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Original Contribution

The Role of Charity Care and Primary Care Physician Assignment on ED Use in Homeless Patients[☆]



Hao Wang, MD, PhD^{a,*}, Vicki A. Nejtck, PhD^b, Dawn Zieger^a, Richard D. Robinson, MD^a, Chet D. Schrader, MD^a, Chase Phariss, DO^a, Jocelyn Ku, DO^a, Nestor R. Zenarosa, MD^a

^a Department of Emergency Medicine, Integrative Emergency Services, John Peter Smith Health Network, Fort Worth, TX 76104

^b Department of Family Medicine, University of North Texas Health Science Center, Fort Worth, TX 76107

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ABSTRACT

Objective: Homeless patients are a vulnerable population with a higher incidence of using the emergency department (ED) for noncrisis care. Multiple charity programs target their outreach toward improving the health of homeless patients, but few data are available on the effectiveness of reducing ED recidivism. The aim of this study is to determine whether inappropriate ED use for nonemergency care may be reduced by providing charity insurance and assigning homeless patients to a primary care physician (PCP) in an outpatient clinic setting.

Methods: A retrospective medical records review of homeless patients presenting to the ED and receiving treatment between July 2013 and June 2014 was completed. Appropriate vs inappropriate use of the ED was determined using the New York University ED Algorithm. The association between patients with charity care coverage, PCP assignment status, and appropriate vs inappropriate ED use was analyzed and compared.

Results: Following New York University ED Algorithm standards, 76% of all ED visits were deemed inappropriate with approximately 77% of homeless patients receiving charity care and 74% of patients with no insurance seeking noncrisis health care in the ED ($P = .112$). About 50% of inappropriate ED visits and 43.84% of appropriate ED visits occurred in patients with a PCP assignment ($P = .019$).

Conclusions: Both charity care homeless patients and those without insurance coverage tend to use the ED for noncrisis care resulting in high rates of inappropriate ED use. Simply providing charity care and/or PCP assignment does not seem to sufficiently reduce inappropriate ED use in homeless patients.

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1. Introduction

Compared with nonhomeless patients, homeless patients are a special population with more barriers to appropriate access to preventive health care services such as personal, bureaucratic, programmatic, and financial factors [1,2]. As such, these patients tend to inappropriately use the emergency department (ED) more often than the general population [3–5]. Inappropriate ED use is operationally defined as those patients who present with clinical signs and symptoms that are categorized as nonurgent and could be handled in a nonemergent manner such as in a primary care physician (PCP) clinic. Anecdotal evidence in our ED in Texas and the empirical evidence from other studies show that homeless patients tend to be high ED users [3,4,6]. They are older, more often male, and their visits tend to result in a higher rate of hospitalization [6]. A tendency toward inappropriate ED use by homeless patients is documented in the literature in association with ED overcrowding resulting in negative prognostic outcomes [7,8].

The New York University ED Algorithm (NYUA) has been commonly used to identify an appropriate level of ED use with consistently high accuracy as reported by previous studies [9,10]. It classifies ED visits into different categories based on patients' ages, chief complaints, and their vital signs. Appropriate ED use is defined as a visit that is within an emergent nonavoidable category, whereas inappropriate ED use refers to an ED visit that is emergent yet avoidable. By definition, inappropriate ED use includes illnesses or injuries that are primary care treatable, ED preventable/avoidable, or nonemergent categories. However, until now, the application of the NYUA to determine appropriateness of ED use among homeless patients has rarely been reported and thus requires further investigation [11].

Meanwhile, multiple charity programs providing PCP clinic access and charity insurance coverage to homeless patients have been examined as mediating factors in minimizing inappropriate ED use [12–17]. Providing charity insurance coverage to the homeless is one supporting program that simply furnishes health care insurance coverage to this population with very low or no cost paid by the patients. In addition, their monthly insurance premiums usually are waived as well. Considering the potential risk of homeless patients unable to access PCP clinics without copay resources or insurance coverage, providing charity insurance theoretically minimizes inappropriate ED use among these patients.

