Physiologic Birth & Labor Pain Management

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August 10, 2021
MOMs Echo
My training background in birth, and personal birth experiences, are largely a midwifery based model, though I am by no means an expert in the field.
Objectives

- Define physiologic birth and understand its role and context
- Describe hormonal physiology of birth and how labor interventions affect normal physiology
- Review non-pharmacologic and pharmacologic labor support and pain management options
- Increase confidence in supporting women through their birth journey
What does this mean to you?
To your patients?

- Vaginal?
- No pain meds?
- No epidural?
- No episiotomy?
- No vacuum/forceps?
- Home or birth center birth?
- Natural onset of labor?
- No synTocin?
- Easy?
- Breastfeeding?
“A normal physiologic labor and birth are powered by the innate human capacity of the woman and fetus. This birth is more likely to be safe and healthy because no unnecessary interventions disrupt normal physiologic processes. Some women and/or fetuses will develop complications that warrant medical attention to assure safe and healthy outcomes.

However, supporting the normal physiologic processes of labor and birth, even in the presence of such complications, has the potential to enhance best outcomes for the mother and infant.”

ACNM: Birhtools.org

“An approach to labour and birth that maximizes the inherent strength and normal physiology of the woman and the fetus and refrains from outside interventions unless the well-being or safety of the pair are in jeopardy”

What is Physiologic Birth?

- Spontaneous onset and progression of labor
- Biological and psychological conditions that promote effective labor
- Results in vaginal birth of infant and placenta
- Low, physiological blood loss
- Promotes optimal newborn transition and early breastfeeding
Disruptors of natural physiology

- Induction of labor
- Labor interventions/augmentation (amniotomy, synTocin)
- Unsupportive environment
- Time constraints
- Inhibitors of movement: IV lines, continuous EFM, epidurals
- Nutritional deprivation
- Pharmacologic pain medication
- Operative delivery (vaginal or cesarean)
- Episiotomy
- Immediate cord clamping
- Maternal/infant separation, lack of S2S, delayed breastfeeding
Why is physiologic birth important?

As a nation we have:

- Poor maternal and fetal health outcomes
- Low rates of breastfeeding
- High rates of postpartum mental health issues

*Listening to Mothers III Survey*

- >½ mom receive synTocin
- <½ report ambulation in labor
- >2/3 birth in supine position
- 1/3 of women give birth via cesarean
- 30% moms experience IOL
- 26% moms and babies separated immediately for routine care
Why is physiologic birth important?

- Reduced iatrogenic harms
- Reduces peripartum morbidity through avoidance of surgery
- Improved rates of breastfeeding
- Improved birth experiences
- Improved maternal-fetal attachment
- Improved maternal mental health
- Decreased costs
- Improved provider satisfaction
- Long term improved health outcomes by increased breastfeeding
The Physiology of Birth
Hormonal physiology of birth

- At term and nearing delivery, cascade of hormones occurs to:
  - Align readiness for birth between mother and baby
  - Prepare a neonate for life outside the womb and protect for labor induced hypoxia
  - Enhance the efficiency of labor and delivery
  - Contribute to improved coping with intensity of labor
  - Decrease PP bleeding
  - Prepare for breastfeeding
  - Promote postpartum maternal adaptations

- Labor interventions can interfere with natural pathways, making innate hormonal systems less efficient
Hormonal physiology of birth

- **Oxytocin**
  - Released in brain, placenta, fetal tissues
  - Receptors upregulate at term
  - ↑ uterine contractions ↑ increases calmness ↓ reduces pain
  - Responsible for ejection reflexes
  - *synTo cin does not cross BBB, can oversaturate receptors
  - Epidurals inhibit release

- **\(B\)-Endorphins**
  - ↓ maternal stress and pain ↑ newborn adaptations
  - After delivery triggers sense of pleasure and euphoria
  - Supra-physiological levels ↓ labor efficiency

- **Prolactin**
  - ↑ breast milk production ↑ mother’s physiologic/behavioral adaptations

- **Catecholamines:** adrenalin and noradrenalin
  - Surge in late labor → ↑ energy ↑ attention
  - Supra-physiological levels ↓ contractions ↑ risk PPH
Hormonal physiology of birth

