

Beyond Pain Relief

**Personalising Labour Analgesia for the
Modern Obstetric Patient**

Ronald B. George, MD FRCPC

Professor & Director of Obstetric Anesthesiology
Mount Sinai Hospital - University of Toronto



**Sinai
Health**

Mount Sinai Hospital
Joseph & Wolf Lebovic Health Complex



**Department of
Anesthesia & Pain
Management**



Anesthesiology & Pain Medicine
UNIVERSITY OF TORONTO

Presenter Disclosure

- Relationships with financial sponsors:
 - Any direct financial relationships including receipt of honoraria
 - **Canadian Journal of Anesthesia - Associate Editor**
 - **International Journal of Obstetric Anesthesia - Editor**
 - **Octapharma**
 - Memberships on advisory boards or speakers' bureau
 - **Canadian Anesthesia Research Foundation**
 - **Society for Obstetric Anesthesia and Perinatology**
 - **WFSA Governing Council**







The findings of UK birth trauma inquiry show that change is long overdue – here's what needs to happen now

The Conversation - Published: July 1, 2024



WFSA
WORLD FEDERATION OF SOCIETIES OF
ANAESTHESIOLOGISTS

Declaration on patients' rights to labor analgesia

“During childbirth it should be unacceptable for labouring patients to experience untreated severe pain that is amenable to safe interventions”





Epidurals may do more than
relieve pain - they could save lives

National Geographic

Clinical vignette

- Patient A: 25 years old, healthy, multiparous patient in spontaneous labour who requests epidural with minimal motor block and hopes to remain mobile
- Patient B: 42 years old, primiparous, BMI 58, prolonged induction, and significant anxiety about possible operative delivery.



Neuraxial Analgesia - Best Practices



Effective



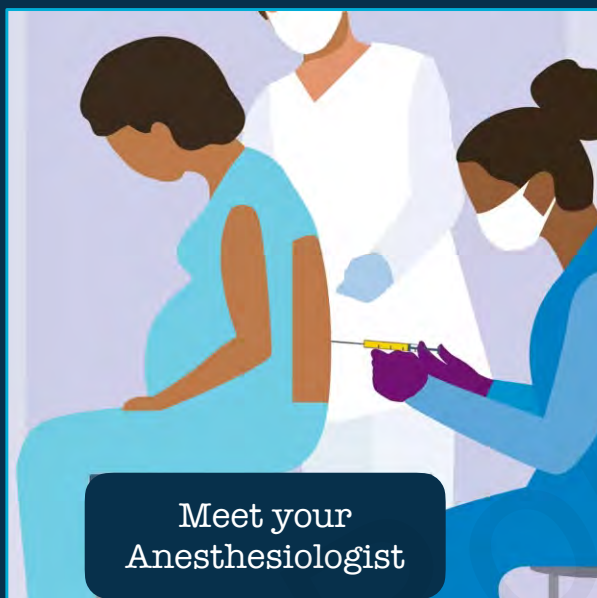
Safety



Efficiency



Experience

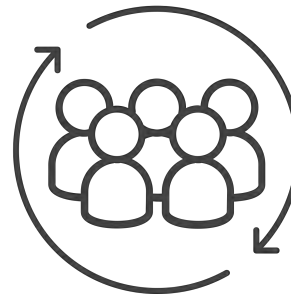
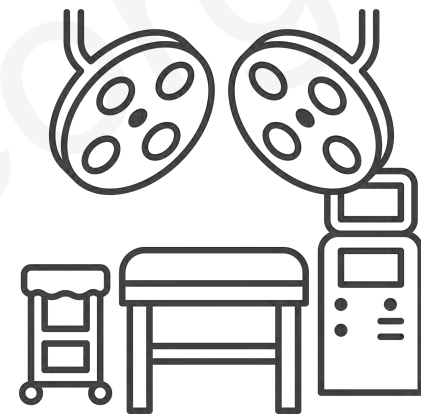


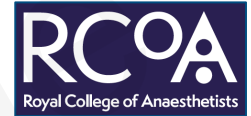
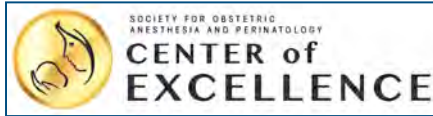
LabourPains





The Patient AS EDUcator in anesthesia (PAS-EDU)





- **Effective** neuraxial labour analgesia on request & **responsive**
- Combined spinal epidural (**CSE**) analgesia
- Programmed intermittent epidural bolus (**PIEB**)
- Patient controlled epidural analgesia (**PCEA**)
- **Low concentration** local anesthetic solutions with opioids
- Labour epidural block **management/replacement**



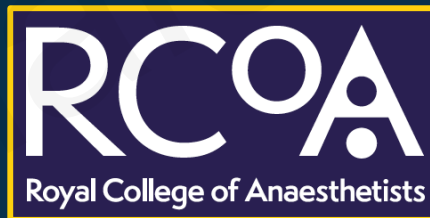
Statement on Quality Metrics



Statement on
Quality Metrics



Responsive
Neuraxial
Analgesia



30
Minutes

- 1 The percentage of women who had an epidural (or a combined spinal epidural) for labour analgesia who had an accidental dural puncture;
- 2 Whether there are guidelines for the referral of patients to an anaesthetist for an antenatal review;
- 3 Whether there are elective caesarean section lists with dedicated (i.e. not expected to cover emergency work) obstetric, anaesthetic and theatre staff;
- 4 Whether point-of-care testing is available for estimation of haemoglobin (e.g. Hemocue[®], Hemocue AB, Ängelholm, Sweden or blood gas analyser);
- 5 The percentage of epidurals for labour analgesia that provided adequate pain relief within 45 min of placement (from the start of epidural insertion).

Bamber JH et al. Anaesthesia 2020, 75, 617–625

Original Article

The identification of key indicators to drive quality improvement in obstetric anaesthesia: results of the Obstetric Anaesthetists' Association/National Perinatal Epidemiology Unit collaborative Delphi project

J. H. Bamber,¹ D. N. Lucas,² F. Plaat,³ B. Allin,⁴ M. Knight⁵ and collaborators for the Obstetric Anaesthetists' Association Quality and Outcomes Working Group¹

