Second Stage of Labor: When to Start and Stop

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  - Celmatix, Mindchild
  - Bob’s Red Mill

Objectives

- Second stage of labor
  - Epidemiology of second stage
  - Methodologic Challenges
  - When to stop - how long is too long?
  - When to start
    - Delayed vs. Immediate Pushing

Question

36 y.o. G1P0 at 40 wks GA with an epidural labored down for 1 hour (from 0 to +1) and now has pushed for 2 hours (from +1 to +2). What is the plan?

A. continue to push for up to 1 more hour
B. continue to push for up to 2 more hours
C. continue to push for up to 3 more hours
D. Begin conversation about OVD
E. Begin conversation about cesarean
Labor: Friedman Curve

- Second stage of labor
  - Nulliparas: 2 hours
  - Multiparas: 1 hour

Second Stage of Labor

- Hamilton – 1861 – suggested 2 hours as prolonged second stage
- 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 25 minutes

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

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>

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 1955

Studying the Second Stage

- Challenges of studying labor duration
  - Non-normal distribution
    - Median, 95th centile

![Gaussian distribution diagram](image)
Results: Second stage of labor

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>95%ile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparas No Epidural</td>
<td>50 min</td>
<td>201 min</td>
</tr>
<tr>
<td>Nulliparas Epidural</td>
<td>126 min</td>
<td>339 min</td>
</tr>
<tr>
<td>Multiparas No Epidural</td>
<td>14 min</td>
<td>84 min</td>
</tr>
<tr>
<td>Multiparas Epidural</td>
<td>40 min</td>
<td>262 min</td>
</tr>
</tbody>
</table>

Median 95%ile

Nulliparas No Epidural 50 min 201 min
Nulliparas Epidural 126 min 339 min
Multiparas No Epidural 14 min 84 min
Multiparas Epidural 40 min 262 min

Second Stage of Labor: How long is too long?

- Hard to even know the natural course
- Particularly with epidural
- What about outcomes with shorter or longer second stage?
- How do interventions improve these outcomes?
Second Stage of Labor: How long is too long?

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


Second Stage of Labor: How long is too long?

- 11,470 (9%) prolonged; 110,206 no prolonged 2nd stage

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

Second Stage of Labor: How long is too long?

- > 4 Hours of second-stage labor
  - Endomyometritis
  - Chorioamnionitis
  - 3/4-Degree lacerations
  - Postpartum hemorrhage
  - Cesarean delivery
  - Operative vaginal delivery
  - Meconium
  - 5-min Apgar < 7
  - Umbilical artery pH < 7
  - Base excess <-12
  - Neonatal intensive care unit admittance


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

Nulliparas
- PP hemorrhage
- Blood transfusion
- OB trauma
- Endomyometritis

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
Summary - How long is too long?

- Varied evidence
  - Maternal outcomes worse
  - Unclear impact on neonatal outcomes
- Consider causal models for maternal outcomes

Summary - How long is too long?

- Chorioamnionitis
  - Is it that simply longer labor leads to more infections?
    OR
  - Women with pre-chorio/chorio have longer labors?

Summary - How long is too long?

- PPH/Perineal lacerations
  - Is it that simply longer labor leads to more bleeding/injury?
    OR
  - Women with longer second stages eventually are delivered via cesarean/op vag delivery leading to complications?

OVD vs. Expectant Management

OVD vs. Expectant Management

<table>
<thead>
<tr>
<th>Table II. Maternal outcomes associated with timing and mode of delivery during the second stage.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nulliparas (n = 3380)</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Third or fourth degree perineal laceration</td>
</tr>
<tr>
<td>Postpartum hemorrhage</td>
</tr>
<tr>
<td>Blood transfusion</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
</tr>
<tr>
<td>Endomyometritis</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
</tr>
</tbody>
</table>


How long is too long? - Summary

- If progress is being made, duration of the 2nd stage alone DOES NOT mandate intervention by operative delivery.
- A specific absolute maximum length of time spent in second stage of labor beyond which all women should undergo operative delivery has not been identified.
- Before diagnosing arrest of labor in second stage, if maternal and fetal conditions permit, allow for following:
  - At least 2 h of pushing in multiparous women
  - At least 3 h of pushing in nulliparous women
- Longer durations may be appropriate on individualized basis (eg, with use of epidural analgesia or with fetal malposition).


‘Prolonged’ Second Stage

<table>
<thead>
<tr>
<th>TABLE 2 Maternal outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended labor (n = 41), n (%)</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Cesarean delivery</td>
</tr>
<tr>
<td>Vaginal delivery</td>
</tr>
<tr>
<td>Spontaneous vaginal delivery</td>
</tr>
<tr>
<td>Operative vaginal delivery</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
</tr>
<tr>
<td>Endometritis</td>
</tr>
<tr>
<td>Postpartum hemorrhage</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
</tr>
<tr>
<td>Relative risk</td>
</tr>
<tr>
<td>95% Confidence interval</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
</tbody>
</table>

25% 20% 8%

Question – When to Start?

36 y.o. G1P0 at 40 wks GA with an epidural labored down is at 0 station. What is the plan?

