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Characteristics of emergency department visits by older versus younger homeless adults in the United States

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Abstract

Objectives—Homeless adults age 50 and older experience premature onset of chronic illnesses and geriatric conditions, and use the emergency department (ED) at high rates. Although the proportion of the homeless population age 50 and older is increasing, little is known about ED use among older homeless adults.

Methods—To identify characteristics of ED visits among older compared to younger homeless adults, we analyzed data from the National Hospital Ambulatory Medical Care Survey for 2005-2009, a nationally representative survey of visits to hospitals and EDs. We used sampling weights, strata, and clustering variables to obtain nationally representative estimates.

Results—Homeless adults age 50 and older had 200,999 ED visits each year, accounting for 36% of visits by homeless patients. While demographic characteristics of ED visits (sex, race/ethnicity and geographic distribution) were similar in older compared to younger homeless adults, clinical and health services characteristics differed. Compared to their younger counterparts, older homeless adults had fewer discharge diagnoses related to psychiatric conditions (10% vs 20%, p=.002) and drug abuse (7% vs 15%, p=.003), but more diagnoses related to alcohol abuse (31% vs 23%, p=.03). Older homeless adults were also more likely to arrive by ambulance (48% vs 36%, p=.02) and to be admitted to the hospital (20% vs 11%, p=.003).

Conclusions—Older homeless adults have unique patterns of ED care compared to younger homeless adults. Health care systems need to account for these differences in use of the ED in order to meet the needs of the aging homeless population.

The average age of the US homeless population is increasing. Whereas 11% of the homeless population was aged 50 years or older in 1990, this percentage had increased to 32% by 2003[1] and has continued to rise since then.[2] The median age of single homeless adults has increased from 37 years in 1990[1] to between 49 and 50 years today.[2,3] This trend is thought to be due to aging of individuals born in the second half of the “baby boom” generation (1954-1965), who have a higher risk of homelessness compared to other age cohorts.[3] Most homeless adults age 50 and older are between 50 and 64 years old, with adults age 65 and older making up less than 5% of the total homeless population.[1,3]

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All authors designed the study, interpreted the analyses, and revised the manuscript. R.T. Brown analyzed the data and drafted the manuscript.

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In the general population, adults age 50-64 are considered middle-aged and have lower rates of chronic conditions than elderly adults age 65 and older.[4,5] However, homeless adults age 50 and older have rates of chronic illnesses and geriatric conditions similar to or higher than housed adults 15-20 years older, including conditions often thought to be limited to the elderly, such as falls and memory loss.[6,7] Because middle-aged homeless adults face the same geriatric problems as elderly housed adults, experts consider them to be elderly at age 50, despite their relatively younger age.[6,8] Similar patterns of premature aging have been found in other vulnerable populations, including prisoners[9] and patients with developmental disabilities.[10]

Despite the growth of the older homeless population, relatively little is known about use of health services among older homeless adults. Homeless health services and research have focused on problems that are common among younger homeless adults, including infectious disease,[11] substance use,[12] and mental illness.[13] The few studies focused on older homeless adults found that they have unique medical problems compared to younger homeless adults, including higher rates of chronic illnesses[6,14] and geriatric syndromes,[6] and lower rates of substance use.[15] New frameworks for providing care to the vulnerable and growing older population are needed, but cannot be developed until more is known about their use of health services.

Homeless adults age 50 and older use the ED frequently, and at rates nearly four times those of the general population.[16-18] Knowledge about ED care received by older homeless adults may allow researchers and clinicians to design interventions to reduce use of the ED and improve ED care for this vulnerable older population. Therefore, the goal of this study was to identify demographic, clinical, and health services characteristics of ED visits in older versus younger homeless adults, using a nationally representative survey of US ED visits.

