



## Grand Rounds: Ob Team Stat: Developing a better L&D rapid response team

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An innovative approach to ob emergencies can make these unnerving episodes seem less like an avalanche and more like downhill skiing. One of the keys is replacing sequential with simultaneous activation of the ob team.

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It's every obstetrician's nightmare: Everything is going smoothly during labor, with normal progress, a reassuring fetal heart rate (FHR) tracing, and a dilated cervix. Suddenly there's profound bradycardia, with deceleration of the FHR to the 60s. The bedside nurse administers oxygen and IV fluids, but bradycardia persists.

A pelvic exam is performed; the cervix is unchanged, the baby is in vertex presentation and cord prolapse is ruled out. A fetal scalp electrode is placed; the monitor is picking up fetal, not maternal heart rate, and the baby has been "down" for over 5 minutes.

The charge nurse calls to the ob's answering service and the ward clerk "beeps" her as well. The ob calls back within 5 minutes, and the patient is moved to the operating room. The in-house ob physician, the OR team, and the ob anesthesiologist are paged "Stat" to the OR, and the baby is delivered by cesarean section, about 8 minutes after the move to the operating room—and 20 to 25 minutes after the onset of bradycardia. The placenta shows a partial abruption. The baby has depressed Apgar scores and cord blood gas studies show metabolic acidosis with pH less than 7.00.

Everything was done "right." The nurses took appropriate measures to try to resuscitate the baby in utero, the in-house physicians and OR team responded promptly, and the baby was delivered well within the American College of Obstetricians and Gynecologists standard of 30 minutes from "decision to incision."<sup>1</sup> But the baby may or may not do well. Can we do better?

### Dealing with obstetric emergencies

Although the vast majority of pregnancies proceed smoothly and with minimal obstetric intervention, serious obstetric emergencies occur in 1% to 2%. Situations that typically require urgent, if not emergent, medical intervention include eclampsia, hypertensive crisis, diabetic ketoacidosis, and severe asthma. Conditions prompting surgical intervention include acute fetal distress, antepartum and intrapartum hemorrhage, umbilical cord prolapse, shoulder dystocia,

and uterine rupture. Both medical and surgical interventions are often needed in cases of postpartum hemorrhage and maternal cardiac arrest. Planning for obstetric emergencies is an integral part of the function of every obstetric service. Responses to these emergencies are a measure of the effectiveness of an ob unit as well. They also help determine how effective the pediatric team will be in achieving optimal neonatal outcomes.

As our opening scenario shows, the traditional response includes a series of activation steps (Table 1), beginning with recognition of the emergency situation by the bedside nurse, communication with the attending obstetrician, evaluation of the patient by the obstetrician, and then sequential recruiting/activating of the required resources for intervention.

ACOG recommends that surgery be started within 30 minutes of decision for cesarean.<sup>1</sup> For an institution such as ours, with an in-house obstetrician, ob anesthesiologist, and neonatal team, it's usually possible to deliver within 30 minutes using the usual "sequential activation" approach. But this response may be inadequate to prevent adverse outcomes for some types of emergencies. When fetal distress is due to acute uterine rupture and/or lacerated vasa previa, for instance, delivery must be accomplished as rapidly as possible, preferably within a few minutes.<sup>2,3</sup> Adverse perinatal outcomes may occur even when the baby is delivered well within 30 minutes of the event.<sup>2</sup> And during maternal cardiac arrest, delivery is recommended within 4 minutes for both maternal and fetal indications.<sup>4</sup>

Even the 30-minute "decision-to-incision" goal is described as being an "elusive target," with institutional series showing up to half of emergency C/S not meeting that goal.<sup>5-7</sup> A recent publication included "decision-to-incision" times among 2,808 C/S performed for emergency indications at 13 university medical centers of the Maternal-Fetal Medicine Units Network; 17% of these started within 10 minutes of decision, 44% within 20 minutes, and 62% within 30 minutes.<sup>8</sup>

