

Making Labor Epidural Analgesia Better: A Quality Improvement Project: Part 3

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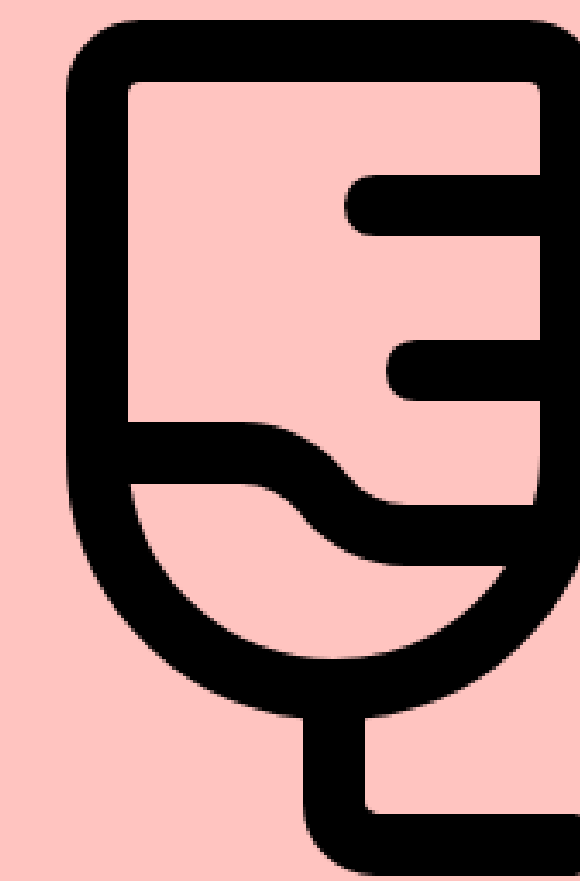
BACKGROUND

- Programmed Intermittent Epidural Bolus (PIEB) is a well-established method for delivering epidural medications.
- Variations in bolus volume, injection interval, and injection rate affect PIEB efficacy, but we lack pragmatic data on how altering these variables effects clinical performance.

AIM

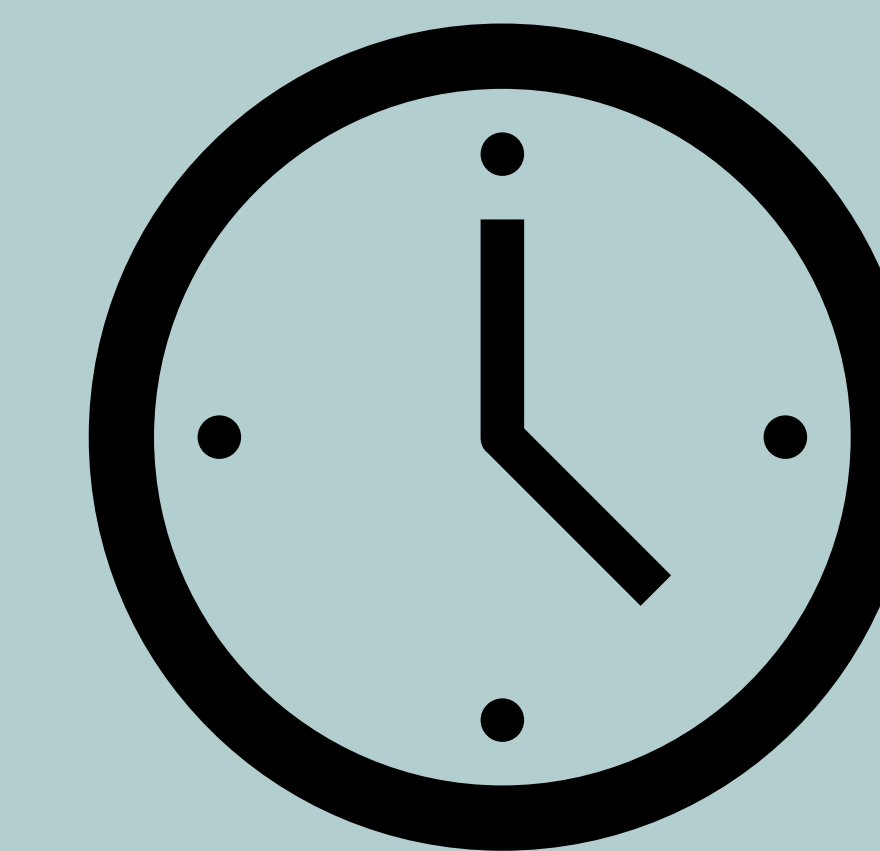
This QI project, performed at Boston Medical Center, evaluates the impact of different PIEB settings on labor analgesic efficacy.

