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REVIEW ARTICLE

Is training in obstetric critical care adequate? An international comparison

Z. Edwards,[a] D.N. Lucas,[a] R. Gauntlett[b]
[a]*Department of Anaesthetics, Northwick Park Hospital, Harrow, United Kingdom*
[b]*Department of Anaesthetics, Royal Victoria Infirmary, Newcastle, United Kingdom*

ABSTRACT
Obstetric critical care is an emerging discipline which cuts across speciality boundaries. We have analysed the training curricula in the three major specialities (obstetrics, anaesthesia and intensive care medicine) likely to be involved in the care of the critically-ill obstetric patient, to assess whether it is adequate to ensure effective training on this subject.

Keywords: Training; Maternal critical care; Anaesthesia; Intensive care medicine; Obstetrics and gynaecology

Introduction

Obstetric critical care is an emerging discipline which cuts across speciality boundaries. Trainees who are preparing to become specialists in obstetrics, anaesthetics and intensive care medicine (ICM) all need to be equipped with the skills to recognise and treat women who become seriously unwell during pregnancy or childbirth. The cornerstone of the provision of good medical care to a critically-ill parturient is a sound knowledge of obstetric physiology, obstetric medicine/pathology and at least a basic understanding of the principles of critical care. Medical staff from different clinical disciplines are likely to possess these skills to varying degrees (Table 1).

It is frequently stated that 'critical care is a treatment not a place' and that critical care in obstetrics should not be considered as a separate entity/aspect of care but the end-point of a continuum of adverse pregnancy events.[1] Most general intensive care units do not have the capacity to care for all level 2 obstetric patients, so many women will more commonly be cared for in a labour ward 'high dependency setting.' Consequently members of the multidisciplinary team must be appropriately trained and have the competencies to provide this care. The definition of levels of care from 0 to 3 comes from a United Kingdom (UK) Department of Health document published in 2000.[2] Table 2 shows the levels of care most likely to be applicable to parturients on a delivery suite.[3,4] An example of level 2 care would be the obstetric patient with major postpartum haemorrhage requiring invasive pressure monitoring ± vasopressor support, or the post-eclamptic fit patient requiring magnesium infusion to control seizures. An example of level 3 care would include the obstetric patient who develops peripartum cardiomyopathy, with acute pulmonary oedema requiring intubation and mechanical ventilation.

All doctors in primary care and those in frontline acute hospital specialities could be confronted with the challenge of identifying a sick mother and providing initial treatment, but we have confined our analysis to the three major specialities likely to be involved in the care of the critically-ill parturient: obstetrics, anaesthesia and ICM. In this review we focus on the global deficiencies in obstetric critical care training. We aim to compare international training recommendations in obstetric critical care between these three specialities, by examining published curricula and training programmes.

Postgraduate sub-specialty training

A summary of training programmes in anaesthesia, obstetrics and gynaecology and ICM is shown in Tables 3–5. The duration of formal, postgraduate training in these programmes ranges between four and eight-years. Progress through training is usually dependent on success in formal postgraduate examinations and annual reviews.

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Correspondence to: Dr Z. Edwards, Department of Anaesthesia, Northwick Park Hospital, Watford Rd, Harrow, HA1 3UJ, UK.
E-mail address: zedwards@doctors.org.uk

Table 1 Skill set required by doctors who may manage critically-ill obstetric patients

	Anaesthetist	Obstetrician	Intensivist	Obstetric physician*
Obstetric physiology	++	++	+	++
Obstetric medicine	–	+	–	++
Critical care skills	++	-	++	+

*An obstetric physician refers to a medical physician with training and expertise in the management of medical problems in pregnancy, which differs from an obstetrician who has undergone obstetric and gynaecology training.

