

Rate of Unscheduled Administration of an Epidural Bolus Among Pregnant Women Receiving Labor Epidurals

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Background

The labor and delivery process is a painful experience that pregnant women undergo and while various medical options are available for managing labor pain, labor epidurals are the most common.^{1,3} Breakthrough pain, or inadequate analgesia, is a significant complication of labor epidurals. Anesthesia providers are directly involved in placing and managing labor epidurals and would benefit from learning the occurrence rate of this phenomenon.

The purpose of this evidence-based practice (EBP) project is to describe the rate of unscheduled epidural bolus administration in pregnant women receiving continuous labor epidurals (CLE) at Providence Sacred Heart Medical Center (PSHMC) and Providence Holy Family Hospital (PHFH).

Methods

- Design:* Retrospective, observational, EBP project
- Human subjects protection:* De-identified data was extracted from electronic health records (EHR) into a HIPPA compliant REDCap database after facility approval and IRB exemption
- Inclusion Criteria:* Parturient women age ≥ 18 with labor epidurals at PSHMC and PHFH from January 2015 to December 2019 excluding scheduled cesarean sections (Table 1)
- Outcome Measurement:* Unscheduled provider administered epidural bolus (UPAEB) (Figure 1)
- Bivariate:* T-tests (symmetrical continuous data), Mann Whitney U (skewed continuous data), Chi-Test (categorical data)
- Multivariate:* Kaplan Meier analysis performed on UPAEB timing (Figure 2)
- Multivariate multivariable:* Proportional hazards model was used to identify independent risk factors associated with time to first UPAEB (Table 2)

Findings

Table 1. Baseline Demographics and Characteristics of Parturients with Labor Epidurals (n=9,969)

Variable	Mean	SD
Age (years)	28.5	5.3
	Median	IQR
BMI (kg/m ²)	31.1	27.9 - 35.3
CLE duration (hours)	12.8	10.4 - 16.3
	Count	Percent
PSHMC	7,365	73.9%
PHFH	2,604	26.1%
Elective Case	6,019	60.4%
Non-Elective Case ^a	3,950	39.6%
Gravida 1	3,567	35.8%
Gravida ≥ 2	6,402	64.2%
CS delivery ^b	997	10.0%
Non-CS delivery ^c	8,972	90.0%
Single CLE	9,262	92.9%
Multiple CLE ^d	707	7.1%

BMI – Body Mass Index; CLE – Continuous Labor Epidural; CS – Cesarean Section; IQR – Interquartile Range; PHFH – Providence Holy Family Hospital; PSHMC – Providence Sacred Heart Medical Center; SD – Standard Deviation; a – Urgent and Emergent; b – Unscheduled; c – Includes all types of vaginal deliveries; d – CLE replaced at least one time (estimate)

Figure 1. Incidence Rate of Provider Administration of an Unscheduled Epidural Bolus

