Implementing a Nurse-Based Early Recognition and Response Program to Reduce Sepsis Mortality

Features

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- Reductions in Sepsis Mortality and Costs After Design and Implementation of a Nurse-Based Early Recognition and Response Program

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“The four key elements of the sepsis early recognition and response program can be summed up as leadership coupled with organizational commitment, health information technology support for bedside nurses, evidence-based screening and response protocols, and nursing workforce education and training.”

—Reductions in Sepsis Mortality and Costs After Design and Implementation of a Nurse-Based Early Recognition and Response Program (p. 489)
Rapid Response Systems

Implementing an Obstetric Emergency Team Response System: Overcoming Barriers and Sustaining Response Dose

Department Editors: Michael A. DeVita, MD; Daryl Jones, MD; Kenneth Hillman, MD. Readers are invited to submit inquiries regarding their own case studies on rapid response teams (also called medical emergency teams) to Steven Berman (sberman@jcrinc.com) or Michael DeVita (mdevpgh@yahoo.com).

Michael G. Richardson, MD; Kim A. Domaradzki, RN; Dennis T. McWeeney, DO

Rapid response systems (RRSs), introduced two decades ago, evolved from the observation that a period of physiologic deterioration commonly precedes in-hospital cardiopulmonary arrest.1-3 Much knowledge has emerged regarding RRS attributes, organizational strategies, and outcomes.4,5 In contrast, knowledge regarding obstetric-specific emergency response systems is sparse.6,7 Such response systems share many features with RRSs—early recognition of antecedents of patient jeopardy, low threshold for summoning help, immediate one-step recruitment of a specialist team, early preventive intervention, and ongoing process assessment and improvement.4,5 Unlike general medical RRSs, the population of interest (pregnant women) is younger and healthier, the nature of the critical events are unique, and the critical events involve both mother and fetus. Although antecedents of cardiopulmonary arrest in general medical patients often manifest minutes to hours before catastrophe,1,3 life-threatening obstetrical crises can develop with less warning. In addition, obstetric emergencies rarely progress to cardiopulmonary arrest or escalation to ICU admission. More often, emergent corrective interventions resolve the threat. The goal of an obstetric RRS is timely resource recruitment and intervention and prevention of obstetric morbidity (for example, fetal asphyxia, massive hemorrhage, large-volume transfusion).5,7

Two other articles have described implementation of obstetric RRSs, including the challenges of activation barriers and achieving sufficient response dose.6,7 In this article, we provide a detailed description of our three-year experience (April 2010–March 2013) in implementing and iteratively refining an obstetric emergency team (OBET) response system on a high-risk obstetrical unit at an academic medical center. In contrast to the previous articles, our OBET response system has several unique features (communication system, response team composition, and interprofessional leadership support), all of which may have promoted staff acceptance and use of the OBET system.

Methods

Setting and Ethics

The Maternal Care Unit at Vanderbilt University Medical Center is a mixed high-risk referral and low-risk delivery academic center (Sidebar 1, page 515). Annual delivery rates have increased linearly from 2008 (2,800) through 2012 (4,500), with the annual cesarean delivery rate increasing from 29% to 31% (peaking at 35%, in 2011). The maternal care unit footprint is expansive, extending across the fourth floors of two buildings, which are connected by an 80-foot walkway. Staffing is nearly uniform throughout the week (Sidebar 1).

The Vanderbilt University Institutional Review Board reviewed and determined this work to be nonresearch, and as such, exempt from requiring approval.

OBET Development & Initial Implementation

In mid-2007, the Obstetric Patient Care Committee—which consists of leader representatives from Obstetrics (OB), Women’s Health Nursing, Midwifery, OB Anesthesiology, and Pediatrics, and is responsible to the Chair of OB/Gyn (Gynecology)—addressed a need identified by frontline providers for a more timely, reliable means of recruiting personnel to obstetric emergencies (particularly threats to fetal well-being and maternal hemorrhage) on the maternal care unit and beyond (for example, the emergency department [ED]). Important questions to address included whom to include on the response team, how to ensure a full response when members are unavailable (for example, performing surgery), and specific indications for response team activation. Initially, a response system incorporating alphanumeric pagers carried by providers was considered. Complexity of teams and shift schedules represented a logistical barrier to this approach (namely, reliably including all relevant providers and excluding non-duty members),8 and so a dedicated set of emergency alphanumeric pagers to be passed from provider to provider at shift change was provided. Finally, in late 2008, the committee chose to equip all personnel with push-
to-talk cellular phones, a communication technology already in use by the anesthesiology group. These phones are associated with providers’ daily clinical roles (for example, OB generalist attending, anesthesiology senior resident), are passed from outgoing to incoming members at shift changes, and serve as the primary means of routine communication between teams and team members. All phones have the same quick-dial contact list containing all member roles. Vanderbilt LifeFlight, the hospital’s communications system dedicated to “emergency assets deployment” within and outside of the hospital, served as the link between the afferent and efferent limbs of the OBET response. The first OBET response drill was activated on April 28, 2010.

