


## RESEARCH BRIEF

# Development of a homelessness risk screening tool for emergency department patients

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## Abstract

**Objective:** To develop a screening tool to identify emergency department (ED) patients at risk of entering a homeless shelter, which could inform targeting of interventions to prevent future homelessness episodes.

**Data sources:** Linked data from (1) ED patient baseline questionnaires and (2) city-wide administrative homeless shelter database.

**Study design:** Stakeholder-informed predictive modeling utilizing ED patient questionnaires linked with prospective shelter administrative data. The outcome was shelter entry documented in administrative data within 6 months following the baseline ED visit. Exposures were responses to questions on homelessness risk factors from baseline questionnaires.

**Data collection/extraction methods:** Research assistants completed questionnaires with randomly sampled ED patients who were medically stable, not in police/prison custody, and spoke English or Spanish. Questionnaires were linked to administrative data using deterministic and probabilistic matching.

**Principal findings:** Of 1993 ED patients who were not homeless at baseline, 5.6% entered a shelter in the next 6 months. A screening tool consisting of two measures of past shelter use and one of past criminal justice involvement had 83.0% sensitivity and 20.4% positive predictive value for future shelter entry.

**Conclusions:** Our study demonstrates the potential of using cross-sector data to improve hospital initiatives to address patients' social needs.

## KEYWORDS

delivery of health care, emergency service, homeless persons, hospital, housing, social problems

## What is known on this topic

- Preventing homelessness before it occurs is a key strategy to reduce the number of people who experience homelessness.
- Challenges of homelessness prevention include accurately predicting who is most likely to become homeless and reaching all people in need of an intervention.

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- Despite growing health care system interest in screening for and addressing patient social needs, no past research has developed an empirically based screening tool to identify patients at highest risk of future homelessness.

**What this study adds**

- Approximately 1 in 20 (5.6%) patients visiting the urban, public hospital study emergency department (ED) who were not already currently homeless entered a homeless shelter within the next 6 months.
- A simple three-item screening tool identified risk for future homelessness with high sensitivity.
- While no screening tool should be used without further testing, this study demonstrates the promise of using cross-sector data and collaboration to improve health care efforts to address patients' social needs.

## 1 | INTRODUCTION

Homelessness—defined as living in a homeless shelter or on the streets, in an encampment, or in another place not meant for human habitation—is associated with poor health and increased mortality.<sup>1–3</sup> The health care system has generally focused on the highest cost, highest need homeless patients, through programs such as care management and efforts to connect patients with supportive housing.<sup>4,5</sup> Housing instability short of literal homelessness is highly prevalent; more than one in five US renter families spent over half of their income on housing, even prior to the coronavirus disease 2019 (COVID-19) pandemic.<sup>6</sup> Homelessness prevention is a key part of federal strategic plans to end homelessness, but thus far, the health care system has paid less attention to preventing homelessness before it occurs.

A notable exception is the Veterans Health Administration, which routinely screens patients for housing instability and offers prevention interventions for those who screen positive.<sup>7</sup> This screening generally excludes emergency departments (EDs), although EDs serve patients with high levels of housing instability. Past studies have found ED patient housing instability prevalence of 18.1%–43.8%.<sup>8</sup> ED patients may therefore benefit disproportionately from interventions to screen for and address homelessness risk. To our knowledge, ED screening for homelessness risk has yet to be described.

Screening for risk of future homelessness is more complex than recognizing current homelessness. While effective homelessness prevention interventions exist, one challenge is accurately targeting people who are most likely to become homeless and benefit from intervention.<sup>9,10</sup> Past research developed screening tools to identify people most likely to need homelessness prevention interventions in New York City, but this research was limited to applicants for homelessness prevention services.<sup>11,12</sup> It is unknown whether predictors of homelessness would differ for ED patients or even if a sufficiently accurate and concise screening tool for homelessness risk could be developed for this population. In the current study, we developed a homelessness risk screening tool to identify ED patients at risk for future homelessness.

## 2 | METHODS

We conducted a prospective cohort study using linked survey questionnaire and administrative homeless services data for ED patients. Stakeholders including governmental agencies, hospital leaders, and nonprofit homelessness and social service providers participated in research advisory committee meetings. Feedback from these meetings and from one-on-one conversations with >20 stakeholders was incorporated into study questionnaire content and project design. The study was approved by the NYU School of Medicine Institutional Review Board.