OAA

**Effective &
Responsive**
neuraxial labour
analgesia



Anaesthesia 2025, 80, 9-12

Editorial

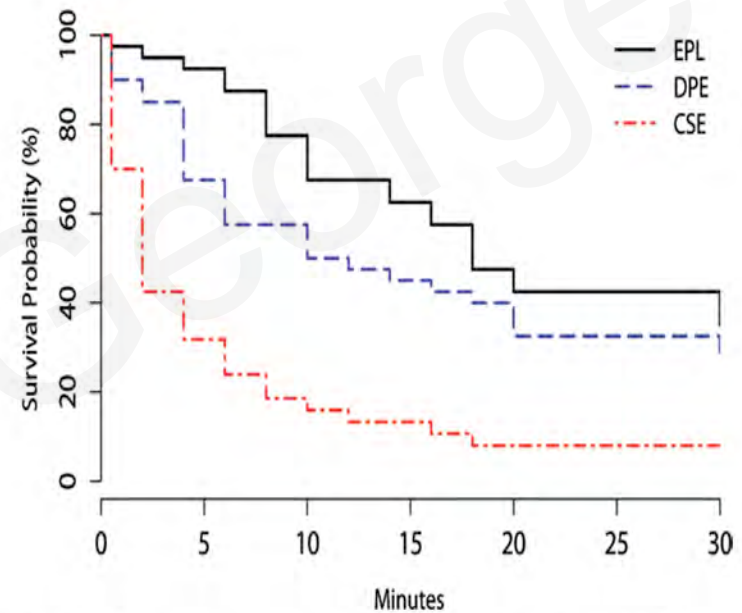
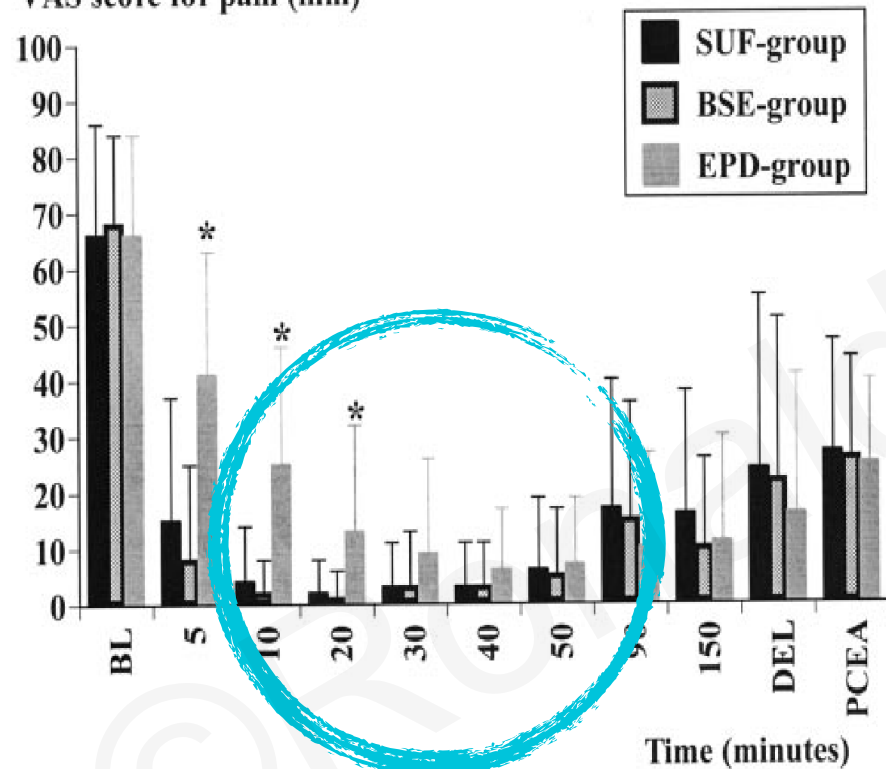
Anaesthetists should adopt a patient-centric approach to labour analgesia and embrace the combined spinal-epidural

Ronald B. George^{1,2} and Ruth Landau³

- “Major benefit of CSE analgesia, and that desired by patients, is efficient and rapid achievement of pain relief.”
- Patient-centric approach
 - Onset of analgesia
 - Quality of analgesia during the 1st and 2nd stages of labour
 - Patient Satisfaction



VAS score for pain (mm)



Van de Velde et al. A&A 2004;98;1153-9
Chau et al. Anesth Analg 2017;124:560-9



Significant Risk of Non-Reassuring FHR

CSE vs. Epidural

RR 1.31 [1.02 - 1.67]

Hattler et al. A&A 2016; 123(4): 955-964

The Effect of Combined Spinal-Epidural Versus Epidural Analgesia in Laboring Women on Nonreassuring Fetal Heart Rate Tracings: Systematic Review and Meta-analysis

Judith Hattler, MD,* Markus Klimek, MD, PhD, DEAA, EDIC,† Rolf Rossaint, MD, PhD,‡ and Michael Heesen, MD, PhD*

BACKGROUND: Combined spinal-epidural labor analgesia has gained popularity, but it is unclear whether this technique is associated with a higher incidence of nonreassuring fetal heart rate (FHR) tracings compared with epidural analgesia. Our meta-analysis aimed at comparing the incidence of nonreassuring FHR tracings between the 2 neuraxial techniques.

METHODS: Databases were searched to identify randomized controlled trials that compared the incidence of nonreassuring FHR tracings, as defined in the individual studies, after combined spinal-epidural versus epidural analgesia in laboring women. Risk ratios (RRs) and 95% confidence intervals (CIs) were calculated using the random-effects model. We performed a subgroup analysis for studies using low-dose epidural bupivacaine concentrations ($\leq 0.125\%$) for epidural analgesia.

RESULTS: Seven trials including 2047 patients were retrieved that compared the 2 neuraxial techniques. The incidence of nonreassuring FHR tracings was significantly higher in the CSE group (RR 1.31 [1.02 - 1.67]).



Spinal

2.5 mg Bupivacaine
25 mcg Fentanyl

Epidural

10 mL 0.25% Bupivacaine

Hattler et al. A&A 2016; 123(4): 955-964

The Effect of Combined Spinal-Epidural Versus Epidural Analgesia in Laboring Women on Nonreassuring Fetal Heart Rate Tracings: Systematic Review and Meta-analysis

Judith Hattler, MD,* Markus Klimek, MD, PhD, DEAA, EDIC,† Rolf Rossaint, MD, PhD,‡ and Michael Heesen, MD, PhD*

BACKGROUND: Combined spinal-epidural labor analgesia has gained popularity, but it is unclear whether this technique is associated with a higher incidence of nonreassuring fetal heart rate (FHR) tracings compared with epidural analgesia. Our meta-analysis aimed at comparing the incidence of nonreassuring FHR tracings between the 2 neuraxial techniques.

METHODS: Databases were searched to identify randomized controlled trials that compared the incidence of nonreassuring FHR tracings, as defined in the individual studies, after combined spinal-epidural versus epidural analgesia in laboring women. Risk ratios (RRs) and 95% confidence intervals (CIs) were calculated using the random-effects model. We performed a subgroup analysis for studies using low-dose epidural bupivacaine concentrations ($\leq 0.125\%$) for epidural analgesia.

RESULTS: Seven trials including 2047 patients were retrieved that compared the 2 neuraxial techniques. The incidence of nonreassuring FHR tracings was significantly higher in the combined spinal-epidural group compared with the epidural group (RR 1.45, 95% CI 1.05-2.00, $P = 0.02$).



FHR

Monitoring NOT described
Monitoring limited duration
Monitoring NOT defined
Monitoring NOT blinded

Hattler et al. A&A 2016; 123(4): 955-964

The Effect of Combined Spinal-Epidural Versus Epidural Analgesia in Laboring Women on Nonreassuring Fetal Heart Rate Tracings: Systematic Review and Meta-analysis

Judith Hattler, MD,* Markus Klimek, MD, PhD, DEAA, EDIC,† Rolf Rossaint, MD, PhD,‡ and Michael Heesen, MD, PhD*

BACKGROUND: Combined spinal-epidural labor analgesia has gained popularity, but it is unclear whether this technique is associated with a higher incidence of nonreassuring fetal heart rate (FHR) tracings compared with epidural analgesia. Our meta-analysis aimed at comparing the incidence of nonreassuring FHR tracings between the 2 neuraxial techniques.