Table 2 Levels of care most likely to be applicable to patients on a delivery suite[3,4]

Level 0: normal ward care	Care of low risk mother
Level 1: additional monitoring or intervention, or step down from higher level of care	• Risk of haemorrhage • Oxytocin infusion • Neuraxial analgesia • Remifentanil analgesia • Mild preeclampsia on oral antihypertensive/fluid restriction etc. • Woman with medical condition such as congenital heart disease, diabetic on insulin infusion
Level 2: single organ support[c]	**Basic respiratory support (BRS)**[c] • 50% O_2 or more via facemask to maintain oxygen saturation • Continuous Positive Airway Pressure (CPAP), Bi-Level Positive Airway Pressure (BiPAP) **Basic cardiovascular support (BCVS)**[c] • Intravenous infusion of anti-hypertensive (e.g. labetalol or hydralazine) to control blood pressure in preeclampsia • Arterial line used for pressure monitoring or sampling • CVP line used for fluid management or access **Advanced cardiovascular support** • Simultaneous intravenous infusion of at least two anti-hypertensive/anti-arrhythmic/vasoactive drugs, one of which must be a vasoactive drug • Need to measure and treat cardiac output **Neurological support** • Magnesium infusion to control seizures **Hepatic support** • Acute fulminant hepatic failure (e.g. from HELLP syndrome or acute fatty liver) such that transplantation is being considered
Level 3: advanced respiratory support alone, or support of two or more organ systems above[c]	**Advanced respiratory support** • Invasive mechanical ventilation via a tracheal tube **Support of two or more organ systems** • Renal support and BRS • BRS/BCVS and an additional organ supported[c]

[c]BRS and BCVS occurring simultaneously count as a single organ of support. CVP: central venous pressure. HELLP: haemolysis, elevated liver enzymes, low platelets. O_2: oxygen.

Table 3 Anaesthesia training around the world

	Year						
	1	2	3	4	5	6	7
UK	Basic		Intermediate		Higher		Advanced
New Zealand / Australia	Introductory (6 months)	Basic		Advanced	Professional Fellowship		
America	Internship	Residency			OPTIONAL Sub-specialty Fellowship		
South Africa	Qualification as Specialist in Anaesthesiology						
Italy	Basic		Advanced				
Sweden	Qualification as a Specialist in Anaesthesia and Intensive Care					OPTIONAL Advanced Diploma Programmes e.g. Obstetric Anaesthesia	

Table 4 Obstetric and Gynaecology training around the world

	Year						
	1	2	3	4	5	6	7
UK	Basic		Intermediate		Higher	Advanced	
New Zealand / Australia	Core				Advanced		
America	Internship	Residency			OPTIONAL Sub-specialty Residency e.g. Maternal-Fetal Medicine		
South Africa	Qualification as Specialist in Obstetrics and Gynaecology						
Italy	Qualification as Specialist in Obstetrics and Gynaecology						
Sweden	Qualification as Specialist in Obstetrics and Gynaecology						

Table 5 Intensive Care Medicine (ICM) training around the world

	Year						
	1	2	3	4	5	6	7
UK	Basic		Intermediate		Higher		
New Zealand / Australia	Core		Transition				
America	1-2 year Critical Care Fellowship (after 4 year basic residency)						
South Africa	Post-fellowship ICM training (after 4 year specialist training as physician/anaesthetist)						
Italy	No separate ICM specialty training (part of 4 year anaesthesia training)				OPTIONAL European Diploma in Intensive Care (usually 2-3 years)		
Sweden	No separate ICM specialty training (part of 5 year Anaesthesia training)					OPTIONAL Advanced Diploma Programmes e.g. ICM	

Training available in obstetric critical care

Training requirements in obstetric critical care in individual countries are discussed below.

United Kingdom

In the UK, exposure to critical care medicine during undergraduate training and the foundation programme (first two-years of clinical practice) is not universal.

Anaesthesia is a seven-year specialist training programme by the Core Anaesthesia training route or eight-years if completing the Acute Care Common Stem. It consists of basic, intermediate, higher and advanced training. Competitive application occurs to join both Basic training and Intermediate training. It is mandatory for all anaesthetists to complete three-month rotations of ICM in their basic, intermediate and higher training, totalling nine-months during their training.[5] Clinical service commitments and on-call duties mean that many trainees will have further exposure to critical care outside of these specified blocks.

