The Optimal Use of Continuous EFM

Turning the Tides – 2011

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Scientific Manager – BORN Ontario
Disclosures

- Have published 2 editions of the AWHONN Intermittent Auscultation practice resource
- Have published a number of articles on EFM use and documentation
- Co-editor of a few editions of the Canadian “Fundamentals of Fetal Health Surveillance Self-Learning Manual”
- Member of the SOGC group for 2007 guidelines
- Not actively practicing – now a data person
Objectives

• To review evidence since 2007 about EFM in labour
• To discuss how attitudes, practices and policies influence decision-making about type of fetal surveillance in labour
• To contribute to the ongoing debate about ‘best practice’ regarding fetal surveillance in labour
EFM in labour – History

• Introduced in late 60s for detecting potential fetal oxygenation problems → decompensation
• RCTs carried out after technology in place
• 1989 – about 72% of Canadian women having EFM in labour (Davies et al, 1993); 2004 – about 85% of US women
• Higher rates in 90s and first decade of new millennium.
• Now a generation of hospital care providers never trained with IA
• New terminology in late 90s to standardize practice
• Litigation increasing over the years
# Fetal Surveillance Aims to Prevent

## Table 1. ADVERSE FETAL AND NEONATAL OUTCOMES ASSOCIATED WITH *ASPHYXIA*

<table>
<thead>
<tr>
<th>Fetal Outcomes</th>
<th>Neonatal Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillbirth</td>
<td>Mortality</td>
</tr>
<tr>
<td>Metabolic acidosis at birth</td>
<td>Metabolic acidosis</td>
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<tr>
<td></td>
<td>Hypoxic renal damage</td>
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<tr>
<td></td>
<td>Necrotizing enterocolitis</td>
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<td></td>
<td>Intracranial hemorrhage</td>
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<td></td>
<td>Seizures</td>
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<td></td>
<td>Cerebral palsy</td>
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<tr>
<td></td>
<td>Neonatal encephalopathy</td>
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</tbody>
</table>

SOGC, 2007

* Asphyxia is defined as hypoxia with metabolic acidosis
Table 12: CONDITIONS ASSOCIATED WITH INCREASED RISK OF ADVERSE FETAL OUTCOME*

| Antenatal maternal conditions | Hypertensive disorders of pregnancy  
Diabetes  
Antepartum hemorrhage  
Other maternal medical disease |
|-------------------------------|------------------------------------------|
| Antenatal fetal conditions    | Intrauterine growth restriction  
Prematurity  
Oligohydramnios  
Abnormal umbilical artery Doppler velocimetry  
Isoimmunization  
Multiple pregnancy  
Breech presentation |
| Intrapartum maternal conditions | Vaginal bleeding in labour  
Intrauterine infection  
Previous Caesarean section  
Prolonged membrane rupture > 24 hours term  
Induced labour  
Augmented labour  
Hypertonic uterus  
Preterm labour  
Post-term pregnancy (>42 weeks) |
| Intrapartum fetal conditions | Meconium staining of the amniotic fluid  
Non-reassuring fetal heart rate on auscultation |

SOGC, 2007
Review of the Evidence
Evidence Review Strategy

- Medline for all EFM studies related to labour since 2006 cross referenced to specific complications and care setting issues
- Websites of professional associations (SOGC, ACOG, NICE, ACNM)
- Cochrane Library
- 42 references available
When Should Continuous EFM be used?

• Depends on:
  – How you define continuous!
  – Policy
  – What a reasonable person in a similar situation would do
  – What you’ve discussed and documented with the woman
Conclusion # 1

NOT FOR ROUTINE USE in LOW RISK WOMEN!

Slight problem – What is the definition of low risk and who falls into this category in ‘modern’ obstetrics?
Conclusion # 2 – Cochrane, 2008
(Alfirevic, Devane & Gyte)

- Continuous cardiotocography during labour is associated with a *reduction* in neonatal seizures, but *no significant differences* in cerebral palsy, infant mortality or other standard measures of neonatal well-being.
  
  (RR 0.50, 95% CI 0.31 to 0.80, n = 32,386, 9 trials)

- However, continuous cardiotocography was associated with an *increase* in caesarean sections and instrumental vaginal births.
  