METHODS: Databases were searched to identify randomized controlled trials that compared the incidence of nonreassuring FHR tracings, as defined in the individual studies, after combined spinal-epidural versus epidural analgesia in laboring women. Risk ratios (RRs) and 95% confidence intervals (CIs) were calculated using the random-effects model. We performed a subgroup analysis for studies using low-dose epidural bupivacaine concentrations ($\leq 0.125\%$) for epidural analgesia.

RESULTS: Seven trials including 2047 patients were retrieved that compared the 2 neuraxial techniques.



NR-FHR

CSE versus Epidural
(Modern practice)

RR 1.12 [0.93 - 1.34]

Blinded Outcome

RR 1.41 [0.99 - 2.02]

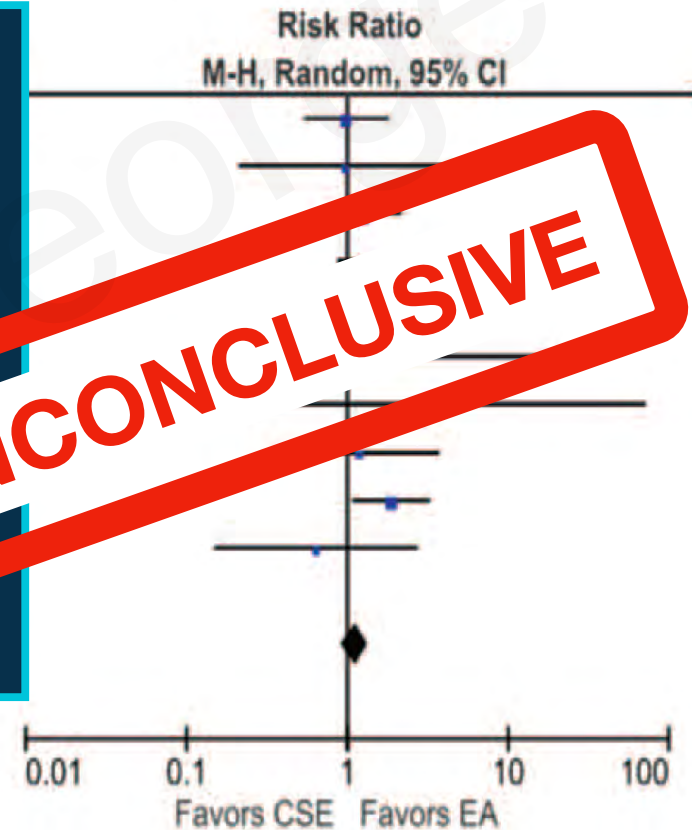
Total events

103

223

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 8.11$, $df = 9$ ($P = 0.52$); $I^2 = 0\%$

Test for overall effect: $Z = 1.17$ ($P = 0.24$)



CSE Myth

"The untested catheter"



Combined Spinal Epidural Technique for Labor Analgesia Does Not Delay Recognition of Epidural Catheter Failures

A Single-center Retrospective Cohort Survival Analysis

Jessica M. Booth, M.D., Joshua C. Pan, B.S., Vernon H. Ross, M.D., Gregory B. Russell, M.S., Lynne C. Harris, B.S.N., Peter H. Pan, M.D., M.S.E.E.

Outcome	CSE	Epidural	P-value
All catheters	1,440	955	
Failed catheters	7%	12%	0.001
Interval to failure	41 minutes	75 minutes	0.006
Failure < 30 min	48%	31%	0.009
Failure > 30 min	52%	69%	
Failure at Cesarean	3%	10%	0.03

1.25 - 2.0 mg Isobaric Bupivacaine + 10 mcg Fentanyl

Anesthesiology 2002; 96:1070-3

© 2002 American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

A Comparison of Intrathecal Fentanyl and Sufentanil for Labor Analgesia

Kenneth E. Nelson, M.D.,* Traci Rauch, M.D.,† Victor Terebuh, M.D.,† Robert D'Angelo, M.D.‡

Intrathecal plain vs hyperbaric bupivacaine for labour analgesia: efficacy and side effects

[Bupivacaine intrathécale pure vs hyperbare pour l'analgésie du travail obstétrical : efficacité et effets secondaires]

Ayman Rofa'el MD, Suzanne Lilker MD, Shafagh Fallah PhD, Eric Goldszmidt MD, Jose Carvalho CA MD PhD

Determination of the ED95 for intrathecal plain bupivacaine combined with fentanyl in active labor

R. Whitty, E. Goldszmidt, R. K. Parkes, J. C. A. Carvalho

Department of Anesthesia and Pain Management, Mount Sinai Hospital, Toronto, Ontario Canada

Effective Dose of Bupivacaine: Dural Puncture Epidural Versus Conventional Epidural Techniques

In labor analgesia, the dural puncture epidural (DPE) technique has distinct physiological advantages over the conventional epidural (EPL) technique



However, it is not known whether initial analgesia can be established with a lower dose of bupivacaine using DPE technique, as compared to the EPL technique

Randomized administration of bupivacaine to healthy pregnant women in labor using DPE or EPL techniques



(N = 100)



Effective dosage 90 (ED90) determination via biased-coin sequential allocation method

Monitoring of effects post bupivacaine administration



Sensory/motor blockade



Maternal or fetal side effects

ED90 of bupivacaine (n = 95)



With DPE

29.30 mg



With EPL

45.25 mg

35% reduction in bupivacaine dose with the DPE technique

The DPE technique requires a lower dose of bupivacaine to achieve initial ED90 analgesia compared to the EPL technique

Effective Dose of Bupivacaine: Dural Puncture Epidural Versus Conventional Epidural Techniques

In labor analgesia, the dural puncture epidural (DPE) technique has several advantages over conventional epidural (EPI) techniques.