The anaesthesia curriculum has an obstetric unit within each level of training with limited mention of maternal critical care:

- Core – Demonstrates ability to recognise when an obstetric patient is sick and the need for urgent assistance.
- Intermediate – Demonstrates the ability to manage a high dependency obstetric patient with distant supervision.
- Higher – Demonstrates skill in managing emergencies including preeclampsia, eclampsia, major haemorrhage.

- Advanced – no mention of maternal critical care.

The ICM unit of the anaesthesia curriculum states the same within basic, intermediate and higher training, that a trainee should "recognise life-threatening maternal peripartum complications and manage care". It is contained within the non-mandatory competency sign-off section of Annex F of the curriculum.[6]

Previously, to train in ICM a Joint Certificate of Completion of Training (CCT) was completed by doing modules of intensive care alongside a partner specialty, but recruitment to this ended in 2013. Now, a doctor can train in ICM under only the 'parent' specialties of acute medicine, anaesthesia, emergency medicine, renal medicine or respiratory medicine and will obtain a dual CCT in both specialties. Alongside this, in 2017 the Faculty of Intensive Care Medicine (FICM)[7] created a five-year single standalone ICM training programme entered out of core training in a medicine, anaesthesia or acute care common stem, to enable a doctor to train exclusively as an intensivist. In 2011 a standalone ICM syllabus was written and most recently updated in 2017. Of all the curricula reviewed in this article, the UK had one of the most extensive references to maternal critical care, under the sub-heading of "Recognises life-threatening maternal peripartum complications and manages care under supervision" (Fig. 1).

The UK obstetrics and gynaecology specialist training programme is a seven-year "run through" programme, with a competitive application to enter at Basic level.[8] There is no mandatory time spent in Intensive Care and very little within the curriculum relates to critical care. Only within the "maternal and fetal medicine" subspecialisation or the "maternal medicine" Advanced Training Skills Module (ATSM) that trainees can opt to do in their final two-years of advanced training, is critical care mentioned. As part of these, doctors may choose to spend time attending sessions in obstetric

3.11 Recognises life-threatening maternal peripartum complications and manages care under supervision
Knowledge
Physiological changes associated with a normal pregnancy and delivery
Cardiopulmonary resuscitation of the pregnant patient
Pathophysiology, identification and management of peripartum complications: pre-eclampsia and eclampsia; HELLP syndrome; amniotic fluid embolism; ante-partum and post-partum haemorrhage; ectopic pregnancy; septic abortion; peripartum cardiomyopathy.
Risks and avoidance of pulmonary aspiration in pregnant patients
Risk factors, identification and management of venous thromboembolism in the pregnant patient
Methods of avoiding aorto-caval compression
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Causes, recognition and management of associated disorders:
Cardiovascular disorders: peripartum cardiomyopathy; pulmonary hypertension
Haematological disorders: coagulation and fibrinolytic pathways and their associated disorders; disseminated intravascular coagulation (DIC); hemolytic syndromes, acute anaemia; complications of massive blood transfusion, principles of cell salvage
Metabolic disorders: electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Management of critical illness in woman with concurrent pregnancy
Awareness of the psychological impact of separation on the family
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Skills
Liaise with obstetric, midwifery and neonatal services
Manage pregnancy induced hypertension
Identify and manage coagulopathies
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Seek appropriate support and supervision in order to provide optimal patient care

Fig. 1 UK intensive care medicine curriculum relating to maternal critical care Available at: https://www.ficm.ac.uk/training-examinations/curriculum-assessment-training. Accessed September 2017. (Reproduced with written permission from the Faculty of Intensive Care Medicine)[7]

anaesthesia, intensive care or the high dependency unit, but this is not compulsory.

