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High Rate of Hospital Admissions Among Patients with Cirrhosis Seeking Care in US Emergency Departments

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Abstract

Background and Aims—Emergency Departments (ED) can serve as a gateway to specialty care for patients with cirrhosis with limited care access. We described the rates and characteristics of patients with cirrhosis who access United States (US) EDs, and identified factors associated with subsequent hospitalization.

Methods—Using data from the National Hospital Ambulatory Medical Care Survey, cirrhosis-related ED from 2000 to 2009 were identified and compared to all other ED visits.

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Conflict of interest None.

Results—From 2000 to 2009, there were an estimated 1,029,693 cirrhosis and 877 million non-cirrhosis visits. Compared to the general ED population, those with cirrhosis were more frequently male (58 vs. 44 %, $p = 0.02$), Hispanic (18.6 vs. 10.6 %, $p < 0.05$), seeking care in urban areas (91.6 vs. 73.4 %, $p < 0.05$) and had Medicaid/no insurance (43 vs. 35 %, $p < 0.01$). Patients with cirrhosis were more frequently triaged immediately or emergently (72.3 vs. 54.2 %, $p < 0.01$). The majority were admitted or transferred to another hospital (66.8 vs. 17.4 %, $p < 0.01$). Among patients with cirrhosis, patients with age ≥ 65 - years were more likely to be admitted (adjusted OR 2.49, 95 % CI 1.08–5.73), and Medicaid/uninsured (adjusted OR 0.34; 95 % CI 0.17–0.67) were less likely to be admitted, after adjusting for patient demographics, hospital characteristics, and triage score.

Conclusions—Patient with cirrhosis account for approximately 100,000 US ED visits annually. The higher admission rates among patients with cirrhosis indicate a high acuity of illness. Older age among those admitted may reflect poorer functional status. Finally, high visit but low admission rates among those with Medicaid/no insurance suggest a gap in specialty care.

Keywords

Cirrhosis; Hospital admissions; Emergency Department

Introduction

Chronic liver disease including cirrhosis is currently the 12th leading cause of death in the United States (US) [1]. This burden of cirrhosis, both in number of patients affected and health care costs, is expected to rise in the next decade [2]. In 2010, there were an estimated 10 million people in the US with cirrhosis [3]. Approximately half of the burden of liver disease is thought to be due to viral hepatitis [4]. While the prevalence of chronic hepatitis C virus (HCV) infection has peaked, complications of cirrhosis due to HCV are not projected to peak until after 2020 [2]. Moreover, care of this growing population of cirrhosis will be expensive. Over the next 20 years, costs related to HCV are projected to be over \$85 billion [5]. To offset the morbidity and mortality associated with cirrhosis, it is critical to effectively manage patients with cirrhosis in the ambulatory setting.

Effective management strategies with appropriate prophylaxis and therapy for variceal bleeding, ascites, and hepatic encephalopathy can reduce the morbidity and mortality related to cirrhosis [6]. However, these strategies may be hindered by challenges to care delivery in this medically complex population. Such challenges include the limited availability of specialty care and overburdened primary care physicians [7, 8]. If specialty care access is limited, the Emergency Department (ED) may serve as an untraditional gateway to specialty care both in the ED and in the hospital.

Characterizing patients with cirrhosis accessing the ED, as well as those patients requiring hospital admission after an ED visit, will aid in understanding the current gaps in care delivery for this patient population. We hypothesized that patients with cirrhosis would be high utilizers of the ED compared with the general ED population. Therefore, the aims of this study were twofold: (1) to describe the rates and characteristics of patients with cirrhosis who access the ED compared to all other patients accessing the ED; (2) to identify factors associated with hospitalization among patients with cirrhosis who seek care in the ED.

Methods

Study Design

The National Hospital Ambulatory Medical Care Survey (NHAMCS) is an annual, national probability sample survey of hospital EDs conducted by the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics [9]. The NHAMCS data are derived through a multistage estimation procedure that allows one to derive national estimates of ED visits across multiple levels [10]. These data are collected on site via a survey encounter form during a 4-week reporting period. As this is a publicly available data set, this study was exempt by the Institutional Review Board of the University of California, San Francisco.