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* Corresponding author. Department of Emergency Medicine, John Peter Smith Health Network, 1500 S. Main St., Fort Worth, TX 76104.

E-mail address: hwang01@jpshealth.org (H. Wang).

Some studies reported that providing charity insurance can decrease inappropriate ED use. Lack of health insurance that usually refers to self-paid homeless patients was strongly associated with inappropriate ED use in several studies, whereas other studies showed little or no association [3,12–14]. Similarly, providing PCP clinics to homeless patients has also been studied. However, these trials were more focused on providing mental health care and prescription medication services. The benefits of providing medical clinic care as an intervention to homeless patients is still questionable [15–17]. Taken together, it is still controversial as to whether providing charity insurance or PCP clinic access results in fewer inappropriate ED visits.

Therefore, the aim of this study was to (1) investigate how often an inappropriate ED use occurs among homeless patients, (2) determine whether the inappropriate ED use was reduced when providing homeless patients with charity care insurance in comparison with patients with “no insurance,” and (3) examine whether patients assigned to a PCP clinic would continue inappropriate ED use.

2. Methods

2.1. Study population

Homeless patients seeking ED care at our local publicly funded county hospital network were identified in our electronic health records (EHR) by using the keywords “homeless status” and pairing those positive queries with the Tarrant County Homeless Management Information System (HMIS) database archived in Fort Worth, TX, United States. The HMIS system contains personal information of individuals meeting the US Department of Housing and Urban Development definition of homelessness at the time of entry into the system. Each person entered into the HMIS is issued a card that entitles them access to homeless shelters and social services for a 12-month period. Individual HMIS information was matched with “homeless status” located in the EHR and verified using personal health information. When the data between the 2 data sets aligned, a flag was created and used to identify ED use. In addition to systematically flagging patients, the Care Connection for the Homeless team (CCHT) at the hospital had the ability to identify and flag patients who may have been missed because of data-matching issues or did not exist in the HMIS system. For situations where data were not matched between systems but homeless status was verified by CCHT, patients were flagged manually. There were also situations where patients may not have been in the HMIS system. This typically occurred when patients were homeless and unsheltered or not using those services requiring an HMIS card. These patients were also flagged manually by the CCHT if sufficient evidence of homeless status existed such as a certification letter from an outreach organization serving the homeless who validated their living situation.

2.2. Study design

After institutional review board approval was obtained, a retrospective chart review was conducted from July 1, 2013, through June 30, 2014, using the EHR of homeless patients who presented at the ED in our publicly funded, level I trauma center and teaching county hospital. The NYUA was used to objectively determine appropriate vs inappropriate ED use. Based on NYUA, 4 major categories were generated: (1) emergent not avoidable considered as ED appropriate visits, (2) primary care treatable defined as care that can be safely provided in a primary care setting without the need for emergent treatment, (3) emergent care needed but preventable/avoidable defined as patients whose disease conditions can be prevented/avoided if preventive care is received in a timely fashion, and (4) nonemergent. Appropriate ED use was considered if patients met the emergent not avoidable category criteria, and inappropriate use was determined if patients were classified within the other 3 categories. Accordingly, the records of homeless patients who were admitted to the hospital from the ED were considered as having

used the ED appropriately per NYUA because of need for continued observation, evaluation, and treatment beyond that which is reasonably delivered in the ED. Therefore, these patients were excluded from this study. The records of homeless patients who were initially seen and then discharged from the ED were considered as potential inappropriate ED users and were eligible for review. We excluded ED visits that were unclassified or excluded by NYUA as well as those with a 50% risk of inappropriate ED use because of uncertainties and variations.

