Second Stage of Labor: Can it be too long?

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University of California, San Francisco

Disclosure
- No financial relationship with industry
- No financial relationship from any of the products or tests discussed herein

Objectives
- Second stage of labor
  - Definition of “normal” second stage
  - Nulliparas
  - Multiparas
  - Definition of “prolonged” second stage
  - Prolonged second stage outcomes
    - Maternal and neonatal outcomes by parity
  - Influence of regional anesthesia
**Question #1**
30 y.o. G1P0 at 39 weeks, pushing for 3 hours with epidural: 0 → +2 station; reassuring fetal heart tracing

A. Continuing pushing  
B. Operative vaginal delivery  
C. Cesarean delivery

**Labor: Friedman Curve**
- Normal active labor progression in the first stage:
  - Nulliparas: 1cm/hour
  - Multiparas: 1.2cm/hour

**Labor: Friedman Curve**
- Second stage of labor
  - Nulliparas: 2 hours
  - Multiparas: 1 hour

**Zhang: Labor Curve**
- Second stage of labor in nulliparous women

<table>
<thead>
<tr>
<th>Station</th>
<th>1stile</th>
<th>Median</th>
<th>95thile</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1 to +2</td>
<td>1</td>
<td>16</td>
<td>176</td>
</tr>
<tr>
<td>+2 to +3</td>
<td>1</td>
<td>7</td>
<td>38</td>
</tr>
</tbody>
</table>

ACOG Practice bulletin. Dystocia and augmentation of labor. No 49; Obstet Gynecol 2003  
Friedman EA. Primigravida labor. Obstet Gynecol 1955  
### Second Stage of Labor

<table>
<thead>
<tr>
<th></th>
<th>Friedman Study (n=500)</th>
<th>Zhang Study (n=1,162)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of data collection</td>
<td>early 1950s</td>
<td>1992 - 1996</td>
</tr>
<tr>
<td>Birthweight 2.5-4.0kg</td>
<td>85 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Induction of labor</td>
<td>4 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Epidural anesthesia</td>
<td>8 %</td>
<td>48 %</td>
</tr>
<tr>
<td>Oxytocin augment.</td>
<td>9 %</td>
<td>50 %</td>
</tr>
<tr>
<td>Low forceps/vacuum</td>
<td>51 %</td>
<td>13 %</td>
</tr>
</tbody>
</table>

Friedman EA. Primigravid labor. Obstet Gynecol 1995

### Second Stage of Labor

- **Duration of the second stage of labor**
  - **Nulliparas:** 54 minutes
  - **Multiparas:** 19 minutes
  - Use of regional anesthesia increases the mean duration of second stage by 20-30 minutes

Kilpatrick et al., Characteristics of normal labor. Obstet Gynecol 1999

### Second Stage of Labor

- **ACOG:** Prolonged second stage of labor
  - **Nulliparas:** 2 hours without regional anesthesia
    3 hours with regional anesthesia
  - **Multiparas:** 1 hour without regional anesthesia
    2 hours with regional anesthesia

ACOG Practice bulletin: Dystocia and augmentation of labor. No 49; Obstet Gynecol 2003

### Second Stage of Labor

- **Challenges of studying labor duration**
  - **Non-normal distribution**
    - **Mean, median, σ, 95th centile**

![](https://via.placeholder.com/150)
Second Stage of Labor

- **Challenges of studying labor duration**
  - Non-normal distribution
    - Median, 95th centile
  
  ![Graph showing normal distribution with μ = 68%, 2σ = 95%, 3σ = 99%](image)


Second Stage of Labor

- **Risk factors associated with a longer duration of second stage**
  - Nulliparity
  - Short maternal stature
  - Increasing birthweight
  - Regional/epidural anesthesia
  - Fetal occiput posterior position
  - Longer first stage of labor
  - High station at complete cervical dilation

Second Stage of Labor

- **Trend of prolonged 2nd stage in Nova Scotia**
  - Nulliparas: >3 hours
  - Multiparas: >2 hours

  ![Graph showing nulliparas and multiparas trend](image)

  Allen et al. Maternal and perinatal outcomes with increasing duration of 2nd stage. Obstet Gynecol 2009

Outcomes

- **15,759 nulliparas delivered in 2nd stage**
  - Mode of delivery by length of second stage of labor

  ![Graph showing mode of delivery](image)

