



Optimizing Outcomes in Patients with Ascites Complicating Cirrhosis—Maximizing the Hour of Power

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Acutely hospitalized patients with decompensated cirrhosis complicated by ascites are at increased risk for spontaneous bacterial peritonitis (SBP), the most common infection in this population, that is asymptomatic in up to one-third of patients [1–3]. Diagnostic paracentesis is thus recommended on admission as an AASLD quality metric in this population, a procedure that in theory is easy to accomplish due to minimal training requirements, low complication rate, and the lack of need for pre-procedure coagulation studies [2–5]. Furthermore, early paracentesis (< 1 day after admission) decreases the risk of acute kidney injury (AKI), intensive care unit (ICU) transfer, length of stay, and inpatient mortality [5–7]. Moreover, diagnostic paracentesis prior to administration of antibiotics can help identify causative microorganisms, guide tailored therapy, combat the rising prevalence of multidrug-resistant organisms (MDROs) by avoiding antibiotics in patients without SBP, and appropriately identify patients who need secondary SBP prophylaxis. Unfortunately, diagnostic paracentesis may be declining in frequency in this population, especially in hospitals run by the US Department of Veterans Affairs [3, 5].

As a result, Dr. Badal and colleagues should be commended for their meta-analysis of eight publications encompassing 116,174 subjects with the aim of evaluating the benefits of early paracentesis (≤ 12 h or ≤ 1 day after initial encounter or admission) among hospitalized patients with cirrhosis, published in this issue of *Digestive Diseases and Sciences* [8]. This important study documents a 31% decrease in inpatient mortality associated with early paracentesis. In the four studies that evaluated the risk reduction associated with paracentesis ≤ 12 h from encounter or

admission (41% of patients received this), the inpatient mortality was reduced by 39%. Moreover, two studies reported that the length of stay was 5.36 days shorter in patients who underwent early paracentesis compared with delayed paracentesis.

As the authors note, it was not possible to examine differences in the rates of paracentesis and outcomes in patients who were empirically treated with antibiotics [5]. Though it is possible that empiric antibiotic treatment may facilitate a decreased sense of urgency among providers to perform a timely paracentesis, the use of inappropriate empiric antibiotics in sepsis is associated with increased mortality, contributing to the rise in prevalence of MDRO infections [9]. Furthermore, initiating empiric antibiotics without performing a diagnostic paracentesis to establish a diagnosis of SBP limits the ability to identify individuals who need secondary SBP prophylaxis.

Although this work is laudable, it is important to highlight a few weaknesses. The authors did compare the risk reduction between patients who received a paracentesis ≤ 12 h to those who received it ≤ 1 day after admission but were likely underpowered to find a statistically significant difference between the groups. Furthermore, there were differences in how the studies defined ‘time zero,’ with some starting at presentation to care and others on admission. In the future, time zero should be standardized, perhaps defined as initial presentation to care. They also were not able to evaluate and quantify the other potential complications resulting from delayed paracentesis such as hepatic encephalopathy, hepatorenal syndrome–acute kidney injury (HRS-AKI), infection-related AKI, acute tubular necrosis (ATN), disseminated infection, ICU transfer, longer term mortality, or additional cost. Likewise, disparities in those who received an early vs. late paracentesis remained unexplored. Previously it was reported that patients were less likely to have an early paracentesis if they were admitted on a weekend [5, 6], though other sociodemographic factors such as age, sex, insurance, and location may also influence