All adult (defined as patients ≥ 18 years of age) ED visits from January 2000 to December 2009 that were captured in each year's NHAMCS were aggregated for this study. Each year, approximately 500 hospitals are surveyed as a representative sample of EDs across the US. This sample includes nonfederal, general, short stay, teaching, and tertiary care centers. At the time of this study, 2009 represented the latest data available from the CDC. Patient demographic characteristics including age, sex, race/ethnicity, and insurance type, as well as hospital ED characteristics including hospital setting (urban, rural), region, (Northeast, Midwest, South, Southwest), ED disposition (admitted, transferred, discharged), patient triage acuity, and safety-net hospital status were available. EDs in safety-net hospitals were classified using the following criteria: (a) Medicaid insurance accounting for ≥ 30 % of total visits, (b) self-pay/no charge accounting for ≥ 30 % of total visits, or (c) a combination of Medicaid and uninsured accounting for ≥ 40 % of total ED visits [11].

Visits for cirrhosis from 2000 to 2009 were identified using the following codes from the International Classification of Disease, Ninth Revision (ICD-9), and mirrored those used in a previous study of readmissions among patients with decompensated cirrhosis [12]. The codes were as follows: alcoholic cirrhosis (571.2), cirrhosis not due to alcohol (571.5), biliary cirrhosis (571.6), hepatic encephalopathy (572.2), ascites (789.59), hepatorenal syndrome (572.4), spontaneous bacterial peritonitis (567.23), esophageal varices with bleeding (456.0, 456.2), portal hypertension (572.3), hepatocellular carcinoma (155.0), other sequelae of chronic liver disease (572.8), or paracentesis (54.91). NHAMCS reports a maximum of 3 ICD-9 codes meant to represent the diagnoses related to the ED visit. Patients were included if one of the cirrhosis codes above was listed among the three visit diagnoses. Visits for "other ascites" were only included if an additional diagnosis consistent with cirrhosis was listed among the three visit diagnoses. This defined cohort of adults with cirrhosis was then compared to all other ED adult patient visits during the same time period.

Statistical Analysis

Weights provided by the National Center for Health Statistics were applied to the study sample to generate national estimates of ED visits for patients with cirrhosis. Patient and visit-related characteristics of the cirrhosis and general ED cohorts were compared using *t* and Chi-square tests as appropriate. Tests for trend were analyzed using the Wald Chi-square of the Cochran–Mantel–Haenszel trend test. Additionally, patient and visit-related characteristics of patients with cirrhosis with and without admission to hospital were

compared. Among patients with cirrhosis, univariate and multivariate logistic regressions were performed to identify factors associated with hospital admission. Age, sex, race, insurance status, urban versus rural location, geographic region, and triage time were included in the multivariate regression. All variables with p values ≤ 0.2 on univariate analyses were included in the multivariate model, and the final model was based on backward variable selection with p value < 0.05 . Results are presented as adjusted odds ratios with 95 % confidence intervals. An additional sensitivity analysis was performed on those with a primary diagnosis of cirrhosis. All analyses were performed using SAS (SAS Institute, Cary, North Carolina) and Sudaan (RTI, Research Triangle, North Carolina).

Results

Prevalence and Characteristics of Patients Seen in ED

From 2000 to 2009, there were an estimated 1,029,693 (95 % CI 860,533–1,198,853) visits for cirrhosis and 877,383,375 (95 % CI 798,936,868–955,829,882) visits for all other diagnoses. Of those, an estimated 434,409 visits were for a primary diagnosis of cirrhosis. The number of cirrhosis visits versus all other ED visits (referred to as the general ED population) per year is shown in Fig. 1. The estimated number of visits during the 10-year period of study did not change significantly ($p = 0.79$ for all other ED visits, $p = 0.90$ for cirrhosis visits).

Patient demographic and hospital characteristics of the cirrhotic and general ED populations are shown in Table 1. Compared with the general ED population, those with cirrhosis were more frequently male (58.2 vs. 43.7 %, $p < 0.01$), with a lower proportion of Blacks (13.8 vs. 20.8 %) and a higher proportion of Hispanics (18.4 vs. 10.6 %, $p = 0.02$). Those with cirrhosis were also more likely to be seeking ED care in urban settings (91.6 vs. 83.4 %, $p < 0.01$) and have Medicaid or no insurance (43.0 vs. 35.2 %, $p < 0.01$) compared with the general ED population. There was a greater representation of patients accessing the ED in the Western regions (29.0 vs. 18.4 %, $p < 0.01$) and a lower representation of patients accessing the ED in the Midwest (14.4 vs. 23.2 %, $p < 0.01$). Figure 2 shows the geographic distribution of the cirrhosis and the ED populations with respect to the US population (information derived from US Census Data from 2000–2009) [9]. There was no significant difference in the proportion of each population seen in designated safety-net EDs (51.5 vs. 46.7 % in those with cirrhosis versus general ED population).