Basic patient characteristics documented in this review included age, sex, race/ethnicity, ED diagnosis (*International Classification of Diseases, Ninth Revision*, codes), mode of arrival, status of PCP assignment, weekend vs weekday ED visits, total number of ED visits within the data collection period, and insurance type. Most patients whose charts were reviewed either had charity care or had no insurance coverage. Therefore, patients were divided into 2 groups based on their insurance status. In this study, homeless patients may qualify for different charity care insurance programs including Medicaid, local taxpayer sponsored, Amerigroup, Healthspring, and Wellcare programs. These patients were placed into the same group as those receiving charity care. Patients with self-pay status were considered under the no insurance coverage category. Patients who received Medicare, Veterans insurance, any commercial insurance, or were incarcerated wards of the city, county, or state were considered as receiving noncharity care insurance. Data analysis was focused on the comparisons among homeless patients with charity care insurance vs patients with no insurance coverage; thus, patients with noncharity care insurance were excluded from the final analysis. The basic demographics of homeless patients included in this study vs those excluded were also compared to determine whether population selection bias existed. The association between patients with charity care coverage, their PCP assignment, and their association with frequency of inappropriate use of the ED were also analyzed and compared. Frequency of ED use was further divided into 3 groups based upon the preliminary data analysis of homeless patients, expert opinion, and results from other studies [18,19]. Low ED use was defined as no more than 2 annual ED visits, moderate was defined as between 3 and 10 annual ED visits, and patients with more than 10 annual ED visits were considered to be the high ED users.

2.3. Statistics

Categorical data in comparison of groups were analyzed by using the Pearson χ^2 test. Continuous data between 2 groups were analyzed using Student *t* test. Analysis of variance with Bonferroni correction was used to analyze differences between several groups. Kendall τ -b correlation coefficient ($\tau\beta$), which is reported better to determine the strength of relationships, was used to analyze the association among variables [20]. Strength of relationships was determined as follows: (1) strong correlations were $\tau\beta > 0.5$, (2) moderate correlations had values between 0.2 and 0.5, and (3) values less than 0.2 signified a weak relationship. All statistical analyses were performed using a 95% confidence interval with STATA 12.0 (College Station, TX) and a $P < .05$ was considered statistically significant.

3. Results

New York University ED Algorithm was deemed applicable to 54% (2886/5336) of all ED visits involving the study population. Appropriate vs inappropriate ED use was then determined among that group. Seventy-six percent (2188/2886) of these visits were considered inappropriate based on NYUA. Furthermore, patients with noncharity care insurance were excluded from this study yielding a total of 2396 ED visits by 867 homeless patients in the final analysis. Results showed that 76% (1828/2396) of ED visits were deemed to be inappropriate. No difference was found when compared with the group mentioned above (Fig. 1). In addition, the basic demographics between homeless ED visits included in this study vs those excluded were compared, and

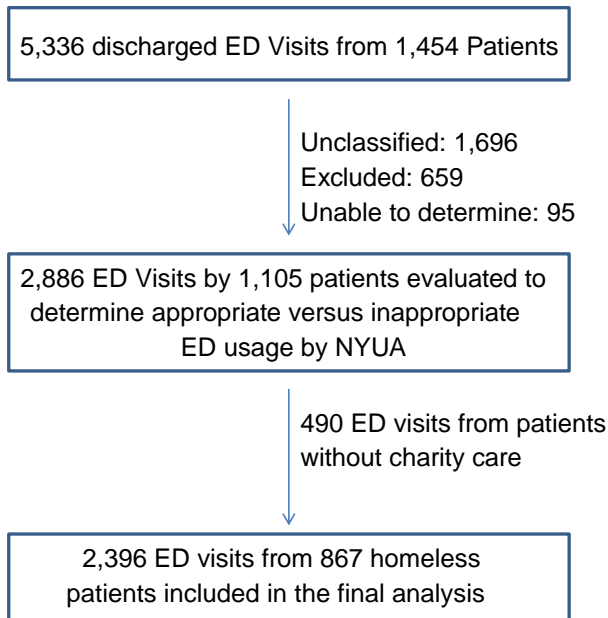


Fig. 1. Flow diagram of patients placed in final analysis.

