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# Management of the critically ill obstetric patient

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## KEYWORDS

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Systemic inflammatory response syndrome;  
Sepsis;  
Acute fatty liver of pregnancy;  
Amniotic fluid embolus;  
Thromboembolic

## Summary

Maternal mortality is rare in the UK at 13.1/100 000 deliveries, but could be further reduced, by prompt recognition of critical illness in the pregnant woman, earlier initiation of intensive care, and more senior involvement. Up to 0.9% of pregnant women require intensive care unit (ICU) admission, leading causes being obstetric haemorrhage and pre-eclampsia. Critical illness can be due to a pregnancy-specific condition, to pregnancy increasing susceptibility or causing deterioration, or unrelated to pregnancy. Critical care management involves initial resuscitation, monitoring and assessment of deranged physiology, and single or multiple organ support. The overall aim is to ensure adequate oxygen delivery and tissue perfusion. The management of various pregnancy-specific conditions and multi-organ critical illness disease states is discussed. The normal physiological adaptations to pregnancy and the effects of any drugs or procedures on the fetus should be taken into account. Recent advances in ICU management need to be applied to the pregnant population.

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## Introduction

The maternal mortality in the UK for 2000–2002 was 13.1/100 000 deliveries (direct and indirect deaths) which

equates to around 87 per year, and about one-third of these cases involved admission to an intensive care unit (ICU).

In developed countries, 0.07–0.9% of pregnant women require ICU admission, accounting for up to 3% of admissions overall. Maternal mortality amongst ICU patients varies between 3% and 33%, the commonest cause of death being acute respiratory distress syndrome (ARDS). Fetal morbidity and mortality reflects maternal mortality, with perinatal ICU mortalities of up to 20–25%, depending on the underlying maternal diagnosis. The leading obstetric causes requiring

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ICU admission worldwide are pre-eclampsia and haemorrhage, and tend to mirror the causes of maternal death. The main exception is thromboembolic disease, which is often a post-mortem diagnosis. Admission rates of pregnant women to ICUs are set to rise in coming years, as increasing numbers of women are becoming pregnant with significant medical co-morbidities (such as congenital heart defects, organ transplants, and ischaemic heart disease), as both life-expectancy for these conditions and maternal age are increasing. ICU maternal admission and mortality rates will depend on a number of factors, including admission criteria and the co-availability of an obstetric high-dependency unit (HDU), which can manage patients with single organ failure.

The following points are important when dealing with critically ill obstetric patients in general:

- Consider the normal physiological changes of pregnancy, otherwise underlying disease may be over- or under-diagnosed.
- If a test, treatment or procedure is necessary then it should be carried out (with appropriate protective measures), and not delayed or disregarded because the woman is pregnant.
- Remember that there are two patients involved, the mother and the fetus, and the optimal treatment/management for one may have adverse effects on/implications for the other.

The latest Confidential Enquiry into Maternal Deaths 'Why Mothers Die', for 2000–2002, makes a number of recommendations regarding the management of critically ill obstetric patients, to try to reduce the number of maternal deaths, and these are discussed in more detail below. In particular, the report stresses the need to get senior obstetric help urgently, as soon as it becomes apparent that the mother is deteriorating, and to involve physicians, anaesthetists and intensivists early.

### Why do pregnant women become critically ill?

Pregnant women can become critically ill due to a wide range of conditions, and these can be divided into four main groups:

- Specific to pregnancy: e.g. pre-eclampsia, acute fatty liver, obstetric haemorrhage, amniotic fluid embolus, peripartum cardiomyopathy, and pulmonary oedema (secondary to tocolytics).
- Increased susceptibility in pregnancy: e.g. venous thromboembolism, aspiration syndromes, varicella and listeria infections.
- Underlying medical condition that is exacerbated by pregnancy: e.g. congenital heart disease, pulmonary hypertension, and chronic renal failure.
- Unrelated to pregnancy and coincidentally developed during pregnancy: e.g. diabetic ketoacidosis, pneumonia, and asthma.

Pregnancy-specific conditions are often not predictable pre-pregnancy or even antenatally, and may present for the first time immediately post-partum, in an otherwise fit and

healthy young woman. The reason for the majority (50–80%) of pregnant women requiring ICU admission is due to an obstetric cause (such as obstetric haemorrhage), with the remainder being medical causes (such as infection). Although critically ill obstetric patients have a range of underlying conditions, the development of one or more organ failures, and need for HDU or ICU support, usually results from the development of a multisystem disorder, such as ARDS, shock, or sepsis.

### Multi-organ critical illness disease states

#### ARDS

ARDS is defined as:

- Severe hypoxaemia [partial pressure of oxygen in arterial blood ( $\text{PaO}_2$ )/fraction of inspired oxygen ( $\text{FiO}_2$ )  $\leq 200$  mmHg or 27 kPa].
- Diffuse bilateral infiltrates on chest X-ray.
- Pulmonary artery occlusion pressure  $< 18$  mmHg (i.e. normal left atrial pressure and left ventricular function, to exclude cardiogenic pulmonary oedema).
- A milder form, known as 'acute lung injury (ALI)' is present if the  $\text{PaO}_2/\text{FiO}_2 \leq 300$  mmHg or 40 kPa.

The commonest causes of ARDS in pregnancy are haemorrhage and infection. A variety of direct (i.e. alveolar damage) or indirect (i.e. systemic disease) insults lead to an acute inflammatory lung injury, with release of inflammatory mediators. The inflammatory response involves sequential exudative, proliferative and fibrotic phases. The result is progressive hypoxaemia and respiratory failure, and complications include nosocomial pneumonia, pulmonary hypertension, and ventilator-induced lung injury (VILI). The latter may be due to barotrauma (e.g. pneumothorax, surgical emphysema) or volutrauma (e.g. pulmonary oedema and diffuse alveolar damage). Most deaths are due to sepsis or multi-organ dysfunction, rather than respiratory failure.

The management involves both general respiratory support, and identification and treatment of the precipitating cause, such as localised or systemic infection. For mild ALI this will include oxygen therapy, physiotherapy, and diuretics (to reduce extravascular lung water). More severe ALI/ARDS will require non-invasive ventilation (NIV) or intubation with mechanical ventilation aiming for a 'protective lung strategy' (discussed below). Sometimes prone positioning (i.e. placing the patient face down) enables the posterior consolidated lung to become non-dependent, thus changing blood flow and allowing a more even distribution of ventilation. Other strategies that are employed to reduce VILI include high-frequency oscillation, or very rarely extracorporeal gas exchange, but the results of large-scale studies are still needed to demonstrate a mortality benefit. Pulmonary vasodilators such as inhaled nitric oxide or prostacyclin, surfactant replacement, and corticosteroids have not been shown to reduce mortality.

#### Shock

'Shock' is a broad term used to describe acute circulatory collapse, with failure of adequate oxygen delivery to the

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