



Intercollegiate Board for Training in  
**INTENSIVE CARE MEDICINE**

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**INTERCOLLEGIATE DIPLOMA  
IN  
INTENSIVE CARE MEDICINE**

**EXAMINATION  
SYLLABUS**

*February 2002*

# SYLLABUS FOR THE DIPLOMA IN INTENSIVE CARE MEDICINE

This should be read in conjunction with the Regulations and the Intercollegiate Board's guidance on competency based training in intensive care medicine which expresses the breadth and the depth of knowledge expected at each stage in training.

This syllabus is not fully comprehensive but gives a guide to the subjects to be examined. The trainee will be expected to have completed advanced life support and advanced trauma life support courses and to have obtained other skills listed in the training guidance.

## **RESUSCITATION**

A knowledge of theory and practice for basic and advanced life support, and of application of algorithms of resuscitation.

- expired air resuscitation
- bag-valve-mask (bvm) ventilation
- oropharyngeal airways
- tracheal intubation
- laryngeal mask airways
- closed chest compression
- defibrillation
- vascular access
- pericardial drainage
- chest drainage
- crico-thyrotomy
- cannulation of large central veins (e.g. internal jugular)
- cut down
- cardiac pacing
- peritoneal lavage
- tracheostomy
- basic paediatric and neonatal resuscitation (with particular reference to acute airway obstruction)

## **ANATOMY**

Anatomical knowledge of the body areas relevant to diagnosis and treatment of critically ill patient including that related to:

- insertion of arterial and venous access lines
- drainage of closed cavities
- local anaesthesia and provision of pain relief
- insertion of variceal tamponade devices
- insertion of intracranial pressure monitors
- secondary airway control (tracheostomy)
- neuroanatomy for understanding
  - brain stem death testing
  - pain relief
  - assessment of nerve conduction

Areas include:

- wrist
- ankle
- antecubital fossa
- anterior triangle of the neck
- deep structures of the neck
- subclavian area
- femoral triangle
- chest wall
- lungs, bronchial tree, pleura
- abdominal wall (and surface marking of organs)
- heart and coronary circulation
- pharynx and larynx
- oesophagus and stomach
- vertebral column
- brachial plexus
- spinal cord, brain, brain stem
- epidural and subarachnoid space and spinal canal
- sympathetic and parasympathetic nervous system

## ***PHYSIOLOGY***

Applied physiological knowledge of systems primarily or secondarily compromised by critical illness or to be optimised in critically ill patients. This will include knowledge of:

- control of consciousness
- locomotor activity
- peripheral nervous system
- muscle action
- control of cardiac output, blood pressure and flows
- pathophysiology of control and mechanics of respiration
  - work of breathing
- pathophysiology of oxygen transport
  - in the peripheral circulation and within the cell and relevant physio-biochemistry
- control of fluid balance and the milieu interieur

This will also include an understanding of:

- fluid challenge
- Starling (or equivalent) relationship
- oxygen consumption, carbon dioxide production
- respiratory quotient
- shunt, dead space, ventilation/perfusion mismatch
- oxygen dissociation curve
- oxygen therapy in acute and chronic respiratory failure
- investigation and treatment of acute renal failure
- neuromuscular function using the nerve stimulator
- nutritional assessment

It will include physiology applied to acute and chronic disease:

- cardiac failure
- inotrope dependence
- respiratory failure
- ventilator dependence

- hepatic failure
  - gastrointestinal failure
  - endocrine disturbance
    - eg thyrotoxicosis
    - Addison's disease
- coagulation failure

Application of physiology to assessment of organ function

## **PHARMACOLOGY**

Applied pharmacology (including pharmacokinetics and dynamics) of drugs used in:

