SOUTH AFRICAN SOCIETY
OF ANAESTHESIOLOGISTS (SASA)

SASA Practice Guidelines 2022
Appendix J

Appendix J

Structural and Organisational Recommendations for Intensive Care Units in South Africa

Introduction

The recommendations in this document should be used as a guideline for the provision of ideal conditions for the care of critically ill patients. It is accepted that some of these are only feasible in certain training institutions. Nevertheless, other centres should aspire to the recommendations set out in this document.

These guidelines for intensive care units have been formulated to assist in the practice and provision of critical care for clinicians, hospital administrators and developers. Critical care, or intensive care, describes the highest level of continuing patient monitoring and treatment. The intensive care unit (ICU) is a specially designated area where facilities for the care of critically ill patients is concentrated, and where the level of care and supervision is considerably more sophisticated than that in the ordinary ward. These units may be multidisciplinary, dealing with all types of critically ill patients; or specialised, dealing with specific groups of patients, e.g. general surgical patients, neuro- or cardiac surgical patients and coronary care or paediatric patients. The level of care and facilities that are required vary depending on the patient mix. This determines the staffing, equipment, services and other facilities that are required in specific ICUs.

Categories of intensive care units

Category 1 (high care)

Patients who are admitted to this category of ICU require intensive monitoring/clinical interventions, which include:

- Patients with fluid, electrolyte or metabolic disturbances, e.g. diabetic ketoacidosis, postoperative monitoring.
- Patients with drug overdose that does not require positive pressure ventilation.
- Patients with neuromuscular weakness that does not require positive pressure ventilation.
- Patients with single-organ dysfunction that does not require active support.
- The provision of epidural analgesia.
- The care of patients recently discharged from a higher level of care.

Category 2 (specialised organ support unit)

Patients who are admitted to this category of ICU require slightly less care than category 3 patients and may include, but are not limited to, those who:

- Require active organ support.
- Have single-organ failure.
- Have a specific need that requires continuous monitoring and observation.

Category 3 (intensive care unit facility)

This category of ICU has the potential to offer the highest degree of patient care and the type of patient who is admitted to this unit may include, but is not limited to, those:

- With multiple-organ failure.
- Requiring multidisciplinary intervention.
- Requiring ventilation with second organ failure.
- Requiring renal replacement therapy with second organ failure.
- Haemodynamically unstable patients.
- Requiring Extra Corporeal Membrane Oxygenation (ECMO).

An ICU may admit patients with lesser disease acuity than they are designated to accept. However, on occasion, an ICU may admit patients of greater disease acuity than they are designated to accept. If the facilities and staff are not available for advanced care, transfer to a higher category ICU should be arranged, once the patient is deemed to be stable enough for transport. Isolation facilities must be available in all categories of ICU for patients who have multi-resistant organisms or communicable diseases.

Staffing of intensive care units

Levels of staffing by qualified medical, nursing, and ancillary and support personnel should be appropriate to the patient mix, severity of illness, and level of intervention. Mechanisms must be available for rapid effective communication between staff members within the unit, and those providing backup services.

Ward rounds should take place at least twice a day in order to provide adequate senior guidance. Rounds should take place at the same time each day and one round a day should be multidisciplinary.

Medical staff

Category 1 intensive care unit

1. 24-hour specialist cover. Specialists should have higher training.

Category 2 intensive care unit

1. 24-hour specialist cover. Specialists should have higher training.
2. A registered medical practitioner must be available in the unit within minutes if necessary.

Category 3 intensive care unit

1. Requires a full-time medical director who is registered by the Health Professions Council of South Africa (HPCSA) for independent practice in the subspecialty of Critical Care. The director's professional activities should be devoted to no less than 80% of the time to intensive care. The director's responsibility includes control of staff, admission and discharge policies, individual patient care, overall management of protocols and staff, quality control and audit function (issues of maintenance of accreditation), a supervisory role, liaison with hospital management, selection of admissions to the unit, arranging of training and research programmes, maintaining of records and equipment, and general supervision of the daily running and forward planning of the ICU.
2. The director of the ICU is assisted by clinicians registered by the HPCSA for independent practice in the subspecialty of Critical Care, and by additional specialists.
3. Care should be led by a Registered Intensivist, as the Closed Unit model of care has been shown to improve morbidity and mortality.
4. 24-hour specialist availability is essential. These individuals should either be subspecialists in critical care or have an acceptable higher qualification in anaesthesia, surgery, internal medicine, emergency medicine, obstetrics and gynaecology or paediatrics. Specialists must be immediately available 24-hours a day and should be physically present within 30 minutes if necessary. Specialists must undertake twice daily ward rounds and must not be responsible for delivering other services whilst covering the ICU when allocated to the on-call roster.
5. Specialist work patterns should be designed to deliver continuity of care. The specialist to patient ratio should not exceed between 1:8 – 1:15.
6. There should be on-site, 24-hour availability of a registered medical practitioner. This person must be available immediately and must not be committed to other duties.

