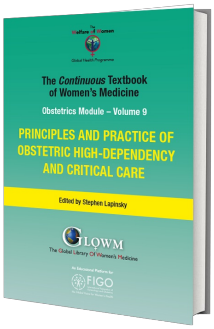
This chapter should be cited as follows:
Langenegger EJ, Hall DR, *Glob. libr. women's med.*,
ISSN: 1756-2228; DOI 10.3843/GLOWM.413753



The Continuous Textbook of Women's Medicine *Series* **– Obstetrics Module Volume 9**

PRINCIPLES AND PRACTICE OF OBSTETRIC HIGH-DEPENDENCY AND CRITICAL CARE

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Chapter

Organization of Obstetric Critical Care and Obstetric Critical Care Units (OCCU)

First published: February 2021

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INTRODUCTION

It has been shown that when patients with severe illnesses are grouped together in the same area and cared for by experienced medical and nursing staff, patient outcomes improve. This principle can also be applied to the management of critically ill obstetric patients.[1] Pregnant and postpartum patients pose specific challenges in terms of altered physiology, fetal monitoring and maintaining a fetal-friendly environment. Pregnant patients admitted to an ICU have a greater risk of cesarean section and are especially susceptible to nosocomial infection with drug-resistant organisms.[2,3] An obstetric critical care unit (OCCU) system provides the ideal facility for optimizing both maternal and fetal outcomes.[4] A specific advantage is that it provides for immediate dedicated obstetric emergency care as well as fetal care and monitoring.[5] There is also sufficient space and skill to induce labor and perform normal as well as assisted vaginal deliveries. It is important for the obstetrician and midwife to have appropriate knowledge and skill in the management of obstetric emergencies, resuscitation and critical care management. In an obstetric service, anesthetists are also closely involved with the management of patients with maternal risk factors or when a cesarean section is indicated, while midwives are trained to observe neonates, assist with neonatal resuscitation and can assist mothers with breastfeeding. It is therefore possible for a mother in a stable condition to remain with her baby, thereby reducing maternal anxiety and psychologic trauma resulting from separation from her newborn baby during critical care unit admission.[6,7]

Owing to the above-mentioned reasons, there are advantages to managing more stable obstetric patients in a specialized OCCU in the labor ward as opposed to management in a general ICU. It is of utmost importance that anesthetists and intensive care specialists are available for consultation and assistance when necessary. It is also important to identify and transfer patients to general intensive care units when indicated. There is little published guidance on how to establish

and organize an OCCU. This chapter provides more detailed guidance based on an OCCU central hospital blueprint which has been developed, implemented and tested.[2,4,5]

Figure 1 Patient on mask respiratory support after delivery in OCCU, South Africa. From right to left (E Langenegger, patient on mask, professional nurse and midwife C Morris) (with permission).

EVIDENCE FOR OBSTETRIC ADMISSIONS TO A DEDICATED OBSTETRIC CRITICAL CARE UNITS (OCCU)