### 2.1 | Sample

Recruitment occurred at a New York City public, safety-net hospital November 2016–September 2017. Research assistants followed a random sampling scheme to approach ED patients during assigned shifts (7 days/week, including overnights) in a distribution approximating ED patient arrival volume. Patients were ineligible if they were <18 years old, medically unstable, psychologically distressed, in police/prison custody, lived outside New York City, or did not speak English/Spanish. Participants gave informed consent and received \$15 compensation.

Because we were interested in homeless shelter entry *after* the ED visit, study participants who were homeless at baseline—defined as self-report of spending the previous night in a shelter or unsheltered (e.g., outdoors)—were excluded from analyses. A sensitivity analysis additionally excluded participants who spent any night in a shelter (documented in City administrative data) in the week pre-baseline.

### 2.2 | Baseline questionnaire

Bilingual research assistants conducted 20–40 min survey questionnaires using REDCap electronic data capture tools.<sup>13</sup> Domains included sociodemographics; housing (past history as well as recent events such as eviction and owing rent arrears); other social needs (e.g., food insecurity, job loss, recent legal issues, and difficulty meeting expenses);

**TABLE 1** Characteristics and housing status of emergency department sample

	<i>n (%)<sup>a</sup></i> <i>n = 1993</i>
<b>Sociodemographics<sup>b</sup></b>	
Age (years)	
18–30	459 (23.0)
31–50	729 (36.6)
51–65	550 (27.6)
>65	254 (12.8)
Gender	
Female	945 (47.5)
Male	1035 (52.1)
Transgender	8 (0.4)
Race and ethnicity	
Hispanic/Latino	1153 (58.2)
Black (non-Hispanic)	402 (20.3)
White (non-Hispanic)	233 (11.8)
Other race (non-Hispanic)	192 (9.7)
Education	
Less than high school diploma	716 (36.0)
High school graduate/GED	495 (24.9)
Some college or more	780 (39.2)
Employment	
Working (full-time or part-time)	995 (49.9)
Unemployed	420 (21.1)
Unable to work	340 (17.1)
Retired	238 (11.9)
Unable to meet essential expenses	727 (36.5)
<b>Health</b>	
Physical health	
Excellent/very good	475 (23.9)
Good	638 (32.2)
Fair/poor	871 (43.9)
Anxiety (GAD-2 screen positive <sup>c</sup> )	543 (27.6)
Depression (PHQ-2 screen positive <sup>c</sup> )	405 (20.4)
Unhealthy alcohol use <sup>c</sup>	608 (30.6)
Any drug use <sup>c</sup>	373 (18.8)
<b>Homelessness history</b>	
Used a homeless shelter, past 12 months	127 (6.4)
Used a drop-in center, past 12 months	60 (3.0)
Applied for shelter, past 12 months	77 (3.9)
Homeless or doubled up, past 12 months	194 (9.7)
Lifetime homelessness	424 (21.4)
<b>Housing status</b>	
Current (past night) living arrangement	
Own apartment, subsidized	438 (22.0)
Own apartment, not subsidized	1137 (57.1)

(Continues)

**TABLE 1** (Continued)

	<i>n (%)<sup>a</sup></i> <i>n = 1993</i>
Doubled up with friends/family	241 (12.1)
Institution (e.g., hospital, nursing home)	118 (5.9)
Other (hotel/SRO, halfway house/detox, other)	56 (2.8)
Owes rent arrears (back rent)	152 (7.6)
Evicted, past 12 months	77 (3.9)
Lived in 2+ places, past 12 months	454 (22.9)

Abbreviations: GED, general educational development; SRO, Single room occupancy.

<sup>a</sup>Excludes those who were currently homeless at baseline. All variables self-reported and over past 12 months unless otherwise noted. Some categories do not add to 1993 due to small amount of missing data ( $\leq 1\%$  for all variables) and/or survey branching logic.

<sup>b</sup>Details and question sources for all variables are described in Table S1, available as an Appendix S1. Full results available from the authors by request.

<sup>c</sup>Generalized Anxiety Disorder 2-item (GAD-2) is a validated two-item screener for anxiety. Patient Health Questionnaire-2 (PHQ-2) is a validated two-item screener for depression. Unhealthy alcohol use was measured with a validated single item screening question on at least 1 day of heavy drinking in the past year. Drug use included any drug use (including marijuana) in the past year. See Appendix S1 for details and citations.

