PRACTICE GUIDELINES 2006

compiled by

THE SOUTH AFRICAN SOCIETY OF ANAESTHESIOLOGISTS
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These documents have been drawn up as a guide, and should not be interpreted as a rigid code of practice.
SECTION I

THE DUTIES OF AN ANAESTHESIOLOGIST

1. Preamble

These guidelines attempt to define the general duties and responsibilities of anaesthesiologists (specialist anaesthetists) and anaesthetists.

2. Scope of practice

2.1 Scope of practice includes:

2.1.1 Maintaining personal knowledge and skills

2.1.2 Providing anaesthetic services or supervising trainees who are providing anaesthetic services:

2.1.2.1 To be directly responsible for only one anaesthetic procedure at anyone time unless acting in a supervisory capacity.

2.1.2.2 Where a local anaesthetic technique is used for pain relief without concomitant surgery e.g. labour epidural, responsibility for patient supervision may be delegated to a suitably trained paramedical or nursing officer.

2.1.3 Carrying out pre-operative assessment and treatment

2.1.4 Supervising the recovery room

2.1.5 Participating in postoperative management where appropriate

2.1.6 Managing and/or supervising the management of patients in the intensive care unit

2.1.7 Providing services related to the management of acute and chronic pain and consulting in pain clinics

2.1.8 Providing services related to resuscitation

2.1.9 Taking responsibility for supervising the maintenance of anaesthetic, monitoring and other life-support equipment relevant to anaesthesiology and critical care. This must be in conjunction with a suitable technical or biomedical engineering service.

2.1.10 Taking responsibility for the safe use of anaesthetic-associated drugs

2.1.11 Providing anaesthetic services related to obstetrics including pain relief in labour

2.2 'Other duties' may include:

2.2.1 Providing consultative anaesthetic and ancillary services

2.2.2 Carrying out administrative duties, education and management

2.2.3 Providing information and training within the community on methods of handling mass casualties, trauma and basic life support techniques to:

- paramedical staff
- interested community groups in subjects such as 'basic life support'

2.2.4 Contributing to activities of professional associations

2.2.5 Audit and reviewing quality of care

2.2.6 Carrying out reviews and investigation on drugs, equipment, methods of clinical management and physiological and pharmacological matters relevant to anaesthesia and intensive care

2.2.7 Providing and/or taking part in advisory services to hospital committees, health commissions and other organisations

The practice of anaesthesiology differs from other medical and surgical specialties in that:

- Anaesthesiologists are often not based at one venue and have to commute between different venues
- They are true service providers and have little control over their daily bookings
- As a group they are faced with more emergency situations than others
- As most surgical cases are now only admitted on the day of surgery this allows them less time to establish a rapport with the patient
- Anaesthesia is procedure associated
- Primary diagnoses are usually made only when the anaesthesiologist is the primary doctor in ICU or the primary doctor in chronic pain treatment
SECTION II

ESSENTIAL TRAINING FOR GENERAL PRACTITIONERS PROPOSING TO ADMINISTER ANAESTHETICS

1. Introduction

The Society at the outset acknowledges the inadequate number of specialist anaesthetists to meet the needs of South Africa. Standards vary with location; the urban population benefits largely from first world standards of anaesthetic practice while a significant percentage of the rural population lack access to even rudimentary primary health care facilities. The position of general practitioners in a community where no specialist anaesthetic service is available and where it is necessary for surgical procedures to be undertaken is acknowledged. In this respect South Africa is not unique as certain first world countries including Australia and Canada share a similar problem in meeting the needs of their respective rural communities.

1.1 It should be clearly understood that what follows is not intended in any way to endorse, reflect on or pre-judge the issue of surgery being undertaken in these circumstances. Nevertheless, any practitioner undertaking such an anaesthetic service should have achieved a certain minimum standard of training and experience, which is hereinafter defined. Some cognisance has to be taken of the international models developed for rural anaesthetic practice in the countries referred to above.

1.2 Furthermore, the availability of an anaesthesiologist, the question of hospital facilities and infrastructure are critical to this matter, and anaesthesia is only one of a number of considerations, which must influence the decision to be made on what is in the best interests of the patient.

1.3 A minimum period of experience in anaesthesia under instruction is required. This experience should be as follows:

- In a department of anaesthesia with a significant caseload; where a graded programme can be arranged; under the instruction of persons who are competent to teach the trainee, i.e. are themselves qualified in anaesthesia; it should be for a period of at least 6 months’ duration, 3 months of which should be in a continuous full-time capacity.

1.4 At the conclusion of this training period, the practitioner must be able to:

1.4.1 Cannulate both the peripheral and central venous systems
1.4.2 Perform basic life support and advanced life support and resuscitation
1.4.3 Test the safety and efficient working of anaesthetic and other life support equipment used in anaesthesia
1.4.4 Manage an airway including intubation, insertion of laryngeal mask airway (LMA) and similar alternate airway devices in patients ranging from neonate toelderly
1.4.5 Maintain intermittent positive-pressure ventilation safely in the intubated and non-intubated patient
1.4.6 Perform local, topical and regional anaesthesia

1.5 In addition the practitioner must have acquired sufficient clinical knowledge to:

1.5.1 Understand the pharmacological and physiological effects of commonly used anaesthetic agents
1.5.2 Understand the physiological responses to subarachnoid and epidural blockade
1.5.3 Be aware of the range, function, clinical use and hazards of anaesthetic equipment, as well as safety issues pertaining to the use and maintenance of this equipment
1.5.4 Appreciate the additional risks of anaesthesia in the presence of pre-existing co-morbid disease or injury
1.5.5 Choose the anaesthetic method most suitable for a particular patient and procedure
1.5.6 Manage local, topical and regional anaesthesia techniques including techniques of subarachnoid anaesthesia and commonly used nerve blocks and intravenous (Biers) blocks as well as the management of their immediate and delayed complications
1.5.7 Adequately monitor patients undergoing regional anaesthesia
1.5.8 Use sedative drugs according to published SASA guidelines
1.5.9 Use general anaesthesia in conjunction with regional anaesthesia
1.5.10 Manage acute pain related to surgery and trauma
1.5.11 Resuscitate patients suffering from fluid and electrolyte depletion, acid-base disturbances or other metabolic disturbance; hypoxia with or without hypercarbia; acute trauma; haemorrhagic or septic shock

1.6 It is to be expected that a background such as the above would equip a prudent and responsible practitioner to recognise those situations, which are beyond his/her capabilities.

1.7 It should also be appreciated that the maintenance and updating of the foregoing skills and knowledge is essential. This implies both continuing education and continuity and adequacy of clinical experience.

2. Two categories of Anaesthetic practice are recognised for the non-specialist anaesthetist

2.1 Diplomates of the College of Anaesthetists (DA(SA)) who are required to undergo supervised training for a minimum period of six months in an approved institution as well as a formal assessment and examination. The diplomat is eligible for independent practice of both general and regional anaesthesia in fit and healthy patients (ASA class I) and patients with controlled systemic disease (ASA class II) undergoing non-major surgery. Patients with poorly controlled systemic disease or functional limitation (ASA class III) should only be anaesthetised in consultation with an anaesthesiologist.
with a specialist anaesthetist or supervisor. Regarding paediatric anaesthesia it is reasonable to expect the diplomate to provide safe anaesthesia for fit and healthy paediatric patients over the age of three years, providing the practitioner has maintained the necessary skills, and the nature of the intended surgery is minor and elective.

The diplomate should be capable of providing safe and appropriate anaesthesia to all obstetric patients barring those with severe systemic disease (ASA class III or IV). In the face of an emergency, or where no alternative exists, the diplomate may in consultation with a specialist anaesthetist administer anaesthesia to sicker patients (ASA class IV and V) constituting supervised practice.

2.2 The level of training given at an undergraduate, intern and community service level cannot be seen to be sufficient to allow for the independent practice of anaesthesia. It would therefore be inappropriate for the medical practitioner who has not received formal anaesthetic training to independently administer general or major regional anaesthesia without supervision.
GUIDELINES TO THE PRE-OPERATIVE ANAESTHETIC EVALUATION

1. General

1.1 These standards apply to all patients who receive anaesthesia or monitored anaesthesia care (sedation). Under unusual circumstances, e.g., extreme emergencies, these standards may be modified. When this is the case, the circumstances shall be documented in the patient’s record.

