THE CCST IN INTENSIVE CARE MEDICINE

Competency-Based Training and Assessment

Part II

THE EDUCATIONAL TRAINING RECORD

and the

Core curriculum

NAME:

TRAINING NUMBER:

Terminology and scope of this document:
The term 'intensive care' in this document is synonymous with 'critical care' or 'intensive therapy'. 'Intensive care unit (ICU)' is synonymous with critical care unit or 'intensive therapy unit (ITU)'. High dependency or step-down care is considered to be an integral part of critical care services.

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1. INTRODUCTION

This educational training record is for the use of

- The trainee
- The trainer
- The examiners for the Diploma in Intensive Care Medicine

The aim of this booklet is to provide a record of your training in Intensive Care Medicine (ICM) and all trainees in ICM must maintain it. It will complement the formal competency-based assessments of trainees by their educational supervisors, details of which will be maintained in Parts III, IV and V of the training programme documents. The Intercollegiate Board for training in Intensive Care Medicine will not be able to approve training unless both this Educational Training Record (ETR) and the accompanying Assessments of Competency have been properly completed. This record will also be an essential part of the Diploma in Intensive Care Medicine.

You should begin to fill your record in as soon as you have started training in ICM. You should agree your training plan with your trainer in the first month of post and should have regular reviews thereafter; hence this record should be regularly maintained. At intermediate level, your plan should include a clear idea of which topics you will cover for your expanded case summaries. These should be chosen to demonstrate reasonable breadth of experience within the core curriculum. You will be questioned on these if you enter the Diploma examination.

2: Record of training in ICM

2.i) Basic level (pre-SpR) training, including complementary specialties

Give details of **all** appointments before specialist registrar training (pre-registration house officer, senior house officer, and clinical fellow or research posts).

	Grade	Speciality	Hospital	Start date	End date
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Identify below by number those posts which meet the criteria for basic level training in ICM: 3 months of intensive care medicine, 6 months of general internal medicine, and six months of anaesthesia:

	Intensive care medicine; 3 months; must be approved by ICBTICM
	Anaesthesia; 6 months + on call; must be approved by the RCA for SHO training
	General Medicine; 6 months + on call; must be approved by RCP for SHO training

2.ii) Specialist Registrar training in ICM

Details of base speciality and ICM SpR appointments:

Base speciality SpR post:	ICM SpR training post:
Speciality:	Date of competitive appointment:
NTN:	Anticipated completion date for intermediate training:
Deanery:	Deanery (if different from base speciality)
Date of appointment to SpR post:	Regional Advisor ICM:
Anticipated CCST date:	What is your current objective: Intermediate or advanced level training in ICM?
Regional Advisor:	

2.ii.a) Record of SpR Intermediate level training:

Intermediate level training consists of six months of ICM with dedicated on call. It must be taken in minimum blocks of three months. If they wish this experience to count towards a CCST in ICM, trainees must:

- have acquired basic level training in ICM and the complementary specialities
- be in a substantive numbered SpR post in a base speciality
- have undergone competitive appointment to the SpR ICM training post
- be registered with the Intercollegiate Board

Details of SpR intermediate level ICM training

Hospital & ICU details	Local Educational Supervisor name:	Start date	End date	On call rota

2.ii.a) SpR ICM Intermediate level: Professional development record

Trainees should complete an educational contract or similar document to guide them and their trainers during each module. A copy of these contracts should be included in the trainees' portfolio, together with other documents describing their professional development such as weekly meetings attended or organised, lectures given, audit projects etc.

The competency assessments are a mandatory component. They must be competed satisfactorily before a trainee can progress to advanced level training.

i) Brief description of experience and teaching received in your ICM modules

ii) Courses and meetings you have attended:

a) *Internal meetings (including journal clubs/grand rounds etc.)*

b) *External courses and meetings: regional, national, international:*

c) Research and audit activities:

2.ii.b) Record of SpR advanced level ICM training

Advanced level training is a minimum of one year, and will involve specialist experience. Trainees can only progress to advanced level training if they have satisfactorily completed basic and intermediate level competency assessments. A CCST in ICM will be awarded jointly with the base speciality CCST on satisfactory completion of the entire training programme and competency assessments, provided trainees entered the ICM training programme competitively and are registered with the ICBTICM.

Details of SpR advanced level ICM training

Hospital & ICU details. Name of LES	Brief details of type of clinical experience	Start & end date	On call rota
LES:			
LES:			
LES:			
LES:			
LES:			

2.ii.b) SpR ICM Advanced level: Professional development record

Trainees should complete an educational contract or similar document to guide them and their trainers during each module. A copy of these contracts should be included in the trainees' portfolio, together with other documents describing their professional development such as weekly meetings attended or organised, lectures given, audit projects etc.