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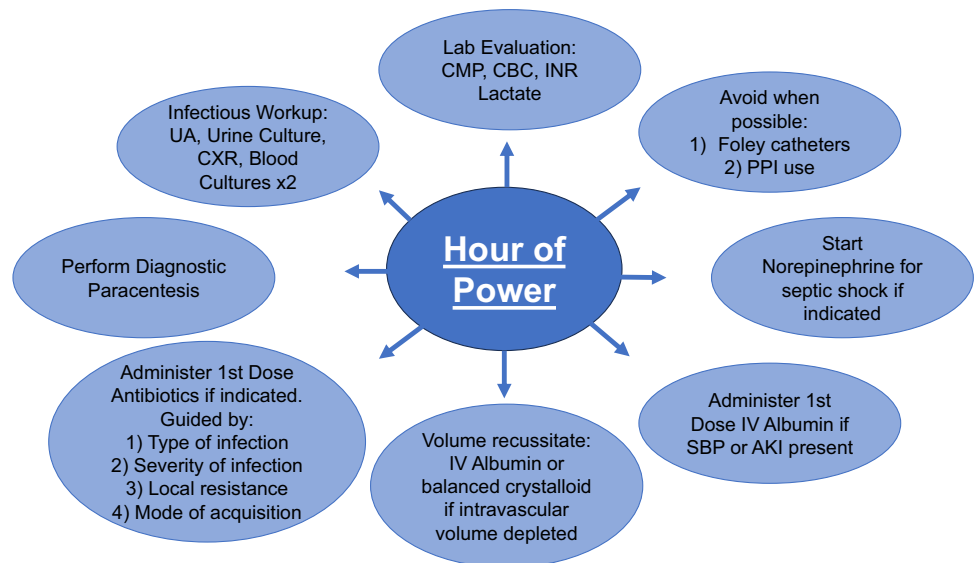
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Table 1 Provider- and systems-related barriers to performing timely diagnostic paracentesis and proposed interventions

Barrier	Proposed interventions
Lack of provider awareness of necessity for performing diagnostic paracentesis in <i>all</i> non-electively admitted patients with cirrhosis and ascites	- Disseminate practice guidelines documenting recommended timeline (< 1 day) for diagnostic paracentesis - Quality improvement project to determine barriers to timely paracentesis - Create automated notifications or order sets in the electronic medical records to identify patients who need paracentesis
Incorrectly perceived procedural risk	- Implement education programs highlighting safety profile of paracentesis, even in patients with elevated INR (up to 8.7) and thrombocytopenia (down to 19,000) [4]
Limited availability of trained providers to perform paracentesis	- Reinstitute paracentesis procedural training for all internal medicine residents
Real or perceived lack of resources, including time and supplies, to perform paracentesis	- Ensure reimbursement rates adequately reflect the clinical need for and high diagnostic yield of the procedure - Create procedural teams that offload paracentesis from primary teams - Supply procedure kits

Fig. 1 The “Hour of Power” is the hour after a patient presents to the hospital with a complication of cirrhosis



this decision [6]. Lastly, this meta-analysis does not capture the reasons for delayed paracentesis. Patient-related factors that affect paracentesis timing may include disease severity (e.g., hemodynamic instability from variceal bleeding or sepsis, or inability to consent due to hepatic encephalopathy), body habitus, prior surgery, and size and accessibility of ascites pocket. Perhaps more actionable are provider- and system-related barriers to timely diagnostic paracentesis (Table 1). These include provider awareness of the need for paracentesis, especially in asymptomatic patients. Lack of trained providers may also contribute, as highlighted in the ‘weekend effect,’ when differences in hospital staffing patterns may limit provider availability [8, 10]. Providers may also overestimate the risks of paracentesis, perceiving them to outweigh its potential diagnostic and therapeutic benefits,

despite data documenting the procedure to be safe even in patients with a high INR (up to 8.7) and thrombocytopenia (as low as 19,000) [4].

Despite these shortcomings, this meta-analysis highlights the importance of timely paracentesis to improve tangible outcomes (reduction in length of stay and inpatient mortality), which have now been consistently documented [6–8]. Other studies have also shown a lower risk for hepatic encephalopathy, other infections, AKI, ICU transfer, and 30-day mortality. Although current guidelines do not specify a recommended timeframe for performing diagnostic paracentesis, sufficient evidence now exists to incorporate a target timeframe (≤ 1 day after presentation to care) in the next iteration of guidance/guidelines. As a result, it is only logical to advocate for early paracentesis in all patients

acutely admitted for decompensated cirrhosis complicated by ascites.

This finding of improved outcomes with early vs. late paracentesis is not surprising given the known association between rapid source control and reduced mortality [11]. Additionally, each hour delay in paracentesis is associated with an increase in in-hospital mortality in patients with SBP, similar to the increased risk for death in patients with sepsis for each hour delay prior to antibiotic administration [7, 12]. Taken together, in an ideal situation, patients with cirrhosis and ascites acutely admitted to hospital should trigger an immediate evaluation for infection, diagnostic paracentesis, volume resuscitation, antibiotic initiation, and related tests during the Hour of Power (e.g., the hour after presentation; Fig. 1). By rapidly delivering high-quality care during the Hour of Power, clinicians may just have the power to deliver many more hours of life after discharge, extending for weeks, months, and even years.

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