1.2 An anaesthesiologist shall be responsible for determining the medical status of the patient, developing a plan of anaesthesia care and acquainting the patient or the responsible adult with the proposed plan.

1.3 Information is obtained by reviewing the medical record, interviewing the patient in terms of the medical history, previous anaesthesia experience, allergies, drug therapy, current disease and aspects that may influence perioperative decisions, results from special investigations or consultations.

1.4 Further consultation or investigations may be ordered at this stage, and specific preparation may be implemented.

1.5 The responsible anaesthesiologist shall verify that the above has been properly performed and documented in the patient’s record.

1.6 Pre-operative assessment should take place early in the patient’s journey so that all requirements for essential resources and obstacles can be anticipated before the day of the operation.

1.7 The anaesthesiologist who will actually give the anaesthetic should, ideally, visit the patient before the operation.

1.8 Sufficient time must be made available in the patient care pathway for the anaesthesiologist to cover the essential points of pre-operative assessment; job plans should incorporate adequate programmed activities for pre-operative anaesthetic visiting and assessment. Whenever possible a pre-operative consultation should be performed in a formal setting. Nevertheless, this might not always be practical or possible. There can therefore be no geographical or time limitation as to when or where this pre-operative consultation should take place.

1.9 At the time of the pre-operative consultation, premedicant drugs, if required, must be prescribed in writing and signed for on the appropriate document by the anaesthesiologist or the individual taking the anaesthesiologist’s orders. Such premedicant drugs may include those for night sedation.

1.10 Telephonic premedication

While it is generally accepted that the ideal is to visit all patients in the ward before prescribing premedicants, it may be in the patient’s best interests to prescribe these telephonically. Patients may, for example, only be admitted on the day of surgery while a busy surgical list is already in progress, making it difficult, if not impossible, for the anaesthesiologist to visit the patient in the ward prior to transfer to the operating suite. In such circumstances it may be desirable or even essential to prescribe some form of anxiolytic or other premedication. Provided the patient’s detailed history, as well as other admission criteria (such as age, weight and gender), are made available to the anaesthesiologist, and the patient is being attended by registered nurses who will have the patient under observation, premedicant drugs may be ordered telephonically. The overall responsibility will, in these circumstances remain that of the anaesthesiologist and he/she should refrain from telephone prescriptions if it is inappropriate.

2. Medical history

The following information, relevant to the anaesthetic management, should be obtained and recorded by the anaesthesiologist by taking a formal history, which may be supplemented with a questionnaire that includes.

2.1 Previous or present illnesses

2.2 Previous anaesthetics or surgery

2.3 Medication and allergies

2.4 Other relevant anaesthetic considerations

3. Physical examination

The above history should be supplemented by a physical examination at the time of the pre-operative consultation to include information deemed necessary by assessment of the individual patient.

3.1 The patient’s weight, height and temperature must be provided

3.2 Airway assessment

3.3 Clinical assessment of cardiovascular and respiratory status as considered appropriate by the anaesthesiologist

3.4 Blood pressure reading

3.5 Further systemic examination as is relevant

3.6 Point of care examination

3.7 Special investigations as indicated by ASA status of patient in the light of findings at the pre-operative assessment

4. Consent and explanation

4.1 Informed consent for anaesthesia and surgery needs to be obtained

4.2 The patient’s fears need to be allayed and reassurance given
4.3 The anaesthetic technique must be discussed with the patient or caretaker.

4.4 Only the more common and relevant risks of the anaesthetic procedure need to be explained to the patient and/or his/her family (as is appropriate). Explanation of risks should not necessarily include rare and uncommon outcomes, which will incur undue anxiety unless specifically asked for.

4.5 Explanations and answers to questions posed by the patient should be frank, but must be tailored according to:
   (i) the ability of the patient to grasp the implications fully; and
   (ii) the patient’s existing medical knowledge and medical background.

4.6 It is preferable that a written information sheet with simple information on fasting, anaesthesia, and pain relief is provided to elective patients before hospital admission.

4.7 The patient is entitled to enquire as to whether the “anaesthetist” is an anaesthesiologist (specialist anaesthetist) or not.

Further information
ASA webpage (www.asahq.org):
• Basic standards for preanaesthesia care
• Statement on routine preoperative laboratory and diagnostic screening
• Practice advisory for preanaesthetic evaluation

Royal College of Anaesthetists webpage (http://www.rcoa.ac.uk):
• Guidelines for the provision of anaesthetic services (July 2004), Chapter 3
SECTION IV

RECOMMENDED FACILITIES FOR SAFE ANAESTHETIC PRACTICE IN HOSPITALS

1. Principles of anaesthetic care

1.1 Anaesthesia should be administered only by medical practitioners with appropriate training in anaesthesia (see Section II).

1.2 The sine qua non of the safe conduct of anaesthesia is the physical presence of such a practitioner constantly in attendance during anaesthesia. Furthermore, the anaesthesiologist should be readily available during the period of recovery from anaesthesia until such time as the patient is deemed fit for transfer from the recovery area. Only in exceptional circumstances should the anaesthesiologist physically leave the operating room, and then only if continued supervision has been handed over to another suitably qualified medical person. In addition, the operating team should be informed that the anaesthesiologist will temporarily be out of the room and that continued monitoring will be performed by a substitute.

1.3 Every patient presenting for anaesthesia should have a general medical assessment by a medical practitioner, preferably by the doctor scheduled to give the anaesthetic. (See Section III)

1.4 A full contemporaneous record of the anaesthetic technique, patient responses to anaesthesia, and other pertinent medical information pertaining to the anaesthetic should be made by the practitioner delivering the anaesthetic.

1.5 Modern practice demands certain basic facilities and equipment for the safe administration of anaesthesia - see below.

2. Operating-theatre staff

2.1 In addition to the nursing staff required by the surgeon, it is considered essential for the safe and efficient conduct of anaesthesia that a suitably trained and competent registered or enrolled nurse or anaesthetic technician be available to assist the anaesthesiologist.

2.2 Such an assistant must be present during preparation for and during induction of anaesthesia, and must remain in the operating room until such time as the anaesthesiologist indicates that the assistant’s presence is no longer required. The presence of the assistant is similarly required at the conclusion of anaesthesia. The assistant should have no other obligations or duties during these periods.

2.3 During the maintenance of anaesthesia the assistant must be available immediately should he or she be required in the operating room.

2.4 Operating theatre rosters must be such as to ensure the allocation of such an assistant.

2.5 There should be at least one trained anaesthetic sister per operating room complex.

3. Anaesthetic equipment

Standards must be influenced by the nature of the surgery undertaken, and to some extent by the quality of the service offered by the institution, and the availability of maintenance and service facilities. Referral hospitals are usually in large centres and must meet higher standards.

3.1 Anaesthetic mixture components

The anaesthetic machine must not be capable of delivering a hypoxic mixture of gases under any circumstances.

**Essential:** Items considered as a minimum for the safe conduct of anaesthesia

3.1.1 Gas sources exclusively from cylinders must have:

- Pin-index yokes with pressure-reducing valves for both oxygen and nitrous oxide. These should be marked with the name or the chemical symbol of the gas and colour-coded in accordance with national standards.
- Pressure indicators for oxygen must be available.
- One nitrous oxide cylinder and one full spare per machine.
- Two oxygen cylinders and two full spares per machine.
- A suitable spanner or key must be available for opening and closing gas cylinders even where the cylinders have finger-control knobs. The spanner should be attached to the anaesthesia machine.

3.1.2 Gas sources from pipelines with back-up cylinders must have:

- Non-interchangeable wall points and connectors for nitrous oxide and oxygen and any other gases, conforming to national standards.
- Colour-coded pipeline hoses capable of withstanding pressures of up to 1 000 kPa affixed to anaesthetic machines by non-interchangeable fittings.
- Pressure indicators for each line.
- Non-return valves fitted at machine connection point of pipeline.
- One back-up cylinder with pin-index yoke for oxygen.
- One spare oxygen cylinder.
- A suitable spanner or key must be available for opening and closing gas cylinders even where the cylinders have finger-control knobs. This should be attached to the anaesthesia machine.