The competency assessments are a mandatory component. They must be competed satisfactorily before a trainee can be recommended for a CCST in ICM.

i) Give a brief assessment of the strengths and weaknesses of the advanced level training you have received

ii) Courses and meetings you have attended:

a) *Internal meetings (including journal clubs/grand rounds etc.)*

b) *External courses and meetings: regional, national, international:*

c) Research and audit activities:

3. TEN EXPANDED CASE SUMMARIES

These case summaries should be completed during intermediate level SpR training. Your educational supervisor must confirm that the case summaries have been produced to an acceptable standard. They will be used as topics for discussion during one of the viva voce examinations if you choose to take the UK Diploma of ICM.

A total of ten are required, with no more required for advanced training. An example is included below. They should be discussed with your local educational supervisor and should cover a broad range of topics relevant to intensive care practice. They could be selected either to complement areas of particular interest or to help develop areas of particular weakness for the trainee. Each expanded case summary should be approximately 1000 words long and typed on a separate sheet using the following subheadings as a guide:

1. Clinical problem
2. Relevant management
3. Further information
4. How would you change your future management
5. References.

	Titles of case summaries
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

I certify that these case summaries have been completed to an acceptable standard.

Name and Signature of Educational Supervisor:

Example of expanded case summary:

Title: Acute Respiratory Failure: the role of steroids in persisting ARDS

Clinical problem

A 40-year-old previously fit merchant banker was admitted with a short history of acute breathlessness, fever, cough and malaise. Clinically he has clear evidence of a right basal pneumonia with associated fever, tachycardia and hypotension. He was hypoxic and tachypnoeic and rapidly required intubation in A&E and transfer to ICU for full mechanical ventilation. Despite the commencement of intravenous broad-spectrum antibiotics and adequate fluid loading he remained hypotensive and required inotrope support. A fully sensitive pneumococcus was isolated from 4 out of 4 blood cultures the next morning and he was changed to intravenous benzylpenicillin. Thirty six hours after admission his chest x ray, along with his gas exchange, PEEP requirements and clinical history all fitted with the development of acute respiratory distress syndrome from pneumococcal septicaemia.

Relevant management

His ventilation deteriorated progressively requiring the sequential introduction of inverse ration and pressure control ventilation, high levels of PEEP and then inhaled nitric oxide. He endured a brief period of prone ventilation but with no improvement in his gas exchange. A percutaneous tracheostomy was performed on the 8th day of admission. After 10 days he still required an FiO_2 of 0.85 and inverse ratio pressure controlled ventilation but had come off all inotropes after the first 5 days. He was thus commenced on intravenous steroids, methylprednisolone 2 mg/kg daily for 2 weeks, and then a reducing dose over a total of 32 days. This produced a dramatic improvement in his gas exchange. Over the next 36 hours he came off the inhaled nitric oxide and after 3 days of steroid therapy he was on 45% oxygen breathing with 25cm H_2O pressure support and fully conscious and alert.

Further information

Focus on Steroids in ARDS:

The adult respiratory distress syndrome (ARDS) is a severe and often fatal form of acute microvascular lung injury. Overall mortality remains high at between 40-60%[1] with the majority of patients requiring mechanical ventilation and prolonged intensive care management. Treatment up to the present has been largely supportive.

ARDS is traditionally divided into three phases: exudative, proliferative and fibrotic[2]. The initial 'exudative' phase involves the leakage of proteinaceous fluid and the migration of cells, in particular neutrophils, from the circulation into the interstitium and alveolar space following diffuse damage to the endothelial and epithelial surfaces. The proliferation of fibroblasts and type II pneumocytes characterises the second phase. Activated fibroblasts secrete a number of extracellular matrix proteins, including collagen, within the interstitium but also migrate into the alveolar space where they form attachments to damaged basement membranes[3]. Unabated, this process leads to established interstitial and intra-alveolar fibrosis. Approximately 60% of patients with ARDS fail to improve or are deteriorating after one week of ventilation and all of these patients demonstrate mechanical, biochemical and histological evidence of fibrosis[4,5]. A doubling of lung collagen is observed in patients with ARDS surviving more than two weeks[4]. Progressive hypoxia and a susceptibility to nosocomial infection result in an 80% mortality in this group[6]. Recent evidence suggests mechanical ventilation itself may exacerbate lung injury and stimulate a fibrogenic response in the lung[7].

