The role of the labor and delivery patient care team in the safe prevention of the primary cesarean delivery

SC Birth Outcomes Initiative
October 14, 2014

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Director, SC Birth Outcomes Initiative
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This webinar is being recorded.
OBJECTIVES

• Describe the revised categorization of fetal heart rate tracings and discuss intrauterine resuscitation measures available to improve FHR tracing
• Understand criteria for first stage arrest of labor and role for artificial rupture of membranes
• Understand recent changes to the definition of arrest in the second stage and describe causes and treatment of fetal malpresentation.
• Describe the risk factors for and maneuvers to relieve shoulder dystocia
• Understand the utility of team simulation training and medicolegal concerns.
AGENDA

I. Fetal Heart Rate Monitoring
   Scott Sullivan, MD, MSCR

II. First Stage of Labor
    Chris Robinson, MD, MSCR

III. Second Stage of Labor
     Ken Trofatter, MD, PhD

IV. Shoulder Dystocia
    Ryan Laye, MD

VI. Q & A

VII. Survey
SPEAKING FETAL: INTRAPARTUM ASSESSMENT

Scott Sullivan, MD
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Department of Obstetrics and Gynecology
Medical University of South Carolina
Charleston
FETAL IS A FOREIGN LANGUAGE*

Latin
Russian
French
Fetal

Cannot practice obstetrics without becoming fluent in fetal

Roger Newman, MD*
How to translate?
“The fetus can be regarded as safe especially if reflex movements are accompanied by an obvious increase in the amplitude of oscillations in the fetal heart rate.”

Hammacher, 1969
Unfortunately, for the past 4 decades the lack of standardized training in FHR monitoring has lead:

- Ill-defined, confusing terms
- Unsubstantiated theories
- Myths and urban legends passed down from generation to generation of OB providers
- Communication failures that jeopardize the safety of mothers and babies
Progress in standardization of FHR definitions: 1997 NICHD Consensus Conference Report (AJOG 1997; 177)

Consensus definitions endorsed by:
- ACOG – May 2005
- AWHONN – May 2005
- ACNM – Dec 2006

First time that physicians, nurses, and midwives have agreed on language

2008 NICHD Workshop Report on EFM updated definitions and interpretation (OBGYN 2008; 112)
Oxygen transfer can be disrupted at any of these points and can manifest as FHR deceleration (variable, late, prolonged).

The degree of oxygen disruption is the important factor, not the point in the pathway at which oxygen transfer is disrupted.

Environment
- Lungs
- Heart
- Vasculature
- Uterus
- Placenta
- Cord

Oxygen transfer

Fetus
- Hypoxemia
- Hypoxia
- Metabolic acidosis
- Metabolic acidemia
- Hypotension

Potential Injury

Fetal response

acidemia
FHR accelerations are highly predictive of the absence of metabolic acidemia at the time they are observed.

Clark SL Am J Obstet Gynecol 1982; 144:706-8
Skupski DW Obstet Gynecol 2002; 99:129-34
Acceleration

Long Term Variability

Acceleration  Acceleration
Motor cortex

1. Motor (efferent)
2. Proprioceptive (afferent)
3. Decreased parasympathetic efferent

Fetal heart rate acceleration

CRC – cardioregulatory center
RAC – reticular activating center
Moderate FHR variability is HIGHLY predictive of the absence of metabolic acidemia at the time it is observed.

Low JA Obstet Gynecol 1999; 93:285-91
Williams KP Am J Obstet Gynecol 2003; 188:820-3
Elimian A Obstet Gynecol 1997; 89:373-6
FHR VARIABILITY

- Fluctuations in the baseline FHR that are irregular in amplitude and frequency
- Fluctuations are visually quantitated as the amplitude of the peak-to-trough in bpm
- Absent; minimal $\leq$ 5 bpm; moderate 6–25 bpm and marked $\geq$ 25 bpm FHR variability

AJOG 1997 : 177 ; OBGYN 2008 : 112
Fetal variability
MINIMAL FHR VARIABILITY

- CNS depressants: Narcotics, Barbiturates, Benzodiazepines, Sedatives, Alcohol
- Parasympatholytics: Phenothiazines, Atropine
- General anesthetics
- Magnesium sulfate
- Fetal tachycardia due to maternal fever or fetal infection
- Preexisting neurological injury
- Fetal acidosis/acidemia
You can ask the fetus 2 questions

Do you have hypoxia?

Do you have acidemia?
DO YOU HAVE HYPOXIA?

- Late decelerations
- Variable decelerations
- Prolonged decelerations
Gradual (>30 sec onset to nadir) decrease in FHR
Starts at the peak of the contraction; nadir and return to baseline delayed until after the peak of contraction
Recurrent: Occur with >50% of contractions in 20 min
Late decelerations reflect hypoxemia (uteroplacental insufficiency)

AJOG 1997: 177; OBGYN 2008: 112
MANAGEMENT OF LATE DECELERATIONS

- Discontinued oxytocin
- Begin oxygen 5–6 L/min
- Correct maternal hypotension
  - Trendelenberg position
  - Increase IV fluids
  - Vasopressor (ephedrine 15 mg IV)
- Assess maternal oxygenation and acid/base status
- Terbutaline 0.25 mg SQ for in–utero resuscitation
VARIABLE DECELERATIONS

- Abrupt (< 30 sec onset to nadir) decrease in FHR
- Decrease in FHR > 15 bpm, lasts > 15 sec and < 2 minutes
- Inherently vary in shape, duration, depth and relationship to contractions
- Described without additional clarification of atypical features