3.1.3 An oxygen failure device with an audible alarm, preferably continuous, must be fitted to the anaesthetic machine.

3.1.4 Appropriate flow controllers for all available gases:

- The flow measuring device for oxygen must be accurate to 100mL/min for flows up to 1L/min and accurate to 500mL/min for higher oxygen flows.
3.1.4.2 Where there is a sequence of gas control knobs, oxygen must be positioned on the right—~ as seen from a position facing the machine.
3.1.4.3 Oxygen must always be the final gas delivered to the common gas pathway.
3.1.4.4 Machines with electronic flow controllers must have a manual device for oxygen delivery independent of electrical supply.

3.1.5 One device capable of delivering accurate, controllable partial pressures of volatile anaesthetic agents at varying fresh gas flows and under the full range of normal clinical conditions. The graduations of the control should not exceed 0.5 minimum alveolar concentration (MAC) and provide at least 3 times the MAC of the selected agent.

3.1.6 Breathing system pressure relief valve should be set to 6 kPa, oxygen flush system delivering at least 35 l/min of oxygen at the machine outflow and controlled by an obvious, recessed, non-lockable button.

3.1.7 Outflow point connector of 22 mm ISO standard male taper.

3.1.8 These components are to be mounted on a rigid frame that maintains the flow-meters in a vertical position and the vaporiser level. The mounting frame for a mobile anaesthetic machine must be sufficiently stable to prevent it from being accidently tipped over. All ancillary monitoring equipment should be mounted on a suitable horizontal surface or securely attached to the machine.

3.1.9 Oxygen analyser with audible low-concentration warning device—~ which should be adjustable but with a minimum of 18%.

3.1.10 Where a potentially hypoxic gas mixture could be delivered, an hypoxic guard must be fitted to ensure a minimum oxygen concentration of 25%.

3.1.11 High-pressure gas supply master/slave switches whereby low pipeline or cylinder pressure of oxygen cuts off hypoxic gas sources (fail-safe device).

3.1.12 Pipeline supply for compressed air in all major theatres.
3.1.13 Appropriate delivery system for delivery of accurate flows of compressed air.
3.1.14 Gas delivery systems capable of delivering accurately proportioned fresh gas mixtures at flow rates down to 250mL/min.

3.2 Breathing circuits

**Essential**

3.2.1 A suitable breathing system for adult patients fitted at all junctions with ISO standard tapered fittings.
3.2.2 Paediatric anaesthetic breathing systems must be available in institutions where children might be anaesthetised.
3.2.3 One set of face masks per machine in a suitable range of sizes appropriate for patient population.
3.2.4 One set of Guedel oral airways per machine.
3.2.5 An appropriate range of different endotracheal tube sizes with standard connectors immediately available.
3.2.6 Breathing circuit pressure gauge.
3.2.7 A self-inflating resuscitation bag (Ambu or similar).

**Desirable:** Items considered not absolutely essential on a basic machine, but normally considered desirable for safe conduct of anaesthesia

3.2.8 Closed-circuit carbon dioxide absorber circle breathing system.
3.2.9 An appropriate anaesthetic ventilator.
3.2.10 Venturi injector for airway inflation within the theatre complex.

**Referral hospital** requirements must include all items set out under Desirable.

3.3 Ancillary equipment per theatre

**Essential**

3.3.1 Laryngoscopes (preferably with fibre-optic light carrier):
3.3.1.1 Two adult, preferably Macintosh pattern with all size blades.
3.3.1.2 Appropriate range of paediatric laryngoscope blades when anaesthesia might be provided for children.
3.3.2 Magill adult endotracheal tube introducing forceps.
3.3.3 Non-metallic or plastic coated, malleable endotracheal tube introducing stylettes.
3.3.4 Anaesthesiologist’s chair on wheels with backrest.
3.3.5 Full set of laryngeal mask airways per theatre complex.
3.3.6 There should be a wall clock with a sweep second hand or digital equivalent present in each theatre.
3.3.7 Suction unit for exclusive use by the anaesthesiologist, generating a minimum negative pressure of 50 kPa at a minimum airflow of 25 l/min into a reservoir bottle of at least 1 litre capacity. Adequate length of suction tubing and appropriate range of cannulae/catheters for oral and endotracheal suction.
3.3.8 Two kidney dishes as receivers for clean and dirty oral and endotracheal instruments.
3.3.9 Inflating device for endotracheal tube cuffs.
3.3.10 A monitor-defibrillator with adult and infant electrodes per theatre suite must be available. A pacing facility is desirable.
3.3.11 Operating table with Trendelenburg position controls at the head of table.
3.3.12 Two Lateral padded straight arm support.
3.3.13 Drug trolley for exclusive use of the anaesthesiologist.
3.3.14 Topical anaesthetic spray.
3.3.15 Two IV infusion poles.
3.3.16 A pair of strong scissors.
3.3.17 A method of securing the anaesthetic breathing system to the operating table.
3.3.18 Anaesthetic and surgical suction bottles should be graduated for volume.
3.3.19 An appropriate selection of intravenous fluids and intravenous infusion devices must be available.
3.3.20 Warming blankets/convection warmers for use in theatre. This is an absolute requirement for neonates and infants.
3.3.21 Where infants and small children are to be anaesthetised a full range of the necessary paediatric equipment as outlined above must be available.
3.3.22 A “sharps” container

**Desirable** Items considered not absolutely essential on a basic machine, but normally considered desirable for safe conduct of anaesthesia

3.3.23 Rigid bronchoscope (need not be for exclusive use by anaesthesiologist) with attachments for ventilating apnoeic patients available in the theatre suite.
3.3.24 Individual illumination of the anaesthesiologist’s area including emergency back up battery powered illumination source.
3.3.25 Pressure infusor for 500 ml (blood) or 1000mL IV bags.
3.3.26 All electrical equipment must be able to operate from batteries particularly where reliable emergency electrical supply is not available.
3.3.27 An appropriately sized fibre-optic bronchoscope in the theatre suite.
3.3.28 Infusion devices, pumps and/or syringe drivers.
3.3.29 In-line warmer for IV fluids.

**Referal hospital** requirements must include all those set out under **Desirable** for safe conduct of anaesthesia.

3.4 Monitors

**Essential**

3.4.1 Stethoscope.
3.4.2 An automated blood pressure measuring device, sphygmomanometer or oscillotonometer with an appropriate range of cuffs.
3.4.3 Thermometer for oesophageal, rectal or tympanic use, reading 22-42°C minimum range.
3.4.4 Electrocardiogram (ECG) monitor using 3-lead cable, chest electrodes and displaying an ECG trace on an oscilloscope screen using a non-fading technique. A display of heart rate is necessary together with limit alarms for heart rate. The unit must incorporate a diathermy filter.
3.4.5 Peripheral nerve stimulator per theatre suite.
3.4.6 Appropriate packing and equipment for positioning of patients to prevent injury.
3.4.7 Thermometer permanently displaying operating theatre temperature.
3.4.8 A pulse oximeter.
3.4.9 Oxygen monitor of the gases (inspired or expired) with at least a low-limit alarm.
3.4.10 Whenever an automatic ventilator is used, a breathing circuit pressure monitor with high and low-limit alarms must be incorporated.
3.4.11 A point-of-care device for the measurement of haemoglobin and/or haematocrit.
3.4.12 A point-of-care device for estimating blood glucose.
3.4.13 Capnograph for rapid breath-by-breath sensing of expired CO₂ levels.
3.4.14 Telephone in each theatre for communication.

**Desirable** Items considered not absolutely essential on a basic machine, but normally considered desirable for safe conduct of anaesthesia

3.4.15 Oesophageal stethoscope.
3.4.16 Coagulation monitoring device.
3.4.17 Cerebral function monitor.
3.4.18 Electronic pressure monitor for intra-arterial/intravenous pressures.
3.4.19 A peripheral nerve stimulator with double-burst stimulation and/or train-of-four facilities.
3.4.20 Nerve stimulator (may be incorporated in the device outlined in 3.4.19) to aid peripheral nerve blocks.

