GUIDELINES ON MANAGEMENT OF INTENSIVE CARE UNIT (ICU) - April 1992

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1. OBJECTIVES

1.1 Objective of the Paper

(i) To provide directions in the management of the ICU.

(ii) To develop protocols and guidelines in the running of ICU since it demands an extensive commitment of time, manpower, equipment and money.

1.2 Objective of the ICU

(i) To manage critically ill patients who require intensive monitoring and life support systems and who are potentially salvageable.

2. BACKGROUND

2.1 The level of care provided in an ICU is more complex than that delivered in a general care unit.

2.2 It is about 3.8 times more expensive to maintain an ICU than a general care unit.

2.3 Currently in US the provision of intensive/critical care costs about 15% of the total hospital care.

2.4 In KKM hospital, it has been found that an ICU bed costs about $2000/day compared to an ordinary 3rd class bed which costs about $200/day.

2.5 At present the ICU is run in a rather adhoc manner varying from hospital to hospital. Hence there is a need to reorganise it and run it as a proper unit.
3. ORGANISATION

3.1 General ICU

The Organisational Chart

3.1.1 It is multidisciplinary unit, headed by an anaesthetist, or in his absence any other specialist who is interested in intensive care.

3.1.2 The unit is to be provided with its own complement of staff including nurses and doctors. The medical officers are to be from the Anaesthetist Department until provision is made for a separate Intensive Care Department.

3.1.3 Nursing sister in-charge.

3.1.4 Staff Nurses
   - 1 S/N to 1 ICU bed per shift.

3.1.5 For organisation and management of Respiratory and Haemodynamic Unit.
   Refer Appendix I

3.1.6 Multidisciplinary ICU’s should be established in General Hospitals as well as District Hospitals with specialist. It should not be established in District Hospitals without specialist.
3.2 Specialised ICU (CICU, NICU etc)

**The Organisational Chart**

3.2.1 The administrative and clinical head of specialised ICU is the head of that particular speciality with anaesthetist providing necessary support.

3.2.2 Guidelines on the management of the specialist unit will be developed by the unit concerned.

3.2.3 Specialised ICU is to be set up only in General Hospital Kuala Lumpur and in other identified General hospitals.

3.3 Management Team

3.3.1 At present there is ambiguity in the role of doctors in the management of patient in ICU. This management team is responsible for continuous care of patients in ICU. Specialists and other doctors may provide advice on management to this team.
3.3.2 The team is responsible for the management of patients. Other relevant consultants are called in to assist in the management of these cases.

3.3.3 Other functions of the team include:

(i) Upgrading of ICU services.

(ii) Acquisition and standardization of ICU equipment.

(iii) Maintenance of equipment.

(iv) Training of doctors and paramedical staff.

(v) Drafting of guidelines/ standing order/ unit manual, duties and responsibilities of staff working in ICU.

4. OPERATIONAL POLICY

4.1 Criteria for Admissions

4.1.1 Decision to admit the patient to the intensive care unit should be made by the Anaesthetist in case of general ICU (with the consultation of the specialist on the admitting unit) and by relevant specialists in case of specialised ICU. These are patients who suffer from serious illnesses which are reversible.

4.1.2 Patients who are terminally ill particularly with the involvement of multiorgan system should not be admitted into ICU. Refer Appendix II – Guidelines on Definitions of Organ System Failure (OSF)

4.1.3 Patients who have been diagnosed as brain death should not be admitted into ICU. However, before diagnosing brain death patients can be admitted into ICU. Refer Appendix III- Guidelines on Diagnosis of Brain Death

4.1.4 The relevant specialist after consultation with the anaesthetist vice versa, needs to decide on the priorities for admission in ICU.

4.1.5 On discharge from ICU, the patient is sent to the admitting unit/ referred hospital after notifying the respective unit/ hospital.

4.1.6 Indications for Admission to NICU- Refer Appendix IV.
4.2 Code of Dress in ICU

4.2.1 Doctors, medical assistants and nurses working in ICU should wear standard ICU attire at all time.

4.2.2 Visiting doctors/ staff and all visitors should wear clean gown preferably disposable gowns.

4.2.3 Visitors should wear disposable gowns and slippers when entering ICU and to wear cap and masks if the patient is in the isolation cubicle.

