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Risk Management in Intrapartum Fetal Monitoring: Accidental Recording of the Maternal Heart Rate

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There is little doubt that continuous electronic fetal monitoring (CEFM) is a technology that is overused for low-risk laboring women in this country. Of course, there are circumstances that require its use. For example, the all-too-common interventions of both epidural anesthesia and oxytocin infusion during labor are indications for CEFM, even in healthy low-risk laboring women.¹

A factor that contributes to the prevalence of CEFM use for low-risk laboring women, despite scientific evidence, is the promise of protection against poor perinatal outcomes. However, this goal has not been achieved. False-positive and false-negative rates for CEFM are unknown, largely because of a lack of consensus concerning what constitutes fetal compromise.² Consequently, the following statements are regularly overheard: “good” babies are born following “bad” CEFM tracings, and its reverse, “bad” babies are sometimes unexpected after “reassuring” CEFM tracings. Historically, poor interrater reliability and even intrarater reliability have been

documented in interpretations of CEFM tracings.³ More recently, the term *suspected fetal compromise* was adopted to replace fetal distress to better indicate the screening versus diagnostic nature of CEFM.

The “3-tier fetal heart rate interpretation system” introduced in the 2008 National Institute of Child Health and Human Development (NICHD) guidelines for electronic fetal monitoring is intended to provide more standard description of the CEFM tracings, specifically in relationship with fetal acid-base status.⁴ Nurses are encouraged to use and integrate this new system into fetal monitoring interpretation and documentation. As these NICHD guidelines are adopted and applied in clinical practice, the hope is that fetal monitoring interpretation and subsequent management will be improved.

The value of CEFM, as with any instrument, is its ability to accurately measure what was intended. In the case of CEFM, all the aforementioned issues rely on the assumption that the output of the device is indeed the fetus. Without this assurance, accurate interpretation is impossible. If the monitor traces the maternal heart rate (MHR), instead of that of the fetus, this presents a major dilemma that impacts all aspects of intrapartum nursing care. Adequately ensuring accurate monitoring of the fetus is an important risk management issue.

Maternal heart rate can be inadvertently recorded and appear as a pattern on CEFM tracings, particularly with an active fetus, in twin gestations, when the ultrasound transducer is repositioned, or if the laboring woman is obese.^{5,6} Also it is possible that on CEFM tracings, the MHR may be double counted in cases where aortic movement is similar in systole and diastole.⁷ Fetal bradycardia may be suspected when in fact, MHR is being monitored.⁸ Following fetal demise, MHR may be detected (generally appearing as a bradycardia) even through the use of a fetal spiral electrode (FSE).⁷ MHR may also be detected if the FSE is unintentionally placed on the maternal cervix.⁹ Therefore, the application of an FSE does not completely resolve the problem of maternal signal interference.⁹

There have been a number of published case reports of monitoring the MHR instead of the fetal heart rate (FHR),^{5,7,10} yet this issue is not well addressed in the current literature. A comprehensive literature search revealed only a few references to published work on this topic within the past 5 years. For example, Nageotte¹¹ described this as one of the 5 most common FHR-monitoring errors and cautioned physicians to ensure that the fetus and not the mother was being monitored. A recent clinical practice guideline from Canada recommended the assessment of the maternal pulse and differentiation from FHR when fetal bradycardia is observed.¹² However, this guideline did not recommend this approach more generally as part of standardized “guidelines to confirm fetal life” when CEFM is initiated, as had been suggested by a well-known fetal monitoring expert.¹³

The first step in addressing this issue from a risk management perspective is to identify CEFM patterns that should be considered suspicious of MHR. Sherman et al¹⁴ compared MHR and FHR pattern recordings during the labors of 30 healthy women. They found that the MHR tracings “closely resemble fetal heart rate patterns.”¹⁴ However, there are some important potentially distinguishing characteristics in MHR patterns: (1) baseline heart rates were lower, rarely exceeding 110 beats per minute; (2) variability was considerably higher although still in the range of 5 to 25 beats per minute; (3) accelerations were symmetrical, generally had one single rise, were corresponded with contractions, and were increased in frequency and amplitude as labor advanced; and (4) decelerations were conspicuously absent, particularly during the bearing-down efforts of the second stage. Because adults in pain, and more specifically women during labor contractions, experience an increase in heart rate, the differentiation can become even more complex.⁷ Laboring women with tachycardia may remain asymptomatic.⁵ Therefore, a laboring woman with a rapid pulse that recorded on the CEFM could potentially have this finding interpreted as a reassuring FHR pattern.¹¹