Second Stage of Labor

- 6791 nulliparas reached second stage (1996-99)
  - Increased maternal morbidity with prolonged 2nd stage
  - No differences neonatal outcomes


Second Stage of Labor

  - Term, singleton pregnancies delivered in 2nd stage
  - 11,470 (9%) prolonged; 110,206 no prolonged 2nd stage

<table>
<thead>
<tr>
<th></th>
<th>Prolonged (%)</th>
<th>No Prolonged (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional anesthesia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>98</td>
</tr>
<tr>
<td>Labor augmentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23</td>
<td>77</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Mode of Delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVD</td>
<td>35</td>
<td>89</td>
</tr>
<tr>
<td>OpVD</td>
<td>43</td>
<td>10</td>
</tr>
<tr>
<td>Cesarean</td>
<td>22</td>
<td>1</td>
</tr>
</tbody>
</table>

Allen et al. Maternal and Perinatal outcomes with increasing duration of 2nd stage. Obstet Gynecol 2009

Second Stage of Labor

  - Term, singleton pregnancies delivered in 2nd stage

<table>
<thead>
<tr>
<th>Nulliparas</th>
<th>&lt;2 hr</th>
<th>2-3 hr</th>
<th>3-4 hr</th>
<th>4-5 hr</th>
<th>&gt;5 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP hemorrhage</td>
<td>6.0%</td>
<td>1.30</td>
<td>1.53</td>
<td>1.59</td>
<td>1.75</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>0.5%</td>
<td>0.89</td>
<td>0.62</td>
<td>0.53</td>
<td>0.64</td>
</tr>
<tr>
<td>OB trauma</td>
<td>0.2%</td>
<td>1.45</td>
<td>1.84</td>
<td>2.07</td>
<td>2.18</td>
</tr>
<tr>
<td>Endomyometritis</td>
<td>2.3%</td>
<td>1.30</td>
<td>1.63</td>
<td>1.51</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Referent: 2nd stage <2 hrs (baseline rate); aOR by 2nd stage duration compared to referent

Allen et al. Maternal and Perinatal outcomes with increasing duration of 2nd stage. Obstet Gynecol 2009

Second Stage of Labor

  - Term, singleton pregnancies delivered in 2nd stage

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<th>Nulliparas</th>
<th>&lt;2 hr</th>
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<th>3-4 hr</th>
<th>4-5 hr</th>
<th>&gt;5 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>5min Aggr&lt;7</td>
<td>1.01%</td>
<td>1.33</td>
<td>1.36</td>
<td>1.04</td>
<td>1.12</td>
</tr>
<tr>
<td>Major trauma</td>
<td>0.13%</td>
<td>1.28</td>
<td>0.61</td>
<td>0.87</td>
<td>1.21</td>
</tr>
<tr>
<td>Sepsis</td>
<td>0.35%</td>
<td>0.89</td>
<td>1.13</td>
<td>0.88</td>
<td>1.00</td>
</tr>
<tr>
<td>NICU</td>
<td>5.31%</td>
<td>1.24</td>
<td>1.64</td>
<td>1.68</td>
<td>1.46</td>
</tr>
</tbody>
</table>

Referent: 2nd stage <2 hrs (baseline rate); aOR by 2nd stage duration compared to referent

Allen et al. Maternal and Perinatal outcomes with increasing duration of 2nd stage. Obstet Gynecol 2009
**Second Stage of Labor**

- **PEOPLE:** 1,862 nulliparas with epidural
  - 12 medical centers; 1994-1996
  - Push early: immediate pushing
  - Push late: 2 hours of passive descent

2 phases of second stage:
- Passive descent of fetal head
- Active expulsive efforts

Le Ray et al. When to stop pushing: Effect of duration of expulsive effort on outcome. AJOG 2009

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**Second Stage of Labor**

- **PEOPLE:** 926 early pushing; 936 late pushing

<table>
<thead>
<tr>
<th>Population Characteristics</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of pushing efforts</td>
<td></td>
</tr>
<tr>
<td>Early pushing group</td>
<td>99.8 ± 68.6</td>
</tr>
<tr>
<td>Late pushing group</td>
<td>117.9 ± 70.9</td>
</tr>
<tr>
<td>&lt;1 hour</td>
<td>81.8 ± 61.2</td>
</tr>
<tr>
<td>1-2 hour</td>
<td>635 (34.2 %)</td>
</tr>
<tr>
<td>2-3 hour</td>
<td>605 (32.6 %)</td>
</tr>
<tr>
<td>&gt;3 hour</td>
<td>374 (20.1 %)</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
</tr>
<tr>
<td>Spont. VD</td>
<td>1026 (55.1 %)</td>
</tr>
<tr>
<td>Operative VD</td>
<td>736 (39.5 %)</td>
</tr>
<tr>
<td>Cesarean</td>
<td>100 (5.4 %)</td>
</tr>
</tbody>
</table>