  (RR 1.66, 95% CI 1.30 to 2.13, n = 18,761, 10 trials)
  
  (RR 1.16, 95% CI 1.01 to 1.32, n = 18,151, 9 trials)

- The real challenge is how to convey this *uncertainty* to women to enable them to make an informed choice without compromising the normality of labour.
Conclusion # 3

EFM *not* a good screening test

- Screening tests have poor + predictive value when searching for rare conditions (e.g. fetal death, CP)
- Aggravated further when screening test does not have good validity
- EFM should be reserved for women at increased risk of adverse outcomes, in whom screening will perform better – however, even with rate outcomes, the improvement is negligible

Grimes and Peipert, 2010
Conclusion # 3

EFM *not* a good screening test

- Few clinicians who routinely use EFM in labour would use a pregnancy test (or a home smoke detector) that is wrong almost every time a positive signal appears.

  Grimes and Peipert, 2010

- There is an unrealistic expectation that a non-reassuring FHR tracing is predictive of CP – The false + rate of EFM for predicting CP is greater than 99%  

  ACOG, 2009
Despite this…. 

• EFM a standard of care and a ‘cultural phenomenon’
• Part of the technological, interventionist and litigious culture that dominates maternity units in US (and Canada)
• Until standards of institutional performance require evidence-based care in relationship to EFM – not optimistic anything will change
• EFM is tragic example of ‘if you build it, they will come’ (Lowe, 2011)
When Things are not “NORMAL”
What about the vast spectrum between normal and abnormal?

- **Which Do We Believe?**

- Most of the clinical trials comparing EFM with IA have excluded those at risk of adverse outcomes
  - Labour of women with high risk conditions should be monitored with continuous EFM
    - ACOG, 2009

- **Cochrane Review**
  - Data for subgroups of low risk, high-risk, preterm pregnancies and high quality trials were consistent with the overall results
    - Alfirevic, Devane & Gyte, 2008
What About?

- Admission Strips
- Inductions
- Augmentations
- Epidurals
- PTB & PPROM
- Post-term
- PROM
- VBACs

- Dystocia
- Fever
- Malpresentations
- Multiples
- Fetal complications
- Bleeding
- Meconium
- Medical complications
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<td>Isoimmunization</td>
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<td>Breech presentation</td>
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<td>Vaginal bleeding in labour</td>
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<td></td>
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<td>Previous Caesarean section</td>
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<td>Prolonged membrane rupture &gt; 24 hours term</td>
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<td>Induced labour</td>
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<td>Hypertonic uterus</td>
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<tr>
<td></td>
<td>Preterm labour</td>
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<tr>
<td></td>
<td>Post-term pregnancy (&gt;42 weeks)</td>
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<tr>
<td>Intrapartum fetal conditions</td>
<td>Meconium staining of the amniotic fluid</td>
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<tr>
<td></td>
<td>Non-reassuring fetal heart rate on auscultation</td>
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SOGC, 2007
Admission Strips

- Clarify - NSTs or labour assessments? inconsistent language
  - 2007 systematic review (Gourounti and Sandall)
    - Admission CTG in low risk women increases risk of c/s and instrumental delivery
    - No evidence of neonatal benefit
    - A larger sample size needed to confirm effects on neonatal outcome (because of rareness of poor outcomes)
    - 79% of units in UK routinely do this test
    - ON – 33-47% in all women AND low-risk women
Inductions

• *Ideally*, done for a maternal or fetal complication that could lead to an adverse outcome
  – No evidence on the effectiveness of monitoring regimens during induction
  – No direct evidence relating to the most effective monitoring regimen \[\text{NICE, 2008}\]

• SOGC guideline allows for 30-minute periods away from monitor for steady-state inductions
Whenever induction carried out, facilities for continuous EFM and uterine contraction monitoring available

Before induction, should be a normal FHR pattern

Ripening: After admin of vaginal prostaglandin, when contractions begin – continuous EFM. Once EFM is normal – switch to IA unless there are clear indications for continuous EFM
Augmentation

- Done to enhance contraction frequency, duration and intensity – usually as a result of a dysfunctional labour pattern
- SOGC, NICE and AGOG all recommend continuous EFM
- Primary concern is hyperstimulation
Epidurals

