NonStress Tests & Using Fetal Monitors in Midwifery Practice

Karen E. Hays, DNP, CNM, ARNP
MAWS Conference
November 9, 2012
Objectives

1. List 6 indications for performing a nonstress test (NST), and discuss how the NST might provide important information for providing quality midwifery care.

2. State 10 minimal documentation requirements when charting the results of an NST, and discuss why they are important.

3. Identify NST results that indicate the need for consultation, co-management, or referral.
What are the goals of doing an NST?

1. To identify ...

2. In order to prevent ...
What are the goals of doing an NST?

1. To identify if there is possible stress to fetal oxygenation & threats to acid-base (pH) status. [Which we call “fetal well-being”.]

2. To prevent intrauterine asphyxia and fetal/neonatal organ damage or death.
What are the goals of doing an NST?

1. To identify if there is possible stress to fetal oxygenation & threats to acid-base (pH) status.

2. To prevent intrauterine asphyxia and fetal/neonatal organ damage or death.

The journey from #1 to #2 can occur slowly or quickly, and is often unpredictable.

for an excellent graph explaining fetal physiology and the effects of stress
Fetal Physiology

The FHR gives clues that the fetus is:

UNDER NORMAL STRESS
COMPENSATING FOR SOME STRESS
DECOMPENSATING FROM AN EXCESS OF STRESS

Afors et al., 2011
Aspects of the NST

• Recognizing when it is indicated
  – Risk factor for fetal well-being has been identified
  – Gestational age >28 weeks (some say 32 weeks)

• Appropriate informed consent
  – Client understands what the NST can & cannot tell us

• Performing it correctly
  – Toco is present and functioning
  – FHR (not maternal HR) is tracing continuously

• Interpreting it correctly
  – Understanding physiology
  – Using defined terminology

• Taking appropriate action
  – Documentation
  – Consultation or referral if indicated
Indications for an NST in midwifery practice

A risk factor has been identified.

What types of clinical situations would inspire a midwife to order or perform an NST?
Indications for an NST in midwifery practice

A risk factor has been identified.

- Decreased fetal movement
- Imminent postterm or postterm
- Hx of obstetrical problem
  - Stillbirth
  - LBW
  - Others
- Current medical or OB problem
  - GDM
  - HTN
  - Almost anything!
- Reassurance
Interpreting the NST: NICHHD Terminology?

- Working Group jointly sponsored by the National Institute of Child Health & Development, ACOG, & the Society for Maternal-Fetal Medicine

- Terminology:
  - 1st formalized in 1997
    - >30 years after the EFM was introduced
  - 2008 was the next update

- Evidence based?
  - They recommend more research needs to be done....
### NICHD 2008 Categories

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>CATEGORY II</th>
<th>CATEGORY III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Indeterminate</td>
<td>Abnormal</td>
</tr>
</tbody>
</table>
### NICHD 2008 Categories

| CATEGORY I  | Baseline 110-160  
|-------------|-------------------|
| *Normal*    | *and* Moderate Variability  
|             | *and* No Late or Variable Decels  
|             | Accels & Early Decels present or absent  |
| CATEGORY II | Indeterminate  |
| CATEGORY III| Abnormal         |
## NICHD 2008 Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
</table>
| **CATEGORY I** | **Normal**  
Baseline 110-160
*and* Moderate Variability
*and* No Late or Variable Decels
Accels & Early Decels present or absent | Predictive of normal pH.  
**Action:** Routine care |
| **CATEGORY II** | **Indeterminate** | | |
| **CATEGORY III** | **Abnormal** | | |
# NICHD 2008 Categories

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>Baseline 110-160 and Moderate Variability and No Late or Variable Decels Accels &amp; Early Decels present or absent</th>
<th>Predictive of normal pH. Action: Routine care</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY II</td>
<td>Indeterminate</td>
<td></td>
</tr>
<tr>
<td>CATEGORY III</td>
<td>Absent Variability + Baseline &lt;110 or Absent Variability + Late or Variable Decels</td>
<td></td>
</tr>
</tbody>
</table>
# NICHD 2008 Categories