Randomized administration of bupivacaine to

Monitoring of effects post bupivacaine administration

Onset of analgesia	DPE	EPI
30 minute NRS < 3/10	84%	78%



maternal or fetal side effects

% reduction in bupivacaine dose with DPE technique

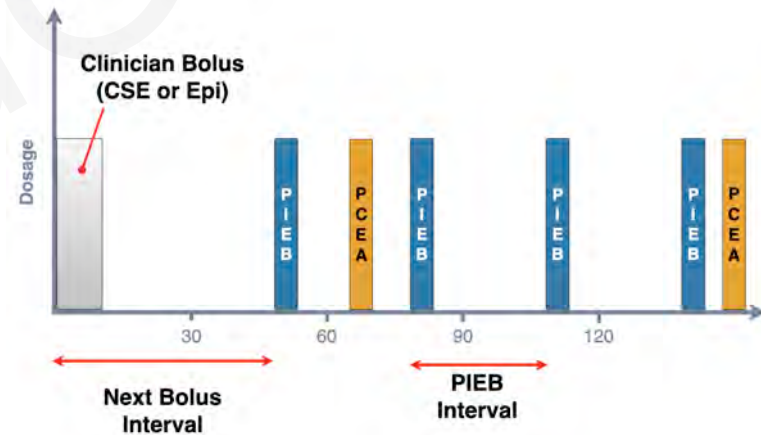
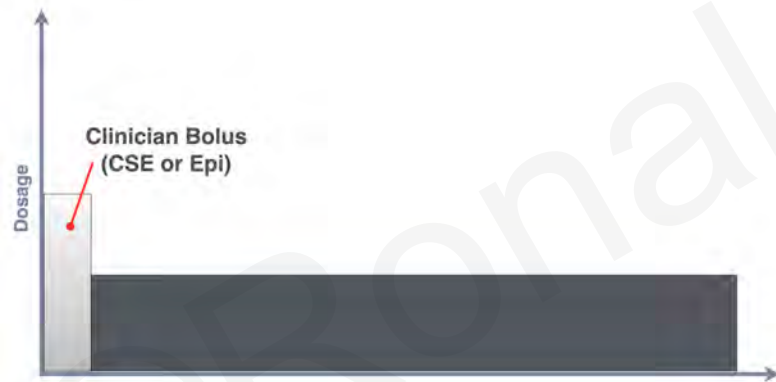
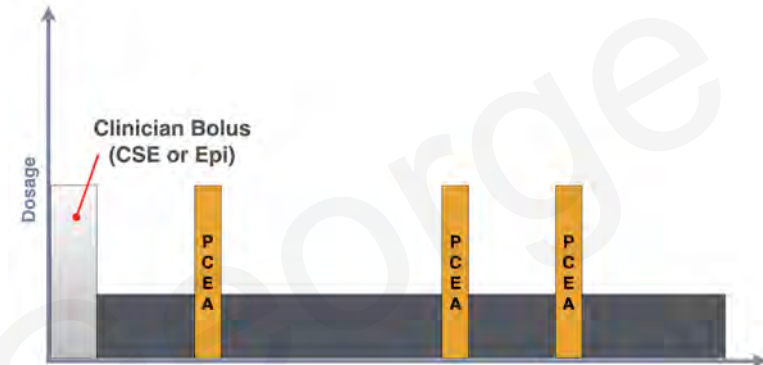
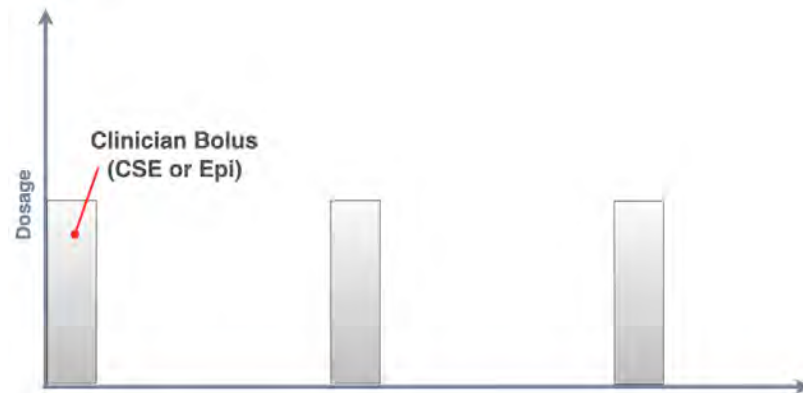


How initial analgesia can be achieved with a lower dose of bupivacaine using DPE technique, as compared to the EPI technique

The DPE technique requires a lower dose of bupivacaine to achieve initial ED90 analgesia compared to the EPI technique

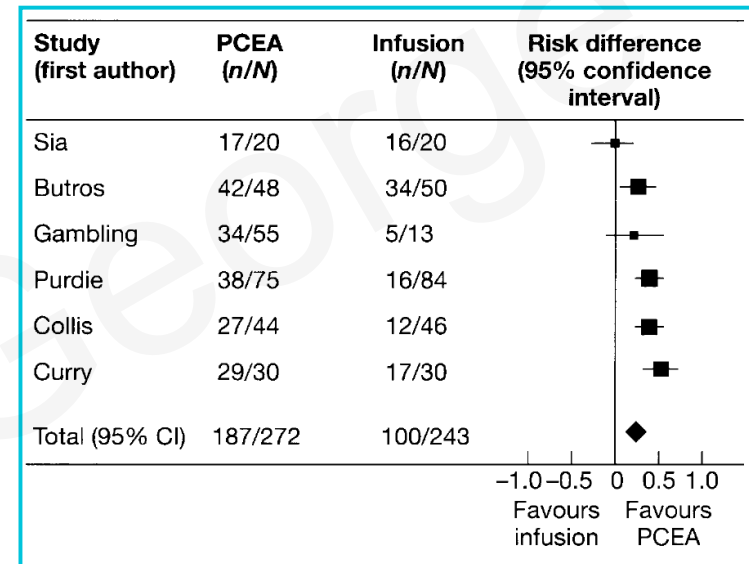
Labor Analgesia Initiation with Dural Puncture Epidural (DPE) versus Conventional Epidural Techniques: A Randomized Biased-Coin Sequential Allocation Trial to Determine the Effective Dose (ED90) of Bupivacaine

Maeda et al. (2023)



Patients who receive PCEA bolus analgesia:

- Less anesthetic interventions
- Higher satisfaction
- Less motor block



Van der Vyver et al. BJA 2002;89(3)

British Journal of Anaesthesia 89 (3): 459-65 (2002)

Patient-controlled epidural analgesia *versus* continuous infusion for labour analgesia: a meta-analysis