our results indicate that no significant population selection bias occurred between these 2 groups (see Appendix Tables 1 and 2)

When further segregating homeless patients into 2 different groups based on insurance coverages, 77.14% of ED visits were considered inappropriate among patients with charity care coverage. There was no statistically significant difference when comparing charity care coverage patients with patients having no insurance coverage (74.05% inappropriate ED visits, $P = .112$, Table 1). More than 50% of ED arrivals via private vehicles in homeless patients were deemed to be associated with inappropriate use and more than 50% of ED arrivals via ambulance were deemed appropriate ED use. Patients with PCP assignments also had more inappropriate ED use than those without (Table 1). In addition, a higher frequency of inappropriate vs appropriate ED visits occurred per homeless patient (2.42 vs 1.90, $P = .0145$). Patients with inappropriate ED visits tended to be younger than those with

appropriate ED visits ($P < .05$). No statistically significant difference was noted when factoring race, ethnicity, or weekend ED usage as contributors (Table 1).

Analysis of the subset of homeless patients with inappropriate ED use through comparisons between those with charity care insurance and those with no insurance coverage showed that only 15.98% of the no insurance coverage group had PCP clinic assignments as compared with 61.64% of those with charity care coverage ($P < .01$). Potential confounders such as race, ethnicity, or weekend ED usage were explored in group comparisons. However, only age was found to be an independent risk factor in both the univariate and multivariate regression analyses (Table 2 and Appendix Table 3). To determine the relationship between PCP assignment and patient insurance status, a Kendall τ_B correlation coefficient test was performed. These results showed that PCP assignment was moderately associated with patients receiving insurance coverage ($\tau_B = 0.2898$) indicating PCP assignment is another factor determining whether charity insurance could affect inappropriate ED use. Overall, the average number of inappropriate ED visits in patients with charity care coverage was greater than those without (2.73 vs 1.80, $P < .01$, Table 2).

Further analysis focused on inappropriate ED use comparisons of homeless patients with different health care coverages, PCP assignments, and frequency of ED use. Frequency of ED use was divided into 3 groups (low, no more than 2 ED visits per year; moderate, between 3 and 10 ED visits per year; and high, more than 10 ED visits per year). When analyzing only homeless patients with inappropriate ED use, fewer high ED users were found among both the charity care and no insurance coverage groups ($P < .001$, Fig. 2). In addition, among more frequent ED users, homeless patients tended to have decreased numbers of inappropriate ED visits regardless of their PCP assignment status ($P > .05$, Fig. 3).

4. Discussion

The goal of this study was to pool all special charity insurance programs together including Medicaid and other national and regional charity care programs and compare that group with patients with no insurance coverage. Our results indicate that ED use patterns in these patients are not impacted whether a charity care program is provided regardless of the specific type of charity care program in place. In line with the available data [21–24], we found that homeless patients use