**Referal hospital** requirements must include all those set out under **Desirable** for safe conduct of anaesthesia.

3.5 Recovery Room Equipment

An area within the theatre suite, preferably with easy access from each theatre, must be provided for the recovery of patients from anaesthesia before discharge to the wards. For further details consult section V.

4. Drugs

In addition to the drugs commonly used to provide anaesthesia, the following basic drugs or their equivalents must be available.

4.1 Drugs used in the treatment of cardiac arrest

4.1.1 Adrenaline
4.1.2 Other inotropic agents, e.g. dopamine, dobutamine
4.2 Bronchodilators
   4.2.1 Salbutamol or hexoprenaline
   4.2.2 Aminophylline

4.3 Corticosteroids
   4.3.1 Hydrocortisone
   4.3.2 Dexamethasone or methylprednisone or equivalent

4.4 A vasopressor, e.g. ephedrine, phenylephrine or etilefrine.

4.5 A vasodilator, e.g. sodium nitroprusside, trinitroglycerine.

4.6 Other drugs
   4.6.1 Lignocaine hydrochloride and other local anaesthetic agents (e.g. bupivacaine, ropivacaine L-bupivacaine)
   4.6.2 Sodium bicarbonate
   4.6.3 Calcium chloride/gluconate
   4.6.4 Beta-adrenergic blocker, e.g. propranolol, esmolol
   4.6.5 Digoxin
   4.6.6 Atropine/glycopyrrrolate
   4.6.7 Neostigmine
   4.6.8 Frusemide
   4.6.9 Mannitol
   4.6.10 Dextrose 50%
   4.6.11 Normal saline
   4.6.12 Oxytocin
   4.6.13 Midazolam or other benzodiazepines
   4.6.14 Flumazanil
   4.6.15 Verapamil or other calcium channel blocker
   4.6.16 Naloxone
   4.6.17 Dantrolene (must be available within 10 minutes)
   4.6.18 Adenosine
   4.6.19 Amiodarone

5. Routines for checking, cleaning, servicing and storage of equipment

5.1 Any institution at which anaesthetics are given must provide an efficient and reliable maintenance and repair service for all anaesthetic equipment. A suitable mechanism must exist whereby faulty essential equipment can be replaced immediately.

5.2 Regular sterilising, cleaning and housekeeping routines for the care of anaesthetic equipment should be established.

5.3 Servicing by an appropriately certified organisation or persons should be carried out on a regular and appropriate basis.

5.4 To promote maximum safety in relation to service procedures the following points are important prerequisites:
   5.4.1 Individual anaesthetic machines should be clearly identified either by the maker’s serial number or preferably by a hospital marking. This identification must extend to all the readily removable components, such as canisters and vaporisers, so that the performance and checking of these can be followed without confusion.
   5.4.2 A record of service procedures performed on each machine, signed by the person responsible for the service, must be provided to the appropriate hospital personnel, e.g. department of anaesthesia, anaesthetic technical staff or theatre nursing staff depending on local circumstances.
   5.4.3 In newly built operating theatres or where operating suites have had major structural alterations, or where anaesthetic machines are either new or returning to use after storage for a period exceeding the normal service interval an instrument check using appropriate gas analysis and flow measurement should be undertaken to ensure that correct gases are emerging from line and machine outlets and that flowmeters are accurate. If this cannot be performed by hospital personnel it should be carried out by company service personnel and duly signed on the service document.
   NB: These tests should be carried out in the presence of a responsible anaesthesiologist who will be working in the operating suites and appropriate certification obtained prior to use.
   5.4.4 Adequate time must be made available for service personnel to perform both regular and emergency servicing without compromising safety.

5.5 Storage facilities should be available for nitrous oxide and oxygen in the sterile area. This storage area should fulfil the criteria described in the appropriate South African Bureau of Standards Code of Practice.

6. RECOVERY AREA
Recommendations as laid out in SASA Section V, ‘Guidelines for the care of patients recovering from anaesthesia’, should be applied.
SECTION V

GUIDELINES FOR THE CARE OF PATIENTS RECOVERING FROM ANAESTHESIA

GENERAL PRINCIPLES
1. Recovery from anaesthesia must take place under appropriate supervision in an area designed for this purpose.
2. This area should be either in the theatre itself or close to where the anaesthetic was administered.
3. The staff working in this area must be appropriately trained. When the need arises the staff must be able to contact the anaesthesiologist or his/her designate promptly.
4. It is desirable for patients to have regained consciousness and be in a stable state before they are transported any distance.
5. If patients have to be transported within and from the operating suite while not fully recovered, they must be on a suitably designed trolley/bed capable of head-down tilt. The bed or trolley should be provided with oxygen, a means of inflating the patient’s lungs, equipment for suctioning and an appropriate monitor. They must be accompanied by staff able to deal with the problems that may occur during transport.

OPERATING SUITE RECOVERY ROOMS

1. Design features
   1.1 The area should be part of the operating suite.
   1.2 The number of bed/trolley spaces must be sufficient for expected peak loads and there should be not less than 1.5 spaces per operating room.
   1.3 The space allocated per bed/trolley should be 9 to 12 square metres. There must be easy access to the head of the patient.
   1.4 Space must also be provided for a nursing station, storage of clean linen, equipment and drugs, and a utility room.
   1.5 Each bed must be provided with:
      1.5.1 An oxygen outlet
      1.5.2 Two general power outlets
      1.5.3 Adequate lighting of the correct colour balance
      1.5.4 Appropriate facilities for mounting and/or storing the necessary equipment, and for the patient’s chart
      1.5.5 Medical suction complying with relevant national standards Refer Section IV paragraph 3.3.7
   1.6 There must be appropriate facilities for scrubbing up procedures.
   1.7 There should be a wall clock with a sweep second hand or digital equivalent clearly visible from each bed space.
   1.8 Communication facilities should include:
      1.8.1 An emergency call system
      1.8.2 A telephone
   1.9 Climate control to operating room standards is desirable.
   1.10 There should be easy access for portable X-ray equipment with appropriate power outlets provided in the area.

2. Equipment and drugs
   2.1 Each bed space should be provided with:
      2.1.1 An oxygen flow meter and nipple
      2.1.2 Suction equipment including a receiver, tubing, a rigid hand piece and a range of suction catheters, including Yankauer
      2.1.3 An automated non-invasive blood pressure monitor with appropriately sized cuffs
      2.1.4 A stethoscope
      2.1.5 A pulse oximeter
      2.1.6 Means of measuring body temperature
   2.2 Within the recovery room there must be:
      2.2.1 A range of devices for the administration of oxygen to spontaneously breathing patients.
      2.2.2 A self inflating manual resuscitator e.g. Ambu bag in order to deliver an oxygen enriched mixture for inflating the lungs. A minimum of 2 per recovery room complex is required
      2.2.3 Equipment and drugs for airway management and endotracheal intubation
      2.2.4 Emergency drugs (see section IV, para 4)
      2.2.5 A range of intravenous equipment and fluids
      2.2.6 Drugs and equipment for acute pain management
      2.2.7 A range of syringes and needles
      2.2.8 An ECG monitor
      2.2.9 Patient warming devices
2.3 There should be immediate access to:
   2.3.1 A monitoring defibrillator preferably with pacing facility
   2.3.2 A blood warmer
   2.3.3 A thermostatically-controlled warming cupboard for intravenous solutions
   2.3.4 A refrigerator for drugs and blood
   2.3.5 A procedure light
   2.3.6 A range of appropriate drugs
   2.3.7 A surgical tray for procedures including tracheostomy and chest drains
   2.3.8 Point of care access to diagnostic services e.g. blood glucose, blood gases, radiology
   2.3.9 A peripheral nerve stimulator
   2.3.10 Other equipment as appropriate to the patient’s condition (e.g. wire cutters)
   2.3.11 Ventilator

2.4 The recovery trolley/bed must:
   2.4.1 Have a firm base and mattress
   2.4.2 Tilt from either end - both head up and head down - to at least 15 degrees
   2.4.3 Be easy to manoeuvre
   2.4.4 Have functional and accessible brakes
   2.4.5 Have provision for sitting the patient up
   2.4.6 Have straps or side-rails which must be able to be dropped below the base or be easily removed
   2.4.7 Have provision for a pole from which intravenous solutions may be suspended
   2.4.8 Have provision for monitoring, mounting portable oxygen cylinders, underwater seal drains and suction apparatus for use during transport.