### **'Simultaneous team activation' as a paradigm shift**

Post-hoc analysis of the time to delivery in cases of unexpected profound fetal bradycardia shows that at our institution, the nursing interventions typically require 3 to 10 minutes. Reaching the attending obstetrician by pager or phone typically requires at least 3 to 5 minutes and there may not be a response for up to 10 or 15 minutes. Even when the obstetrician is in house and decides to proceed immediately with C/S, it is unlikely that the patient and anesthesiologist will be in the OR within 10 minutes of the onset of fetal bradycardia. At our institution, delivery for intrapartum emergencies like cord prolapse and profound fetal bradycardia was historically nearly always well within 30 minutes of decision for C/S, but seldom within 15 minutes of onset of bradycardia.

After a series of discussions, we reached the conclusion that while 15 minutes to delivery was a laudable achievement, it was unreasonable—at least if we continued to use a sequential activation approach. Incremental change might result in shaving minutes from the time to delivery, but could never cut the time in half. So we asked ourselves, "How can we make it possible?" To answer that question, we took a page from the defense aerospace industry handbook and started using the "Skunk Works" approach.

Lockheed Martin's "Skunk Works" has become synonymous in the business world with rapid and focused technical innovation:

"A Skunk Works is a group of people who, in order to achieve unusual results, work on a project in a way that is out-side the usual rules. A Skunk Works is often a small team that assumes or is given responsibility for developing something in a short time with mini-mal management

constraints."<sup>9</sup>

**Among the operating rules of the original Lockheed Skunk Works team<sup>10</sup> :**

- The Skunk Works team leader should have virtually complete control over the project and in turn be personally responsible for its success or failure.
- The number of people having any connection with the project must be strictly limited. "Use a small number of very good people!"
- "Be quiet, be quick, and be on time."<sup>7</sup>

**As we "deconstructed" and redesigned our response to obstetric emergencies, we made the following observations:**

- If the OR is on the same floor as L&D, as it is in our institution, then the staff can nearly always move the mother from labor room to OR in less than 5 minutes.
- An experienced anesthesiologist can nearly always have the mother anesthetized—either by spinal or general—within 5 minutes of arrival in the OR.
- An experienced obstetrician can nearly always deliver a baby by C/S within 3 to 5 minutes of the start of surgery.
- At our hospital, with in-house neonatology, respiratory therapist, and neonatal advanced life support nurses, the neonatal team can be present and ready to resuscitate the baby within 5 minutes of being called.

From this analysis, on our L&D unit, emergent delivery could *almost always* occur within 15 minutes of decision for delivery. However, in order to approach this goal, we identified several key changes that needed to be made.

**First, it's necessary to activate the entire response team rapidly and simultaneously.**



Figure 1

Even awaiting arrival of an "in-house" obstetrician prior to activation would make it virtually impossible to reach the 15-minute goal. Similarly, it's essential to empower the front-line team member—namely the L&D nurse—to make the activation decision—to pull the trigger, as it were (Figure 1).

**Second, the response must proceed in a coordinated, virtually choreographed fashion.**

- The OR team identified changes that could shorten its time to surgery start.

Even on L&D, the culture of the OR is to move at a measured and cautious pace at the beginning of each case. However, when each second is precious, we can shave time at start-up by having the L&D nurse and the circulating nurse "double team" the patient, placing a Foley catheter and prepping simultaneously. A few more seconds can be saved by using a "splash and dash" prep, by skipping the clip, by using a minimal instrument set, and, if necessary, even replacing sponge and needle counts at the beginning of the case with an x-ray check at the end of surgery.

- The obstetrician can vary operative technique for a faster delivery.

