Management of the critically ill obstetric patient

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Abstract

From 2006 to 2008, 261 women in the United Kingdom died either as a direct or indirect result of pregnancy. More than half of these received critical care input. The support required varied from observation and supportive management to multi-organ support. In many women death occurred despite optimal care, but in a number substandard care was identified when the cases were reviewed as part of the Confidential Enquiry into Maternal Deaths. An understanding of the different types of organ support and treatment that are available in a critical care setting and when these are indicated is therefore crucial for medical professionals caring for these unwell obstetric patients.

Described here are the technical aspects of organ support that can be utilized in a critical care setting and the alterations in physiology that occur in pregnancy which influence the use of each treatment modality. Also highlighted in more detail are conditions that are common or life threatening in pregnancy and key points about management of these conditions when they mandate critical care support.

Keywords acute fatty liver of pregnancy; acute respiratory distress syndrome; amniotic fluid embolus; critical care; maternal mortality; sepsis; systemic inflammatory response syndrome

Introduction

The majority of pregnant women negotiate pregnancy, delivery and the post-partum period without any significant complication. A small number of women, however, can become severely unwell with pregnancy-related conditions such as eclampsia or acute fatty liver of pregnancy, or develop complications from pre-existing conditions that are worsened by the physiological changes of pregnancy or delivery. Despite the best efforts of clinicians to identify women at risk of severe pregnancy-related morbidity, each year women die from catastrophic events including eclampsia, heart failure, intracranial haemorrhage and hepatic capsular rupture. Critical care is a crucial part of the care of these women, both in the management after life threatening events, and in optimizing management of women at highest risk of developing these complications.

Recent data from ICNARC (Intensive Care National Audit and Research Centre) showed that 11% of all women aged 16–50 years admitted to a critical care setting were either pregnant or had recently been pregnant. 61% of these admissions were for obstetric reasons. Only 18.5% of the admissions were women who were 'currently pregnant', the vast majority of whom were admitted for non-obstetric reasons, most frequently pneumonia. In contrast, the majority of 'recently pregnant' women were admitted to critical care for obstetric reasons, the predominant diagnosis being haemorrhage. In this report 'currently pregnant' and 'recently pregnant' women were much less likely to die (critical care mortality of 2% compared to 11% in a control population) and on average had a shorter critical care and hospital stay.

The Confidential Enquiry into Maternal Deaths is published by the Centre for Maternal and Child Enquiries every 3 years and assesses the causes and management of all maternal deaths that occur in the UK. Over half the women who die spend some time in a critical care setting. In the most recent reported triennium (2006–8), sepsis was the leading cause of deaths directly related to pregnancy, followed by haemorrhage and pre-eclampsia related complications. In some cases women did not survive despite optimal care, but in a significant number care was felt to be suboptimal and may have contributed to the death. This highlights the importance of an understanding of what critical care can offer, and how best to utilize these services in a timely fashion when an obstetric patient becomes unwell.

The term 'Critical Care' is replacing the terms 'High Dependency Care' and 'Intensive Care' and patients are now described according to what level of care they require. These levels of care, as described by the Intensive Care Society, are defined in Table 1.

Critical care organ system support

Many principles of therapy for organ dysfunction are the same, irrespective of the underlying disease process. The approach to organ support in the obstetric patient in most cases will be similar to that in the general adult population, with the caveat that a minority of therapies may need modification because of pregnancy. Additionally, the targets set for individual organ support modalities may be different in the presence of a viable fetus, in view of a reduced tolerance to physiological derangement that would be tolerated by the mother in her own right. Moreover, knowledge of normal physiological parameters in the obstetric population at different gestations is vital to avoid inappropriate interventions for findings that are not pathological, such as aggressive fluid resuscitation for presumed hypovolaemia in a patient with a systolic blood pressure of 90 mmHg and pulse of 100 beats per minute in the second trimester.