**Obstetric Emergency Team Activation and Response**

**Afferent Limb.** Any frontline provider may activate the OBET afferent limb by using the designated emergency phone number to connect immediately with a LifeFlight dispatcher. Initially, staff were instructed to activate OBET for several specific triggers—prolonged fetal bradycardia, hemorrhage, shoulder dystocia, and cord prolapse—common situations that demanded a timely interprofessional team response. However, the list was not meant to be comprehensive. Staff were encouraged to use OBET to summon a response whenever they considered a clinical situation to be potentially life threatening. Providers request an OBET response using a standard script, which is posted prominently in all clinical areas, including patient rooms (Appendix 1, available in online article). “I need the OB Emergency Team” prompts the LifeFlight dispatcher to solicit the caller’s (1) name, (2) call-back number, and (3) exact location. After the caller provides these required elements, the LifeFlight dispatcher “reads back” (validates) the caller’s request (for example, “OB Emergency Response Team needed, Medical Center East, North Tower, Room 4037”), and the call ends. On occasion, the OBET is summoned outside the maternal care unit; for example, to the ICUs or to the ED for impending births or other OB emergencies transported by ambulance.

**Efferent Limb.** Immediately after the request call, the LifeFlight dispatcher activates the OBET response efferent limb by transmitting an audio voice dispatch alert simultaneously to all cell phones in the OBET responder group (Sidebar 2, page 516). At least one responder acknowledges alert receipt by using “push-to-talk” (for example, “Charge nurse responding”). If no validation is received, the dispatcher transmits a validation request to the entire responder group. In addition to the primary audio alert, a redundant text message with the emergency location is transmitted to the same OBET responder team phones. Although the efferent OBET alert is transmitted to a large group of members (Sidebar 2; Figure 1 [page 517]), not all individuals necessarily present en masse to the patient’s room. Critical ongoing care may prevent certain members from responding.

However, staffing levels (Sidebar 1), including backup personnel, have been adjusted purposefully over time, with sufficient redundancy (cross coverage, backup, and team depth) to safely handle patient volume, including emergencies. Furthermore, ongoing crucial care activities (for example, cesarean or vaginal deliveries) are known to key leadership personnel (for example, charge nurse, attending staff), who can call on backup personnel in the event of emergencies.

Immediately following an OBET alert, phone communication between specialty team members (particularly, first responders to other team members) facilitates rapid resource
deployment appropriate to specific clinical needs (Figure 1) while accounting for resource limits, given need for concurrent care for other patients. For example, a first responding charge nurse might dispatch the technician and a nurse to the operating room (OR) to prepare for likely emergent surgery. The anesthesiology attending might direct a specific team member to bed-side to assess or help initiate care, another to go directly to prepare the OR. The midwife attending or charge nurse might dispatch the technician and a nurse to the operating room (OR) to prepare for likely emergent surgery. The anesthesiologist is known to be scrubbed in surgery. A life-saving perimortem cesarean illustrates the effectiveness of OBET in rapidly recruiting resources, as follows:

Almost immediately after cardiopulmonary arrest, the anesthesiology team performed tracheal intubation and initiated Advanced Cardiac Life Support in a morbidly obese (BMI [body mass index] 55) preeclamptic who had flash pulmonary edema. A hospital-wide code was not called, rather OBET was used to recruit a full-scale emergency response. Instant provider mobile phone capability was used to summon personnel and equipment quickly enough to permit the obstetrician to make skin incision in her labor room four minutes after the arrest and deliver the baby one minute later. Spontaneous circulation resumed shortly thereafter, and the mother survived.