• Latent labor
  • Oxytocin upregulating: social, conversational

• Active labor
  • High oxytocin, rising endorphins: release of control, withdrawing

• Transition
  • Increasing catecholamines: confusion, fear, overwhelm

• 2nd stage:
  • Peak of catecholamines and oxytocin: alert optimistic, responsive

• Birth
  • High levels of oxytocin, prolactin and endorphins, drop of catecholamines: relief, ecstasy love, energy, preoccupation with baby
Working with pain in labor and birth
Anatomy of pain in labor

• **1st stage of labor:**
  - Stretching of cervix, ligaments, muscles, tissues
  - Visceral, diffuse, cramping or contractions
  - Uterine pain is typically transmitted via nerve roots T10 to L1
  - Referred to back or abdomen

• **2nd stage of labor:**
  - Traction on pelvis, stretching of pelvic floor, perineum, perineal muscles and pelvic cavity as the fetal head descends
  - Transmitted by pudendal nerve and anterior divisions of S2-S4
  -Sharper, somatic, continuous pressure
  - Felt in the perineum, anus, lower sacrum, thighs and legs
  - Can also experience pain from nerve impingement
  - Some report pushing improves pain
  - At crowning, intense stretching can cause pain “ring of fire”
Physiologic approach to pain management

- Pain is a subjective: “interaction of physiologic, psychosocial, cultural and environmental influences”
- *Pain* is a **NORMAL** physiologic response to labor
- *Suffering* occurs when a woman is unable to activate her own mechanisms or her methods are insufficient to deal with the situation
- *Stress, fear and anxiety* interfere with natural coping skills, disrupts normal hormonal physiology, play a large role in pain perception contributing to *suffering*
- Pain control ≠ satisfaction
- With each intervention, consider benefits and risks
Pain and patient experience

- Pain interpretation and desire for pain management differs significantly
  - Home birth vs hospital birth
  - US vs Denmark: regional anesthesia less common
- Expectation, expressed preferences and control in pain management more important than achieved level of pain relief
- Understand the goal
  - Avoiding suffering
  - Coping with pain
  - Complete avoidance of pain
  - Elimination of fear and anxiety
  - Control
Setting the stage

- Promote self efficacy, patient centered decision making
- Set the environment (RR 1.17, 95% CI 1.01-1.35)
  - Allows for birth person to feel safe, behave instinctually (primitive brain calm neocortex- Michel Odent)
  - Quiet, minimal disturbance, low lighting, comforting environment
- Eliminate or reduce factors causing pain
- Increase pleasant or neutral sensations to dampen pain awareness
- Focus attention elsewhere
- Ensure the laboring person feels cared for, respected, heard
- Assess and promote the birthing person’s innate coping “3Rs”
  - Relaxation, Rhythm, Ritual (Penny Simpkins)
Eating and hydration in labor

- Withholding of food and fluids can increase stress and discomfort
- Dehydration can be linked to labor dystocia
- When allowed to drink freely in labor most women drink to relieve thirst, not to excess, and prevent dehydration, even if vomiting
- Most laboring women do not desire to eat in active labor
- IVF run risk of overhydration, hyponatremia and labor dystocia, tissue swelling, PP edema and breast engorgement, neonatal weight loss
- Withholding PO intake does not increase risk of aspiration (gastric contents more acidic), theorized risk with general anesthesia
## Table 1. Bonapace and Marchand Classification