Le Ray et al. When to stop pushing: Effect of duration of expulsive effort on outcome. AJOG 2009

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**Second Stage of Labor**

- **PEOPLE:** 926 early pushing; 936 late pushing

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>1-2hour aOR 95%CI</th>
<th>2-3 hour aOR 95%CI</th>
<th>&gt;3 hour aOR 95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVD w/o asphyxia</td>
<td>0.4 0.3-0.6</td>
<td>0.1 0.09-0.2</td>
<td>0.03 0.02-0.05</td>
</tr>
<tr>
<td>Operative VD</td>
<td>2.3 1.7-3.0</td>
<td>9.0 6.5-12.3</td>
<td>31.0 19.3-50.0</td>
</tr>
<tr>
<td>5min Apgar&lt;7</td>
<td>1.1 0.3-3.6</td>
<td>0.4 0.1-2.1</td>
<td>0.7 0.1-3.5</td>
</tr>
<tr>
<td>NICU admission</td>
<td>1.1 0.6-2.0</td>
<td>1.5 0.8-3.9</td>
<td>1.5 0.7-3.3</td>
</tr>
<tr>
<td>Neonatal trauma</td>
<td>1.2 0.7-2.0</td>
<td>1.5 0.8-2.6</td>
<td>1.7 0.9-3.3</td>
</tr>
</tbody>
</table>

Le Ray et al. When to stop pushing: Effect of duration of expulsive effort on outcome. AJOG 2009

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**Second Stage of Labor**

- 5158 multiparas reached second stage (1991-2001)
  - Increased maternal complications
  - Increased neonatal morbidity

Second Stage of Labor

  - Term, singleton pregnancies delivered in 2nd stage

<table>
<thead>
<tr>
<th></th>
<th>&lt;1 hr</th>
<th>1-2 hr</th>
<th>2-3 hr</th>
<th>&gt;3 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiparas</td>
<td>0.43 %</td>
<td>1.75</td>
<td>2.64</td>
<td>2.24</td>
</tr>
<tr>
<td>5min Apgar&lt;7</td>
<td>0.43 %</td>
<td>1.75</td>
<td>2.64</td>
<td>2.24</td>
</tr>
<tr>
<td>Major trauma</td>
<td>0.13 %</td>
<td>1.60</td>
<td>1.34</td>
<td>0.43</td>
</tr>
<tr>
<td>Major trauma</td>
<td>0.13 %</td>
<td>1.60</td>
<td>1.34</td>
<td>0.43</td>
</tr>
<tr>
<td>Sepsis</td>
<td>0.22 %</td>
<td>1.17</td>
<td>1.17</td>
<td>1.39</td>
</tr>
<tr>
<td>Birth depression*</td>
<td>0.80 %</td>
<td>1.27</td>
<td>1.76</td>
<td>1.68</td>
</tr>
<tr>
<td>NICU</td>
<td>3.5 %</td>
<td>1.35</td>
<td>1.50</td>
<td>1.55</td>
</tr>
</tbody>
</table>

Referent: 2nd stage <1 hr (baseline rate); aOR by 2nd stage duration compared to referent
* Birth depression: mask/ET vent >3min, 5min Apgar<3, neo seizure, neo trauma, NICU >24hr, sepsis

Allen et al. Maternal and Perinatal outcomes with increasing duration of 2nd stage. Obstet Gynecol 2009

Question #2

Management of epidural in the second stage:

A. Continue epidural infusion/top-off
B. Discontinue epidural

Epidural and Second Stage

- Does epidural increase length of 2nd stage?
  - Management of women with epidural
    - Epidural
      - Mode of delivery
      - Perinatal outcomes

Epidural and Second Stage

- Epidural compared to non-epidural or no analgesia in labor
  - Epidural is associated with:
    - Longer second stage
    - Oxytocin augmentation
    - Instrumental delivery (aOR 1.38 [1.24-1.53])
    - Urinary retention
    - Fever