The nature of the emergency tends to determine leadership at the front line. Potential team leaders include the anesthesiologist, generalist obstetrician, and maternal fetal medicine (MFM) consultant, who communicate and establish appropriate leadership on arrival. As the clinical situation evolves, they often negotiate leadership change. For example, in cases of severe hypovolemia/hypotension (for example, severe postpartum hemorrhage, uterine inversion), immediate intravenous access and resuscitation is typically led by the anesthesiologist, and definitive treatment then becomes a shared process. In contrast, the obstetrician leads management of, for example, dystocia or prolonged fetal bradycardia unresponsive to in utero resuscitation, with the anesthesiology and neonatology teams following that lead, responding to the constraints of the obstetric emergency. Cases of uterine rupture demand collaborative, shared leadership to save mother and fetus. Responding team leaders communicate face-to-face to rapidly intensify or de-escalate the response. Importantly, first responders might attenuate or even “turn off” their team’s response by communicating (by phone, or at the doorway) to team members that the situation has stabilized or that their particular team’s full response is unnecessary—in cases of, for example, precipitous delivery, resolution of a worrisome electronic fetal monitoring (EFM), and stability of an incoming ED trauma patient.

### Sidebar 2. Obstetric Emergency Team Members

<table>
<thead>
<tr>
<th>Obstetrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalist attending</td>
</tr>
<tr>
<td>Maternal fetal medicine attending</td>
</tr>
<tr>
<td>Midwife attending</td>
</tr>
<tr>
<td>Residents (PGY-1, -3, -4)</td>
</tr>
<tr>
<td>Maternal Special Care Unit/Triage midwife</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Anesthesiology</th>
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<tbody>
<tr>
<td>Attending</td>
</tr>
<tr>
<td>Fellow</td>
</tr>
<tr>
<td>Senior resident</td>
</tr>
<tr>
<td>Junior-1 &amp; -2 (residents and student nurse anesthetists)</td>
</tr>
<tr>
<td>“Extra” (float nurse anesthetist)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Obstetric Nursing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge Nurses—labor and delivery, ante-post-partum unit, overflow unit, Maternal Special Care Unit L&amp;D Resource</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obstetric Technologists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatology (OBET alerts via alphanumeric pager messaging, not via push-to-talk cellular technology)</td>
</tr>
<tr>
<td>Attending</td>
</tr>
<tr>
<td>Nurse practitioners</td>
</tr>
</tbody>
</table>

PGY, postgraduate year; L&D, labor and delivery; OBET, obstetric emergency team.

### Continuous Monitoring and Iterative Improvement

When OBET was initiated on May 4, 2010, a dedicated obstetrics quality consultant [K.A.D.] was assigned to monitor and audit the OBET system. She presented OBET data monthly to the Patient Care Committee and reviewed all OBET activations (examining the OBET event record—blank [Appendix 2, available in online article] and completed—and interviewing involved members, when necessary) to assess system performance, with the goal of identifying factors promoting an effective and timely response, as well as barriers and opportunities for improvement. Providers at all levels were encouraged by nursing and physician leaders to report any specific cases or issues of concern. The consultant reviewed these reports and collaborated with the LifeFlight communication manager and clinical leaders to strengthen the OBET response system in an iterative fashion. She attended regularly scheduled staff meetings to solicit feedback, provide targeted improvement interventions, and deliver ongoing education (including examples of ideal OBET calls, with audio). The OB nurse educator did the same at staff meetings of other units, such as the ED). The chronology of key events in and modifications to the OBET response system is presented in Appendix 3 (available in online article).

Occasional episodes of reluctance to activate OBET during the first year derived from staff’s lack of confidence for certain high-stakes indications (for example, shoulder dystocia, fetal heart rate decelerations), fearing delays in response. Instead, nurses sometimes reverted to notifying individual providers, as was customary before OBET. Others feared criticism by more senior
personnel for unnecessarily activating OBET for situations that might not warrant full-scale emergency response. Leadership addressed these episodes by promoting a low threshold for OBET activation and a policy of no retribution. A fundamental principle—that responders would rather be summoned to a false alarm than be called too late—was continually emphasized.

The occurrence of clusters of similar events revealed system- and process-based flaws. Analysis of these events led to iterative systems improvement (Appendix 3). For example, the initial call-taking script required the clinical indication for the OBET request. Although advance knowledge of the reason for OBET activation was considered beneficial, audio recordings of calls revealed this to be a source of confusion, which delayed efferent alert limb activation, consistent with findings of Akhtar et al.10 Eliminating the diagnosis requirement from the script in November 2010 reduced call durations, accelerating response time and ensuring a standardized team response (versus a decision tree dependent on diagnosis). Another early problem was misdirection of teams to incorrect locations, which was thought to result from dispatcher unfamiliarity with the physical layout of a maternal care unit that extends across different buildings, with some duplication of room numbers. Formal orientation of LifeFlight communicators to the physical layout of the fourth-floor maternal care complex reinforced awareness of building-location distinctions and reduced the incidence of misdirection errors.

