Baylor College of Medicine

Bedside Inoculation of Blood Culture Bottles Does Not Improve Ascites Culture Positivity Rate in Spontaneous Bacterial Peritonitis Tyler Brehm, MD,¹ Todd Lasco, PhD,² Mayar Al Mohajer, MD, MBA^{1,3}

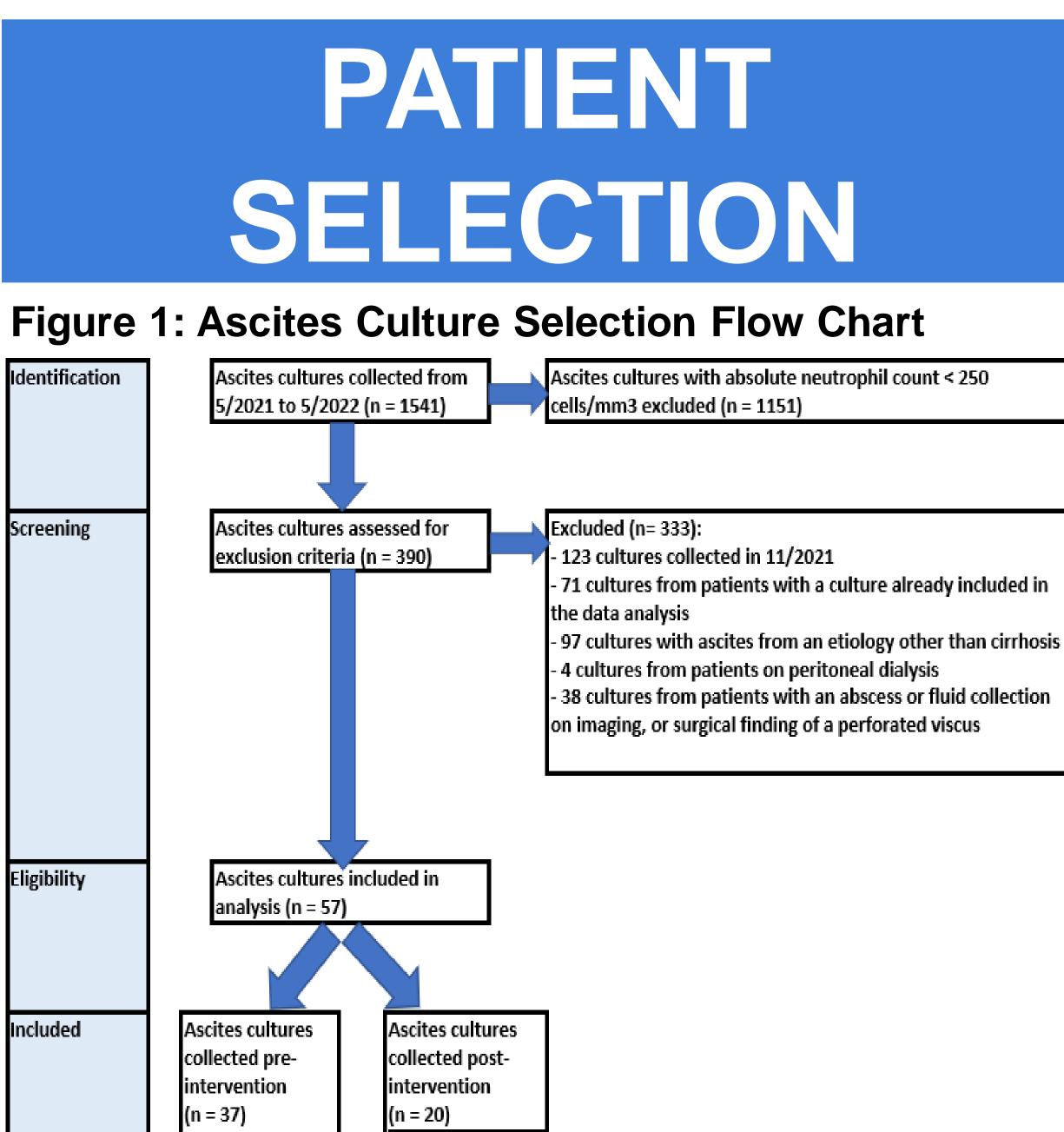
BACKGROUND

- Cirrhosis, the late-stage result of progressive fibrosis leading to impaired hepatic function, affects over 600,000 people in the United States.¹
- Spontaneous bacterial peritonitis (SBP) is a common and serious complication of decompensated cirrhosis, with an annual incidence of 3.5%² in patients with decompensated cirrhosis and a 1-year survival rate after the first episode of SBP of only 40%.³
- Antibiotic selection is often empiric for SBP; but given the severity of this illness, accurate microbiological diagnosis is critical in order to appropriately treat multi-drug resistant organisms, as well as non-bacterial causes (e.g., fungal, TB, etc.).
- Historically, ascites cultures were performed by plating centrifuged sediment of ascitic fluid onto Blood, MacConkey, and Chocolate agars, along with a Schaedler broth.
- However, culture yields via this method were poor, and it was theorized that utilizing blood culture bottles would improve culture growth rates because they are optimized for low bacterial concentration fluids, as seen in bacteremia and SBP. Blood culture bottles were subsequently demonstrated to have superior culture yield in SBP compared to historical methods (81-93% compared to 35-52%).^{4, 5, 6}

METHODS

Study Design

- Single center retrospective chart review
- Adults with SBP hospitalized at Baylor-St. Luke's Medical Center from 5/2021 to 5/2022
- Compared outcomes between direct inoculation of ascitic fluid into blood culture bottles at the bedside (12/2021-5/2022) with plating centrifuged sediment of ascitic fluid onto Blood, MacConkey, and Chocolate agars, along with a Schaedler broth (5/2021-10/2021)
- **Primary outcome**: ascites culture positivity rate
- Secondary outcomes: days of antimicrobial therapy (DOT), days of hospitalization, time to ascites culture positivity, 30-day readmission rate, ICU admission after culture collection, and 30-day mortality rate