METHODS

Study Design

We analyzed data from the ED component of the National Hospital Ambulatory Medical Care Survey (NHAMCS). This nationally representative sample of visits to US EDs was designed by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. NHAMCS employs a four-stage probability sample, and includes EDs based in non-institutional general short-stay hospitals and excludes EDs in Federal, military, or Veterans Administration Hospitals. Data are collected by hospital staff trained by US Census field representatives. Staff collect data from a systematic random sample of patient visits during a randomly-assigned 4-week time period. To make the results of the survey nationally representative, each patient visit is weighted based on survey sampling probabilities. Details of the survey methodology are available from the National Center for Health Statistics.[19]

Study Sample: Homeless Adults

The study sample included all ED visits by homeless patients age 18 and older in the 2005-2009 NHAMCS survey years. Homelessness was defined using the NHAMCS patient residence variable. In 2005, NHAMCS added a residence category for “homeless” in addition to “private residence,” “nursing home,” “other institution,” and “other residence.” ED staff recorded the residence as “homeless” if “the patient has no home (e.g., lives on the street) or patient’s current place of residence is a homeless shelter.”[20] The sensitivity and specificity of the NHAMCS residence variable for detecting homelessness have not been described. However, other studies that used similar residence variables to identify homelessness validated reported homelessness by performing chart reviews and matching

residential addresses to local homeless shelters.[21,22] Though these studies did not report sensitivity and specificity, chart reviews confirmed homelessness in patients reported as such, yet matching addresses to shelters identified additional homeless persons not captured by the residence variable. These findings suggest that residence variables may have high specificity but lower sensitivity for identifying homelessness.

Measures: Visit Characteristics

We analyzed the following characteristics of ED visits among older compared to younger homeless adults: demographic characteristics, clinical characteristics, and health services. Demographic characteristics included sex, race/ethnicity, ED region, and insurance status. Race/ethnicity was entered by ED staff according to their hospital's usual practice, or based on the medical record or the staff member's knowledge of the patient. Insurance status was collapsed to the following categories: no insurance (self-pay or no charge), Medicaid, Medicare (including patients with both Medicaid and Medicare), and other insurance (private, workers' compensation, or other).

Clinical characteristics included triage level, services and medications received in the ED, presenting complaint, and discharge diagnosis. Triage level was recorded on a five-level scale, and collapsed to three levels for analysis: low (nonurgent), medium (urgent or semi-urgent) or high (immediate or emergent). ED staff recorded up to three "complaints, symptoms, or other reasons for visit" in the patients' own words. These free text complaints were abstracted and coded by NHAMCS central staff using the standardized Reason for Visit Classification for Ambulatory Care (RVC).[23] To capture all patient complaints, we used all (i.e., up to three) recorded RVC codes per patient.

To identify ED discharge diagnoses, we used codes from the International Classification of Diseases, Ninth Revision (ICD-9). ED staff recorded up to three provider diagnoses as free text, which NHAMCS coded centrally using the ICD-9. To identify diagnoses related to alcohol or drug intoxication, withdrawal, abuse, or dependence, we used ICD-9 codes 291-292,303-305, 790.3, 962, 965, 967-971, 977, 980, V11.3, and V79.1.[24] To identify psychiatric diagnoses, we used codes 290, 293-302, and 306-319. Injuries were defined as ICD-9 codes 800-959 and 990-999. NHAMCS includes an additional "injury" variable that asks ED staff to record whether the visit was related to an "injury, poisoning, or adverse effect." Because this item is not based on clinician discharge diagnosis and does not distinguish injuries from poisonings and adverse effects of treatment, we defined injuries using discharge diagnoses.

Health services included mode of arrival, length of ED visit, discharge disposition, and length of stay of hospital admissions.

Statistical analysis

To obtain nationally representative estimates, we used sampling weights, strata, and clustering variables provided by NHAMCS. Descriptive statistics were used to present characteristics of ED visits by homeless adults, dichotomized by age (18-49 years vs 50 years and older), using means and standard deviations for continuous variables and frequencies and proportions for categorical variables. All results are presented using weighted estimates. Individual results are presented as weighted percents without the corresponding unweighted *N*; unweighted summary *N*s are shown in footnotes to Table 1.

To compare characteristics of visits by older versus younger adults, we used the t-test and the Rao-Scott chi-square test, a design-adjusted version of the Pearson chi-square test. According to NCHS statistical guidelines, we considered an estimate to be reliable if it was

based on 30 or more records and had a relative standard error of 30% or less.[19] *P* values less than .05 were considered statistically significant.

Analyses were conducted using the *survey* package provided by SAS version 9.2 (SAS Institute, Cary, North Carolina).