In spring 2011 a series of events threatened trust in the OBET system among frontline providers and responder team members (Appendix 3). The identified issues and problems were remedied through targeted education efforts with specific relevant groups and demonstration of leadership responsiveness. Most major system problems appeared and were remedied by the end of 2011, so that, beginning in 2012, problems were less frequent and more isolated or unique in nature. By early 2013, sampling of OBET request recordings revealed shorter call length and greater efficiency. For example, callers increasingly give most or all required information, with little prompting from the LifeFlight dispatcher.

**Response Dose, Indications, and Origination of Calls**

Response dose data, presented in Figure 2 (page 519), demon-
strate near-linear quarterly increases over time. The locations of origination for OBET activations are presented in Table 1 (above); most (441 [82%]) of the 538 OBET activations originated from the fourth-floor maternal care complex, with the remainder from disparate locations. Indications for OBET activation are presented in Table 2 (right) and Figure 3 (page 519). More than half (313 [58%]) of the 538 activations were prompted by EFM abnormalities (for example, prolonged fetal heart rate decelerations), while precipitous delivery and ante-/postpartum hemorrhage combined for an additional 124 (23%). EFM indications accounted for most of the response dose increase over time.

Discussion

Through a process of continuous auditing and review, engagement with frontline staff, and iterative improvement modifications, staff embraced and used the OBET system to rapidly recruit an interprofessional care team response to bedside during deteriorating maternal and fetal situations, as reflected in a sustained rate of response dose increase during the three-year study period. As stated, only two previous articles describe obstetric response systems, both at major specialized medical centers, although mention has been made more recently of such systems elsewhere. "OB Team Stat" was implemented by Sharp Mary Birch Hospital for Women & Newborns (San Diego), a center with more than 9,000 annual deliveries. A reduction in decision-to-delivery times, which was an identified goal, in a very small sample of urgent cesarean delivery cases was reported. Gosman et al., who did not report outcomes, described their implementation experience at Pittsburgh’s Magee-Womens Hospital, a center with 8,800 annual deliveries during the period described. Like Sharp Mary Birch Hospital, their system used hospitalwide overhead and pager alerts. Uniquely, their system includes three response categories—Condition “O” (obstetric), “A” (arrest), and “C” (crisis), each category involving a different subset of responders.

Response dose (number of RRS activation calls per 1,000 admissions) has been proposed as a standard utilization metric for RRS. Cardiac arrest rates appear to be inversely related to response dose. Because RRS is the primary prevention against arrest, dose must match or exceed the frequency and severity of the problem, with an insufficient dose unlikely to improve the outcome it is designed to prevent. A dose of at least 25 RRS activations per 1,000 admissions is considered a mark of success, with 40 per 1,000 admissions reflective of a “mature academic system.” However, determining optimal dose is complicated by the host of factors unaccounted for in the metric. Optimal response dose for a high-risk obstetrics unit is unknown. Because rapid clinical deterioration necessitating immediate interprofessional team intervention is not uncommon on our unit, we applied the dose response metric to quantify utilization of our OBET system. During the first three quarters following implementation, there were only 28 activations (averaging one per

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of Calls (% of total)</th>
</tr>
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<tbody>
<tr>
<td>Maternal Care Unit Complex</td>
<td></td>
</tr>
<tr>
<td>Labor &amp; Delivery</td>
<td>343 (63.8)</td>
</tr>
<tr>
<td>4 East Ante-/Postpartum</td>
<td>52 (9.7)</td>
</tr>
<tr>
<td>Maternal Special Care Unit</td>
<td>26 (4.8)</td>
</tr>
<tr>
<td>Triage</td>
<td>17 (3.2)</td>
</tr>
<tr>
<td>4 South Overflow Unit</td>
<td>3 (0.6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>538 (100)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of Calls (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>87 (16.2)</td>
</tr>
<tr>
<td>Children’s Hospital</td>
<td>3 (0.6)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (1.3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>538 (100)</strong></td>
</tr>
</tbody>
</table>

ED, emergency department.