Regarding visit disposition, a greater proportion of patients with cirrhosis compared to the general ED population were triaged immediately or in less than 15 min (26.7 vs. 17.2 %, $p < 0.01$) and emergently, within 15 min to an hour (45.6 vs. 37 %, $p < 0.01$) and a significantly greater proportion were admitted to the hospital or transferred to another hospital from the ED (66.8 vs. 17.4 %, $p < 0.01$).

Factors Associated with Hospital Admission Among Patients with Cirrhosis

Higher rates of hospital admission were observed among patients age ≥ 65 years (79.4 vs. 58.0 % < 65 years; $p < 0.01$) (Table 2). Lower rates of hospital admission were seen among patients with Medicaid/uninsured (47.3 vs. 73.2 % non-Medicaid insurance types; $p < 0.01$).

There was a higher rate of admission among those who were triaged immediately or emergently (adjusted OR 2.42; 95 % CI 1.10–5.34). There was no relationship between insurance type and triage acuity ($p = 0.11$). In multivariate analyses (Table 3), older age (adjusted OR 2.49, 95 % CI 1.08–5.73) and insurance status (adjusted OR 0.34; 95 % CI 0.17–0.67; referent group = private insurance) remained independently associated with hospital admission. The odds of patients with cirrhosis age ≥ 65 years being admitted were 2.49 times higher than patients age < 65 years, and the odds of patients with Medicaid/uninsured being admitted were 0.34 times lesser likely than those with other types of insurance. These factors, older age (adjusted OR 4.19, 95 % CI 1.36–12.91) and insurance status [adjusted OR 0.33 (0.13–0.86)], remained significant in our sensitivity analysis.

Conclusions

Using a representative sampling of US ED visits between 2000 and 2009, we found that approximately 100,000 visits per year are for a cirrhosis-related diagnosis. This estimate may be an underestimation of the total number of patients with cirrhosis accessing EDs for care given our use of ICD-9 codes to identify cirrhosis visits. While these codes have not been validated, these codes were previously used [12] and to the best of our knowledge represent the best available method to identify patients with cirrhosis. By limiting our ICD-9 codes to just cirrhosis, visits among patients with well-compensated, asymptomatic, or undiagnosed liver disease are unlikely to be represented. Nonetheless, we believe these numbers to provide a minimum estimate of the delivery system burden attributable to cirrhosis. Furthermore, these numbers are similar to those reported by the CDC for the number of hospital discharges with chronic liver disease and cirrhosis as the first-listed diagnosis [13]. Among our study cohort, more patients were triaged as emergent/immediate and about two-thirds were admitted to the hospital, a rate significantly higher than the general ED population. This finding suggests a much higher acuity of illness among patients with cirrhosis presenting to the ED as well as a population of patients in need of higher level of care.

This is the first study to report a relationship between insurance type and hospital admission among ED patients with cirrhosis. In our cohort, patients with Medicaid or no insurance comprised 43 % of the cirrhotic population utilizing the ED—a rather remarkably high proportion. Other studies have shown that Medicaid enrollees or patients without insurance have reduced access to primary care and specialist care, and this may explain the high rate of ED use [14–16]. The higher proportion of cirrhosis patients with Medicaid/uninsured compared with the general ED population suggest that patients with cirrhosis may be more vulnerable to complications of this disease as a result of the access barriers associated with Medicaid/lack of insurance. In addition, our study found that cirrhosis patients with Medicaid/no insurance were 70 % less likely to be admitted to the hospital, after adjusting for patient demographics, hospital characteristics, and triage score. It is still possible that these variables in our model inadequately account for total differences in acuity between Medicaid/uninsured patients with cirrhosis and those with other forms of insurance—in which case, the lower admission rate could reflect lower acuity visits among patients with cirrhosis on Medicaid/no insurance due to limited access to outpatient care [17]. Another

explanation may be that hospitals are reluctant to admit patients without insurance. Further exploration of this finding through direct case review is warranted.