RESULTS

From 2005 to 2009, adults in the US made 468 million ED visits (95% confidence interval (CI) 428-508 million), or an average of 94 million visits annually. Homeless adults made 0.6% (95% CI 0.5%-0.7%) of these visits, or 560,510 ED visits annually. Homeless adults age 50 and older accounted for 36% (95% CI 32%-40%) of all ED visits by homeless adults. Most visits by older homeless patients were made by adults age 50-64, who accounted for 32% (95% CI 28%-36%) of total visits by homeless persons; homeless adults age 65 and older made just 4% of visits (95% CI 2%-6%; Figure 1).

Table 1 shows characteristics of ED visits by homeless adults, dichotomized by age (18-49 years vs 50 years and older). Demographics were similar in older versus younger homeless adults, including sex, race/ethnicity and geographic distribution. Older homeless adults were more likely to have Medicare than their younger counterparts (20% vs 9%, p=.001).

Certain clinical characteristics were similar in older versus younger homeless adults, including triage level, services and medications received in the ED. However, presenting complaints and ED discharge diagnoses differed by age. Older homeless adults were less likely to present with psychiatric complaints than younger homeless adults (15% vs 23%, p=.01), but were more likely to seek care for injuries (28% vs 21%, p=.04) and cardiovascular complaints (11% vs 5%, p=.02). Other types of complaints did not differ by age.

Most discharge diagnoses were psychiatric, substance abuse-related, or injury-related, accounting for 64% of diagnoses among older homeless adults, and 70% among younger ones. Older homeless adults were less likely to have a psychiatric discharge diagnosis than their younger counterparts (10% vs 20%, p=.002), the same pattern found for psychiatric presenting complaints. Diagnoses at discharge (recorded by the treating clinician) did not always match the presenting complaint, however. Only 8% of older and 12% of younger homeless adults presented with a complaint of substance use, but 35% of adults in each age group received a clinician diagnosis of alcohol or drug use at ED discharge. Of older homeless patients presenting with a chief complaint of substance use, only 4% requested alcohol or drug detoxification, compared to 40% of younger homeless patients (p<.001). Though the overall rate of discharge diagnoses related to substance abuse did not differ by age, older homeless adults were more likely to have alcohol-related diagnoses (31% vs 23%, p=.03), and less likely to have drug-related diagnoses (7% vs 15%, p=.003). Nearly 30% of older homeless patients presented with a complaint of injury, but only 19% were diagnosed with an injury; reported and diagnosed injuries among younger homeless adults showed a similar but less pronounced discrepancy (21% vs 14%).

Use of health services differed by age. Older homeless adults arrived by ambulance more often than younger homeless adults (48% vs 36%, p=.02), despite similar triage levels. Of older homeless patients who arrived by ambulance, 13% had cardiovascular complaints, compared to 3% of younger homeless adults (p=.002). Rates of other chief complaints among homeless patients arriving by ambulance did not differ by age (data not shown). Older homeless adults were also admitted to the hospital from the ED at higher rates than younger homeless adults (20% vs 11%, p=.003). Of older homeless patient who were

admitted to the hospital, 22% had cardiovascular ED discharge diagnoses, compared to 5% of younger homeless adults (p=.01), but rates of admission for other ED discharge diagnoses did not differ by age (data not shown). Length of stay for patients with hospital admissions did not differ by age.

DISCUSSION

Using a nationally representative sample of ED visits, we found that older homeless patients accounted for more than a third of all visits by homeless adults, and that visits by older and younger homeless patients differed in several key aspects. In terms of clinical characteristics, older homeless adults were less likely than younger homeless adults to have psychiatric complaints or to receive a psychiatric discharge diagnosis. Alcohol-related diagnoses were more common among older homeless adults, while drug-related diagnoses were less common. In the category of health services, older homeless adults were more likely than their younger counterparts to arrive by ambulance and to be admitted to the hospital following a visit to the ED. These differences have important implications for service delivery.

Visits by older homeless patients accounted for more than a third of visits by homeless adults. This proportion is consistent with their reported age distribution in the underlying population. Homeless adults at least 50 years of age made up 32% of the homeless population in 2003, a percentage that has likely increased over the past 9 years.[1-3] Because the proportion of ED visits by older homeless adults reflects their proportion in the population, if the older homeless population continues to increase as predicted,[3] we will see a corresponding increase in the proportion of ED visits by older homeless adults over the coming decade.