- No new evidence
- NICE (2007) recommends continuous EFM for 30 min after establishing regional anesthesia and after admin of boluses of 10 ml or more (risk of hypotension)
- ACOG (2009) – no recommendation but does discuss risk of hypotension
- Can affect labour which may lead to augmentation and EFM
- In practice, IA can be done, but EFM is convenient
PTB and PPROM

- Preterm delivery can occur in up to 10%
- In continuous EFM review (Cochrane, 2008) – only 1 trial looked specifically at preterm infants (< 32 wks) – no differences
- No evidence about late PTB
- Concerns about higher rates of CP, especially in VLBW infants
- SOGC and ACOG recommend monitoring because of secondary reasons
  - Higher rates of decels
  - Higher incidence of other pathologies
Post-Term

- SOGC (2007) said EFM after 41+3
- Post-term fetus at higher risk of intrapartum FHR abnormalities and passage of meconium and neonatal acidemia—most authors recommend continuous EFM (Caughey et al, 2008)
- Close fetal surveillance should be offered during either spontaneous or induced labour (Mandruzzato et al, 2010) – Level B – based on limited or inconsistent scientific evidence
PROM @ Term

- Risk of serious neonatal infection increases from 0.5 to 1%. 60% will go into labour within 24 hrs – offer induction after 24 hrs  
  NICE, 2007, p. 40

- Need for monitoring likely related to need for induction
VBAC

• SOGC (2007), ACOG (2010) recommends continuous EFM because a FHR abnormality has been associated with up to 70% of cases of rupture (Level 2 evidence)
Dystocia

• Normally a disorder treated with oxytocin augmentation and therefore EFM
Malpresentations

- No evidence
- Not many breeches in labour, but perhaps on the upswing!
- Some malpresentations associated with dystocia and therefore intervention
Multiples

- Continuous EFM should be used (SOGC, 2000 & 2007; Ayres & Johnson, 2005)
- ~50% deliver preterm
- Higher rates of other complications (preeclampsia, malpresentations)
- ACOG, 2006 and NICE Feb 2011 draft – no mention of fetal surveillance in labour
Fetal Complications

• Unclear what to do about:
  – Fetal growth issues (IUGR, macrosomia)
    • IUGR can be associated with adverse outcome
    • Important to distinguish between small babies with adequate growth and IUGR
  – Congenital anomalies
    • Dependent on the anomaly type
  – Fetal heart rate changes on IA
    • How long to wait for resolution before EFM?
Bleeding

• NICE (2007) recommends continuous EFM for ‘fresh bleeding developing in labour’
Meconium

- MSAF a ‘soft marker’ for fetal stress
- Unclear of the significance in labour and management of baby in pp period
- MSAF has remained fairly steady, but MAS has decreased – likely related to less ‘true’ postterms
- Probably influences management of labour and is ‘emphasized’ in legal proceedings
- NICE (2007), SOGC (2007) and recommends continuous monitoring,
Table 2
Perinatal fetal outcome

<table>
<thead>
<tr>
<th></th>
<th>MSAF</th>
<th>Control</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight</td>
<td>3500 g (±462 g)</td>
<td>3447 g (±456 g)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Apgar 5 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–3</td>
<td>–</td>
<td>–</td>
<td>0.108</td>
</tr>
<tr>
<td>4–6</td>
<td>10 (0.9%)</td>
<td>4 (0.4%)</td>
<td></td>
</tr>
<tr>
<td>7–10</td>
<td>1113 (99.1%)</td>
<td>1119 (99.6%)</td>
<td></td>
</tr>
<tr>
<td>Arterial chord pH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;7.00</td>
<td>2 (0.2%)</td>
<td>1 (0.1%)</td>
<td></td>
</tr>
<tr>
<td>7.0–7.19</td>
<td>165 (14.8%)</td>
<td>150 (13.6%)</td>
<td></td>
</tr>
<tr>
<td>&lt;7.20</td>
<td>942 (84.9%)</td>
<td>952 (86.3%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3
Subgroup-analysis ‘post-term’: 40 + 0–42 + 0 weeks of gestation