3. Staffing
   It is the responsibility of the institution to ensure that the staff appointed to the recovery room is trained and competent. The recovery staff must be available at all times.

   3.1 A registered or enrolled nurse trained and competent in recovery room care must be present at all times.
   3.2 An appropriately trained registered nurse experienced and competent in recovery room work should be in charge.
   3.3 The ratio of nursing staff trained in recovery room care to patients needs to be flexible so as to provide no less than 1 : 2 patients, and one to each patient who has not recovered protective reflexes.

4. Management and supervision
   4.1 Written protocols for safe management should be established.
   4.2 A written routine for checking the equipment and drugs must be established.
   4.3 Observations should be recorded at appropriate intervals and should include at least: state of consciousness, colour, respiration, oxygen saturation, pulse and blood pressure and level of pain. The record should form part of the patient’s clinical notes.
   4.4 All patients should remain until the anaesthesiologist considers it safe to discharge them from the recovery room, according to validated criteria, which includes the return of protective airway reflexes, stable cardiovascular and respiratory function, full reversal of neuromuscular blockade, absence of nausea and vomiting and absence of pain.
   4.5 The anaesthesiologist is responsible for:
      4.5.1 Supervising the recovery period and authorising the patient’s discharge
      4.5.2 Accompanying the patient to the recovery room and adequately handing him/her over to the nursing staff who will document the patient’s condition on arrival and subsequent course in recovery
      4.5.3 Providing appropriate written and verbal instructions and information to the recovery room staff for each case
      4.5.4 Specifying the type of apparatus and the flow rate to be used in oxygen therapy
      4.5.5 Remaining in the facility until the patient meets the criteria detailed in 4.4, or delegating this responsibility to another anaesthesiologist or intensivist.
GUIDELINES

SECTION VI

MAJOR REGIONAL ANAESTHESIA

1. Introduction
1.1 Major regional anaesthesia should only be administered by medical practitioners with appropriate training and resuscitation skills
1.2 A single operator may not assume the dual role of anaesthesiologist / anaesthetist and surgeon / obstetrician
1.3 An exception may occur in that, in an emergency situation, a single practitioner may assume the dual responsibility of the operator and the anaesthesiologist/anaesthetist in the context of neuraxial blockade or major plexus anaesthesia.

2. Principles
2.1 The practitioner is expected to have the skill and ability to promptly recognise and adequately treat any complication that may arise from the anaesthetic technique.
2.2 Management of major regional anaesthesia should include appropriate monitoring of the patient during and after the completion of the block. The practitioner must be present until the block is fully established. All vital signs and physiological parameters of the patient must be within normal limits for that patient and the condition of the patient must be stable before the practitioner leaves the facility where the procedure has been performed.
2.3 Staffing and equipment in the area in which the patient is being managed should conform with the recommendations contained in Section IV and V of these guidelines.

3. Neuraxial anaesthesia and analgesia
These procedures refer to the injecting of pharmaceutical preparations into the vicinity of spinal cord or nerve tissue. The methods of administration of these agents and the agents used may vary but the underlying principles for the management of the patient remains the same. The agents used are local anaesthetics, opiates, and other analgesics or adjuvants. The methods of administration include administration by bolus or intermittent bolus with or without indwelling catheter placement, and administration by continuous infusion via an indwelling catheter.

3.1 Responsibility of the practitioner
3.1.1 The responsibility for the application, maintenance and sequelae of neuraxial techniques, regardless of the anaesthetic technique or the agent used, is that of the attending practitioner
3.1.2 A practitioner may delegate such responsibility to another suitably trained medical practitioner or competent nursing personnel, who will then assume subsequent responsibility
3.1.3 The responsible practitioner must:
    3.1.3.1 Ascertain that there is no absolute contraindication to the procedure
    3.1.3.2 Ensure that the patient understands and gives his informed consent to the procedure
    3.1.3.3 Ensure that all equipment and drugs necessary for the management and prevention of complications related to the procedure are immediately available
    3.1.3.4 Establish intravenous access prior to the procedure
    3.1.3.5 Check the agent/s to be injected and administer the initial dose
    3.1.3.6 Ensure that adequate monitoring is performed and that accurate records are kept

3.2 Monitoring and clinical observations
3.2.1 The practitioner or a qualified nursing sister or trained observer must be in constant attendance in order to perform regular and appropriate monitoring of the patient’s physiological status and the effects of the block
3.2.2 Such an observer shall:
    3.2.2.1 have been trained in the proper use and have an understanding of monitoring equipment;
    3.2.2.2 have the necessary clinical skills to perform, interpret and react appropriately to basic clinical observations made on the neurological, respiratory and cardiovascular status of the patient
3.2.3 Such an observer shall be trained in measures related to basic life support
3.2.4 All orders and routines to be followed by the observer should be conveyed in writing by the responsible practitioner
3.2.5 The practitioner who performed the block, or the designated practitioner, must at all times be available to the observer for consultation and recall
3.2.6 Availability should be interpreted according to the stage of evolvement of the blockade, the likelihood of complications pertinent to that stage, the concomitant use of other drugs including those used for sedation, the presence of other co-morbid disease, and physical status of the patient
3.2.7 It is not incumbent on the practitioner to be physically present until complete regression of blockade, provided the other conditions of these guidelines are fulfilled
3.2.8 The responsible practitioner is free to embark on other procedures provided this does not conflict with the other conditions outlined in these guidelines
3.3 ‘Topping-up’ and management of continuous infusions

3.3.1 There is no objection to a qualified nursing sister or junior doctor’s undertaking the ‘topping-up’ or adjustment of continuous infusion rates. The responsible practitioner must be satisfied that the experience and capabilities of such a person are appropriate and each ‘top-up’ or change in dosage should be verbally confirmed. This must be recorded in writing as soon as possible.

3.3.2 The responsibility for the effects of the top-up or dosage alteration remains that of the practitioner responsible for the procedure.

3.3.3 Written instructions as to the dose or infusion rate must be issued by the responsible practitioner.

3.3.4 The dose, or change in infusion rate, should be checked and verified by a second competent person prior to any action being taken.

3.3.5 Instructions as to patient posture at the time of injection, clinical observations, and measures to be taken in the event of untoward effects must be issued by the responsible practitioner.

3.3.6 There is no objection to a qualified nursing sister or junior doctor removing an epidural catheter on the instructions of the responsible practitioner.

4. Major plexus anaesthesia

These procedures involve injecting pharmaceutical agent(s) into the close proximity of major nerves or nerve plexuses. The agents employed for these purposes include local anaesthetics and opioids or other recognized adjuvants. The methods of drug administration include single bolus injections or continuous infusions via indwelling catheters.

4.1 Responsibility of the practitioner

4.1.1 The responsibility for the application, maintenance and sequelae of the block, regardless of the anaesthetic technique or the agent used, is that of the attending practitioner.

4.1.2 The responsible practitioner must:

4.1.2.1 Ascertain that there is no absolute contraindication to the procedure.

4.1.2.2 Ensure that the patient understands and gives their informed consent for the procedure.

4.1.2.3 Ensure that all equipment and drugs necessary for the management and prevention of complications related to the procedure are immediately available.

4.1.2.4 Check the agent to be used and administer the first dose.

4.1.2.5 Ensure that adequate monitoring is performed and that accurate records are kept.

4.2 Monitoring and clinical observations

This responsibility remains with the practitioner who performs the procedure. The same principles apply to plexus anaesthesia as to neuraxial blockade. (See paragraph 3.2).