There is now evidence that steroids may be of benefit after the initial stages of the illness[2, 8] and this was seen dramatically in this patient who made a huge improvement after their commencement. If steroids are to be used they should be commenced only in those patients who have a significant respiratory dysfunction and have failed to improve more than one week after the onset of ARDS. Trials to date suggest that brief courses of steroids are ineffective, hence treatment should be maintained for more than one week. If a benefit is to be seen this usually occurs within the first five days of institution of steroids. The mechanism of action for steroids at this stage is unclear but may include effects on permeability, reduction in inflammatory cell load (through both increased apoptosis and/or reduced cellular influx) and reduction in fibroblast proliferation and collagen deposition. The problems with steroids are that they have been shown to make things worse in the initial stages of ARDS and of sepsis and there are concerns that they will lead to increased susceptibility to nosocomial infections. There is a minor risk of steroid psychosis.

HOW would you change your future management.

I am now aware that there is a place for steroids in the management of this complicated condition but have also been made aware from this literature search that these drugs must be used in clearly defined situations, when there is clinical evidence of non-resolving fibrosis[8].

References

1. Suchyta MR, Clemmer TP, Elliott CG, Orme JF, Jr., Weaver LK. The adult respiratory distress syndrome. A report of survival and modifying factors. *Chest* 1992;**101:**1074-1079.
2. Meduri GU, Chinn AJ, Leeper KV, et al. Corticosteroid rescue treatment of progressive fibroproliferation in late ARDS. Patterns of response and predictors of outcome. *Chest* 1994;**105:**1516-1527.
3. Kuhn C, 3rd, Boldt J, King TE, Jr., Crouch E, Vartio T, McDonald JA. An immunohistochemical study of architectural remodelling and connective tissue synthesis in pulmonary fibrosis. *Am Rev Respir Dis* 1989; **140:**1693-1703.
4. Zapol WM, Trelstad RL, Coffey JW, Tsai I, Salvador RA. Pulmonary fibrosis in severe acute respiratory failure. *Am Rev Respir Dis* 1979;**119:**547-554.
5. Raghu G, Striker LJ, Hudson LD, Striker GE. Extracellular matrix in normal and fibrotic human lungs. *Am Rev Respir Dis* 1985;**131:**281-289.
6. Bell RC, Coalson JJ, Smith JD, Johanson WG, Jr. Multiple organ system failure and infection in adult respiratory distress syndrome. *Ann Intern Med* 1983;**99:**293-298.
7. Parker JC, Hernandez LA, Peevy KJ. Mechanisms of ventilator-induced lung injury. *Crit Care Med* 1993;**21:**131-143.
(Abs) *Am J Respir Crit Care Med*!4 1997; A613.
8. Meduri GU, Headley AS., Golden, E, Carson, SJ, Umberger, RA, Kelso T and Tolley EA Effect of Prolonged Methylprednisolone therapy in unresolving acute respiratory distress syndrome; a randomised controlled trail. JAMA 1998 **280:** 159-165.

4. CORE CURRICULUM in ICM

The core curriculum for training in adult ICM is categorised in domains, each of which is presented as *Knowledge, Skills, Attitudes and behaviour,* and *Workplace training objectives*, in addition to basic sciences. This format inevitably results in repetition and some redundancy, with the same topic appearing in more than one domain or area. Similarly there is inevitably some crossover between the knowledge and skills lists. The *Workplace training objectives* are intended to assist the trainees' self-directed learning and to indicate key aspects of clinical practice that they could be expected to demonstrate in order to satisfy their workplace assessments. The curriculum refers only to adult practice except for those items listed in the paediatric section.

The domains are presented as tables that allow trainees to track the progression of their learning from basic, through intermediate, to advanced level by entering a mark in the appropriate box. It is **not** intended that these lists and tables be used for the assessment of competence, but simply to facilitate self-directed learning, and to help trainers identify any deficiencies in clinical experience. No trainee can be expected to have a comprehensive knowledge of every single aspect of the curriculum, and it is not expected that every box at each level will be filled in. Trainees can use the 'definitions of level of competence' below, as a guide.