4.3 Procedure/ Regulation for Visitors

4.3.1 Visiting hours are limited to twice a day and to 1-2 visitors/ patient.

In the Paediatric ICU and especially in NICU, mothers are encouraged to stay in for bonding and breastfeeding.

4.3.2 Visitors are not allowed to see patients during medical procedures.

4.3.3 Relatives can be allowed to see critically ill patients at any time with the consent of the doctor/ sister in-charge.

4.4 Disinfection and Sterilization Policy

4.4.1 Existing regulations as stated in the

(i) “Guideline on Control of Hospital Acquired Infections”. Refer KPK’s circular Bil. 2/ 1990 (33) dl m KKM-87 (49/5) dated 7.2.1990 Page 39-47.
(ii) “Disinfection and Sterilization Policy and Practice MOH 1990 (Revised).

should be followed and adhered.

4.4.2 Like any other wards, ICU should provide facilities for washing of hands (Refer to guidelines from Bahagian Perkhidmatan Perubatan, Bil. (37) dl m. KKM-87 (520) Bhg 1 dated 20.3.1989: Garis panduan Mengenai Kemudahan-kemudahan Untuk Mencuci Tangan Di Wad).
5. FACILITIES, MANPOWER AND TRAINING

5.1. Physical Facilities

(a) Bed Requirements

Number of ICU beds per hospital shall depend on the type of services available in the hospital as well as the needs of the community.

For cost effectiveness, an ICU should have 6-10 beds.

- Working area about 200 sq. ft.
- Open concept is highly preferred.
- Placing of beds in semi circular position.
  All patients can be viewed from nursing station (See diagram- Appendix V)
  20-30% should be cubicles. Cubicles should have sliding door and screen.
- Window located near bed.
- Day light in main ICU.

(b) Nursing station (central monitoring)
(c) Sister’s office
(d) Male and female changing rooms with toilet/ shower facilities
(e) Doctor’s call room (male/ female)
(f) Common rest room
(g) Treatment/ preparation room
(h) Mini laboratory
(i) Sluice room
(j) Pantry
(k) Reception/ Conference room/ Library
(l) Waiting room

5.2. Equipment

Basic equipments required for ICU is listed as in Appendix VI.

5.3. Respiratory Lab

A Respiratory Laboratory should be set up to coordinate and supervise the use and maintenance of respiratory therapy equipment and haemodynamic monitors (Please Refer Appendix I).

5.4. Manpower and Training

(a) Staffing

- Anaesthetist in-charge
- Registrar
- Medical officers: 1 MO per shift
- Nurse: 1 S/N per patient
- Medical Assistant (proposed norm as in Appendix I)
- Attendance (male and female)

(b) Training

(i) Doctors:

After Master/ FFA/ MRCP should be sent further training overseas for 1 year in adult/paeds intensive care (Neonatology 3-6 months). Local training for Medical Officers and Registrar. Number of specialists sent out will depend on requirement.

(ii) Nurses:

All nurses working in ICU should have adequate training in ICU nursing. Nurses working in NICU should have training in paediatrics and/or neonatal nursing.

(iii) Medical Assistants:

Adequate numbers to be sent for Respiratory and Haemodynamic monitoring courses overseas and upon graduating to set up respiratory/haemodynamic units.

(iv) All categories of staff are to attend Seminar, symposium, locally or overseas.

5.5. Research

Research must be concentrated in several areas

(i) Cost-effectiveness of therapy.

(ii) Selection of patients into admission into intensive care unit using criteria evolved from local experience.

(iii) Establishment of treatment protocol.

6. ACKNOWLEDGEMENT

The guidelines is prepared by Bahagian Perkhidmatan Perubatan in collaboration with Dato` Dr S. Radha Krishna, Ketua Jabatan Anesthesiologi and other relevant specialists at General Hospital Kuala Lumpur and at other general hospitals.
RESPIRATORY AND HAEMODYNAMIC UNIT

1. OBJECTIVE

1.1 General Objective

To co-ordinate the use, care and maintenance of respiratory and haemodynamic monitoring equipment in all ICUs of a hospital.

1.2 Specific Objectives

(a) To ensure the availability of appropriate respiratory and haemodynamic monitoring equipment and relevant consumables in ICUs.