In the true emergency, there is no place for the "Hollywood" incision. If the goal is to deliver the baby safely but as rapidly as possible, the key is to make an adequate skin incision. Subcutaneous bleeders can be ignored until after the baby has been delivered. For many patients, it's possible to separate the recti in the midline, skip the step of dissecting the recti

from the fascia, and bluntly enter the peritoneum in very rapid fashion. With some attention to choreography, the surgeon can keep Mayo scissors in hand during these steps and then use Mayos to open the uterus without reaching for a scalpel (this also reduces the chance of inadvertently nicking the baby). Some obs prefer to use a vertical subumbilical incision for "stat" cesareans; most at our institution use a Pfannensteil incision, and we've seen many cases with delivery within 2 minutes of surgery start.

- An experienced ob anesthesiologist can nearly always provide surgical anesthesia by means of a spinal or general anesthetic within 5 minutes of the mother's arrival in the OR.

If an epidural catheter is in place and the local anesthetic is administered en route to the OR, surgery can usually start within 5 to 10 minutes.<sup>11</sup> A suitable epidural dose in this situation would be pH-adjusted 2% lidocaine with 1:200,000 epinephrine 10 to 15 mL plus 100 µg fentanyl. At the same time an IV fluid bolus is given if the woman's condition allows, and vasopressors can be given to treat or prevent maternal hypotension. The ob anesthesiologist must also be prepared to administer a general anesthetic if the regional anesthetic is not yet effective when surgery needs to start. Augmentation of a regional block with a local anesthetic by the obstetrician is an option that can permit the operation to start while an epidural (or spinal anesthetic) is "setting up."

- The neonatal team (MD and/or NNP, advanced life support nurse, NICU nurse, and respiratory care practitioner) is accustomed to responding to emergencies, with typical time of less than 5 minutes to arrival at the bedside.

With an Ob Team Stat call, the neonatal team ascertains the nature of the emergency, double-checks the resuscitation equipment, and is ready to resuscitate the baby if needed.

### **Bringing in the rapid response team**

In most hospitals a *Code Blue* can be called by any member of the medical or nursing staff, is broadcast hospital wide both by overhead page and by beeper, and results in simultaneous activation of all of the members of the team needed to treat cardiac arrest. It differs from the obstetric situation in that the trigger, cardiac arrest, is an unambiguous event, and that the team response is to the patient's bedside. In contrast, the triggers in an obstetric emergency are varied and often should result in the patient being moved to meet the response team in the operating room.

Rapid response teams for other emergencies have been developed in the hospital environment—primarily in the critical care environment—as a means of rapidly assembling the medical and nursing staff and resources for medical and surgical emergencies ranging from hemodynamic instability short of cardiac arrest, to stroke, to motor vehicle trauma.<sup>12-14</sup> Approaches to design and implementation vary both in the general hospital environment and the ob unit.<sup>15</sup> Preliminary information suggests that such teams may improve patient outcomes.<sup>12-14</sup>

The Sharp Mary Birch Hospital "Ob Team Stat" rapid response team concept was developed by an ad hoc group from a series of discussions among obstetrics, anesthesia, OR, neonatology/newborn ICU, and administrative staff. Key points of the concept are as follows:

1. The system is activated by any team member, RN or MD, not only for specified obstetric emergencies—which include severe fetal bradycardia, hemorrhage, eclampsia, and maternal cardiac arrest—but also for any potentially serious emergency in which a team response is required.

2. The team that is activated includes the L&D charge nurse, in-house obstetrician, anesthesiologist, OR surgical team, neonatologist, and NICU team simultaneously.
3. Team activation is by means of hospital-wide overhead page and by beeper.
4. The patient's attending physician is contacted by phone and/or pager immediately following Ob Team Stat activation.