While our study found that older adults with cirrhosis are more likely to be hospitalized than younger patients, the reasons are unclear. We speculate that this reflects a reduced functional reserve among older adults to tolerate complications of cirrhosis. These findings are supported in part by a previous study showing that older Americans with cirrhosis had higher rate of hospitalizations compared with an age-matched cohort without cirrhosis [18]. Using data from the Health and Retirement Study, older patients with cirrhosis had significantly worse health status and functional disability compared with older adults without cirrhosis. These findings have particular significance given the projected increase in the prevalence of cirrhosis among older adults due to the aging baby boomer population with HCV [19].

Our study also examined regional variation in ED visits. In general, the proportion of ED visits by region paralleled the regional distribution of the US population. However, among ED visits for cirrhosis, a higher proportion was seen in the West and a lower proportion seen in the Midwest than predicted by the US Census data estimates from 2000 to 2009 [20]. Specifically, 23 % of US population lives in the West, but 29 % of the ED visits in the West were for cirrhosis; 22 % of the US population lives in the Midwest, but only 14 % of ED visits were for cirrhosis in that region. This may suggest that there is a disproportionate number of adult patients with cirrhosis in the West and less in the Midwest relative to the general population or that there are regional differences in access to care or need for ED care among persons with cirrhosis. There is little in the literature to aid in the interpretation to these findings, and this association warrants further study.

Our study has some limitations. First, NHAMCS does not contain longitudinal data regarding patient survival, length of stay, and hospital readmission which would improve our understanding of the severity of illness among patients who visit the ED, who get admitted, and why. NHAMCS does not have patient-level data such as ED revisit rates; therefore, it is difficult to tell the number of unique patient visits among this cohort of patients. Furthermore, due to the limited number of diagnosis fields (3) in NHAMCS, it is not possible to accurately measure and adjust for the comorbidity case mix in our study population. Therefore, it is difficult to account fully for differences in medical comorbidities among patients admitted and not admitted to the hospital who have Medicaid/no insurance.

Second, misclassification bias is possible. While physicians and staff are expected to perform the actual visit sampling and data collection, field staff are responsible for completeness and self-reported fields such as insurance status, and race/ethnicity may have higher non-response rates than clinical fields. To overcome this, NHAMCS analysts use imputation for missing data since these biases are likely to be random—particularly in regard to this study question. Of note, <5 % of data were missing for any one variable.

In summary, we find that patients with cirrhosis account for approximately 100,000 ED visits per year, and have much higher hospitalization rates than the general ED population. Among patients with cirrhosis hospitalized, our findings show age and insurance type are

important factors associated with hospitalization. These findings suggest either a population that is at risk for complications warranting ED visits and a need of higher level care or possibly an unmet need in managing cirrhosis in the outpatient care setting. Additional studies, especially studies with more detailed clinical data, are needed to determine exact reason for ED visit and subsequent hospital admission, and medical comorbidities among patients with cirrhosis, as well as severity of liver disease. This study represents a first step toward understanding patterns of care in ED utilization among patients with cirrhosis. Understanding such patterns is important given that ED visits will likely increase given the projected increase in patients with cirrhosis.

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Fig. 1. Number of cirrhosis and all other ED visits: 2000–2009. The ED visits are shown in the *line graph* with the axis on the *left*. The cirrhosis visits are shown in the *bar graph* with the axis on the *right*

Fig. 2.
Geographic distribution of cirrhosis visits versus all other ED visits

Table 1

NHAMCS ED visits in the US, 2000–2009, visits for cirrhosis versus all other ED visits

