Increasing Health Care Burden of Chronic Liver Disease Compared With Other Chronic Diseases, 2004–2013

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BACKGROUND & AIMS: Chronic liver disease (CLD) is a common and expensive condition, and studies of CLD-related hospitalizations have underestimated the true burden of disease. We analyzed data from a large, diverse health care system to compare time trends in CLD-related hospitalizations with those in congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD). **METHODS:** We collected data from a large health care system in Texas on hospitalizations related to CLD (n = 27,783), CHF (n = 60,415), and COPD (n = 34,199) from January 1, 2004 through December 31, 2013. We calculated annual hospitalization rates (per 100,000) and compared hospital course, inpatient mortality, ancillary services, and readmissions. **RESULTS:** Compared with patients with CHF (median age, 71 years) or COPD (median age, 69 years), patients with CLD were significantly younger (median age, 57 years) ($P < .01$ vs CHF and COPD). Higher proportions of patients with CLD were uninsured (11.7% vs 5.4% for CHF and 5.4% for COPD, $P < .01$) and Hispanic (17% for CLD vs 9.3% for CHF and 5.0% for COPD, $P < .01$). A lower proportion of patients with CLD had Medicare (41.5% vs 68.6% with CHF and 70.1% with COPD, $P < .01$). From 2004 through 2013, the rate of CLD-related hospitalization increased by 92% (from 1295/100,000 to 2490/100,000), compared with 6.7% for CHF (from 3843/100,000 to 4103/100,000) and 48.8% for COPD (from 1775/100,000 to 2642/100,000). During this time period, CLD-related hospitalizations covered by Medicare increased from 31.8% to 41.5%, whereas hospitalizations covered by Medicare did not change for CHF (remained at 70%) or COPD (remained at 70%). Patients with CLD had longer hospital stays (7.3 days vs 6.2 days for CHF and 5.9 days for COPD, $P < .01$). A higher proportion of patients with CLD died or were discharged to hospice (14.2% vs 11.5% of patients with CHF and 9.3% of patients with COPD, $P < .01$), and a smaller proportion had access to postacute care (13.2% vs 23.2% of patients with CHF and 27.4% of patients with COPD, $P < .01$). A higher proportion of patients with CLD were readmitted to the hospital within 30 days (25% vs 21.9% of patients with CHF and 20.6% with COPD, $P < .01$). **CONCLUSIONS:** Patients with CLD, compared with selected other chronic diseases, had increasing rates of hospitalization, longer hospital stays, more readmissions, and, despite these adverse outcomes, less access to postacute care. Disease management models for CLD are greatly needed to manage the anticipated increase in hospitalizations for CLD.

Keywords: Cirrhosis; Epidemiology; Temporal; Trend.

The burden of chronic liver disease (CLD) in the United States is underestimated.[1,2] Despite tremendous advancements in medical management, liver-related mortality has remained relatively unchanged over the last 3 decades, and CLD is currently the 4th leading cause of death among persons aged 45–64 years.[2] In addition, morbidity attributed to CLD is substantial given the high prevalence of hepatitis C cirrhosis and its complications, suboptimal penetration of treatment for hepatitis C virus (HCV), increasing prevalence of nonalcoholic fatty liver disease, pervasive influence of alcoholic liver disease, and rising incidence of liver cancer.[3–11]

Similar to other chronic diseases, a large proportion of CLD-related morbidity is reflected in inpatient health care use.[12–17] There are, however, conflicting data on time trends in morbidity and mortality attributable to CLD. Recent studies are limited by examination of trends in general prevalence of specific diagnoses in selective populations, comparisons across selected liver diseases, or incomplete case ascertainment.[6,18–21] Furthermore, there are sparse comparisons of CLD burden relative to other chronic diseases such as congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD)—conditions that may serve as effective comparators given their complex chronic nature (similar to CLD), established inpatient morbidity burden, and relative prioritization in existing quality improvement initiatives.[13,14,22]

We used data from a large, diverse health care system in the United States to compare time trends in CLD-related hospitalizations with those in other chronic conditions (CHF and COPD). We hypothesized that CLD-related morbidity is higher than the morbidity associated with other common chronic diseases. If true, these data would suggest that parallel efforts are warranted to temper CLD-related morbidity.

