (37%). Sixty-three (45%) families had a positive response in 1 domain, 37 (26%) in 2 domains, 28 (20%) in 3 domains, and 13 (9%) in ≥ 4 domains.

Compared with unscreened patients ($n = 748$), screened patients ($n = 374$) were younger (3 vs 4 years; $P < .01$), not Hispanic or Latino (72% vs 64%; $P = .01$), English-speaking (96% vs 91%; $P = .01$), and less frequently had a CCC (27% vs 38%; $P < .01$) (Supplemental Table 3). There were no significant differences in median household income, sex, insurance status, or connection to a PCP. Screened patients had a longer LOS (2.6 vs 2.3 days; $P = .04$) but no difference in ED and UC visits (9% vs 10%, $P = .61$) or unplanned readmissions (7% vs 9%; $P = .27$).

Factors Associated With Screening Status

Characteristics associated with a positive screen result in bivariate analyses included lower median household income (\$62 321 vs \$71 460; $P < .01$), lower parental education ($P < .01$), public insurance (57% vs 43%; $P < .01$), living in a 1-parent household ($P < .01$), and presence of a CCC (35% vs 23%; $P = .01$). There was no difference in LOS or any care reuse between the 2 groups. Patients with a positive screen result did have a higher incidence of unplanned readmission (10% vs 5%; $P = .05$; Table 2).

Care Reuse

In bivariate analyses, patients with a lower median household income (\$57 662 vs \$69 967; $P = .01$), presence of a CCC (47% vs 24%; $P < .01$), and longer LOS (3.2 vs

2.4 days; $P < .01$) were more likely to reuse care. The distribution of the number of parents in the household was significantly different between the care-reuse groups ($P = .03$) because of the inclusion of “refused” responses (11% refusal in the no care-reuse group versus 0%).

In adjusted analyses, increased LOS (OR: 1.21; $P < .01$) and presence of a CCC (OR: 2.93; $P < .01$) were associated with any care reuse (Fig 1).

DISCUSSION

Our study revealed that social risks are commonly identified during pediatric inpatient SDOH screening and the majority of patients with a positive screen result have >1 social risk factor. The presence of a CCC and a longer LOS were both associated with a higher rate of 30-day care reuse in adjusted analyses. A positive psychosocial screen result was not associated with 30-day care reuse after adjusting for covariates. Despite a high prevalence of identified social risks, less than one-half of patients desired additional resources to address their need.

Although gaining traction in the outpatient arena, screening for SDOH in the pediatric inpatient setting remains uncommon.^{10,41} Hospitalists and inpatient nurses report a lack of time, adequate resources, and standardized screening tools as barriers to screening.¹⁰ As a result, there is limited understanding of the prevalence of social risks in the hospitalized population. In a recent study, researchers examining the feasibility of inpatient SDOH screening identified at least 1 socioeconomic risk factor in one-third of patients.⁴² In our study, we identified a similar prevalence of social risks among hospitalized children (38%), with multiple needs reported by the majority (55%) of patients with a positive screen result. In studies from the outpatient and ED setting, researchers report similar trends.^{16,17,43} However, hospitalization represents a unique opportunity to identify and intervene on identified needs because of the longer time available with each individual patient during a hospital admission. Even at institutions with routine ambulatory SDOH screening, inpatient screening efforts can identify social risks

among patients who do not frequently seek primary care or attend clinics without the resources available to support social screening.