<table>
<thead>
<tr>
<th>Theoretical model</th>
<th>Type of stimulation</th>
<th>Activated mechanism</th>
<th>Effects</th>
<th>Nonpharmacologic approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate Control theory</td>
<td>Nonpainful stimulation of the pain site</td>
<td>Fibers which do not transmit pain messages are activated during non-painful stimulation and block part of those that transmit pain</td>
<td>Acts only on the stimulated area. Modulates the sensory-discriminative component of pain (intensity)</td>
<td>Light massage Water immersion (bathing) Positions/ambulation Birth ball Warm packs Vibration Conventional TENS (high frequency - low intensity)</td>
</tr>
<tr>
<td>Diffuse Noxious Inhibitory Control (DNIC)</td>
<td>Painful stimulation of any site of the body</td>
<td>Painful stimulation triggers an endorphinergic system, which reduces pain everywhere, except in the stimulated area. This scheme allows the brain to address the second source of pain</td>
<td>Acts on all painful areas of the body, except the one that is stimulated. Modulates the sensory-discriminative component of pain (intensity)</td>
<td>Painful massage Reflexology Sterile water injections Acupressure Acupuncture TENS (high intensity - low frequency) Ice</td>
</tr>
<tr>
<td>Control of the higher centers of the central nervous system (CNSC)</td>
<td>Activated by thought and mental processes (Attention deviation)</td>
<td>The brain modulates the potentially painful stimulations by conditioning the areas which are responsible for memory, emotions, and reaction to pain</td>
<td>Acts on all painful areas of the body. Modulates the motivational-affective component of pain (unpleasantness)</td>
<td>Antenatal education Continuous support Relaxation/Breathing Mental imagery Meditation/Yoga Hypnosis/Self-hypnosis Music Aromatherapy Biofeedback Placebo</td>
</tr>
</tbody>
</table>

Non-pharmacologic modalities

- Upright positioning
- Hydrotherapy
- Sterile water injections
- Emotional support (doulas)
- Relaxation techniques
- Massage/counterpressure
- Aromatherapy
- Acupressure/acupuncture
- Music/sound
- Birth props
- Warm/cold packs
- TENs

Supported by both ACOG and SOCG as first line modalities
Mobility, positioning and props

- No one optimal position - dorsal lithotomy least natural
- Encourage frequent changes and ambulation
- Effective through:
  - Alignment of pelvic bones
  - Optimal fetal positioning and fetal descent
  - More effective contractions
  - Harnessing gravity and maximizing the “drive angle”
  - Reduce length of labor
  - Improve fetal-maternal circulation, fetal oxygenation →
    improved FHR (RR 0.46)
- Diminish serious perineal trauma/episiotomy (RR 0.79)
- Fewer cesareans (RR 0.71), operative vaginal deliveries (RR 0.78)
- May decrease epidural usage

ACOG Committee Opinion No 687, 2017
How movement impacts labor

- Optimal physical relationship between body and baby to ease process of childbirth
  - Head decent into pelvis with a flexed head, midline body position, LOA
  - Releasing tight ligaments or muscles
  - Aligning uterus
  - Opening pelvis

- Can be used with or without props, with or without pharmacologic pain management, antenatally or intrapartum
  - Antenatally: Spontaneous onset of labor and faster labor progression
  - Intrapartum: When labor is not progressing, relaxation, pain management
Hydrotherapy

- Water immersion or showering
- Relaxation ↓ catecholamines
- ↑ oxytocin → reduces pain & accelerates labor

Safety
- No increase risk of infection
- Temp no higher than 38°C

- Tub best used in active 1st phase
- Effect only short lived (2hrs) but consistently lowers pain scores
- Prolonged use may affect circulation and decrease contraction efficacy
Sterile Water injections

- **Diffuse Noxious Inhibitory Control**
  - Increases endorphins (?)
- Sub Q 0.5cc 4 sites preferred
- Especially effective with lumbar pain (back labor)
- Effect lasts 45-120 minutes
- Cochrane: insufficient data
Continuous birth support: Doulas

- 1:1 support in addition to traditional care
- Decrease in obstetric interventions, increased maternal satisfaction with labor
- Shortened labor, decreased requests for analgesia, improved spontaneous vaginal birth
- Fewer operative vaginal deliveries, c-sections (RR 0.78)
- Higher Apgars (RR 0.69)
- Highest benefit in women at highest risk of low support

ACOG Committee Opinion No 687, 2017
Pharmacologic pain management

- Nitrous Oxide
- Regional (Neuraxial) Analgesia
- Parenteral pain medication
Nitrous Oxide