DEFINITIONS OF LEVELS OF COMPETENCE

	Basic (SHO)	**Intermediate (SpR)**	**Advanced (SpR CCST)**
Overview	Basic level trainees would be expected to understand the general principles of intensive care medicine, to be familiar with the more common conditions and reasons for admission, to be able to identify patients at risk of organ system failures, and to resuscitate and stabilise critically ill patients. They will also know the degree of urgency required in summoning senior help. Intermediate level trainees will have developed these skills further, often in relation to their base speciality (anaesthesia, medicine, surgery, and accident & emergency medicine). Specialist level (CCST) trainees will have acquired broad knowledge of general and specialist aspects of ICM. They will also have skills in management and service organisation, in teaching and audit, and well developed integrative skills.		
Knowledge	Presentation and treatment of common life-threatening emergencies	Detailed knowledge of general aspects of critical care	General and specialist aspects of critical care, including management of the service
Skills	Manages initial assessment and stabilisation of emergencies safely. Provides continuing care under supervision.	Stabilisation, assessment, routine management and investigation of critically ill patients on a daily basis.	Defines and supervises long-term collaborative management plans for larger numbers of patients. Leads whole ICU team effectively. Teaches and supervises junior colleagues. Integrates information.
Attitudes	Recognises limitations, refers and communicates promptly and effectively.	Proactive, able to co-ordinate and supervise care delivered by junior trainees. Recognises limits of expertise and summons help appropriately	Ensures that critical care service functions effectively within wider environment. Supports service development and research. Plans personal professional development

CORE CURRICULUM DOMAINS in ICM

1. RESUSCITATION AND INITIAL STABILISATION

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: All intensive care practitioners and trainees must be able to recognise, resuscitate and stabilise patients sustaining, or at risk of, cardiopulmonary arrest of other life-threatening disturbances in acute physiology. Basic level trainees will achieve a level of competence equivalent to advanced life support (preferably with ALS certification), while higher level trainees should be able to identify and provide initial management of more complex problems including a difficult airway or vascular access, and would be expected to have ALS provider certification.			
Knowledge Identification of the patient at risk of critical illness including cardiopulmonary arrest Immediate management of common medical emergencies (acute asthma, COPD, hypertension, myocardial infarction, ventricular failure, hypotension and shock, haemorrhage) Understand common causes for admission to intensive and high dependency care Triage and management of competing priorities Methods of maintaining a clear airway Indications for and methods of tracheal intubation Appropriate use of drugs to facilitate airway control Selection of tube type (oral, nasal, armoured etc), diameter and length Management of difficult intubation and failed intubation Methods of confirming correct placement of the endotracheal tube Insertion and use of oral airways, face masks and laryngeal mask airway Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration Cricoid pressure Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock) Indications for and methods of ventilatory support Recognition and emergency treatment of life-threatening disorders of cardiac rhythm External cardiac massage Drugs: pharmacology and dosages of hypnotics, analgesics and relaxants Side effects of drugs used and their interactions Monitoring during sedation/induction of anaesthesia for endotracheal intubation Recognition and management of anaphylactic and anaphylactoid reactions Recognition and management of inadvertent intra-arterial injection of harmful substances Problems of the obese or immobilised patient Methods of securing adequate vascular access rapidly			
Skills			
Life support skills to ALS provider level			
Airway assessment and optimising the patient's position for airway management			
Airway management with mask and oral/nasal airways			
Support of ventilation using bag and mask			
Introduction and checking correct placement of laryngeal mask airway.			
Appropriate choice and passage of oral endotracheal tubes			
Orotracheal intubation: (up to grade II Cormack-Lehane for SHOs)			
Use of gum elastic bougie and stilette			
Identifying correct/incorrect placement of tube (oesophagus, R main bronchus)			
Interpretation of capnograph trace			
Failed intubation drill			
Rapid sequence induction/cricoid pressure			
External cardiac massage			
Percutaneous pericardial aspiration (emergency)			
Obtaining vascular access sufficient to manage acute haemorrhage			
Fluid resuscitation and initial management of shock, including use of drugs			
Use of emergency monitoring equipment			
Safety checking of resuscitation equipment (see equipment section)			
Management and avoidance of cardiovascular and respiratory changes during and after intubation			
Attitudes and behaviour			
Safety first and knowing limitations			
Always knowing the location of senior assistance			
Being clear in explanations to patient and staff			
Being reassuring to patients and relatives			
Consideration of ethical issues: patient autonomy, appropriateness of ICU admission.			
Workplace training objectives			
Possession of current ALS certification, or competence in the elements of ALS			
Describe risk factors for, and methods of prevention of, cardiopulmonary arrest			
Demonstrate control of airway with bag and mask			
Demonstrate and confirm the correct placement of an orotracheal tube (Grade I-II)			
Describe failed intubation drill			
Demonstrate methods for preventing aspiration of gastric contents			
Safe management of patient with difficult airway or shock			
Identify need for surgical assessment of acute abdominal problems or occult bleeding			
Initial management of common medical emergencies (see Medical Conditions)			
Practical management of triage: competing priorities for admission			