AJOG 1997 : 177 ; OBGYN 2008 : 112
MANAGEMENT OF VARIABLE DECELERATIONS

- Discontinue oxytocin
- Vaginal exam: assess progress and rule out prolapsed cord
- Begin oxygen 5–6 L/min
- Change maternal positions
- If uterine activity causative consider terbutaline 0.25 mg SQ
- Amnioinfusion if recurrent
Acute interruption of oxygen delivery to the fetus:

- Lungs – maternal apnea
- Heart – maternal bradycardia
- Vasculature – maternal hypotension (supine, epidural, hemorrhage)
- Uterus – rupture, tetanic contraction
- Placenta – abruption
- Cord – compression, prolapse
## FHR PATTERNS AND PH VALUES

<table>
<thead>
<tr>
<th>Group</th>
<th>FHR Patterns</th>
<th>Mean pH + S.D.</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No deceleration</td>
<td>7.30 + 0.042</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Early deceleration</td>
<td>7.30 + 0.041</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Variables (mild)</td>
<td>7.29 + 0.046</td>
<td>42</td>
</tr>
<tr>
<td>II</td>
<td>Variables (moderate)</td>
<td>7.26 + 0.044</td>
<td>33</td>
</tr>
<tr>
<td>III</td>
<td>Lates (mild)</td>
<td>7.22 + 0.060</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Lates (moderate)</td>
<td>7.21 + 0.054</td>
<td>7</td>
</tr>
<tr>
<td>IV</td>
<td>Variables (severe)</td>
<td>7.15 + 0.069</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Lates (severe)</td>
<td>7.12 + 0.066</td>
<td>10</td>
</tr>
</tbody>
</table>

Kubli et al AJOG 1969
Category I  FHR tracings include ALL of the following:

- Baseline FHR 110–160 bpm
- Baseline FHR variability: moderate
- Late or variable decelerations: absent
- Early decelerations: present or absent
- Accelerations: present or absent
- “Normal”; no action required
Category III  FHR tracings include either:

- Absent FHR variability and ANY of the following: recurrent late or variable decelerations or bradycardia
- Sinusoidal pattern
- “Abnormal”: predictive of abnormal acid–base status and requires prompt resolution or delivery
Category II: all FHR tracings not categorizable as I or III

- Baseline rate: Bradycardia or Tachycardia not accompanied by absent variability
- Variability: Minimal or Marked variability or absent variability without deceleration
- Absence of induced accelerations after FSS
3–Tier FHR Interpretation System

Category II:
- Recurrent variables with minimal or moderate variability
- Recurrent lates with moderate variability
- Prolonged deceleration $> 2$ but $< 10$ min
- Variable decelerations with atypical features (overshoots, slow return)
Category II  FHR tracings are considered “indeterminate”

- Not predictive of abnormal fetal acid-base status but inadequate evidence to classify as Category I or III
- Requires evaluation and in-utero treatment if appropriate
- Requires continued surveillance and re-evaluation in context of clinical circumstances
Flaws in Tier System

- No solid evidence it is any better
- 85% of labor strips are Cat II
- No malpractice relief
- Need more data!
Avoid imprecise terms
- Fetus is “alert”
- Fetus is “doing well”
- Fetus is “happy”

Specifically describe FHR changes/patterns

Describe FHR patterns as reassuring or non-reassuring

Hypoxia yes/no
- Acidosis yes/no
SPEAKING FETAL

- Fetuses DO NOT LIE
- Fetuses sometimes speak in riddles
- Despite its whining, if the fetus says it’s OK, it’s OK
- Providers who better understand Fetal will have lower cesarean rates and improved outcomes
SPEAKING FETAL

![Image of fetal tracing with the word "help" written on it.]

Courtesy Roger Newman MD
In 2003, ACOG and the American Academy of Pediatrics (AAP) jointly published a monograph summarizing the medical literature regarding the relationship between neonatal encephalopathy and cerebral palsy.
A word about accreditation

- Likely coming soon
- Controversy about how to do it
- Cost
- Data
The First Stage of Labor: Guiding Vaginal Birth

Christopher Robinson, MD, MSCR
Associate Professor
Maternal Fetal Medicine
University of South Carolina School of Medicine
Learning Objectives

- Understand recent changes to the traditional Friedman curve
- Review criteria for first stage arrest of labor
- Application of artificial rupture of membranes in the management of the first stage of labor
Friedman Curve

Abnormal Labor - Friedman

Latent Phase

Prolonged

Nullipara = 20 hrs

Multipara = 14 hrs
### Abnormal Labor - Friedman

<table>
<thead>
<tr>
<th>Active Phase</th>
<th>Protraction</th>
<th>Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nullipara = 1.2 cm/hr</td>
<td>Lack of cervical Δ for 2 hours in presence of adequate contractions and dilation of at least 4 cm</td>
</tr>
<tr>
<td></td>
<td>Multipara = 1.5 cm/hr</td>
<td></td>
</tr>
</tbody>
</table>
Evidence based care of yesterday is not the same as evidence based care today.

- Significant changes in obstetrical population over past decade
  - Delayed childbearing / Increased maternal age
  - Increased maternal weight / obesity
  - Rising incidence of multiple gestation
  - Increased “intervention”
  - Reduced acceptance of VBAC
  - Litigation exposure
Evolution of Evidence Based L&D

Consortium on Safe Labor

- 12 Centers in the United States representing 19 hospitals
- Friedman Curve followed for over ½ century
- U.S. population and demographics changed significantly over time.
- No change in labor rules / guidelines
Friedman curve may no longer be appropriate for contemporary labor practice.

New, evidence-based definitions of labor protraction and arrest are needed. Goals:
- Describe contemporary labor progression in the U.S. population; and
- Determine when is the more appropriate time to perform a cesarean delivery in women with labor protraction and arrest.
Objective: To use contemporary labor data to examine labor patterns in a modern U.S. obstetric population

Consortium on Safe Labor Centers

Multicenter (n=19), retrospective analysis

Examined:

- Normal neonatal outcomes (n=62,415)
- Vertex singletons w/ spontaneous labor onset
- Achieved vaginal delivery
Women were grouped by parity.

