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## Control of massive hemorrhage

# Lessons from Iraq reach the US labor and delivery suite

Transfusion management of massive OB hemorrhage has been enlightened by military trauma care in war

Recent experience has shown that, as the initial response to massive obstetric hemorrhage, we should consider infusing fresh-frozen plasma (FFP) at a ratio of 1:1 or 1:2 with transfusion of units of red blood cells (RBCs). As the case progresses, administer blood products to achieve specific targets:

- Fibrinogen, >100 mg/dL
- Hematocrit,  $\geq 21\%$  (hemoglobin,  $\geq 7$  g/dL)
- Platelet count,  $>50 \times 10^3/\mu\text{L}$
- Prothrombin time and activated partial thromboplastin time, <1.5 times control (International Normalized Ratio, or INR, <1.5).

## Maternal death is a risk even in developed world

Massive obstetric hemorrhage, defined as hemorrhage requiring transfusion with more than 8 U of blood, is uncommon. However, even in the developed world, where surgical and blood-banking resources are available, it remains a major cause of maternal death. The same is true, of course, in the developing world, where emergency surgical and blood-banking resources are limited.

Few clinical trials have focused on the optimal transfusion management of patients with massive obstetric hemorrhage; rather, much of our knowledge of massive hemorrhage and optimal transfusion protocols has been developed in the practice of military and domestic civilian

trauma care—settings in which massive hemorrhage is more common and can be studied more readily.

Recently, military trauma surgeons working in Iraq have analyzed their clinical experience managing massive hemorrhage.<sup>1,2</sup> They report that early replacement of clotting factors is critical—but often delayed—in managing patients with massive hemorrhage. What they have learned offers valuable insight for managing massive obstetric hemorrhage.

## Experiences treating military injuries

Hemorrhage caused by trauma can result in death from hypotension, acidosis, hypothermia, or coagulopathy. In a review of cases from Iraq, military trauma surgeons note that the response to treating anemia, hypovolemia, hypothermia, and acidosis has been excellent but that management of coagulopathy in cases of massive trauma has not been optimal. Consequently, military trauma teams have turned their focus to aggressively replacing clotting factors with FFP, cryoprecipitate, and, when necessary, recombinant activated clotting factor VII (rF-VIIa) early in resuscitation.<sup>1-3</sup>

### Answer the Instant Poll!

**How prepared are you to handle massive obstetric hemorrhage?**

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### FAST TRACK

**Early replacement of clotting factors is critical in managing patients who have a massive hemorrhage—but treatment is often delayed**

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TABLE

**Laboratory values to target when treating massive obstetric hemorrhage**

Fibrinogen, >100 mg/dL
Hematocrit, ≥21% (hemoglobin, ≥7 g/dL)
Platelet count, >50 × 10 <sup>3</sup> /μL
Prothrombin time and activated partial thromboplastin time, <1.5 times control (International Normalized Ratio, or INR, <1.5)

Targets are derived from field experience and expert consensus in trauma surgery practice.

**Recommendation #1.** The first key recommendation of these military trauma experts is to use FFP at a ratio of 1:1 or 1:2 with units of RBCs early in resuscitation.<sup>1</sup> Then maintain aggressive, early transfusion with FFP until 1) the clinical situation stabilizes or 2) it becomes clear that the patient does not have a coagulopathy. If the patient immediately stabilizes and hemorrhage is easily controlled, establish transfusion targets that are based on measurement of key laboratory parameters to care for the patient (see TABLE).<sup>4,5</sup>

**Recommendation #2.** For optimal management of massive hemorrhage, surgeons and the blood bank must establish a fixed response plan that speeds appropriate blood products to the patient by minimizing haggling, so to speak, between the 2 teams. Military trauma surgeons have agreed on the following with their blood banks: If it becomes clear that the patient has massive hemorrhage, institute a predetermined transfusion protocol that requires the blood bank to send to the operating room, stored in individual coolers, the following:

- 6 U of RBCs
- 6 U of plasma
- 6 packs of platelets
- 10 U of cryoprecipitate.<sup>1</sup>

Transfuse these products as indicated clinically.

**Recommendation #3.** Minimize administration of crystalloids—mainly, use

them to dilute drugs and to keep IV lines open.

**Civilian trauma: Confirmatory reports**

Authors of case reviews from civilian trauma centers have also reported recently that treatment of hypovolemia, hypothermia, and acidosis has been excellent (and continues to improve) but that management of coagulopathy in patients experiencing massive hemorrhage remains suboptimal in the first 24 hours. Some civilian surgical teams have also recommended increasing the focus on early and aggressive replacement of clotting factors in the resuscitation process following massive hemorrhage.<sup>6</sup> Some experts recommend infusion of FFP at a ratio of 1:1 or 1:2 with transfusion of units of RBCs until 1) the clinical situation is stabilized and 2) it can be demonstrated that the patient does not have a coagulopathy (INR, <1.5; platelet count, >50 × 10<sup>3</sup>/μL; and fibrinogen, >100 mg/dL).

**Speed and decisiveness—plus training—are also key**

A major barrier in the blood bank is the time it takes to thaw and prepare cryoprecipitate for administration: as long as 1 hour. Blood banks often have a few thawed units of FFP, such as blood type AB, readily available for infusion, but it may take a significant amount of time to prepare additional units once those thawed units have been administered. Given the considerable time it takes to prepare clotting factors for infusion, and the rapid nature of massive obstetric hemorrhage, the obstetrician may have only minutes to make life-saving decisions about management.

In 2004, the Joint Commission on the Accreditation of Hospitals\* advised hospitals with obstetric services to conduct simulation training, or drills, that focus on common obstetric emergencies, including hemorrhage.<sup>7</sup> Physician-experts

\*Beginning in 2007, known simply as the Joint Commission

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**FAST TRACK**

**The surgical team and the blood bank need a fixed response plan that speeds blood products to the patient**

# Have you been drilled recently to prepare for massive obstetric hemorrhage?

The Joint Commission recommends that labor and delivery services practice responding to common obstetric emergencies by using simulation training. Has your obstetric service had a simulation drill for massive obstetric hemorrhage during the past year?

Yes

No

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have also recommended obstetric hemorrhage drills to improve system response times and effectiveness in managing massive hemorrhage.<sup>8,9</sup> An important component of an obstetric hemorrhage drill is to test the preparedness of the blood bank to prepare and transport—rapidly—large volumes of RBCs and clotting factors to the operating room for a bleeding obstetric patient.

By expediting our response to obstetric hemorrhage—through adoption of the lessons learned in war and during simulation training—we can save the life of more mothers.



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