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- number (%) Image: Constraint of the second se	Unknown	4 (7.0)	1 (2.7)	3 (15.0)	
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prior ascitic fluid sample – number (%) Se of PPIs within 30 days – number Se of PPIs within 30 days		12 (21.1)	6 (16.2)	6 (30.0)	0.309
	Ascitic fluid total protein < 1 g/dL in	`	9 (24.3)	4 (20.0)	1
	Use of PPIs within 30 days – number		21 (56.8)	12 (60.0)	0.813
Median MELD (IQR) 25 (21-32) 25 (21-30) 26 (19.8-33.2) 0.828		25 (21-32)	25 (21-30)	26 (19.8-33.2)	0.828

stage liver disease (utilized Organ Procurement and Transplant Network model) *For the purposes of statistical comparison, races were combined into White or Caucasian vs. Non-White or Caucasian (due to low n).

**For purposes of statistical comparison, cirrhosis etiologies were combined into cirrhosis secondary to ethanol versus cirrhosis not secondary to ethanol (due to low n). If a patient had a cirrhosis etiology attributed to more than one etiology (e.g., hepatitis C and ethanol), they were then counted as one patient in each of those etiologies.

Table 2: Primary and Secondary Outcomes

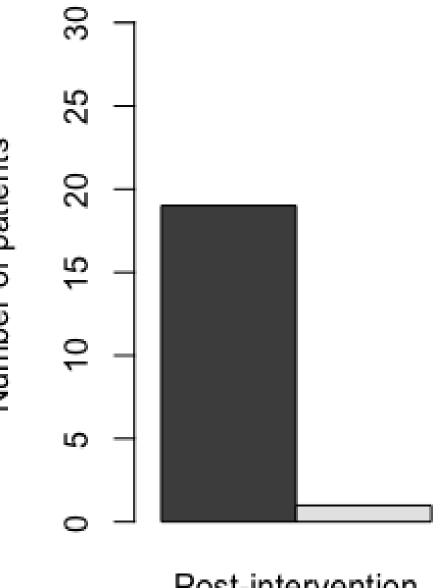
Outcome	Pre-Intervention (n = 37)	Post-Intervention $(n = 20)$	P value
Primary Outcome			
Ascites Culture Positivity Rate – number (%)	7 (18.9)	1 (5.0)	0.238
Secondary Outcomes			
Median Days of Antibiotic Therapy – days (IQR)	7 (2-11)	7 (2.5-10)	0.840
Median Days of Hospitalization – days (IQR)	15 (10-28)	19.5 (8-43.8)	0.682
Median Time to Positivity – hours (IQR)	25.9 (23.8-41.0)	23.5 (23.5-23.5)	0.383
Readmission Within 30 Days – number (%)	10 (27.0)	6 (30.0)	0.812
ICU Admissions After Ascites Culture – number (%)	6 (16.2)	5 (25.0)	0.491
30-Day Mortality – number (%)	7 (18.9)	1 (5.0)	0.238
IQR = interquartile range (Q1-Q3)			

DISCUSSION

- There was no statistically significant difference in ascites culture positivity rate after the implementation of bedside blood culture bottle inoculation.
- There was no statistically significant difference in antibiotic administration between the pre- and post-intervention groups.
- Inappropriate inoculation volumes may be the culprit for the lack of expected improvement in culture positivity rate.