- cardiopulmonary resuscitation including
  - magnesium, esmolol, vasopressin
- local anaesthesia including
  - opioids for extradural and intrathecal use
- cardiovascular support or control
  - inotropes including
    - sympathomimetics
    - phosphodiesterase inhibitors
    - glucagon
    - digoxin
  - vasodilators including
    - nitrates
    - sympathetic blockers
    - centrally acting drugs
    - calcium channel blockers
  - vasoconstrictors including
    - sympathomimetics
    - vasopressin
  - antiarrhythmics
  - anti hypertensives (including ACE inhibitors)
  - diuretics
  - anticoagulants
- respiratory support
  - oxygen therapy
  - respiratory stimulants
  - bronchodilators
  - nitric oxide
  - epoprostanol
- analgesics
  - opioids
  - NSAIDS
  - clonidine
  - ketamine
  - amitryptiline
- sedatives
  - benzodiazepines
  - $\alpha$ 2 blocking agents
  - anaesthetic induction agents used for continuous infusion
  - inhalational agents

- anti-convulsants
  - including those used by infusion and second line drugs
  - major tranquillisers
- anaesthetic agents
  - induction agents
  - neuromuscular blocking agents
  - reversal drugs
    - anticholinesterases
    - flumazenil
    - naloxone
  - inhalational agents
- intravenous fluids
  - blood products
  - artificial colloids
  - crystalloids
- nutritional agents
  - carbohydrates, fats, nitrogen
- steroids
- antimicrobial agents
  - treatment of:
    - bacterial infection
    - tuberculosis
    - protozoa (malaria, pneumocystis)
    - fungal infection (candida)
    - viral infection (herpes)
- miscellaneous groups of drugs which require dosage alteration/reduction in critically ill patients
- antidotes
- pathopharmacology of drug and substance abuse
  - cannabis
  - "ecstasy", other amphetamines
  - ketamine
  - fentanyl derivatives
  - cocaine
  - heroin
  - barbiturates
  - benzodiazepines
- pathopharmacology of drugs used for self poisoning
  - aspirin
  - paracetamol
  - tricyclics
  - lithium
  - methanol
  - ethylene glycol
  - aminophylline
  - digoxin
  - anticholinesterases
  - paraquat
  - carbon monoxide

## ***KNOWLEDGE TO SUPPORT CLINICAL PRACTICE***

Interpretation of physiological displays  
Interpretation of pathological data  
Interpretation of imaging data  
Application of clinical examination to pharmacological strategies  
Application of anatomy and physiology to clinical procedures  
    vascular access in adults, children and neonates  
    Seldinger and dilatational techniques for cannulation  
    difficult airway management  
        adults, children and neonates  
    laryngeal mask airway  
    tracheostomy  
    bronchoscopy, laryngoscopy  
    bronchoalveolar lavage  
    lung biopsy  
    insertion of pacemaker  
    insertion of pulmonary artery catheter  
    cardiopulmonary bypass in adults  
    Sengstaken-Blakemore tube insertion  
    renal replacement therapies  
    plasma exchange  
    insertion of intracranial pressure monitoring devices  
    brain stem death testing  
    organ retrieval  
    imaging

## ***CLINICAL MANAGEMENT PLANNING***

Applied knowledge to permit formulation of a management plan for patients with:  
    acute and chronic respiratory failure  
    cardiac failure  
    diffuse head injury  
    subarachnoid haemorrhage  
    acute renal failure  
    massive blood loss  
        gastro-intestinal haemorrhage  
        traumatic injury  
        major vessel rupture  
    cardiopulmonary arrest  
    multiple organ failure

## ***USE OF RELEVANT TECHNICAL EQUIPMENT***

artificial airways  
equipment for management of a difficult airway  
airway exchange equipment  
anaesthetic masks  
Water's type breathing systems