Obstetric medicine attempts to bridge the gap between the expertise of general medical physicians and obstetricians. Within the UK, an acute medicine physician can undertake a 12-month obstetric medicine module as part of the acute medicine curriculum and gain clinical obstetric medicine experience via out-of-programme attachments attending outpatient obstetric medicine clinics, pre-pregnancy counselling clinics, inpatient ward rounds and spending time with obstetricians on labour ward. This generally has to be a self-organised module and is a reasonably new scheme offered in Oxford and London at present. No compulsory time is spent in critical care as part of this module, but acute medicine physicians will complete at least 12-months of critical care medicine elsewhere in their training.[9]

Australia/New Zealand

Postgraduate training in anaesthesia (regulated by the Australian and New Zealand College of Anaesthetists[10]) is a five-year programme consisting of six-months' introductory, 18-months basic, 24-months advanced and 12-months professional fellowship training. Specialised Study Units can be completed within the basic and advanced training, one of which is ICM. Within this ICM Specialised Study Unit curriculum there are four bullet points relating to the specific requirements of managing obstetric patients in the intensive care, including maintenance of fetal viability, management of severe preeclampsia, eclampsia, postpartum haemorrhage and amniotic fluid embolism; as well as basic and advanced life support in the pregnant patient. Within the "Obstetric anaesthesia and analgesia" specialised study unit curriculum there is no mention of maternal critical care apart from ''participating in the multidisciplinary management of a complicated obstetric case".

There is a separate College of Intensive Care Medicine of Australia and New Zealand[11] that have an ICM training programme lasting three-years, requiring a six-month ICM foundation term prior to application to the programme, then two-years core ICM followed by 1 transition/advanced year ICM. In addition to this a trainee must complete six-months in either acute medicine, emergency medicine or retrieval medicine, six-months in internal medicine (longitudinal care), 12-months of anaesthesia and a six-month elective. The core ICM training states that the trainee should be developing knowledge of obstetric conditions so they can assist with the diagnosis and management of those conditions that are recognised to be within the domain of the intensive care specialist. The reference to maternal critical care in the advanced ICM training curriculum is very similar to the Anaesthesia Specialised Study unit of ICM, only stating that a trainee should be able to recognise, understand the pathophysiology, manage and work to prevent complications associated with pregnancy, such as eclampsia, preeclampsia, amniotic fluid embolism and obstetric haemorrhage.

The Obstetrics and Gynaecology training programme (regulated by the Royal Australian and New Zealand College of Obstetricians and Gynaecologist[12]) is a six-year course divided into four-year core and two-year advanced training. The advanced training can either follow a generalist pathway extending and developing their expertise in general obstetrics and gynaecology/sexual and reproductive health/academic practice or they can follow a non-generalist pathway commencing subspecialty training in gynaecological oncology, maternal fetal medicine, obstetric and gynaecology ultrasound, reproductive endocrine and infertility or urogynaecology. The only mention of maternal critical care is as part of the maternal-fetal medicine subspecialisation curriculum, which states the trainee should be aware of principles of ICM, invasive haemodynamic monitoring and the impact of pregnancy and the postpartum period in the management of the critically-ill gravida.

South Africa

In South Africa after graduating from medical school, all doctors complete a two-year internship consisting of rotations through multiple specialties, followed by a year of community service where doctors may choose to do a rotation in their specialty interest. For someone interested in anaesthesia, this may involve doing a diploma in anaesthesia. A doctor can then competitively apply for a specialty training post within anaesthesia or obstetrics and gynaecology, which lasts four-years. The Colleges of Medicine of South Africa[13] has many specialty colleges under its umbrella, including the College of Anaesthetists and College of Obstetricians and Gynaecologists.

The anaesthesia training programme within South Africa has a curriculum heavily borrowed from the Australian and New Zealand College of Anaesthetists and the European Society of Anaesthesiology. It takes a domain approach to learning and within the domain dedicated to obstetric anaesthesia and analgesia one bullet point states the trainee is expected to understand the critical care management of the pregnant patient. A minimum of three-months in an approved ICU is required for sign-off of the ICU domain, within which the curriculum states trainees are expected to understand pregnancy disorders including eclampsia, preeclampsia, amniotic fluid embolism and obstetric haemorrhage. At the end of the four-year anaesthesia training programme the trainee should have acquired the expertise to manage ICU patients for surgical procedures or to support a specialist intensivist in an ICU.