(b) To set up and operate life support and monitoring of equipment for ICU patients as and when requested.

(c) To provide constant and regular monitoring of the various parameters measured at the patient bed side and make necessary recommendations to the doctor in-charge.

(d) To inspect, test and calibrate various ICU equipment so as to ensure they are in proper operating condition at all time.

(e) To clean and carry out disinfection/ sterilization procedure of all respiratory and haemodynamic monitoring equipment and their accessories.

(f) To provide 24 hours service call to all ICU’s.

(g) To set up the concept of centralised respiratory care and haemodynamic monitoring services.

(h) To help in the maintenance and functioning of haemodynamic and respiratory equipment used elsewhere in the hospital (besides the ICU).

2. BACKGROUND

2.1 In general there is lack of trained personnel to look after equipment for respiratory therapy and haemodynamic monitoring in ICUs.

2.2 The lack of expertise in respiratory/ haemodynamic monitoring services has caused the following problems.

(a) The maintenance of such equipment is not properly organized and has resulted in frequent breakdown, and this will affect the standard of patient care.
(b) Purchase of new equipment and disposable items are not standardised.
(c) Service provided is not cost effective.
(d) There is no centralised unit to coordinate the service.
(e) The service is heavily dependent on expertise from the supplier.

3. ORGANISATION

3.1 Organisational Structure

(a) Hospital Besar Kuala Lumpur

(b) Other General Hospitals and District Hospital with Specialists
3.2 Management Team of Respiratory and Haemodynamic Unit

(a) Hospital Besar Kuala Lumpur

- HEAD OF MULTIDISCIPLINARY ICU
- MEDICAL ASSISTANT TINGKATAN TERTINGGI 'B'

- MEDICAL ASSISTANT TINGKATAN KANAN
  - MEDICAL ASSISTANTS TIMESCALE
    - Neuro ICU
    - SCN/NICU
    - Burns ICU
    - Paeds ICU
  - ATTENDANTS

- MEDICAL ASSISTANT TINGKATAN KANAN
  - MEDICAL ASSISTANTS TIMESCALE
    - Multi-D ICU
    - CICU
    - Uro ICU
    - Wards CCU
  - ATTENDANTS
(b) Other General Hospitals and District Hospitals with Specialists

HEAD OF MULTIDISCIPLINARY ICU

MEDICAL ASSISTANT TINGKATAN TERTINGGI ‘B’

MEDICAL ASSISTANTS TIMESCALE
- Multi-D ICU
- CCU
- SCN
- NICU
- BURNS ICU
- Wards

ATTENDANTS

(c) Other District Hospitals

HEAD OF MULTIDISCIPLINARY ICU

MEDICAL ASSISTANT TINGKATAN KANAN

MEDICAL ASSISTANTS TIMESCALE

ATTENDANTS
4. OPERATIONAL POLICY

4.1 The administrative and clinical head of respiratory and haemodynamic unit will be the anaesthetist (Head of ICU) or in his absence the head of any specialty.

4.2 The day to day management of the unit will be carried out by the medical assistant, who is directly responsible to the head of ICU.

4.3 The unit will be responsible for providing respiratory therapy and haemodynamic monitoring services to all ICUs.

4.4 Respiratory Therapy and Haemodynamic monitoring equipment of all ICUs/wards will be centralized and their use, management, maintenance and inventories will be coordinated by the Respiratory and Haemodynamic Unit.

4.5 Consumables, disposables and spare parts or all these equipment will be requested, controlled, stored and distributed to various units by the Unit.

4.6 The Medical Assistants, in consultations with the various specialist/medical officers, shall be responsible for the selection and assignment of proper equipment to each patient within the scope of service.

4.7 Trouble shooting, minor repairs will be carried out by MAs from the Respiratory and Haemodynamic Unit. Major breakdown of equipment, when determined, have to be referred to the Hospital Engineering Department.

5. FACILITIES AND EQUIPMENT

5.1 PHYSICAL FACILITIES

(a) An area of 80-100m² is required for supplying 4-6 intensive care areas (working areas). The Unit should be located as a component of the multidisciplinary ICU.

(b) The working area should be separated into a ‘clean’ and a ‘dirty’ area, air conditioned.