Table 1. Locations of Origination for 538 Obstetric Emergency Team Activations, April 2010–March 2013

Table 2. Indications for 538 Obstetric Emergency Team Activations, April 2010–March 2013

<table>
<thead>
<tr>
<th>Indication</th>
<th>No. of Calls (% of Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic fetal monitoring</td>
<td>313 (58.2)</td>
</tr>
<tr>
<td>Precipitous delivery/outborn</td>
<td>77 (14.3)</td>
</tr>
<tr>
<td>Postpartum hemorrhage</td>
<td>47 (8.7)</td>
</tr>
<tr>
<td>Trauma</td>
<td>19 (3.5)</td>
</tr>
<tr>
<td>Cord prolapse</td>
<td>16 (3.0)</td>
</tr>
<tr>
<td>Maternal cardiovascular/neurologic instability</td>
<td>11 (2.0)</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
<td>6 (1.2)</td>
</tr>
<tr>
<td>Antepartum hemorrhage</td>
<td>6 (1.2)</td>
</tr>
<tr>
<td>Maternal seizure</td>
<td>5 (0.9)</td>
</tr>
<tr>
<td>Labor in ED</td>
<td>5 (0.9)</td>
</tr>
<tr>
<td>Uterine rupture</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Abruptio</td>
<td>3 (0.6)</td>
</tr>
<tr>
<td>Breech in labor, full cervical dilation</td>
<td>2 (0.4)</td>
</tr>
<tr>
<td>Ruptured ectopic</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Hypoglycemic neonate</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Duplicate or canceled activation</td>
<td>10 (1.9)</td>
</tr>
<tr>
<td>Unknown</td>
<td>12 (2.2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>538 (100)</strong></td>
</tr>
</tbody>
</table>
representing a dose of < 20/1,000 deliveries, which we considered gross underutilization. System refinements and educational efforts were implemented to counteract identified barriers to use. Subsequently, response dose escalated linearly. During the last six months of the three-year period, OBET activations averaged 28 per month (nearly 1 per day), or 77.5 per 1,000 deliveries. In contrast, Clements et al. reported approximately 3 activations per 1,000 deliveries at Sharp Mary Birch Hospital in 2005 (assuming a delivery rate of 8,400/year).7,12 Similarly, the response dose at Magee-Womens Hospital fell short of 9 combined Condition O (6.2/1,000) and C (2.5/1,000) activations per 1,000 obstetric admissions in 2006.6 A significant increase in Condition O response dose during the first half of 2006 (42 per 1,000) followed a major education intervention bundle. This appears to have been short-lived, however, as the second half rate decreased to 17 per 1,000. Both reports6,7 discuss the challenges of generating sufficient response dose and strategies to overcome activation barriers.

We attribute our observed increase in frontline provider acceptance and use of OBET, as reflected in response dose growth, to several factors. Although there are significant differences between OBET and hospitalwide RRSs, both share the four structural features recognized as fundamental to a mature RRS: (1) afferent limb (crisis detection and response trigger); (2) efferent limb (medical resource response); (3) process assessment, feedback, and improvement; and (4) a supporting and sustaining administrative leadership structure.4,5 Recognizing formidable social and cultural barriers to implementation,15,16 obstetric, nursing, and anesthesiology leadership at Vanderbilt University Medical Center collaborated to advocate a low threshold for triggering the afferent limb among frontline staff from the beginning. Promoting a low threshold for OBET activation, including both objective and subjective (“staff worried”) criteria for activation, by any provider, has been a consistent intentional core strategy.4,15 Delivering negative feedback to providers who trigger an OBET activation that responders view as unnecessary is discouraged—a single case of pushback on activation of OBET triggered a prompt corrective response (Appendix 3). Several attributes prevent the OBET system from being perceived as burdensome or distracting from ongoing patient care activities—an average response dose of only one per day, effective mechanisms for secondary communication between team members, sufficient staffing, and the fact that emergencies demanding a team response inevitably occur regardless of the existence of an emergency response team system. The presence of several identifiable champions of OBET among leaders in each of the professions involved is undoubtedly a factor promoting
OBET’s acceptance and use. Responder team composition may contribute to the low observed threshold for OBET activation. In contrast to other reports,6,7 OBET’s efferent limb responders are limited to teammates who routinely collaborate together in obstetric care. Intensivists, respiratory therapists, and personnel outside the unit, who are rarely relevant to emergencies that OBET addresses, are excluded. On the rare occasion when those personnel are needed, response escalation is achieved using the hospitalwide RRS. Use of “high capability” teams may be intimidating to frontline providers, inhibiting activation for lesser perceived emergencies.4 The high variability in RRS team membership in many reports has been highlighted.17 Howell et al. described a less resource-intensive, primary care-based RRS.18 Their system emphasized detection and systematic assessment of clinically unstable patients and took a “personnel-neutral” approach—notification of the patients’ usual care providers rather than recruiting additional providers in the form of a larger critical care response. Their approach yielded an enviable response dose of 53/1,000 discharges and a reduction in unexpected mortality.18 They hypothesized that team structure (familiar, versus calling in a separate critical care team4) may reduce social barriers to team activation, promoting a high response dose.18 Of note, the response teams at Magee-Womens Hospital include high-capability members,6 which might inhibit activation. A high level of interprofessional teamwork and the collaborative culture on our maternal care unit may have also contributed to our high response dose. Leach and Mayo reported on the high perceived value of teamwork, communication, and team familiarity among providers in a primary-team-centered RRS.19

