EDUCATION

The case for an electronic fetal heart rate monitoring credentialing examination

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The Perinatal Quality Foundation has created an examination containing both knowledge-based and judgment questions relating to the interpretation of electronic fetal heart rate monitoring for credentialing all medical and nursing personnel working on a labor and delivery floor. A description of the examination and the rationale for its use throughout the United States is presented.

Key words: credentialing for labor and delivery, electronic fetal heart rate monitoring examination, script concordance testing in obstetrics

Significant neonatal and early childhood central nervous system impairment is frequently ascribed to adverse events occurring during the intrapartum period. The use of electronic fetal heart rate (FHR) monitoring (EFM) to assess fetal well-being during labor is essentially ubiquitous throughout the United States, and is virtually the only currently available tool to evaluate the status of a fetus during that time. The ability of this modality to accurately predict neurological outcome is questionable, but it clearly can be useful in detecting fetuses at increased risk for neonatal hypoxia and acidemia,[1,2] and is almost always scrutinized in retrospect when a child is thought to have suffered neurological damage as a result of care rendered during the intrapartum period. Therefore, optimizing and standardizing the interpretation of EFM should be an important part of efforts to improve patient safety in obstetrical care.

Recognition of the importance of this modality led to a requirement in 2005 that all caregivers in the hospitals insured by the Medical Center Insurance Company (MCIC) pass an EFM credentialing examination before being allowed to work on any of the labor and delivery floors in their network. MCIC insures the primary and all of the affiliated hospitals of the Yale, Johns Hopkins, University of Rochester, Cornell, and Columbia University Medical Centers. The expectation was that this mandate would apply to all nurses, residents, fellows, midwives, and attending physicians who rendered care to laboring women, and the hospitals were given a period of 18-24 months to comply. The credentialing process consisted of passing an existing commercially available examination related to the theory and interpretation of EFM tracings. All post graduate year-1 residents were required to pass the examination prior to being able to work on the obstetrical service as a post graduate year-2 resident, and all new nursing and attending physician hires had to pass it within 12-18 months of their start date.

Not unexpectedly, there was initial resistance to this decision. The argument most frequently made was that every obstetrical residency and nursing training program in the United States provides extensive training in EFM interpretation, and this modality is used daily in the oversight of women who deliver on labor and delivery floors in each of the excellent medical centers insured by MCIC. Many of the senior members of the physician and nursing staff insisted that they had been interpreting FHR monitoring in exemplary fashion for years. Why on earth, then, was it necessary to have them take an examination on this subject? The argument in defense of the credentialing process was that there was no objective evidence that EFM was in fact being used optimally on any of the services in the network, but there was clear evidence that the terminology used by different caregivers to describe a particular tracing was often discrepant in that patient's chart.

In any case, the credentialing process became a requirement to work on each of the MCIC hospital's labor and delivery services, and is now believed by most clinicians in these facilities to have improved both communication and clinical care. In all of these hospitals there were other safety measures that were introduced over the ensuing 7 or 8 years and it is difficult to separate out the contributions of individual components of the final program. Nevertheless, a report by Pettker et al[3] has documented that the overall efforts that have been undertaken have led to a substantial

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improvement in neonatal outcomes at the Yale University Medical Center, and these authors believe that implementation of a required credentialing examination has been an important contributor to that improvement.

Clark et al[4] reported on the improved outcomes in the Hospital Corporation of America (HCA) network associated with the development of an online FHR monitoring course, among other safety initiatives. Completion of the course is mandatory for nurse employment, and has been adopted by many of the obstetrical services in the HCA system as being required for staff privileging. Although a credentialing test was not specifically mentioned in the report, an examination is an integral part of the online course.

A major component of all patient safety improvement programs is the enhancement of effective communication between the members of a team caring for each individual on their service. In 2008, a multidisciplinary group composed of representatives from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American Congress of Obstetricians and Gynecologists (ACOG) issued a document with new definitions for a variety of terms used and patterns seen in EFM tracings.[5] Shortly thereafter ACOG produced Practice Bulletins that endorsed the use of the new nomenclature and provided guidelines for the management of women undergoing EFM during labor.[6,7] The question, therefore, is not whether relevant information exists, it is whether that information has been absorbed and is being utilized by all members of the obstetrical care teams providing intrapartum care to women across the United States.[8]

The Perinatal Quality Foundation (PQF) is an independent nonprofit foundation with the mission of improving the quality of obstetrical medical services in the United States. In 2011, a group of nationally recognized experts in FHR monitoring was convened by the PQF to explore the advisability of creating a credentialing examination. This group concluded that growing numbers of obstetrical units throughout the United States would want to "raise the bar" on their service and would see the wisdom in assuring that the members of their staff were at the very least speaking the same language as relates to this subject. The group also thought that the existing credentialing examination offered by the National Certification Corporation was suboptimal because it focused on purely factual information and the interpretation of static segments of a FHR strip, as opposed to the management of evolving clinical issues in the real world of laboring patients. Existing educational programs such as those provided by Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), advanced practice strategies (APS), and General Electric contain testing elements within their teaching modules, but do not function as a free-standing evaluation of the examinee's overall comprehension of the teaching material.