- No. 1 modality used worldwide, use limited in US
- Least impact on labor, least invasive
- Long standing safety record
- Self administered gas 50% NO 50% O2, demand valve
- Best as a contraction is building and through peak
- Quick on and off (5min ½ life)
- SE: nausea, dizziness
- Can be used for post-delivery procedures
- Not all women find effective
Regional (Neuraxial) Analgesia

• Epidural (most common) or spinal - 76% of vaginal births
  • Contraindications: coagulopathy, severe thrombocytopenia
  • Combination of local anesthetic and opioid
    • Bupivacaine or ropivacaine and fentanyl
    • Continuous, PCA, bolus

• Maximal pain relief, balance with mobility
  • Impacts contraction pain (visceral), variable effect on somatic (2\textsuperscript{nd} stage) pain

• Side effects:
  • Prolonged second stage, increase need for augmentation
  • Increase rate of operative vaginal delivery
  • Conflicting data on impact on cesarean section rates
  • Can cross into placenta
  • Post-dural HA, fever, may cause drop in BP leading to FHR abnl
  • “High” spinal, infection- rare
Parenteral medication

- 39-56% of US labors, rarely solo agent
- One drug not superior to another
  - Fentanyl, morphine, nalbuphine, butorphanol
- May provide unreliable anesthesia
- Adverse effects like n/v, drowsiness
- Crosses placenta and may affect fetus/newborn
  - Decreased FHR variability, FHR baseline
  - Respiratory depression, neurobehavioral changes
- Fewer impacts on birth physiology than epidural
  - Theoretical oxytocin downregulation
  - Less need for augmentation, shorter stages of labor, more mobility, fewer malpositions, instrumented deliveries
- Can be used for labor pain in active labor or for “therapeutic rest” in patients with prolonged latent labor
Parenteral medication
ACOC Practice Bulletin No. 177, 2017

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage and Route of Delivery</th>
<th>Onset</th>
<th>Duration</th>
<th>Elimination Half-life (Maternal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>50–100 micrograms (every hour); Alternatively, as PCA, load 50 micrograms then 10–25 micrograms Q 10–12 minutes</td>
<td>2–4 minutes IV</td>
<td>30–60 minutes</td>
<td>3 hours</td>
</tr>
<tr>
<td>Morphine</td>
<td>2–5 mg (IV); 5–10 mg (IM)</td>
<td>10 minutes IV; 30 minutes IM</td>
<td>1–3 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Nalbuphine</td>
<td>10–20 mg IV, SQ, or IM</td>
<td>2–3 minutes IV; 15 minutes SQ or IM</td>
<td>2–4 hours</td>
<td>2–5 hours</td>
</tr>
<tr>
<td>Butorphanol</td>
<td>1–2 mg IV or IM</td>
<td>5–10 minutes IV; 30–60 minutes IM</td>
<td>4–6 hours</td>
<td>2–5 hours</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>0.15–0.5 micrograms/kg Q 2 minutes as PCA</td>
<td>20–90 seconds</td>
<td>3–4 minutes</td>
<td>9–10 minutes</td>
</tr>
</tbody>
</table>

Abbreviations: IM, intramuscularly; IV, intravenously; PCA, patient-controlled analgesia; Q, every; SQ, subcutaneous.
Working with pain: Pharmacologic modalities

- Remember: any medical intervention has potential SE or risks
- Should be thought of as second line, or used in conjunction with non-pharmacologic supports
- Keeping in mind patient wishes and needs
- There are times when medication can be helpful: one of many tools in your toolbox
Take home points

- Every birth should be approached with a physiologic framework
- Deviations are often necessary, but we don’t need to “throw the baby out with the bath water”
- It is our job to safely manage a labor and birth with two patients in mind
  - It is ALSO our job to help women cope with labor and birth
- Before an intervention consider: necessity, safety, how this may impact hormonal physiology and/or labor, maternal satisfaction, impact on the fetus
- Non-pharmacologic pain management modalities should be first line and can be combined with pharmacologic modalities

Trust women, Trust birth


Smith LA, Burns E, Cuthbert A. Parenteral opioids for maternal pain management in labour. Cochrane Database of Systematic Reviews, 2018; Issue 6 Art. No.: CD007396.


Questions?