

Steps Toward a National Disaster Plan for Obstetrics

Kay Daniels, MD, Ann Marie Oakeson, MSN, RDMS, and Gillian Hilton, MBChB, FRCA

Hospitals play a central role in disasters by receiving an influx of casualties and coordinating medical efforts to manage resources. However, plans have not been fully developed in the event the hospital itself is severely damaged, either from natural disasters like earthquakes or tornados or manmade events such as a massive electrical failure or terrorist attacks. Of particular concern is the limited awareness of the obstetric units' specialized needs in the world of disaster planning. Within the same footprint of any obstetric unit, there exists a large variety of patient acuity and needs including laboring women, postoperative patients, and healthy postpartum patients with their newborns. An obstetric-specific triage method is paramount to accurately assess and rapidly triage patients during a disaster. An example is presented here called OB TRAIN (Obstetric Triage by Resource Allocation for Inpatient). To accomplish a comprehensive obstetric disaster plan, there must be 1) national adoption of a common triage and evacuation language including an effective patient tracking system to avoid maternal–neonatal separation; 2) a stratification of maternity hospital levels of care; and 3) a collaborative network of obstetric hospitals, both regionally and nationally. However, obstetric disaster planning goes

beyond evacuation and must include plans for shelter-in-place and surge capacity, all uniquely designed for the obstetric patient. Disasters, manmade or natural, are neither predictable nor preventable, but we can and should prepare for them.

(*Obstet Gynecol* 2014;124:154–8)

DOI: 10.1097/AOG.0000000000000326

When we think of natural disasters, we think in terms of the area in which we live. The coastal areas think of hurricanes and flooding, whereas the central plains of the United States think of tornados. Those living in the seismic-active area think of earthquakes and tsunamis. In contrast, infectious diseases such as the H1N1 pandemic or manmade disasters including bombings, fires, electrical outages, and cyber attacks are not restricted to any one area.

Medical facilities play a central role in mitigation planning. However, the majority of disaster protocols have been developed to address the occurrence of mass casualty events that occur outside of the hospital and where the hospital will be receiving large numbers of injured people in a short period of time. However, what happens if a hospital is severely damaged, either from natural disasters or manmade events? If the hospital includes an active maternity ward, what then?

An accurate number of current U.S. hospital evacuations is difficult to find. Sternberg retrieved information from newspapers and databases of hospital evacuations from 1971 to 1999. They found a total of 275 hospital evacuations in this time period, which they considered an underestimate as a result of lack of accurate data. This report showed an annual average of 21 hospital evacuations in the 1990s with the most being 33 in 1 year as a result of the Northridge Earthquake. This report did not include the more recent events such as Hurricane Katrina (30 hospitals evacuated), Superstorm Sandy, and others.¹

From the Departments of Obstetrics and Gynecology and Anesthesia, Stanford University School of Medicine, and the Lucile Packard Children's Hospital at Stanford, Stanford, California.

Supported by the Department of Obstetrics and Gynecology, the Department of Anesthesia, Lucile Packard Children's Hospital at Stanford University School of Medicine.

The authors thank the Disaster Committee at Lucile Packard Children's Hospital: Fran Schlaefer, Nancy Peterson, Barbara Petree, Susan Lee, Mariamne Sulayma, Ana Clark, Camille Anacabe, Laura Harwood, Brandon Bond, Ronald Cohen, and Anna Linn for their contributions to the development of disaster planning tools; and Jane Chueh for editorial assistance.

Corresponding author: Kay Daniels, MD, Department of Obstetrics and Gynecology, Stanford University School of Medicine, H3330, 300 Pasteur Dr., Stanford, CA 94305; e-mail: k.daniels@stanford.edu.

Financial Disclosure

The authors did not report any potential conflicts of interest.

© 2014 by The American College of Obstetricians and Gynecologists. Published by Lippincott Williams & Wilkins.

ISSN: 0029-7844/14



OBSTETRIC UNITS ARE UNIQUE

The American College of Obstetricians and Gynecologists notes “Providers of obstetric care and facilities that provide maternity services, offer services to a population that has many unique features warranting additional consideration.”² For example, pregnant women suffered disproportionately during the H1N1 pandemic. Teams responding to the earthquakes in Haiti (2010) and Japan (2011) were ill equipped to deal with pregnant victims.^{3,4}

Within the same footprint of any obstetric unit, there exists a large variety of patient acuity and unique needs. The obstetric unit is comprised of labor and delivery, antepartum, postpartum wards, and the newborn nursery. In each of these wards there are a wide variety of patients ranging from preoperative to postoperative, low risk to high risk, medically stable to unstable in all stages of labor. Nowhere else in the hospital is there such a variety of patient acuities so closely housed within the same unit.