**TABLE 2** Characteristics of emergency department (ED) patient sample who did versus did not enter a New York City homeless shelter within 6 months of baseline ED visit

	By shelter entry status <sup>a</sup>		<i>p</i> -Value <sup>b</sup>
	No shelter	Shelter	
	<i>n</i> (%)	<i>n</i> (%)	
	<i>n</i> = 1881	<i>n</i> = 112	
Sociodemographics			
Age			0.03
18–30	439 (23.3)	20 (18.0)	
31–50	681 (36.2)	48 (43.2)	
51–65	513 (27.3)	37 (33.3)	
>65	248 (13.2)	6 (2.4)	
Gender			<0.01
Female	930 (49.5)	15 (13.5)	
Male	940 (50.1)	95 (85.6)	
Transgender	7 (0.4)	1 (0.9)	
Race and ethnicity			<0.01
Hispanic/Latino	1118 (59.8)	35 (31.8)	
Black (non-Hispanic)	347 (18.6)	55 (50.0)	
White (non-Hispanic)	219 (11.7)	14 (12.7)	
Other race (non-Hispanic)	186 (9.9)	6 (5.5)	
Sexual orientation			0.75
Gay or lesbian	50 (2.7)	4 (3.6)	

(Continues)

TABLE 2 (Continued)

	By shelter entry status <sup>a</sup>		p-Value <sup>b</sup>
	No shelter	Shelter	
	n (%)	n (%)	
	n = 1881	n = 112	
Straight/not gay	1763 (93.8)	104 (92.9)	
Bisexual	55 (2.9)	4 (3.6)	
Other	12 (0.6)	0 (0.0)	
Relationship status			<0.01
Single, never married	665 (35.4)	65 (58.0)	
Dating/partnered, not married	289 (15.4)	13 (11.6)	
Married or civil union	515 (27.4)	13 (11.6)	
Divorced, separated, or widowed	409 (21.8)	21 (18.8)	
Currently living with children	507 (27.0)	14 (12.5)	<0.01
Currently pregnant	40 (2.1)	2 (1.8)	0.81
Education			<0.01
Grade school or less	339 (18.0)	5 (4.5)	
Some high school	344 (18.3)	28 (25.0)	
High school graduate/GED	456 (24.3)	39 (34.8)	
Some college	311 (16.6)	24 (21.4)	
College degree or more	429 (22.8)	16 (14.3)	
Employment			<0.01
Working full-time	582 (30.9)	24 (21.4)	
Working part-time	379 (20.1)	10 (8.9)	
Unemployed, looking for work	244 (13.0)	35 (31.3)	
Unemployed, not looking for work	133 (7.1)	8 (7.1)	
Unable to work	315 (16.7)	25 (22.3)	
Retired	228 (12.1)	10 (8.9)	
Became unemployed, past 12 months	490 (26.1)	49 (43.8)	<0.01
Unable to meet essential expenses	659 (35.0)	68 (60.7)	<0.01
Homelessness history			
Used a homeless shelter, past 12 months	78 (4.2)	49 (43.8)	<0.01
Used a drop-in center, past 12 months	31 (1.6)	29 (25.9)	<0.01
Applied for shelter, past 3 months	39 (2.1)	38 (33.9)	<0.01
Homeless or doubled up, past 12 months	136 (7.2)	58 (51.8)	<0.01
Lifetime homelessness	355 (19.0)	69 (61.6)	<0.01
Housing status/instability			
Current living arrangement (where slept last night)			<0.01
Own apartment, subsidized	422 (22.5)	16 (14.4)	

TABLE 2 (Continued)