Bolus Volume



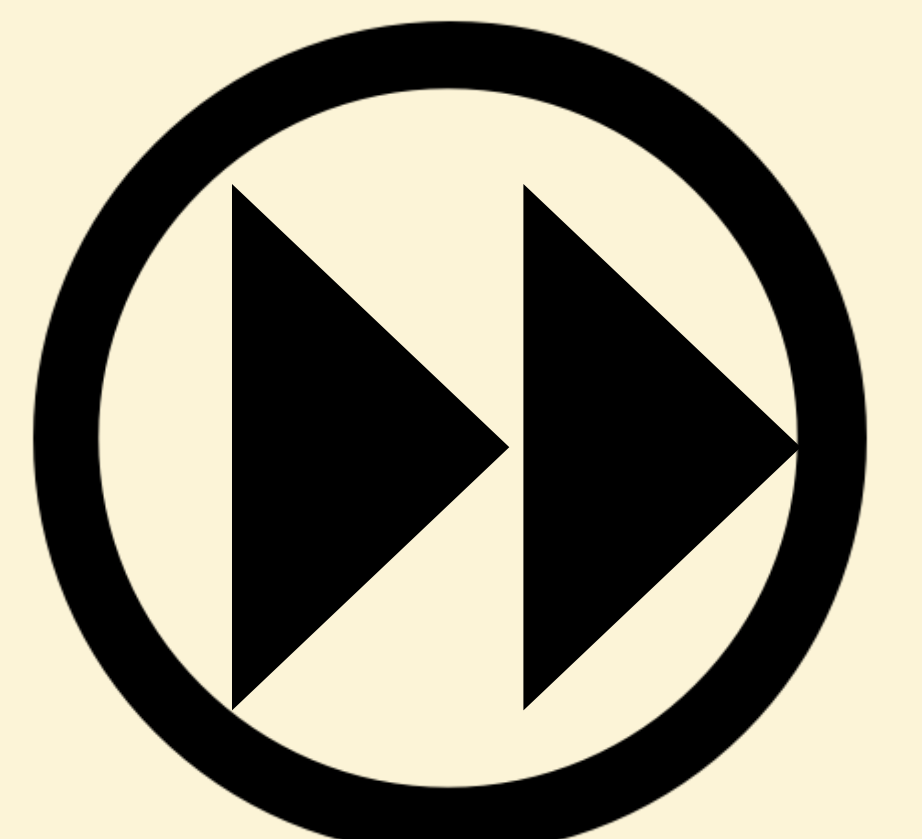
8mL or 10mL

Injection Interval



30 minutes or
40 minutes

Injection Rate



40mL/h or
250mL/h

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METHODS

- Laboring Patients
- Urban Safety-Net Hospital
- March 2023-August 2025

Data extracted from electronic medical records.

- Epidural
- Dural Puncture Epidural (DPE)
- Combined Spinal Epidural (CSE)

Per anesthesiologist preference

CADD Infusion pumps delivered 0.0625% bupivacaine with 2 mcg/mL fentanyl

Primary outcome: time to first provider intervention or vaginal delivery

Secondary outcomes:

- Infusion adjustments
- Catheter replacement
- Delivery/rescue bolus by 8 hours
- Hypotension requiring vasopressors
- Neck/back pain

- Competing risk survival analysis using the Fine-Gray sub-distribution hazards model accounted for competing events, including vaginal delivery and cesarean section.

Group A: 8mL q30min @ 40mL/h

- n=256
- Optional PCEA setting: 8mL q15 min

Group B: 10mL q40min @ 40 mL/h

- n=423
- Optional PCEA setting: 10mL q20 min

Group C: 10mL q40min @ 250 mL/h

- n=278
- Optional PCEA setting: 10mL q20 min

Group D: 8mL q30min @ 250 mL/h

- n=257
- Optional PCEA setting: 8mL q15 min

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RESULTS (n=1214 patients)

- 38.2% required at least 1 rescue bolus
- 26.2% delivered by C-Section.

Gave birth without rescue bolus:

Group A: 59.8%

Group B: 57.7%

Group C: 69.9%

Group D: 72.8%

- High infusion rates were associated with a significantly lower need for rescue bolus.
- Patients receiving the higher infusion rate were more likely to experience “excessive anesthesia” (a composite of vasopressor use, neck/back pain and decreased infusion rate).