If the trainee wishes to become a specialist intensivist then they must undertake post-fellowship training in

ICM, which is a two-year programme with four part exit exam. The subspecialty of critical care comes under the College of Physicians of South Africa and can be entered from a variety of specialties. Within the critical care programme it is mandatory for the trainee to know about preeclampsia, eclampsia, amniotic fluid embolism and obstetric haemorrhage.

The obstetric and gynaecology curriculum only states under a subheading of critical care, that the trainee should understand the principles of fluid replacement, intubation and care of the critically-ill pregnant patient during or after delivery.

Italy

After medical school, a doctor in Italy must complete a three-month internship (consisting of one-month medicine, one-month surgery, one-month general practice) followed by a written exam in order to obtain a licence to practice and proceed to a specialty training programme. The anaesthesia training programme is a four-year course consisting of two-year basic and two-year advanced anaesthesia. As part of the final year exam syllabus there is a section on "Anaesthesia in Obstetrics" with four subheadings – physiological and anatomical changes of pregnancy; labour analgesia techniques and complications; anaesthesia for caesarean section and obstetric emergencies. No further details are given.

Historically, there has been wide variation in ICM training between European countries. In an effort to create common training standards, the European Society of Intensive Care Medicine (ESICM) and the Leonardo Project of the EU set-up the Competency Based Training in Intensive Care Medicine (CoBaTrICE) project.[14,15] Within Italy, ICM training is part of anaesthesia training. If a doctor wants to practise ICM then they may choose to complete the European Diploma in Intensive Care (EDIC) set up by ESICM.[16] To be eligible for the EDIC a doctor must be enrolled or have completed a national training programme in Anaesthesia, General/Internal Medicine (and other medical specialities), General Surgery (and other surgical specialities), Emergency Medicine, Paediatrics or ICM (if it is a primary speciality). The EDIC, which is based around the CoBaTrICE ICM competencies, consists of a written and oral/objective structured clinical exam completed alongside two to three-years of ICM clinical experience. The CoBaTrICE syllabus mirrors the UK ICM curriculum as seen in Fig. 1.

Sweden

After medical school all doctors in Sweden complete a compulsory two-year educational "public service" internship, after which they obtain their licence to practise. They then go on to specialise by completing a five-year residency programme in their chosen field, such as anaesthesia or obstetrics and gynaecology.

At the end of the five-year anaesthesia specialist training programme participants are awarded a "Qualification as a Specialist in Anaesthesia and Intensive Care". There are optional two-year diploma programmes offered by the Scandinavian Society of Anaesthesiology and ICM,[17] which would be completed after the specialist training. These include an "Advanced Obstetric Anaesthesia Training Programme" and "Intensive Care Medicine Training Programme". The Advanced Obstetric Anaesthesia diploma qualifies the doctor for a job as Director of Obstetric Anaesthesia in a hospital. Its curriculum does not mention maternal critical care. The Intensive Care Medicine diploma is based around the CoBaTrICE programme and doctors must pass the exam for the EDIC, as well as complete an ICU Research project. It is open to specialists within anaesthesia as well as specialists outside anaesthesia, but candidates must have a minimum of one-year of full-time general anaesthesia practice.

The obstetrics and gynaecology specialist training programme is a five-year programme. No part of their curriculum refers to maternal critical care, but it does encompass the common problems that may lead to critical care admission such as preeclampsia, eclampsia, major haemorrhage. Inter-professional team simulation training, such as in acute obstetric emergencies, is often incorporated into the training programme and the majority of trainees also take part in the Advanced Life Support in Obstetrics course, though neither of these are compulsory.