(c) Medical gases, electrical and vacuum outlets are important for carrying out testing/maintenance procedures.

   2 x compressed air outlets
   2 x O₂ outlets
   1 x N₂O outlet
   1 x vacuum outlet
   14 x electrical sockets (2 x 7-gang)

(d) Built in worktop, floor cupboard and tall cupboards.
(e) 2 x stainless steel sinks with side arm and swivel type pullout SS tap.

(f) Hot and cold water supplies.

(g) 3-phase electrical wiring for decontaminator.

Note: Each ICU beside the multidisciplinary ICU should also be provided with a room with basic facilities:

(i) Built in worktop, floor cupboard and tall cupboard.

(ii) Stainless steel sink with side arm and water tap.

(iii) Hot and cold water supplies.

(iv) Facilities for chemical sterilization.

(v) Air conditioned for equipment storage.

(vi) 6 x electrical outlets (2 x 3-gang)

5.2 BASIC EQUIPMENT

(a) GHKL, other GHs and DHs with specialist

1 Unit Formalin Aseptor
1 Unit Decontaminator
1 Unit Dryer
1 Unit Ethylene oxide sterilizer (GHKL and Regional Hospitals only, subject to International approval on human safety)
1 Unit Autoclave machine
1 Unit Testing Apparatus
2 Units Pressure transducer calibrator
2 Units ECG/Pressure simulator
1 Unit Ultraviolet water sterilizer
1 Unit Sealing Machine

(b) Other District Hospitals

1 Unit Decontaminator
1 Unit Dryer
1 Unit Autoclave machine
1 Unit Testing apparatus
1 Unit Pressure Transducer Calibrator
1 Unit ECG/Pressure simulator
1 Unit Ultraviolet water sterilizer
6. MANPOWER AND TRAINING

6.1 (a) Proposed Norms For Medical Assistants in Intensive Care Units (Respiratory and Haemodynamic Units)

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Proposed Norms</th>
</tr>
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<tbody>
<tr>
<td>GHKL</td>
<td>(i) 1 MA T/T’B’ in charge of 8 Critical Care Areas</td>
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<tr>
<td></td>
<td>(ii) 2 MA T/ Kanan in charge of</td>
</tr>
<tr>
<td></td>
<td>a. 4 Intensive Care Areas (CCU, CICU, Urology ICU Wards and Multidisciplinary ICU)</td>
</tr>
<tr>
<td></td>
<td>b. 1 MA T/ Kanan in charge of peripheral Intensive Care Areas (Neuro ICU, NICU, Burns ICU and Paediatric ICU)</td>
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<tr>
<td></td>
<td>(iii) Timescale MAs</td>
</tr>
<tr>
<td></td>
<td>1 MA T/S per 3 Intensive Care Beds</td>
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<tr>
<td>Other GHs</td>
<td>(i) 1 MA T/T ‘B’</td>
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<tr>
<td></td>
<td>(ii) 1 MA T/ Kanan in charge of Intensive Care Units (Respiratory ad Haemodynamic Unit)</td>
</tr>
<tr>
<td></td>
<td>(iii) Timescale MAs</td>
</tr>
<tr>
<td></td>
<td>1 MA T/S per 3 Intensive Care Beds</td>
</tr>
<tr>
<td>District Hospitals</td>
<td>(i) 1 MA T/ Kanan in charge of OT and Intensive Care Units</td>
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<td></td>
<td>(ii) Timescale MAs</td>
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<td></td>
<td>3 MAs T/S to cover the ICU and OTs</td>
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6.2 Training

All medical assistants should undergo training programme in respiratory and haemodynamic monitoring and services.
CLEAN ASSEMBLE, CHECK, TEST & CERTIFICATION

ASEPTIC WASHER

DIRTY DISASSEMBLE, CLEAN & STERILISE

DIRTY HOLDING AREA

TO OTs & OTHER WARDS

MULTIDISCIPLINARY ICU

USED EQUIPMENT FROM GICU

CONSUMABLES STORAGE

GENERAL LAYOUT OF A TYPICAL RESPIRATORY AND HAEMODYNAMIC LABORATORY
TABLE 2. DEFINITIONS OF ORGAN-SYSTEM FAILURE (OSF)

If the patient had one or more of the following during a 24 hour period (regardless of other values), OSF existed on that day.