	By shelter entry status <sup>a</sup>		p-Value <sup>b</sup>
	No shelter	Shelter	
	n (%)	n (%)	
	n = 1881	n = 112	
Own apartment, not subsidized	1098 (58.4)	39 (35.1)	
Doubled up with friends/family	217 (11.5)	24 (21.6)	
Hotel, SRO, boarding home	11 (0.6)	3 (2.7)	
Halfway house, residential treatment program	9 (0.5)	0 (0.0)	
Transitional housing	10 (0.5)	3 (2.7)	
Institution (e.g., hospital, nursing home)	97 (5.2)	21 (18.9)	
Detoxification	0 (0.0)	2 (1.8)	
Other	15 (0.8)	3 (2.7)	
Where spent majority of nights in past 12 months			<0.01
Own apartment, subsidized	424 (22.7)	12 (10.7)	
Own apartment, not subsidized	1161 (62.1)	45 (40.2)	
Doubled up with friends/family	192 (10.3)	15 (13.4)	
Hotel, SRO, boarding home	8 (0.4)	2 (1.8)	
Halfway house, residential treatment program	8 (0.4)	1 (0.9)	
Transitional housing	9 (0.5)	1 (0.9)	
Institution (e.g., hospital, nursing home)	17 (0.9)	7 (6.3)	
Shelter	22 (1.2)	22 (19.6)	
Outdoors/streets (unsheltered)	23 (1.2)	4 (3.6)	
Detoxification	6 (0.3)	3 (2.7)	
Evicted, past 12 months	61 (3.2)	16 (14.3)	<0.01
Lived in 2+ places, past 12 months	384 (20.5)	70 (62.5)	<0.01
Time when did not pay full rent, past 12 months	368 (19.7)	28 (25.0)	<0.01
Social support			
Has someone can count on to lend money	1362 (72.4)	61 (54.5)	<0.01
Has someone can count on to give place to stay	1348 (71.7)	56 (50.0)	<0.01
Health			
Physical health			0.58
Excellent/very good	446 (23.8)	29 (25.9)	
Good	607 (32.4)	31 (27.7)	
Fair/poor	819 (43.8)	52 (46.4)	
Head injury, lifetime	423 (22.5)	49 (43.8)	<0.01

**TABLE 2** (Continued)

	By shelter entry status <sup>a</sup>		<i>p</i> -Value <sup>b</sup>
	No shelter	Shelter	
	<i>n</i> (%)	<i>n</i> (%)	
	<i>n</i> = 1881	<i>n</i> = 112	
Current ED visit related to injury	440 (23.4)	34 (30.4)	0.09
Victim of physical violence, past 12 months	131 (7.0)	23 (20.9)	<0.01
Victim of sexual violence, past 12 months	22 (1.2)	4 (3.6)	0.03
Anxiety (GAD-2 screen positive) <sup>c</sup>	493 (26.5)	50 (45.5)	<0.01
Depression (PHQ-2 screen positive) <sup>c</sup>	366 (19.5)	39 (34.8)	<0.01
Schizophrenia	39 (2.1)	11 (9.8)	<0.01
Bipolar disorder	94 (5.0)	15 (13.4)	0.02
PTSD	87 (4.6)	12 (10.7)	<0.01
Borderline personality disorder	34 (1.8)	13 (11.6)	<0.01
Hospitalized for mental illness, past year	69 (3.7)	20 (17.9)	<0.01
Unhealthy alcohol use	555 (29.6)	53 (47.7)	<0.01
Any drug use	323 (17.2)	50 (45.0)	<0.01
Criminal justice history			
Arrested, past 6 months	62 (3.3)	19 (17.0)	<0.01
Spent nights in jail or prison, past 6 months	46 (2.5)	20 (17.9)	<0.01
On probation or parole	30 (1.6)	8 (7.1)	<0.01
Incarceration (jail or prison) history, lifetime	313 (16.6)	72 (64.3)	<0.01

Abbreviations: GED, general educational development; SRO, Single room occupancy.

<sup>a</sup>Excludes those who were currently homeless at baseline. All variables self-reported and over past 12 months unless otherwise noted. Some categories do not add to 1993 due to small amount of missing data ( $\leq 1\%$  for all variables) and/or survey branching logic.

<sup>b</sup>*p*-Value for chi-squared test of independence examining bivariate associations between ED patient characteristics and future shelter entry.

<sup>c</sup>Generalized Anxiety Disorder 2-item (GAD-2) is a validated two-item screener for anxiety. Patient Health Questionnaire-2 (PHQ-2) is a validated two-item screener for depression. See Appendix S1 for details and citations.

physical and mental health (including chronic medical and psychiatric conditions, past year physical or sexual violence, and screeners for depression, anxiety, pain, and overall health); substance use (including types and amounts and validated screening tools for degree of problems related to alcohol and drug use); health care use (including specific types of outpatient and inpatient health care); criminal justice history (lifetime and more recent); and social support. Participants also reported whether their current ED visit was related to substance use or injury. A full list of variables is available in Table S1. Participants provided their name,

date of birth, and social security number (SSN), if they had one, to allow data linkage.

