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Use of Paracentesis in Hospitalized Patients With Decompensated Cirrhosis and Ascites: Opportunities for Quality Improvement

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Ascites is the most common complication of cirrhosis leading to hospital admission.[1] Approximately 12% of hospitalized patients who present with decompensated cirrhosis and ascites have spontaneous bacterial peritonitis (SBP); half of these patients do not present with abdominal pain, fever, nausea, or vomiting.[2] Guidelines published by the American Association for the Study of Liver Diseases (AASLD) recommend paracentesis for all hospitalized patients with cirrhosis and ascites and also recommend long-term antibiotic prophylaxis for survivors of an SBP episode.[3] Despite evidence that in-hospital mortality is reduced in those patients who receive paracentesis in a timely manner,[4,5] only 40% to 60% of eligible patients receive paracentesis.[4,6,7] We aimed to describe clinical predictors of paracentesis and use of antibiotics following an episode of SBP in patients with decompensated cirrhosis and ascites.

METHODS

We conducted a retrospective cohort study of adults admitted to a single tertiary care center between January 1, 2009 and December 31, 2009.[7] We included patients with an International Classification of Diseases, Ninth Revision discharge code consistent with decompensated cirrhosis who met clinical criteria for decompensated cirrhosis (see Supporting Figure 1 in the online version of this article) [7] and had enough ascitic fluid to be sampled under imaging guidance. We collected presenting vital signs, laboratory data (within 24 hours of admission), evidence of infection other than SBP (eg, urinary infection, pneumonia), results of peritoneal fluid analysis (defining SBP as $\geq$250 polymorphonuclear leukocytes), and use of antibiotic therapy. Our statistical analysis calculated summary statistics as means, medians, and proportions. Furthermore, we used multiple logistic regression to examine the association between predictors and receipt of paracentesis, including age, sex, and clinical measures associated with paracentesis at $P \leq 0.20$ using the Fisher exact test. Alpha was set at $\leq$0.05 (2-sided) for all comparisons.

RESULTS

We identified 193 admissions for 103 patients with decompensated cirrhosis and ascites (Table 1). Of these, 41% (80/193) received diagnostic paracentesis. Mean/standard deviation for age was 53.6/12.4 years; 71% of patients were male and 63% were English speaking. Common comorbidities included diabetes mellitus (33%), psychiatric diagnosis (29%), substance abuse (18%), and renal failure (17%). Excluding SBP, 31% of patients had another documented infection. Gastroenterology was consulted in 50% of the admissions. Fever was present in 27% of patients, elevated white blood cell (WBC) count (ie, WBC >11 k/mm^3) was present in 27% of patients, International Normalized Ratio (INR) was elevated (>1.1) in 92% of patients, and 16% of patients had a platelet count of <50,000/mm^3. Patients who received paracentesis were less likely to have a fever on presentation (19% vs 32%, $P = 0.06$), low (ie, <50,000/mm^3) platelet count (11% vs 19%, $P = 0.14$), or concurrent gastrointestinal (GI) bleed (6% vs 16%, $P = 0.05$). In a multiple logistic regression model including characteristics associated at $P \leq 0.2$ with paracentesis, fever, low platelet count, and concurrent GI bleeding were associated with decreased odds of receiving paracentesis (Appendix 1).

Of the patients who received paracentesis (n = 80), 14% were diagnosed with SBP. Of these, 55% received prophylaxis on discharge. Among the patients who did not receive paracentesis (n = 113), 38 (34%) received antibiotics for another documented infection (eg, pneumonia), and 25 patients (22%) received antibiotics with no other documented infection or evidence of variceal bleeding. Of these 25 patients who were presumed to be empirically treated for SBP (Figure 1), only 20% were prescribed prophylactic antibiotics on discharge.

CONCLUSION

We found that many patients with decompensated cirrhosis and ascites did not receive paracentesis when hospitalized, which is similar to previously published

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TABLE 1. Characteristics of Patients With Diagnostic Paracentesis and Without Diagnostic Paracentesis