United States

American students interested in a career in medicine must first successfully complete a four-year undergraduate college programme incorporating pre-med curricula, before then competitively applying for a four-year bachelor's medical degree. After completing medical school, doctors can search an online database of graduate medical education programmes in order to apply for a specialty. Doctors who choose anaesthesiology as their specialty must complete four-years training, known as basic residency, consisting of a one-year internship and three-years residency. The American Board of Anesthesiology[18] (ABA) requires that anesthesiology resident must have at least two-months of training in Critical Care Medicine within their four-year basic residency. After completing an anaesthesiology residency course, residents are eligible to sit the ABA exam, consisting of written and oral exams, in order to become board certified. The curriculum for the ABA exam refers to maternal physiology, maternal-fetal considerations and the pathophysiology of complicated pregnancy under the obstetric anaesthesia heading. Though the curriculum refers to conditions that may lead to critical care admission, there is no specific mention of maternal critical care under the obstetric anaesthesia or critical care

subheadings. Many anaesthesia residents may choose to complete an extra year of subspecialty training/fellowship in a specific area such as critical care medicine, or obstetric anaesthesia. The ABA critical care medicine examination, which can be completed by a board-certified anaesthesiologist after a one-year critical care fellowship, only has headings of complications of pregnancy, physiology of pregnancy and respiratory physiology of pregnancy.[18]

There is no stand-alone basic residency training in critical care medicine and no national curriculum for critical care training, but exposure to critical care medicine will occur within some residency programmes such as anaesthesia, internal medicine and surgery. There are critical care medicine fellowships, usually one-year in length that can be competitively applied for after doctors have completed their basic residency. The eligible basic residency courses for the one-year fellowships generally include anaesthesia, surgery, emergency medicine, internal medicine and sometimes obstetrics and gynaecology. Most require an exam to be passed prior to achieving added certification (such as the American Board of Surgery Surgical Critical Care Certifying exam[19] or the ABA critical care medicine examination). For the physicians with a residency in Internal Medicine there are several pathways by which they may train in critical care medicine[20] before passing the Critical Care Medicine Certification Program exam[21] to become board certified:

- A two-year accredited fellowship in critical care medicine after completing their internal medicine residency.
- Two-years of fellowship training in advanced general internal medicine (that includes at least six-months of critical care medicine) plus one-year of accredited clinical fellowship training in critical care medicine.
- Two-years of accredited fellowship training in a subspecialty of internal medicine (three-years for cardiovascular disease or gastrointestinal disease), plus one-year of accredited clinical fellowship training in critical care medicine.

The exception to this is when critical care medicine is combined with subspecialty training in pulmonary medicine, where a three-year fellowship is required to dual certificate in both pulmonary medicine and critical care medicine.

Obstetrics and gynaecology training in America is composed of a four-year residency programme with a post-residency written and oral exam if a doctor wishes to seek certification from the American Board of Obstetrics and Gynaecology[22] (ABOG). The ABOG exam curriculum makes no reference to maternal critical care. Doctors may choose to further subspecialise after basic residency, in areas such as maternal-fetal medicine for example, requiring an extra three-years of training and a further written and oral exam. The maternal-fetal medicine subspecialty curriculum[23] has only one sentence under the obstetrical critical care subheading that states, "A program must ensure the fellows demonstrate knowledge and experience in obstetrical critical care, which must include the training in the management of acute peripartum medical and surgical complications".

Discussion

We have found that training programmes for the three specialities we analysed (anaesthesia, obstetrics and gynaecology and ICM) contain very little content relating to care of the critically-ill obstetric patients. The result of this could be training programmes that fail to prepare clinicians who will likely be delivering care to these women.

