PATIENT SAFETY

# Triggers, bundles, protocols, and checklists—what every maternal care provider needs to know

Kavita Shah Arora, MD, MBE; Larry E. Shields, MD; William A. Grobman, MD, MBA; Mary E. D'Alton, MD; Justin R. Lappen, MD; Brian M. Mercer, MD

The rise in maternal morbidity and mortality has resulted in national and international attention at optimally organizing systems and teams for pregnancy care. Given that maternal morbidity and mortality can occur unpredictably in any obstetric setting, specialists in general obstetrics and gynecology along with other primary maternal care providers should be integrally involved in efforts to improve the safety of obstetric care delivery. Quality improvement initiatives remain vital to meeting this goal. The evidence-based utilization of triggers, bundles, protocols, and checklists can aid in timely diagnosis and treatment to prevent or limit the severity of morbidity as well as facilitate interdisciplinary, patient-centered care. The purpose of this document is to summarize the pertinent elements from this forum to assist primary maternal care providers in their utilization and implementation of these safety tools.

**Key words:** obstetric quality, patient safety, quality improvement

The United States is one of the few developed countries in the world with an *increasing* maternal mortality rate.[1] Equally disconcerting is that its rate of 17 maternal deaths per 100,000 live births is ranked 60th in the world.[2] While the maternal mortality rate is alarming, the number of deaths is dwarfed by the number of women who experience severe maternal morbidities, and these complications have increased >75% from 1998 through 1999 and 2008 through 2009, affecting approximately 2-4 women per 1000 live births.[3-5] Furthermore, marked disparities remain in maternal health outcomes for those of racial/ethnic minority and/or low socioeconomic status.[2,5] The causes of the rise in maternal morbidity and mortality are multifactorial and likely include the increasing maternal age, body mass index, and prevalence of comorbid medical conditions, along with the increasing cesarean delivery rate.[6]

Multifaceted and collaborative approaches to optimizing maternal health in the United States have been advancing, exemplified by initiatives such as state-level perinatal quality collaboratives.[7-9] These collaboratives have prioritized core obstetric safety programs that are focused on postpartum hemorrhage, severe hypertension, and venous thromboembolism.[10,11] Recently, national attention has been directed to the development and implementation of regionalized systems of maternal care to facilitate provision of services in risk-appropriate settings.[12] This regionalization of obstetric care may result in improved outcomes for women known prior to delivery to be at risk for severe morbidities (eg, maternal heart disease or placenta accreta).[13-15] Yet, even if such regionalization were to be widely enacted, most women in the United States would continue to be delivered in lower-acuity birthing centers and hospitals by primary maternal care providers (obstetricians, family medicine physicians, and midwives) and not in specialized, tertiary-care centers by maternal-fetal medicine subspecialists. Hemorrhage, acute severe hypertension, venous thromboembolism, sepsis, and cardiovascular collapse (eg, secondary to amniotic fluid embolism) are examples of the complications that can occur unexpectedly in patients considered to be low risk.

Therefore, because maternal morbidity and mortality can occur unpredictably in any obstetric setting, primary maternal care providers should be integrally involved in efforts to improve the safety of obstetric care delivery. Quality improvement initiatives remain vital to meeting this goal. While the science behind quality improvement is rapidly evolving, there are several core tools that have been demonstrated to improve the quality and safety of care. Triggers, bundles, protocols, and checklists are examples of tools that: (1) are evidence-based and can facilitate measurable improvements in quality of care, (2) aid timely diagnosis and treatment to prevent or limit the severity of morbidity, and (3) are customizable for local implementation. These tools also have

From the Department of Obstetrics and Gynecology, MetroHealth Medical Center, Case Western Reserve University, Cleveland, OH (Drs Arora, Lappen, and Mercer); Patient Safety, Dignity Health, San Francisco, CA (Dr Shields); Maternal Fetal Medicine, Marian Regional Medical Center, Santa Maria, CA (Dr Shields); Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Northwestern University, Feinberg School of Medicine, Chicago, IL (Dr Grobman); and Department of Obstetrics and Gynecology, Columbia University Medical Center, New York, NY (Dr D'Alton).

Received June 20, 2015; revised Sept. 13, 2015; accepted Oct. 8, 2015.

The authors report no conflict of interest.

