RESEARCH LETTER

Feasibility of an Interprofessional Inpatient Educational Intervention for Patients With Decompensated Cirrhosis

Cirrhosis is associated with significant morbidity, mortality, and the need for hospitalization.[1,2] Over 200,000 hospitalizations due to chronic liver disease occurred in 2016, and readmission rates can be as high as 55% at 30 days and 36% at 90 days.[3–5] Interventions that help patients build self-management skills through disease-specific education can improve outcomes.[6] Despite this, patients with cirrhosis report uncertainty regarding fundamental concepts including etiology, prognosis, and management, even in subspecialty care.[7] There is a paucity of literature on patient-focused educational interventions to improve disease-specific knowledge in cirrhosis.[7] Prior work has focused on the outpatient setting.[8] When hospitalized, patients and families are confronted with the complex management of cirrhosis-related complications, creating a unique opportunity for interventions.[9] Because little is known regarding the delivery of interventions in the inpatient setting for patients with cirrhosis, we assessed the feasibility of an inpatient educational intervention to improve disease-specific knowledge in a real-world setting.

This study was done as part of a quality improvement initiative for an inpatient liver care unit at an urban tertiary care center between January 1, 2019 and March 15, 2020. Consecutive patients with cirrhosis admitted to this service were offered an educational session delivered by an advanced practice provider in a model analogous to inpatient diabetes education.[10] Patients were excluded if they had severe cognitive impairment, were unable to read English, or had hepatic encephalopathy at the time of the session. Patients admitted with hepatic encephalopathy were offered the session at a later point, if practically feasible, once the encephalopathy resolved. The educational materials were developed by an interprofessional team including a hepatologist, advanced practice provider, and nutritionist and consisted of a 30-minute presentation reviewing the natural history, complications (including ascites, infections, variceal bleeding, hepatic encephalopathy, and hepatocellular carcinoma), and treatment (including diuretics, antibiotics, beta-blockers, lactulose, rifaximin, paracentesis, and variceal band ligation) of cirrhosis-related complications. Patients completed a self-administered knowledge questionnaire before and after the session. The knowledge questionnaire consisted of fourteen multiple-choice questions on the definitions, treatments, and warning signs of cirrhosis-related complications, as well as a question on whether patients were previously aware of their diagnosis. Patients' caregivers were encouraged to attend the session in person or by phone. Clinical data including cirrhosis etiology and complications, the Child-Turcotte-Pugh class, and the Model for End Stage Liver Disease-Sodium (MELD-Na) score were collected from the electronic medical record, as well as 30-day readmissions, outpatient visits, liver transplantation, and mortality, all at 90 days.[11] Results of the questionnaire before and after the intervention were collected. Demographic and clinical characteristics were summarized using medians and ranges for continuous variables and counts and percentages for categorical variables. A paired t-test was used to assess for differences in preintervention and postintervention knowledge questionnaire scores. The association between prespecified demographic and clinical patient characteristics and changes in knowledge questionnaire scores, controlling for preintervention score, was assessed using linear regression. The study, which was reviewed by the Yale University Institutional Review Board, was deemed exempt and within the scope of quality improvement. Data were analyzed using SAS version 9.4 (SAS Institute; Cary, NC, USA).

Eighty-one patients with cirrhosis received the educational intervention, and caregivers participated in 44% of cases. The majority of patients were male (62%) and non-Hispanic white (81%) with a median age of 57 years (Table A1). The most common etiology of cirrhosis was alcohol-associated liver disease (68%) followed by hepatitis C infection (16%) and metabolic dysfunction-associated steatotic liver disease (12%), and the median MELD-Na score was 20. Most patients had Child-Turcotte-Pugh Class B and C cirrhosis. The most common decompensations were ascites (81%), hepatic encephalopathy (74%), and variceal hemorrhage (44%). Thirty-three percent of patients were previously unaware of their diagnosis. The mean pre-education questionnaire score was 9.2 out of 14, which increased to 11.7 out of 14 posteducation ($P < .0001$). The questions that were answered incorrectly most frequently prior to the educational intervention involved management of ascites with diuretics and thresholds for communicating with medical providers, followed by questions on safe analgesic options and treatments for hepatic encephalopathy. There were significant improvements in the percentage of patients answering questions correctly after the session. The distribution of answers to various categories of questions is shown in Figure. As shown in Table A2, 46% of those who survived the index hospitalization had a 30-day readmission. Liver