In addition, obstetric units have the unique task of caring for not only one, but two patients simultaneously. The job of assuring mothers and their newborn are evacuated together during a time of chaos is neither trivial nor simple. During Katrina, “125 critically ill newborn babies and 154 pregnant women were evacuated to Woman’s Hospital in Baton Rouge. Some of the fragile newborns arrived without their mothers. It was at least 10 days before some of the infants and mothers were reunited.”⁵

OBSTETRIC TRIAGE BY RESOURCE ALLOCATION FOR INPATIENTS

Whether the need is to evacuate the facility or to prepare for increased surge capacity, a triage method is required to quickly and accurately assess patients. The most effective triage tool is one that is “clearly defined, with consistent and understood categories, and a method of recording and displaying the information.”⁶

Triage has military origins with a purpose of returning soldiers back to the battlefield. In modern disasters, triage has been used primarily in prehospital settings to prioritize care and to distribute resources appropriately. Going forward, there is a need for a tool that will support cooperation within regions to coordinate suitable care for each patient while making the best use of resources.

Several years ago, our neonatal intensive care unit (NICU) colleagues at Lucile Packard Children’s Hospital at Stanford developed a triage assessment tool for neonates called TRAIN (Triage by Resource Allocation for Inpatient). It is a preplanning tool incorporated

into daily practice, categorizing patients according to their medical needs and the type of transport required if evacuation becomes necessary. By completing the assessment on a daily basis, the unit is one step ahead in the event of an emergency.⁷

The utility of the neonatal TRAIN program has been demonstrated by its acceptance regionally (Santa Clara, Santa Cruz, and San Diego counties). Using this triage tool, Lucile Packard Children’s Hospital is able to act as a regional clearinghouse allowing up-to-date patient census. The TRAIN program has been endorsed by the California Association of Neonatologists, who are leading the way to a national plan (personal communication, Dr. R. Cohen).

We have developed an obstetric triage system called OB TRAIN (Obstetric Triage by Resource Allocation for Inpatient) using the framework of the NICU tool. When tailoring a triage system for obstetric patients, we considered four crucial parameters. Table 1 demonstrates the critical considerations for antepartum and laboring patients. For postpartum patients, the questions differ with a focus on the unique needs after delivery (Table 2). Consideration of these parameters allows the suitable transport of the patient to the appropriate facility. Often a patient will demonstrate a range of acuity levels based on each of the four parameters. However, the highest level acuity of a single parameter is considered the final triage score used for evacuation. To allow further ease of use, each OB TRAIN triage score has been given a color identifier corresponding to increasing acuity, blue, green, yellow, or red. Color-coding has long been used in emergency triage in the field and is being adopted for use in the hospital setting. Color-coding allows for rapid and simple communication among the unit, the command center, and the receiving hospital.

Fortunately, no major disasters requiring rapid evacuation have occurred at our institution since the development of this tool. To compensate for actual events, simulation drills are being used to test and refine the tools needed to achieve disaster preparedness.

COLLABORATIVE NETWORKS

The use of preexisting collaborative networks during a disaster has been successful in other medical disciplines. As noted by Mattox after Hurricanes Katrina and Rita, the nation’s trauma centers (which have a collaborative network in place based on the trauma-level designation of 1, 2, or 3) were able to communicate regularly between centers about case-load, supply needs, and patient movement. Mattox



Table 1. OB TRAIN Antepartum and Labor and Delivery

Transport	Car (Discharge), Blue	Basic Life Support (Ambulance), Green	Advanced Life Support (Ambulance), Yellow	Specialized,* Red
Labor status	None	Early	Active	At risk for en route delivery
Mobility	Ambulatory [†]	Ambulatory or nonambulatory	Nonambulatory	Nonambulatory
Epidural status	None	Placement greater than 1 h [‡]	Placement less than 1 h [‡]	Not applicable
Maternal or fetal risk	Low	Low or moderate	Moderate or high	High

OB TRAIN, Obstetric Triage by Resource Allocation for Inpatient.

* Must be accompanied by physician or transport registered nurse.

[†] Modified Bromage scale 6=patient is able to perform a partial knee bend from standing.

[‡] Epidural catheter capped off.

states “physicians who are familiar with and experienced in integrated collaborative network are best suited from a training and mind set management approach to handle disasters.”⁸ A recent example is the approach that was used immediately after the bombings at the Boston Marathon in 2013. Multiple patients were directed efficiently to various hospitals across the city because it had been established previously what the capacity and capabilities of the specific hospitals were when dealing with mass numbers of trauma patients.⁹

The overarching principles required to create a workable collaborative network for obstetric units include 1) a common language and 2) understanding the capacities and capabilities of hospitals, both locally and regionally.

