Decision to Incision Timing with Terminal Bradycardia: How Long is Too Long?

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- No financial disclosures related to this talk
- Medical Advisor to Celmatix, Mindchild
- Bob’s Red Mill

Overview
- 30 minute rule?
  - History
- Biology / pathophysiology
- Epidemiology
- Quality Improvement
- Management

Bradycardia
How long would it take to achieve delivery?

- A. 10 minutes or less
- B. 15 minutes
- C. 20 minutes
- D. 30 minutes
- E. Longer

Minimum time until injury?

- A. 10 minutes or less
- B. 15 minutes
- C. 20 minutes
- D. 30 minutes
- E. Longer

Disconnect?

- If injury occurs faster than we can intervene, then why a 30-minute rule?
- Should it be shorter?

The 30 minute rule

- Established as a time threshold for cesarean delivery to occur – 1980s
- ACOG, RCOG, etc
- Became a more prominent rule of the land in the late 1990s

Tuffnell et al. BMJ 2001;322:1330–3
Why 30 minutes?

- Improving outcomes?
- Feasibility?
- Whim?

30 minutes in nonemergent?

The time required to extract an infant from a hostile in utero environment is a frequent issue in medical negligence cases. The American College of Obstetricians and Gynecologists and the American Academy of Pediatrics suggest a time guideline of 30 minutes from decision for Cesarean delivery to the beginning (incision) of the procedure. This time frame is based on survey data from hospitals throughout the United States and is not based on clinical outcomes or the pathophysiology of obstetric events.

Sabol BA, Lim J, Gregory T, Caughey AB. Am J Obstet Gynecol, 2017

Lavery JP1, Janssen J, Hutchinson L.

Is the obstetric guideline of 30 minutes from decision to incision for Cesarean delivery clinically significant?
What time threshold?

- What outcomes are we interested in?
  - Mortality
    - Short-term (neonatal)
    - Long-term (infant and beyond)
  - Morbidity
    - HIE / CP
    - Seizures?
    - Apgars?
    - Cord gases

Prolonged decelerations

- 238 neonates w/ UA pH < 7.1
- Primary outcome – seizures from HIE
- Examined all gas features
  - pO2; pCO2; base excess, pH
- pH < 7.0 only was associated in MV model

References:

Williams KP1, Singh A. The correlation of seizures in newborn infants with significant acidosis at birth with umbilical artery cord gas values. Obstet Gynecol. 2002 Sep;100(3):557-60.

US, 1995-2005


### How long?

<table>
<thead>
<tr>
<th>Time ≥10 min</th>
<th>Time &lt;10 min</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=31 (%)</td>
<td>n=920 (%)</td>
<td></td>
</tr>
<tr>
<td>Acidemia ≤ 7.10 (n=12)</td>
<td>4 (12.9) 8 (0.9)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Acidemia ≤ 7.05 (n=4)</td>
<td>2 (6.5) 2 (0.2)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>APGAR 5min &lt; 7 (n=4)</td>
<td>2 (6.5) 2 (0.2)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Special Care* or NICU Admission (n=38)</td>
<td>5 (16.7) 33 (3.6)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>NICU Admission (n=11)</td>
<td>3 (10.0) 8 (0.9)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>


### Only Time?

- Are there other features that matter?
- Leung et al – decelerations
- Variability?
- Etiology – uterine rupture, abruption, etc.
- Heart rate?

### Variability

**Decreased variability before bradycardia**

Combined with no recovery of the bradycardia

mean pH 6.83 +/- 0.16

78% incidence of significant acidosis


Fetal heart rate parameters predictive of neonatal outcome in the presence of a prolonged deceleration.
**Heart Rate**

<table>
<thead>
<tr>
<th>Time until acidemia</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHR 80s</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FHR 70s</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FHR 60s</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FHR 50s</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FHR 40s</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>


**What threshold?**

- Given the data, what approach?
- Should there be a set time?
- Should the standard time differ?
  - Hospital size
  - Local geography / population
  - Level

**What to do?**

- **Is it a bradycardia?**
What to do?

Is it a bradycardia?

What to do?

Is it a bradycardia?

What to do?

Is it a bradycardia?

What to do?

Is it a bradycardia?
What to do – Parer case?

- What is the Baseline status?
- What is the Etiology?
- What needs to be done to achieve Delivery?
- BED

What to do?