2. CLINICAL ASSESSMENT

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Clinical skills are important in managing critically ill patients, particularly when assessing patients outside the ICU before admission or after discharge, and in the day-to-day review of the longer stay ICU patient. Basic skills include the compassionate handling of sick patients during physical examination and the correct identification and interpretation of clinical signs.			
Knowledge			
Importance of clinical history in making diagnosis			
Relevance of prior health status in determining risk of critical illness and outcomes			
Understanding of the impact of drug therapy on organ-system function			
Physical signs associated with critical illness			
The inflammatory response in relation to organ-system dysfunction			
Infection and its relation to the inflammatory response			
Methods of obtaining clinical information			
Relative importance and interpretation of clinical signs			
Pathogenesis of multiple organ dysfunction			
Principles of prevention of multiple organ failure			
Skills			
Obtain an accurate history of the current condition, comorbidities and previous health status using appropriate sources of information			
Elicit and interpret symptoms and signs on clinical examination			
Examination and care of the unconscious or confused patient			
Obtain and interpret information from case records, charts and ICU chart			
Document information in the case record in a structured and accessible manner			
Link clinical with laboratory information to form a diagnosis			
Establish a management plan			
Recognition of impending organ system dysfunction			
Attitudes & behaviour			
Manage patients in a compassionate and considerate manner			
Communicate effectively with other health care professionals to obtain accurate information and plan care			
Workplace training objectives			
Demonstrate ability to elicit history and clinical signs			
Identify key points in the care of the unconscious patient			
Integrate information from the ward or ICU charts			
Present clinical cases accurately and concisely			

3. INVESTIGATION, DATA INTERPRETATION AND DIAGNOSIS

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Diagnostic accuracy determines therapeutic specificity. Intensive care focuses so greatly on technology and organ system support that it is easy to forget the fundamental importance of making a diagnosis, and how difficult that can be. Basic level trainees should be able to integrate clinical with laboratory information in order to diagnose the more common conditions encountered in intensive care, and to correct acute and life-threatening complications.			
Knowledge Appropriate use of laboratory tests to confirm or refute a clinical diagnosis Advantages and disadvantages of laboratory tests *Indications for, and basic interpretation of:* Electrocardiographs of common dysrrhythmias, infarction, pulmonary hypertension/embolism, pericarditis, LVH Echocardiography Ultrasound examination Cardiovascular physiological variables Fluid balance charts Blood gas measurement Respiratory function tests Chest radiographs: collapse, consolidation, infiltrates (including ALI/ARDS), pneumothorax, pleural effusion, pericardial effusion, position of cannulae, tubes or foreign bodies, airway compression, cardiac silhouette, mediastinal masses X-rays of long bone, skull, vertebral and rib fractures CT and MRI scans of head demonstrating fractures/ haemorrhage Neck and thoracic inlet films X-rays of abdominal fluid levels / free air Microbiology: types of organisms; colonisation vs infection; appropriate antibiotic use Haematology (including coagulation and sickle tests) Blood grouping and X-matching Urea, creatinine, electrolytes (Na, K, Ca, Mg) Liver function tests Drug levels in blood or plasma Endocrine function: diabetes, thyroid disorders, adrenal failure			
Skills			
Bronchoscopic broncho-alveolar lavage in an intubated patient			
Diagnostic bronchoscopy in a non-intubated awake patient			
Lumbar puncture and CSF sampling			
Link clinical with laboratory information to form a diagnosis			
Establish a management plan based on clinical and laboratory information			
Document results of laboratory tests			
Attitudes & behaviour			
Communicate and collaborate effectively with all laboratory staff			
Avoid unnecessary tests			
Workplace training objectives			
Justify use of particular laboratory tests			
Interpret results of laboratory tests			
Interpret microbiology lab results in relation to patient's condition and environment			
Demonstrate ability to refine differential diagnoses using appropriate investigations			