Median time and 95% CI were calculated for each dilatory point (defining normal labor)

Multipara labor curve started at 5 since most presented at this level of dilation.

Median cervical dilation by parity:
- 0 = 4 cm
- 1 = 4.5 cm
- 2 = 5 cm
Baseline trends in population studied:

- Increasing parity → increased maternal age and BMI
- Oxytocin augmentation was used in 50% of cases.
- Epidural used in 80% of cases

Median number of exams (admit to 10 cm):
- 5 for nulliparas
- 4 for multiparas
Contemporary Patterns of Spontaneous Labor With Normal Neonatal Outcomes

Average labor curves by parity in singleton term pregnancies with spontaneous onset of labor and vaginal delivery
Labor may take more than 6 hours to progress from 4 to 5 cm.

Labor may take more than 3 hours to progress from 5 to 6 cm.
Normal labor progress is defined by starting point given that labor is not a linear function from 4 cm.

Any deviation to the right of the 95%ile line is labor arrest given normal uterine activity.
Labor progression example based on initial cervical exam at admission

<table>
<thead>
<tr>
<th>Admission:</th>
<th>Labor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – 2 cm</td>
<td>A – normal</td>
</tr>
<tr>
<td>B – 4 cm</td>
<td>B – arrested 6 cm</td>
</tr>
<tr>
<td>C – 5 cm</td>
<td>C – arrested 9 cm</td>
</tr>
</tbody>
</table>

![Graph showing labor progression](image)
Implementing Best Practices
“The Safe Prevention of the First Cesarean”

- Slow but progressive labor in the first stage of labor should rarely be an indication for cesarean delivery.

- Six centimeters defines the active phase in most laboring women.
  - Active phase standards not applicable prior to 6 cm
  - Implement new Labor Curve definition
What has changed over the past 50 years?

Collaborative Perinatal Project (1959-1966)  
N=39,491

Consortium on Safe Labor (2002-2008)  
N=98,359

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>24.1 years</td>
<td>26.8 years</td>
</tr>
<tr>
<td>BMI</td>
<td>26.3</td>
<td>29.9</td>
</tr>
<tr>
<td>Epidural use</td>
<td>4%</td>
<td>55%</td>
</tr>
<tr>
<td>Oxytocin use</td>
<td>12%</td>
<td>31%</td>
</tr>
<tr>
<td>Cesarean</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>Length of first stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparas</td>
<td>Referent</td>
<td>+2.6 hours</td>
</tr>
<tr>
<td>Multiparas</td>
<td>Referent</td>
<td>+2.0 hours</td>
</tr>
<tr>
<td>Birthweight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparas</td>
<td>Referent</td>
<td>+113 grams</td>
</tr>
<tr>
<td>Multiparas</td>
<td>Referent</td>
<td>+117 grams</td>
</tr>
</tbody>
</table>
Average Labor Curve of Nulliparas

CPP: 1959-66

CSL: 2002-08
Average Labor Curve of Secundagravids (P1)

CPP: 1959-66
CSL: 2002-08
Average Labor Curve for Multiparas

CPP: 1959-66
CSL: 2002-08
Role of Amniotomy in Labor Management

- Effective in labor augmentation and induction.

- Benefits are seen among both nulliparas and multiparas

- Requirements:
  - Dilation of cervix
  - Engaged fetal vertex – well applied
  - Absence of funic presentation / vasa previa / placenta previa
Amniotomy + Oxytocin for IOL

- **Amniotomy alone:**
  - No increase in cesarean (RR 0.87 [0.73, 1.05])
  - No increase in chorioamnionitis
  - Duration of labor – no effect
  - No increase in abnormal FHR tracing

- **Early amniotomy with early oxytocin reduced duration of first stage of labor** (-1.57 hours [-2.14, -1.01])
  - Reduces first stage abnormalities of labor
  - No adverse neonatal effects seen

Cochrane Library 2013: Early amniotomy and early oxytocin for prevention of, or therapy for, delay in first stage spontaneous labour compared with routine care
“Membrane rupture and oxytocin administration, except in rare circumstances, should be considered prerequisites to any definition of failed labor induction, and experts have proposed waiting at least 24 hours in the setting of oxytocin and ruptured membranes before declaring an induction failed.”
Defining the Failed IOL

- Failure to generate regular (e.g. every 3 minutes) contractions and cervical change after at least 24 hours of oxytocin administration, with artificial membrane rupture if feasible.

Defining First Stage Arrest

Spontaneous Labor

≥ 6cm dilation with membrane rupture and labor

Induced Labor

≥ 6cm dilation with membrane rupture or ≥ 5cm without membrane rupture and labor

Labor:

≥ 4 hours of adequate contractions (eg >200 Montevideo units), or

≥ 6 hours if contractions inadequate with no cervical change
Algorithm for spontaneous labor. *Try not to admit unless at least 3 cm dilated.
†Expectant management; no need for intervention.
Algorithm – Induced Labor

1. **Induction**
   - Oxytocin with regular frequent contractions

2. **Cervical change from baseline**
   - At least 6 cm
     - Contraction at least every 3 minutes for at least 6 hours, but no further cervical change
     - Rupture of membranes not safe or not feasible
     - Consider cesarean delivery
   - Less than 6 cm
     - Rupture of membranes safe and feasible
     - Administer oxytocin for up to 18–24 hours
     - Rupture of membranes not safe or not feasible
     - Consider double setup for attempted rupture of membranes
     - Rupture of membranes
     - No cervical change despite adequate contractions for at least 4 hours
     - Continue labor
     - Inadequate contractions; no cervical change for at least 6 hours
     - Rupture of membranes not feasible
     - Consider cesarean delivery
Supporting vaginal birth:

- Utilizing modern labor curves in labor management

- Adequate time allowed for first stage of labor based on modern labor curve.