Table 1
Comparisons of the appropriateness of ED use in homeless patients

ED visits (total 2396 ED visits in 867 homeless patients)	Inappropriate ED visits (n = 1828) (total 755 patients)	Appropriate ED visits (n = 568) (total 298 patients)	P
Age (mean \pm SD, 95% CI)	44.54 \pm 11.23	46.02 \pm 10.34	.049
Sex (male, %)	431 (57.09%)	191 (64.09%)	.037
Race (%)			.412
White or Caucasian	318 (47.42%)	143 (47.99%)	
Black or African American	347 (45.96%)	128 (42.95%)	
American Indian or Alaska Native	3 (0.40%)	1 (0.34%)	
Asian	1 (0.13%)	0 (0)	
Other	43 (5.70%)	26 (8.72%)	
Unknown	3 (0.40%)	0 (0)	
Ethnicity (%)			.289
Hispanic or Latino	43 (5.70%)	24 (8.05%)	
Not Hispanic or Latino	711 (94.17%)	273 (91.61%)	
Unknown	1 (0.13%)	1 (0.34%)	
Mode of arrival (%)			<.0001
Ambulance	584 (31.95%)	292 (51.41%)	
Private car	1,005 (54.98%)	214 (37.68%)	
Public transportation	147 (8.04%)	27 (4.75%)	
Insurance type (%)			.112
Charity care coverage	1340 (77.14%)	397 (22.86%)	
No insurance coverage	488 (74.05%)	171 (25.95%)	
Primary care physician (yes, %)	904 (49.45%)	249 (43.84%)	.019
ED visits during the weekend (yes, %)	447 (24.45%)	156 (27.46%)	.149
Average ED visits (mean \pm SD, 95% CI)	2.42 \pm 3.10 (2.19–2.64)	1.90 \pm 3.00 (1.56–2.24)	.0145

Table 2
Comparison of inappropriate ED use in homeless patients with different insurance status

Inappropriate ED visits in homeless patients (total ED visits = 1828)			
	ED visits in patients with charity care (n = 1340) (498 patients)	ED visits in patients with self pay (n = 488) (257 patients)	P
Age (y, mean ± SD)	45.35 ± 11.20	43.03 ± 11.16	.007
Sex (male, %, n)	275 (55.22%)	156 (60.70%)	.149
Race (% , n)			
African American	253 (50.80%)	94 (36.58%)	.004
Caucasian	219 (43.98%)	139 (54.09%)	
Ethnicity (% , n)			
Hispanic	24 (4.82%)	19 (7.39%)	.274
Not Hispanic	473 (94.98%)	238 (92.61%)	
Mode of arrival (%)			
Ambulance (yes)	433 (32.31%)	151 (30.94%)	.578
PCP (yes, %)	826 (61.64%)	78 (15.98%)	<.001
ED visits during the weekend (yes, %)	332 (24.78%)	115 (23.57%)	.594
Average ED visits (mean ± SD)	2.73 ± 3.53	1.80 ± 1.87	.0001

the ED inappropriately 76% of the time. These results suggest that providing charity care and assigning PCP clinics as 2 independent interventions do not prevent homeless patients from using the ED inappropriately. However, fewer inappropriate ED visits occur in patients with higher frequency ED use regardless of PCP assignment.

Although use of the NYUA to determine appropriateness of ED use is well validated [21,25], it has been rarely applied to homeless patients who are a special needs population with higher rates of coexisting disorders, chronic physical disease, and mental illness. Our data suggest that it is a valuable tool in determining appropriate vs inappropriate ED use among homeless patients and aligns with the existing data in the literature. We found a higher frequency of inappropriate ED use by homeless men and a high ambulance transportation rate with frequent inappropriate ED visits among charity care–insured patients [6,26].

In contrast to studies that only focus on Medicaid patients in relation to ED use [15,27–29], the patient population served in our level I trauma hospital allowed us to investigate ED overuse as a function of the different kinds of charity care available to homeless patients. Tsai et al [29] found that most homeless patients are not enrolled in the Medicaid program and are therefore either left uninsured or become a tax burden of the state, county, or city to compensate for hospital costs. This finding aligns with our results and indicates the importance of investigating homeless patients with different types of charity care coverage [29].

