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Reducing Alarm Fatigue in Maternal Monitoring on Labor and Delivery: A Commentary on Deimplementation in Obstetrics

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Abstract

Hospital labor and delivery floors frequently operate like intensive care units (ICUs)—with continuous data feeds pouring into central monitoring stations against a background of blaring alarms. Yet the majority of obstetric patients are healthy and do not require ICU-level care. Despite limited organizational recommendations guiding the frequency of vital sign measurement, continuous pulse oximetry is used widely for laboring patients. There is also no evidence that morbidity prevention is linked to specific frequencies of vital sign monitoring in low-risk patients. In fact, studies examining the performance of maternal early warnings systems based on vital signs suggest that these may not reliably provide actionable information regarding maternal physiologic status. Furthermore, it is very possible that intrapartum maternal overmonitoring can impact care negatively by generating alarm fatigue, causing providers to miss actual abnormal vital signs that may precede morbidity.

Keywords

alarm fatigue; deimplementation; implementation science; maternal monitoring; labor and delivery; patient safety

Alarm Fatigue on Labor and Delivery

Alarm fatigue, or the desensitization to patient alarms due to sensory overload, is a prime example of the unintended harms of health care overuse. As technology was developed to automate vital sign monitoring for patients in hospital settings, frequent—or even continuous—vital sign assessment was adopted widely. The unanticipated consequence of this practice, however, is that many abnormal vital signs do not actually signify acute pathophysiology—in other words, they are not "actionable."[1] If an alarm sounds to alert

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Conflict of Interest

None declared.

a clinician to abnormal data that do not actually trigger a response, that clinician will be inadvertently trained to ignore the alarms. Increasing burden of alarms that are not linked to adverse patient outcomes further dulls clinician responsiveness. At its simplest level, this is a problem of "crying wolf." Over time, a clinician's blunted reaction to physiologic alarms can lead to delayed response times to patient deterioration, as well as longer hospitalizations and increased risk for iatrogenic harm. This phenomenon has been explored extensively across the spectrum of medical subspecialties,[2] and reducing alarm fatigue has been a Joint Commission National Patient Safety Goal since 2014.[3]

The obstetric environment is particularly vulnerable to the dangers of alarm fatigue.[4,5] The majority of patients on a given labor and delivery unit are likely to be young and healthy, and the absolute risk of a major adverse event that could be detected by vital sign abnormalities—such as sepsis, myocardial infarction, cerebrovascular accident, or pulmonary embolism—is low. Intrapartum vital signs may be fraught with measurement inaccuracies, such as vitals checked during contractions, compounded by blurry "normal" ranges for vital signs during the turbulent transitions through labor, delivery, and the immediate postpartum period. With a low prevalence of severe complications and vital sign thresholds that may not accurately reflect pathologic states, the positive predictive value of maternal physiologic monitor alarms for morbidity is limited. Alarms reflecting maternal status are further at risk of being muted by alarms related to fetal status, which may generate a robust response to fetal heart rate decelerations. Finally, such a large quantity of maternal data are frequently collected during labor that truly concerning abnormal values may be lost in a sea of normal heart rates and oxygen saturation levels. First responders to physiologic alarms, usually the nursing staff, are thus severely disadvantaged in their ability to discern patient decompensation via maternal vital sign monitoring by the very act of overmonitoring.

The Science of Deimplementation

Rapid advancement of medical technologies over the past two centuries has outpaced the evolution of research supporting their benefits. This has generated a clinical environment rife with practices unsubstantiated by evidence. These entrenched practices can be difficult to modify, and compelling scientific data alone are often insufficient to change the status quo. The entire field of medical implementation science is devoted to studying how to best translate evidence-based medicine into clinical practice.[6] An important counterpart to implementation science is deimplementation science, the systematic identification and elimination of unproven, low-value care. With emerging evidence demonstrating the harms of medical overuse, deimplementation has been identified by quality-improvement experts, clinicians, and researchers as an essential strategy to advance health care quality.[7,8] In fact, according to the Institute of Medicine, 30% of all health care interventions may represent low-value care or overtreatment.[9]

The medical community at large has increasingly committed itself to the recognition and elimination of overuse and low-value care.[10] Numerous major medical journals and organizations have devoted specific attention to these issues, including the "Right Care" series in *The Lancet*[11] and the Choosing Wisely campaign of the American Board of Internal

Medicine Foundation.[12] These efforts must confront deeply rooted biases that favor the status quo such as the endowment effect, a behavioral economics principle that describes human tendencies to preserve objects that they already own. It is commonly believed by the general public and medical practitioners alike that “more is more”; in other words, more evaluations and more interventions lead to better outcomes. Although it is now well known that this is not the case in medicine, this pervasive attitude requires dismantling of cognitive biases to recalibrate the collective obstetric consciousness and learn to relinquish practices that obstruct care. Eradicating medical practices that are ineffective, harmful, overutilized, or not cost-effective is challenging, and requires a systematic approach to (1) identify low-value care, (2) facilitate deimplementation, (3) evaluate post-deimplementation outcomes, and (4) ensure sustainability.[13]