- 6 cm = the new active phase starting point

- 24 hours of IOL with oxytocin/AROM (if possible)

- Preventing the first cesarean delivery – greatest risk factor for cesarean is a prior history of cesarean
Management of the Second Stage Of Labor

Kenneth F Trofatter, Jr., MD, PhD.
Clinical Professor of OB/GYN
Division of Maternal-Fetal Medicine
USC School of Medicine - Greenville
Goals

- Define *current norms* for the 2nd stage of labor
- Discuss *routine care* that can increase the probability of vaginal delivery
- Discuss factors that may contribute to a *protracted 2nd stage*
- Discuss *management options* in a complicated or protracted 2nd stage
- Discuss the potential resurrection of *operative obstetrics* as a means of safely reducing the need for cesarean delivery
Average labor curves by parity in single term pregnancies with spontaneous onset of labor, vaginal delivery, and normal neonatal outcomes
Second Stage - Definition

- Time from complete cervical dilation until delivery of the fetus:
  - **Passive Phase** – time from complete cervical dilation to onset of active maternal expulsive efforts
  - **Active Phase** – time from beginning of active maternal expulsive efforts to delivery
## Progress of Labor

*Zhang, et al., Obstet Gynecol 2010;116:1281*

<table>
<thead>
<tr>
<th>Change in cervix</th>
<th>Parity 0 Median number of hours (95th percentile)</th>
<th>Parity 1 Median number of hours (95th percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 4 cm to 5 cm</td>
<td>1.3 (6.4)</td>
<td>1.4 (7.3)</td>
</tr>
<tr>
<td>From 5 cm to 6 cm</td>
<td>0.8 (3.2)</td>
<td>0.8 (3.4)</td>
</tr>
<tr>
<td>From 6 cm to 7 cm</td>
<td>0.6 (2.2)</td>
<td>0.5 (1.9)</td>
</tr>
<tr>
<td>From 7 cm to 8 cm</td>
<td>0.5 (1.6)</td>
<td>0.4 (1.3)</td>
</tr>
<tr>
<td>From 8 cm to 9 cm</td>
<td>0.5 (1.4)</td>
<td>0.3 (1.0)</td>
</tr>
<tr>
<td>From 9 cm to 10 cm</td>
<td>0.5 (1.8)</td>
<td>0.3 (0.9)</td>
</tr>
</tbody>
</table>

**Duration of second stage**

<table>
<thead>
<tr>
<th></th>
<th>Parity 0 Median number of hours (95th percentile)</th>
<th>Parity 1 Median number of hours (95th percentile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second stage with epidural analgesia</td>
<td>1.1 (3.6)</td>
<td>0.4 (2.0)</td>
</tr>
<tr>
<td>Second stage without epidural analgesia</td>
<td>0.6 (2.8)</td>
<td>0.2 (1.3)</td>
</tr>
</tbody>
</table>
“Two Hour Rule”

- Previous teaching – decreased risk of maternal morbidity and mortality – recommendation made before widespread use of fetal monitoring and epidural anesthesia
- Current belief – safe to wait with reassuring FHR tracing and evidence of descent
- Prolonged second stage beyond 4 hours may increase risk for operative vaginal delivery and maternal trauma
Influences on Progress of Labor

- Parity
- Fetal size
- Fetal position
- Maternal pelvis
- Maternal age, BMI and mental conditioning
- Labor position
- Timing and dosing of epidural
- Membrane status
- Use of oxytocin
Optimizing Routine Care in the 2nd Stage

- Patience
- Positioning - benefits of the upright position for both labor and birth & for 2nd Stage
- Psychosocial, emotional and physical support accompanied by explanation and instruction
- Behaviors by the intrapartum team – confidence in actions as well as empathy and respect for patient
- Pushing - spontaneous pushing techniques rather than Valsalva
- Avoidance of counterproductive and harmful behaviors such as loud counting and hyperflexion of the hips
Support by Intrapartum Team

- Can influence labor duration
- Can reduce use of analgesia or anesthesia
- Lower need for operative births
- Increases patient satisfaction with the birth experience.
Benefits of Upright Position

- May increase the pelvic diameter as much as 30%.
- May shorten labor (1st and 2nd stage)
- Has been shown to increase contraction strength and frequency
- Can minimize the intensity of pain
- May decrease the need for pain meds
- May decrease the need for oxytocin
- Accompanied by fewer operative deliveries, perineal lacerations, episiotomies and FHR abnormalities
- Lessens time spent actively pushing
- Lessens maternal fatigue
- May increase the satisfaction of the birth experience
Upright vs. Supine Labor Positions

THIS

Instead of THIS
Active Pushing Phase

- **Timing is everything**
  - Most physiologically stressful for the fetus - ↓Maternal Blood Flow to Uterus
  - Results in more FHR decelerations
  - Can progress to adverse effects on acid-base status of the fetus
Delayed Pushing – “Laboring Down”

- Consider delayed pushing for 2 hrs in nulliparas and 1 hr in multiparous
- Beneficial to women WITH epidural anesthesia and no urge to push
- Beneficial to women WITHOUT anesthesia until they feel the spontaneous urge to push
- Fewer FHR decelerations
- Less time spent actively bearing down
- Less fatigue, especially in nulliparous women
- Less perineal damage
- Fewer lacerations/episiotomies
- Fewer operative births
Risks of “Directed Pushing”