The challenges of favorably impacting homeless patients and their inappropriate use of ED resources are multifactorial. One of the potential barriers may be personal finances thereby virtually eliminating individual ability to appropriately access the health care system and leaving the ED as the only option [30]. Some studies suggest that providing charity health insurance and assigning these patients to PCPs offer a potential solution thereby minimizing inappropriate ED use [13,31]. However, our study showed that simply assigning homeless patients to PCP clinics did not prevent them from using the ED inappropriately (Fig. 3). Similar results have been reported in previous studies as well [32,33]. Based on our

experiences with this patient population, these results may be caused by a lack of hospital staff reinforcement, irregular and/or sporadic patient communication, and inappropriate referrals to the ED by emergency shelter case managers and executive directors who interpret all illnesses as a need to call “911.” Moreover, homeless persons who are only slightly ill may find more comfort in an ED waiting room than in a line waiting for a shelter bed. In these examples, proactive education across all community outreach organizations and hospital staff may be highly effective in reducing ED use. Taken together, simply providing PCP assignment does not seem to be effective if not combined with other supportive interventions such as housing and case management access [34–36].

Another possible intervention to minimize inappropriate ED use is to recognize the visitation patterns in these patients. Some studies showed the more ED visits per patient, the more inappropriate use by a given patient [23,37]. Our study showed a different pattern with fewer inappropriate ED visits among higher frequency ED users (Fig. 2). This is in part because of early recognition of high users by case managers in this hospital. Once identified, these patients are enrolled in the community or emergency medicine service outreach program, which seems to help minimize inappropriate ED visits. Although text messaging and proactive case management designed to remind patients of clinical outpatient appointments may significantly increase overall clinic visits in some patient populations [38,39], it is still uncertain whether increased clinic visit frequency will decrease inappropriate ED use in the homeless. Whether increasing outpatient services will mitigate inappropriate ED use is unclear. Therefore, future multisite studies examining the efficacy of combined interventions designed to minimize inappropriate ED use in homeless patients are needed.

5. Conclusions

Overall, our study showed frequent inappropriate ED visits among homeless patients. Simply providing charity care and PCP assignments

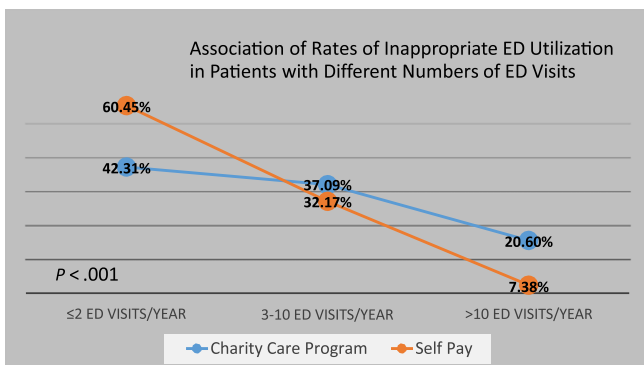


Fig. 2. Association of inappropriate ED use in homeless patients with different numbers of ED visits.

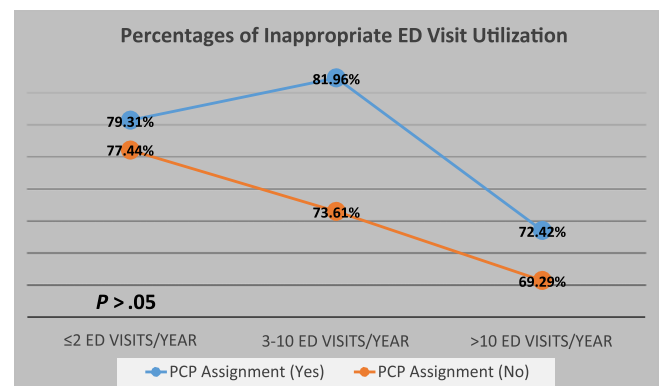


Fig. 3. Percentages of the inappropriate ED use with PCP assignments.

is insufficient to significantly redirect this cohort of patients to access the health care system in a more cost-effective manner. Recognizing ED visit patterns and committing to alternative resources and interventions should be considered as viable means to minimize inappropriate ED use among the homeless population.