Deimplementation in Obstetrics

Obstetric deimplementation science is only beginning to surface alongside more established parallel fields in internal medicine and pediatrics. For example, the American College of Obstetricians and Gynecologists has released a Committee Opinion on “Approaches to Limit Intervention During Labor and Birth.” Common obstetric practices, like administration of intrapartum supplemental oxygen during fetal heart rate decelerations,[14] are coming under scrutiny after being tested with rigorous research methods and found ineffective. In collaboration with the Choosing Wisely campaign, the Society for Maternal-Fetal Medicine has published a list of common, but low-value obstetric practices to re-consider in routine clinical care, such as activity restriction for preterm birth prevention and screening for intrauterine growth restriction with umbilical artery Doppler.[15] Further efforts to concretize the field of deimplementation science in obstetric research must first involve familiarizing obstetric practitioners with the fundamental concept of overuse harm and the dangers of diverting resources to low-value care. This will require overcoming significant cognitive biases as clinicians are reluctant to abandon deeply rooted and comfortable practices with perceived benefit.[16] This is further complicated in the obstetric clinical context as the health and safety of the maternal–fetal dyad is often attributed a transcendent importance, beyond the usual mission of ensuring effective patient care. This could drive clinicians away from evidence-based practice in favor of perceived higher levels of care, which may in fact constitute dangerous excesses. The barriers to deimplementation specifically in obstetrics require further study.

Deimplementation: A Promising Solution to Alarm Fatigue

Deimplementing intrapartum maternal overmonitoring has the potential to improve obstetric practice through several mechanisms. Although it seems counterintuitive at face value, less monitoring can actually facilitate better monitoring. Fewer vital sign assessments increases the attention paid to any given value and enhances the clinician’s focus on concerning measurements.[2] Reducing overmonitoring may also help to decrease invalid alarms—alarms generated due to artifact such as improper pulse oximeter placement or inappropriately sized blood pressure cuff—and nuisance alarms—alarms that are not actionable and do not actually signify an emergency. Utilizing continuous monitoring only when specifically indicated can increase overall accuracy of vital sign collection, and this combined with

other efforts to ensure quality of measured vital signs such as appropriate timing, sizing, and placement, can reduce invalid alarms. Ensuring that thresholds to trigger alarms are appropriate for laboring patients and reflect criteria concordant with evidence-based maternal early warning systems is another important strategy to reduce nuisance alarms.[17] Ultimately, removing barriers such as signal saturation with meaningless alarms and general volume overload can then re-direct efforts to more meaningful patient evaluations. This can improve response times to critical alarms indicating real emergencies, thereby potentially improving overall outcomes. Addressing overmonitoring can also decrease the likelihood of unnecessary interventions based on poorly measured vitals or invalid alarms. In that vein, it has additional potential to improve patient satisfaction.

The lay press is saturated with media cautioning against the over-medicalization of birth, and natural birth advocates voice the “cascade of interventions” as a specific grievance with obstetric hospital care. While many obstetric interventions are employed based on a solid grounding in medical evidence, there are no data to support intensive care unit-level frequency of intrapartum maternal physiologic monitoring in low-risk patients without medical complications. The discomfort of being tethered to a blood pressure cuff and pulse oximeter during labor combined with the worry generated by alarms that may be regularly silenced or ignored by clinical staff likely has a detrimental impact on the patient experience. Re-designing intrapartum maternal monitoring for low-risk patients could thus serve as a vehicle for deescalating patient concerns about potentially inappropriate care and recalibrating focus on high-value interventions.

The prospect of reducing alarm fatigue on labor and delivery is tied to the formulation of a dedicated obstetric deimplementation science to elucidate and eliminate overuse and low-value care. This involves building an evidence base by measuring the rates of overmonitoring and identifying barriers and facilitators of overuse to inform a deimplementation roadmap. Research evaluating nursing and physician perspectives is critical to understand the intellectual frameworks that must be addressed in clinical interventions, and rigorous clinical studies are required to evaluate protocols that optimize care for low-risk patients on labor and delivery. In parallel, it is also essential for individual labor and delivery units to begin to consider the impact of overmonitoring and to assess their environment for readiness to change to optimize care value and efficacy (►Table 1). The impact of evidence-based deimplementation of overmonitoring on nursing workload and response times, maternal outcomes, and validated indices of alarm fatigue also needs to be evaluated. This can then serve as a foundation for standards of care and recommendations for best practice in maternal intrapartum physiologic monitoring. Similar deimplementation work has already been successfully accomplished in many fields of medicine, including pulse oximetry use for bronchiolitis management in children, imaging utilization for evaluation of low-risk headaches in acute care settings, screening criteria for cervical cancer, and numerous others.[18-20]

Conclusion

Re-imagining obstetric care based on emerging science is an ongoing role of obstetric clinical research, and translating those efforts into real practice is the goal of implementation

science. There remains an equally important directive to eliminate harmful practices that have been historically ingrained into routine care, and this requires the discerning lens of deimplementation science. Maternal overmonitoring and resultant alarm fatigue is merely one of many salient manifestations of embedded low-value care in routine clinical practice on labor and delivery. It is time to act upon the old adage “less is more” and improve care for obstetric patients.

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Key Points

- Labor and delivery units may engage in maternal physiologic overmonitoring.
- Overmonitoring increases risk for alarm fatigue.
- Deimplementing low-value care may improve obstetric outcomes.

Table 1

Suggested key steps to reduce alarm fatigue on labor and delivery units

- Evaluate the protocols for vital sign assessment and alarms on your unit.
  - How do clinicians and nurses on your unit respond to vital sign alarms?
  - How effective are the alarms on your unit at alerting clinicians and nurses to patient decompensation?
  - Are all of your alarms necessary?
  - Are there systems in place to identify low-risk and high-risk patients?
- Gauge the culture on your labor and delivery unit.
  - Are clinicians and nurses ready to change practice?
  - What barriers are in place that might prevent overmonitoring deimplementation?
- Consider what optimal vital sign monitoring might look like on your unit.
  - How could alarms be optimized in your labor and delivery environment?
  - How would changes in practice impact nursing workload and patient experiences?