RESULTS

Figure 2: No Difference in Ascites Culture **Positivity Rate Pre- and Post-Intervention**





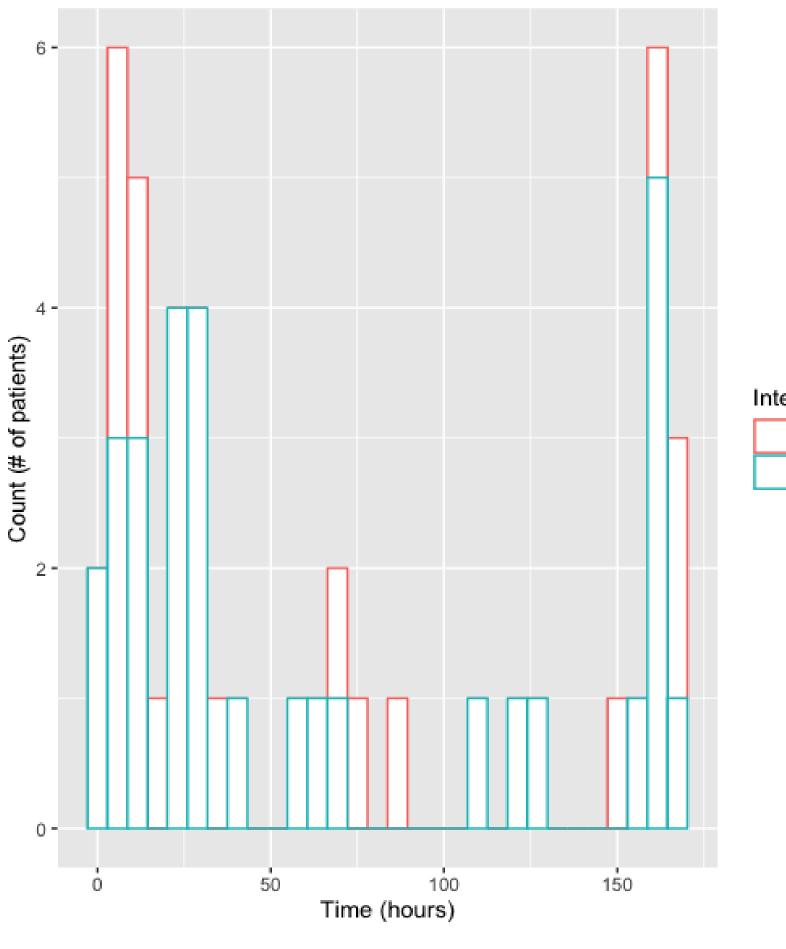
Post-intervention

Pre-intervention

Intervention Period

There was no significant difference in ascites culture positivity rate preand post-intervention (18.9% and 5.0%, respectively, p = 0.238). Negative culture = dark gray, positive culture = light grey,

Figure 4: No Difference in Time from First Antibiotic Administration to Ascites **Culture Collection Pre- and Post-**Intervention



Histogram of the time from the first antibiotic administered to the patient to the time of ascites culture collection – stratified by pre- (blue) and post-intervention (red) groups. There was no significant difference between groups (p = 0.791).