- unidirectional valves eg Ambu
  - self reflatng bags (eg Ambu, Laerdal)
  - laryngoscopes (adult, child)
- endotracheal tubes and cuffs
  - manipulating forceps
  - bougies, stylets
- Seldinger wire-through-needle access (with or without dilatation)
- oxygen therapy equipment
  - flow meters
  - Ventimasks, MC/Hudson masks
  - CPAP
  - oxygen cylinders
- endotracheal suction equipment
  - vacuum controller
  - suction controller
  - suction catheters
  - sterility
- blood pressure measurement equipment
  - (non-invasive and invasive)
- CVP
- pulse oximetry
- ECG recording machines
- monitoring equipment
  - (non-invasive and invasive)
- transducers and related equipment
- pressure infusor/"intraflo" system
- capnograph (side stream/mainstream)
- oxygen analyser (including calibration)
- syringe driver (including bolus and PCAs)
- infusion pumps
- nebulisers
- chest drain systems
- nerve stimulator
- tamponade devices (including Sengstaken- Blakemore tube)
- ultrasound imaging devices
- rapid infusion devices (eg 'Level 1')

The trainee should understand the use of:

- ventilators (and ventilatory techniques) in use in the ICU (intermittent positive pressure ventilation, inverse ratio ventilation, biphasic airway pressure, pressure support ventilation, airway pressure release ventilation, positive end-expiratory pressure)
- routine weaning techniques included in ventilators (synchronised intermittent mandatory ventilation, pressure support ventilation, biphasic airway pressure, airway pressure release ventilation)
- cardiac output monitors
- transport ventilators and other transfer equipment
- all CPAP systems
- laboratory equipment for measurement of blood gases, electrolytes

The trainee should have a working knowledge of:

- renal replacement equipment
- high flow blood infusion equipment ('Level 1')
- pressurised suits

- bronchoscope injectors
- high frequency ventilators
- double lumen endotracheal tubes
- warming and cooling equipment (blankets, mattresses - air/water)
- echocardiography: transthoracic and transoesophageal
- ultrasound examination of abdomen and guided aspiration
- haematology, pathology and microbiology technology/techniques
  - eg: Coulter counter
  - coagulation measurement
  - multichannel chemistry analysers (SMAC)
  - routine plating and microscopy of sputum, urine, etc
- bronchoalveolar lavage

## **PHYSICS & MEASUREMENT**

An understanding of physiology (eg flow of gases and liquids) and measurement (eg measurement of pressure, damping, resonance) as is needed for care of the patient with particular reference to recognition of measurement error.

- Pressure, volume and the gas laws
- Physics of flow of gases and liquids
- Electro magnetic radiation
- Electrical energy
- Vibration and sound
- Recording equipment and signal processing
- Measurement of flow and volume
- Measurement of pressure in gases and liquids
- Statistics relevant to intensive care

An understanding of the following equipment, sufficient to be aware of its problems and pitfalls:

### **Ventilators**

- Airway pressure and flow measurement (low pressure transducers, siting of transducers, pneumotachographs and simple flow meters)
- Metabolic measurement ( $VO_2$ ,  $VCO_2$ )
- Mechanics measurements (including P0.1)
- Oxygen blenders and measuring devices (pressure regulators, paramagnetic analysers, polarographs, fuel cells, etc)

### **Cardiovascular Equipment**

- Transducers (frequency response, damping, resonance, signal degradation, zero drift and calibration)
- Sphygmomanometry and oscillometry
- Cardiac output measurement (indicator dilution, impedance, echo, Doppler)
- Flow measurement (Doppler, electromagnetic)
- Pulse oximetry

### **ICU Laboratory Physics and Measurement**

- $PO_2$ ,  $PCO_2$  and pH electrodes
- Transmission (Co-)oximetry
- Ion selective electrodes
- Photo electrodes
- Oncometry

Osmometry

**Imaging Equipment outside ICU**

Ultrasound

X-ray and CT

MR

***SPECIALIST DISEASES AND SYNDROMES***

The trainee must have specific knowledge of a number of syndromes or diseases where their severity or symptom complex require the patient to be admitted to the ICU.