- Increased adverse pelvic floor and perineal outcomes especially when significant edema occurs
- Increased risk of structural and neurogenic injury to pelvic floor and perineum
- Pushing before feeling an urge to do so may force supportive structures, bladder and parts of vaginal wall in front of fetal head, obstructing descent and increasing risk of urinary incontinence
## Diagnostic criteria for abnormal patterns in active labor

<table>
<thead>
<tr>
<th>Labor pattern</th>
<th>Nullipara</th>
<th>Multipara</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First stage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>24.7 hours</td>
<td>18.8 hours</td>
</tr>
<tr>
<td>Protracted dilation</td>
<td>&lt;1.2 cm/h</td>
<td>&lt;1.5 cm/h</td>
</tr>
<tr>
<td>Arrested dilation</td>
<td>&gt;2 h</td>
<td>&gt;2 h</td>
</tr>
<tr>
<td><strong>Second stage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrest of descent (epidural)</td>
<td>&gt;3 h</td>
<td>&gt;2 h</td>
</tr>
<tr>
<td>Arrest of descent (no epidural)</td>
<td>&gt;2 h</td>
<td>&gt;1 h</td>
</tr>
</tbody>
</table>

Values represent approximately two standard deviations from the mean.
The 5 P’s of Labor

- **Power** - Contractions and bearing down
- **Passenger (Fetus)** - Size of fetal head, fetal presentation, lie, attitude, and position
- **Passageway** - Pelvis, cervix, pelvic floor, vagina, and introitus
- **Positioning Of Mother** - Open pelvis positions
- **Psychological Response Of Mother** - Preparation and support
Fetal Determinants of Descent Through the Birth Canal

- Size of the fetal head
- Fetal presentation
- Fetal lie
- Fetal attitude
- Fetal position
Station
Cranial Landmarks

- Lambdoid suture
- Occipital bone
- Posterior fontanel
- Parietal bone
- Sagittal suture
- Biparietal diameter = 9.5 cm
- Coronal suture
- Frontal bone
- Anterior fontanel
- Metopic suture
Position
Attitude
Pelvic Shape

- Gynecoid
- Platypelloid
- Android
- Anthropoid
Arrest and of Protraction Labor

- Occur in 20% of \textit{ALL} labors and in one study 37% of all \textit{healthy term} nulliparas
- \textit{Protraction} –
  - \textit{Nulliparas}: 2\textsuperscript{nd} stage $>$ 2 hr (3 hr with epidural)
  - \textit{Multiparas}: 2\textsuperscript{nd} stage $>$ 1 hr (2 hr with epidural)
- Arrest – Cervical dilation $\geq$ 6 cm in a patient with ruptured membranes and:
  - No cervical change for $\geq$ 4 hr despite adequate contractions
  - No cervical change for $\geq$ 6 hr with inadequate contractions ad administration of oxytocin
Risk Factors for Protracted Labor

- Older maternal age
- Pregnancy complications
- Nonreassuring fetal heart rate
- Epidural anesthesia
- Macrosomia
- Pelvic contraction
- Occiput posterior position
- Nulliparity
- Short stature (less than 150 cm)
- High station at full dilatation
- Chorioamnionitis
- Postterm pregnancy
- Obesity
MOST COMMON CAUSES TODAY

- Obesity
- Cephalopelvic disproportion
- Occiput posterior presentation
- Epidural anesthesia
- Chorioamnionitis
Occiput Posterior (OP) Position

- Strong association between epidural anesthesia and fetal occiput posterior position
- Relaxation of pelvic musculature can prevent normal rotation of the head with descent
- Association between adverse neonatal outcome and persistent OP position
Initial Management of Protracted Fetal Descent

- Evaluate fetal position - If OP change maternal position to promote fetal rotation to OA and consider *manual rotation*
- Acknowledge progress, encourage patient
- Support spontaneous pushing
- Continue or initiate upright position - sitting, squatting, standing or kneeling
- Discourage supine, semirecumbent or lithotomy positions
- Maintain empty bladder
Assess Adequacy of Labor – Frequency and Strength of Contractions

Montivideo Units (MVUs) calculated by subtracting baseline uterine pressure from peak contraction pressure and summed over 10 minute window.
“Adequacy of Labor”

- Requires placement of intrauterine pressure catheter
- Generally 200-250 MVUs are considered “adequate”
- Average MVUs in spontaneous normal labor:
  - 100 MVUs early 1\textsuperscript{st} stage
  - 175 MVUs in advanced 1\textsuperscript{st} stage
  - 250 MVUs in 2\textsuperscript{nd} stage
- Treat inadequate labor with oxytocin

\textit{Caldeyro-Barcia, et al., Ann NY Acad Sci 1959 75:813}
Operative Vaginal Delivery – ACOG Position

- “CONSIDER” when:
  - Nullipara has lack of continuing progress for 3 hours with regional anesthesia and 2 hours without
  - Multipara has lack of continuing progress for 2 hours with regional anesthesia and 1 hours without and...
  - Following complete evaluation of progress in labor, maternal and fetal status, contraindications, etc....
Operative Vaginal Delivery
Indications

- Prolonged 2nd stage
- Expeditious delivery for non-reassuring FHR
- Maternal cardiac or neurological disease where pushing contraindicated

**BUT, there is no absolute indication**
Current Use of Operative Vaginal Delivery

- Today accounts for only 3.5% of vaginal births in U.S. (forceps/vacuum ratio of ¼)
- Rates range between 1 and 23% in different geographic regions
- **BUT, success rates approach 99%!!!!!!!**
- **Suggests opportunity for reducing primary cesarean section rates if more widely applied**
Reasons for Declining Use Over Past 30 years