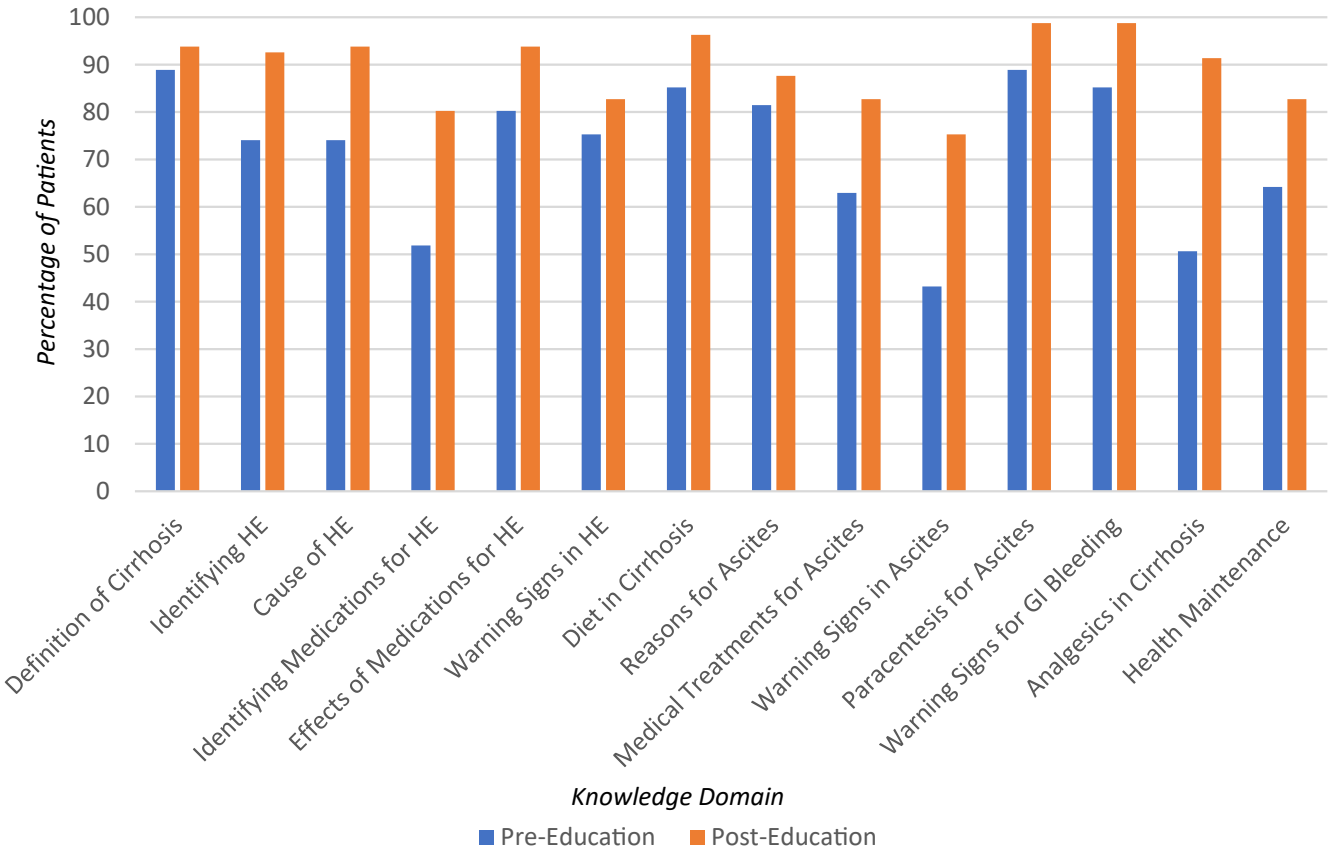

Figure. The percentages of correct answers to knowledge questions regarding cirrhosis and its complications among patients who were hospitalized with decompensated cirrhosis before and after receipt of an educational intervention are shown. Statistically significant improvements in the percentages of patients answering correctly occurred after the educational session for each question. GI, gastrointestinal; HE, hepatic encephalopathy.

transplantation and 90-day mortality were 6% and 23%, respectively. The most common reasons for readmission were hepatic encephalopathy (33%), infection (20%), hypervolemia (12%), and acute kidney injury (12%). In exploratory analyses, there was no statistically significant association between changes in knowledge questionnaire scores and patient characteristics, controlling for preintervention score.

A standardized, advanced practice provider-delivered educational intervention for patients with cirrhosis on an inpatient primary hepatology service was feasible and led to increases in knowledge related to cirrhosis. There is a high rate of 30-day readmission and 90-day mortality in this population. There are several limitations to consider. Because this was a pilot study to assess feasibility of a novel inpatient educational intervention, the sample size was limited, and there was no control arm. In addition, because knowledge was assessed immediately following receipt of the intervention rather than at a later timepoint, the durability of these changes is unknown. Additional follow-up assessments, educational boosters, and efforts to promote caregiver participation may strengthen the effects in future work. Furthermore, the impact of this intervention with regard to outcomes such as medication adherence, hospitalizations, and survival were not examined in this preliminary study. Finally, the severity of illness and frequent readmissions may diminish the impact of this intervention, particularly among those with high MELD-Na scores, who may require more intensive case management. There are also notable strengths, including the demonstration of feasibility within the real-world context of routine care as well as its unique delivery as an inpatient advance practice provider-driven intervention developed by an interprofessional team. Future research is needed to test the validity, effectiveness, and durability of this intervention, as well as the optimal mode of delivery and impact on clinical outcomes.

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Supplementary Materials

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Abbreviations used in this paper: **MELD-Na, Model for End Stage Liver Disease-Sodium**

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Ethical Statement:
The study, which was reviewed by the Yale University Institutional Review Board, was deemed exempt and within the scope of quality improvement (IRB Protocol ID: 2000025033).

Data Transparency Statement:
Study materials and analytic methods may be made available to investigators with an approved study protocol and appropriate permissions, and investigators may contact the corresponding author in this regard. Due to the relatively small sample size with which this single-center quality improvement feasibility study was conducted, data will not be made available to protect confidentiality.

Reporting Guidelines:
None.