Anim-Somuah et al. Cochrane Database of Systematic Reviews 2005.
Epidural and Second Stage

- Epidural and instrumental delivery
  - Relaxation of the pelvic floor muscle
  - Malrotation/malposition
  - Weakened desire to push
  - Reduced uterine activity
  - Oxytocin augmentation

Bates et al. Uterine activity in the 2nd stage of labor and the effect of epidural. BJOG 1985
Leighton et al. The effect of epidural on labour, maternal and neonatal outcomes. AJOG 2002

Epidural and Second Stage

- Cochrane Systematic Review
  - 5 RCTs (462 participants)
  - Assess impact of discontinuing epidural on:
    - Rates of instrumental delivery and outcomes
    - Analgesia and satisfaction with labor care


Epidural and Second Stage

- Discontinuing vs continuing epidural:
  - Instrument delivery: RR=0.84 [0.61-1.15]
  - Cesarean delivery: RR=0.98 [0.34-2.25]
  - Spontaneous VD: RR=1.11 [0.95-1.30]
  - Malposition: RR=1.36 [0.73-2.56]
  - Inadequate pain relief: RR=3.68 [1.99-6.80]
  - 5-min Apgar<7: RR=3.92 [0.45-34.2]
  - Duration of 2nd stage: -5.8min [-12.9-1.30]


Question #3
30 y.o G1P0 at 39 weeks with epidural anesthesia; SVE: complete/0 station.

A. Immediate pushing
B. Delayed pushing/passive descent

Question #3
30 y.o G1P0 at 39 weeks with epidural anesthesia; SVE: complete/0 station.

A. Immediate pushing
B. Delayed pushing/passive descent
**Epidural and Second Stage**

- **PEOPLE:** 1,862 with epidural
- **12 medical centers; 1994-1996**

<table>
<thead>
<tr>
<th></th>
<th>Delayed Push (n=926)</th>
<th>Early Push (n=936)</th>
<th>RR  95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration 2nd stage (min)</td>
<td>187min (86-314)</td>
<td>123min (49-248)</td>
<td>----</td>
</tr>
<tr>
<td>Operative delivery</td>
<td>17.8 %</td>
<td>22.5 %</td>
<td>0.79 0.66-0.95</td>
</tr>
<tr>
<td>Midpelvic procedures</td>
<td>9.3 %</td>
<td>13.0 %</td>
<td>0.72 0.55-0.93</td>
</tr>
<tr>
<td>Low-pelvic procedure</td>
<td>3.5 %</td>
<td>3.8 %</td>
<td>0.93 0.58-1.49</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>5.0 %</td>
<td>5.7 %</td>
<td>0.88 0.60-1.29</td>
</tr>
<tr>
<td>3rd/4th degree lac</td>
<td>9.3 %</td>
<td>9.5 %</td>
<td>NS</td>
</tr>
<tr>
<td>EBL&gt;500ml</td>
<td>17.6 %</td>
<td>16.8 %</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Positioning in Second Stage**

- **Positioning in women with epidural:**
  - Upright vs. Neutral
  - 2 trials (281 participants)

<table>
<thead>
<tr>
<th></th>
<th>RR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrumental delivery</td>
<td>0.77</td>
<td>0.46-1.28</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>0.57</td>
<td>0.28-1.16</td>
</tr>
</tbody>
</table>

**Second Stage: Management**

- **ACOG:** If progress is being made, duration of the 2nd stage alone DOES NOT mandate intervention by operative delivery
2nd Stage: Management Options

- Women in labor
  - 2nd stage 0-3 hours
    - Cesarean
    - Operative VD
    - Continued Labor
  - 2nd stage >3 hours
    - Cesarean
    - Operative VD
    - Spont. VD

Cesarean Epidemic

- Leading indications of cesarean
  - Previous cesarean
  - Labor dystocia
  - Breech
  - Non-reassuring fetal heart rate
  - Others

Summary: Second Stage of Labor

- Length of second stage in itself not an indication for immediate intervention
- Prolonged 2nd stage and maternal morbidity:
  - Increased in nulliparas and multiparas
- Prolonged 2nd stage and neonatal outcomes:
  - Increased neonatal morbidity in multiparas
  - Need further investigation in nulliparas