COMMON LANGUAGE

The development of an obstetric-specific triage algorithm such as OB TRAIN can be used to create a universal language for regional evacuation and surge processes. Concise and accurate patient information is critical. Moving a patient to a site that is unable to

adequately care for her and her fetus or newborn is ethically unacceptable.

During an evacuation, all communication must go through the command centers of the evacuating and accepting hospitals. There is no opportunity for direct health care provider-to-health care provider communication. As such, triage planning must include easily communicated descriptions of individual patient’s required level of care.

HOSPITAL STRATIFICATION FOR MATERNAL CARE

Consideration of where to transfer a pregnant woman at 26 weeks of gestation in preterm labor is a much different predicament than that of a term parturient in the early stages of labor. Consequently before a disaster occurs, there needs to be a triage mechanism in place that takes into consideration the acuity level of both the mother and her fetus or newborn, allowing for optimal disposition.

A nationally accepted rating of maternity levels of care, as have been so clearly delineated for the NICU, does not currently exist. Hankins et al¹⁰ have called

Table 2. OB TRAIN Postpartum

Transport	Car (Discharge), Blue	Basic Life Support (Ambulance), Green	Advanced Life Support (Ambulance), Yellow	Specialized,* Red
Delivery	Vaginal delivery greater than 6 h or cesarean delivery greater than 48 h	Vaginal delivery, 6 h or cesarean delivery less than 48 h	Complicated vaginal delivery or cesarean delivery	Medically complicated
Mobility	Ambulatory [†]	Ambulatory or nonambulatory	Ambulatory or nonambulatory	Nonambulatory
Postoperative	Noncesarean delivery surgery greater than 2 h [‡]	Greater than 2 h from cesarean delivery	Less than 2 h from cesarean delivery	Medically complicated
Maternal risk	Low	Low or moderate	Moderate or high	High

OB TRAIN, Obstetric Triage by Resource Allocation for Inpatient.

* Must be accompanied by physician or transport registered nurse.

[†] Modified Bromage scale 6=patient is able to perform a partial knee bend from standing.

[‡] If adult supervision is available for 24 h.



for designation of levels of maternity care. This system needs to be further utilized and accepted on a national scale.

Presently, networks exist for the transfer of high-risk obstetric patients in some regions of the United States. Building on these preexisting networks for disaster transfers would be optimal.

BEYOND EVACUATION FOR DISASTER PLANNING

Disaster planning does not end with collaborative networks and effective triage systems. Comprehensive disaster planning must include plans for “shelter in place” and “surge capacity.” “Shelter in place” refers to the actions and equipment necessary to attend to those patients who cannot be moved safely and must be cared for in austere conditions, for example patients who are going to deliver imminently or if transport services are not available. Having preprepared kits for surgical and nonsurgical deliveries is essential for the care of patients outside our usual environment, whether this is elsewhere within the hospital or outside in the parking lot (Box 1).

“Surge capacity” refers to strategies that hospitals need to have to be able to accept and adequately care for a higher census than is their norm. There are three subsets of surge capacity: conventional capacity—consistent with daily practices; contingency capacity—not consistent with daily practices but has minimal effect on usual patient care practices; and crisis capacity—not consistent with usual standards of care but provides sufficiency of care in the setting of a catastrophic disaster.¹¹ Crisis surge capacity would generally apply to undamaged hospitals that will receive an influx of patients from those hospitals affected by the disaster, but it may also apply to the damaged hospital as local patients arrive seeking care despite the damage.

Training for these rare yet catastrophic events is challenging. Consideration should be given to the use of simulation training for disaster drills. There is growing evidence that the use of simulation training facilitates education, improves team training and communication, and reduces errors in high-acuity environments such as in operating rooms and emergency rooms.^{12,13} Disaster scenarios are no exception, and we should incorporate these regularly into our standard elements of training for all medical and nursing disciplines.

WHERE ARE WE NOW?

At this point in time, maternity care in the United States does not have the needed infrastructure to adequately achieve the goal of disaster preparedness. To implement a nationwide disaster plan will require the joining

Box 1. Grab and Go Labor and Delivery

- Gloves
 - Nonsterile—1 box
 - Sterile size 7 (×10)
- Examination gel (×10)
- Fetal Doppler
- Antibacterial hand gel
- Suture
 - Monocryl 2.0×2
 - Monocryl 3.0×2
- Instruments
 - Mayo scissors
 - Clamp
 - Needle driver
 - Umbilical clamp (×3)
- General supplies
 - Under-buttocks drape
 - Needle box
 - Peripads×2
 - Red bag×2
- Medications
 - Oxytocin 20 units intramuscular
 - Methergine 0.2 mg intramuscular
 - Misoprostol 1,000 micrograms
 - Lidocaine 1% 30 mL
 - Needles
 - Syringes
- Neonatal
 - Ambubag (neonatal)
 - Bulb syringe
 - Hat
 - Blanket
 - Stethoscope

of local, regional, and national initiatives. Locally, each hospital must determine their particular resources while simultaneously understanding the capabilities of their neighboring hospitals. Nationally, obstetric leadership (eg, American College of Obstetricians and Gynecologists, Society of Maternal-Fetal Medicine) must take the lead in this endeavor by endorsing a common language to be used in evacuation and triage, creating a stratification of maternity hospitals based on universally accepted treatment capabilities (similar to the NICU model) and determining national standards for surge capacity for maternity hospitals.