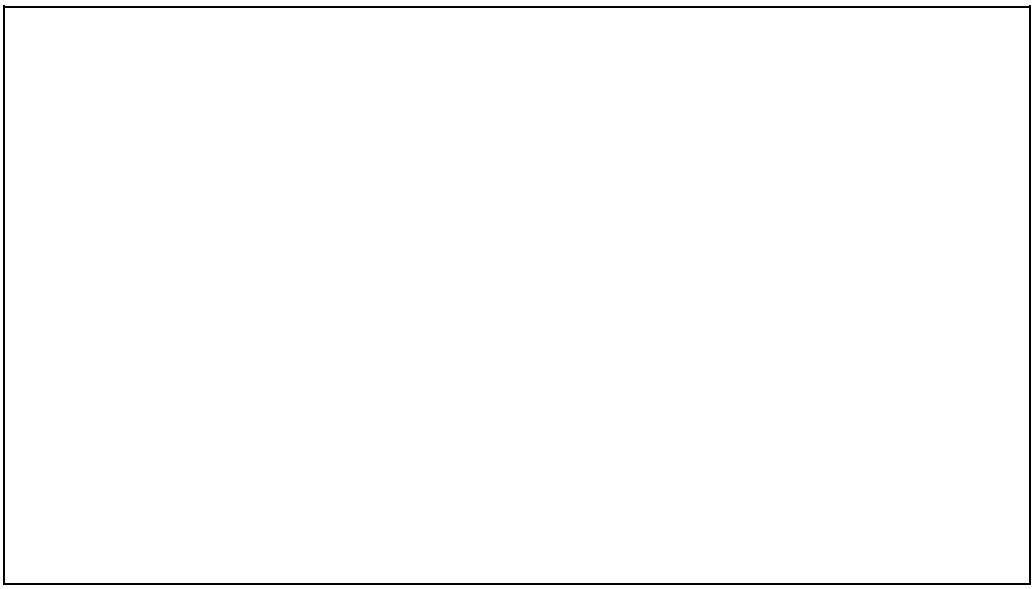
The volume of research specifically addressing the impact of dedicated obstetric critical care on maternal and perinatal outcomes is limited to descriptive case series, with units reporting generally favorable outcomes and noting the need for mechanical ventilation as the main indication for transfer to general ICU.[8,9,10] Two more recent prospective studies[2,5] were described by Langenegger *et al.*, which aimed to investigate the outcomes in critically ill obstetric patients managed in a newly established OCCU at a South African Hospital.

In one study, patients with severe maternal morbidity and/or criteria for critical care managed in the labor ward of Tygerberg Academic Hospital, South Africa, were studied over a 3-month period. Immediately thereafter, an OCCU was established within the labor ward of that hospital. Patients admitted and managed in the “after OCCU” group were studied using the same methodology, with 123 patients meeting the inclusion criteria. The data of the “before OCCU” group were compared with the data of the “after OCCU” group. The before and after comparison, demonstrated a decrease in the ratio of mortalities per severe morbidity for patients managed in the OCCU.[5] The impact of the intervention was further investigated in a prospective cohort study which described the management and outcome of the initial 302 patients managed in the established OCCU located within the labor ward. Of the admissions, 46% were undelivered, two-thirds of admissions had severe organ dysfunction requiring level 2 obstetric critical care, while one-third developed or had existing indications for level 3 obstetric critical care. The most common reasons for admission were hypertensive disorders (43%), medical disorders (23%), severe sepsis (19%) and massive hemorrhage (11%). Intra-arterial lines were frequently used (91%) to guide resuscitation and administration of vasoactive drug infusions. Mask CPAP (continuous positive airway pressure) was utilized in pre-eclampsia patients with respiratory distress and pulmonary edema first, with the intubation rate being only 12%. Patients with more than one organ system failure or requiring ventilation for more than 24 hours were transferred to general ICU when a bed became available. There were eight deaths (2.6%) in the series.[11] The SAMM (severe acute maternal morbidity): mortality rate at the institution prior to the establishment of the OCCU was one death in every five women admitted with severe morbidity, this decreased to

one mortality in every 30 patients admitted with severe morbidity afterwards. These studies demonstrated that it was possible to reorganize existing resources to better care for patients with morbidity.

In a review on the provision of critical care services for the obstetric population in the United Kingdom, Sultan *et al.* emphasized the importance of reducing the incidence of SAMM and mortality.[12] They stated that in specific circumstances there may be a role for high dependency care units within labor wards in higher-income countries. Specialist obstetric units show lower rates of maternal transfer to intensive care units and provide continuity of care before and after labor.[12] Obstetric patients and critically ill women should receive the same standard of care for both their pregnancy-related and critical care needs provided by relevant professionals whether these are provided in a maternity or general critical care setting.[13]

Video 1 demonstrates the initiation non-invasive respiratory support provided by a midwife with basic critical care training.



Video 1 Video demonstrating the initiation of mask respiratory support in an OCCU with permission.

WHEN SHOULD A DEDICATED OCCU BE ESTABLISHED?