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>Baseline 110-160 and Moderate Variability and No Late or Variable Decels Accels &amp; Early Decels present or absent</th>
<th>Predictive of normal pH. Action: Routine care</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY II</td>
<td>Indeterminate</td>
<td></td>
</tr>
<tr>
<td>CATEGORY III</td>
<td>Absent Variability + Baseline &lt;110 or Absent Variability + Late or Variable Decels</td>
<td>Predictive of abnormal pH. Action: Immediate remedies</td>
</tr>
</tbody>
</table>

**NORMAL**

- Baseline 110-160
- Moderate Variability
- No Late or Variable Decels Accels & Early Decels present or absent

**ABNORMAL**

- Absent Variability + Baseline <110
- Absent Variability + Late or Variable Decels

**PREDICTION**

- Predictive of normal pH
- Immediate remedies
## NICHD 2008 Categories

| CATEGORY I | Baseline 110-160  
and Moderate Variability  
and No Late or Variable Decels  
Accels & Early Decels present or absent | Predictive of normal pH.  
Action: Routine care |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal</strong></td>
<td><strong>Indeterminate</strong></td>
</tr>
</tbody>
</table>
| CATEGORY II | Baseline <110 or >160  
or Variability absent, minimal, or marked  
or Accels – none after stimulation  
or any of these Decels:  
• Variable with slow return, shoulders, or overshoots  
• Variables with min or mod variability  
• Lates with moderate variability  
• Prolonged decel >2 min | **Abnormal**  
Absent Variability + Baseline <110  
or  
Absent Variability + Late or Variable Decels | Predictive of abnormal pH.  
Action: Immediate remedies |
| **Indeterminate** | **Abnormal**  |

---
## NICHD 2008 Categories

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>Baseline 110-160 and Moderate Variability and No Late or Variable Decels Accels &amp; Early Decels present or absent</th>
<th>Predictive of normal pH. Action: Routine care</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY II</td>
<td>Baseline &lt;110 or &gt;160 or Variability absent, minimal, or marked or Accels – none after stimulation or any of these Decels: • Variable with slow return, shoulders, or overshoots • Variables with min or mod variability • Lates with moderate variability • Prolonged decel &gt;2 min</td>
<td>Not predictive of pH status. Actions: 1. Longer surveillance +/- other testing and 2. Re-evaluation</td>
</tr>
<tr>
<td>CATEGORY III</td>
<td>Absent Variability + Baseline &lt;110 or Absent Variability + Late or Variable Decels</td>
<td>Predictive of abnormal pH. Action: Immediate remedies</td>
</tr>
<tr>
<td>CATEGORY</td>
<td>Description</td>
<td>Predictive of</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>CATEGORY I</td>
<td>Normal</td>
<td>Predictive of normal pH.</td>
</tr>
<tr>
<td>Normal</td>
<td>Baseline 110-160 and Moderate Baseline Variability and No Late or Early Decels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accels &amp; Early Decels present or absent</td>
<td></td>
</tr>
<tr>
<td>CATEGORY II</td>
<td>Indeterminate</td>
<td>Not predictive of pH</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Baseline &lt;110 or &gt;160 or Variability absent, minimal, or marked</td>
<td>status.</td>
</tr>
<tr>
<td></td>
<td>after stimulation or any of the following criteria:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Variable with slow return, shoulders, or overshoots</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Variables with min or mod variability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Lates with moderate variability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Prolonged decel &gt;2 min</td>
<td></td>
</tr>
<tr>
<td>CATEGORY III</td>
<td>Abnormal</td>
<td>Predictive of abnormal pH.</td>
</tr>
<tr>
<td>Abnormal</td>
<td>Absent Variability or Baseline &lt;110 or Late or Variable Decels</td>
<td></td>
</tr>
</tbody>
</table>
NICHD 2008 Categories

Do the NICHD Categories apply to Antepartum EFM or only to Intrapartum EFM?
### NICHD 2008 Categories

<table>
<thead>
<tr>
<th>CATEGORY I</th>
<th>Baseline 110-160 and Moderate Variability and No Late or Variable Decels Accels &amp; Early Decels present or absent</th>
<th>Predictive of normal pH. Action: Routine care</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY II</td>
<td>Baseline &lt;110 or &gt;160 or Variability absent, minimal or Accels – possible neonatal depression for slow return, shoulder or overshoots</td>
<td>Not predictive of pH status. Actions: 1. Longer surveillance +/- other testing and 2. Re-evaluation</td>
</tr>
<tr>
<td>CATEGORY III</td>
<td>Abnormal Absent Variability + Baseline &lt;110 or Absent Variability + Late or Variable Decels</td>
<td>Predictive of abnormal pH.</td>
</tr>
</tbody>
</table>

