Enhancing operating room efficiency and patient outcomes:
The impact of preoperative neuraxial ultrasound in cesarean deliveries

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Background and Hypothesis

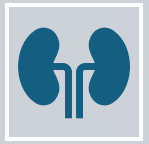
The operating room (OR):

- 40% of hospital costs
- 60–70 % of hospital revenue

Prolonged epidural procedures and multiple attempts in the OR could cause:

- Surgical delays
- Increased patient discomfort
- Risks to patient safety
- Decrease in OR inefficiency with cost implications.

Primary objective: Assess if utilizing pre-procedure neuraxial US in the holding area can enhance the efficiency of obstetric OR by reducing the time and attempts needed to perform an epidural.



Secondary objective: Evaluate the potential to improve patient comfort, safety, and satisfaction.

Study Methods Summary

Category	Details
Guidelines & Approval	- Reported per SQUIRE 2.0 - IRB-approved prospective QI study (informed consent waived)
Setting & Population	- Academic tertiary hospital (Miami, FL) - Jan–Mar 2022 - 98 parturients (≥18 years) undergoing elective C-section with CSE
Sample Size	- Target: Reduce mean epidural insertion time by 30% (14.2 min → 10 min) - Power: 90%, Confidence: 95% - Total: 94 patients (49 per group)
Groups & Intervention	**Ultrasound Group (U):** - Pre-op spinal ultrasound (sitting position) - Marked entry point + measured dura depth **Palpation Group (P):** - Standard landmark palpation in OR
Key Variables	- **Demographics:** Age, comorbidities - **Temporal:** In-room time, procedure time, ART, OR time - **Procedural:** Depth of epidural space, neuraxial attempts, pain score (1–10), satisfaction (1–10)
Procedure Protocol	- CSE performed by PGY-2 residents (supervised) - Ultrasound group: Initial attempt at marked point; palpation allowed if failed - Control group: Palpation only
Data Collection	- Circulating nurse recorded timings - Post-op patient surveys (pain/satisfaction)
Statistical Analysis	- Descriptive stats (medians, percentages) - Mann-Whitney U tests (non-normal data per Shapiro-Wilk) - No blinding (open-label)

Summary of measure of interest for patients receiving an ultrasound for epidural placement vs. those not receiving an epidural ($n = 98$).

Measure	*Group*				
	*Ultrasound ($n = 49$)**		*Non-Ultrasound ($n = 49$)*	*p-value*	
	mean ± SD	*median (IQR)*	*mean (SD)*	*median (IQR)*	
BMI	32.43 ± 6.21	31.48 (29–35)	31.82 ± 4.97	31 (29–34)	*0.751*
Age at Surgery (years)	32.58 ± 4.02	31.98 (29.57–35.40)	32.78 ± 4.44	33.22 (30.25–35.81)	*0.82*
Height (cm)	162 ± 5.8	162 (158–166)	162.4 ± 6.55	162 (159–166)	*0.677*
Weight (kg)	85.23 ± 17.03	82 (74–95)	84.81 ± 15.74	82 (75–95)	*0.842*
No. of Attempts	1.49 ± 1.06	1 (1–2)	2.49 ± 1.89	2 (1–3)	< 0.001*
Reported Backpain (Scale)	0.286 ± 0.65	0 (0–0)	1.86 ± 2.04	1 (0–3)	< 0.001*
Patient Satisfaction (Scale)	9.33 ± 1.16	10 (9–10)	7.92 ± 2.23	9 (7–10)	< 0.001*
Duration of Epidural Placement (min)	8.61 ± 3.88	9 (6–10)	14.59 ± 7.05	13 (10–19)	< 0.001*
In-Room Anesthesia Ready Time (min)	23.37 ± 6.69	22 (19–28)	37.61 ± 28.07	31 (27–36)	< 0.001*
In-Room Sitting-Up Time (min)	3.67 ± 2.29	3 (2–4)	5.9 ± 3.22	5 (4–7)	< 0.001*
Total OR Time (min)	126.4 ± 29.01	122 (108–144)	144.7 ± 35.77	140 (121–164)	0.004*
Sitting-Up Anesthesia Ready Time (min)	19.69 ± 5.91	18 (16–25)	31.71 ± 27.4	25 (22–32)	< 0.001*

* Denotes statistically significant p-value. ˆHeight (cm) has $n = 48$ for Ultrasound group.

Key Findings & Implications of Preoperative Ultrasound for CSE

Statistically Significant Improvements with Ultrasound (Group U vs. Group P)

Metric	Outcome	Clinical Impact
Procedure Duration	↓ Shorter in Group U ($p < 0.05$)	Faster epidural placement, enhanced OR efficiency
Number of Attempts	↓ Fewer in Group U ($p < 0.05$)	Reduced risk of complications (hematoma, infection, nerve damage)
Anesthesia Ready Time (ART)	↓ T4 dermatomal level achieved faster ($p < 0.05$)	Quicker surgical readiness
Total OR Time	↓ Significant reduction ($p < 0.05$)	Cost savings (~$100s/procedure) and improved throughput
Post-Procedural Back Pain	↓ Lower pain scores in Group U ($p < 0.05$, Fig. 1)	Enhanced patient comfort
Patient Satisfaction	↑ Higher in Group U	Fewer attempts + less pain + shorter OR time