Corresponding author: Kavita Shah Arora, MD, MBE. Kavita.Shah.Arora@gmail.com

0002-9378/$36.00

http://dx.doi.org/10.1016/j.ajog.2015.10.011

the potential to facilitate interdisciplinary, patient-centered care and to contribute to a culture of safety. It is important to note, however, that the implementation of many of these tools in obstetrics is still in its early stages. Thus, recommendations for implementation are often based on data from other specialties, expert opinion, or clinical consensus, although the body of direct evidence in obstetrics supporting utilization continues to grow.

While the primary benefit of the adoption of this set of tools would be to improve patient outcomes, there are several appealing secondary benefits as well. The implementation of quality improvement initiatives has been associated with decreased costs related to professional liability litigation and adverse outcomes. For example, data from a national health care system with >200 hospitals documented a decrease in malpractice claims from 14-6 per 10,000 births after the institution of a quality improvement program.[16] Payers, specialty societies, and national policymakers also have placed an emphasis on quality and patient safety through their endorsement of publically reportable metrics, reimbursement through pay-for-performance mechanisms, and mandating of continuing physician education through maintenance of certification.[10,17-19] The purpose of this document is to summarize the definition, purpose, and supporting evidence, as well as provide examples of triggers, bundles, protocols, and checklists to assist primary maternal care providers in their utilization and implementation of these safety tools.

## Triggers

### Definition and purpose

Triggers can be used prospectively or retrospectively. Prospectively, a "trigger" is used to identify an event or condition that mandates further action by the health care team.[16,20] This action is designed to facilitate timely intervention and reduce practice variation to improve efficiency and safety. While "notify MD if" orders are commonplace, triggers not only notify the maternal care provider, but also require further action by the entire health care team. Retrospectively, a "trigger tool" is a list of predefined occurrences likely to indicate an action or potential adverse event and are generally used for retrospective internal quality monitoring and improvement.[21]

### Examples

Examples of prospective triggers include patient agitation, new onset of difficulty of movement, or specific thresholds for abnormal vital signs.[22] While utilized for >20 years in the nonobstetric population, early warning systems for abnormal vital signs have been less commonly utilized in obstetrics.[23]

Effective early warning systems include an expectation for surveillance, defined criteria for abnormalities, and a protocol for direct provider assessment after an abnormality is detected. An early warning system can serve as both a diagnostic *and* communication tool, highlighting an increased risk for compromise prior to clinical decompensation, so that care can be escalated to limit the severity of morbidity.[24] Thus, triggers can help to identify patients at risk of decompensation and prevent morbidity by facilitating the escalation of care. Recently, several early warning systems have been either created specifically for pregnancy or adapted for use in the obstetric context and are termed "maternal" or "modified" obstetric early warning systems.[23-26] While a comprehensive review of modified obstetric early warning systems is beyond the scope of this discussion, it is notable that this type of early warning system has been broadly implemented by the United Kingdom's National Health Service.[25]

In the United States, the National Partnership for Maternal Safety was formed in response to the rising maternal mortality rate and evidence demonstrating the contribution to this rate of delays in recognition and treatment of hemorrhage and hypertension as well as prevention of thromboembolism. This collaborative initiative included the American Congress of Obstetricians and Gynecologists (ACOG); Society for Maternal-Fetal Medicine; American Academy of Family Physicians; American College of Nurse-Midwives; and Association of Women's Health, Obstetric and Neonatal Nurses, among others. It has proposed an early warning system—maternal early warning criteria (MEWC)—that incorporates aspects of the United Kingdom's early warning system. In the MEWC system, any *one* abnormal value should trigger a response by the health care team, including bedside assessment by a clinician (Figure 1).[24] This system, ideally incorporated into the electronic medical record, provides a practical tool to facilitate timely recognition of and response to acute maternal illness and may serve as a framework for quality improvement on obstetric units. Figure 2 graphically depicts one health system's individual early warning system along with a guide to assist physicians in the initial evaluation and management of abnormal vital signs.

**FIGURE 1**
**Maternal early warning criteria**

| | |
|---|---|
| Systolic BP (mm Hg) | <90 or >160 |
| Diastolic BP (mm Hg) | >100 |
| Heart rate (beats per min) | <50 or >120 |
| Respiratory rate (breaths per min) | <10 or >30 |
| Oxygen saturation on room air, at sea level, % | <95 |
| Oliguria, mL/hr for ≥2 hours | <35 |
| Maternal agitation, confusion, or unresponsiveness; Patient with preeclampsia reporting a non-remitting headache or shortness of breath | |

Early warning system proposed by National Partnership for Maternal Safety.

*BP*, blood pressure.

*Arora. Triggers, bundles, protocols, and checklists for obstetric safety. Am J Obstet Gynecol 2016.*