Disclosures

Off-label use of drugs may be discussed
Objectives

By the end of this lecture, participants should be able to

• Cite current knowledge regarding use of oxytocin for postpartum hemorrhage prophylaxis, including dose and side effects.

• Examine the reasoning behind choice of vasopressors (epheedrine and phenylephrine) for the treatment of neuraxial-anesthesia induced hypotension during cesarean delivery.
Objectives

• Explain the benefits and limits of crystalloid and colloid administration for the prevention of hypotension during spinal anesthesia for cesarean delivery.

• Examine current knowledge regarding risk of neuraxial infections associated with neuraxial procedures, and recommended techniques to minimize the risk of infection.

• Cite current evidence regarding neuraxial anesthesia/analgesia for external cephalic version of breech presentation.
- Oxytocin
- Phenylephrine vs. ephedrine
- Crystalloid vs. colloid
- Neuraxial infections
- External cephalic version
Question (raise your hands):

Who routinely adds oxytocin 20 IU to a one-liter bag of fluid and runs it in wide open after delivery?
Oxytocin 2.5 IU bolus
Blinded RCT

N = 40 / 10 non-pregnant

Oxytocin 10 IU vs. methylergometrine 0.2 mg IV bolus

Primary outcome: ST segment changes
Oxytocin: ST Segment Depression

Br J Anaesth 208;100:683-9
Oxytocin ED$_{90}$ (Elective)

ED$_{90}$: 0.35 IU (95% CI 0.18-0.52)

Carvalho JA. Obstet Gynecol 2004;104:1005
Oxytocin Bolus: Dose Response

Butwick AJ. Br J Anaesth 2010;104:338
Up-down determination of the ED$_{90}$ of oxytocin infusions for the prevention of postpartum uterine atony in parturients undergoing Cesarean delivery

Ronald B. George, MD · Dolores McKeen, MD · Anna C. Chaplin, BSc · Lynne McLeod, MD

• Prospective, biased-coin up-down sequential allocation dose-finding study
• Elective cesarean delivery
• Outcome: ED$_{90}$ of oxytocin infusion for “satisfactory uterine tone”
Oxytocin Infusion: $\text{ED}_{90}$

ED$_{90}$:
0.29 IU/min (95% CI 0.15 – 0.43)
Oxytocin ED$_{90}$ (following labor)

ED$_{90}$: 2.99 IU (95% CI 2.32-3.67)

Balki M. Obstet Gynecol 2006;107:45
Oxytocin infusion: ED_{90} (following labor)

**Control Group**

ED90: 16.2 IU / h
(95% CI 13.1-19.3)

**Experimental Group**

ED90: 44.2 IU / h
(95% CI 33.8 to 55.6)

- **Oxytocin dose (Units/h)**
- **Number**
- **Successful uterine tone after 4 minutes**
- **Unsuccessful uterine tone after 4 minutes**

Lavoie A 2013. Unpublished
• RCT: N = 143
• Cesarean delivery: 1 risk factor for uterine atony
• Oxytocin 5 IU vs. NS over 30 s
• All had oxytocin 40 IU for 30 min, then 20 IU for 8 h
• Primary outcome: need for additional uterotonics
### Table 3. Outcome Measures

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Oxytocin (n = 70)</th>
<th>Saline (n = 73)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional uterotonics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st h, n (%)</td>
<td>12 (17)</td>
<td>15 (21)</td>
<td>0.38a</td>
</tr>
<tr>
<td>24 h, n (%)</td>
<td>20 (29)</td>
<td>29 (40)</td>
<td>0.11a</td>
</tr>
<tr>
<td>Additional oxytocin, mean dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st h (IU)</td>
<td>16.5 (12.5)</td>
<td>20.6 (21.2)</td>
<td>0.28c</td>
</tr>
<tr>
<td>24 h (IU)</td>
<td>44.0 (42.0)</td>
<td>45.1 (37.5)</td>
<td>0.47c</td>
</tr>
<tr>
<td>Uterotonics other than oxytocin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-Methyl PG F&lt;sub&gt;2α&lt;/sub&gt;</td>
<td>2</td>
<td>2</td>
<td>0.67d</td>
</tr>
<tr>
<td>Ergonovine</td>
<td>1</td>
<td>1</td>
<td>0.74d</td>
</tr>
<tr>
<td>Misoprostol</td>
<td>1</td>
<td>3</td>
<td>0.93d</td>
</tr>
<tr>
<td>Estimated blood loss (mL)</td>
<td>812 (761–862)</td>
<td>902 (825–980)</td>
<td>0.92c</td>
</tr>
<tr>
<td>No. needing blood transfusion</td>
<td>1 (1.4)</td>
<td>3 (4.1)</td>
<td>0.33d</td>
</tr>
</tbody>
</table>
Oxytocin bolus versus oxytocin bolus and infusion for control of blood loss at elective caesarean section: double blind, placebo controlled, randomised trial