4.3 ‘Topping-up’ and management of continuous infusions

The same principles apply to plexus anaesthesia as to neuraxial anaesthesia. (See paragraph 3.3).
SECTION VII

GUIDELINES FOR INTENSIVE CARE 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 centers should aspire to the guidelines set out herein. They should not be viewed as a binding code of practice.

These guidelines for intensive care have been formulated to assist in the practice and provision of intensive care for physicians, hospital administrators and developers. Intensive care (or intensive therapy or critical 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 critically ill are concentrated and where the level of care and supervision is considerably more sophisticated than in the ordinary ward. These units may be multidisciplinary, dealing with all types of critically ill patients, or specialized, dealing with specific entities, e.g. general surgical patients, neuro- or cardiac surgical patients, coronary care or paediatric, etc. The level of care and facilities required vary depending on the type of patient admitted. This helps to determine the staffing, equipment, services and other facilities required in specific intensive care units.

1. Categories of intensive care units

1.1 Category 3 (tertiary ICU facility)

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

1.1.1 With multiple-organ failure
1.1.2 Requiring multidisciplinary intervention
1.1.3 Requiring ventilation with second-organ failure
1.1.4 Requiring haemodialysis with second-organ failure
1.1.5 Haemodynamically unstable patients, e.g. unstable myocardial infarct, immediate post bypass surgery, etc.

1.2 Category 2 (Specialised organ support unit)

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

1.2.1 Require active system support, e.g. intermittent positive-pressure ventilation
1.2.2 Have single-organ failure, e.g. stable myocardial infarct, diabetic coma, head injury, flail chest, severe asthma, acute pancreatitis, status epilepticus, eclampsia, etc.
1.2.3 Airway problems
1.2.4 Conditions requiring potent drug infusions, e.g. sodium nitroprusside, dopamine, etc.

1.3 Category 1 (High care)

Patients who are admitted to this category of intensive care unit require intensive monitoring only and include those patients who have:

1.3.1 Fluid, electrolyte or metabolic disturbances (e.g. diabetic pre-coma, post-operative monitoring)
1.3.2 Drug overdose not requiring IPPV
1.3.3 Neuromuscular weakness not requiring IPPY
1.3.4 Single-organ dysfunction not requiring active support (e.g. asthma, congestive cardiac failure, pneumonia)

Most intensive care units will not only admit one or other category of patient but the majority of patients should fall into the category which is designated for the ICU and as such should provide the facilities recommended for the highest category of patient admitted to the ICU. If these facilities and staff are not available, the patients who require a higher category of intensive care should be transferred to an institution where this can be provided once the patient is haemodynamically stable. Transport should be supervised by the senior transferring doctor or by the admission unit.

Isolation facilities must be available in all categories of ICU for patients who have multi-resistant organisms or who have highly contagious diseases (i.e. single-bed cubicles with separate ablution facilities if possible). Isolation facilities should also be available for the care of immunosuppressed patients.

2. 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, with facilities available for rapid effective communication between staff members within the unit and those providing back-up services.

2.1 Medical staff

2.1.1 Category 3 ICU

2.1.1.1 Requires a full-time medical director who should be an intensivist. 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), supervisory role, liaison with hospital management, selection of admissions to unit, arranging of training and research programs, maintaining of records and equipment and general supervision of the daily running and forward planning of the ICU. The admitting physician should not abrogate total responsibility for patient care.

2.1.1.2 Twenty-four-hour consultant availability. Consultants should have clinical and teaching responsibilities and should have a minimum training of 2 years in an acceptable ICU unit. These consultants should have an acceptable higher qualification in anaesthesia, surgery, internal medicine or paediatrics. The consultant should be physically present within 30 minutes if necessary.

2.1.1.3 Twenty-four-hour registrar (surgical, medical, anaesthetic or paediatric) or equivalent medical graduate available on the premises 24 hours a day. This person must be available immediately and should not be committed to other duties.

2.1.2 Category 2 ICU
2.1.2.1 Consultant cover 24-hourly. Consultants should have accepted higher training as in 2.1.1.2.
2.1.2.2 Registrar-in-training or equivalent doctor or consultant must be available in hospital within minutes if necessary.

2.1.3 Category 1 ICU
2.1.3.1 Consultant cover 24-hourly. Specialists in anaesthesia, internal medicine, paediatrics or surgeons with a minimum of 3 months' intensive care experience in an acceptable ICU (pre- or post-higher training are preferable).

2.2 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.

2.2.1 Category 3 ICU
2.2.1.1 ICU nurse/patient ratio 1.5 : 1 and 2 : 1 depending on number of category 3 patients. (This means that there is one registered nurse with each patient at all times.)
2.2.1.2 Not less than 50% of nurses with intensive care nurse training.

2.2.2 Category 2 ICU
2.2.2.1 Nurse/patient ratio 1 : 1
2.2.2.2 At least 25% of nurses should be trained in intensive care

2.2.3 Category 1 ICU
2.2.3.1 Nurse/patient ratio 1 : 2
2.2.3.2 Control nurse should be trained in intensive care

2.2.4 Nursing assistants
The above ratio of nurses to patients may be slightly decreased if nursing assistants can be used for patient washing, as runners and to assist nursing staff in other ways. They should not, however, take over patient care responsibilities or monitoring responsibilities. Nurses should not work more than 12 hours in any period of 24 hours.

2.3 Technologists
Technologists who have been trained in any of the recognized branches of medical technology or intensive care technologists who have a minimum of a year's intensive care unit experience should be available 24 hours a day to provide equipment and therapeutic support. This includes:
2.3.1 Care, maintenance and decontamination of ICU equipment
2.3.2 Operation of ICU equipment
2.3.3 Setting up and calibration of monitoring equipment, e.g. pressure transducers, oximetry, gas analyzers, etc.
2.3.4 Blood gas analysis, oximetry, electrolyte estimations, etc.
2.3.5 Education of nursing and paramedical staff in user care and operation of equipment.

A technologist should be available on call in all three categories of ICUs on a 24-hour basis.

2.4 Physiotherapists
A physiotherapist experienced in ICU work (minimum 6 months' experience in an acceptable ICU) should be available on a 24-hour basis.

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

2.6 Secretaries, clerks and cleaners
2.6.1 Secretarial assistance should be available for patient summaries and records
2.6.2 A ward clerk should be available for filing, taking calls, handling visitors and handling requests for investigations.
2.6.3 A cleaning staff team should be available to provide a 24-hour cleaning service.

2.7 Social worker
A social worker should be available to solve patients’ and their dependants’ social and financial problems.

3. Design of ICUs

3.1 Facilities

3.1.1 Siting
The ICU should be sited close to the departments from which patients are admitted such as emergency and accident units, recovery rooms and theatres, etc. It should be easily accessible to support areas such as chemistry laboratories, bacteriological laboratories, sterilizing units, radiographic facilities and other diagnostic and treatment areas. It should be positioned where optimal use can be made of outside windows, lighting and views for both patients and staff.

3.1.2 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 and there should be at least 20 square meters of floor area for each bed in open-plan areas at least 2 meters of corridor space beyond the working area. Separate cubicles are preferable in many instances. A minimum of one isolation cubicle should be available for every 5 ICU beds.

3.1.3 Lighting
Maximum use should be made of outside windows and artificial lighting should be of the correct color temperature and should have the facility to provide regional dimming and provide lighting over single beds only.

3.1.4 Hand basin
1 per bed to 1 per 2 beds.

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

3.1.5.1 Communication:
- 2 telephones per 3 - 4 beds.
- An intercom system connecting related areas, laboratories, etc.
- Audible signals should be adjustable in intensity as well as have visual signals.

3.1.5.2 Central monitoring

3.1.5.3 Drug storage and administration facilities

3.1.5.4 Facilities for storage of notes

3.1.5.5 Emergency trolley

3.1.5.6 Electrical sockets

3.1.5.7 Refrigeration storage

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

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

3.2 Additional support

3.2.1 Chemistry laboratory

3.2.2 Microbiology laboratory

3.2.3 Sterilizing service

3.2.4 Haematology service

3.2.5 Pathology service

3.2.6 Dietetic service

4. Equipment

4.1 Monitoring equipment
Appropriate monitoring ensures:
- Early detection of abnormalities requiring correction
- Continuous surveillance of the patient’s condition
- Evaluation of the effects of any intervention

For the early detection of abnormalities requiring 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, end-tidal CO₂).