M. van der Vyver¹, S. Halpern^{2*} and G. Joseph²



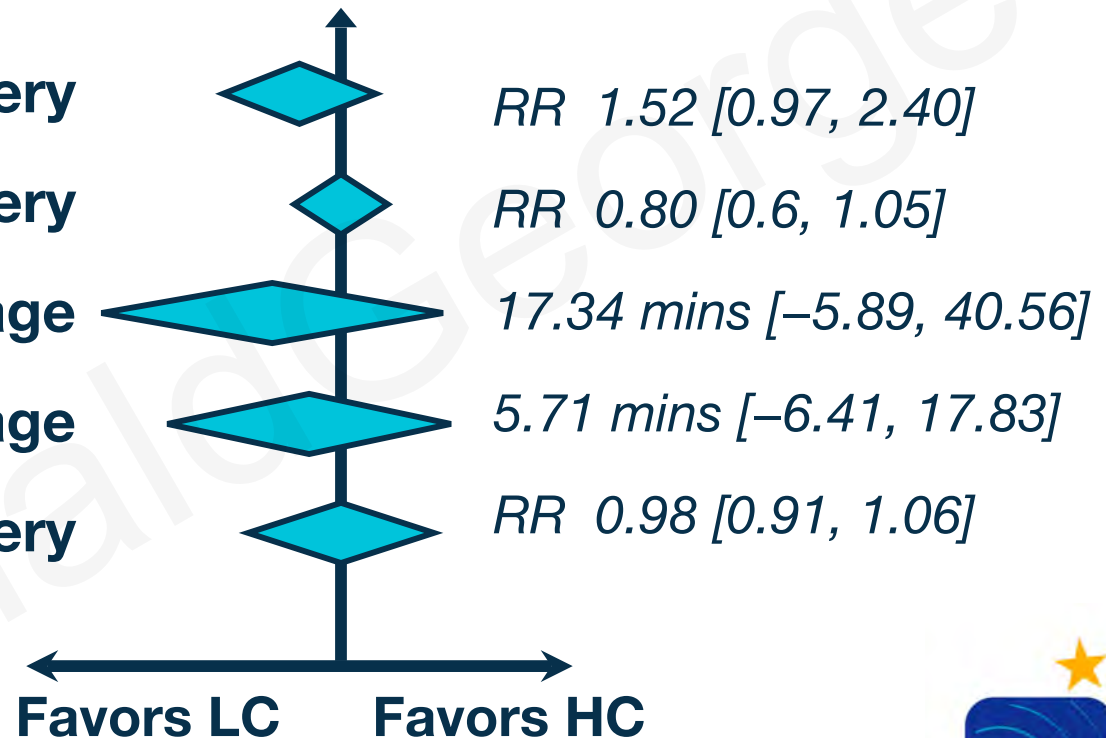
Assisted Vaginal Delivery

Cesarean Delivery

Duration 1st Stage

Duration 2nd Stage

Spontaneous Delivery



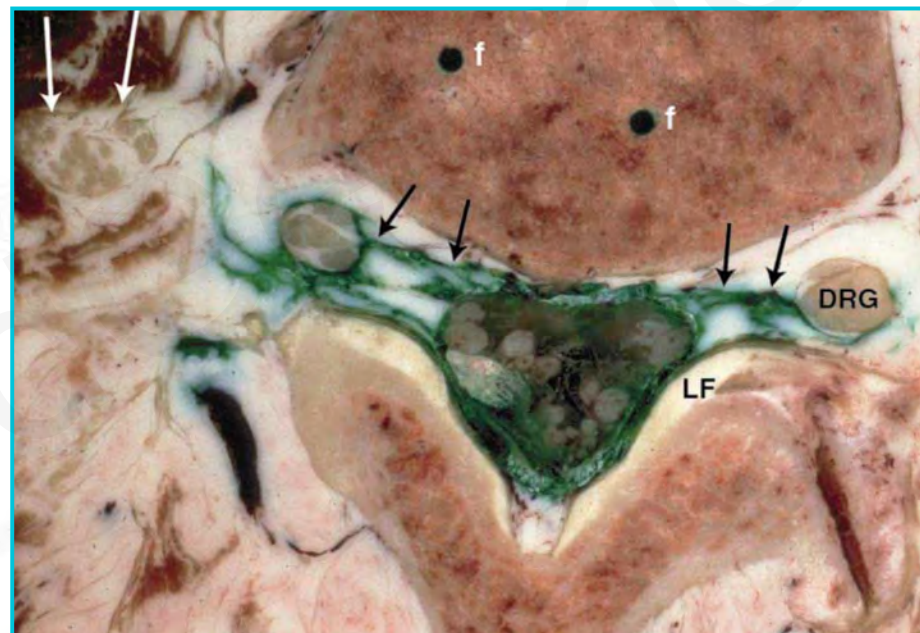
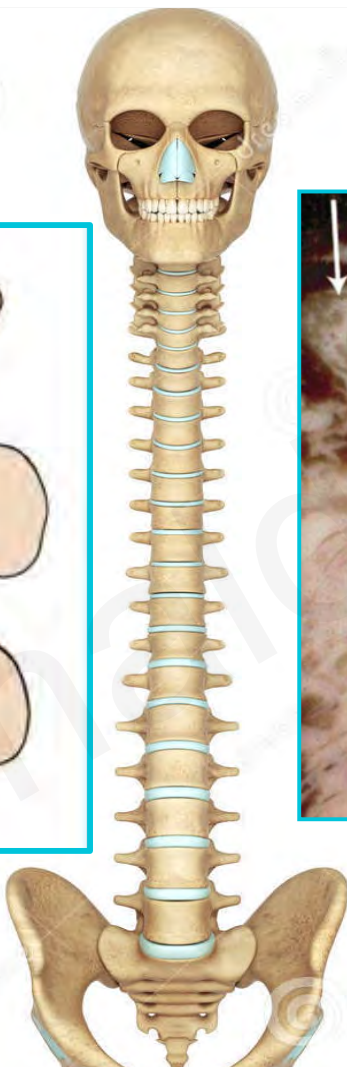
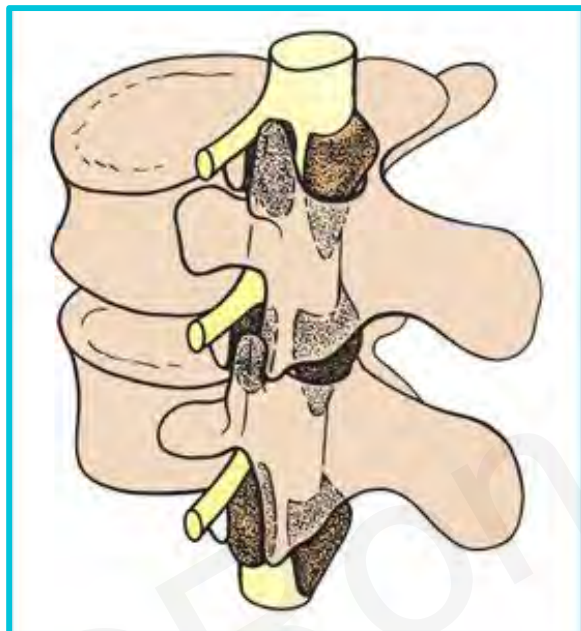
Obstetric Anesthesiology
Section Editor: Jill M. Mhyre

Effects of Epidural Labor Analgesia With Low Concentrations of Local Anesthetics on Obstetric Outcomes: A Systematic Review and Meta-analysis of Randomized Controlled Trials