Hospitalization is a stressful event for children and their families that may generate new social needs because of lost time at work or other trade-offs that parents must make to care for their hospitalized child. As a result, families with limited social and financial reserve may have difficulty successfully transitioning from the hospital to home.⁴⁴ In previous studies, researchers have examined the impact of social risk factors available in large databases on pediatric health care use.^{22,24} Risk-adjustment for demographic variables available in the EHR (race, payer, etc) impacted hospitals' readmission rank order,²⁴ whereas social risk ICD codes available in a national readmissions database were associated with a long LOS but not readmission, in adjusted analyses.²² Additionally, deJong et al⁴⁵ included social risk screening in an intervention bundle that aimed to decrease 30-day readmissions. Yet, the large amount of missing data in the databases and bundled approach to reducing readmission in these studies make it difficult to understand the true impact of social risks on care use. In our study, which is the first in which the isolated association between patient-reported social risks and care use in the pediatric inpatient setting is investigated, we found that a positive SDOH screen result was associated with an increased incidence of unplanned 30-day readmission in bivariate analyses, although this effect was no longer present after adjusting for covariates. It is possible that results were biased to the null because of certain exclusion criteria (screening completed within the previous 6 months, etc) and/or the fact that we intervened to address social risks for these families. Identifying both new and chronic social risks can provide actionable items to intervene on to improve a vulnerable family's ability to successfully transition home.

We found the presence of a CCC to be associated with a positive screen result as

TABLE 2 Baseline Demographics and Outcomes of Hospitalized Children With a Positive and Negative Inpatient Psychosocial Screen Result

Variable	Positive Screen Result (n = 141)	Negative Screen Result (n = 233)	P
Child's age, y, median (IQR)	3 (1–9)	3 (1–9)	.79
Household income, \$, median (IQR) ^a	62 321 (52 865–84 089)	71 460 (54 346–92 263)	<.01
Child's sex, n (%)			.91
Female	68 (48)	111 (48)	
Male	73 (52)	122 (52)	
Child's race, n (%)			.27
White	97 (70)	170 (76)	
Other	41 (30)	55 (24)	
Child's ethnicity, n (%)			.26
Not Hispanic or Latino	90 (68)	166 (74)	
Hispanic or Latino	42 (32)	59 (26)	
Parental education, n (%)			<.01
High school graduate or less	39 (28)	52 (22)	
Some college or technical school	46 (33)	47 (20)	
College graduate or more	47 (34)	127 (55)	
Refused	8 (6)	6 (3)	
Insurance status, n (%)			<.01
Commercial	61 (43)	134 (58)	
Public or charity	80 (57)	99 (43)	
Any CCC, n (%)			.01
No	92 (65)	180 (77)	
Yes	49 (35)	53 (23)	
No. parents in household, n (%)			<.01
1-parent household	41 (30)	27 (12)	
2-parent household	82 (59)	180 (79)	
Refused	15 (11)	20 (9)	
LOS, d, median (IQR)	2.6 (1.8–3.7)	2.6 d (1.7–4.0)	.73
Any unplanned care reuse, n (%)			.24
No	118 (84)	205 (88)	
Yes	23 (16)	28 (12)	
Unplanned readmission, n (%)			.05
No	127 (90)	222 (95)	
Yes	14 (10)	11 (5)	
ED or UC visit, n (%)			.95
No	128 (91)	212 (91)	
Yes	13 (9)	21 (9)	

P values from Pearson's χ^2 or the Wilcoxon rank test. IQR, interquartile range.

^a Based on zip code.

well as care reuse. High care use among patients with medical complexity is well established in the literature.^{46,47} There is also growing evidence that these children are at a higher risk of social complexity, despite connection to a medical home.^{48,49} Additionally, a national, multidisciplinary group of experts and caregivers recently identified understanding the impact of SDOH

and methods of integrating SDOH screening into care for children and youth with special health care needs as a top research priority for this population.⁵⁰ Some states have already introduced social screening as a quality metric.⁵¹ If this requirement is adopted by more payers, an increasing number of hospitals will be required to develop policies and procedures to support

both social screening and connection to resources. Our data support targeting children with chronic conditions for initial screening and intervention, if resources for such efforts are limited.