Obstetricians practicing in large referral central hospitals are increasingly confronted with critically ill patients. Often, doctors and nurses with limited experience in critical care have to care for these patients in labor wards with limited access to ICU resources.[14]

However, in high-income countries most of the level 2 and 3 intensive care is provided in a general ICU or in a maternity hospital ICU.[15] In these circumstances a separate obstetric ICU is not a practical use of resources, based on factors such as appropriateness of population size. In large referral hospitals (which may include those in higher-income countries) and especially in countries with limited ICU resources it is often necessary to provide dedicated level 2 critical care in a labor ward setting. It would then be ideal to have the emergency capacity to upgrade to ICU care which includes short-term ventilation.[8,9,10,11]

The current FIGO recommendation is based on the central OCCU blueprint described by Langenegger *et al.*, as well as the collective experience of two large OCCUs in South Africa and Columbia.[4] To justify a stand alone OCCU, it was estimated that a minimum of four dedicated obstetric critical care beds are required in central hospitals with 45,000–50,000 deliveries per annum when the SAMM incidence is around 1–2%. The requirements and objectives of an OCCU are listed in Table 1.

Table 1 Requirements and objectives of an OCCU

Objectives of an OCCU

Early identification and correct assessment of patients at risk of severe acute maternal morbidity (SAMM) defined as organ dysfunction and established organ dysfunction or failure
A resuscitation area for obstetric patients
To provide level 2 and emergency level 3 critical care
Monitoring of the patient and fetus in a critical care environment
Systemic maternal evaluation with appropriate management of the underlying condition
Continuous fetal evaluation
Management of maternal complications such as antepartum hemorrhage, postpartum hemorrhage, sepsis, complications of hypertension, respiratory distress, medical complications and postoperative care for patients with or at risk of morbidity
The ability to offer short-term ventilation and full intensive care prior to transfer to a general ICU or if no such bed is available
Induce and monitor labor, safe delivery of the baby
The ability to perform neonatal resuscitation

GUIDANCE FOR THE ESTABLISHMENT AND ORGANIZATION OF AN OCCU

Based on the experience gained from the establishment of a four-bedded dedicated OCCU in South Africa there is now detailed guidance describing exactly how to establish a new OCCU with minimal changes in labor ward infrastructure and human resources. In the conceptualization and planning of an OCCU, it is important to combine common standards of care applicable to a general ICU and apply them in an OCCU. In this regard, an urgent need exists for a detailed blueprint describing the establishment of an OCCU located within a labor ward. This blueprint should provide sufficient detail to be used by lead clinicians, nursing managers, builders and clinical engineers. Another integrated essential aspect is the planning of an educational blueprint to train the midwives and doctors who will provide care in the OCCU. The model for a central hospital OCCU described here was recommended by the FIGO Safe Motherhood committee.[4]

WHO SHOULD BE ADMITTED TO AN OCCU?

Combining general critical care definitions and SAMM, the following definition is proposed for obstetric critical care: “A critically ill obstetric patient can be defined as an antenatal, intrapartum or postpartum (42 days) woman with impending, developing or established significant organ dysfunction, which may lead to long-term morbidity or death”.[16,17] The indications for admission and the levels of obstetric critical care requirements are described in Tables 2 and 3.

Table 2 Criteria for admission to an OCCU

Existing or impending organ failure
Indication for invasive monitoring
Indication for respiratory support
Severe acute maternal morbidity (SAMM)
General intensive care bed indicated but not available
Complicated pre-eclampsia
Hemorrhagic shock
Acute kidney injury (AKI)
Severe sepsis and/or septic shock
Pre-existing cardiac disorders with significant dysfunction
Medical emergencies such as diabetic keto-acidosis
Morbid obesity
Anesthetic complications

Table 3 Requirements for different levels of care in an OCCU

	OCCU (level 2)	OCCU (level 3)
Monitoring	Arterial-line, central venous pressure catheter (CVP), ECG, SaO_2	Cardiac output assessment, CVP, ECG, SaO_2
CVS support	IV infusion antihypertensives, IV nitrates	IV infusion antihypertensives, IV nitrates, inotropes
Respiratory support	Non-invasive respiratory support	Emergency intubation and ventilation capacity (short term), refer to general ICU
Renal support	Dialysis done by renal team in renal unit	Dialysis done by renal team in OCCU
Organ system support	Single organ system failure	Single organ system failure and another organ system dysfunction