**The NICHD Categories are not appropriate for antepartum surveillance (NSTs).**

But the physiological concepts & other terminology are relevant.
Terminology for NSTs

**“Accelerations”**
- 15 x 15
- 10 x 10 for preterm <32 weeks
  - ‘NST’ is inappropriate for <28 weeks

**Baseline, variability, decels, …**
- Same terminology, with knowledge of term vs. preterm physiology informing your Assessment.
- Some decels can only be defined with contractions present, so know the physiology & the proper use of the terms.
Accelerations ("Accels")

This website has excellent pictures and EFM strips, many that you can click to watch scroll on the screen.
Center for Experiential Learning, Quillen College of Medicine, East Tennessee State University

[utilis.net/fhm/](utilis.net/fhm/)
Nonperiodic Accelerations (do not occur in a pattern with contractions)

What’s the physiology?
Well-oxygenated heart, brain, & adrenals.

UNDER NORMAL STRESS
Periodic Accelerations  (occur regularly with contractions)

What’s the physiology?

Cord compression – these are ‘upside down variables’.
A little squeeze of the umbilical vein causes an accel,
while a stronger squeeze of the umbilical vein + artery causes a decel.
Accelerations?
These rise off the baseline but do not meet the criteria of 15 beats above baseline at the acme even though they are more than 15 seconds at the base.

What’s the physiology?
Fetus <32 weeks?
Sleeping fetus under normal stress?
Compensation due to some stress?
(cord compression, oligohydramnios, smoking, drugs, ...)
Something else?
Are there accelerations?

What’s the physiology?

Fetus >32 wks or <32 wks?
Baseline 120-125, mod variability, no decels.
Need 2 accels to reach >135-140.
Not reactive at this point – but cannot say if fetus is under normal stress or not.
Might consider stimulation to ‘wake baby up’
Stimulation for Accelerations

Sometimes 30-60 minutes have passed, all else looks okay, but no 15x15 accels have been identified.

• Techniques to try to “wake” the baby up:
  – Massaging or ‘jiggling’ the maternal abdomen
  – Change maternal position
  – Juice or other cold / glucose food items
  – Noise (clapping, music, vibroacoustic stimulation)
  – Light (halogen is popular)
  – Rub presenting part in vagina (‘scalp stim’)
  – Others?

88 decibels
Between a garbage disposal & a power mower.
NST Assessment Terminology

“Reactive” → 2 accels within 20 min of each other

“Nonreactive” → does not meet reactive criteria

‘Reaffirmed’ in 2012 without changes.
NST Assessment Terminology

“Reactive” → 2 accels within 20 min of each other

“Nonreactive” → does not meet reactive criteria

Other terms often used but are not standardized:
   – Equivocal
   – Unsatisfactory
   – Suspicious
   – Indeterminate
   – Abnormal
What can the midwife conclude from an NST?

Remember our Goals:

1. To identify if there is possible stress to fetal oxygenation & threats to acid-base (pH) status.

   ‘Reactive NST’ with a normal baseline + moderate variability + no decels indicates that fetal well-being is present.

   Anything else is not interpretable without further surveillance – baby may or may not be in a situation where oxygenation is compromised.
What can the midwife conclude from an NST?

Remember our Goals:

1. To identify if there is possible stress to fetal oxygenation & acid-base (pH)

'Reactive NST' with a normal baseline + moderate variability + no decels indicates that fetal wellbeing is present.

Anything else is not interpretable without further surveillance – baby may or may not be in a situation where oxygenation is compromised.

The NST is a SCREENING test, not a DIAGNOSTIC test.
What can the Midwife predict from an NST?

Remember our Goals:

2. To prevent intrauterine asphyxia and fetal/neonatal organ damage or death.

Although controlled research studies are few and ‘evidence’ based on research is weak, anecdotal experience and ‘expert opinion’ perpetuate a strong belief in the NST as a screening test.