The goal of critical care management is to correct abnormal physiology whilst the underlying disease process is treated. In many cases the diagnosis will be evident, but often it is necessary

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Levels of critical care with examples

Level of care	Types of patient	Obstetric examples
Level 0	Normal ward care in an acute hospital	• Low risk mother
Level 1	Patients at risk of their condition deteriorating Those recently relocated from higher levels of care whose needs can be met on an acute ward with support from critical care	• Risk of haemorrhage • Women with underlying cardiac or other medical conditions
Level 2	Single organ support or postoperative care Those stepping down from higher levels of care	• Severe hypertension in pre-eclampsia requiring intravenous antihypertensives • Liver failure in HELLP or AFLP • Non-invasive ventilation e.g. pulmonary oedema or sickle cell chest crisis
Level 3	Advanced respiratory support alone or support of at least two organ systems	• Invasive mechanical ventilation in severe Influenza • Renal replacement therapy in addition to basic respiratory or cardiovascular support

Table 1

to institute life-sustaining treatments in the absence of a clear diagnosis whilst investigations continue in parallel.

Admission to critical care should not simply be determined by how unwell the patient is; the potential for rapid deterioration and requirement for organ support in the near future is a primary consideration. This is especially the case for cardiopulmonary disease where intubation and mechanical ventilation may be required, because of the risks associated with managing the obstetric airway. Thus it may be reasonable to transfer a patient who appears well to a critical care environment. The increasing use of early warning scores to detect clinical deterioration is a welcome development and existing systems are modified to ensure that they are fit for purpose in the obstetric population.

Cardiovascular

At the simplest level, more intensive monitoring can be utilized involving either non-invasive (frequent measurement of blood pressure, continuous cardiac monitoring and oxygen saturations, meticulous fluid balance) or invasive measures (arterial lines, central venous pressure monitoring). This allows judicious fluid and if necessary blood product therapy and correction of electrolyte disturbances.

Patients receiving vasoactive drugs will require invasive blood pressure monitoring using an arterial line. Commonly used agents include norepinephrine, a vasopressor predominantly causing peripheral vasoconstriction, and dobutamine, an inotrope mainly increasing cardiac work. Many such drugs have to be given into a central vein via central venous catheters, which also allow measurement of central venous pressure (CVP) and mixed venous oxygen saturation (a marker of oxygen extraction by the tissues and hence adequacy of cardiac output). Various techniques exist for measuring cardiac output including oesophageal Doppler probes (only in sedated, intubated patients) and lithium dilution cardiac output (LiDCO). The once favoured pulmonary artery catheter is now used infrequently, following recognition of its significant complication rate and lack of evidence of beneficial effect on outcome.

From 20 weeks of gestation, cardiac output may reduce by 30–40% when supine, as a consequence of aortocaval compression. Positioning of the critically ill obstetric patient is therefore of particular importance; simple manoeuvres such as tilting the patient onto her left side or using a Cardiff wedge may relieve cardiovascular compromise.

In cases where intra-aortic balloon pumps are used, patients are typically also receiving vasoactive drugs with or without respiratory support and a critical care environment is essential.

Respiratory and airway

Changes in pulmonary physiology in pregnancy are driven by hormonal influences (primarily progesterone) and the physical effects of diaphragmatic splinting by a gravid uterus on ventilatory mechanics. Taken together with concomitant circulatory changes and increased oxygen consumption, pregnant women develop hypoxaemia more readily. A typical non-pregnant patient undergoing elective general anaesthesia, who has been breathing pure oxygen, may take up to 5 minutes to desaturate – despite apnoea following induction of anaesthesia and neuromuscular blockade. Conversely, in a pregnant woman at term, much less time may be available, especially in obese patients whose functional residual capacity is severely reduced. The problem is compounded by potential challenges from the airway in pregnant patients; anaesthetists are more likely to encounter difficulty with endotracheal intubation in obstetric patients for several reasons. Large breasts impinge on the space available for manipulation of the laryngoscope and special blades (e.g. short-handled Macintosh or Polio blade) may be required. Oedema of upper airway tissues can distort anatomy and restrict the view available on direct laryngoscopy. Pregnant women are at a high risk of aspiration even if fasted, due to compression of the stomach by the gravid uterus, delayed gastric emptying and incompetence of the lower oesophageal sphincter. Effective cricoid pressure to reduce the risk of reflux and aspiration is therefore required. Prophylactic histamine receptor (H2) antagonists are also recommended.