MANAGEMENT MODELS OF CRITICAL CARE UNITS

There are two management models for general critical care, namely open and closed units. In the closed unit the patient is transferred to the specific ICU. The dedicated ICU team takes over responsibility of the patient, while members of the multidisciplinary specialties are consulted when necessary. In the open unit a surgeon, physician, obstetrician, anesthetist or pediatrician admit their patient into an open ICU. The admitting doctor maintains responsibility for the management of patient. The closed unit has the advantage of a clinical director managing the unit.. Clinical care is provided by an intensivist or fellow on a 24-hour basis. Closed models have been shown to have improved clinical outcomes with lower morbidity and mortality and shortened length of hospital stay.[3,18] A hybrid of the closed ICU system may be possible for an OCCU in South Africa with limited resources. During normal working hours the medical director or obstetrician with an interest in Maternal Medicine will triage, admit and decide on patient management. Outside normal working hours the on call obstetric consultant and registrar will be primarily responsible for patient management. Critical care support when needed may be provided by the labor ward theater anesthetic registrar. Involving anesthetists in obstetric critical care patient management may improve maternal outcomes in obstetric critical care. It is valuable when critically ill women or women at risk of critical illness can be assessed in the antenatal period in order to formulate an anesthetic and combined critical care plan.[4]

HOW TO PLAN, DESIGN AND ESTABLISH AN OCCU

Unit design and site location

The unit should be located in close proximity to the labor ward. It is also important that the unit must be located close to the obstetric admissions area, obstetric theaters, neonatal resuscitation station and postoperative recovery room. The location of an OCCU must allow for access to existing infrastructure such as gas pipelines, emergency power supply and ventilation shafts, which can be extended to the OCCU site.

Size and infrastructure construction

The optimum size for the unit is set at four beds in an open area. The open floor area should be 80–120 m^2 in order to allow for at least 20 m^2 floor area for each bed as well as 2.5 m of unobstructed corridor space between the beds. Partitions should be used to ensure privacy during labor and delivery.[4] Critical care units with less than four beds pose clinical management challenges in terms of staffing ratios and may not be cost-effective due to scales of economy. Units larger than eight beds on the other hand present problems with regards to unit management. The doorways of the area have to be wide enough to allow easy passage for a bed and movable equipment. Clinical aspects of addressing adequate size in terms of the number of beds needed should be based on general intensive care guidelines. An OCCU

should ideally have the capacity to accept 95% of all patient referrals with an indication for admission.[4]

Bedside layout taking fetal monitoring into consideration

The practical bed head-to-wall layout is the recommended option (Figure 2). The unit must be furnished with four critical care beds with bedside rails and adjustable height as well as positions (head up, head down, elevate or lower bed). It is useful, but not essential, to have access to a delivery bed in the event of vaginal delivery; however, the majority of deliveries can safely be performed on the ICU bed. In the case of a unexpected emergency such as shoulder dystocia, the patient can be turned sideways with support to facilitate the delivery. Delivery beds are more expensive and most of the available labor ward delivery beds do not have bedside railings; most delivery beds can only be used for a vaginal delivery when the patient is stable and fully conscious with no risk of falling off the bed. There must be suitable screening between each bed. The ideal is a ceiling to floor partition, however, material curtains hung from ceiling suspended curtain railings can also be used. The walls must be strong enough to support equipment fixed from them such as monitors. A rail with a load capacity of 20 kg must be mounted to the wall for equipment.[19,20,21] The monitors can be fixed to the wall using monitor mountings (Figure 2).

Adjustable examination lights should ideally be suspended from the ceiling. A framed mobile light can also be used. Sufficient lighting is essential to conduct a vaginal delivery or a clinical procedure such as inserting a central venous catheter. Storage as well as a bedside light must be available next to each patient's bed. Every bed must have a mobile trolley with adjustable height for meals, patient files and observation charts. The key requirement for the layout of the bed area is that it must provide for easy access to the patients. Infrastructure and equipment must be mounted in such a way that it will not impede basic nursing care (Figure 2).

Figure 2 OCCU infrastructure and equipment.