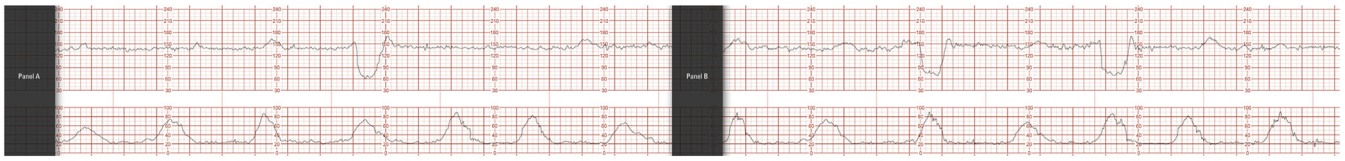
The group then set about creating 2 separate examinations, one for obstetrical nurses and the other for physicians or midwives. Both tests provide traditional "knowledge" questions relating to the current definitions of the terms that are necessary to describe EFM tracings and the interpretation of a variety of different heart rate strips, along with a series of "judgment" (script concordance test [SCT]) questions that ask the examinee to reevaluate their management options as the tracing from a particular patient evolves over time and in association with changing clinical events.

Separate panels of experts in obstetrical nursing and maternal-fetal medicine generated a total of 120 knowledge and SCT questions for each examination. These questions were then sent in an online examination format to 2 groups of recognized national experts, composed of 20 physicians and an equal number of nurses, who had previously agreed to serve as expert examinees. The final 70 questions for each examination were selected based on a statistically significant degree of concordance between the answers given by these experts. Beta testing of the examination by both nurses and physicians is ongoing at the time of this article's submission, and the answers from those tests will be subjected to Cronbach alpha and split-half test analysis to assure consistency of the individual questions, as well as their reliability as discriminators within subject domains.

The judgment measure chosen for this examination is the SCT, which is a tool that attempts to measure mental processes in uncertain clinical situations. An SCT question presents a specific clinical scenario after which potentially important information is added that is reflective of the dynamic aspects of the obstetrical patient in labor. For each such question there are 5 ordered answers intended to measure the degree to which, if any, the additional information affects one's initial clinical management plan. The main goal of an SCT question is not to measure specific knowledge or memory levels but to assess contextual reasoning and decision making in an evolving clinical setting. The very nature of FHR monitoring in the laboring patient makes it ideally suited for evaluation by this type of assessment tool.

Importantly, there is never one agreed-on correct answer to an SCT question, but there are at least 2, and usually 3 answers that are clearly incorrect. If everyone agreed on 1 correct answer the question would be knowledge based. After analysis of the expert's responses to the SCT portion of the examination, a potential test question was eliminated if all the experts agreed on a single answer, or if $\geq$4 different answers were given. Scoring of the SCT questions that remain after the beta testing is based on the level of agreement between the answers given by those taking the test and the responses submitted by the experts. The following is an example of this type of question:

FIGURE
Fetal heart rate tracings



A, Tracings on admission. **B**, Tracings 2 hours later.

Berkowitz. A credentialing examination for electronic fetal monitoring. Am J Obstet Gynecol 2014.

Case context

A 25-year-old G1P0 patient presents at 41 weeks in spontaneous labor. Ruptured membranes are confirmed and the initial cervical examination is 3/+1/100%/vtx. The initial FHR tracing is shown in the Figure A.

Your management plan is…

Continue FHR monitoring and expectantly manage

…**and then you learn the following additional information:**

2 hours later, you review the FHR tracing shown in the Figure B, and note that the cervix is unchanged.

How does this additional information affect your thinking about the management plan?

- ○ Strongly invalidates
- ○ Could invalidate
- ○ No impact
- ○ Could support
- ○ Strongly supports

While this type of question may seem somewhat unfamiliar, it has been established as a valuable and accepted modality in the assessment of critical decision making in medical practice.[9,10] Test takers will be informed that there is >1 correct answer to the SCT questions, and asked to use their best judgment in selecting the one most consistent with their management style. Scoring of this type of question will be based on the level of agreement between the answers given by those taking the test and responses submitted by the experts. Full credit is given to the answer most frequently chosen by the experts; partial credit proportional to the percentage of experts choosing the answer is given for other correct choices. In the example given above, full credit would be given for the third answer, 25% for the fourth, and no credit for the other 3 if, for example, 6 of 24 experts had chosen answer number 4 and 18 had chosen number 3. On the other hand, 33% would be given for the fourth answer if it had been chosen by 8 of the 24 experts.