CONCLUSION

Investing in the triad of an obstetric-specific triage system (OB TRAIN), including a process that will avoid maternal–neonatal separation, a national stratification of maternity hospital levels of care, and a collaborative network of obstetric units are the steps needed toward the creation of a national disaster plan for obstetric units. These steps need to be taken by the obstetric community on both a local and national level. We can neither predict nor prevent disasters, but we can



prepare for them, and the best time to prepare for them is now, before they happen.

REFERENCES

1. Sternberg E, Lee G, Huard D. Counting crises: US hospital evacuations 1971-1999 prehospital and disaster. *Medicine* 2004;19:150-7.
2. Pinkert M, Dar S, Goldberg D, Abargel A, Cohen-Marom O, Kreiss Y, et al. Lessons learned from an obstetrics and gynecology field hospital response to natural disasters. *Obstet Gynecol* 2013;122:532-6.
3. Beigi RH. Pandemic influenza and pregnancy: a call for preparedness planning. *Obstet Gynecol* 2007;109:1193-6.
4. American College of Obstetricians and Gynecologists. Hospital disaster preparedness for obstetricians and facilities providing maternity care. Committee Opinion No. 555. *Obstet Gynecol* 2013;121:696-9.
5. Lakshmi R. Group urges disaster planning for pregnant women, babies. *The Washington Post* 2006. Available at: <http://www.washingtonpost.com/wp-dyn/content/article/2006/08/16/AR2006081601516.html>. Retrieved December 20, 2013.
6. Aitken P, FitzGerald G. Disaster triage: evidence consistency and standard practice. *Emerg Med Australasia* 2012;24:222-4.
7. Cohen R, Murphy B, Ahern T, Hackel A. Regional disaster planning for neonatology. *J Perinatol* 2010;30:709-11.
8. Mattox K. Hurricanes Katrina and Rita: role of individual and collaborative networks in mobilizing/coordinating societal and professional resources for major disasters. *Crit Care* 2006;10:205.
9. Gawande A. Why Boston's hospitals were ready. *The New Yorker* 2013. Available at: <http://www.newyorker.com/online/blogs/newsdesk/2013/04/why-bostons-hospitals-were-ready.html>. Retrieved November 19, 2013.
10. Hankins GD, Clark SL, Pacheco LD, O'Keefe D, D'Alton M, Saade GR. Maternal mortality, near misses, and severe morbidity lowering rates through designated levels of maternity care. *Obstet Gynecol* 2012;120:929-34.
11. Hick JL, Barbera JA, Kelen GD. Refining surge capacity: conventional, contingency, and crisis capacity. *Disaster Med Public Health Prep* 2009;3(suppl):S59-67.
12. Sundar E, Sundar S, Pawlowski J, Blum R, Feinstein D, Pratt S. Crew resource management and team training. *Anesthesiol Clin* 2007;25:283-300.
13. Biddinger PD, Baggish A, Harrington L, d'Hemecourt P, Hooley J, Jones J, et al. Be prepared—the Boston Marathon and mass-casualty events. *N Engl J Med* 2013;368:1958-60.

OBSTETRICS & GYNECOLOGY



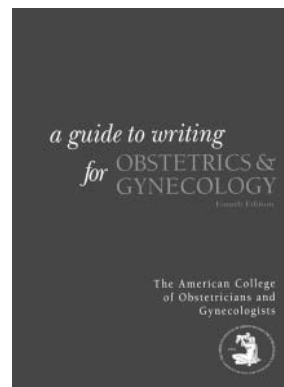
Need Help With Your Manuscript? Get the Guide!

Developed by Editors and staff of the Green Journal, *A Guide to Writing for Obstetrics & Gynecology* is meant to help prospective authors, especially those who are beginning in medical journal writing, produce better papers.

Topics covered include:

- Conflict of interest policy
- Levels of evidence
- Planning and structuring a manuscript
- Writing tips, including an overview of syntax, grammar, abbreviations, acronyms, jargon, and troublesome terms
- Common pitfalls of authorship (eg, redundant publication and conflict of interest)
- An overview of the peer-review process

A PDF of this valuable resource is available, free of charge, from *Obstetrics & Gynecology* at <http://ong.editorialmanager.com>.



rev 7/2013