- What is the Baseline status?
  - Decels
  - Variability
  - Meconium
  - Chorioamnionitis
  - Compromised mother or fetus?
    - Htn disorder; fetal anomaly; preterm
What to do?

What is the Etiology?
- Abruptio
- Tachysystole/Tetany
- Cord prolapse
- Uterine rupture
- Maternal
  - Hypotension (AFE); hypoxic (PE)
- Fetal
  - Oligo; arrhythmia; rapid descent

What to do?

What needs to be done to achieve Delivery?
- What is the exam? Include position
- Parity and prior OB Hx
- Patient BMI
- EFW
- Anesthesia?
- OR / staff?

What to do?

Individual level – BED
Hospital level
- Establish benchmarks
- Environment (Geography; Populations)
- Engineering (Internal and External)
Societal level
- Encourage collaboration
- Public Health

Can we reduce the length of time?

[Graph showing meeting the 30-minute standard]
Can we reduce the length of time?

- Can emergent cesareans be improved?
- Does it matter?

**TABLE 2**

<table>
<thead>
<tr>
<th>Variable</th>
<th>P1 n = 292</th>
<th>P2 n = 301</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean DDI, min</td>
<td>21.7 ± 9.1 (7–62)</td>
<td>12.3 ± 3.8 (5–30)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>ECS within DDI &lt;30 min</td>
<td>241 (82.5)</td>
<td>299 (99.3)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>ECS within DDI &lt;20 min</td>
<td>166 (56.8)</td>
<td>282 (93.7)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Mean surgery duration, min</td>
<td>35.3 ± 11.8 (18–105)</td>
<td>34.6 ± 18.9 (16–120)</td>
<td>.609</td>
</tr>
</tbody>
</table>

All data are shown as number (%) or mean ± standard deviation (range). Mean surgery duration (min) defined as the time interval from incision to skin closure.

DDI, decision-to-delivery interval; ECS, emergency cesarean section.

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Can we reduce the length of time?

**TABLE 4**

<table>
<thead>
<tr>
<th>Variable</th>
<th>P1 n = 292</th>
<th>P2 n = 301</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal hospitalization time, d</td>
<td>7.4 ± 11.1</td>
<td>6.6 ± 8.3</td>
<td>.290</td>
</tr>
<tr>
<td>NICU admission</td>
<td>86 (29.5)</td>
<td>78 (25.9)</td>
<td>.350</td>
</tr>
<tr>
<td>Umbilical cord pH &lt;7.1</td>
<td>31 (10.7)</td>
<td>16 (5.3)</td>
<td>.016</td>
</tr>
<tr>
<td>5-min Apgar score ≤7</td>
<td>17 (5.8)</td>
<td>7 (2.3)</td>
<td>.031</td>
</tr>
<tr>
<td>Respiratory morbidity</td>
<td>35 (12)</td>
<td>18 (6.0)</td>
<td>.01</td>
</tr>
<tr>
<td>Cerebral morbidity</td>
<td>4 (1.4)</td>
<td>3 (1)</td>
<td>.721</td>
</tr>
<tr>
<td>Neonatal sepsis</td>
<td>11 (3.8)</td>
<td>3 (1)</td>
<td>.026</td>
</tr>
<tr>
<td>Necrotizing enterocolitis</td>
<td>1 (0.4)</td>
<td>0 (0)</td>
<td>.492</td>
</tr>
<tr>
<td>Blood transfusions</td>
<td>10 (3.4)</td>
<td>4 (1.3)</td>
<td>.093</td>
</tr>
<tr>
<td>Phototherapy</td>
<td>30 (10.3)</td>
<td>15 (5)</td>
<td>.015</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>3 (1)</td>
<td>4 (1.3)</td>
<td>.734</td>
</tr>
<tr>
<td>Composite of adverse neonatal outcome</td>
<td>94 (32.2)</td>
<td>47 (15.6)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

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What should be done?

- Gather together leadership to discuss
  - OB providers (MFM, OB, CNM, FM, RN, Anesthesia)
- Measure the outcomes – report the data
- Potentially use QI methods
  - Institutionally based (e.g. Lean)
- Establish standards / standard behaviors
What time goal?

A. 30 minutes?
B. 20 minutes?
C. 15 minutes?
D. 10 minutes?

As fast as possible!!!