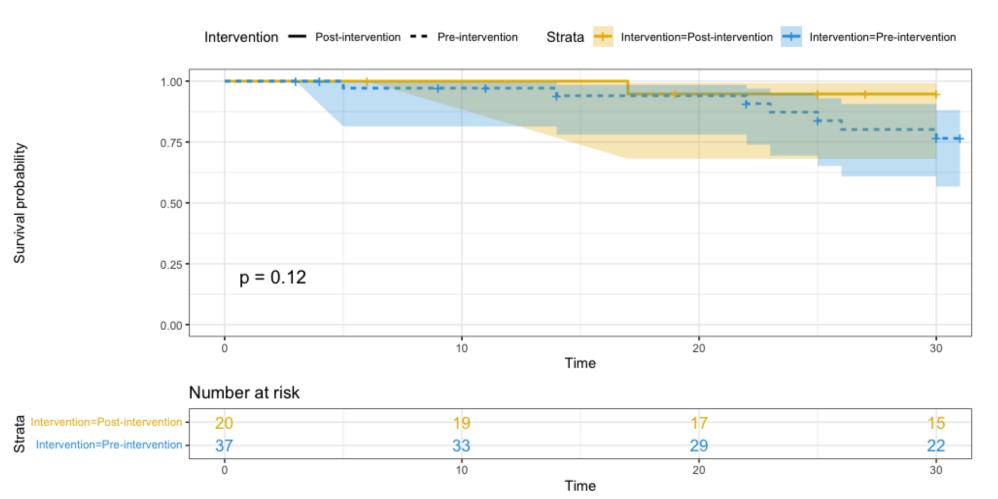


FUTURE DIRECTIONS

- Evaluate the optimal inoculation volume for ascites culture yield.
- Change inoculation site from the bedside to the laboratory, implementing new protocols to control inoculation volumes.

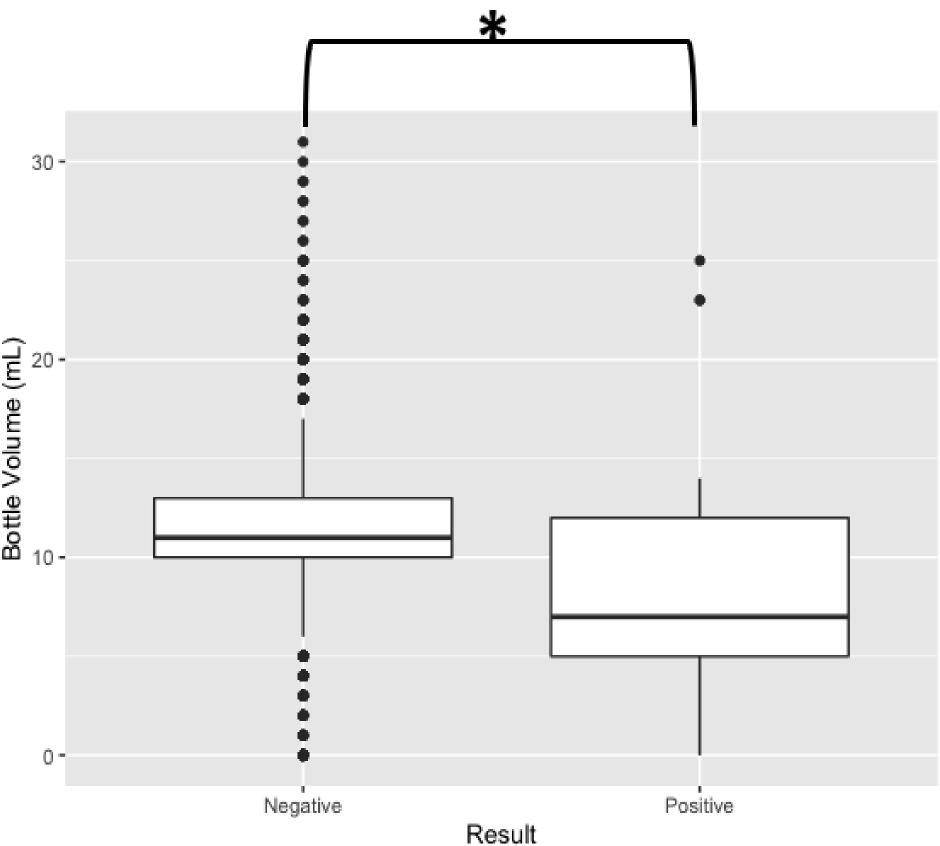


Figure 3: No Difference in 30-Day **Mortality Pre- and Post-Intervention**



Kaplan-Meier curves comparing the hazard ratios for 30-day mortality between pre-intervention (blue hashed line) and post-intervention (solid yellow line), "Time" on the x-axis is days after ascites culture collection. The "number at risk" section accounts for those lost to follow up – where the number listed is the number of patients with known follow up to that time (i.e., day 10, 20, 30). There was no significant difference in 30-day mortality pre- and post-intervention (p = 0.12).

Figure 5: Positive Ascites Cultures have Significantly Lower Inoculation Volumes



Intervention Post-intervention Pre-interventior

Negative cultures had significantly higher inoculation volumes than positive cultures (p < 0.001). This data is of all ascites cultures (aerobic + anaerobic blood culture bottles) collected from November 2021 to May 2022 (n = 1704), not just those of patients with SBP. Black dots represent outliers in the data set



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