More recently, 41 twin birth cases where the second twin had an umbilical artery pH of 7.05 or less were retrospectively analyzed. They looked for evidence that the FHR, assumed to be that of the second twin, was actually MHR.⁶ There were 4 cases in which an unexpectedly poor outcome was attributable to MHR recordings that were falsely interpreted as reassuring FHR patterns. In each of these cases, the typical MHR patterns that were missed during intrapartum care were clearly identifiable after the birth of the first twin. First, they noted a rapid change in the baseline. Second, they identified that the tracing printout became denser, possibly reflecting sinus arrhythmia, which is more intense in the mother than in the fetus and would result in more frequent pen movement if recording the mother. The authors concluded that this misinterpretation could contribute to the increased prevalence of fetal asphyxia in second twins.

Murray⁷ suggested that nurses ensure that hospital protocols include confirmation of fetal life during the initial application of CEFM. To date, this recommendation has not been consistently incorporated into the procedural guidelines for CEFM but does appear in the guidelines for intermittent auscultation. For example, both the Association of Women's Health, Obstetrics and Neonatal Nurses (AWHONN) and the American College of Nurse-Midwives intermittent auscultation guidelines included directions to palpate the MHR using the radial pulse to establish that the heart rate heard is fetal, not maternal.^{9,15} The 2009 AWHONN guidelines⁹ included an extensive discussion aimed at ruling out inadvertent recording of the MHR. This comprised suggestions to palpate the maternal radial pulse and compare it with the audible signal, as well as the printed rate, when CEFM is initiated; when there is a change in the mode of monitoring; or where there is a noncontinuous tracing. Furthermore, in the section on FSE troubleshooting, a list of suggestions included simultaneous assessment of the MHR and FHR and auscultation with a fetoscope. However, these recommendations did not appear in the document as part of the AWHONN decision tree for fetal monitoring.

During CEFM application, the simplest way to confirm fetal life is to monitor and compare the maternal radial pulse for 1 minute while listening to the sounds of the fetal heart through the electronic monitor.⁷ Other options include palpation of fetal movement or auscultation with a fetoscope. The situation becomes more complex when the MHR and FHR are similar. Murray⁷ suggested that the nurse perform Leopold's maneuvers to identify the fetal position, reposition the ultrasound transducer over the fetal back, and place another device over the maternal heart to monitor and record the 2 heart rates simultaneously. Subsequently, fetal scalp or vibroacoustic stimulation can be performed in an attempt to identify FHR accelerations to better distinguish FHR from MHR. These efforts at differentiation should be documented in the medical record and then repeated at regular intervals if the MHR and FHR remain within similar ranges. Medicolegal challenges with the differentiation between MHR and FHR continue during labor. It is recommended that nurses maintain vigilance to identify this potential problem during their intrapartum care. For example, check maternal pulse at regular intervals when vital signs are routinely taken and consider repeating this assessment anytime when there is a break in the tracing, a fetal bradycardia, a change in baseline, or a change in monitoring mode to ensure that the FHR and MHR are distinguishable. Ultrasound may also be used to confirm the FHR.⁸ Fetal pulse oximetry is not currently recommended because its value in ensuring fetal well-being has not been established.¹⁶ However, the use of maternal pulse oximetry could provide a continuous readout of the MHR that could more easily be compared with that of FHR.⁶

The misinterpretation of MHR as FHR can lead to unnecessary interventions, a delay or absence of appropriate intrapartum nursing care for FHR abnormalities, false reassurance that a fetus is tolerating labor, and overlooked maternal tachycardia that may signal fever and other potential intrapartum problems. Unfortunately, it is often the poor outcome, not the unique features of the CEFM tracing, that triggers the suspicion that MHR interfered with correct FHR interpretation.⁵ Guidelines to confirm fetal life are recommended with the initiation of CEFM. Continued assessment of MHR compared with that of FHR throughout labor should remain a consideration, especially when the two are not easily distinguished. Further

research to establish the prevalence of misattributed MHR tracings in labor is recommended. More current literature is necessary to disseminate this issue into contemporary nursing practice and into clinical practice guidelines.

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