Ting-Ting Wang, MD, Shen Sun, MD, and Shao-Qiang Huang, MD

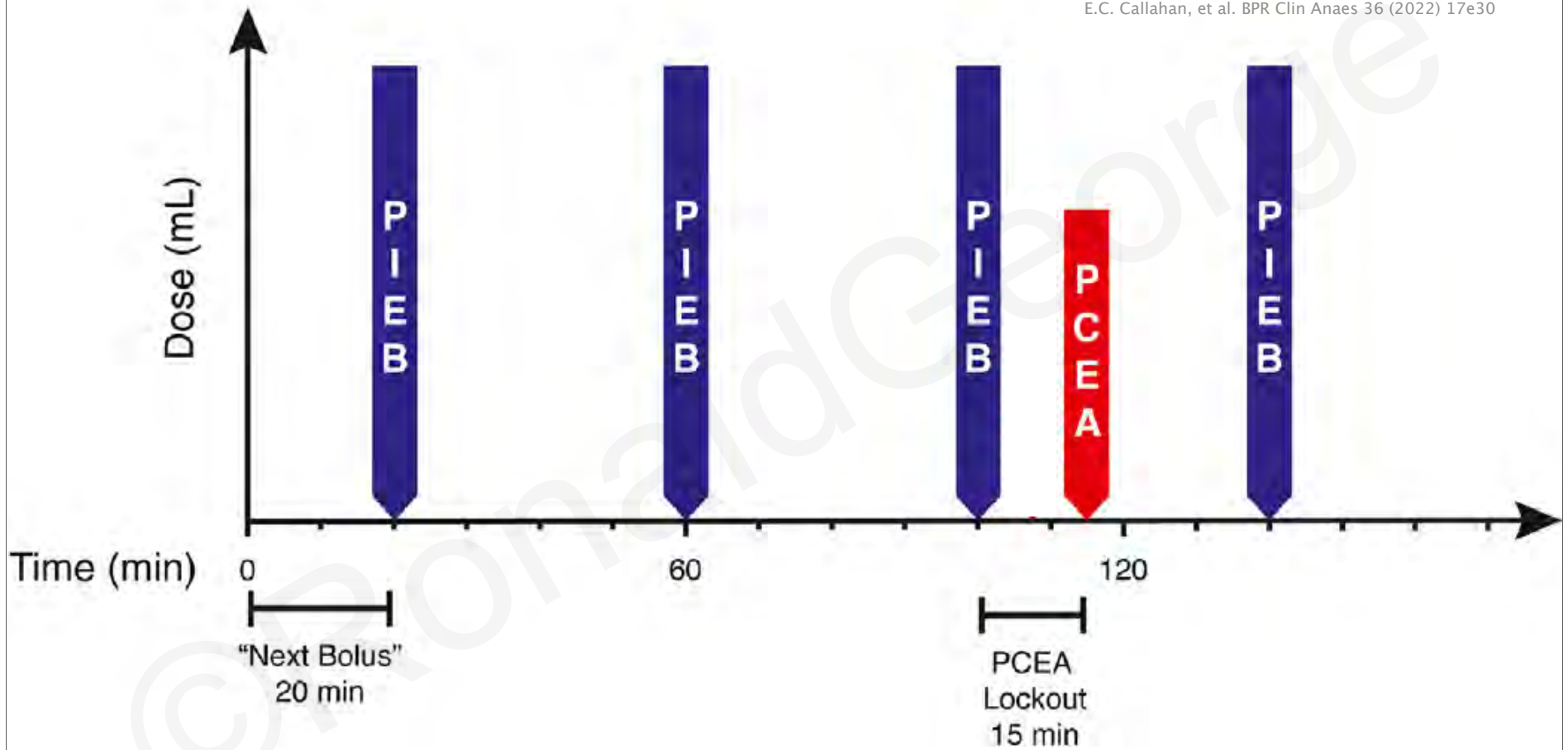
ANESTHESIA & ANALGESIA





Kaynar et al, Anesth Analg 1999;89
 Rusha et al. SOAP 2019 T210-187
 Hogan, Reg Anesth Pain Med 2002;27

Beyond Pain Relief - Personalised Labour Analgesia

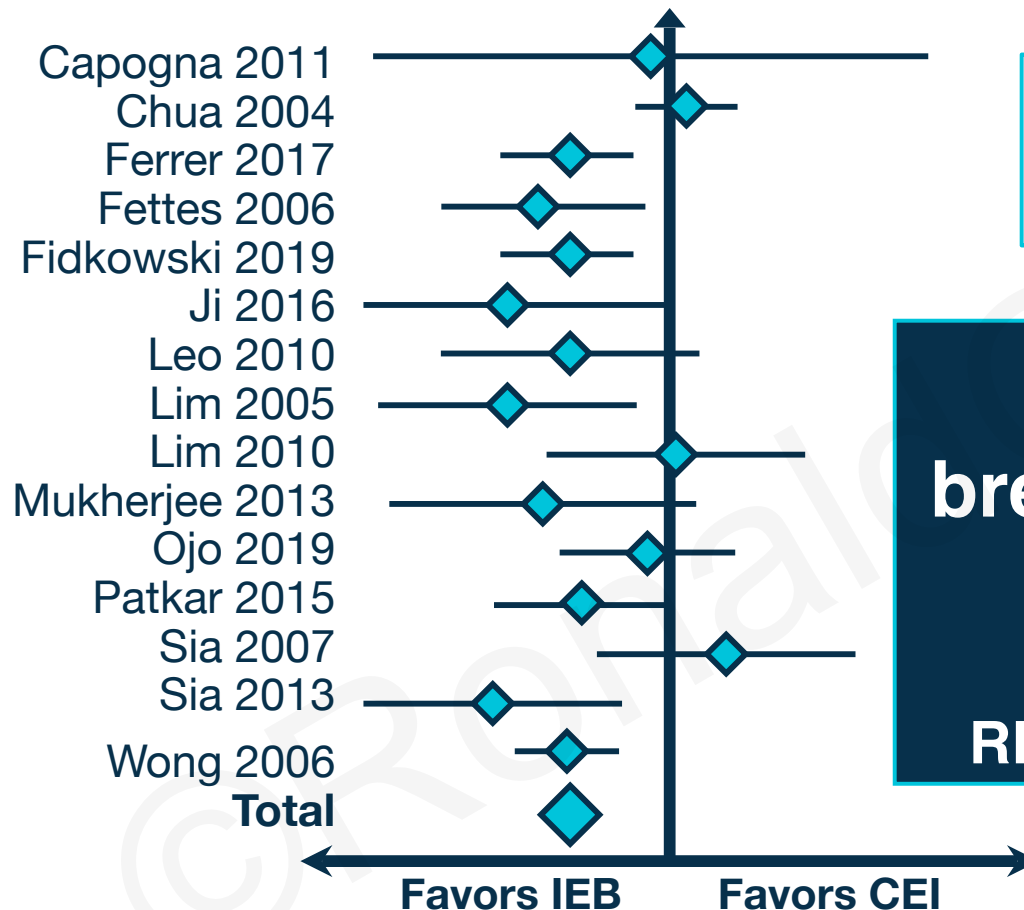


OBSTETRIC ANAESTHESIA

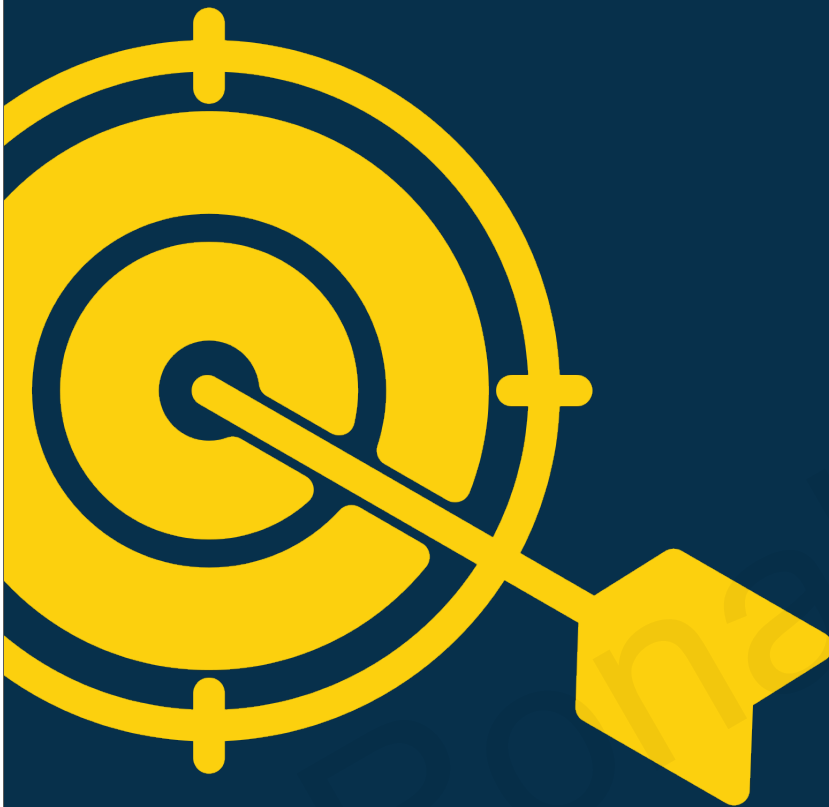
Comparative analgesic efficacy and safety of intermittent local anaesthetic epidural bolus for labour: a systematic review and meta-analysis