Nursing staff

Appropriate levels of nurse staffing should be determined on a shift-by-shift basis by consultation between the senior nurse and the critical care physician in charge, either directly, or through the use of unit-based policies. Staffing arrangements should be flexible to allow matching of supply with variable demand. An operational manager is responsible for the functioning and quality of the nursing care in the unit. Units must not contract more than 20% of nurses from an agency per shift when they are not their own staff.

Category 1 intensive care unit

1. Nurse to patient ratio 1:2.
2. Control nurse should be trained in intensive care.

Category 2 intensive care unit

1. Nurse to patient ratio 1:1.
2. At least 25% of the nurses should be trained in intensive care.

Category 3 intensive care unit

1. ICU nurse to patient ratio between 1.5:1 and 2:1, depending on the number of category 3 patients. (This means that there is always one registered nurse with each patient.)
2. Not less than 50% of nurses with intensive care nurse training

Nursing assistants

The above ratio of nurses to patients may be slightly decreased if nursing assistants are employed to wash patients, as runners and to assist nursing staff in other ways. However, they should not take over patient care responsibilities or monitoring responsibilities.

Clinical technologists

Clinical technologists registered with the HPCSA, should be available 24 hours a day to provide equipment and therapeutic support. This includes:

- Care, maintenance and decontamination of ICU equipment.
- Operation of ICU equipment.
- Setting up and calibration of equipment, e.g. ventilators, pressure transducers, cardiac output monitors, oximetry and gas analysers.
- Performing blood gas analysis, oximetry and electrolyte measurement.
- Education of nursing and paramedical staff in user care and the operation of equipment.

Physiotherapists

A physiotherapist who is experienced in ICU work (a minimum of six months' experience in an acceptable ICU) should be available on a 24-hour basis.

Pharmacists

Category 3 ICUs should have a critical care pharmacist available to consult during normal working hours.

Radiographers

An experienced radiographer who can provide mobile X-ray facilities should be available in all categories of ICUs.

Microbiologists

Input from clinical microbiologists must be available daily.

Other healthcare professionals

- Dietetic support should be available daily, particularly for patients on parenteral and tube feed nutrition.
- Speech and language therapists and occupational therapists should be available for patients when indicated.
- Social workers should be available to help with social and financial problems of patients and their dependents.

Secretaries, clerks and cleaners

- Secretarial and clerical assistance should be available to manage patients' records and administrative issues. A ward clerk should be available for filing, taking calls and assisting with visitors.
- A cleaning team must be available to provide a 24-hour cleaning service, they must be familiar with infection control protocols and the handling of hazardous materials and waste.

Design of intensive care units

Facilities

Siting

The ICU should be situated close to the departments from which patients are admitted, such as emergency and trauma units, recovery rooms and operating theatres. It should be easily

accessible to support areas, such as laboratory services, sterilising units, radiographic facilities and other diagnostic and treatment areas. Its design should incorporate the use of outside windows, providing lighting and views for both patients and staff.

Size

Of the total number of acute beds in a hospital, 2–8% should be intensive care beds. These should be grouped into units of 8–12 beds for convenient management. There should be at least 20 m^2 of floor area for each bed in open-plan areas, with at least 2.5 m of unobstructed corridor space beyond the working area. In many instances, separate cubicles are preferable and should be a minimum of 25 m^2. A minimum of one isolation cubicle should be available for every five ICU beds.

Lighting

Maximum use should be made of outside windows. Artificial lighting should be of the correct colour and temperature and should have a facility to provide regional dimming and lighting over single beds only.

Hand basin

One basin with hot and cold running water per two beds. Elbow taps or similar should be installed.

Bedside storage

A cupboard with shelves for the storage of small amounts of disposable equipment (i.e. drugs, wound dressings).

Management base

A central station should be provided where the following facilities are available:

- Two telephones per 3–4 beds.
- Central monitoring/telemetry
- Audible signals should be adjustable in intensity, and should have visual signals.
- Appropriate computer and IT availability to access laboratory results, radiology etc.
- Drug storage and administration facilities.
- Facilities for the storage of notes.
- An emergency trolley.
- Electrical sockets.
- Refrigeration storage.