Finally, consistent with RRS consensus recommendations,4 a dedicated quality consultant and interprofessional committee (obstetrics, nursing, midwifery, anesthesiology) have systematically monitored and improved OBET from the start. Concerns regarding critical events and OBET responses that are “elevated” to leadership are addressed by the quality improvement committee, and improvements are implemented. The importance of evaluation and continual process improvement and of overall governance of response systems have been identified as key attributes of a mature RRS.4

EMBRACING OBET AHEAD OF CONCLUSIVE OUTCOMES EVIDENCE

This article, which is intended to provide detailed description of the implementation of an OB–specific emergency response system, is limited by the absence of patient outcomes data. For a variety of reasons, demonstrating improved outcomes has proven surprisingly elusive after implementing hospitalwide RRS.5,17,20–22 The complexities inhibiting clear demonstration of improved outcomes have been discussed,17,23,24 with the suggestion even made that this is a secondary issue. It has been recommended that the focus be placed on rectification of triage errors and ineffective patient flow management, which result in a mismatch between patient illness and level of care, thereby creating the need for RRS rescue in the first place.25 For example, a Maternal Early Obstetric Warning System (MEOWS) establishes physiologic (vital sign) parameter thresholds to trigger a timely, in-person patient assessment (often interprofessional) to promote early detection of trends potentially leading toward a critical event.26 Nonetheless, leading stakeholders in the United States have promoted RRSs as a leading safety initiative,27,28* and evidence of benefit is emerging.5,20,21 The value of timely recruitment of expertise to critical situations has been embraced ahead of supporting RRS outcomes evidence.17,21 Our unit took this same stance with parturients (women in labor or having recently given birth). Maternal and neonatal mortality are too rare to be useful measures of impact. Evaluation of response timeliness or delays, certain well-defined morbidities, or adverse events, might be useful surrogate outcomes, although obstetric morbidity is challenging to measure, and causation, as for neonatal encephalopathy and maternal transfusion, for example, is often uncertain and multifactorial. Our unit’s goal was a reliable mechanism to immediately recruit a team of responders to the parturient’s bedside in response to the full range of common, heterogeneous, rapidly evolving, potentially life-threatening events. We were motivated by explosive and sustained clinical demands across a large clinical footprint served by a collaborative team of providers. OBET is consistent with recommendations for addressing delay and failure to respond, a leading contributor to maternal mortality and morbidity.29,30

Conclusion

We present our three-year OBET implementation process, including strategies designed to achieve and sustain a high response dose. Although OB–specific response teams differ from hospitalwide RRS, we have highlighted parallels, including fundamental goals, guiding principles, and attributes that may con-
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tribute to success. These results may be useful to institutions considering implementation, or those currently wrestling with implementation barriers. They also raise questions regarding optimal implementation strategies, responder team composition, response dose, communications technology, and feedback processes. These questions, as well as the role that obstetric-specific RRSs should play in enhancing maternal and fetal safety, warrant further research. 1

The findings reported in this article were presented in part at the 45th annual meeting of the Society for Obstetric Anesthesia and Perinatology, San Juan, Puerto Rico, May 24–28, 2013.

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Appendix 1. Sample Standard Obstetric Emergency Team Communication Script
Appendix 2. Obstetric Emergency Team Event Record

References
### Appendix 1. Sample Standard Obstetric Emergency Team Communication Script

This script is posted in all clinical areas, including patient rooms, and contains location-specific information.