Fine-Gray Hazards Model	Hazards Ratio	(95% Confidence Interval)	p-value
Group A (8 mL q 30min @ 40 mL/h)	-	-	-
Group B (10 mL q 40min @ 40 mL/h)	1.07	(0.84, 1.36)	0.600
Group C (10 mL q 40min @ 250 mL/h)	0.68	(0.51, 0.90)	0.008
Group D (8 mL q 30min @ 250 mL/h)	0.62	(0.46, 0.83)	0.002

	Group A (n = 256)	Group B (n = 423)	Group C (n = 278)	Group D (n = 257)	p-value
Outcomes, n (%)					
Neck/Back Pain	0 (0.0)	8 (1.9)	9 (3.2)	4 (1.6)	0.102
Epidural Replacement	15 (5.9)	26 (6.1)	21 (7.6)	17 (6.6)	0.862
Inc. Infusion Concentration	17 (6.6)	8 (1.9)	6 (2.2)	6 (2.3)	0.003
Excessive Anesthesia	7 (2.7)	36 (8.5)	31 (11.2)	33 (12.8)	< 0.001

Cumulative Incidence Function, % (95% CI)					
Rescue Bolus at 8 Hours	33% (27%, 39%)	35% (30%, 39%)	22% (17%, 27%)	23% (18%, 28%)	< 0.001

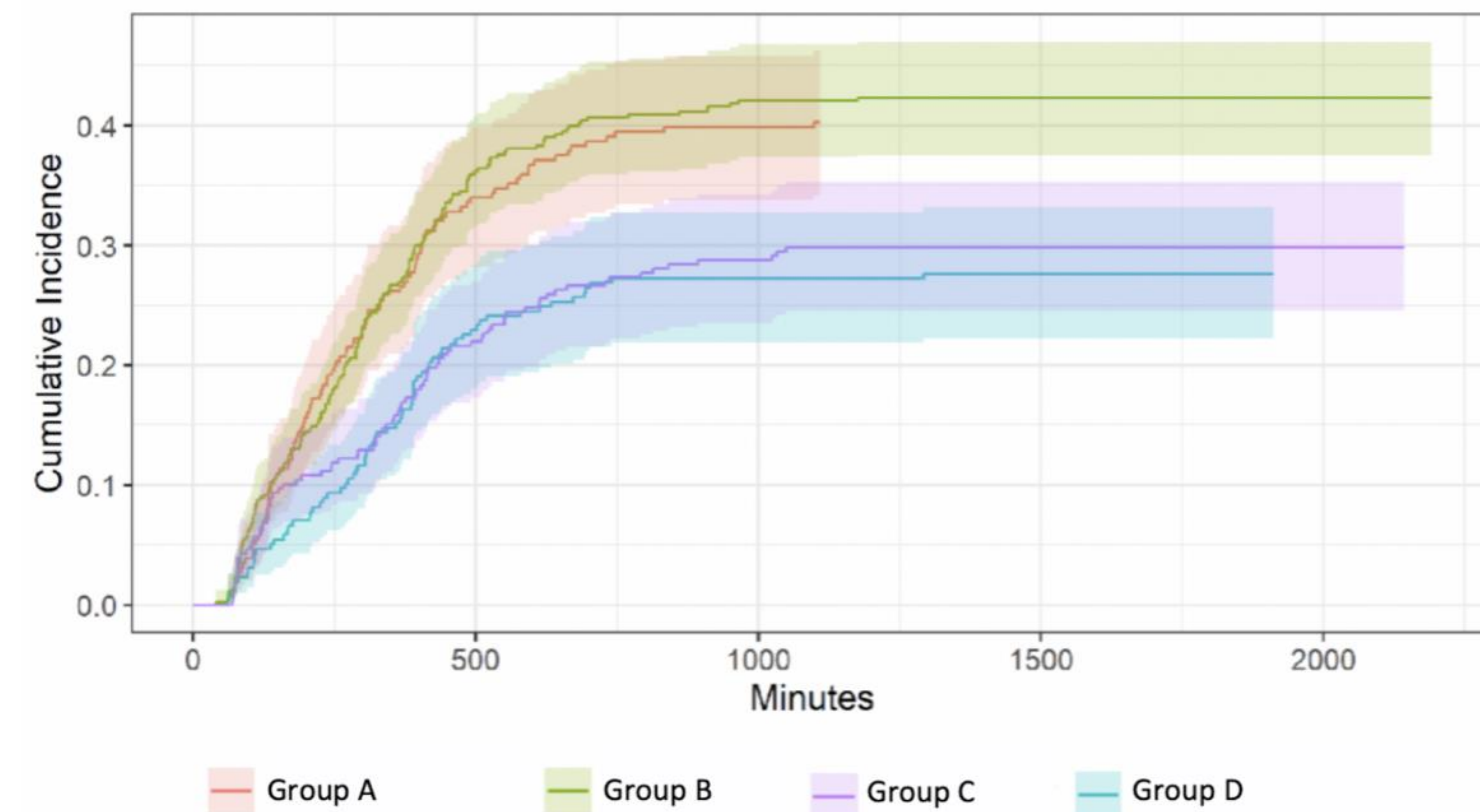


Figure 1: Cumulative Incidence Function for each Group with 95% confidence bands.

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CONCLUSION

- **At our institution, changing bolus volume and interval did not improve PIEB efficacy.**
- **Increasing the infusion rate to 250 mL/h was associated with significantly improved analgesic efficacy.**
- **Future research on PIEB should include optimal infusion rate.**