4. ORGAN SYSTEM SUPPORT AND RELATED PRACTICAL PROCEDURES

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Intensive care started with the co-ordinated provision of ventilatory support to polio victims. Multiple organ failure and multiple organ system support are now a routine part of clinical practice. Organ system support is not just equipment: it also includes drugs and the co-ordinated provision of multidisciplinary care. Basic level trainees must be able to provide emergency resuscitation, and know the principles of management of commonly used modalities of organ system support. No practitioner of whatever grade should undertake an elective practical procedure without due consideration for patient safety.			
Knowledge *Respiratory system* Indications for and methods of tracheal intubation Appropriate use of drugs to facilitate airway control Tube types (oral, nasal, tracheostomy etc), diameter and length Management of difficult intubation and failed intubation Methods of confirming correct placement of the endotracheal tube Insertion and use of oral airways, face masks and laryngeal mask airway Indications and contraindications to tracheostomy and minitracheostomy Management of and complications associated with tracheostomy tubes Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration Cricoid pressure: indications and safe provision Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock, cervical spine injury) Indications for and methods of mechanical ventilation Ventilatory modes: CMV, IRV, PRVC, SIMV, PS, CPAP, BiPAP, Non-invasive ventilation Principles of extra-corporeal membrane oxygenation (ECMO) Detection and management of complications of mechanical ventilation Detection and management of pneumothorax (simple and tension) Insertion and safe management of chest drains Indications and methods of bronchoscopy via an endotracheal tube Indications and methods of bronchoscopy in a conscious non-intubated patient Principles of weaning from mechanical ventilation *Cardiovascular system* Cardiopulmonary resuscitation to ALS provider level Peripheral and central venous cannulation Arterial catheterisation Pulmonary arterial catheterisation, oesophageal Doppler, transoesophageal echo Principles of transvenous cardiac pacing Use of inotropic, chronotropic, vasodilator and vasoconstrictor drugs Use of intravenous fluids: crystalloids, colloids, blood and blood products Principles of intra-aortic counterpulsation balloon pump *Renal system* Safe urinary catheterisation Methods of preventing renal failure Investigation of impaired renal function Knowledge of nephrotoxic drugs Adjustment of drug doses in renal impairment/failure Renal replacement therapies *Gastrointestinal system and nutrition* Principles of adequate nutrition in the critically ill patient, including vitamins, trace elements, immunonutrition Assessment of nutritional status (eg: skin-fold thickness, muscle wasting) Selection of enteral or parenteral routes for nutrition Nasogastric cannulation Nasojejunal and percutaneous feeding tube insertion Sengstaken tube insertion Principles of support for the failing liver Prevention of stress ulceration Techniques for preventing microbial translocation *Nervous system* Principles of management of closed head injury Principles of management of raised intracranial pressure Principles of management of vasospasm Indications for and use of information from intracranial pressure monitoring devices *Musculoskeletal system* Prevention of pressure sores Principles of management of fluid losses following burns Short-term complications of fractures Consequences of muscle wasting *Sepsis and infection* Requirements for microbiological surveillance and clinical sampling Relation between lab results and patient's condition Appropriate use of antibiotics Proper handling of invasive medical devices			

Skills			
Maintenance of a clear airway using bag and mask			
Orotracheal intubation			
Naso-tracheal intubation			
Percutaneous tracheostomy			
Minitracheostomy or needle crico-thyoidotomy			
Changing an orotracheal tube			
Changing a tracheostomy tube electively			
Manual bagging and tracheal suction			
Institution and maintenance of controlled mechanical ventilation in a critically ill patient			
Confirmation of adequate oxygenation and control of $PaCO_2$ and pH			
Aseptic insertion of a pleural chest drain and connect to a one-way seal device			
Establish peripheral venous access sufficient to manage major haemorrhage			
Aseptic insertion of central venous, pulmonary arterial, and arterial catheters			
Aseptic insertion of tunnelled central venous catheter for parenteral nutrition			
Appropriate use of intravenous fluids			
Appropriate use of infused vasoactive drugs			
Measurement of cardiac output using pulmonary artery catheter or oesophageal Doppler			
Identification and avoidance of factors contributing to impaired renal function			
Urinary catheterisation: male and female			
Nasogastric tube placement			
Management of cardiorespiratory physiology to minimise rises in intracranial pressure			
Recognition and temporary stabilisation of unstable cervical spine			
Attitudes & behaviour			
Understand importance of ensuring physiological safety as a primary aim			
Understand difference between organ system support and specific treatment			
Appreciation of importance of timely institution of organ-system support			
Call for senior/more experienced help when experiencing difficulties			
Consideration of patient comfort in performance of practical procedures			
Workplace training objectives			
Practical procedures as listed above			
Nasogastric and urinary catheterisation			
Aseptic insertion of peripheral venous, central venous, pulmonary arterial and peripheral arterial cannulae			
Safe administration of intravenous drugs			
Performance of practical procedures with attention to patient comfort and nursing care			
Safe orotracheal intubation (up to grade II Cormack-Lehane for SHOs)			
Setting up a ventilator for a new post-operative ICU admission			
Setting ventilatory modes for a patient with ARDS			
Constructing a weaning plan			
Safe extubation			