Consistent with previous studies, homeless subjects in this study had high rates of ED discharge diagnoses related to mental illness and substance use compared to the general population.[25-27] When compared to their younger counterparts, however, older homeless adults were less likely to have psychiatric chief complaints or discharge diagnoses. Because NHAMCS only includes up to three chief complaints or discharge diagnoses, it is possible that older and younger homeless adults had equally high rates of psychiatric chief complaints and discharge diagnoses, but that these complaints and diagnoses were displaced by a higher rate of medical illnesses among older homeless adults. However, while older homeless adults did have a significantly higher rate of cardiovascular complaints than younger homeless adults, rates of neurologic, gastrointestinal and respiratory complaints did not differ by age. Moreover, the lower rate of psychiatric visits among older homeless adults is consistent with findings in housed adults. In the general population, lower rates of ED visits for psychiatric diagnoses[28] have been attributed to lower rates of mental illness among older adults[29] and to less perceived need for mental health treatment among older adults with mental illness.[30] These characteristics may also be true of homeless adults. Alternatively, older homeless adults with mental illness may be underrepresented among homeless persons visiting the ED, due to death or institutionalization. The lower rate of psychiatric visits among older homeless adults suggests that as the homeless population ages, there may be less need for ED-based psychiatric care for homeless adults.

Though older and younger homeless adults had similar rates of chief complaints related to substance use, older adults complaining of substance use were significantly less likely to request alcohol or drug detoxification. This finding supports research showing that older homeless adults are less likely than younger homeless adults to report a need for substance abuse treatment.[15] Though older homeless adults were unlikely to request detoxification, they may experience more severe effects of substance use as a consequence of aging.[31] For

this reason, it may be especially important to screen older homeless patients in the ED for substance use problems.

More than a third of discharge diagnoses for both older and younger homeless adults were related to alcohol or drug intoxication. The similar rate of substance-related diagnoses in older and younger homeless adults contrasts with the general older population, in which the number of ED visits related to substance use decreases with age.[32] Of note, the percentage of discharge diagnoses related to substance use (35% in both age groups) was much higher than the percentage of presenting complaints related to substance use (8% among older homeless adults and 12% among younger). This discrepancy likely reflects a tendency to underreport substance use.[32,33]

Though the overall rate of substance use-related discharge diagnoses did not differ by age, older homeless adults had significantly more alcohol-related and fewer drug-related diagnoses than younger homeless adults. The lower rate of drug-related diagnoses among older homeless adults is consistent with research showing that they are less likely to use illegal drugs than their younger counterparts.[6] However, while older homeless adults have been found to be less likely to drink heavily,[1,6] they actually had a higher rate of alcohol-related ED discharge diagnoses than younger homeless adults. This apparent discrepancy may reflect a tendency for older adults to experience more severe effects of alcohol intoxication,[31] leading to more ED visits and more alcohol-related discharge diagnoses.

The high proportion of ED diagnoses related to substance use in older adults underscores the potential to use existing interventions for this vulnerable older population. Like younger homeless adults, older homeless adults use the ED frequently and at rates nearly four times higher than the general population.[16-18] Clinicians, researchers, and policy makers have sought to decrease high rates of public services use among homeless adults with substance use problems.[34] Two recent trials that provided housing to homeless adults with active substance use found that use of health services and costs of health care decreased after housing was provided.[35,36] Similar programs, adapted for older homeless adults, may have the potential to decrease the number of ED visits in the growing older homeless population.

While older homeless adults were less likely to report than to be diagnosed with substance use, the opposite pattern was found for injuries. Nearly 30% of older homeless patients reported injuries, but only 19% were diagnosed with injuries. Higher reports of injuries relative to diagnoses may reflect differing perceived needs of homeless patients versus treating clinicians. For example, a patient who sustained an injury while under the influence of alcohol or drugs may consider the injury to be the reason for the visit, while the treating clinician may consider substance use to be the discharge diagnosis.