<table>
<thead>
<tr>
<th>I. Cardiovascular failure (presence of one or more of the following):</th>
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<tbody>
<tr>
<td>A. Heart rate &lt; 54/ min</td>
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<tr>
<td>B. Mean arterial blood pressure &lt; 49mmHg</td>
</tr>
<tr>
<td>C. Occurance of ventricular tachycardia and/or ventricular fibrillation.</td>
</tr>
<tr>
<td>D. Serum pH &lt; 7.24 with a PCO2 of &lt; 49 mmHg</td>
</tr>
</tbody>
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<tr>
<th>II. Respiratory failure (presence of one or more of the following):</th>
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<tbody>
<tr>
<td>A. Respiratory rate &lt; 5/min or &gt; 49/min</td>
</tr>
<tr>
<td>B. P CO &gt; 50 mmHg</td>
</tr>
<tr>
<td>C. A DO &gt; 350 mmHg A DO = 713 F10 –P CO –P 0</td>
</tr>
<tr>
<td>D. Dependent on ventilator on the fourth day of OSF, e.g. not applicable for the initial 72 h of OSF</td>
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<tr>
<th>III. Renal Failure (presence of one or more of the following):*</th>
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<tbody>
<tr>
<td>A. Urine output &lt; 479 ml/ 24h or &lt; 159 ml/ 8h</td>
</tr>
<tr>
<td>B. Serum BUN &gt; 100 mg/100ml</td>
</tr>
<tr>
<td>C. Serum creatinin &gt; 3.5 mg/100ml</td>
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<tr>
<th>IV. Haematologic Failure (presence of one or more of the following):</th>
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<tbody>
<tr>
<td>A. WBC &lt; 1000 mm$^3$</td>
</tr>
<tr>
<td>B. Platelets &lt; 20000 mm$^3$</td>
</tr>
<tr>
<td>C. Haematocrit &lt; 20%</td>
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<tr>
<th>V. Neurologic Failure</th>
</tr>
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<tbody>
<tr>
<td>Glasgow Coma Score &lt; 6 (in absence of sedation at any one point in day)</td>
</tr>
<tr>
<td>Glasgow Coma Score: Sum of best eye opening, best verbal and best motor responses. Scoring of responses as follows: (points)</td>
</tr>
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<thead>
<tr>
<th>Eye</th>
<th>Open spontaneously (4), to verbal command (3), to pain (2), no response (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor</td>
<td>Obey verbal command (6), response to painful stimuli/localizes pain (5), flexion-withdrawal (4), decorticate rigidity (3), decerebrate rigidity (2), no response (1)</td>
</tr>
<tr>
<td>Verbal</td>
<td>Orientated and converses (4), inappropriate words (3), incomprehensible sounds (2), no response (1). If intubated, use clinical judgement for verbal responses as follows: patient generally unresponsive (1), patient’s ability to converse in question (3), patient appears able to converse (5)</td>
</tr>
</tbody>
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*Excluding patients on chronic dialysis before hospital admission.
**CRITERIA FOR BRAIN DEATH**

1. Deep coma.

2. Cause of coma known and sufficient to explain the state of coma. In cases of cardiopulmonary collapse and secondary brain damage, examination must be done after at least 6 hours of insult.

3. Bilaterally fixed pupils, diameter > 4 mm.

4. Absent brain stem reflexes, corneal, ciliospinal, oculocephalic, vestibular, pharyngeal, cough, swallowing and jaw jerk.

5. The patient is on ventilator because spontaneous respiration has ceased altogether. The apnoea is confirmed after apnoea test.

6. Persistence of all the above features at repeat examination after at least 6 hours apart.

**EXCLUSION CRITERIA**

1. Children under 6 years.

2. Hypothermia (< 35°C)

3. Drug intoxication.

4. Endocrine and metabolic disorders.

5. Deep anaesthesia.


7. Severe Gullain Barre Syndrome.

8. Locked in state.
APPENDIX IV

INDICATIONS FOR ADMISSION TO NEONATAL INTENSIVE CARE UNIT (NICU)

1. Birth weight < 1.5 kg.
2. Gestation < 33/52.
3. Respiratory failure.
4. Care for severe infections and metabolic illness.
5. Total parenteral nutrition.