The UK and European CoBaTrICE ICM curricula offer the most extensive and detailed maternal critical care content, including knowledge of anatomical and physiological changes of pregnancy, peripartum complications, impact of concurrent medical comorbidities and skills of liaison with obstetric, midwifery and neonatal colleagues. Anaesthesia training programmes in all the countries examined contained elements of both obstetric anaesthesia and critical care medicine. The anaesthesia curricula focused mainly on the life-threatening maternal peripartum complications, such as preeclampsia/eclampsia, major haemorrhage and amniotic fluid embolism. The inevitable exposure to ICM within anaesthesia training means anaesthesia trainees are more likely to be familiar with the environment and management of a patient with organ compromise and be competent in the safe provision of organ support. When caring for sick women on the labour ward, anaesthetists are uniquely positioned to connect knowledge of both obstetric anaesthesia and critical care, regardless of whether maternal critical care is explicitly included as a separate element in training programmes.

Of the countries and regions evaluated, none of the obstetrics and gynaecology training programmes required mandatory time to be spent in an intensive care unit. For trainees in obstetrics recognition of critically-ill, patients basic resuscitation and an understanding of what advanced critical care intervention entails might be included in the early part of a training programme. For an obstetric doctor specialising in labour ward care and maternal medicine, a higher level of knowledge in obstetric critical care would be appropriate.

In the UK, postgraduate training has altered a great deal over the past 15-years following the recommendations of the 'Modernising Medical Careers' Report[24] and the impact of the European Working Time Directive. The 'Shape of Training Report' Report[25] published in 2013 commented that medical education in the UK

was slow to adapt to patient and service needs. In 2017 the General Medical Council published standards and guidance on developing and making curriculum changes,[26] which emphasised the regular review of curricula in order to keep them up to date. Both the former and latter points have international resonance.

Many international reports of maternal mortality and morbidity demonstrate that failure to recognise and treat critically-ill patients is a common underlying theme when women die. The changing pattern in the demographics of maternal deaths in the developed world, from a predominance of direct to indirect causes,[27] suggests an increasing role for critical care as part of modern obstetrics. Obstetric patients with medical comorbidities are associated with a five-fold increase in the odds of maternal death from direct pregnancy complications.[4] Early recognition of the critically ill, with prompt involvement of senior clinical staff and authentic multidisciplinary team working is the key to improving outcomes.[28] A UK Maternal Critical Care Working Group commissioned by the Royal College of Anaesthetists and the Royal College of Obstetricians and Gynaecologists published a report in 2011 "Providing equity of critical and maternity care for the critically-ill pregnant or recently pregnant woman."[4] The overall message, was that, "the few women who become critically-ill during this time should receive the same standard of care for both their pregnancy related and critical care needs, delivered by professionals with the same level of competencies irrespective of whether these are provided in a maternity or general critical care setting".

There may be a number of barriers impeding the recognition and development of specific training requirements in maternal critical care.

Maintenance of skills

Critical care has been defined as the specialised care of patients, with, at risk of, or recovering from potentially life threatening failure of one or more of the body organ systems. This includes the provision of organ system support, investigation, diagnosis, and treatment of acute illness, and patient safety, ethics, and support of families.[29] Using this definition, a significant number of women with common obstetric morbidities could be classed as needing critical care at some point as they progress through childbirth. In most cases, women will rapidly improve and critical care interventions are not necessary. However, there is a broad spectrum of severity for conditions such as postpartum haemorrhage, preeclampsia and sepsis and defining the boundaries of what is classified as maternal critical care is not straightforward. Only a very small proportion of women, around 1%, will develop complications of their pregnancy severe enough to require formal critical care, in an ICU setting.[30] Therefore even units with a large number of deliveries will only see a small number of very sick women. Difficulty lies not just with education to ensure a solid knowledge base in critical care skills, but also in maintenance of these skills.

Location of care

Much of the discussion about critical care in obstetrics has focused on the physical location where women who require critical care support should be cared for - either in a labour ward high dependency area or in the general critical care unit, with both options having a range of relative advantages and disadvantages.[31] The physical location in which critically-ill obstetric patients are cared for, draws into focus the question of which clinical staff should care for these patients, in the labour ward obstetricians and anaesthetists will deliver care to the sick woman, whereas within the critical care unit intensivists will lead the care of the sick obstetric patient, ideally with input from obstetricians and obstetric anaesthetists. However, labour wards are frequently remote from critical care units and in some situations the delivery of critical care may even be in a separate hospital. Geographical distance and isolation can make the practical delivery of multidisciplinary care inherently difficult.