The advantage of an OCCU situated in close proximity to the labor ward is access to storage space within the labor ward store room with a dedicated storage area for OCCU. It is essential to have storage space within OCCU to store essential items listed in Table 4

Table 4 Essential items in the OCCU cupboard space

Circulation: infusion lines, intra-arterial lines, central venous catheters, pulmonary artery catheter
Airway: oxygen mask, ambu bag, ventilator circuits and filters
Breathing: additional oxygen cylinder
Cables for monitors
Fridge: blood and necessary drugs for cold storage
Other drugs in glass cabinet
Scheduled drugs (e.g. opioids) in a lockable cabinet
Blood gas analyser on cupboard surface
Environment: gloves, masks, soap, sterile swabs
Disposables
Small capital items, e.g. ophthalmoscope, reflex hammer

Central nursing station

The central nursing station should be sited where direct visual contact with all four patients and their monitors is possible, and close enough to patients to enable the staff to hear any alarms. There should be storage shelves behind the nursing station desk to store management booklets, files, forms (e.g. laboratory and blood bank forms) and stationery.

The following nursing station communication facilities are regarded as essential:

- a computer terminal connected to the hospital intranet service
- an internet link to laboratories and radiology
- two telephone extensions: one internal and one external.

Accommodation

Accommodation such as rooms for dirty linen and tearoom should be incorporated into the existing labor ward accommodation where possible in order to save on cost and decrease construction time. It is, however, important to have a separate office for the nursing manager. The essential accommodation that could be shared with the existing labor ward is listed in Table 5.

Table 5 Accommodation that could be shared with existing labor ward

Reception area
Patient areas
Staff tearoom
Lavatories, showers and cloakrooms
Kitchen facilities
Storage area for case notes
Secretary’s office
Doctors sleeping room
Linen rooms
Dirty utility rooms
Clinical waste disposal holding area

Bedside layout of engineering services and specifications

Recommendations of the International Federation of Gynaecology and Obstetrics,[4] European Society of Critical Care Medicine,[22] United Kingdom Health Building Note 27,[23] and the South African Policy on Defining Critical Care[24] were followed to compile a blueprint for bedside engineering services such as the specifications for oxygen pipelines, central vacuum pipelines, electricity, water and basins, unit ventilation requirements, infection control requirements (Table 6), climate control, heating, lighting, safety and security requirements.

Table 6 Infection control requirements

Antibiotic policy guided by the department of microbiology
Infection control guidance on clothing of staff and visitors
Guidance on hand washing methods
Sterilization of equipment
Aseptic precautions for invasive procedures such as placement of a central venous catheter
Disposable items
Changing of catheters, humidifiers, ventilator filters, tubing and other equipment
Isolation of patients with an infective disease
Barrier nursing
Temperature control

Equipment in OCCU: maternal, fetal and neonatal

The correct equipment is essential to provide an appropriate level of critical care. Patient physiological variables need to be monitored. Effective respiratory and hemodynamic support equipment are key functions in critical care and may be life-saving. The monitor screens in the unit have to be clearly visible to the medical and nursing personnel. Detailed standards for critical care unit equipment are listed in Tables 7 and 8. A neonatal resuscitair should be available to the unit with the recommended temperature settings, oxygen and suction connections. In the case of twin deliveries, a neonatal resuscitair crib in the delivery room next to the unit was used. The baby was placed in a standard cot next to the mother in OCCU when both mother and baby was stable. Skin contact and breastfeeding were encouraged and maintained when the mother was stable.

Table 7 Equipment needed in an OCCU

Large capital items	Indication
Resuscitation trolley ***Adult & neonatal***	Maternal resuscitation, neonatal resuscitation Elective and emergency intubation
Defibrillator	Resuscitation
Neonatal “Mecacrib”	Maintain neonatal temperature and infrastructure for neonatal resuscitation
Monitors	Monitor vitals: blood pressure, SaO_2, ECG, respiration, cardiac output
Respiratory support equipment	Bi-PAP/CPAP machine, Ventilator
Circulatory support equipment	Volumetric infusion pumps Syringe drivers for IV drug infusions
Electric warming blanket	Maintain adequate temperature during critical illness or resuscitation
Small fridge	Drug storage for specific drugs requiring cold storage, emergency blood products

Large capital items	Indication
Cardiotocograph (CTG)	Monitor fetal heart and contractions
Blood gas analyser (preferable)	Frequent blood gas analysis
Lockable cupboard	Morphine and other scheduled drugs
Procedure trolley	Insertion of arterial lines, central venous pressure catheters (CVP)
Sterile procedure pack	CVPs, arterial lines, epidural
Sterile delivery pack	Delivery of baby
Ultrasound machine	Fetal ultrasound and ultrasound guided procedures, non-invasive CVP

CPAP, continuous positive airway pressure; Bi-PAP, Bi level positive airway pressure.