In the preliminary discussions, we identified potential drawbacks of the Ob Team Stat concept:

1. Physician autonomy is affected. This system includes a change from the concept of "She's Dr. Smith's patient" to the view that "She's our patient."
2. Nurses must act well outside their traditional comfort zone. Even the experienced L&D nurse is not usually trained to move a patient and the team towards emergency C/S, with a de-emphasis on the initial nursing interventions to correct severe fetal bradycardia, particularly in the context of prior C/S. This was recognized as representing a major change in the physician-nurse practice culture in L&D.
3. Both physicians and nurses might view the Ob Team Stat activation for an undelivered patient as a decision to deliver by emergency C/S. But we emphasized that, for the undelivered patient, the activation would typically result in a move to the OR for further evaluation, *not necessarily* delivery, and that we expected that many bradycardias would resolve without emergent C/S.
4. Activations have the potential to cause a "cry wolf" phenomenon, in which the physicians and staff would be frequently distracted from patient care to rush to the OR for situations that are not true emergencies. However, from the start we anticipated that at least half of the activations would not result in a delivery (for example, with a fetal bradycardia resolving after the move to the OR), and we worked to set the proper expectations in this regard. There is no safer place to watch the FHR recover from a profound bradycardia than in the OR, with a team ready. If this occurs and mom returns to the labor room, then the Ob Team Stat response should be viewed as an essential preparedness drill for the team, and not as a "waste of time" for any of its members.

Our analysis suggested that the potential benefits of proceeding with the rapid response team concept far outweighed the potential risks. We decided to risk overuse by disseminating general guidelines for activation, but empowering the nursing staff to "pull the trigger" for any event that they felt warranted the team response. Before going forward with the concept, we added a key element: monitoring of activations for appropriateness and debriefing the team after activations, with a plan in advance to revise the activation steps in response to feedback.

### **Testing our team concept**

The first test of teamwork for Ob Team Stat was cutting through the usual 3 to 6 months of "red tape" time frame for developing new hospital procedures. The team moved from presentation to the Sharp Mary Birch L&D Operations Committee on a Monday morning, to discussion at the Medical Executive Committee on Tuesday evening, to approval of the concept by the Ob Supervisory Committee on Thursday. We solicited input from potential responders—L&D nursing staff, operating room staff, ob anesthesiologists, obstetricians participating in the in-house call rotation, neonatal team, and the hospital operators—to create and refine the procedures. The hospital policy was developed, edited, disseminated, and put into operation during the next week!

The first activation of the Ob Team Stat came 6 days later at about 7 PM, for a prolonged fetal bradycardia. In sharp contrast to past events, we had the mother in the OR and the full team assembled within 2 minutes of the call. The difference between the hospital-wide overhead page and the old "beep people one-by-one" practice was underscored by the fact that the entire team was present and the mother was being moved *before* the pages had even propagated through the beeper system!

The next Ob Team Stat call followed an umbilical cord prolapse 2 weeks later, in the early morning hours on Easter Sunday, 2005. The time from activation to delivery was less than 8 minutes, and the baby had Apgar scores of 8 and 9.

Two key components of the Ob Team Stat concept are monitoring and adaptation. We originally expected the vast majority of activations to be for undelivered patients, but experience revealed that it was being used for delivered mothers with problems such as postpartum hemorrhage and postpartum eclampsia. So to avoid unnecessary activation of the neonatal staff, the call was revised into two subcategories: Ob Team Stat Alpha (in which the entire team mobilizes) and Ob Team Stat Bravo (in which the neonatal team does not respond).

In reviewing our data after implementing the Ob Team Stat, we found a mean decision to OR transfer time of 4.7 minutes, mean OR arrival-to-incision time of 6.3 minutes, for a mean total "decision-to-incision" time of 11 minutes. A subsequent audit of activations resulting in delivery for the first 6 months of 2006 showed 21 cases with times from team activation to delivery of  $10.9 \pm 4.0$  minutes, with a range of 4 to 19 minutes. In only four of these cases was the time to delivery over 15 minutes.

We are in the process of collecting data regarding frequency and appropriateness of Ob Team Stat activations, as well as physician and nurse response to the program. Our initial impressions are that the program has been well received by physicians and L&D staff, has not resulted in a "cry wolf" phenomenon, and dramatically improved our Center's ability to respond to ob emergencies. The most recent activation in which we were present was for a uterine rupture during a VBAC trial. The FHR tracing showed abrupt and profound bradycardia. At the time of C/S, the baby's arm and head had been extruded into the abdominal cavity. Time from onset of bradycardia to delivery was 6 minutes, 20 seconds; the baby had Apgar scores of 8 and 9, normal cord blood gas studies, and did not even require observation in the NICU!