**OBET**

1-1111

“I need the OB Emergency Team”

**Building:** MCE

**Floor:** 4 North Tower

**Room:** 4037

**Nature of Emergency:** OB Emergency

**State your name & Call back number:** xxx-xxxx
Appendix 2. Obstetric Emergency Team Event Record

The Obstetric Emergency Team Event Record is completed during and following each response activation.

Obstetric Emergency Team Event Record

Date: __________ Building: ________ Room: __________
Activation Time: __________ End Time: __________

Has the patient’s Primary Provider been notified?

Team Member | Name | Time Arrived | Team Member | Name | Time Arrived
--- | --- | --- | --- | --- | ---
Attending | | | Primary RN | | |
CNM | | | Resource RN | | |
PGB 4 | Charge RN |
PGB 3 | ORT1 |
PGB 2 | ORT2 |
Anesthesia | | |
Anesthesia | | |

Situation
- FHT Decel
- Cord Prolapse
- Out Born
- Off Unit Delivery
- Seizure
- Other

Patient Information
- Gravida: _____ Para: _____ Delivery Date/Time: ____________ @ _______
- Wks Gestation: _____ Anesthesia: ____________ @ _______
- Cervix: ____________ @ _______
- Complications: ____________________________

Interventions Prior OBET Arrival
- Repositioned
- NRB O2
- IV Bolus
- Pit Dec / OFF
- Meds: ____________________________
- Other: ____________________________

Assessment
- Other: ____________________________

Recommendations/Interventions & Time Performed
- Positioning
- Right:
- Left:
- Kn/Ch:
- Trendel:
- Other:
- Pit OFF: ________
- Labs: ____________________________
- NRB O2: T&S: ____________________________
- Art line: CBC: ____________________________
- IV Insert: PT/PTT: ____________________________
- EKG monitor: ____________________________
- Other Interventions: ____________________________

Fluids/Blood:
- NS/LR: ____________________________
- PRBC’s: ____________________________
- FFP: ____________________________
- PLTs: ____________________________
- Other:

Del Assist:
- Vacuum: ____________________________
- Forceps: ____________________________
- McRoberts: ____________________________
- Suprapubic: ____________________________
- Woods: ____________________________
- Rubin: ____________________________
- Post. Arm: ____________________________
- All Fours: ____________________________

Other Interventions: ____________________________

Medications/Dosage/Route/Time:
- Terb: ____________________________
- Mag: ____________________________
- Pitocin: ____________________________
- Cytotec: ____________________________
- Mephine: ____________________________
- Carboprost: ____________________________
- Other:

CODE: ____________________________
- RR T called @ _______
- ACLS charting @ _______

Event End Time: ____________

Maternal Disposition/Time:
- Stabilized: _____ Vag Del: _____
- To OR: _____ To ICU: _____
- Other: ____________________________
- See Delivery summary in Star Panel

Fetal Disposition:
- Stabilized: _____ NICU: _____ NN: _____
- Other: ____________________________

Other: ____________________________

OBET Team Signatures:
- OB Attending: ____________________________
- Resident: ____________________________
- RN: ____________________________
- Recorder: ____________________________

See Back for additional Charting and Vital Signs
### Appendix 3. Chronology of Key Events in and Modifications of the Obstetric Emergency Team (OBET) Response System, November 2010–January 2013