Nasir Hussain¹, Christopher M. Lagnese¹, Blair Hayes¹, Nicolas Kumar¹, Tristan E. Weaver¹, Michael K. Essandoh¹, Joseph Reno¹, Robert H. Small¹ and Faraj W. Abdallah^{2,3,4,5,*}

Hussain et al. BJA 2020;125(4):560-79



**The risk of
breakthrough pain was
reduced by 38%
RR 0.62 95%CI (0.48 to 0.81)**



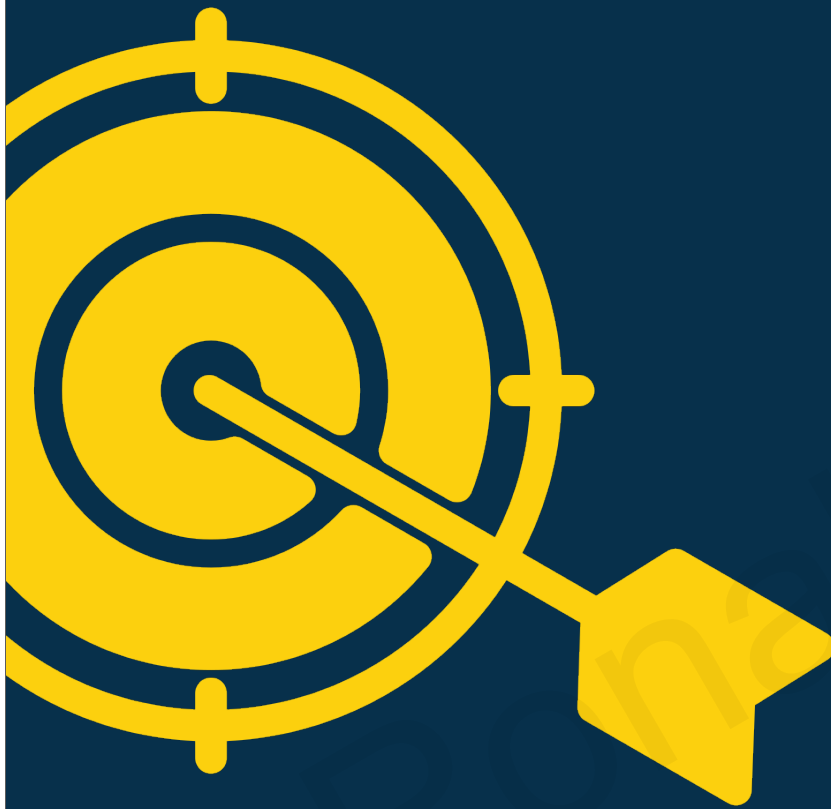
0.9 - 25 %
“Failure”

Agaram R et al. IJOA 2009;18:10–4
Eappen S et al. IJOA 1998;7:220–5

Paech MJ et al. IJOA 1998;7:5–11
Sng BL et al. IJOA 2018;34:28–36

Hess PE et al. A&A 2001;93:414–8
Le Coq G et al. CJA 1998;45:719–23

Pan PH et al. IJOA 2004;13:227–33



Success is not final Failure is not Fatal

Agaram R et al. IJOA 2009;18:10-4
Eappen S et al. IJOA 1998;7:220-5

Paech MJ et al. IJOA 1998;7:5-11
Sng BL et al. IJOA 2018;34:28-36

Hess PE et al. A&A 2001;93:414-8
Le Coq G et al. CJA 1998;45:719-23

Pan PH et al. IJOA 2004;13:227-33



Technical Factors



Anatomical Factors



Pharmacologic
Factors



Obstetric Factors



Cognitive/Systems
Factors



EJA

Eur J Anaesthesiol 2025; **42**:96–112

GUIDELINES

ESAIC focused guidelines for the management of the failing epidural during labour epidural analgesia

Nicolas Brogly , Isabel Valbuena Gómez, Arash Afshari, Kim Ekelund, Peter Kranke, Carolyn F. Weiniger, Nuala Lucas, Pierre-Yves Dewandre, Emilia Guasch Arevalo, Alexander Ioscovich, Andrea Kollmann, Kim Lindelof, Sharon Orbach-Zinger, Stephanie Reis, Oscar van den Bosch, Marc Van de Velde and Carolina S. Romero

- **Anesthesiologists must take responsibility**
- **Regular & objective assessments of pain**
- **Algorithm/protocol driven management**



Failed Epidural Catheter Algorithms



**Context
Sensitive**



**Culturally
Appropriate**



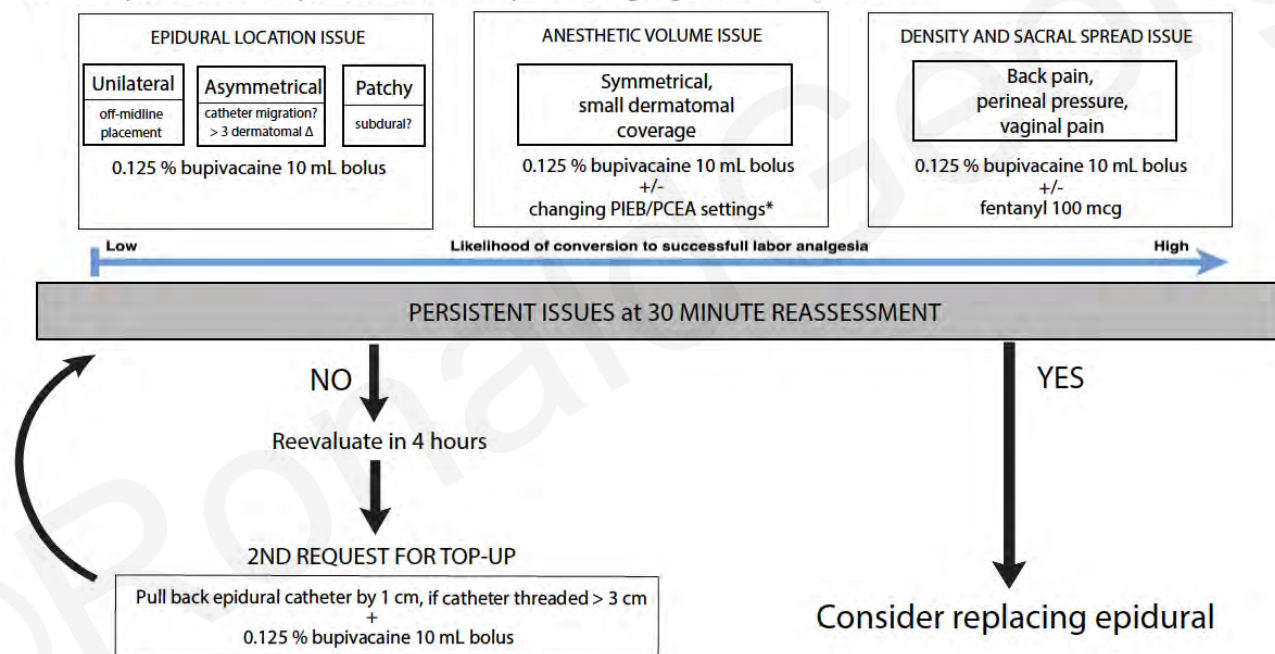
**Pharmacologically
Relevant**



LABOUR EPIDURAL TROUBLESHOOTING GUIDE

- 1) At time of placement, educate patient regarding epidural function and PCEA demand dose.
- 2) Check on patients within 1 hour of initial epidural placement.
Evaluate for and document quality of block (sensory coverage and motor function).
- 3) Evaluate epidural every 4 hours.