### **Can our program improve response times for every hospital?**

Certainly, for hospitals with an in-house OR team, obstetrician, and ob anesthesiologist, a system similar to ours should be practical, and we believe it will likely have a positive impact. For hospitals without in-house teams, it may still be possible to improve response times by analyzing the timing of responses, assessing the possibility of using simultaneous rather than sequential activation, and building a feedback mechanism into the emergency response concept from the start.

As we have watched Ob Team Stat evolve, our "choreography" has steadily improved; responding to ob emergencies feels less like being caught in an avalanche and more like downhill skiing. Many of the early skeptics have become ardent proponents of the concept. We believe that this approach has also improved unit morale and "word of mouth" dissemination to other hospitals in our area. Most importantly, it seems that every week, in the lounge "the morning after," we are hearing not about "the disaster last night" but about the "great save."

### **REFERENCES**

1. American College of Obstetricians and Gynecologists. Standards of Obstetric-Gynecologic

Services, 7th ed. Washington, DC: ACOG; 1989.

2. Katz V, Balderston K, DeFreest M. Perimortem cesarean delivery: were our assumptions correct? *Am J Obstet Gynecol*. 2005;192:1916-1920.

3. Bujold E, Gauthier RJ. Neonatal morbidity associated with uterine rupture: what are the risk factors? *Am J Obstet Gynecol*. 2002;186:311-314.

4. Oyelese Y, Catanzarite V, Prefumo F, et al. Vasa previa: the impact of prenatal diagnosis on outcomes. *Obstet Gynecol*. 2004;103:937-942.

5. Moriarty KT, Onwurzurike B, Jones JJ, et al. The 30 minutes decision to delivery interval for 'urgent' caesarean sections: an elusive target. *J Obstet Gynaecol*. 2006;26:736-739.

6. Quinn AJ, Kilpatrick A. Emergency caesarean section during labor: response times and type of anaesthesia. *Eur J Obstet Gynecol Reprod Biol*. 1994;54:25-29.

7. Tuffnell DJ, Wilkinson K, Beresford N. Interval between decision and delivery by caesarean section—are current standards achievable? Observational case series. *BMJ*. 2001;322:1330-1333.

8. Bloom SL, Leveno KJ, Spong CY, et al. Decision-to-Incision times and maternal and infant outcomes. *Obstet Gynecol*. 2006;108:6-11.

9. [http://whatis.techtarget.com/definition/0,289893,sid9\\_gci214112,00.htm](http://whatis.techtarget.com/definition/0,289893,sid9_gci214112,00.htm)

10. Rich BR, Janos L. *Skunk Works: A Personal Memoir of My Years at Lockheed* (Paperback). Time Warner Books, New York, 1995. p9, 59. ISBN: 0751515035.

11. Lam DT, Ngan Kee WD, Khaw KS. Extension of epidural blockade in labour for emergency Caesarean section using 2% lidocaine with epinephrine and fentanyl, with or without alkalinisation. *Anaesthesia*. 2001;56:790-794.

12. Winters B, Pham J, Pronovost P. Rapid response teams—walk, don't run. *JAMA*. 2006;296:1645-1647.

13. Devita MA, Bellomo R, Hillman K, et al. Findings of the first consensus conference on medical emergency teams. *Crit Care Med*. 2006;34:2463-2478.

14. King E, Horvath R, Shulkin DJ. Establishing a rapid response team (RRT) in an academic hospital: one year's experience. *J Hosp Med*. 2006;1:296-305.

15. Anderson ER, Black R, Brocklehurst P. Acute obstetric emergency drill in England and Wales: a survey of practice. *BJOG*. 2005;112:372-375.