## 2.3 | Data linkage

Shelter entry after the baseline ED visit was determined using the New York City Department of Homeless Services CARES database. CARES contains dates of shelter entry and exit for >90% of City shelter stays. The New York City Center for Innovation through Data Intelligence (CIDI)—an agency in the Office of the Mayor that conducts cross-sector, policy-relevant data analysis—performed data linkage.<sup>14</sup> Study investigators provided CIDI with participant identifying information. CIDI used SAS Link King to conduct probabilistic and deterministic matching with CARES. Participants with a first and last name plus either a full birthdate or SSN were matched. SAS Link King uses “fuzzy” matching on names/birthdates/SSNs that are closely related; CIDI manually reviewed borderline cases to confirm the match.

## 2.4 | Variables

The outcome was homeless shelter entry documented in the administrative data within 6 months of the baseline ED visit. We were interested in any shelter entry, regardless of whether or not it was an individual's first time being homeless, because each episode of homelessness is associated with health risks as well as high public costs. Therefore, from the standpoint of an ED intervention, we would be interested in preventing any homelessness episodes, not only first-time homelessness.

Research has identified a wide array of risk factors for homelessness. Therefore, we cast a broad net, including all relevant independent variables from the baseline questionnaire (see Table S1 for list). We did not include independent variables from administrative data because we wanted to create a screening tool practical to implement in EDs where staff lack access to such data.

## 2.5 | Analysis

To develop a practical screener responsive to local needs, we used a two-stage method: (1) predictive modeling to identify candidate predictor variables and (2) selection among candidate screening tools based on performance and stakeholder conversation.

We compared five modeling methods: (1) logistic regression with leave-one-out cross-validation; (2) 10-fold cross-validation with selection of variables using LASSO; (3) high-performance logistic modeling using Bayesian information criterion; (4) classification and regression trees (CART); and (5) CART with k-fold cross-validation. All models included the universe of ED questionnaire variables. Complete case deletion was used for missing data, resulting in 56 (2.8%) of 1993 observations removed, equally balanced across those who did and did not enter shelter. Variables significant in  $\geq 2$  models were selected as “candidate predictors.”

We next examined sensitivity, positive predictive value, and number of patients who would have screened “positive” for candidate screening tools consisting of all possible combinations of candidate predictors. Selection of an “ideal” homelessness risk screening tool is a practical and policy decision.<sup>12</sup> Therefore, a spreadsheet showing performance of candidate screening tools was shared with a stakeholder group including an emergency physician, homelessness experts, and representatives from the New York City Department of Social Services and CIDI. A screening tool was selected by consensus for further pilot testing, based on goals including maximizing sensitivity even at the cost of specificity and positive predictive value (i.e., “casting a wide net”). The ready availability of preventive services in the City also informed these goals.

### 3 | RESULTS

Research assistants approached 6097 ED patients. 52.0% were ineligible; reasons for ineligibility have been previously reported and

primarily included language, medical instability, and intoxication, with fewer excluded due to being in prison/police custody, living outside New York City, psychological distress, or prior study participation.<sup>14</sup> Of 2924 eligible patients, 2396 (81.9%) participated. Eighty-four had participated more than once, leaving 2312 nonduplicated participants. Three did not give identifying information. Of 2309 participants whose data could be linked, 316 (13.7%) were excluded as currently homeless, leaving a final analytic sample of  $n = 1993$ . Participants were diverse in age, gender, ethnicity, and race and had high levels of social needs (Table 1).

In the 6 months following the baseline ED visit, 112 patients (5.6%) who were not currently homeless entered a City shelter. Those who entered a shelter were more often male, non-Hispanic Black and had a history of mental illness, criminal justice involvement, and past homelessness experience when compared to nonentrants (Table 2).

Model performance statistics and significant predictor variables from each modeling method appear in Tables S1 and S2. Variables emerging as significant in  $\geq 2$  models are described in Table 3.