Multi-professional teaching and training

A crucial aspect of any educational curriculum is to recognise how that curriculum should be delivered. The value of regular, written, documented and audited training for the identification and management of serious medical health conditions and the early recognition and management of severely ill pregnant women with impending maternal collapse is widely recognised.[26] It has been recommended that multi-professional learning be a core part of all training for doctors, nurses and midwives as a standard part of continuous professional development and for the management of routine and emergency situations. Integrated multi-professional programmes such as PROMPT (Practical Obstetric Multi-Professional Training) and MOET (Managing Obstetric Emergencies and Trauma) have demonstrated positive benefit. Approximately 75% of units in the UK have attended PROMPT train-the-trainers (T3) training with a view to implementing PROMPT locally. This training has been associated with a reduction in permanent brachial plexus injury,[32] as well as neonates born with hypoxic ischaemic encephalopathy and low Apgar scores.[33] Internationally, around 50 different countries have attended PROMPT T3 training, with units in the USA,[34] Australia[35] and Zimbabwe[36] also publishing improved maternal and fetal outcomes since instituting multi-professional training.[37] The development of specific multidisciplinary training in maternal critical care would be a logical strategy to ensure effective learning.

Shortage of staff

There is a global shortage and marked misdistribution of health, professionals with the World Health Organization forecasting an 18 million shortfall by 2030.[38–40] Countries with lower healthcare professionals to population ratios face major difficulties in developing maternity critical care.[41] Even in countries with higher healthcare professionals to population ratios there may still be a relative shortage that can affect the ability to deliver high quality specialised care.[42]

As with the fellowship programs available within many of the countries studied, a one or two-year subspecialty fellowship in maternal critical care could be developed. A suggested model for the curriculum could incorporate the UK and European CoBaTrICE ICM curriculum (Fig. 1) with compulsory clinical placements within the specialties of anaesthetics, ICM and obstetrics and gynaecology. This would help to learn skills in advanced monitoring, organ support, illness severity assessment and the obstetric/anaesthetic management of life threatening peripartum complications. Experience in multidisciplinary clinical skills training and simulation drills would be an essential part.

Conclusion

We found that despite the acknowledged need for expertise in caring for the sick obstetric patient, this subject is not well covered in many curricular and training programmes of anaesthesia, obstetrics and gynaecology and ICM. When content is included it is often lacking in detail and consists of a short list of diagnoses that may result in critical illness but usually with no mention of severity assessment, techniques of advanced monitoring or organ support. This may be because maternal critical care is still seen as an emerging speciality and training programmes have been slow to revise their content to reflect modern clinical practice or may reflect an uncertainty about which clinicians should be providing this care when it is required. No specialist in anaesthetics, obstetrics and gynaecology or critical care medicine alone can provide optimum care if only trained in their respective specialty with no subspecialty fellowship training in maternal critical care. To impact on maternal morbidity and mortality it is essential to incorporate knowledge and skills of maternal critical care within the training programmes of anaesthesia, obstetrics and gynaecology and ICM, with maintenance of skills through multi-professional teaching, to enable us to provide the highest quality care for the sick obstetric patient.

Declaration of interests

Dr Zara Edwards – no declarations of interest.

Dr Nuala Lucas – OAA Honorary Secretary; MBRRACE assessor and anaesthetic co-lead.

Dr Rupert Gauntlett – OAA Representative Maternal Critical Care; MBRRACE assessor; Member of National Maternal Perinatal Audit clinical reference group; Member of Guideline Development Group – NICE Guideline - Intrapartum care for high risk women.

Dr Lucas is an editor of the International Journal of Obstetric Anesthesia but took no role in the assessment of this submission.

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