Management of the critically-ill obstetric patient

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Abstract

From 2013 to 2015, 202 women in the United Kingdom died during or within 6 weeks of the end of their pregnancy, as a direct or indirect result of the pregnancy. In one third of cases, care was considered 'good', but in more than one third of cases, improvements in care were identified which may have influenced outcome. Many women received critical care input, ranging from close observation to multi-organ support. An understanding of the types of organ support available, their indications and objectives is important for all medical professionals caring for these unwell women. This review describes technical aspects of critical care organ support and how the physiology of pregnancy influences their use. Life-threatening conditions are highlighted, together with key management recommendations and the importance of a collaborative multi-disciplinary approach. In addition, the unique non-clinical challenges faced by professionals caring for sick pregnant and recently pregnant women, from logistical to psychological, are discussed.

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

Maternal morbidity and mortality

Most pregnant women negotiate pregnancy, delivery and the postpartum period uneventfully. However, a minority become severely unwell with pregnancy-related conditions or from pre-existing conditions that are worsened by physiological changes during pregnancy or delivery.

Audit findings from MBRRACE-UK (Mother and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK), and the interventions based on these findings, are a driving force for reducing pregnancy-related mortality.

There has been no significant change in the overall maternal death rate in the UK between 2010 and 2012 and 2013 and 2015, nor within the sub-group of maternal deaths due to direct causes, with thrombosis and thromboembolism, haemorrhage and death due to psychiatric causes (suicide) being the leading causes of direct death during the latter time period. Given this plateauing in UK maternal death rates, further action is needed to meet the government target of a 50% reduction in maternal deaths by 2030.

There has however been a significant decrease (23%) in maternal deaths due to 'indirect' causes since 2010–2012. This appears to be predominantly a result of a reduction in deaths due to influenza and maternal sepsis, which emphasises the importance of uptake of immunisation in pregnancy and the heightened awareness and pro-activity amongst all healthcare professionals in the identification and treatment of maternal sepsis. Cardiac disease remains the leading cause of death in this group.

Though many women did not survive despite optimal care, in 41% cases for whom notes were available, it was determined that improvements in the care received may have made a difference to the outcome, a finding supported by sources such as the 2015 Kirkup report.

Critical care has much to offer these women, not only during the management of life-threatening events, but also in optimising management of those at highest risk of developing these complications and intervening to prevent them from occurring at all.

The latest ICNARC (Intensive Care National Audit and Research Centre) report, which has collected data on ICU admissions of pregnant women since 2006, showed that 12% of all women aged 16–50 years admitted to a critical care setting were either 'currently pregnant' or 'recently pregnant' (within 42 days of delivery). This equated to 290 women per 100,000 maternities, which is notably lower than the documented rates of 'serious morbidity' in obstetric deliveries. There was almost a five-fold greater number of 'recently pregnant' than 'currently pregnant' admissions, with the majority of 'recently pregnant' women admitted due to obstetric reasons, the commonest being haemorrhage and the overwhelming majority of 'currently pregnant' women being admitted with non-obstetric pathologies, most commonly respiratory complications. The mortality rate was lower than the non-pregnant population (acute hospital mortality of 2% compared to 11%).

It has been recognised that a multi-disciplinary, cross-specialty, collaborative approach is essential for maximising the outcomes of unwell pregnant women. Implementation of (and training in the use of) standardised early warning charts (such as MEOWS – Modified Obstetric Early Warning System) and close working between obstetric, midwifery, anaesthetic and critical care outreach teams should facilitate early admission to Intensive Care when appropriate. There must be a focus on a common knowledge base across specialties involved in the care of unwell pregnant women to ensure consistency in the care delivered and understanding amongst treating healthcare professionals of what care is available on ICU.

As for all patients, the decision to admit someone to a critical care environment should not simply be determined by how unwell the woman is at that time, but also by the potential for deterioration. In the pregnant woman, deterioration may be precipitous and interventions for some types of organ support are often more complicated than in the non-obstetric population. Management of the airway can be a particular challenge for example. For these reasons it may be reasonable to transfer a

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woman who is not yet critically ill to a higher level of care. The increasing use of early warning scores helps to identify these women and should be encouraged. Similarly, the resources available at a particular time (i.e. staff-to-patient ratios and staff experience with unwell peri-partum women) should also influence the decision to transfer an obstetric patient to Intensive Care.

Critical care organ system support

The approach to organ support in the obstetric patient is similar to that in the general adult population in most cases, though some therapies need modification in pregnancy. The physiological goals set for individual organ support modalities may be different, in accordance with the 'normal' physiological changes of pregnancy or in response to pregnancy-specific conditions such as hypertensive disorders. Stricter targets may be set in the presence of a viable fetus, respecting the lack of placental autoregulation and hence tolerance of physiological derangement e.g. hypotension. Knowledge of physiological parameters in the obstetric population at different gestations is therefore vital, to avoid unnecessary or inappropriate interventions.

Hospitalised patients may be classified according to their current or potential requirement for organ support, described as the necessary 'level' of care (Table 1). Though not universally employed, this system is referred to by guidance from the UK Department of Health, Royal College of Nursing, Intensive Care Society and National Institute for Clinical Excellence.

Cardiovascular

At the simplest level, more intensive monitoring is available in critical care environments, in terms of staff-to-patient ratio and technological provision. Both non-invasive and invasive monitoring of cardiovascular function (such as continuous and intermittent BP, cardiac output, and oxygen saturation monitoring as well as fluid balance documentation) can be used to direct fluid resuscitation, blood product therapy, correction of electrolyte disturbances and effective manipulation of cardiac output.

Whilst arterial lines may be used in non-critical care areas, responsible staff should receive training in their safe use, as incorrect management can result in particularly hazardous consequences, such as haemorrhage, digital ischaemia, pseudoaneurysm and infection.

Patients receiving vasoactive drugs should have an indwelling arterial cannula for continuous invasive monitoring of blood pressure. Agents commonly used to support the circulation include noradrenaline and vasopressin (drugs which predominantly cause peripheral arterial vasoconstriction) and dobutamine or adrenaline (which enhance cardiac contractility, i.e. the 'pump function' of the heart). These drugs should be administered via a central venous catheter, which also facilitates concomitant administration of multiple infusions and measurement of central venous pressure (an inaccurate indicator of venous return).

There are now an increasing number of devices available, which attempt to provide a continuous assessment of cardiac output. These include oesophageal Doppler probes (for use in sedated, intubated patients), lithium dilution cardiac output (LiDCO) monitors and devices that function through pulse-contour analysis of the arterial line trace. Pulmonary artery catheters are now rarely used, as there is no documented outcome benefit and a relatively high complication rate.

Transthoracic echocardiography is increasingly adopted by Critical Care physicians as a non-invasive bedside test of cardiac function. The level of support for this is such that there are now two UK formal training and accreditation pathways for critical care Echocardiography, the more basic 'Focused Intensive Care Echocardiography' targeted towards recognition of major disturbances of cardiac function and volume status and the higher level British Society of Echocardiography qualification equivalent to that achieved by Cardiologists and ECHO technicians. This technique is limited in the obstetric population due to potentially poor acoustic windows which may compromise the quality of the images. The operator must be aware of the expected cardiac function changes in normal pregnancy, as this could alter the interpretation of the images obtained.

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 Basic respiratory support together with support of at least two organ systems	• Invasive mechanical ventilation in severe Influenza • Renal replacement therapy in addition to basic respiratory and cardiovascular support

Table 1