	Visits for cirrhosis (<i>n</i> = 1,029,693)	Visits for all other diagnoses (<i>n</i> = 877,383,375)	<i>p</i> value
Age			
18–64	825,160 (80.1 %)	705,839,666 (80.4 %)	0.91
65	204,533 (19.9 %)	171,543,709 (19.6 %)	
Sex			
Female	430,443 (41.8 %)	493,885,685 (56.3 %)	<0.01
Male	599,250 (58.2 %)	383,497,690 (43.7 %)	
Race/ethnicity			
White, non-Hispanic	661,673 (64.3 %)	576,922,389 (65.8 %)	0.02
Black, non-Hispanic	142,033 (13.8 %)	182,597,556 (20.8 %)	
Hispanic	189,487 (18.4 %)	93,423,285 (10.6 %)	
Other	36,500 ^a (3.5 %)	24,440,145 (2.8 %)	
Hospital/practice setting			
Urban	880,039 (91.6 %)	664,979,747 (83.4 %)	0.01
Rural	80,575 ^a (8.4 %)	132,435,038 (16.6 %)	
Insurance			
Private	283,903 (27.6 %)	339,136,908 (38.7 %)	<0.01
Medicare	210,763 (20.5 %)	133,196,712 (15.2 %)	
Medicaid/uninsured	443,255 (43.0 %)	308,457,726 (35.2 %)	
Other/missing	91,772 ^a (8.9 %)	96,592,029 (11.0 %)	
Region			
Northeast	181,339 (17.6 %)	171,325,753 (19.5 %)	<0.01
Midwest	148,345 (14.4 %)	203,811,510 (23.2 %)	
South	401,007 (38.9 %)	340,407,065 (38.8 %)	
West	299,002 (29.0 %)	161,839,047 (18.4 %)	
Safety-net			
Yes	530,405 (51.5 %)	409,736,805 (46.7 %)	0.18
No	499,288 (48.5 %)	467,646,570 (53.3 %)	
Triage			
Immediate (<15 min)	275,111 (26.7 %)	150,836,717 (17.2 %)	<0.01
Emergent (15–59 min)	469,951 (45.6 %)	325,060,615 (37.0 %)	
Urgent (60 min to <2 h)	81,310 (7.9 %)	180,222,391 (20.5 %)	
Semi-urgent (2 to <24 h)	77,563 ^a (7.5 %)	85,477,347 (9.7 %)	
No triage/missing	125,758 (12.2 %)	135,786,305 (15.5 %)	
Disposition			
Admit/transfer	688,070 (66.8 %)	152,697,063 (17.4 %)	<0.01
Other/no disposition	341,623 (33.2 %)	724,686,312 (82.6 %)	

^a <30 unweighted visits—considered unreliable by the National Center for Health Statistics

Table 2

Factors associated with hospital admission among patients with cirrhosis accessing the ED

	Admitted (<i>n</i> = 640,568) ^a	Not admitted (<i>n</i> = 389,125) ^a	<i>p</i> value
Age			
18–64	478,180 (58.0 %)	346,980 (42.1 %)	<0.01
65	162,388 (79.4 %)	42,145 ^a (20.6 %)	
Sex			
Female	258,210 (60.0 %)	172,233 (40.0 %)	0.57
Male	382,358 (63.8 %)	216,892 (36.2 %)	
Race/ethnicity			
White	405,778 (61.3 %)	255,895 (38.7 %)	0.73
Non-White	234,790 (63.8 %)	133,230 (36.2 %)	
Insurance			
Private/medicare	362,187 (73.2 %)	132,479 (26.8 %)	<0.01
Medicaid/uninsured	209,628 (47.3 %)	233,627 (52.7 %)	
Other/missing	68,753 ^a (10.7 %)	23,019 ^a (5.9 %)	
Region			
West	195,430 (65.4 %)	103,572 (34.6 %)	0.53
All other	445,138 (60.9 %)	285,553 (39.1 %)	
Location			
Urban	566,762 (64.4 %)	313,277 (35.6 %)	0.30
Rural	42,725 ^a (53.0 %)	37,850 ^a (47.0 %)	
Triage (collapsed)			0.07
0–60 min	494,720 (77.2 %)	250,342 (64.3 %)	
60 min to <24 h	64,672 ^a (10.1 %)	94,201 ^a (24.2 %)	
No triage/missing	81,176 ^a (12.7 %)	44,582 ^a (11.5 %)	

^aFigures represent inflated population estimates from NHAMCS

Table 3

Multivariate analyses: factors associated with hospital admission

	Unadjusted OR (95 % CI)	Adjusted OR (95 % CI)	p value
Age			
Age < 65	Ref	Ref	0.03
Age ≥ 65	2.80 (1.33, 5.88)	2.49 (1.08, 5.73)	
Sex			
Female	Ref	–	
Male	0.85 (0.48–1.50)	–	
Race			
White	Ref		
Non-White	1.11 (0.62–2.01)		
Insurance			
Private	Ref	Ref	
Medicare	0.71 (0.32, 1.55)	0.52 (0.21, 1.24)	
Medicaid/uninsured	0.28 (0.14, 0.56)	0.34 (0.17, 0.67)	0.01
Other	0.94 (0.29, 3.01)	1.10 (0.30, 4.30)	
Location			
Urban	Ref	–	
Rural	0.50 (0.18, 1.40)	–	
Geography			
Other	Ref	–	
West	0.85 (0.48, 1.48)	–	
Triage, min			
60 min	Ref	Ref	0.08
0–59 min	2.88 (1.28, 6.48)	2.42 (1.10, 5.34)	