Use of SCT questions will allow the PQF to provide separate scores on knowledge and judgment. An experienced clinician who has not continued to read the recent literature may be very strong on judgment but less knowledgeable of new terminology and concepts. A resident in training, on the other hand, may score high in knowledge but lower in judgment. Measuring both elements of clinical decision making should provide insight and incentive for further education, experience, or training. The separate portions of the examination will be graded independently, but after combining them a single pass or fail mark will be given. The results of the component parts of the examination, however, will be included along with the final mark so that the examinee will be informed about his or her areas of strengths and weaknesses.

While there is a great deal of overlap in knowledge required to interpret EFM strips by physicians and nurses there are significant differences in the roles they play in the management of their patients, and so separate examinations were designed for each group. Midwives will be required to take the physician examination because they are often called on to act in that capacity. Multiple reference documents and superb online EFM courses exist to provide the necessary factual information required to pass this examination, and the group that compiled the test has not specified any preparatory process required prior to taking it. The test will be available to individuals who simply want to assess their own knowledge of this subject as well as to institutions that plan to use it in a fashion similar to that utilized by MCIC.

In the process of developing this EFM credentialing examination, the PQF recognized that protecting the confidentiality of the examinees along with harnessing the strengths of the Internet were of critical importance to provide an optimal format for the testing experience. Consequently, a consultant was identified who assisted PQF in bringing these concepts to fruition. From the inception of that relationship, however, it was contractually agreed that only PQF would exclusively own and be responsible for the development of all aspects of the examination questions, subsequent revision of those questions, and all data regarding the testing results. No one but PQF has the ability to review the test, change or modify the questions, or have access to any data generated by those taking the examination.

An individual who passes the examination will be credentialed for a period of 3 years. The test results will not be made public. They will always be sent to the examinee, but only to that individual's department chairman, hospital chief executive officer, or insurance company safety officer if one of the latter organizations pays the examination fee.

There will be a charge to take the examination to cover its administrative costs. The creators of the examination did this on a strictly voluntary basis and will not receive any monetary remuneration for the work they have done to date or any income derived from the process, all of which will go to the PQF.

Finally, it should be emphasized that this examination does not certify anyone

to interpret EFM tracings. The American Board of Obstetrics and Gynecology (ABOG) is the only organization that can certify individuals to practice our specialty in the United States, and the American Midwifery Certification Board serves that function for midwives. This process is voluntary and as such is similar to accreditation provided to practices by American Institute of Ultrasound in Medicine for obstetrical ultrasound and credentialing provided to individuals by Nuchal Translucency Quality Review for nuchal translucency measurements. Both ACOG and ABOG were apprised of the creation of this examination throughout the period of its development, as was done during the establishment of Nuchal Translucency Quality Review, which was the first quality improvement project of PQF. Furthermore, in this case we also informed the leadership of AWHONN and American College of Nurse Midwives. All of the physicians and nurses who were involved in the creation and subsequent beta testing of this examination were members of ACOG, AWHONN, or American College of Nurse Midwives. None of those organizations have officially endorsed the examination but neither have they objected to it, nor is it in conflict with their fundamental missions.

So, can a case be made for credentialing every member of the obstetrical caregiver team in EFM as a precondition for working on a labor and delivery floor? In "To Err is Human," the Institute of Medicine advocates the development of requirements to demonstrate safe and competent clinical skills during one's career as opposed to the current standard that concentrates only on qualifications at initial licensure.[11] As pointed out by Abuhamad and Grobman,[12] virtually all of the studies published to date of improved clinical outcomes following the incorporation of a variety of different safety measures are longitudinal analyses, and there is a dearth of randomized trials that evaluate the effectiveness of those initiatives. It can therefore be said that there is a paucity of high-level evidence-based data to support the adoption of any of those modalities. However, pursuit of perfection should not become the enemy of achieving the good. It has been argued that an absence of gold-standard studies should not impede the adoption of alterations in behavior or processes that are highly likely to improve outcomes.[13]

We believe that establishing a universal standard for defining and interpreting EFM tracings is important for every labor and delivery unit in the country. It will be up to each individual institution to decide whether they will do this, and if so how it should be done. If that process includes a credentialing examination we believe that the one described in this article will provide an objective measure of both knowledge and judgment relating to the optimal use of EFM. ■

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