A. Labor down until urge to push
B. Labor down for up to 2 hours
C. Discuss options of pushing and laboring down with patient
D. Start pushing
**Delayed Pushing – “Laboring Down”**

- Brought to us by the epidural
- Facilitated by the loosening of the “3 hour” rule for second stage
- Attempts to address the association between epidural and operative vaginal deliveries

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**Delayed Pushing - PEOPLE**

- Largest RCT is the PEOPLE study (Pushing Early or Pushing Late with Epidural)
- Multi-site trial from Canada, et al. with a total of 1862 nulliparous women randomized into two groups
- “Delay” = ~2 hrs


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**Delayed Pushing - PEOPLE**

- PEOPLE: 1,862 with epidural; 1994-1996

<table>
<thead>
<tr>
<th></th>
<th>Delayed Push (n=926)</th>
<th>Early Push (n=936)</th>
<th>RR</th>
<th>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>
<td>----</td>
</tr>
<tr>
<td>&quot;Difficult&quot; delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midpelvic procedures</td>
<td>17.8 %</td>
<td>22.5 %</td>
<td>0.79</td>
<td>0.66-0.95</td>
</tr>
<tr>
<td>Low-pelvic procedure</td>
<td>9.3 %</td>
<td>13.0 %</td>
<td>0.72</td>
<td>0.55-0.93</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>3.5 %</td>
<td>3.8 %</td>
<td>0.93</td>
<td>0.58-1.49</td>
</tr>
<tr>
<td></td>
<td>5.0 %</td>
<td>5.7 %</td>
<td>0.88</td>
<td>0.60-1.29</td>
</tr>
<tr>
<td>Other OVD</td>
<td>24.5%</td>
<td>24.3%</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>


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**Delayed Pushing - PEOPLE**

- Maternal Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Delayed Push (n=926)</th>
<th>Early Push (n=936)</th>
<th>RR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd/4th degree lac</td>
<td>9.3 %</td>
<td>9.5 %</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Fever (38°C)</td>
<td>8.5%</td>
<td>4.5%</td>
<td>1.88 (1.31-2.71)</td>
<td></td>
</tr>
<tr>
<td>EBL&gt;500ml</td>
<td>17.6 %</td>
<td>16.8 %</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

Delayed Pushing - PEOPLE

- Neonatal Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Delayed Push (n=926)</th>
<th>Early Push (n=936)</th>
<th>RR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal uAPH (&lt;7.10)</td>
<td>4.5%</td>
<td>1.8%</td>
<td>2.45 (1.35-4.43)</td>
<td></td>
</tr>
<tr>
<td>Ventilation</td>
<td>6.9%</td>
<td>6.3%</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

- No difference – Respiratory, blood cultures, fractures, Apgars


Delayed Pushing - Meta

- Delayed pushing vs. Active pushing
  - Meta-analysis of 7 RCTs (n=2,827)

<table>
<thead>
<tr>
<th></th>
<th>Relative Risk</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous VD</td>
<td>1.08</td>
<td>1.01 – 1.15</td>
</tr>
<tr>
<td>Operative VD</td>
<td>0.77</td>
<td>0.77 – 0.85</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>0.80</td>
<td>0.57 – 1.12</td>
</tr>
<tr>
<td>Duration of pushing (hrs)</td>
<td>-0.19</td>
<td>-0.27 – -0.12</td>
</tr>
<tr>
<td>Perineal lacerations</td>
<td>0.88</td>
<td>0.72 – 1.07</td>
</tr>
<tr>
<td>Episiotomies</td>
<td>0.97</td>
<td>0.88 – 1.06</td>
</tr>
</tbody>
</table>


Summary: Second Stage of Labor

- Delayed vs. Active
  - Sounds good
  - Data are mixed
  - Is benefit only achieved in settings of poor patience?
  - Potential tradeoffs between:
    - Mode of delivery
    - Fever / pH
    - Pelvic floor

Optimizing Management of the Second Stage of Labor

To assess the effectiveness of immediate vs. delayed pushing at complete cervical dilation in nulliparous women on:
1) Rate of spontaneous vaginal delivery
2) Composite neonatal morbidity, and
3) Maternal pelvic floor dysfunction
**Optimizing Management of the Second Stage of Labor**

Study Sites:
1. Washington University (Cahill, Tuuli)
2. UAB (Tita)
3. U Penn (Srinivas)
4. OHSU (Caughey)

Enrolling 3200 women - 2014-2018

**Future Research Directions**

- Large, prospective, observational, multicenter study of second stage
- Prospective, interventional trials:
  - Prolonged second stage definitions
    - 3 hours vs. 4/5/6 hours
  - Epidural use / regimens
  - Manual rotation / Operative vaginal delivery
  - Etc.

**Question**

36 y.o. G1P0 at 40 wks GA with an epidural labored down is at 0 station. What is the plan?

A. Labor down until urge to push  
B. Labor down for up to 2 hours  
C. Discuss options of pushing and laboring down with patient  
D. Start pushing

**How long is too long?**

![Graph showing laboring options and percentages]

How long is too long?

The undue haste suggested by these items was found to be justified only very rarely on careful perusal of the events leading up to delivery. Many appeared to be the result of an irrepressible impatience that is not characteristic of competent obstetricians; the injudicious and sometimes desperate acts eventuating from efforts to conclude a labor of seemingly interminable duration.

Friedman E, Sachtleben M. Dysfunctional Labor II. Obstet Gynecol. 1961;17:566-78
Secondary Analysis of Fetal Pulse OxTrial

Nulliparous women N=5341
- 96% epidural use, 87% oxytocin use, 38.6% IOL
- 75% NSVD, 18.5% OVD, 7.4% CD

In >3 hours of 2nd Stage labor, increased risk for:
- Chorioamnionitis
- 3rd & 4th deg lacerations
- PPH (atony)
- No negative neonatal outcomes

Second Stage of Labor

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

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]

Positioning in Second Stage

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

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>0.57</td>
<td>0.28-1.16</td>
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