<table>
<thead>
<tr>
<th></th>
<th>MSAF (N = 789)</th>
<th>Control (n = 623)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight</td>
<td>3565 g (±453 g)</td>
<td>3581 (±437)</td>
<td>0.356</td>
</tr>
<tr>
<td>Apgar 5 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–3</td>
<td>–</td>
<td>–</td>
<td>0.184</td>
</tr>
<tr>
<td>4–6</td>
<td>7 (0.9%)</td>
<td>2 (0.3%)</td>
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</tr>
<tr>
<td>7–10</td>
<td>782 (99.1%)</td>
<td>621 (99.7%)</td>
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<tr>
<td>Arterial chord pH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;7.00</td>
<td>1 (0.1%)</td>
<td>–</td>
<td>0.517</td>
</tr>
<tr>
<td>7.0–7.19</td>
<td>119 (15.2%)</td>
<td>85 (13.8%)</td>
<td></td>
</tr>
<tr>
<td>&lt;7.20</td>
<td>661 (84.6%)</td>
<td>529 (86.2%)</td>
<td></td>
</tr>
</tbody>
</table>

(Becker et al, 2006)
Medical or Pregnancy Complications

• Most lead to some risk for fetus
  – Oxygenation of mother
  – Oxygen delivery to fetus
  – Oxygen uptake and use

• If the medical or pregnancy complication has the potential to affect any of these – EFM recommended
Maternal Obesity (BMI > 35)

- 2008 prospective observational case control study in U.K.– 50 in each group (term, singletons)
  - Difficult to monitor contractions by palpation and more likely to have invasive FM because of difficulty with external monitoring
  - No differences in abnormal monitor tracings
  - More likely to have epidural and more difficulty with placement
  - Higher rates of induction in obese
- CONCLUSION – Invasive fetal monitoring should be embarked upon as soon as possible as it is the only way of effectively monitoring the fetus (Level 3 evidence)
Prior to Elective C/S

- Insufficient data to determine the value of EFM prior to scheduled c/s in patients with no risk factors
- Presence of fetal heart tones prior to surgery should be documented

ACOG, # 382, 2007
Conclusion

• Modern-day hospital obstetrics doesn’t leave many women with the option for a non-EFM experience

• Canadian Maternity Experiences Study – over 90% of women with a vaginal birth or who attempted vaginal birth reported EFM at some point in labour- 62% had continuous
Why the chasm between evidence & practice?

• Multiple Factors in Literature
  - Organizational factors
  - Medicolegal issues
  - Knowledge of care providers
  - Differences in attitudes of care providers
  - Women’s choices and attitudes
  - Dependence on technology
  - IA ‘deemed’ expensive in personnel costs
No single best intervention for KT and no identification of which intervention is most likely to be effective (or cost effective) in a particular situation.

As clinical practice is a form of human behaviour, theories of human behaviour that have proved useful in other similar settings may provide a basis for developing a scientific rationale for the choice of interventions to translate research findings into clinical practice.

This study will amplify and populate scientifically validated theories of behaviour with evidence from the experience of health professionals; to develop predictive questionnaires using replicable methods; to identify which elements of the questionnaire (i.e., which theoretical constructs) predict clinical practice and distinguish between evidence compliant and non-compliant practice; and on the basis of these results, to identify variables (based on theoretical constructs) that might be prime targets for behaviour change interventions.
PRIME – Interviews about IA & EFM (Grimshaw et al)

- Nurses agree IA is best method and were confident in their abilities, but other issues were important in choice of method
  - Time available
  - ‘Who’ they are working with
  - Hospital policies
  - Knowing ‘who’ was ultimately responsible for decision
  - Staffing
  - Equipment available
Other Issues Driving Decisions

- Lack of mobility during labour
- Differences in language and interpretation
- No standards for education and updating in Canada
What About New Technologies?

• Looking for holy grail. Increasing publications about St-analysis (STAN), fetal ECG, computerized analysis

• Are we simply trying to ‘fix’ a technology that is not effective for what we want it to do?

• Some argue that we need to go back to basics
  – Standardized terminology and education at a team level
  – Better communication
  – Easy way to get help rapidly
  – ‘Attending’ women in labour

Minkoff et al, 2009 – The Fetal Monitoring Bundle
What is the Optimal Use of Continuous EFM?

- Not sure there is a clear answer
- 2nd question – what is the optimal use of IA – not sure we are clear on this either!
- Evidence is definitely lacking for the EFM technology to detect what it was designed for
- Will the practice environment and care providers change? Carrot didn’t work – perhaps time for the stick! Performance indicators tied to bonus thereof
- Key to have good data collection methods monitoring outcomes
Questions?

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