Sharon R Sheehan research fellow in obstetrics¹, Alan A Montgomery reader in health services

• RCT, elective cesarean delivery, N = 2069
• Oxytocin 5 IU over 1 min, 40 IU for 4 h vs. oxytocin 5 IU over 1 min, NS for 4 h
• Primary outcome: EBL > 1000 mL, additional uterotonic
<table>
<thead>
<tr>
<th></th>
<th>Bolus and infusion No (%)</th>
<th>Bolus only No (%)</th>
<th>Adjusted odds ratio* (95% CI)</th>
<th>P value</th>
<th>Number needed to treat (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major obstetric haemorrhage (blood loss &gt;1000 mL)†</td>
<td>158/1007 (15.7)</td>
<td>159/994 (16.0)</td>
<td>0.98 (0.77 to 1.25)</td>
<td>0.86</td>
<td>–</td>
</tr>
<tr>
<td>Additional uterotonic agent‡</td>
<td>126/1033 (12.2)</td>
<td>189/1025 (18.4)</td>
<td>0.61 (0.48 to 0.78)</td>
<td>&lt;0.001</td>
<td>16 (11 to 32)</td>
</tr>
</tbody>
</table>

Sheehan SR. BMJ 2011;343:d4661
Oxytocin: Conclusions

- Low bolus dose ($\leq 3$ IU) or infusion ($0.3 - 0.4$ IU/h)
- Laboring $>$ elective
- Infusion $>$ bolus without infusion
- Adding bolus before infusion does not improve outcome
Oxytocin
- Phenylephrine vs. ephedrine
- Crystalloid vs. colloid
- Neuraxial infections
- External cephalic version
Question (raise your hands):

Who routinely uses EPHEDRINE for preventing/treating hypotension associated with spinal anesthesia in CS patients?

Who routinely uses PHENYLEPHRINE for preventing/treating hypotension associated with spinal anesthesia in CS patients?
Ephedrine vs. Phenylephrine

Weighted mean difference (umbilical cord arterial blood pH)

- Favours ephedrine
- Favours phenylephrine

Alahuhta (6)
Hall (8)
LaPorta (12)
Moran (9)
Pierce (11)
Thomas (7)
Overall effect
Phenylephrine vs. Ephedrine

Placental transfer

Fetal metabolism

Ngan Kee W. Anesthesiology 2009;111:506
Phenylephrine vs. Ephedrine

Cardiac Output

Stroke Volume / SVR

Dyer R. Anesthesiology 2009;111:753
## How much phenylephrine?

<table>
<thead>
<tr>
<th></th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA pH</td>
<td>7.30 (0.03)</td>
<td>7.30 (0.03)</td>
<td>7.32 (0.04)</td>
<td>0.036</td>
</tr>
<tr>
<td>Nausea (n)</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Ngan Kee WD. Br J Anaesth 2004
**Phenylephrine Infusion Rate**