Finally, our study reveals attrition along the path from screening to obtaining resources. In previous studies, researchers examining food insecurity screening and referral

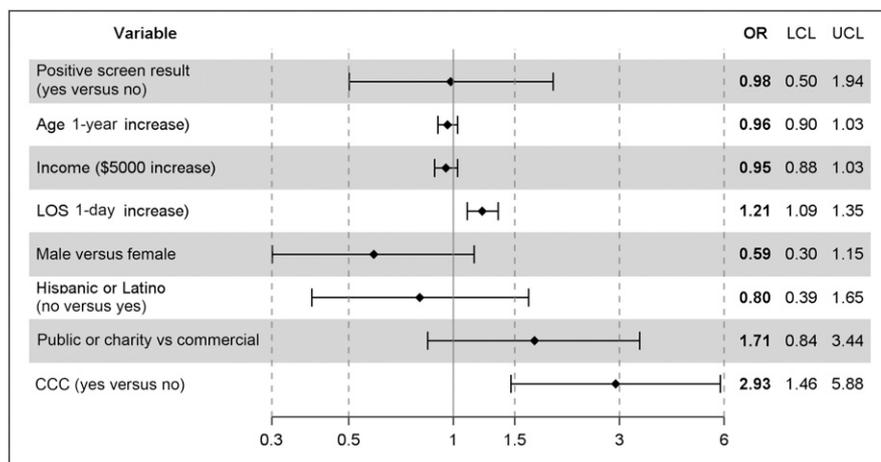


FIGURE 1 Odds of 30-day care reuse in adjusted analyses. LCL, 95% lower confidence limit; UCL, 95% upper confidence limit.

practices have demonstrated this phenomenon,⁵² which represents the true challenge associated with SDOH screening in any setting. Less than one-half of patients who reported a social risk desired referral or additional resources in our study, but our study was not designed to assess reasons for this. Although previous studies have demonstrated that families are receptive to SDOH screening in the inpatient setting,⁵³ it is possible that families are too overwhelmed by their child's acute illness to prioritize addressing social risks during admission. This reinforces the importance of using shared decision-making and respecting family autonomy in developing an approach to SDOH screening and referral.⁵⁴ It also highlights the need for researchers of future studies to examine families' perspectives on the best approach to offering referrals and resources in the pediatric inpatient setting.

Several limitations must be considered when interpreting the results of this study. First, because this was part of a quality improvement initiative, we screened a convenience sample of patients on the basis of legal guardian availability during business hours, which may have resulted in a biased sample. However, a comparison of screened versus unscreened controls reveals that the demographic composition of our sample is largely representative of the population of the general inpatient floor targeted through screening. Additionally, we

likely underestimated the prevalence of social risks because of exclusion of patients with a preexisting relationship with the social work team. Furthermore, in our study, we considered 30-day unplanned care reuse; it is possible that longer-term reuse results could differ from our findings. Also, we were only able to capture readmissions within our institution's NOC, which represents the majority of beds in the state, but may have missed readmissions that occurred elsewhere, leading to underestimation of care reuse. Our study was conducted in a single academic children's hospital, so results related to prevalence and distribution of needs may not be generalizable to community hospitals or hospitals in states with different social resources. Institution-specific screening tools also make it difficult to compare our results to other institutions that may screen for different social risk factors. Finally, a major limitation of our study, similar to previous studies of SDOH screening,⁴¹ is that we were unable to verify receipt of resources for the majority of patients who accepted referrals. This limits our ability to understand both the true proportion of patients connected to a resource after inpatient screening as well as the impact obtaining a resource has on care reuse. Additional studies in which families are prospectively followed after referral from the inpatient setting to quantify the proportion connected to resources are

needed to truly understand the impact of referral on child health and care use.

CONCLUSIONS

Social risks are common among hospitalized children, although the distribution of needs is likely to vary by institution and region. Routine social screening can be done to enable a hospital to provide effective and comprehensive care that addresses its patients' social risk factors as well as their medical issues. Identifying and addressing these issues before discharge may ultimately be helpful in reducing excess health care use, especially among children with chronic medical conditions. Effective strategies to connect families to desired resources are needed to successfully translate screening into improved health outcomes.

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