Nearly one-half of older homeless adults arrived by ambulance compared to about one-third of younger homeless adults, despite similar triage acuity. Of homeless patients who arrived by ambulance, older adults were more likely to have cardiovascular complaints than younger adults. High rates of ambulance use by homeless adults are thought to be due to physical barriers including lack of transportation.[25,37] Consistent with these findings, 90% of homeless adults transported to the ED by ambulance are transported nonurgently.[25] Higher rates of ambulance use by older versus younger homeless adults may be due both to higher rates of acute medical conditions (e.g., myocardial infarction) as well as higher rates of physical barriers, such as functional and mobility impairment.[6,7] For nonurgent ED visits, providing homeless adults with access to alternative transportation may decrease use of costly ambulance services.

While not unexpected, the finding that older homeless adults had a higher hospital admission rate following an ED visit than younger homeless adults is important given the

expected increase in the proportion of the homeless population at least 50 years old. Though the proportion of ED visits made by older homeless adults reflects their population distribution (approximately one-third), their rate of admission was nearly double that of younger homeless adults, accounting for about two-thirds of admissions among homeless persons. These data support research showing that older homeless adults had similar rates of ED use compared to younger homeless adults, but a trend towards higher rates of hospitalization.[15] Because older homeless adults who were admitted to the hospital had higher rates of cardiovascular ED discharge diagnoses than younger homeless adults, developing interventions to meet the needs of older homeless adults with cardiovascular disease has the potential to decrease use of the ED among these patients, and in turn to decrease costs related to hospital admission.

Limitations

This study has several limitations. Because NHAMCS defines homelessness as self-reported patient residence, the number of visits by homeless patients is likely underestimated. Some EDs may not systematically obtain housing status. Moreover, patients may underreport homelessness due to feelings of shame or distrust, and instead report the address of a friend or shelter. Determining the degree to which visits by homeless adults are underestimated is challenging, as few studies have examined the proportion of all ED visits made by homeless persons; those studies that have were typically based at single urban safety-net hospitals and used methods to determine patient residence similar to those used by NHAMCS. Reported proportions range from 0.4% (for an urban area with a relatively small homeless population) to 19.5% (at a safety net hospital in San Francisco).[24,38-40] While differential underreporting of homelessness by older versus younger homeless adults is possible, we are not aware of data that support this concern. Because NHAMCS samples visits rather than patients, we were unable to assess characteristics of visits made by “frequent users,” patients who use the ED multiple times per year and account for a disproportionately high number of ED visits.[41] Although veterans are overrepresented in the homeless population and especially among homeless men aged 45-54,[42] NHAMCS does not include Veterans Affairs hospitals. Therefore, the results of this study may not be generalizable to homeless veterans. Diagnosis codes may underestimate psychiatric and substance use diagnoses if clinicians do not screen for these conditions. An additional limitation is the testing of multiple visit characteristics for differences by age. Due to this multiple hypothesis testing, the results should be confirmed in other datasets. Furthermore, because of limited power due to small sample sizes for some visit characteristics, we were unable to determine if small differences between characteristics of ED visits made by older versus younger homeless adults were statistically significant. However, small differences in visit characteristics are unlikely to be important for clinical practice or health policy. Finally, small sample sizes for homeless adults age 65 and older precluded meaningful analyses for this relatively small but important population.

Conclusions

The average age of the homeless population is expected to continue to increase. This aging trend will lead to a corresponding increase in the proportion of ED visits by older homeless patients. Our study shows that older homeless adults receive different types of ED care than their younger counterparts. Given the higher use of ambulances and higher admission rate of older homeless adults, the aging of the homeless population is likely to pose an increased financial burden on health care systems. Health care systems need to account for differences in use of the ED by older homeless adults in order to meet the needs of the aging homeless population.