Table 8 Smaller capital items necessary in an OCCU

Durable items	Non-durable items
Diagnostic ophthalmoscope	Pressure bags for arterial lines
Wright's spirometer	Normal and large sized blood pressure cuffs
Low temperature thermometer	Pressure air mattress
Oxygen bed rack for transport of patients on a ventilator	Nasal CPAP mask sets
Fiberoptic laryngoscope & blades	Full face mask CPAP sets
	Ambu bags (manual resuscitators)

CPAP, continuous positive airway pressure.

The construction of the unit and purchasing of equipment should be performed as a parallel process. The admission guidelines, unit management model, recruiting and allocation of required human resources are described in the following section.

ADMISSION AND DISCHARGE GUIDELINES

It is important to decide on appropriate admission guidelines in order to ensure that the resources are used appropriately. The medical and nursing staff as well as infrastructure must be planned carefully in order to provide the effective care required by the patients admitted to the OCCU. The proposed admission criteria are described in Table 2.

HUMAN RESOURCES AND OPERATIONAL RECOMMENDATIONS

In the blueprint described in this chapter, the OCCU level 2/3 human resource management plan was based on a hybrid of the closed general ICU system. This required the appointment of an obstetrician with an interest in critical care, and the ability to lead and manage the process of establishing the OCCU. The director of OCCU should be a specialist obstetrician with an interest in high-risk obstetrics and a prior 3-month rotation in a general ICU. Additional support from cardiology, nephrology, and the medical and the surgical ICUs should be mobilized by the identified head of the OCCU. The duties of the head of the unit are listed in Table 9.

Table 9 Duties and responsibilities of the head of the OCCU

Manage the unit establishment process
Function as multidisciplinary team leader

Establish and monitor admission and discharge criteria
Establish policies and protocols
Quality assurance
Coordinate education and, if possible, research
Manage the unit budget
Manage staff requirements

After identification of the clinical head, the next important step was to appoint a suitable, dedicated nursing manager for the OCCU. The recommended requirements for the nursing manager are knowledge and skill in critical care and obstetrics. Together, the clinical head and nursing manager proceeded with communicating the vision and care benefits for complicated cases previously managed in a labor ward but now in an OCCU. The nursing manager was responsible for the nursing program including delegation of roles and responsibilities of the nursing staff. Other functions performed by her were the implementation of policies and procedures, quality assurance, provision of supplies and equipment and staff education and training.

Day-to-day care in the OCCU

Day-to-day care should be provided by a dedicated registrar (resident) and a dedicated medical officer under the guidance of a specialist/consultant with experience in obstetric critical care. Although the OCCU should be managed by the clinical head, this person will also have other clinical responsibilities. For this reason, additional consultant cover during office hours and out of hours should also be provided by the other specialists/consultants in the department. The obstetric registrars (residents) or a dedicated senior medical officer can provide daytime clinical patient management. Senior residents or experienced medical officers should cover the unit after hours. The anesthetist registrar on call for the labor ward should be available for preoperative assessment, critical care advice and to assist with procedures such as intubation and ventilation. The duties of the obstetric doctors working in the unit are listed 10.