*P < 0.05 vs. PE 25 and PE 50*

---

**Table 2. Hemodynamic Variables**

<table>
<thead>
<tr>
<th></th>
<th>PE 0 (n = 20)</th>
<th>PE 25 (n = 20)</th>
<th>PE 50 (n = 20)</th>
<th>PE 75 (n = 19)</th>
<th>PE 100 (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of interventions</td>
<td>2 (1–3.5)</td>
<td>0.5 (0–4.5)</td>
<td>1.5 (0–3.5)</td>
<td>4 (1–6)</td>
<td>5 (4–6)*</td>
</tr>
<tr>
<td>Infusion permanently stopped</td>
<td>1 (5%)</td>
<td>5 (25%)</td>
<td>3 (15%)</td>
<td>9 (47%)</td>
<td>15 (68%)†</td>
</tr>
<tr>
<td>Predelivery hypotension</td>
<td>16 (80%)†</td>
<td>6 (30%)</td>
<td>3 (15%)</td>
<td>2 (11%)</td>
<td>18 (82%)</td>
</tr>
<tr>
<td>Predelivery hypertension</td>
<td>2 (10%)§</td>
<td>5 (25%)</td>
<td>8 (40%)</td>
<td>14 (74%)</td>
<td>2 (22%)</td>
</tr>
<tr>
<td>Postdelivery hypotension</td>
<td>9 (45%)</td>
<td>5 (25%)</td>
<td>1 (5%)</td>
<td>4 (21%)</td>
<td>8 (36%)</td>
</tr>
<tr>
<td>Postdelivery hypertension</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>5 (25%)</td>
<td>2 (11%)</td>
<td>0 (0–0)</td>
</tr>
<tr>
<td>No. of hypotensive episodes</td>
<td>2 (1–3)¶</td>
<td>0 (0–2)</td>
<td>0 (0–0)</td>
<td>0 (0–1)</td>
<td>3 (2–6)</td>
</tr>
<tr>
<td>No. of hypertensive episodes</td>
<td>0 (0–0)#</td>
<td>0 (0–0)**</td>
<td>0.5 (0–2)††</td>
<td>2 (0–5)</td>
<td>6 (32%)</td>
</tr>
<tr>
<td>Maximum percent change in SBP</td>
<td>8.3 (4.7–15.5)††</td>
<td>12.7 (5.0–19.8)§§</td>
<td>22 (14.4–27.1)</td>
<td>29.3 (19.9–37.2)</td>
<td>33.2 (23.9–46.5)</td>
</tr>
<tr>
<td>Minimum percent change in SBP</td>
<td>−26.9 (−30.5, −19.1)¶¶</td>
<td>−19.2 (−22.5, −13.1)</td>
<td>−9.8 (−15.1, −5.5)</td>
<td>−8.3 (−19.7, −0.4)</td>
<td>−11.8 (−17.6, −6.2)</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>1 (5%)</td>
<td>3 (15%)</td>
<td>0 (0%)</td>
<td>6 (32%)</td>
<td>7 (32%)</td>
</tr>
</tbody>
</table>

Allen TK. Anesth Analg 2010:111;1221
Phenylephrine Infusion Rate: Median Absolute Performance Error

Allen TK. Anesth Analg 2010:111;1221
Percentage performance error

A. PE 0

B. PE 25

C. PE 50

D. PE 75

E. PE 100

Minutes After Spinal

% Performance Error
Phenylephrine vs. ephedrine: Conclusions

Phenylephrine

- Higher umbilical cord pH
- Less nausea and vomiting
- CO and HR move in the same direction
  - Low dose phenylephrine to move HR back to baseline
Oxytocin
• Phenylephrine vs. ephedrine
• Crystalloid vs. colloid
• Neuraxial infections
External cephalic version
Question (raise your hands):

Who administers a crystalloid bolus BEFORE initiation of spinal anesthesia?
Wollman SB. Anesthesiology 1968;29:374

Note: After hypotension 1000 cc D 5% in L/R was given.
Crystalloid Kinetics

1.2 mL/kg/min for 5 min

Minutes

Plasma Dilution

Brauer LP. Anesth Analg 2002;95:1547
Fluid Management

• Crystalloid preload vs. coload
• Colloid vs. crystalloid preload
• Colloid preload vs. coload
• Crystalloid vs. colloid coload
## Crystalloid Preload vs. Coload: 20 mL/kg

<table>
<thead>
<tr>
<th></th>
<th>Coload N = 25</th>
<th>Preload N = 25</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume (mL)</strong></td>
<td>1386 ± 177</td>
<td>1474 ± 206</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Duration infusion (min)</strong></td>
<td>9.8 ± 4</td>
<td>20 ± 0</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Ephedrine unit doses (n)</strong></td>
<td>0 (0-5)</td>
<td>2 (0-13)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Ephedrine (mg)</strong></td>
<td>0 (0-10)</td>
<td>10 (0-20)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Dyer RA. Anaesth Intensive Care 2004
Crystalloid Pre-load vs. Co-load