5. MONITORING AND CLINICAL MEASUREMENT

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Intensive care is synonymous with close observation, documentation, and interpretation of clinical information. Routinely used methods for obtaining clinical information must be understood by all trainees. Higher level trainees should develop skills at integrating information from several sources and interpreting them in a clinical context.			
Knowledge The role of clinical assessment in monitoring Physical principles underlying use of monitoring devices (see physics and measurement) Indications for and contraindications to the use of monitoring devices Interpretation of information from monitoring devices, and identification of common causes of error Principles of 'minimal monitoring' Complications associated with monitoring and monitoring devices Methods for measuring temperature Methods for assessing pain and sedation One general method for measuring severity of illness (severity scoring systems) Methods for severity scoring or case mix adjustment for trauma, burns, therapeutic intensity or costs Glasgow Coma Scale Drug levels monitoring			
Skills: *Safe use of, and interpretation of data from:* Pulse oximetry ECG (3- and 12-lead) Non-invasive arterial blood pressure measurement Invasive arterial blood pressure measurement Central venous pressure measurement Pulmonary artery catheters or oesophageal Doppler Jugular bulb catheters and SjO_2 monitoring Arterial blood gas sample handling Inspired and expired gas monitoring for O_2, CO_2, and $NO^{\bullet}$ Spirometry and peak flow measurement Ventilator alarms Intracranial pressure monitoring Nerve stimulator to measure therapeutic neuromuscular block Clinical assessment of pain Scoring or scaling systems to assess degree of sedation Collection of data for one general method for severity scoring or case mix adjustment			
Attitudes & behaviour			
Ensure safe use of monitoring equipment in an appropriate environment			
Minimise patient discomfort in relation to monitoring devices			
Support other staff in the correct use of devices			
Review regularly the need for continued monitoring			
Workplace training objectives			
Identify an appropriate level of monitoring in relation to a patient's condition			
Demonstrate safe management of invasive monitoring devices			
Set up flush system and transducer for intra-arterial pressure measurement			
Correctly interpret data from clinical measurement in relation to patient's condition			
Resolve apparent contradictions between clinical information *vs* data from monitors			
Correct documentation of Glasgow Coma Scale.			
Demonstrate understanding of several case mix adjustment methods			

6. SAFE USE OF EQUIPMENT

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Proper use of equipment is an essential component in the safe delivery of effective care. Basic level trainees should know the indications, contraindications and safe use of those items of equipment that they are expected to use, particularly those required for organ system support. They should also understand some of the physical principles underlying their operation (see physics section).			
Knowledge Airways, tracheal tubes, tracheostomy tubes, emergency airways, laryngeal masks, fixed and variable performance oxygen therapy equipment, self-inflating bags, Humidification and nebulising devices Modes of ventilation and method of operation of at least one positive pressure ventilator, one non-invasive ventilator, and a constant positive airway pressure (CPAP) device Principles of use of pressure regulators, flowmeters, vaporizers, breathing systems. Principles of disconnection monitors. Manufacture, storage and safe use of oxygen, nitric oxide ($NO^{\bullet}$), compressed air and helium. Pipeline and suction systems, gas cylinders Non-invasive monitoring devices Methods for checking ventilator, breathing systems and monitoring apparatus Environmental control of temperature, humidity, air changes and scavenging systems for waste gases and vapours Sterilisation and cleaning of equipment. Electrical safety Characteristics and safe use of vascular access cannulae, spinal needles, epidural catheters, chest drains Function and use of defibrillator and other resuscitation equipment, transfusion devices. Function and use of continuous haemodiafiltration devices			
Skills Checking and setting the ventilator Checking pipelines, checking and changing cylinders Connecting and checking breathing systems Setting alarm limits for monitoring equipment Identifying and correcting ventilator miss-assembly and disconnections Collecting data from monitors Record keeping Checking, assembling resuscitation equipment Safe defibrillation Preparing equipment for: difficult and failed intubation paediatric intubation set aseptic vascular access intravascular pressure monitoring Choosing appropriate fluid balances using renal replacement therapies			
Attitudes & behaviour			
Shared responsibility for equipment with nursing and technical staff			
Determination to maximise safety			
Rapid response to acute changes in monitored variables			
Workplace training objectives			
Set up a ventilator for a new post-operative ICU admission			
Set ventilatory modes for a patient with ARDS			
Assemble and check breathing systems			
Determine appropriate monitoring			
Decide when additional monitoring (e.g. CVP, arterial line) is needed			
Set up and check monitoring equipment and alarm limits			
Check resuscitation equipment			
Document equipment settings			

7. SPECIFIC CIRCUMSTANCES

In this section specific areas of practice are considered. The knowledge, skills, attitudes and workplace training objectives identified here do not replace those listed under other domains, but are in addition to them. It is not expected that a basic level trainee would have direct exposure to all the conditions and diagnoses listed, but the content of this section should provide the foundation for further reading. A specialist would be expected to have a working knowledge and experience of the majority of components.