**TABLE 3** Performance of selected illustrative candidate screening tools for predicting homeless shelter entry within 6 months of a patient's emergency department visit<sup>a,b</sup>

	N	Sensitivity	PPV
One-item screening tool examples			
Homeless (shelter or unsheltered) or doubled up (12 months)	194	51.8%	29.9%
Used shelter (12 months)	138	46.4%	37.7%
Applied for shelter (3 months)	77	33.9%	49.4%
Jail/prison (lifetime)	385	64.3%	18.7%
Two-item screening tool examples			
Used shelter (12 months), applied for shelter (3 months)	153	51.8%	37.9%
Used shelter (12 months), homeless or doubled up (12 months)	218	55.4%	28.4%
Homeless or doubled up (12 months), jail/prison (lifetime)	487	79.5%	18.3%
Used shelter (12 months), jail/prison (lifetime)	448	81.3%	20.3%
Three-item screening tool examples			
Used shelter (12 months), homeless or doubled up (12 months), applied for shelter (3 months)	229	59.8%	29.3%
Used shelter (12 months), homeless or doubled up (12 months), jail/prison (lifetime)	503	81.3%	18.1%
Used shelter (12 months), applied for shelter (12 months), jail/prison (lifetime)	455	83.0%	20.4%
Four-item screening tool example			
Used shelter (12 months), homeless or doubled up (12 months), applied for shelter (3 months), jail/prison (lifetime)	510	83.0%	18.2%

<sup>a</sup>Six candidate predictor variables emerged as significant in  $\geq 2$  models: (1) use of a homeless drop-in center (past year); (2) a broad definition of homelessness including literal homelessness (living in a shelter or unsheltered) or living doubled up (past year); (3) location where spent the majority of past year (shelter or institution); (4) applied for shelter (past 3 months); (5) self-judged likelihood of entering a shelter; and (6) lifetime jail/prison stay. Given concern that patients may not accurately distinguish “drop-in center” versus “shelter,” and prior research showing that past shelter use is the strongest predictor of future shelter use, we added a combined variable for past 12 months shelter/drop-in center use and a variable for past 12 months shelter use, to produce a total of eight candidate predictors. Based on a priori stakeholder-defined desired screening tool characteristics, we focused on tools of  $\leq 3$  questions that would not require complicated scoring.

<sup>b</sup>Number from sample who would have screened “positive” (N), sensitivity, and positive predictive value (PPV) for candidate screening tools. A “yes” to any item is considered a positive screen. We chose to examine PPV as a more intuitive measure of specificity given the relatively low prevalence of future homelessness. In total, performance characteristics were examined for 163 potential screening tools consisting of all possible combinations of 1–4 candidate predictor variables. For illustration purposes, we show several potential screening tools for the one, two, and three question options and one potential screening tool for a four question option. The tools shown are not necessarily those with the best performance but rather were selected to show an illustrative range of tools (a fuller list of potential screening tools was presented during stakeholder discussions). All variables are self-reported based on past experience in the time frames listed in parentheses. In this table “used shelter” includes affirmative response to either sleeping in a shelter or at a drop-in center in the past 12 months.



Next, we examined candidate screening tools containing all possible combinations of candidate predictor variables. Based on a priori stakeholder-defined desired screening tool characteristics, we focused on tools of  $\leq 3$  questions that would not require complicated scoring. Table 3 shows performance of selected illustrative candidate screening tools considered in stakeholder discussions. A three-item tool (use of a shelter or drop-in center in the past 12 months, application for shelter in the past 3 months, and/or lifetime history of incarceration or jail stay, with any “yes” representing a “positive” screen) had 83.0% sensitivity and 20.4% positive predictive value for identifying shelter entry within 6 months of the ED visit. Sensitivity analyses are shown in Appendix S1.

## 4 | DISCUSSION

Using a combined empiric and stakeholder feedback process, we developed a homelessness risk screening tool for ED patients using linked patient questionnaire and administrative homeless shelter data. EDs are uniquely accessible and serve a population that has high levels of health-related social needs.<sup>8</sup> Past research has found that patients generally believe social needs screening in EDs is appropriate.<sup>15,16</sup> More than one-third of New England EDs screen for at least one health-related social need,<sup>17</sup> but knowledge about the most effective ED-based screening and intervention programs is still in its infancy. No prior research has considered homelessness prevention in ED settings despite EDs serving large numbers of patients who may be at risk for future homelessness.<sup>8</sup> We previously found spikes in ED visits in the days and weeks immediately preceding shelter entry,<sup>18</sup> suggesting the importance of future efforts to screen for homelessness risk and refer to prevention services.<sup>19,20</sup> Notably, 13.7% of individuals in our sample were homeless at baseline, and many patients identified as future shelter entrants had past shelter stays. This finding highlights the marginalized population served by EDs and the often-episodic nature of homelessness and suggests an additional need for connecting patients with rapid rehousing and other resources.