Preload or coload for spinal anesthesia for elective Cesarean delivery

The Incidence of Hypotension

<table>
<thead>
<tr>
<th>Study</th>
<th>Co-load n/N</th>
<th>Preload n/N</th>
<th>OR (random) 95% CI</th>
<th>Weight %</th>
<th>OR (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalloid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyer</td>
<td>15/25</td>
<td>21/25</td>
<td>12.04</td>
<td>0.29</td>
<td>[0.08, 1.09]</td>
</tr>
<tr>
<td>Cardoso</td>
<td>9/40</td>
<td>5/20</td>
<td>13.14</td>
<td>0.87</td>
<td>[0.25, 3.06]</td>
</tr>
<tr>
<td>Mercier</td>
<td>15/24</td>
<td>12/24</td>
<td>14.78</td>
<td>1.67</td>
<td>[0.53, 5.27]</td>
</tr>
<tr>
<td>Bouchnak</td>
<td>29/30</td>
<td>26/30</td>
<td>5.18</td>
<td>4.46</td>
<td>[0.47, 42.51]</td>
</tr>
<tr>
<td>Subtotal</td>
<td>68/119</td>
<td>64/99</td>
<td></td>
<td>45.13</td>
<td>0.99 [0.37, 2.67]</td>
</tr>
</tbody>
</table>

Test for heterogeneity: $\chi^2 = 5.86$, df = 3 ($P = 0.12$), $I^2 = 48.8\%$
Test for overall effect: $Z = 0.02$ ($P = 0.99$)
Fluid Management

- Crystalloid preload vs. coload
- Colloid vs. crystalloid preload
- Colloid preload vs. coload
- Crystalloid vs. colloid coload
Crystalloid vs. Colloid Preload

Morgan PJ. Anesth Analg 2001

![Graph showing comparison between crystalloid and colloid preload.](image)
Fluid Management

- Crystalloid preload vs. coload
- Colloid vs. crystalloid pre-load
- Colloid preload vs. coload
- Crystalloid vs. colloid coload
Colloid Preload vs. Coload

Teoh WH. Anesth Analg 2009;108:1592

15 mL/kg
### The Incidence of Hypotension

<table>
<thead>
<tr>
<th>Study</th>
<th>Co-load (n/N)</th>
<th>Preload (n/N)</th>
<th>OR (random) 95% CI</th>
<th>Weight %</th>
<th>OR (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teoh</td>
<td>15/20</td>
<td>18/20</td>
<td>7.75 [0.33, 1.97]</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Carvalho</td>
<td>7/23</td>
<td>11/23</td>
<td>13.85 [0.48, 1.60]</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Sahar Siddik</td>
<td>66/88</td>
<td>61/90</td>
<td>26.45 [1.43, 2.74]</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>Nishikawa</td>
<td>3/18</td>
<td>2/18</td>
<td>6.81 [1.60, 10.94]</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td></td>
<td></td>
<td>54.87 [0.90, 1.86]</td>
<td>0.90</td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity: $\chi^2 = 4.26$, df = 3 (P = 0.23), $I^2 = 29.6\%$

Test for overall effect: $Z = 0.29$ (P = 0.77)

---

Banjeree A. Can J Anaesth 2010;57:24-31
Fluid Management

- Crystalloid preload vs. coload
- Colloid vs. crystalloid preload
- Colloid preload vs. coload
- Crystalloid vs. colloid coload
Maternal Cardiac Output Changes After Crystalloid or Colloid Coload Following Spinal Anesthesia for Elective Cesarean Delivery: A Randomized Controlled Trial

Sarah McDonald, FRCA,* Roshan Fernando, FRCA,* Keri Ashpole, FRCA,* and Malachy Columb, FRCA†

- RCT, elective cesarean delivery, N = 60
- Colloid 1-L vs. crystalloid 1-L coload
- Primary outcome: cardiac outcome
- Secondary outcomes: phenylephrine dose
<table>
<thead>
<tr>
<th></th>
<th>HS group (n = 30)</th>
<th>HES group (n = 30)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total phenylephrine dose: spinal injection to delivery (mg)</td>
<td>2.59 (1.05)</td>
<td>2.21 (0.90)</td>
<td>0.14</td>
</tr>
<tr>
<td>≥1 boluses of phenylephrine, n (%)</td>
<td>8 (27%)</td>
<td>3 (10%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Hypotension, a n (%)</td>
<td>18 (60%)</td>
<td>12 (40%)</td>
<td>0.20</td>
</tr>
</tbody>
</table>
Crystalloid vs. Colloid: Conclusions

• Crystalloid preload has no advantage over colloid preload
• Colloid preload > crystalloid preload
• No difference between colloid preload and colloid coload
• No difference between colloid and crystalloid coload
• Fluid loading does not reliably prevent hypotension
• RCT, N = 112
• Crystalloid coload (~ 2 L) vs. none
• Phenylephrine infusion starting 100 μg/min
• Primary outcome: incidence of hypotension (80% baseline)
Ngan Kee WD. Anesthesiology 2005;103:744