WHAT YOU NEED TO KNOW

BACKGROUND AND CONTEXT

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NEW FINDINGS

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Methods

The aim of the study was to compare CLD-related hospitalizations vs hospitalizations related to CHF and COPD. The study protocol was approved by Baylor Scott & White Health system (BSWH) under a waiver of informed consent. The STROBE reporting recommendations (Supplementary Material) were followed in presentation of the data.[23]

Setting

BSWH is one of the largest integrated health care systems in the United States. The north Texas division of BSWH serves the Dallas-Fort Worth Metroplex and surrounding communities (including 16 hospitals with a catchment area of 7 million individuals and over 130,000 annual hospitalizations). The Dallas-Fort Worth Metroplex is the largest metropolitan area in Texas and the fourth largest metropolitan area (out of 382) in the United States. Between 2000 and 2010 (US census data), the population increased from 5.1 million to 6.4 million (23% increase). Between 2000 and 2010, median age changed from 32.0 to 33.5 years, age > 65 years from 7.9% to 8.8%, and proportion of women from 50.2% to 50.7%. In the same period, the white population decreased from 69.3% to 65.3% and the Hispanic population increased from 21.7% to 27.5%. The distribution of the BSWH patient population (as compared with the US population in 2010) is 63.8% white (72.4%), 16.4% African American (12.6%), and 14.2% (16.3%) Hispanic, with 61.1% women (50.8%) and 30.3% 65 years or older (13.0%).[24] Overall, 44% of patients have commercial insurance, 33% have Medicare, 13.8% have Medicaid, 7.3% are either private-pay patients or are uninsured, and 2% are other.

Case Ascertainment

We examined all CLD-related hospitalizations from January 1, 2004 to December 31, 2013 among adult patients (>25 years) in the BSWH system. Discharge diagnoses were classified in accordance with the International Classification of Diseases. We have previously shown that current national practices to identify CLD-related hospitalizations underestimate the true burden of disease.[2] For example, we found that in enumerating liver-related deaths, mortality attributed to certain manifestations of liver disease (eg, hepatorenal syndrome), viral hepatitis, and hepatobiliary malignancy were not included in national estimates of liver-related mortality. Based on these data, we classified a hospitalization as a CLD-related hospitalization if it was associated with (1) a primary diagnosis of CLD (eg, alcoholic cirrhosis) as the underlying reason for hospitalization or (2) a secondary related complication associated with CLD (eg, sepsis or hepatic encephalopathy) as the underlying reason for hospitalization in combination with a primary diagnosis of CLD (eg, alcoholic cirrhosis or viral hepatitis). We used the same approach to define CHF- and COPD-related hospitalizations (Supplementary Table 1).

Statistical Methods

We used BSWH data available from the latest year (2013) and examined the overall differences in demographics between the 3 groups of patients.

Primary Outcome. The primary outcome was a comparison of trends in CLD-, CHF-, and COPD-related hospitalizations between 2004 and 2013. First, we examined rates of CLD-related hospitalizations compared with CHF- and COPD-related hospitalizations. The numerator included the number of hospitalizations related to a specific disease (CLD, CHF, and COPD), and the denominator was the total number of inpatient hospitalizations for a given year.

Next, we developed adjusted models for each of the 3 conditions (CLD, CHF, and COPD) to examine changes in hospitalizations for each disease after accounting for patient demographic, disease severity, and hospitalization-related characteristics. Comparisons were made for subsequent years (2005–2013) using 2004 as a reference for each of the 3 chronic diseases. For each condition, we examined hospitalizations for patients with vs all those without the given condition. CLD, CHF, and COPD were not mutually exclusive, and hence the current models included patients who might have more than 1 chronic condition in the numerator, although this percentage was small (5.6%). The deviance test for the quality of fit of model and the residual plot indicated extra Poisson variation.[25] Consequently, after a series of specification tests, we estimated hospitalization rates with a negative binomial regression model.[26] Like a standard Poisson model, the negative binomial model is log-linear but allows for a more general variance structure than the Poisson model. Multivariate regression models were created by including all variables with $P < .05$ in unadjusted analysis. Patient demographics included age, sex, race/ethnicity, and primary insurance payer defined each year. We used the case mix index, which is a measure of the relative cost or resources needed to treat the mix of patients and reflects the diversity and clinical complexity.[27–29] We tested the model by checking the quality of fit of our negative binomial model. The value of the Pearson chi-squared and deviance divided by the number of degrees of freedom was close to 1, indicating that the fit of the model was adequate.

We also calculated the standardized hospitalization rate (SHR). This allowed a comparison of trends in CLD relative to