4.1.1 ECG monitor:
- ICU category 3, 2 and 1 (1 per bed).
4.1.2 Pressure monitor/transducers:
ICU category 3 (3 channels per bed).
ICU category 2 (2 channels per bed).
ICU category 1 (1 channel per bed).
4.1.3 Baumanometer (preferably an automatic manometer as well, e.g. Dinamap):
ICU categories 3, 2 and 1 (1 per bed).
4.1.4 Oximetry:
ICU categories 3, 2 and 1 (1 per bed).
4.1.5 Exhaled CO2 and O2 analyzers:
ICU category 3 (1 per 10 beds).
4.1.6 Glucotest machine or equivalent:
ICU categories 3, 2 and 1 (1 per unit).

4.2 System support equipment:
4.2.1 Ventilators with appropriate humidification devices and air- oxygen mixers, 3 - 4 ventilator circuits per ventilator:
ICU category 3 (1.5 per bed).
ICU category 2 (1 per bed).
4.2.2 Constant positive airways pressure (CPAP) facilities with air oxygen mixers:
ICU categories 3 and 2 (1 per 2 beds).
ICU category 1 (1 per 4 beds).
4.2.3 Renal replacement therapy/ haemoperfusion
ICU categories 3 and 2 (must be available).
4.2.4 Plasmapheresis:
ICU categories 3 and 2 (must be available).
4.2.5 Aortic balloon pump:
ICU category 3 (must be available).
4.2.6 Manual resuscitators:
ICU categories 3, 2 and 1 (1 per bed).

4.3 Other equipment
4.3.1 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 sit up. They should preferably be electrically operated as well as have a manual assist or hydraulics for easy movement. They must be mobile with suitable locking and must be suitable for intubation.
4.3.2 Infusion controllers/pumps:
ICU categories 3 (8 per bed) 2 (6 per bed)
ICU category 1 (2 per bed).
4.3.3 Infusion controllers should be used for intravenous fluid (iv) administration and syringe pumps for drug administration.
4.3.4 Suction controllers (to provide a negative pressure of 66.6 kPa and maintain a flow of 40 l/min):
ICU categories 3, 2 and 1 (2 per bed).
4.3.5 Emergency intubation trolley:
ICU categories 3, 2 and 1 (1 per unit), to carry:
4.3.5.1 Laryngoscope x 2 (small, medium and large blades)
4.3.5.2 Selection of endotracheal tubes
4.3.5.3 Selection of tracheostomy tubes
4.3.5.4 Endotracheal tube introducer
4.3.5.5 Magill forceps
4.3.5.6 Mouth gag and wedge
4.3.5.7 4% lignocaine solution
4.3.5.8 Macintosh or equivalent spray device
4.3.5.9 Vasoconstrictor nose drops (e.g. ephedrine)
4.3.5.10 Mosquito forceps (protected jaws to clamp pilot tube)
4.3.5.11 Tracheostomy dilator
4.3.5.12 Small Langenbeck retractors x 2
4.3.5.13 Headlight
4.3.5.14 Strapping for endotracheal tubes
4.3.5.15 Tracheostomy tape
4.3.5.16 Hand sucker and suitable suction tube
4.3.5.17 Appropriate drugs for sedation/ anaesthesia during intubation
4.3.5.18 Syringes and needles
4.3.5.19 Infusion sets and iv cannulas including central venous cannulas
4.3.5.20 A range of intravenous fluids
4.3.5.21 Manual resuscitator/catheter mount/masks
4.3.5.22 Emergency chest drain pack

4.3.6 Defibrillator/external pacing device
 ICUs categories 3, 2 and 1 (1 per unit)

4.3.7 Procedure light (pivot light of high intensity for special procedures):
 ICUs categories 3, 2 and 1 (1 per bed)

4.3.8 Forced air convective warming devices:
 ICUs categories 3, 2 and 1 (1 per 3 beds)

4.3.9 Haemoglobinometer:
 ICUs categories 3, 2 and 1 (1 per unit)

4.3.10 Urine testing apparatus:
 ICUs categories 3, 2 and 1 (1 per unit)

4.3.11 Microscope:
 ICUs categories 3, 2 and 1 (1 per unit)

4.3.12 Ophthalmoscope and bedside investigational apparatus:
 ICUs categories 3, 2 and 1 (1 per unit)

4.3.13 A flexible fibre-optic bronchoscope:
 ICUs categories 3 and 2 (1 per unit)

4.3.14 Chest drainage suction apparatus

4.3.15 Micro-haematocrit

4.3.16 Stethoscope (1 per bed)

4.3.17 There should be a wall clock with a sweep second hand clearly visible from each bed space

4.3.18 Spirit levels (1 per bed)

4.3.19 Respirometers (1 per bed)

4.3.20 A transport monitor
 All ICUs categories (At least one per unit)

5. Services

5.1 Lighting
 Natural daylight, preferably with a view, must be utilized as much as possible for both patients and staff. Artificial light should be of daylight quality with the ability to light sections of the ICU only in addition to single-bed area only, and there should be facilities for suitable dimming for night lighting.

5.2 Electricity
 The electricity should be 220-volt single-phase with a single common earth ground and with all outlets to the patient areas 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 5 seconds interruption when switching to the standby source. The standby generator should be tested at least every month. Separate protected battery power sources may be required for emergency lighting, computers, ventilators and other sensitive equipment.

5.3 Medical gases

5.3.1 Oxygen
 Medical oxygen should be available at a pressure of 4 bar. This pressure should be maintained when a flow of 50 l/min 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 indication (in the ICU and at the changeover area) when one bank of cylinders is exhausted.

5.3.2 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/min at each outlet when all are in use. The supply should be supplied by a fail-safe tandem system of providing compressed air.

5.4 Vacuum
 The ICU should have a central vacuum supply capable of generating a negative pressure of 50 kPa and of maintaining 40 l/min air flow at each suction outlet when all outlets are in use.

5.5 Air conditioning
 The unit should be air-conditioned to allow a choice of temperature from 16°C to 27°C and a choice of humidity from 25% to 95%. Patient areas should have at least 3 changes of air per hour. A thermometer and hygrometer are necessary to monitor air conditioning in each room.

5.6 Communications

5.6.1 Telephones - two telephones will be required for every 3 - 4 beds.

5.6.2 An intercom should be available in every unit connected between all other intensive care rooms and other major service departments such as chemistry laboratories, microbiology laboratories, etc.

5.6.3 Medical staff and other staff should be immediately contactable through some form of paging system.
5.6.4 Alarm calls displaying origin should be operated from each bedside and visible at a central station. An alarm call should be available in the doctor’s bedroom.

5.6.5 A computer station should be available for computerized results if the facilities exist.

5.7 Bedhead layouts
Access to the head of the bed must be unimpeded.

5.8 Gas outlets
5.8.1 Oxygen:
   ICU categories 3 and 2 (3 per bed).
   ICU category 1 (1 per bed).
5.8.2 Air:
   ICU categories 3 and 2 (2 per bed).
   ICU category 1 (1 per bed).

5.9 Electricity points
These should have a pilot light indicating that the circuit is live (no more than 4 points per fuse):
   ICU categories 3 and 2 (16 per bed).
   ICU category 1 (6 per bed).

5.10 Vacuum inlets
For suction controller, tracheal aspiration and continuous drainage suction:
   ICU categories 3 and 2 (3 per bed).
   ICU category 1 (2 per bed).

5.11 Mounts for monitors.

5.12 Hanging IV sky hooks (or equivalent):
   ICU categories 3, 2 and 1 (2 per bed).

5.13 Equipment rails - electricity points, gas outlets and equipment rails must be distributed to both sides of the bed. Some rails must be below electrical outlet.