- Fear of fetal morbidity
- Fear of maternal morbidity
- Fear of litigation
- Outspoken critics in the OB community
- Decrease in willing educators
- Decrease in resident teaching
- *Decrease in skilled operators*
- *Facilities discontinuing availability of forceps*
- *Facilities unprepared for immediate cesarean section*
Prerequisites for Operative Vaginal Delivery

- Experienced provider
- Cervix fully dilated
- ROM
- Head engaged
- Presentation, position, lie known
- Size estimated and adequate pelvis
- BLADDER EMPTY
- Adequate anesthesia
- Informed consent documented in the medical record
- Ability to immediately perform c/section
Forceps Classification

- **Outlet forceps** - Fetal scalp visible at introitus without separating the labia, skull has reached pelvic floor, OP, ROP or LOP or OA, ROA or LOA. Fetal head is at or near perineum, rotation does not exceed 45
- **Low forceps** - Fetal skull at station +2 cm and not on pelvic floor, rotation 45 or more.
- **Midforceps** - The station is above 2+ cm but head is engaged.
- **High forceps** - Not permitted (not recommended)

Contraindications

- Fetal demineralizing diseases (e.g. osteogenesis imperfecta)
- Fetal bleeding diatheses (e.g., hemophilia, alloimmune thrombocytopenia)
- Unengaged head - Station < +1
- Severe cephalopelvic disproportion
- Unknown presentation
- Malpresentation with severe hyperextension of the head (e.g., brow or face presentation)
- < 34 weeks if considering vacuum extraction
Relative Contraindications to Use of Obstetric Forceps

- Lack of indication
- Suspected Macrosomia
- Maternal Macrosomia
- Relative Cephalopelvic Disproportion
- Prominent ischial spines and/or suspected android pelvis
- Poor descent with Valsalva
Relative Contraindications to Use of Obstetric Forceps

- Excessive caput or molding
- Overlapping sutures
- Cephalohematoma
- Significant fetal distress
- Correctable hyperextension of fetal head
- Inadequate cooperation or anesthesia
- Inability to proceed with cesarean in timely fashion
Choice of Instruments - Vacuum

- Easy to apply
- Safer for mother – fewer soft tissue lacerations
- Require less maternal anesthesia
- Minimize compressive force on fetal head
- Lower risk of maternal pain postpartum
- Higher risk of cranial and intracranial hemorrhage
- Poor for rotation of the fetal head
- Less likely to be successful than forceps – especially at higher fetal stations or fetal ‘malpresentation’
Vacuum Extraction – General Recommendations

• Do not attempt rotation
• Stop if three pop-offs, no progress, or evidence of fetal scalp trauma, more than 10 min of max pressure on fetal head or 15 min total time
• Pressure should not exceed 500-600 mg HG
• Document station, duration of application, pressure, # of pulls, pop-offs
Neonatal Complications of Vacuum Deliveries

- Intracranial hemorrhage
- Scalp trauma
- Hyperbilirubinemia
- Retinal hemorrhage
- Subgaleal hematoma
Choice of Instruments - Forceps

- Different instruments are available for use depending on fetal size, station, and position
- Can be used to correct asynclitism and for rotation
- Useful at higher fetal stations
- Probably safer for fetus
- Will not ‘pop-off’
- Higher success rates across the board than vacuum
- *Increased risk for maternal soft tissue and pelvic floor trauma*
- *Increased risk for shoulder dystocia especially with midpelvic applications*
A Real-Life Experience – A Study

Trofatter KF - unpublished

- Nonrandomized, retrospective chart review
- 100 consecutive patients with ARREST of labor in MIDPELVIS
- All offered c/section vs trial of midforceps
- Single faculty member
- Ultrasound used to confirm fetal position prior to forceps application in ALL cases
- Use of Luikhart – Kielland forceps
RATIONALE FOR STUDY

- Evaluation of fetal head position in midpelvis can be difficult, especially with molding, caput and asynclitism
- Morbidity to fetus and mother is increased when forceps are poorly applied
- Inability to confirm position of fetal head is an absolute contradiction to forceps application and (appropriately) discourages attempts at midforceps applications.
To Rotate or Not?

Fetal head position may be a consequence of the maternal pelvis, But…

- Occiput – posterior requires greater AP diameter of head to traverse pelvis;
- May exacerbate hyperextension;
- Often requires greater traction;
- May increase fetal trauma;
- May increase maternal trauma
Maternal Population

- Mean age (yrs): 23.4 ± 5.8 (range 15 – 42)
- Weight (lbs): 172 ± 3.8 (range 101 – 304)
- Height (in): 64.6 ± 3.3 (range 58 – 78)
- Gestational Age (wks): 39 ± 2.2 (range 30 – 42)
Gestational History

Nulliparous: 63
Multiparous: 36

Previous Deliveries:

Vaginal: 31
Cesarean: 3
Forceps: 1
Primary Indications for Midforceps

- Failure to Progress
  - Persistent Occiput Posterior: 44
  - Persistent Occiput Transverse: 28
  - Prolonged Second Stage: 2
- Fetal heart Rate Decelerations: 17
- Maternal Exhaustion: 1
- Unable to Determine from Record: 8
Luikhart-Keilland Forceps
Luikhart – Keilland Forceps in Midpelvic Applications

Advantages of:

- Design facilitates placement and rotation
- Solid blade disperses pressure over maximum area
- Sliding lock permits correction of asynclitism
Route of Delivery

- Vaginal Forceps *
  - Occiput Anterior: 90
  - Occiput Posterior: 5
  - Occiput Transverse: 0
- Cesarean Section: 5

*Note: 65% of deliveries involved a rotation; Approximately 90% of rotations succeeded*
## Episiotomies

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**NOTE:** If this study was done today, an episiotomy would NOT be routinely cut
Delivery / Fetal Complications