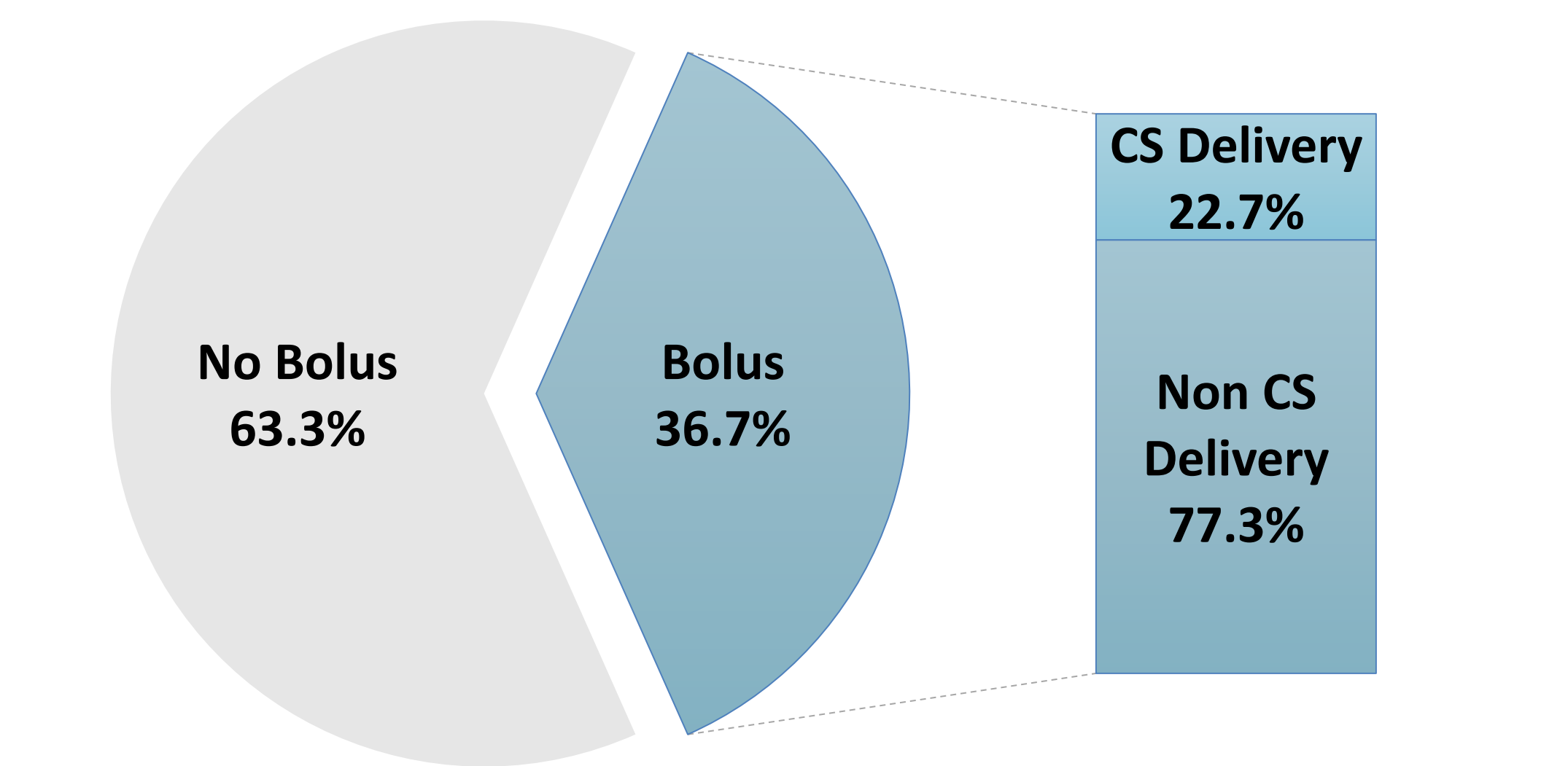


Table 2. Independent Risk Factors Associated with Time to First Unscheduled Epidural Bolus Administration

Covariate	p-Value	Hazard	95% CI
Facility	0.28	1.05	0.96 – 1.14
Age	0.46	1.00	0.99 – 1.00
Gestational Age	0.1	1.00	1.00 – 1.00
BMI (kg/m ²)	<0.001	1.02	1.01 – 1.02
Gravida	<0.001	1.22	1.14 – 1.31
Elective Case	<0.001	1.14	1.06 – 1.23
CLE Duration (hours)	<0.001	1.04	1.03 – 1.04

CI – Confidence Interval; **Bold** signifies statistically significant risk factors

Figure 2. Time to First Unscheduled Provider Administered Epidural Bolus Stratified by Delivery Mode