Commonly reported statistics:

Reactive NST = fetal death rate of <5/1000
Nonreactive NST = fetal death rate of 40/1000
Cochrane Systematic Review
Grivell et al., 2010

- 6 studies, N = 2105 women
- Studies were not high quality, all from the 1980s & 1990s
- Antepartum NST with EFM ("CTG") vs. no EFM
- Results:
  - Perinatal Mortality: no statistically significant difference, n = 1627
  - Cesarean: no statistically significant difference, n = 1279
- Conclusion – no recent or high quality experimental research evidence to support the use of NSTs.
Electronic Fetal Monitoring Revisited

It has been difficult to demonstrate that EFM is indicated or superior to other forms of fetal surveillance with RCTs. But it is ‘the standard of care’ in many clinical situations, so midwives must understand it & if they use it, to do so wisely.
Interpretations & Actions

• **Reactive NST** (normal, reassuring):
  – Actions:
    » Fetal movement education in latter half of pregnancy
    » Inform when to return for next visit

• **Indeterminate** – a temporary assessment, not a final assessment.
  Need more info before deciding. Time limit: 2 hours.

• **Nonreactive &/or Other Nonemergent Concerns**
  (fetus compensating for some kind of stress):
  – Actions:
    » Consult with physician, probably refer for further assessment.
    » Position change, hydration?
    » Extended monitoring +/- US (BPP)

• **Nonreactive &/or Emergent Concerns** (fetus decompensating):
  – Actions:
    » Immediate position change, hydration, O₂
    » Immediate referral to L&D hospital
NST Documentation

1. Maternal name, age, G/P
2. Gestational Age
3. Maternal risk factors relevant to fetal compromise
4. Fetal risk factors relevant to fetal compromise
5. Maternal vital signs (minimum: BP & *Pulse*)
6. Characteristics of ‘the strip’
   - Contractions – regularity, maternal perception, strength
   - FHR – baseline, variability, accels, decels, anything unusual
7. Interpretation/Assessment
   - Reactive or Nonreactive (urgency)
8. Actions & Plan – follows from assessment & risk factor eval
Date/Time

S: Pam called this a.m. to report decreased FM x2h. Baby is ‘usually active in the morning’. She reclined, drank juice, counted 4 ‘small’ movements over the next hour. No ctxs, back ache, bldg, LOF, pain, fever, or other s/sx. Was asked to come to clinic now for eval.

O: 29 yo G1P0 GA 37\textsuperscript{2} based on LNMP & 12 wk US. No pg risk factors except Rh- & GBS+. NKDA.

BP 128/72    P 86    T 98.2

FH 37.5 cm    Abd NT. Cephalic by Leopold’s, FM noted w/ abd exam. NST: BL 130-135, mod variability, 3 accels >15x15 in 18 min, no decels. 1 mild nonpainful ctx recorded.

A: IUP at 37+ wks, c/o decreased FM, no other risk factors

Reactive NST

P: Reassurance given. Will cont to monitor FM & call if concerned.

RTC for next reg scheduled PNV in 4 days.

~Signature
NST Recording Sheet

Client’s Name ____________________________ Date: _______________________

EDD: ___________ Gestational Age: _______ Purpose of EFM today: _______________________

EFM Start Time: ___________ End Time: ___________ Location: _______________________

BP _________ Pulse ________ Temp (optional) _______ Maternal Position _______________________

Fetal Movement □ None □ Present: Maternal Report □ Observable □ Palpable (Circle one or more)

Contractions □ None □ Present (freq, length, strength) _______________________

Baseline FHR (increments of 5 bpm) _______________________

Variability □ Absent (undetectable) □ Minimal (1-5 bpm) □ Moderate (6-25 bpm) □ Marked (>25 bpm)

If variability changed, describe: ______________________________________________________

Accelerations □ Present: ≥2 in ≤20 minutes (≥15 bpm x ≥15 sec)

□ Present: ≥2 in ≤20 minutes (≥10 bpm x ≥10 sec) for babies <32 weeks gestation

□ None present, or present but do not meet above criteria

□ Stimulation used to encourage accel (describe) _______________________

Decelerations □ None (Recurrent = with ≥50% of ctxs; Intermittent = with <50% of ctxs)

□ Early (□ Recurrent □ Intermittent) _______________________

□ Lates (□ Recurrent □ Intermittent) _______________________

□ Variables (□ Recurrent □ Intermittent) _______________________

Other ____________________________________________________________

Interpretation □ Reactive □ Nonreactive □ Other _______________________

Plan for Follow-Up ____________________________________________________________

Signature of Person Interpreting NST ____________________________ Date ____________________
S: Pam called this a.m. to report decreased FM x2h. ...Was asked to come to clinic now for eval.