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Issues/Problems</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 2010</td>
<td>Three index cases of callerDispatcher communication errors, resulting in delays</td>
<td>Audio transcripts reviewed, indicating too many questions, conversation unscripted</td>
<td>Streamlined script—diagnosis/reason is now optional; LF portal revised (Feb 10, 2011)</td>
</tr>
<tr>
<td>Feb, Mar 2011</td>
<td>Two location errors, resulting in OBET members responding to the wrong location</td>
<td>LF dispatchers unfamiliar with the geographical layout of the clinical service area</td>
<td>LF dispatchers participate in “Scavenger Hunt” orientation to clinical service area (Jun 2011)</td>
</tr>
<tr>
<td>Apr, Jun, Sep 2011</td>
<td>5 cases of errors using/not using OBET by ED providers—one trauma, 4 precipitous deliveries (including a PPH)</td>
<td>ED is infrequent user, unfamiliar with system; education efforts insufficient</td>
<td>Education intervention for ED users</td>
</tr>
<tr>
<td>Apr 2011</td>
<td>Some OBET staff not receiving audible alert—and not responding until receiving delayed text alert</td>
<td>Cell phone speaker accidentally set to “off”</td>
<td>Reeducated OBET staff to ensure volume control is in “on” position; trialed new phone models to reduce risk of accidentally switching speaker to “off.” New phone style swapped in (Jul 2011).</td>
</tr>
<tr>
<td>May 2011</td>
<td>Shoulder dystocia with delay in activating OBET; Nurse speaking volumes, rapidly, LF dispatcher not yet ready with script. Clinical leadership requests removing this diagnosis from OBET.</td>
<td>Extreme emergent nature of dystocia makes delay very problematic—likely, an isolated event.</td>
<td>Pros/cons of pulling certain emergency diagnoses out of OBET process debated. Cons outweighed pros, so dystocia remained an OBET trigger, but staff may also alert floor personnel for immediate assistance as indicated.</td>
</tr>
<tr>
<td>May 2011</td>
<td>Complaints: too many/redundant questions from dispatcher, losing confidence in OBET system</td>
<td>Nurse provider rapidly giving lots of information before dispatcher pulls up script; inefficiency, repetition &amp; delay in completing call; loss of trust in system</td>
<td>Educate nursing staff to state “OB Emergency,” then allow dispatcher to ask questions in order; mock calls; audio exemplar demonstration calls</td>
</tr>
<tr>
<td>Jul, Nov 2011</td>
<td>Neonatology staff not present or late in arriving for precipitous deliveries</td>
<td>Neonatology department’s reliance on pagers &amp; mobile phones incompatible with OBET system; only receive pager alerts, (delayed), not audible alerts (instant); consider compatible phones</td>
<td>Neonatology personnel opt for OBET alert system–compatible mobile phones</td>
</tr>
<tr>
<td>Sep 2011</td>
<td>Resident delivers negative pushback/feedback to postpartum nurse for having called OBET (1,000 mL PPH)</td>
<td>Residents unaware of PPH as OBET trigger and of principle of abstaining from delivering negative feedback to staff who activate OBET. This event involved new house staff.</td>
<td>Resident classes educated. Nurses reassured &amp; encouraged to maintain low threshold for calling OBET. Reemphasized the principle of “no harm to activators.”</td>
</tr>
<tr>
<td>Nov, Dec 2011; Jan 2012</td>
<td>L&amp;D staff activating OBET using cell phones, connecting to non-designated dispatchers without OBET training, resulting in delays.</td>
<td>OBET activation was designed to use dedicated in-hospital 1-1111 direct line extension. Cell phones provided to L&amp;D nursing staff (Sep 2011) incapable of connecting to internal direct line; speed dial programmed to call via general LF dispatch number, resulting in delays.</td>
<td>Staff reeducated to use landline (in every patient room) to activate OBET. General LF speed dial remained on cell phone in case of landline inaccessibility.</td>
</tr>
<tr>
<td>Jan 2012</td>
<td>Children’s Hospital ED calls L&amp;D directly, asking how to activate OBET for multiparous woman with imminent delivery</td>
<td>Unfamiliarity with OBET because of infrequent use.</td>
<td>Renewed education intervention for pediatric ED providers</td>
</tr>
<tr>
<td>Sep 2012</td>
<td>Parturient (pregnant patient) in medical ICU; precipitous delivery of nonviable fetus. OBET activated well for delivery, but RRT activated for PPH.</td>
<td>Unfamiliarity with OBET because of infrequent use.</td>
<td>Renewed education intervention for MICU providers.</td>
</tr>
<tr>
<td>Jan 2013</td>
<td>L&amp;D parturient with severe bronchospasm; respiratory therapist at bedside places call for rapid response team (not OBET). LF: “Where is your emergency?” RT: “L&amp;D” . . . LF: “So you want OB Emergency Team?” . . . RT: “Yes” OBET responders arrive within a minute, then new call placed for RRT (1 minute, 38-second delay)</td>
<td>LF dispatcher keyed in on location rather than specific response team requested. Caller unfamiliar with OBET system. LF followed OBET script, “leading” caller to request wrong team.</td>
<td>Improvement opportunity for LF staff</td>
</tr>
</tbody>
</table>

S, systemic or recurring problem, addressed with major system change; LF, LifeFlight; ED, emergency department; PPH, postpartum hemorrhage; L&D, labor and delivery; U, unique, one-time event, addressed with minor modification or staff education; RRT, rapid response team; MICU, medical ICU.