- Bruises 19
  - Facial: 10
  - Scalp: 8
  - Unknown: 1
  
- Nuchal Cord 14
  
- Forceps Mark 10
  
- Shoulder Dystocia 8
  
- Cephalohematoma 2
  
- Facial Nerve Palsy 2 (Transient)
  
- Laceration 1 (Facial)
Be Prepared to Manage Complications

- Emergency cesarean section
- Lacerations: vaginal, cervical, perineal, uterine
- Shoulder dystocia
- Uterine atony
- Bleeding
Potential Benefits

- Reduction in need for cesarean section
- Reduction in significant maternal morbidity
- Shorter hospital stays
- Reduced peripartum costs
- More rapid post–partum recovery than with cesarean section
Summary

- Defined current norms for the 2nd stage of labor
- Discussed routine care that can increase the probability of vaginal delivery
- Discussed factors that may contribute to a protracted 2nd stage
- Discussed management options in a complicated or protracted 2nd stage
- Discussed the potential resurrection of operative obstetrics as a means of safely reducing the need for cesarean delivery
Shoulder Dystocia

M. Ryan Laye, MD
Medical Group of the Carolinas-Maternal Fetal Medicine
MUSC AHEC Associate Professor- Spartanburg
10/14/2014
“The doctor is in court on Tuesdays and Wednesdays.”
Learning Objectives

- Describe the maneuvers to relieve shoulder dystocia
- Understand the utility of team simulation training in response to shoulder dystocia
- Medicolegal concerns
Shoulder Dystocia

- Inability to deliver any shoulder
- Obstetric emergency in which baby’s anterior shoulder is impacted behind the mother’s symphysis with the bisacromial diameter in the AP diameter of the pelvic inlet (Bower, Clin Fam Prac 2001)
- “Turtle sign”
- ACOG Clinical Management Guidelines for Obstetricians-Gynecologists No. 40, Nov 2002
Shoulder Dystocia (Spong Obstet Gynecol 1995)

- Defined as report by physician or use of ancillary maneuvers to effect delivery
- Prolonged delivery defined as greater than 60 seconds from head-to-body-completion interval
- No delay average wt 3300 g, 11% low 1 minute APGAR
- Delay 11% incidence – wt 4000-4200 g, 34-42% low 1 minute APGAR
Shoulder Dystocia

- Risk factors 100 controls and 100 consecutive cases (Dildy 1999)
  - Birth weight
  - Diabetes mellitus
  - Operative vaginal delivery
- Shoulder dystocia - One factor in 81%, two factors in 32%.
- Control group 27% had one risk factor.
Shoulder Dystocia

- Birth weight > 4000 g (10%) risk 3-13%
- Birth weight > 4500 g (1.5%) risk 14-35%
- Diabetes 6X risk
- Operative delivery occurs in 39-58% of shoulder dystocia
  - Bofill vacuum 4.7%, forceps 1.9%
Risk Factors

- Gestational age - postdates RR 1.3
- Male gender
  - Infants > 4500 g 70% male
- Excessive weight and weight gain
  - >300 lbs macrosomia 30% vs 11%
- Labor abnormalities
Brachial Plexus Injury

- Incidence 0.1 – 0.2%
- Occurs in 10% of deliveries complicated by shoulder dystocia
- Injury occurs in 18% with wt > 4000g and 26% with wt > 4500 g
Brachial Plexus Injury

- Excessive lateral traction stretches nerve roots
- Erb-Duchenne palsy upper roots (C5-C6), paralysis of shoulder and upper arm
- Klumpke palsy (3%) lower roots (C7-T1) involvement of hand
- Horner syndrome (T1-T3)
Brachial Plexus

C5
C6
C7
C8
T1

Roots

Trunks

Cords

Nerves

1. Upper
2. Middle
3. Lower
4. Lateral
5. Posterior
6. Medial
7. Ulnar
8. Median
9.Radial
Shoulder Dystocia and Brachial Plexus Injury

Scarring and contracture of the sternocleidomastoid muscle causing the head to be pulled down and to the right (torticollis).

Damage to the 5th and 6th cervical nerve roots of the brachial plexus.

Erb’s palsy of the right arm.

Normal sternocleidomastoid muscle.

Baby as seen at 2 months.
Erbs Palsy
Brachial Plexus Injury

- Electromyography
  - Motor amplitudes decline in 2-4 days but up to one week
  - Sensory amplitudes decline in 5-6 days but up to 10 days
  - Studies within 3 weeks may underestimate injury
- 75-81% brachial plexus injuries completely resolve in the first month
- Spontaneous recovery in 92% usually complete by 12 months
Brachial Plexus Injury

- Gilbert - 1611 cases 47% did not involve shoulder dystocia, 60 cases after Cesarean
- Gehrman – Persistent after one year
  - No shoulder dystocia – 41.2%
  - Shoulder dystocia – 8.7%
- Walle – 170 cases one third are injury to the posterior arm
- Electromyographic studies may help with the timing of the injury
Forces (Allen AJOG 1994)

- 47 Newtons (0.22 lbs) for normal delivery, 69 N for difficult delivery, and 100 N for shoulder dystocia
- Pressure from uterine and expulsive efforts were 4-9 X that of clinician applied forces (Gonik AJOG 2000)
- Neck bending forces applied downward but also upward direction
- Greater rate of application of force associated with more injury
Shoulder Dystocia

- Wood (1973) drop in pH of 0.04 for each minute after delivery of fetal head (0.2 pH for 5 min)
- Jennett (AJOG 1992) 54% of brachial plexus injury not associated with shoulder dystocia
McRoberts Maneuver

- Flexing patient’s hips against abdomen
- Cephalad rotation of symphysis and straightening of lumbar vertebrae free impacted anterior shoulder
- Places plane of greatest pelvic dimension perpendicular to horizontal force less force required (Gonik)
McRoberts Maneuver
McRoberts Maneuver
Suprapubic Pressure

