

Background

- Diagnosing meningitis requires a lumbar puncture (LP) and obtaining interpretable cerebrospinal fluid (CSF).
- The youngest infants have the highest rates of meningitis and unsuccessful LP.

Objective

- We studied patient, provider, and procedural factors associated with any/interpretable CSF obtainment.

Methods

- Retrospective chart review from 2012 to 2022
- Emergency departments and wards
- < 2 months with LP attempt
- Patient/provider/procedural factors extracted (Table 1)
- Descriptive statistics, Wilcoxon rank sum, and Fisher's exact test performed to compare patients with and without CSF/interpretable CSF (Tables 1 and 2)
- Jonckheere trend test used to compare red blood cell (RBC) medians among attempts (Table 1)

Tables

Table 1. Descriptive Statistics for Lumbar Punctures

N=642

Patient Factors:		Median	Interquartile Range (IQR)
Age		17.0 days	29
Gestational Age		38.0 weeks	2
Weight		3.47 kg	1.11
BUN		8.0 mg/dL	6
Specific Gravity		1.01	0
Provider Factors:		Percent	
Learners		59%	
Attendings		38%	
APPs		3%	
Procedural Factors:		Percent	
Sedation			
Local Anesthetic		22%	
None		78%	
Position			
Side-lying		57%	
Sitting		23%	
Missing		20%	
Outcomes:			
Number of Attempts	Percent	Median RBC By Attempt	IQR RBC By Attempt
1	53.40%	11	315
2	24.50%	535	4794
3	13.10%	6311	103584
4	6.30%	1825	16601
5	2.50%	1099	34575
6	0.20%		

APPs, advanced practice providers; BUN, blood urea nitrogen

Table 2. Patient Factors with Interpretable CSF

Variable	p-Value	Median Difference (MD)	95% Confidence Interval (CI)
Age (days)	<.001	-5	[-8.0, -2.0]
Weight (kg)	0.016	-0.16	[-0.30, -0.03]
Specific Gravity	0.005	-0.001	[-0.003, -0.000]

Results

- No patient/procedural factors were associated with obtainment of any CSF.
- Attending physicians obtained interpretable CSF more frequently (76%) than advanced practice providers (65%) or learners (47%), $p < .001$.
- Increasing attempts were associated with increased RBC ($p < .001$).

Discussion

- Learners obtained interpretable CSF on fewer than half of the patients.
- Increased attempts were associated with increased RBCs and uninterpretable CSF.
- While small significant differences in patient factors were associated with obtaining interpretable CSF, only provider type was clinically significant.
- Next steps include studying the impact of ultrasound, LP seating devices, and simulation training on the obtainment of interpretable CSF by learners.