5.1. Limitation

This was a retrospective study using homeless patient data from a single urban publicly funded hospital. The retrospective methodology limits its applicability including potential bias regarding the accuracy of information, potential selection bias because of 1 institutional database, lack of follow-up data, and missing data for analysis. With respect to the homeless population, patients were determined to have met criteria associated with a status of homeless at the time they registered at the ED. We are not able to determine the total length of homeless status of an individual patient. We are also unable to determine the association between the length of individual homeless status and associated ED use patterns. Using NYUA to determine ED use patterns might not be accurate based on a given selected population. Determination of ED use patterns is sophisticated, and none of the tools currently in use are considered reliable. This study also did not analyze the accuracy of combining NYUA with individual patient acuity levels to determine relative appropriateness of ED use among homeless patients. Furthermore, in this study, patients with uncertain use patterns (such as unclassified, split, or excluded by NYUA) were not included for data analysis. This may potentially result in bias because of incomplete patient population selection. The study hospital also has an emergency psychiatric unit that may further diverge the study population. Therefore, when analyzing and interpreting ED use, one must consider the potential impact of different patient populations and ED settings on study outcomes.

Competing Interests: N/A

Author contributions: H.W., V.A.N., and R.D.R. conceived the study and developed the design in consultation with all of the authors. D.Z., C.S., C.P., and J.K. assembled the data set and collected the data. H.W., V.A.N., R.D.R., and N.R.Z. conducted the statistical analyses and drafted the article, and all authors read and approved the final article. H.W. takes responsibility for the article as a whole.

Appendix A

Appendix Table 1

Comparisons of the ED use in homeless patients included in this study vs those excluded

ED visits (total 5336 ED visits in 1454 homeless patients)	ED visits included (n = 2886)	ED visits excluded (n = 2450)	P
Age (mean ± SD, 95% CI)	46.06 ± 11.12	45.09 ± 11.19	.0016
Sex (male, %)	1746 (60.50%)	1525 (62.24%)	.192
Race (%)			.001
White or caucasian	1314 (45.53%)	1256 (51.27%)	
Black or African American	1389 (48.13%)	1053 (42.98%)	
American Indian or Alaska Native	13 (0.45%)	10 (0.41%)	
Asian	1 (0.03%)	4 (0.16%)	
Other	165 (5.72%)	125 (5.10%)	
Unknown	4 (0.14%)	2 (0.08%)	
Ethnicity (%)			.696
Hispanic or Latino	158 (5.47%)	132 (5.39%)	
Not Hispanic or Latino	2725 (94.42%)	2317 (94.57%)	
Unknown	3 (0.10%)	1 (0.04%)	
Mode of arrival (%)			.048
Ambulance	1079 (37.39%)	868 (35.43%)	
Private car	1411 (48.89%)	1136 (46.37%)	
Public transportation	222 (7.69%)	228 (9.31%)	
Insurance type (%)			.078
Charity care coverage	1737 (60.19%)	1463 (59.71%)	
No insurance coverage	659 (22.83%)	613 (25.02%)	
Primary care physician (yes, %)	1314 (45.53%)	1041 (42.49%)	.026
ED visits during the weekend (yes, %)	721 (24.98%)	655 (26.73%)	.145

Appendix Table 2

Adjusted odds ratios of variables to affect the patient population selection in this study

Variables	Adjusted odds ratio	95% confidence interval	P
Age	1.00	1.00-1.01	.006
African American	1.00	0.79-1.26	.996
White or Caucasian	0.80	0.63-1.01	.070
Primary care physician assignment	1.07	0.96-1.20	.186

Appendix Table 3

Adjusted odds ratios of variables to affect the inappropriate ED use between homeless patients with charity vs no insurance coverages

Variables	Adjusted odds ratio	95% confidence interval	P
Age	0.97	0.96-0.98	<.001
African American	0.83	0.45-1.52	.553
White or Caucasian	1.05	0.57-1.94	.856
Primary care physician assignment	3.22	2.51-4.14	<.001

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