- Directed posteriorly to push anterior shoulder below the symphysis
- Directed laterally to push shoulders toward fetal chest and decrease the shoulder-shoulder distance
- Fundal pressure, Gross (AJOG 1987) reported 77% complication rate
Rotational Maneuvers

- Woods screw 1943 - Pressure on anterior surface of the posterior shoulder
- Rubin – Pressure placed on posterior surface of posterior shoulder
Delivery of Posterior Arm
Hibbard Maneuver
Zavanelli Maneuver

- Cephalic replacement
- Sandberg review of 12 years 92% success
- 70% only mild pressure needed
- Uterine relaxants may help
- Intubation possible if head outside vagina
- Complications: uterine rupture (5/103) and postpartum sepsis
Other Procedures

- Fracture of clavicle, cleidotomy for fetal demise
- Symphysiotomy
  - Lateral displacement of urethra with Foley in place
  - Lateral support of lower extremities
  - Partial dissection of symphysis
- Abdominal rescue
  - Disimpaction and release of anterior shoulder
Abdominal Rescue
(O’Leary, Cuva Obstet Gynecol 1992)
Obstetric Shoehorn (WM Chavis)
All-Fours Maneuver

- Gaskin Maneuver
- Different from knee-chest position
- Mechanism
  - Shift in fetal position
  - Possible increase in pelvic dimensions
Recurrence Risk

- Recurrence risk 1.1 %, (Baskett, 1995)
- Recurrence risk 33% when complicated by gest. diabetes and wt > 4000 g (Al-Qattan, Ann Plast Surg 1996)
- Ginsberg (AJOG 2000) 16.7% recurrence - fetal wt and maternal parity influence but prior occurrence is best predictor (OR 10.98)
- Cesarean delivery reduces the risk of brachial plexus injury by 80-95%
Estimation of Fetal Weight

- **Maternal** (Chauhan Obstet Gynecol 1992)
  - 70% maternal estimates within 10%
  - 67% Clinical estimates within 10%
  - Ultrasound 60% sensitivity and 90% specificity for the detection of macrosomia
  - Hadlock’s formula has error of 13% with macrosomic fetus compared to 8% with nonmacrosomic fetus
Prophylactic Cesarean
O’Reilly-Green Clin Obset Gynecol 2000

- Nondiabetic
  - 4500 g - 3,695 C-sections prevent 1 perm. brachial plexus injury, $8.7 million
  - 4000 g - 2,345 C-sections prevent 1 brachial plexus injury at $4.9 million

- Diabetic
  - 4500 g – 443 C-sections prevent 1 perm. brachial plexus injury, $930,000
  - 4000g – 489 C-sections prevent 1 brachial plexus injury $880,000
Maternal Complications

- Postpartum hemorrhage
- Temporary incontinence and pubic symphysis traumatic diastasis from syphysisiotomy
- Anal sphincter tear with pudendal nerve damage
- Zavanellli maneuver – ruptured uterus, lower segment lacerations, sepsis
**HELPER Mnemonic**  
*(Rosen, Emergency Medicine 1998)*

<table>
<thead>
<tr>
<th>Help</th>
<th>Ob/Gyn, Neonatal, Anesthesia</th>
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<tr>
<td>Episiotomy</td>
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<td>Legs flexed</td>
<td>McRoberts</td>
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<td>Pressure</td>
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<tr>
<td>Enter vagina</td>
<td>Rubin’s or Wood’s m.</td>
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<tr>
<td>Remove posterior arm</td>
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Cutting the medicolegal risk of shoulder dystocia
Documentation Suggestions

- Narrative, preferably dictated, note summarizing series of events and interventions
- Document approximate time interval between delivery of fetal head and body
- Include times for calls for assistance and when other providers arrived
- Describe resuscitation efforts and who attended to newborn
- Make sure umbilical cord gases are in the medical record
A multicenter assessment of 1,177 cases of shoulder dystocia: lessons learned.

With over 1,000 Shoulder Dystocia
- No Zavanelli Maneuver
- No Symphysiotomy
- No Fundal pressure
- No Hypoxic Ischemic Encephalopathy
- No Perinatal Mortality

With over 45,000 Births
- Only 3 Litigations, with 1 Settlement
- Not a Single Case of Professional Liability Proceeding to Trial for BPI

Incidence of frightening complications may be misplaced or exaggerated
Risk Factors for Dystocia & BPI Have Varied:
- Maternal Obesity & Second Stage < 20 min
- Maternal Height, Weight, GA, Parity, Birthweight
- Occiput Posterior Position, Vacuum Assisted Delivery, Birthweight > 4,000 g
- Labor Acceleration with Oxytocin

Others, Including Our Earlier Report, Found Intrapartum & Antepartum Risk Factors Can Not Identify Newborn That Will Have BPI & Dystocia

Thus, Ascertaining Risk Factors for Dystocia & BPI is Hampered by Sample Size, Risks Examined, Population Studied
Conclusions

- Shoulder Dystocia is NOT a Nightmare
  - Resolved With Well Known Maneuvers
  - Likelihood of Permanent Injury is Low
  - Likelihood of Litigation is Uncommon
- Rate of BPI is Decreasing!
- With Simulation Training, it May be Possible to Decrease the Morbidity & Litigation Further
Conclusion

C'mon, c'mon – it's one or the other.
Questions?
2014 SC BOI Symposium
Thursday, November 6, 2014
8:30am-4:15pm
Columbia Mariott

To register online, visit www.scdhhs.gov/boi
SC Birth Outcomes Initiative

Thank You!

Please visit: https://www.scdhhs.gov/boi