- Storage for emergency medical equipment.

Storage facilities

These should be situated outside the patient area to accommodate: ventilators, drip stands, monitoring apparatus, syringe drivers, portable suction apparatus, linen and other equipment.

Additional areas

Additional areas required include equipment and consumable stores, utility rooms, a sisters' office, doctors' office, staff lounge, doctors' bedroom, laboratory, workshop, relatives' rooms, reception area, cleaners' room, seminar room, receptionist's office, dirty utility rooms, clean utility rooms, patient lavatories and showers, staff change rooms, lockers and shower facilities. The kitchen should be adequate to provide light meals for staff.

A private interview room must be available for discussions with relatives, dealing with bereavement issues and family interaction.

Additional support services

- Chemistry laboratory.
- Microbiology laboratory.
- Haematology service.
- Sterilising service.
- Pathology service.
- Blood bank

Equipment

Monitoring equipment

For the early detection of abnormalities that require correction, high and low alarm limits should be determined and set appropriately for specific interventions, e.g. airway pressure, blood pressure, heart rate, oxygen saturation and end-tidal CO_2.

Electrocardiogram monitor

One per bed

Pressure monitor/transducers

- ICU category 1 (one channel per bed)
- ICU category 2 (two channels per bed)
- ICU category 3 (three channels per bed)

Non-invasive blood pressure monitoring device

One per bed

Oximetry

One per bed

Capnography

- ICU categories 1 and 2 (available when needed).
- ICU category 3 (one per bed) Glucometer device One per unit

Thermometers or temperature probes

One per bed

Organ system support equipment

Ventilators with appropriate humidification devices

- ICU category 2 (1 per bed)
- ICU category 3 (1.5 per bed)

Continuous positive airways pressure devices

Capacity for non-invasive ventilation

High-flow nasal oxygen

Renal replacement therapy/haemoperfusion

Plasmapheresis

Intra-aortic balloon pump

Capability for measuring cardiac output

Capability for performing bronchoscopy

Extra-corporeal membrane oxygenation

Other equipment

Beds

- These must be able to tilt both head up and head down, move up and down (40–90 cm minimum), and break in the middle to allow patients to sit up and facilitate mobilisation. Preferably, they should be electrically operated, as well as have a manual assist or hydraulics for easy movement. They must be mobile with a suitable locking mechanism and must allow unimpeded access to the head of the bed for intubation, resuscitation and the insertion of central venous lines. Bed safety rails must be continuous and run the full length of the bed.

- A combination of Infusion pumps and syringe drivers must be available for intravenous fluid and drug administration.
- ICU category 1: 2 per bed
- ICU category 2: 4 per bed
- ICU category 3: 8 per bed

Suction

(to provide a negative pressure of 75 kPa and maintain a flow of 40 l/minute)

Two per bed.

Emergency intubation trolley

- One per unit, to carry:
  - Manual resuscitator (bag-valve-mask)/catheter mount/facemasks.
  - Selection of different sizes of oropharyngeal airways.
  - Naso-pharyngeal airway.
  - 2 laryngoscope handles (with a selection of small, medium and large blades and spare batteries).
  - Selection of endotracheal tubes.
  - Laryngeal mask airway.
  - Endotracheal tube introducer/gum elastic bougie.
  - Strapping for endotracheal tubes.
  - Bacterial filter.
  - Magill forceps.
  - Lignocaine spray.
  - KY Jelly.
  - Nasogastric tubes.
  - A pair of scissors.
  - Surgical blades.
  - Disposable gloves.
  - Safety glasses.
  - Surgical masks.
  - Oxygen masks and/or nasal cannulae.
  - Tracheostomy tape.
  - Yankauer suction tube and flexible suction catheters.
  - Appropriate drugs for intubation and resuscitation.

  - Syringes, needles and alcohol swabs.
  - Infusion sets, intravenous cannulae and transparent adhesive dressing.
  - Resuscitation fluids.
  - Emergency chest drain pack.
- Defibrillator/external pacing device with pads, paddles and electrodes
  One per unit
- Procedure light (pivot light of high intensity for special procedures)
- Forced air convective warming devices must be available
- Haemoglobinometer
- Urine-testing apparatus
- Ophthalmoscope and bedside investigational apparatus
- A flexible fibre-optic bronchoscope
- Low pressure suction apparatus
- Blood warming device
- Stethoscope (one per bed)
- A wall clock with a sweep second hand that is clearly visible from each bed space.
- Spirit levels
- Transport monitor
- Transport ventilator
- Ultrasound machine with an appropriate selection of probes
- Equipment for the provision of subglottic suction
- 12-lead ECG machine
- Intracranial pressure monitoring
- Provision for the safe disposal of sharps

Services

Lighting

Natural daylight, preferably with a view, must be utilised as much as possible for both patients and staff. Artificial light should be of daylight quality. Facilities for suitable dimming for night lighting should also be available. Individual bed lighting should be available for use at night.