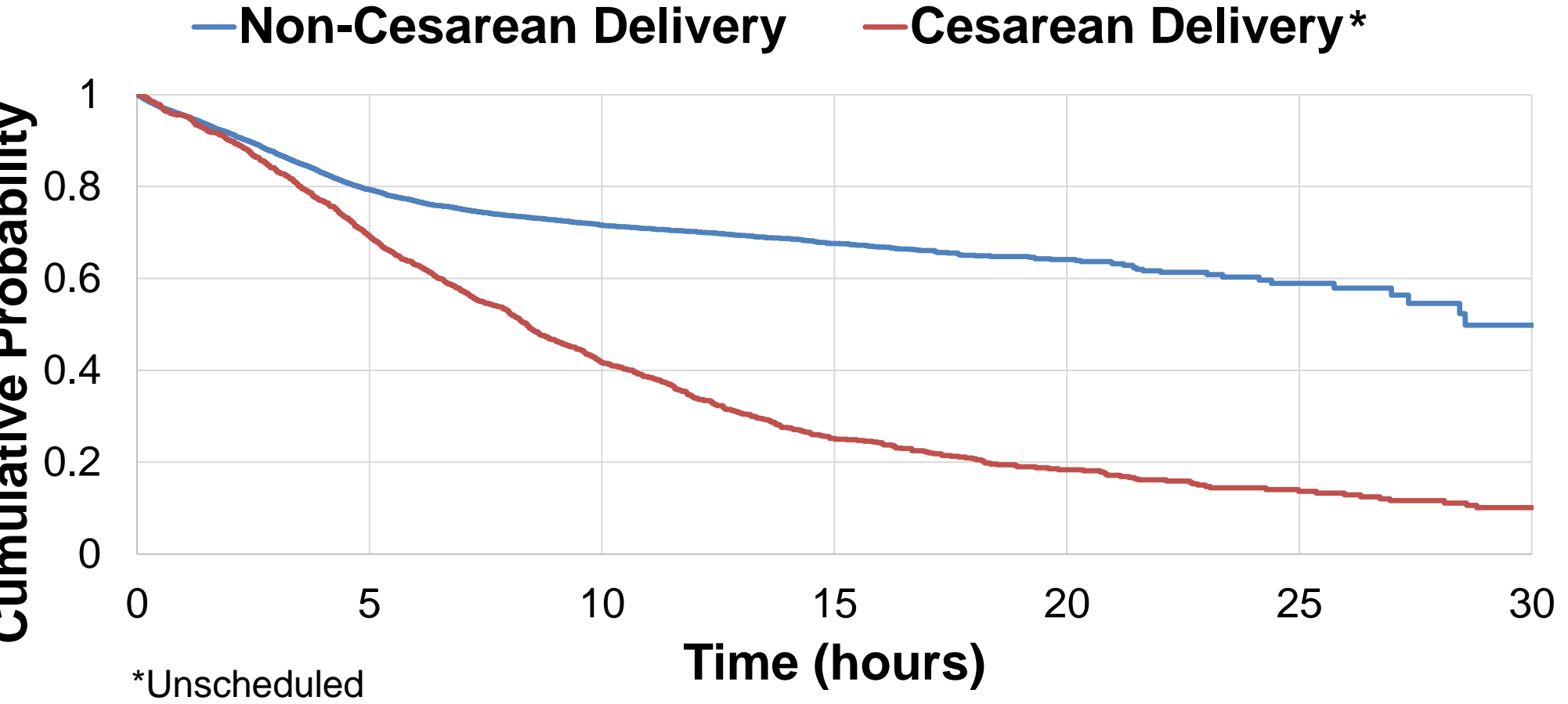


Table 3. Estimated Number of Parturients at Risk for Receiving an Unscheduled Provider Administered Epidural Bolus

Cesarean Delivery							
Hour	0	5	10	15	20	25	30
At Risk	997	671	346	149	68	29	10
Percent*	100%	67%	38%	22%	17%	12%	9%
Non-Cesarean Delivery							
Hour	0	5	10	15	20	25	30
At Risk	8,972	7,010	4,161	1,028	242	49	12
Percent*	100%	79%	71%	68%	65%	61%	48%

*Cumulative probability

Discussion

We found that approximately 36.7% of parturient women with a CLE required at least one UPAEB. Primigravida, elective case type, increased BMI and CLE duration were identified as independent risk factors associated with receiving a provider bolus. Of the identified risk factors, primigravida was the most significant with women having a 1.22 increase in risk of requiring an UPAEB (hazard risk 1.22; 95% CI 1.14 – 1.31; p <0.001).

The rate of 36.7% is higher compared to literature reported rates of 30.7% and 14.4% from RCTs and observational studies that had comparable epidural regimens and techniques to our facilities.^{2,4,5} PCEA use is a prominent limitation in this project as this data is not documented in the EHR. Further in-depth investigation is warranted in describing with more detail the patient characteristics and anesthesia provider practices as they relate to UPAEBs before practice changes can be made.

References

- Butwick, A. J., Wong, C. A., & Guo, N. (2018). Maternal Body Mass Index and Use of Labor Neuraxial Analgesia. *Anesthesiology*, 129(3), 448–458.
- Gambling, D., Berkowitz, J., Farrell, T. R., Pue, A., & Shay, D. (2013). A randomized controlled comparison of epidural analgesia and combined spinal-epidural analgesia in a private practice setting: Pain scores during first and second stages of labor and at delivery. *Anesthesia and Analgesia*, 116(3), 636–643.
- Jung, H., & Kwak, K. H. (2013). Neuraxial analgesia: A review of its effects on the outcome and duration of labor. *Korean Journal of Anesthesiology*, 65(5), 379–384.
- Sng, B. L., Tan, M., Yeoh, C. J., Han, N. L. R., Sultana, R., Assam, P. N., & Sia, A. T. (2018). Incidence and risk factors for epidural re-siting in parturients with breakthrough pain during labour epidural analgesia: a cohort study. *International Journal of Obstetric Anesthesia*, 34(2018), 28–36.
- Sng, B. L., Zeng, Y., de Souza, N. N. A., Leong, W. L., Oh, T. T., Siddiqui, F. J., Assam, P. N., Han, N.-L. R., Chan, E. S., & Sia, A. T. (2018). Automated mandatory bolus versus basal infusion for maintenance of epidural analgesia in labour. *Cochrane Database of Systematic Reviews*, 10.