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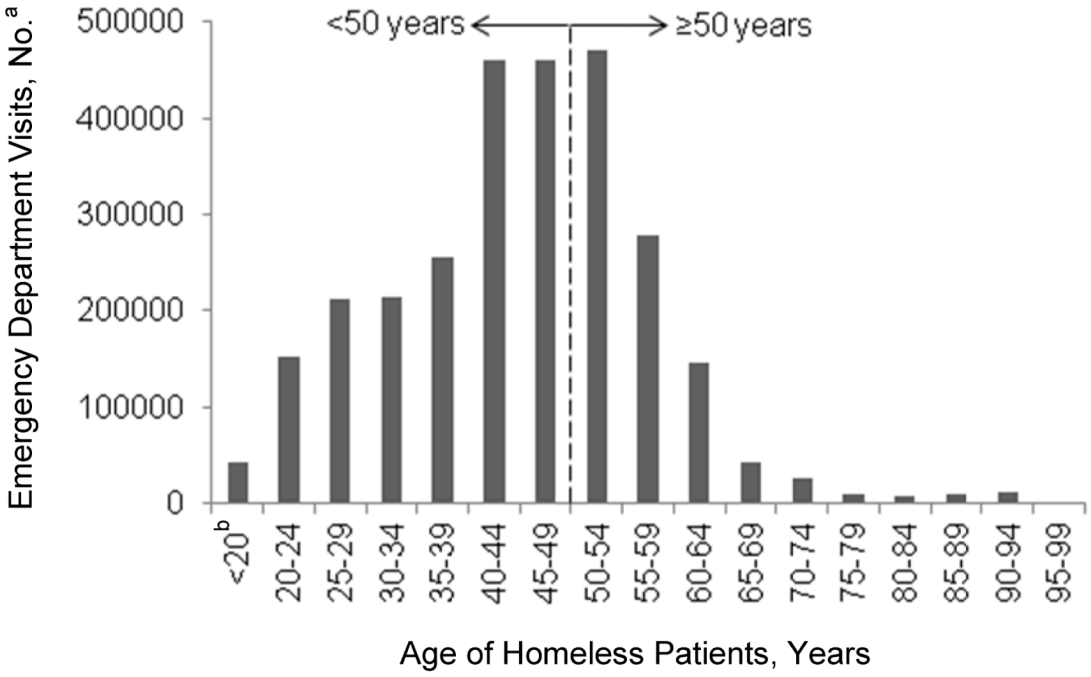

FIGURE 1. Age distribution of US emergency department visits by homeless adults, 2005-2009
[a]Number of emergency department visits includes years 2005-2009. Results weighted to generate nationally representative estimates. Total unweighted *N*=1177.
[b]<20 includes ages 18-19

TABLE 1

Characteristics of US emergency department visits by homeless adults, 20052009, by age

	Weighted ED visits, %		P Value
	Age 18-49[a]	Age 50-95[b]	
Demographic characteristics			
Male	74	80	.17
Race			.72
White	53	57	
Black	24	24	
Latino	18	15	
Other	5	4[c]	
Geography			.54
Northeast	19	17	
Midwest	13	16	
South	26	23	
West	43	45	
Insurance			.005
None	42	37	
Medicaid	25	20	
Medicare	9	20	
Other	11	12	
Clinical characteristics			
Triage level			.44
High	16	21	
Medium	59	53	
Low	9	9	
Diagnostic or screening test in ED	68	73	.59
Procedure performed in ED	39	46	.15
Medications received in ED or prescribed at discharge	65	68	.33
Presenting complaints[d]			
Psychiatric	23	15	.01
Injury	21	28	.04
Musculoskeletal	19	16	.37
Alcohol or other drug abuse	12	8[c]	.10

	Weighted ED visits, %		P Value
	Age 18-49[a]	Age 50-95[b]	
Among patients with substance abuse: request for detoxification	40	4[c]	<.001
Neurologic	10	11	.64
Gastrointestinal	11	12	.73
Respiratory	8	12	.09
Cardiovascular	5	11	.02
Discharge diagnoses[d]			
Psychiatric	20	10	.002
Injury	14	19	.16
Musculoskeletal	10	9[c]	.70
Alcohol or other drug abuse	35	35	.94
Alcohol abuse	23	31	.03
Drug abuse	15	7[c]	.003
Neurologic	5	2[c]	.08
Gastrointestinal	2[c]	2[c]	.15
Respiratory	6	4[c]	.86
Cardiovascular	4	8[c]	.02
Health services characteristics			
Arrived by ambulance	36	48	.02
Length of ED visit, hours (mean)	2	3	.41
Admitted to hospital	11	20	.003
Length of admission, days (mean) among patients admitted to the hospital	7	8	.22

[a] Unweighted *N*=826

[b] Unweighted *N*=351

[c] Unweighted *N*=2-27

[d] Patients could have up to 3 presenting complaints or discharge diagnoses