	Overall, N = 193, Mean/SD or N (%)*	Paracentesis (−), n = 113, Mean/SD or N (%)	Paracentesis (+), n = 80, Mean/SD or N (%)	Odds Ratio (95% CI)
Age, y	53.6/12.4	54.1/13.4	53.2/11.7	1.00 (0.98–1.03)
Sex (male)	137 (71.0%)	78 (69.0%)	59 (73.8%)	1.26 (0.67–2.39)
English speaking	122 (63.2%)	69 (61.1%)	53 (66.3%)	1.25 (0.69–2.28)
Etiology				
Alcohol	120 (62.2%)	74 (65.5%)	46 (57.5%)	0.71 (0.40–1.29)
Hepatitis C	94 (48.7%)	57 (50.4%)	37 (46.3%)	0.85 (0.48–1.50)
Hepatitis B	16 (8.3%)	7 (6.2%)	9 (11.3%)	1.92 (0.68–5.39)
NASH	8 (4.2%)	4 (3.5%)	4 (5.0%)	1.43 (0.35–5.91)
Cryptogenic	11 (5.7%)	6 (5.3%)	5 (6.3%)	1.19 (0.35–4.04)
Comorbidities				
Substance abuse	34 (17.6%)	22 (19.5%)	12 (15.0%)	0.73 (0.34–1.58)
Psychiatric diagnosis	55 (28.5%)	38 (33.6%)	17 (21.3%)	0.53 (0.27–1.03)
Diabetes mellitus	63 (32.6%)	37 (32.7%)	26 (32.5%)	0.99 (0.54–1.82)
Renal failure	33 (17.1%)	20 (17.7%)	13 (16.3%)	0.90 (0.42–1.94)
GI bleed	23 (11.9%)	18 (15.9%)	5 (6.3%)	0.35 (0.12–0.99)
Admission MELD	17.3/7.3	17.5/7.3	17.0/7.3	0.99 (0.95–1.03)
Creatinine, median/IQR	0.9/0.7	0.9/0.7	0.9/0.8	1.02 (0.82–1.27)
Gastroenterology consult	97 (50.3%)	46 (40.7%)	51 (63.8%)	2.56 (1.42–4.63)
Infection, UTI, pneumonia, other	60 (31.1%)	38 (33.6%)	22 (27.5%)	0.75 (0.40–1.40)
Temperature $\geq$100.4°F	49 (26.8%)	34 (32.4%)	15 (19.2%)	0.50 (0.25–1.00)
WBC >11 k/mm^3	50 (27.3%)	28 (26.7%)	22 (28.2%)	1.08 (0.56–2.08)
WBC <4 k/mm^3	43 (23.5%)	23 (21.9%)	20 (25.6%)	1.23 (0.62–2.44)
INR >1.1†	149 (92.0%)	83 (93.3%)	66 (90.4%)	0.68 (0.22–2.13)
Highest temperature, °F	98.9/1.1	99.1/1.3	98.8/0.8	0.82 (0.62–1.09)
Highest HR	98.2/20.4	97.4/22.4	99.2/17.4	1.00 (0.99–1.02)
Highest RR	24.5/13.7	25.2/16.8	23.5/7.8	0.99 (0.96–1.02)
Lowest SBP	101.0/20.0	99.4/20.3	102.2/19.7	0.99 (0.98–1.01)
Lowest MAP	73.0/12.2	73.2/13.3	72.7/10.6	1.00 (0.97–1.02)
Lowest O_2Sat	92.6/13.6	91.0/17.7	94.9/2.8	1.04 (0.99–1.10)
Highest PT‡	15.8/3.8	15.9/3.7	15.7/3.9	0.98 (0.90–1.08)
Platelets $\leq$50 k/mm^3§	30 (15.9%)	21 (19.3%)	9 (11.3%)	0.53 (0.23–1.23)

NOTE: **Abbreviations:** CI, confidence interval; GI, gastrointestinal; HR, heart rate; INR, International Normalized Ratio; IQR, interquartile range; MAP, mean arterial pressure; MELD, model for end-stage liver disease; NASH, nonalcoholic steatohepatitis; O_2Sat, oxygen saturation; PT, prothrombin time; RR, respiratory rate; SBP, systolic blood pressure; SD, standard deviation; UTI, urinary tract infection; WBC, white blood cell. *Fever, WBC, temperature, respiratory rate, SBP, MAP, and O_2Sat were documented for 183 patients (105 paracentesis patients and 78 nonparacentesis patients). †INR was documented for 162 patients (73 paracentesis patients and 89 nonparacentesis patients). ‡PT was documented for 133 patients (59 paracentesis patients and 74 nonparacentesis patients). §Platelet count was documented for 189 patients.

data.[4,6,7] Clinical evidence of infection, such as fever or elevated WBC count, did not increase the odds of receiving paracentesis. Many patients treated for SBP were not discharged on prophylaxis.

This study is limited by its small single-center design. We could only use data from 1 year (2009), because study data collection was part of a quality-improvement project that took place for that year only. We did not adjust for the number of red blood cells in the ascitic fluid samples. We were also unable to determine the timing of gastroenterology consultation (whether it was done prior to paracentesis), admission venue (floor vs intensive care), or patient history of SBP.

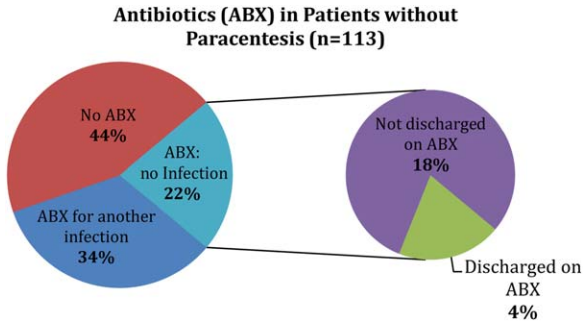

FIG. 1. The pie chart on the left displays the percentage of patients in each group who did not receive paracentesis (red = no antibiotics, dark blue = receiving antibiotics for another infection, light blue = receiving antibiotics with no other infection). The pie chart on the right displays the light blue group and whether they were discharged on antibiotics (green) or not (purple).

Despite these limitations, there are important implications. First, the decision to perform paracentesis was not associated with symptoms of infection, although some clinical factors (eg, low platelets or GI bleeding) were associated with reduced odds of receiving paracentesis. Second, a majority of patients treated for SBP did not receive prophylactic antibiotics at discharge. These findings suggest a clear opportunity to increase awareness and acceptance of AASLD guidelines among hospital medicine practitioners. Quality-improvement efforts should focus on the education of providers, and future research should identify barriers to paracentesis at both the practitioner and system levels (eg, availability of interventional radiology). Checklists or decision

support within electronic order entry systems may also help reduce the low rates of paracentesis seen in our and prior studies.[4,6,7]

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