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 with 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, workahip, 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
   ICU categories 3, 2 and I (1 per unit)

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

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

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

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

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

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

4.3.13 A flexible fibre-optic bronchoscope:
   ICU 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 ICU 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° to 27° 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
8.4 Guidelines

8.4.1 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 Artifcial 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.