2% vs. 28%

$P < 0.001$
Question (raise your hands):

Who uses POVIDONE IODINE for skin prep before an epidural or spinal procedure?
# ASA Closed Claims Database

**Table 5. Injuries to the Neuraxis in Regional Anesthesia Claims, 1980–1999 (n = 84)**

<table>
<thead>
<tr>
<th></th>
<th>Obstetric (n = 26), No. (% Cases)</th>
<th>Nonobstetric (n = 58), No. (% Cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma</td>
<td>3 (12)</td>
<td>33 (57)</td>
</tr>
<tr>
<td>Unknown</td>
<td>4 (15)</td>
<td>9 (16)</td>
</tr>
<tr>
<td>Anterior spinal artery syndrome</td>
<td>2 (8)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>6 (23)</td>
<td>2 (3)§</td>
</tr>
<tr>
<td>Spinal cord infarct</td>
<td>2 (8)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Abscess</td>
<td>6 (23)</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Herniated disc</td>
<td>2 (8)</td>
<td>3 (5)</td>
</tr>
<tr>
<td>Other causes</td>
<td>1 (4)</td>
<td>4 (7)</td>
</tr>
</tbody>
</table>

*Estimated incidence: 1:302,757*

Lee LA. Anesthesiology 2004;101:143

Reynolds F. Anesthesiol Clin 2008;26:23
Sources of Infection

• Spinal-epidural abscess: skin flora
  – *Staph aureus*
• RCT, surgical wound prep
  • chlorhexidine-alcohol scrub (n=409) vs. povidone-iodine (n=440)
• Primary outcome: incidence of infections
Incidence of infections lower in chlorhexidine group (relative risk 0.59, 95% CI: 0.41-0.85)
Practice Advisory for the Prevention, Diagnosis, and Management of Infectious Complications Associated with Neuraxial Techniques

A Report by the American Society of Anesthesiologists Task Force on Infectious Complication.

- Aseptic techniques should always be used during the preparation of equipment (e.g., ultrasound) and the placement of neuraxial needles and catheters, including the following:
  - Removal of jewelry (e.g., rings and watches), hand washing, and wearing of caps, masks (covering both mouth and nose and consider changing before each new case), and sterile gloves.
  - Use of individual packets of antiseptics for skin preparation.
  - Use of chlorhexidine (preferably with alcohol) for skin preparation, allowing for adequate drying time. §§
  - Sterile draping of the patient.
  - Use of sterile occlusive dressings at the catheter insertion site.
Maximal barrier precautions involve full hand washing, the wearing of sterile gloves and gown, a cap, mask and the use of a large sterile drape [42]. The skin entry site should be cleaned with an alcoholic chlorhexidine gluconate solution or alcoholic povidone-iodine solution [43]. The antiseptic should be allowed to dry before proceeding.

Certain invasive anaesthetic procedures require this optimum aseptic technique:

- Insertion of central venous catheters.
- Spinal, epidural and caudal procedures.
Sources of Infection

• Spinal-epidural abscess: skin flora
  – *Staph aureus*

• Meningitis
  – *Strep viridans*

- 2 anesthesiologists / 2 hospitals
- 5 cases of meningitis (3 CSE, 2 SAB)
- Onset of symptoms 13 – 21 h
- One death (26 h)
- *Strep salivarius* 4/5
- One anesthesiologist did not wear a mask
Meningitis Case Clusters

• 4 cases of viridans streptococci meningitis after spinal anesthesia in 15 months

• One anesthesiologist
  – Recurrent pharyngitis
  – No handwashing
  – Did not remove jewelry
  – Did not wear a face mask
  – Wore sterile gloves

Schneeberger PM. Infection 1996;24:29
Practice Advisory for the Prevention, Diagnosis, and Management of Infectious Complications Associated with Neuraxial Techniques

A Report by the American Society of Anesthesiologists Task Force on Infectious Complications:

- Aseptic techniques should always be used during the preparation of equipment (e.g., ultrasound) and the placement of neuraxial needles and catheters, including the following:
  - Removal of jewelry (e.g., rings and watches), hand washing, and wearing of caps, masks (covering both mouth and nose and consider changing before each new case), and sterile gloves.
  - Use of individual packets of antiseptics for skin preparation.
  - Use of chlorhexidine (preferably with alcohol) for skin preparation, allowing for adequate drying time.§§
  - Sterile draping of the patient.
  - Use of sterile occlusive dressings at the catheter insertion site.
2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee

Acknowledgement: The authors and HICPAC gratefully acknowledge Dr. Larry Strausbaugh for his many contributions and valued guidance in the preparation of this guideline.


venous catheters \(^9\). In October 2005, the Healthcare Infection Control Practices Advisory Committee (HICPAC) reviewed the evidence and concluded that there is sufficient experience to warrant the additional protection of a face mask for the individual placing a catheter or injecting material into the spinal or epidural space.
Neuraxial Infection: Conclusions

• Skin prep solution: Chlorhexidine with alcohol

• Anesthesiologist: should wear masks
Oxytocin
- Phenylephrine vs. ephedrine
- Crystalloid vs. colloid
- Neuraxial infections
- External cephalic version
Question (raise your hands):

Who works in an institution that offers ECV for breech presentation?

Who offers NEURAXIAL ANALGESIA/ANESTHESIA for attempted ECV in their institution?
Anesthetic dose neuraxial blockade increases the success rate of external fetal version: a meta-analysis
À dose anesthésique, les blocs périmédullaires accroissent le taux de succès des versions fœtales: une méta-analyse

Anne Lavoie, MD · Joanne Guay, MD

- 7 studies, N = 681
- Neuraxial analgesia/anesthesia vs. no neuraxial
- Primary outcome: success ECV
### Effects of central neuraxial blocks on the success rate of fetal versions

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<th>Group by Dose</th>
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<tr>
<td>Analgesic</td>
<td>Delisle</td>
<td>1.363, 0.936, 1.984, 0.106</td>
<td>41 / 99, 31 / 102</td>
<td>RR 1.36, 95% CI 1.01 – 1.88, P = 0.042</td>
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<td>Analgesic</td>
<td>Dugoff</td>
<td>1.040, 0.666, 1.624, 0.863</td>
<td>22 / 50, 22 / 52</td>
<td>RR 1.04, 95% CI 0.67 – 1.62, P = 0.80</td>
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<td>Analgesic</td>
<td>Hollard</td>
<td>1.006, 0.542, 1.867, 0.985</td>
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<td>RR 1.01, 95% CI 0.51 – 2.02, P = 0.98</td>
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<td>Analgesic</td>
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<td>1.197, 0.744, 1.926, 0.459</td>
<td>22 / 48, 18 / 47</td>
<td>RR 1.19, 95% CI 0.71 – 2.01, P = 0.52</td>
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<td>Analgesic</td>
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<td>1.182, 0.940, 1.485, 0.152</td>
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<td>2.119, 1.241, 3.620, 0.006</td>
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**Overall**

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**Mixed effects models**

RR 1.44; 95% CI 1.16 – 1.79; P = 0.001
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Mixed effects models
Neuraxial Analgesia: Success
Lavoie A. Can J Anaesth 2010;57;408-14

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Mixed effects models

RR 1.95; 95% CI 1.46 – 2.60; P < 0.001
A Cost Analysis of Neuraxial Anesthesia to Facilitate External Cephalic Version for Breech Fetal Presentation

Brendan Carvalho, MBCh, FRCA, * Jonathan M. Tan, MD, MPH, † Alex Macario, MD, MBA, * Yasser Y. El-Sayed, MD, * and Pervez Sultan, MBChB, FRCA ‡
Neuraxial Analgesia: Cost

Breech

ECV

Successful ECV

VD

EM CD

Unsuccessful ECV

VD

Elective CD

EM CD

Rpt ECV

Elective CD

EM CD

Breech VD

No ECV

As for “No ECV”

Carvalho B. Anesth Analg 2013;117:155-9
Neuraxial Analgesia: Cost
Carvalho B. Anesth Analg 2013;117:155-9

• 6 studies, N = 508
• Mean ECV success rate
  – with analgesia 60% (range 44% - 87%)
  – without analgesia 38% (range 31% - 58%)
• Mean delivery cost $8931/$9207
• Difference $-276 (2.5^{th}-97.5^{th} CI $-720 to $112)
- Oxytocin
- Phenylephrine vs. ephedrine
- Crystalloid vs. colloid
- Neuraxial infections
- External cephalic version
Update in Obstetric Anesthesia

Conclusions

- Oxytocin: Low-dose infusion/± small bolus
- Phenylephrine > ephedrine
  - Infusion 25 – 50 µg/min
- Crystalloid coload
- Chlorhexidine with alcohol skin prep
- Neuraxial anesthesia/analgesia for ECV