At time of re-evaluation for inadequate epidural, rule-out issues with CADD pump and epidural catheter (kinks, catheter connection, insertion site, etc). Evaluation should include: dermatomal and motor assessment, pain intensity, cervical dilation, and PCEA bolus frequency & pump interrogation. Determine epidural issue and implement intervention. Aspirate before giving boluses in 5 mL increments.



* Communicate during sign-out if PIEB settings have changed from standard PIEB settings or the solution has changed. Possible PIEB changes: shorten PIEB interval by 5-10 minutes **OR** increase PCEA delivery volume by 1-2 mL. Chart should reflect patient assessment and epidural changes.



LABOUR EPIDURAL TROUBLESHOOTING GUIDE

- 1) At time of placement, educate patient regarding epidural function and PCEA demand dose.
- 2) Check on patients within 1 hour of initial epidural placement.
Evaluate for and document quality of block (sensory coverage and motor function).
- 3) Evaluate epidural every 4 hours.

At time of re-evaluation for inadequate epidural, rule-out issues with CADD pump and epidural catheter (kinks, catheter connection, insertion site, etc). Evaluation should include: dermatomal and motor assessment, pain intensity, cervical dilation, and PCEA bolus frequency & pump interrogation. Determine epidural issue and implement intervention. Aspirate before giving boluses in 5 mL increments.

- PCEA Education
- Start strong - check within 1 hour
- Evaluate frequently
- Pump interrogation
- Catheter inspection
- Patient assessment (pain, motor, dermatome, cervix)



EPIDURAL LOCATION ISSUE

Unilateral off-midline placement	Asymmetrical catheter migration? > 3 dermatomal Δ	Patchy subdural?
--	--	----------------------------

0.125 % bupivacaine 10 mL bolus

ANESTHETIC VOLUME ISSUE

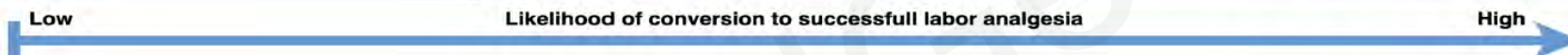
Symmetrical,
small dermatomal
coverage

0.125 % bupivacaine 10 mL bolus
+/-
changing PIEB/PCEA settings*

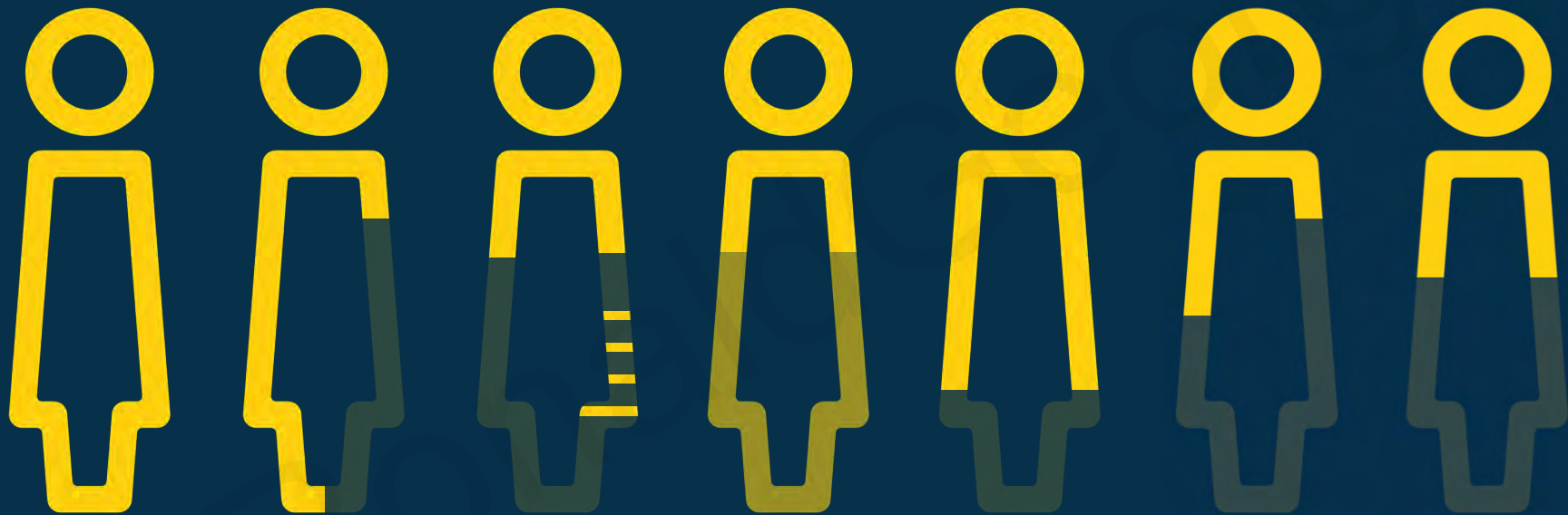
DENSITY AND SACRAL SPREAD ISSUE

Back pain,
perineal pressure,
vaginal pain

0.125 % bupivacaine 10 mL bolus
+/-
fentanyl 100 mcg



Epidural Failure Phenotypes



NO BLOCK

UNILATERAL

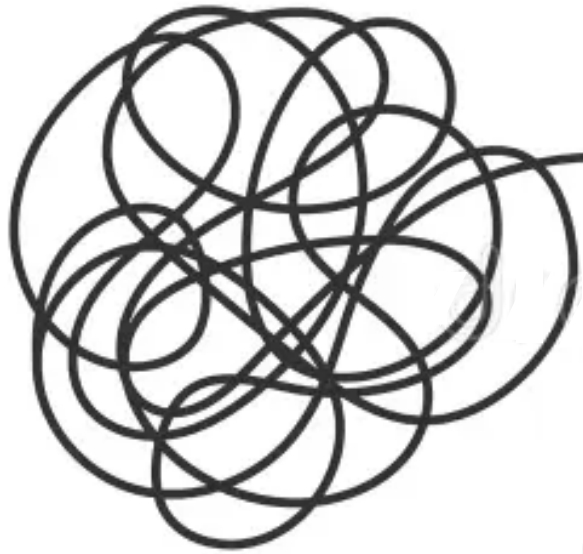
PATCHY

DENSITY

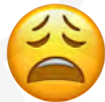
LOW

ASYMMETRICAL

NORMAL



No plan
Repeated Top-ups



Structured
Decisive



Neuraxial Analgesia - Best Experiences

- **Effective** neuraxial labour analgesia on request & **responsive**
- Combined spinal epidural (**CSE**) analgesia
- Programmed intermittent epidural bolus (**PIEB**)
- Patient controlled epidural analgesia (**PCEA**)
- **Low concentration** local anesthetic solutions with opioids
- Labour epidural block **management/**
replacement



Experience



Effective



Efficiency



Safety



Reliability



**Patient
Experience**



**Systems-based
Anesthesia**

Beyond Pain Relief

**Personalising Labour Analgesia for the
Modern Obstetric Patient**

Ron.George@uhn.ca



**Sinai
Health**

Mount Sinai Hospital
Joseph & Wolf Lebovic Health Complex



**Department of
Anesthesia & Pain
Management**



Anesthesiology & Pain Medicine
UNIVERSITY OF TORONTO