**Organ System Failures (Acute or Acute on Chronic)**

Respiratory failure

Cardiovascular failure

Renal failure

Hepatic failure

Brain failure

Coagulation failure

Gut failure

Immunological failure

**Specific Syndromes or Complications**

Sepsis

Acute Respiratory Distress Syndrome

Massive transfusion

Hypothermia

Post cardiopulmonary arrest management

Disseminated intravascular Coagulopathy

**Specialist Diseases commonly needing Intensive Care**

Polyneuropathies

Tetanus

Botulism

Myasthenia

Eaton Lambert, and muscle relaxant myopathy

Accelerated hypertension

Poisoning including:

tricyclics

SSRIs

anti-epileptics

'ecstasy'

lithium

aminophylline

paracetamol

methanol

ethylene glycol

beta blockers

calcium channel blockers

digoxin

anticholinesterases

Purpura fulminans (and meningococcal septicaemia)

Epiglottitis (including adult)

DIC

Necrotising fasciitis

Goodpasture's syndrome

Haemolytic uraemic syndrome

Burns

Malignant hyperthermia and heat stroke

Diffuse head injury

Chronic obstructive airways disease

Sleep apnoea (and surgery)

Thyroid storm

Myxoedema

Addison's disease

Phaeochromocytoma

Malaria

Status epilepticus

Eclampsia/PET/HELLP

The trainee must know the methods of and indications for:

### **Respiratory Support**

Institution of airway control

Institution of IPPV

PEEP

Weaning and techniques

Tracheostomy

Indications for unusual support (ECMO, transplant)

### **Cardiovascular Support**

Invasive monitoring

Pulmonary artery catheter insertion

Cardiac output monitoring and control

Use of inotropes, constrictors, dilators

Pacemaker insertion/arrhythmia control

Balloon pumping

### **Renal Support**

Peritoneal dialysis

Haemodialysis

Continuous haemo(dia)filtration/techniques

Haemoperfusion

Plasmapheresis or exchange

### **Nutritional Support**

Enteral nutrition

Parenteral nutrition

Metabolic measurement

Enterostomy

Hormonal manipulation

### **Hepatic Support**

Treatment for variceal haemorrhage

Coma treatment & support

### **Brain Support**

- Control of intracranial pressure
- Triple H therapy
- Vasomotor manipulation
- Brain (stem) death testing

### **Haematologic Support**

- Therapies of massive bleeding (components, fibrinolysis control)
- Blood substitutes
- Haemodilution

## ***INTER- AND INTRA-HOSPITAL TRANSPORT AND TRANSFER***

The trainee should be familiar with the problems of transport:

- the physiological consequences of movement (acceleration)
- the environmental problems (space, vibration, temperature) on the patient and transport equipment
- minimal monitoring and transfer
- pre-transfer assessment and resuscitation
- intra-transfer care
- choice and problems of transfer and transport equipment

The trainee should know the problems of patient management in unusual environments within the hospital eg imaging suites (angiography, Doppler), CT and magnetic environments (MR).

The trainee should understand the paramedic system and the problems of retrieval, resuscitation and monitoring.

## ***IMAGING***

Trainees should be able to interpret and comment on:

- departmental and portable CXR: supine and erect
- plain abdominal X-ray films: supine, erect and lateral
- cervical spine X-ray
- lumbar spine X-ray
- pelvic X-ray
- long bone X-ray
- lateral skull X-ray
- CT brain
- CT thorax
- CT abdomen (kidney, pancreas)
- echo cardiography
  - pericardial effusion
  - dyskinesis
  - vegetations (valves)
  - dilated ventricles
- trans oesophageal echo
  - ventricular functional failure
- ultra sound chest
  - pneumothorax

- ultra sound abdomen
  - subphrenic collections
  - pancreatic swelling/pseudocyst/abscess
  - renal outlines and urinary tract
- Doppler ultra sound
  - blood flow to brain (carotid), kidneys, gut
  - venous obstruction/thrombosis
    - subclavian, internal jugular, femoral, popliteal veins
- dipyridamole-thallium scanning
- ventilation-perfusion scanning
- labelled white cell scanning

## ***INFORMATION TECHNOLOGY***

- Word processing
- Database management
- Graphics package
- Knowledge of a major statistics package eg SPSS

## ***Literature search***

## ***AUDIT***

- Principles of audit, severity scoring, outcome prediction
- ICNARC

## ***MEDICAL ETHICS***

- Principles
- Application to intensive care