Electricity

The electricity should be 220-volt, single phase, with a single common earth ground. All outlets to the patient areas should be on the same phase. The patient area should be served by a maintained standby power source with the highest priority rating. There should be less

than five seconds interruption when switching to the standby source. The standby generator should be tested at least once every month. Separate protected battery power sources may be required for emergency lighting, computers, ventilators and other sensitive equipment.

Medical gases

Oxygen

Medical oxygen should be available at a pressure of 4 bar/400kPa. This pressure should be maintained when a flow of 50 l/minute at each outlet is in use at the same time. There should be two banks of cylinders or two tanks with automatic changeover controls with a visible and audible indication of failure in any part of the supply.

Compressed air

Filtered oil-free medical air at a pressure of 4 bar should be available, and this pressure should be maintained with a flow of 50 l/minute at each outlet when all of them are in use. The supply should be governed by a fail-safe tandem system of providing compressed air.

Vacuum

The ICU should have a central vacuum supply that can generate a negative pressure of 75 kPa and be capable of maintaining 40 l/minute air flow at each suction outlet when all outlets are in use.

ICU category 1: two inlets per bed

ICU categories 2 and 3: two inlets per bed

Air conditioning

The unit should be air conditioned to allow a choice of temperature from 16–27 ^{0}C and a choice of humidity from 25–95%. Patient areas should have at least three changes of air per hour. A thermometer and hygrometer are necessary to monitor air conditioning in each room. Isolation rooms should be ventilated with reversible positive/negative airflow with at least 15 air changes per hour.

Electricity points

These should have a pilot light indicating that the circuit is live (no more than four points per fuse):

ICU category 1: six per bed

ICU categories 2 and 3: sixteen sockets per bed

An alternative electrical supply must be available at all times in the event of a power failure.

Mounts for monitors and equipment

Rails should be able to carry 20 kg every 60 cm. Some rails must be below the electrical sockets.

Hanging intravenous sky hooks (or equivalent)

Two per bed

Electricity points, gas outlets and wall mounted equipment rails must be distributed on both sides of the bed.

Diagnostic and investigational facilities

Biochemistry laboratory (24-hour availability)

Full serum chemistry

Full urinary chemistry

Blood gas laboratory

- ICU category 1: must be available immediately.

Microbiology laboratory (24-hour availability)

Haematology laboratory (24-hour availability)

Full blood counts.

Coagulation testing, including viscoelastic testing

Diagnostic radiology

Routine radiography (24-hour availability)

Ultrasound investigation

- ICU category 1: daytime availability
- ICU categories 2 and 3: 24-hour availability

Computed tomography scanning

- ICU category 1: daytime availability
- ICU categories 2 and 3: 24-hour availability

Magnetic Resonance Imaging

- ICU category 3: 24-hour availability

Radioisotope scanning (daytime availability)

Angiography

- ICU category 1: daytime availability
- ICU categories 2 and 3: 24-hour availability

Protocols and policies

Protocols and policies for common ICU activities, unit-specific procedures and interventions, should be established, reviewed and practised. Such protocols and policies should be available in the unit to which staff may refer. These documents should include but are not limited to:

Admission, discharge and transfer criteria.

Infection control and antibiotic stewardship policies, including:

- Isolation of infected patients
- Sterilisation, changing and disposing of equipment
- Cleaning of the unit

Tracheal intubation and extubation.

Bundles for the management and care of invasive devices.

Audit and continuous quality improvement

There should be regular objective audits of:

- Structure
- Processes
- Outcomes from the perspectives of staff, patients, relatives and hospital administrators.

Sources:

1. Guidelines for the Provision of Intensive Care Services (2015). Core Standards Working Party of the Joint Professional Standards Committee, United Kingdom.
2. Core Standards for Intensive Care Units (2013). Core Standards Working Party of the Joint Professional Standards Committee, United Kingdom.
3. Levels of Critical Care for Adult Patients. Intensive Care Society Standards 2009.
4. Recommendations on basic requirements for intensive care units: structural and organizational aspects. Valentin A, Ferdinande P. Int Care Med 2011; 37:1575-1587.