The Journal of Emergency Medicine, Vol. 51, No. 2, pp. 172–177, 2016

0736-4679/$ - see front matter

ELSEVIER

Case Presentations of the Harvard Affiliated Emergency Medicine Residencies

CrossMark

CARE OF THE CRITICALLY ILL PREGNANT PATIENT AND PERIMORTEM CESAREAN DELIVERY IN THE EMERGENCY DEPARTMENT

Megan E. Healy, MD,* Dana E. Kozubal, MD,* Amanda E. Horn, MD,* Gary M. Vilke, MD,† Theodore C. Chan, MD,† and Jacob W. Ufberg, MD*

*Department of Emergency Medicine, Temple University School of Medicine, Philadelphia, Pennsylvania and †Department of Emergency Medicine, University of California, San Diego Medical Center, San Diego, California

Corresponding Address: Megan E. Healy, MD, Department of Emergency Medicine, Temple University School of Medicine, 1316 W. Ontario St., 10th Fl, Jones Hall, Philadelphia, PA 19140.

☐ **Abstract—Background: Maternal resuscitation in the emergency department requires planning and special consideration of the physiologic changes of pregnancy. Perimortem cesarean delivery (PMCD) is a rare but potentially life-saving procedure for both mother and fetus. Emergency physicians should be aware of the procedure's indications and steps because it needs to be performed rapidly for the best possible outcomes. Objective: We sought to review the approach to the critically ill pregnant patient in light of new expert guidelines, including indications for PMCD and procedural techniques. Discussion: The prevalence of maternal cardiac arrest and survival outcomes of PMCD in the emergency department setting are difficult to estimate. Advanced cardiovascular life support protocols should be followed in maternal arrest with special considerations made based on the physiologic changes of pregnancy. The latest recommendations for maternal resuscitation are reviewed, including advance planning, rapid determination of gestational age, emergent delivery, and postprocedure considerations for PMCD. Conclusions: Maternal resuscitation requires knowledge of physiologic changes and evidence-based recommendations. PMCD outcomes are best for both mother and fetus when the procedure is performed rapidly and efficiently in the appropriate setting. Emergency physicians should be familiar with this unique clinical scenario so they are adequately prepared to intervene in order to improve maternal and fetal morbidity and mortality.**

☐ **Keywords—emergency department; maternal resuscitation; perimortem cesarean delivery**

Reprints are not available from the authors.

INTRODUCTION

Background

Perimortem cesarean delivery (PMCD) is a rare yet potentially life-saving procedure that falls within the scope of emergency medicine practice. Recent data from the U.S. Nationwide Inpatient Sample quote cardiac arrest in 1:12,000 admissions for delivery, but importantly this does not include emergency department cesarean sections, unless the patient survives to admission (1). Interestingly, this inpatient sample showed a remarkable rate of maternal survival to hospital discharge of 58.9%, far higher than other cardiac arrest populations, reinforcing the importance of adequate preparation for this rare scenario.

Maternal death is difficult to accurately calculate worldwide, given its relative rarity and the lack of data in low-income countries. However, a recent study by Kassebaum et al. estimated that 18.5 mothers died for every 100,000 U.S. births in 2013, a rate twice that of

Canada and Saudi Arabia and three times higher than in the UK. This represents a concerning rise from 7.2 per 100,000 in 1987. This may be explained by better reporting, higher rates of significant comorbidities, such as diabetes and hypertension, and mothers with previously life-limiting illnesses surviving to adulthood and conceiving (2). Important to note is that this study included postpartum maternal deaths ≤1 year after birth. Overall, 24% of deaths occurred antepartum, a quarter intrapartum or immediately postpartum, and the rest occurring ≥24 hours after delivery. The recommendations discussed below would not apply postpartum or early antepartum patients. Kassebaum et al. address the debate around classifying maternal deaths (2). In their data, only deaths where pregnancy is considered a causal factor are included. Accidental and incidental deaths in pregnant women were not counted, and may account for a substantial number of critically ill pregnant patients presenting to the emergency department. To our knowledge, there is no reliable estimation of these numbers.

Rationale for Perimortem Cesarean Delivery

In the direst of circumstances, delivery of the fetus may be life-saving for both patients. One review showed that PMCD led to a clear maternal survival benefit in 31.7% of cases, and no case showed a deleterious effect on maternal survival (3). As outlined above, many of the recommendations for care of the critically ill pregnant patient are based upon the physiologic changes of pregnancy, most importantly uterine obstruction of venous return. For example, by emptying the uterus via PMCD, aortocaval compression is relieved, which results in a 60% to 80% increase in cardiac output (4). As discussed in the American Heart Association (AHA) statement, timely delivery is important for two key reasons: first, by improving venous return to the mother through relief of aortocaval compression, and second, by ensuring early delivery of the fetus, decreasing the risk of permanent neurologic damage (5). Best outcomes have been shown for both mother and fetus when the procedure is performed within 5 minutes of maternal cardiac arrest; therefore, rapid and decisive action must be taken under the appropriate circumstances (6–9).

It is important to consider which advanced resources are available at the site where the procedure may be performed. The availability of a skilled neonatal resuscitation team, for instance, would likely improve morbidity and mortality for the fetus. In the discussion of other rare procedures in the emergency department, we often consider which interventions are temporizing and necessitate transfer for higher level care, such as in the case of emergency department thoracotomy. The important difference in the case of PMCD is that the procedure can potentially be life-saving for both the mother and the fetus and, if successful, the immediate postprocedure management is within the scope of the emergency physician (EP).

DISCUSSION

General Approach to Cardiac Arrest in Pregnancy

Etiology of maternal arrest. Major causes of cardiac arrest to consider in pregnant patients include cardiac disease, thromboembolism, hemorrhage, sepsis, peripartum cardiomyopathy, preeclampsia/eclampsia, amniotic fluid embolism, and trauma. Cardiac disease remains the most common cause of death in pregnant women, with myocardial infarction as the leading cause, followed by aortic dissection (10). Deaths from hemorrhage, hypertension, and maternal sepsis have decreased over the past decade according to the Kassebaum et al. (2). The highest proportion of maternal deaths are attributable to pregnancy complications in high-income regions like the United States, followed by exacerbation of underlying illness, such as sickle cell anemia, obesity, or chronic kidney disease. Interestingly, accidental deaths, including trauma, were excluded. It is important to keep in mind that pregnant women are at higher risk for domestic violence, which may represent a significant number of deaths. In the United States, 324,000 pregnant women report intimate partner violence per year, with a known skew toward underreporting overall (11).

Institutional planning for maternal arrest. In October of 2015, the AHA released the first Scientific Statement on maternal resuscitation, titled “Cardiac Arrest in Pregnancy.” First, they recommend that pregnant women who become ill should be risk stratified using a validated obstetric early warning score and that hospital units that care for pregnant women should ensure proper preevent planning for maternal resuscitation (class Ic). The guidelines detail the makeup of a maternal cardiac arrest team composed of staff to care for two critically ill patients. The team should ideally include an adult resuscitation team, an obstetrician and obstetric nurse, anesthesia care providers, and a neonatology team, with defined leaders for each subgroup (class Ic).

Emergency medical services considerations. The AHA guidelines state that the emergency medical services (EMS) response to maternal cardiac arrest should include enough staff to ensure chest compressions, manual lateral uterine displacement (LUD), defibrillation, and airway management (class Ic). Transport should be directed to a facility capable of performing PMCD, but transport time should not be delayed >10 minutes for this purpose (class