The Veterans Health Administration offers the best example of routine screening for homelessness risk in health care settings. Its two-item screener for current homelessness and concern for future homelessness is administered routinely in outpatient clinic settings.<sup>7</sup> Positive screens trigger referrals to services to address and prevent homelessness. Qualitative interviews revealed that Veterans Health Administration health care providers thought the screener was helpful but felt burdened by competing demands and mixed on whose role it should be to administer.<sup>21</sup> These concerns, among others, are likely also applicable to ED settings<sup>22</sup> and should be considered in future research.

Predicting risk for future homelessness is challenging, even for experienced case workers.<sup>12</sup> Our research builds upon prior work by Shinn and colleagues that examined predictors of future homelessness among people seeking homelessness prevention services in New York City.<sup>11,12</sup> Similar to our findings, these and other studies have found the strongest risk factor for future shelter entry was past shelter

use.<sup>11,12,23</sup> More recently, Byrne and colleagues found that models using administrative data—including medical record and homeless services data—from 5.8 million veterans had good sensitivity (72.6%–78.6%) yet poor positive predictive value (4.2%–4.3%) for self-reported housing instability.<sup>24</sup> It might seem surprising that factors such as mental health and substance use did not emerge as stronger predictors of future shelter use in our ED patient sample. We found significant associations between such factors and future shelter use in bivariate analyses, but our modeling results suggest that their relative contribution was dwarfed by measures of past homelessness. Notably, our findings suggest that homelessness risk screening tools developed for other populations might be applicable to ED patients and that relatively simple screening for past homeless services use might go a long way toward identifying patients in need of homelessness prevention interventions.

We do not suggest one “right” screener for all settings, but rather illustrate methods that could be replicated by others. In addition to past shelter use, we found that history of being in jail or prison was a strong predictor of shelter entry among an ED patient population largely comprised of single adults, a finding consistent with prior research.<sup>25</sup> Notably, structural racism and resulting downstream inequities underlie large observed racial disparities in both homelessness and incarceration.<sup>26</sup> We chose to include the question about jail/prison history in the screening tool used for a local pilot study, which was conducted by trained research staff, to broaden the net of patients identified as at risk for future homelessness. On the other hand, we would not suggest that potentially stigmatizing questions be incorporated routinely into ED triage screening without community input and clear evidence of benefits outweighing risks.<sup>27</sup> More generally, our screening tool was developed in the context of a research study that had specific exclusion criteria; we cannot predict how such a tool would perform among all-comers to an ED, administered by ED staff outside the context of research. Future implementation evaluation should examine real-world functionality of ED-based social needs screening. In addition, when deciding on any screening tool, consideration of local settings, needs, and goals is critical. Further, given demonstration of racial bias in health care predictive algorithms,<sup>28</sup> we recommend screening tools be examined carefully for evidence of bias before widespread implementation.

Our study was limited to a single ED. While the risk factors identified are consistent with research conducted across the country, others should not adopt any specific screening tool without future development and validation efforts. Results may be different for pediatric EDs or other settings, highlighting the importance of considering context when developing screening tools. Approximately half of ED patients approached for study participation were excluded due to ineligibility, which may have affected precision of the analyses. Though we excluded patients who were medically unstable, past research has shown that homeless and nonhomeless patients have similar ED triage acuties.<sup>29</sup> Also, while the City database captures 90% of shelter use in New York City, a small number of shelters are not included. Another limitation is that we did not include unsheltered homelessness, for which accurate date of onset is challenging to capture with

administrative data. Because New York City has a right to shelter, the large majority of people experiencing homelessness in the City are sheltered.<sup>30</sup> Finally, while our study focuses on individual-level risk factors, homelessness is strongly driven by policy-level factors such as availability of affordable housing.

## 5 | CONCLUSION

There has been a groundswell of interest in housing within the health care sector<sup>5</sup> but little past research to guide related efforts. To our knowledge, ours is the first empirically based screening tool to predict risk of homelessness in a health care setting. While more research is needed before implementation, deploying such tools to screen and refer patients to services could reach people at risk for future homelessness who might not access traditional social services. More generally, this research demonstrates the benefit of cross-sector collaborations including use of linked data.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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