O: 29 yo G1P0 GA 37\textsuperscript{2} based on LNMP & 12 wk US. No pg risk factors except Rh- & GBS+. NKDA. BP 128/72  P 86  T 98.2
FH 37.5 cm Abd NT. Cephalic by Leopold’s, FM not noted w/ exam. NST: BL 130-135, mod variability, no 15x15 accels in 60 min, 2 variable decels lasting 20-30 sec to nadir 90-100. 1 mild nonpainful ctx recorded. Position change from reclining to sidelying. Abd massage did not elicit an accel.

A: IUP at 37+ wks, c/o decreased FM, no other risk factors
NonReactive NST + 2 variable decels

P: Reviewed nonreac NST results & concept of screening test-need for further evaluation. Pam states understanding, called partner Chris. T.C. consult w/ Dr Smith - advises monitoring at Mercy Hosp L&D. I'll call Pam &/or hosp in 1-2 hr to f/u. Pam left for hosp at 10:15.  ~Signature
Reducing Errors with EFM

EFM is “effective only when used in accordance with published standards and guidelines by professionals skilled in correct interpretation and when appropriate timely intervention is based on that interpretation.”

Reducing Errors with EFM

EFM is “effective only when used in accordance with published standards and guidelines by professionals skilled in correct interpretation and when appropriate timely intervention is based on that interpretation.”


Over the past 40 years, EFM education has evolved from an ‘on-the-job’ RN-only training approach to requiring both providers & staff to demonstrate formal education and ongoing competency (similar to NRP).
EFM Certification

• Certification
  – courses are usually 1-2 days with an exam
  – maintenance either requires CEUs or exam retake

• Becoming a requirement across the nation
  – Interdisciplinary (physicians, nurses, midwives)
    • in educational programs (CNMs)
    • for hiring
    • continued certification (every 2-3 years)

• Published reports are appearing that describe EFM education/certification as a mandatory risk management activity. Some reports are linking this education to improved outcomes.
EFM Certification

‘Certification’ course
In-person, not online, is best for 1st time

Some only let MDs, RNs, CNMs take exam
NST Informed Consent

Please share your informed consent discussion

- Verbal?
- Written?
- Signed?

- Different info for recommending or advising the NST vs. performing the NST?
Writing Practice Guidelines

Indications for NST
Initiation, frequency

Informed Consent

Criteria for Assessment
Define your terms!
- Reactive
- Nonreactive
- Others (‘indeterminate’)

Criteria for Documentation

Indications for Consultation, Co-management, Referral

- Decreased fetal movement
- Imminent postterm or postterm
- Hx of obstetrical problem
  - Stillbirth
  - LBW
  - Others
- Current medical or OB problem
  - GDM
  - HTN
  - Almost anything!
- Reassurance
NST Practice Guidelines

• **Decreased Fetal Movement**
  - Initiation – same day as the report of decreased FM (if no FM after the usual efforts of lying down → drink juice → count longer)
  - Frequency – once, in the absence of other risk factors

• **Pending Postterm**
  - Initiation – 41 wks completed gestation (some start at 40½ )
  - Frequency – q 3-4 days until birth

• **Medical or OB Risk Factors** *(hx or current)*
  - Initiation – per consultation with MD, usually sometime between 32-36 weeks
  - Frequency – per consultation, usually weekly
Strip Review

Reactive?
NonReactive?

Under normal stress
Compensating
Decompensating
Strip Review

• Center for Experiential Learning, Quillen College of Medicine, East Tennessee State University [utilis.net/fhm/] has excellent pictures and EFM strips, many that you can click to watch scroll on the screen.
Take Home Messages

• Know when an NST is indicated: maternal/fetal physiology & risk factors.

• Demonstrate appropriate training before performing & interpreting NSTs.

• Informed Consent: NSTs are for screening only.

• Develop practice guidelines that reflect the recognition of the screening nature of NSTs, and the consultation & referral indicators & resources of your particular practice.

• Document thoroughly, with a plan that reflects the normalcy or urgency of the Assessment.