Table 10 Clinical duties of the doctor working in the OCCU

Resuscitation of unstable patients
Assess labor ward patient referrals
Admit patients with, or at risk of organ disfunction or failure
Do a systematic evaluation
Discuss admissions with the on call consultant
Consult relevant disciplines
Treat the underlying cause
Administrative duties

Professional nurses

The nurse functioning in the critical care environment should monitor patients closely, make decisions based on clinical and monitoring assessment, and act accordingly.[6] Midwives and professional nurses working in an OCCU, must be trained in and understand basic obstetric critical care principles as well as midwifery. The nursing staff required for the four-bedded unit include were, one unit-nursing manager, ten professional nurses and five enrolled nursing assistants. The planned work pattern was a 12-hour shift in order to provide two nurses in the OCCU on each shift. Ideally, an experienced midwife with critical care knowledge and one general nurse with experience in critical care were placed together on a shift. The duties of the professional nurse and midwife are listed in Table 11. Ancillary nursing staff play a very important role in the OCCU patient management through supporting the professional nurse in her duties under supervision. However, they are not able to replace a trained professional nurse and midwife (in South Africa this is one person).

Table 11 Duties of the professional bedside nurse and midwife

Provide compassionate and holistic care
Collect and interpret vital data
Repeated clinical assessments
Communicate relevant findings to the doctor
Interact with family members
Provide patient health care education

Other ancillary staff must be available for consultation when necessary. These include physiotherapists, social workers, nutritionists, radiographers, clinical engineers and critical care technicians when available. The daily program of the OCCU model is shown in Table 12.

Table 12 Day to day program of care in the OCCU model

Prior to the consultant morning round: • Nursing staff to assess all vitals • Collect appropriate blood samples • Nurse night shift handover to day shift • Handover by doctor on night shift to day shift doctor • Systematic re-evaluation by the day shift doctor
At the consultant morning ward round: • Present clinical information • Formulate management plan • Discuss and assess new referrals for admission
Afternoon consultant ward round: • Update clinical information • Re-evaluate treatment strategy • Assess new admissions • Formulate management plan for night shift
After hours care: • Nursing handover round • Doctor handover round • Assess new referrals • Discuss new admissions with consultant on call

Quality assurance and ongoing training

The recommended quality indicators must be used to measure the effectiveness and safety of critical obstetric care services. These should include number of admissions as level 3, number of admissions as level 2, readmissions, length of hospital stay, referrals, maternal morbidity and mortality, patient outcomes, communication and availability of staff with competencies for critical care management.[4,13]

Ongoing training is essential to ensure quality care. Simulation is the preferred strategy that makes it easier for teams to

practice in a safe environment and eliminates the possibility of harm to patients. Medical staff working in the obstetric critical care unit must also receive ongoing training in monitoring to ensure correct interpretation and management.

CONCLUSION

Models of obstetric critical care vary widely, depending on health system characteristics and, in particular, the degree of development of each country. One of the options to provide a dedicated obstetric critical care service is to establishment an obstetric critical care unit. The discipline of obstetric critical care must be expanded wherever possible. The OCCU blueprint adapted for local requirements and conditions can be implemented in central or tertiary level hospitals in both low- and middle-income countries.

ACKNOWLEDGEMENTS

The Tygerberg OCCU's nursing manager, Charmaine de Villiers played a central role in the establishment and organization of the unit. She provided invaluable in service critical care skills training for midwives working in the unit.

PRACTICE RECOMMENDATIONS

- **Obstetric patients at risk of organ dysfunction or with established organ dysfunction must receive emergency critical care management as soon as possible.**
- **Obstetric critical care (OCC) is described as the specialized management of critically ill obstetric patients via an interdisciplinary approach in which the optimization of the clinical variables of pregnant women should be approximated to the maternal–fetal unit needs as a whole.[21]**
- **One pragmatic solution is to establish OCCUs in the labor wards of central hospitals with the recommended infrastructure, equipment and human resources required.[4]**
- **An OCCU must be able to provide the following clinical services:**
  - **Provide clear admission, discharge guidelines and operational procedures;**
  - **Early identification and resuscitation of patients with maternal complications and organ dysfunction;**
  - **The ability to offer short-term ventilation and full intensive care prior to transfer to a general ICU or if no such bed is available;**
  - **Monitor the mother and fetus in a critical care environment;**
  - **Induce and monitor labor, safe delivery of the baby;**
  - **Rooming-in of healthy newborn babies when the mother is stable.**

CONFLICTS OF INTEREST

The author of this chapter declares that he has no interests that conflict with the contents of the chapter.

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