6. Diagnostic and investigational facilities

6.1 Biochemistry laboratory (24-hour availability)
   6.1.1 Full serum chemistry:
      ICU categories 3, 2 and 1
   6.1.2 Full urinary chemistry:
      ICU categories 3, 2 and 1
   6.1.3 Blood gas laboratory:
      ICU categories 3 and 2 should be within the unit
      ICU category 1 must be available immediately

6.2 Bacteriology laboratory Full microbiological service:
   ICU categories 3, 2 and 1 (24-hour availability)

6.3 Haematology laboratory (24-hour availability)
   6.3.1 Full blood counts
   6.3.2 Coagulation screens

6.4 Diagnostic radiography
   6.4.1 Routine radiography:
      ICU categories 3, 2 and 1 (24-hour availability)
   6.4.2 Ultrasound investigation:
      ICU categories 3 and 2 (24-hour availability)
      ICU category 1 (daytime availability)
   6.4.3 Computed tomography scanning:
      ICU categories 3 and 2 (24-hour availability)
      ICU category 1 (daytime availability)
   6.4.4 Radio-isotope scanning:
      ICU categories 3, 2 and 1 (daytime availability)
   6.4.5 Angiography:
      ICU categories 3 and 2 (24-hour availability)
      ICU category 1 (daytime availability)

7. Recommended training for intensive care staff

7.1 Medical staff
Career in intensive care medicine
7.1.1 Director of an intensive care unit
A minimum of 2 years in a full-time capacity in an acceptable intensive care unit at the level of junior consultant (i.e. after higher training) is recommended. Acceptable higher training includes anaesthesia, internal medicine, paediatrics or surgery.
The 2 years may be a combination of the following experience:
• Not less than 1 year in a multidisciplinary ICU (admits surgical, medical and trauma patients). The unit should treat more than 300 patients per year.
• The second year may comprise not more than 6 months in each of the following ICUs: surgical ICU, neurosurgical ICU, cardiac surgical ICU, coronary care unit, paediatric ICU, total parenteral nutritional unit, renal unit.

7.1.2 Director of specialized unit (coronary care or paediatric unit)
For a career in a specialized unit the following requirements should be fulfilled:
• Not less than 18 months in the specialized unit and not less than 6 months in an ICU (category 3 multidisciplinary intensive care unit at a junior consultant level.)

7.1.3 Consultant in intensive care (ICU categories 3, 2 and 1)
A consultant in ICU will supervise patient care and should be a specialist in anaesthesia, internal medicine, paediatrics or surgery and should have had a minimum of 1 year’s experience in an acceptable intensive care unit. The following criteria should be met:
• Not less than 6 months full-time in an acceptable multidisciplinary category 3 ICU at a junior consultant level (these 6 months may be in a specialized unit, i.e. coronary care or paediatric unit, if the trainee is to act as a consultant in a specialized unit).
• The remaining 6 months may be spent in any other acceptable ICU including multidisciplinary, general surgical, cardiac surgical, neurosurgical, paediatric or coronary care at a registrar or junior consultant level.
• No less than 9 months of the total training should be full-time experience. The remaining 3 months may be made up of part-time experience on a pro rata basis (i.e. 6 months of 50% involvement).

7.1.3.1 Consultant in intensive care (category 1)
A specialist in anaesthesia, internal medicine, paediatrics or surgery with a minimum of 3 months’ full-time experience in an acceptable ICU at either junior consultant or registrar level is acceptable to supervise patient care in a category 1 ICU.

7.2 Nurse training
The South African Nursing Council or British Nursing Council equivalent ICU training courses are the recommended minimum requirements for senior control nurses.

7.3 Technologists
Any national diploma in clinical technology which has included not less than 1 year’s experience in an acceptable intensive care unit during or after training is recommended.

7.4 Physiotherapists
Completion of any acceptable intensive care course for physiotherapists and an additional 6 months’ experience in an acceptable ICU is recommended.

8. Protocols and policies
Protocols and policies for common ICU activities (as outlined below) and, where appropriate, unit specific procedures and interventions should be established, reviewed and practised.

8.1 For all procedures
The availability, and correct calibration and function, of all necessary equipment should be checked in advance. The operator should be appropriately experienced or supervised, and competent assistance should be available. Expected benefits should outweigh anticipated risks. Specific risk-benefit assessments should be made at least daily, and all invasive devices removed as soon as practicable.

8.2 Intravascular catheters
8.2.1 The location of ‘central’ catheter tips should be checked by X-ray after insertion and re-positioning
8.2.2 Waveforms should be inspected critically at regular intervals
8.2.3 When a pulmonary artery catheter is in place, cardiac output, oxygen delivery and consumption and other derived variables should be determined and the results recorded at regular intervals.

8.3 Oxygen therapy
8.3.1 Pulse oximetry should be used to monitor all high-risk patients
8.3.2 Capnometry should be used in selected patients
8.3.3 Arterial blood gases should be measured and interpreted initially and at regular intervals

8.4 Tracheal intubation
8.4.1 Tracheal intubation should be considered if patients do not have sufficient reserve to clear secretions, to maintain
protective glottic reflexes, to maintain blood gas homeostasis, with or without supplemental oxygen therapy

8.4.2 All patients should be pre-oxygenated and treated as being at risk of vomiting
8.4.3 Tracheal placement of the endotracheal tube must be confirmed using chest auscultation/inspection; capnometry is highly recommended
8.4.4 The position of the endotracheal tube tip should be confirmed by chest X-ray, and tooth (or gum) or nose to tip distance documented
8.4.5 Cuff inflation volume or pressure should be recorded.

8.5 Artificial ventilation of the lungs
8.5.1 Appropriate ventilator and patient monitoring should be maintained and relevant alarms set at limits suitable for each patient. Ventilator settings should be in writing on the patient chart and any changes should be signed by the attending physician
8.5.2 All ventilator and patient alarms must be visible/audible in areas of the ICU that are staffed continuously
8.5.3 In patients with severely compromised cardio respiratory function, the most effective combination of FiO2 rate, mode and pattern of ventilation, and level of positive end expiratory pressure, should be determined in conjunction with blood gas determination, haemodynamic measurements and, in special situations, oxygen delivery and consumption. Patients receiving muscle relaxants should be nursed on an individual basis

8.6 Tracheal extubation
8.6.1 Extubation should be considered when the patient:
   a. can maintain adequate gas exchange with spontaneous ventilation
   b. has adequate protective airway reflexes
   c. can clear secretions by coughing
8.6.2 In patients in whom airway patency may be compromised, extubation should normally be delayed until an air leak is demonstrated when the cuff is deflated
8.6.3 All patients should be pre-oxygenated after final clearance of pharyngeal and tracheal secretions
8.6.4 All patients should receive supplemental oxygen after extubation.
8.6.5 The means to re-establish an artificial airway urgently must be available.
8.6.6 Patients should be closely observed and monitored in the immediate post-extubation period.

8.7 Prevention of infection
Precautions must be taken at all times to protect patients and ICU personnel. These should include:
8.7.1 Washing the hands frequently, and always after each patient contact
8.7.2 Appropriate separation or isolation of infected patients or patients at risk
8.7.3 Use of closed infusion and drainage systems
8.7.4 Single-patient use of all intravenous drugs and invasive devices.
8.7.5 Use of an aseptic technique when inserting or accessing devices that may come into contact with normally sterile areas of the body.

8.8 Antimicrobial use
Each unit should generate recommended antimicrobial regimens. The cause of any infection should be sought and eliminated. Wherever possible, antimicrobial therapy should be based on microbiological test results and adjusted to produce therapeutic serum levels.
8.8.1 Antimicrobial therapy should be restricted to patients with confirmed infections, with the following exceptions:
   8.8.1.1 Short-term prophylactic antimicrobial coverage:
      a. in association with surgery
      b. after invasive procedures in particularly susceptible patients
   8.8.1.2 Broad-spectrum antimicrobial coverage in life-threatening situations (after obtaining specimens for culture and sensitivity testing and while awaiting results).
8.8.2 Microbiological data must be collected, analyzed, and interpreted for individual ICUs so that unit-specific data are available and appropriate prescribing practices ensured.

8.9 Audit and continuous quality improvement
There should be regular objective audits of:
8.9.1 Structure
8.9.2 Processes
8.9.3 Outcomes from the perspectives of: staff, patients, relatives and hospital administrators.
Practice Guidelines
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