7a) GENERAL MEDICAL CONDITIONS

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: General medical patients requiring intensive care are almost exclusively emergency admissions, and many have complex or multiple problems. Basic level trainees should be able to identify the main risk factors for critical illness in this population, and to consider some of the underlying diagnoses. Higher level trainees will acquire greater depth and breadth of experience, which allows them to manage more complex problems. Safe investigation and management of these patients is expected; encyclopaedic knowledge of all details of every condition is not.			
Knowledge: Recognition and management of medical emergencies which may require admission to intensive or high dependency care, or complicate a patient's stay in the ICU, including the emergency presentation of the symptoms, signs and clinical conditions listed below: *Respiratory:* Tachypnoea, dyspnoea, chest pain; the unprotected airway; pneumonia, collapse or consolidation, asthma, chronic obstructive airways disease, pulmonary oedema, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; pleural effusion, pneumothorax (simple and tension); upper and lower airway obstruction including epiglottitis *Cardiovascular:* Hypotension and hypertension; shock (cardiogenic, hypovolaemic, septic); crescendo or unstable angina; acute myocardial infarction; left ventricular failure; cardiomyopathies; pulmonary hypertension; right ventricular failure; cor pulmonale; pulmonary embolus; malignant hypertension; cardiac tamponade; atrial tachycardias, ventricular tachycardias, conduction disturbances, atrial and ventricular fibrillation, pacing box failure *Renal and genito-urinary:* Oliguria and anuria; polyuria; urological sepsis; acute renal failure; chronic renal failure; renal manifestations of systemic disease including vasculitides; nephrotoxic drugs and monitoring; pyometra; septic abortion *Gastrointestinal:* Abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea and vomiting; pancreatitis; jaundice; fulminant hepatic failure; paracetamol (acetaminophen)-induced liver injury; *Neurological:* Confusion and coma; post-anoxic brain damage; Intracranial haemorrhage and infarction; convulsions and status epilepticus; meningitis and encephalitis; medical causes of raised intracranial pressure; neuro-myopathies (e.g.: Guillain-Barre, myasthenia gravis, malignant hyperpyrexia) causing respiratory difficulty; critical illness polyneuropathy, motor neuropathy, and myopathy *Sepsis and infection:* Pyrexia and hypothermia; patients at risk; organ-specific signs of infection including haematogenous (venous catheter-related, endocarditis, meningococcal disease), urological, pulmonary, abdominal (peritonitis, diarrhoea), skeletal (septic arthritis) and neurological. Organisms causing specific infections: Gram positive and Gram negative bacteria, fungi, protozoa (e.g.: malaria), viruses (e.g.: influenza, RSV, Hepatitis A, B and C, HIV, CMV); use of antibiotics (see also infection control). *Haematology and oncology:* The immunosuppressed or immunoincompetent patient; agranulocytosis and bone marrow transplant patients; severe anaemia; major blood transfusion; coagulation disorders; haemoglobinopathies *Metabolic, hormonal and toxicology*: Diabetes; over- and under-activity of thyroid, adrenal and pituitary glands; electrolyte disorders; general principles of the treatment of poisoning, and the specific management of poisoning with aspirin, paracetamol/acetaminophen, paraquat, carbon monoxide, alcohol, tricyclic and quadricyclic antidepressants.			
Skills			
Develop a limited differential diagnosis based on presenting clinical features			
Develop a differential diagnosis to include less common or rare conditions			
Recognise that diverse diseases share limited forms of acute physiological expression			
Identify and integrate co-morbid diseases with the acute condition			
Attitudes & behaviour			
Communicate effectively to establish care plan with admitting clinicians, nursing staff and other professionals, and with relatives and patient where appropriate			
Workplace training objectives			
Learn treatment algorithms for treatment of common medical emergencies			
Integrate long-term and chronic treatment with the acute care process			
Able to recognise when senior / more experienced advice and help is required			
Recognise and manage medical emergencies until senior or more experienced assistance is available			

7b) PERIOPERATIVE CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: substantial proportions of patients admitted to intensive care are postoperative admissions, or have surgical problems. Basic level trainees should have a working knowledge of the problems encountered by general surgical patients. Intermediate level trainees may, and advanced level trainees must also have experience of the main surgical specialities such as cardiothoracic and neurosurgery. Specialist level trainees will have an understanding of transplantation. All practitioners should understand the nature of the surgical and anaesthetic procedures undertaken routinely on the patients under their care.			
Knowledge *General factors:* Importance of preoperative health status on postoperative outcomes Factors determining perioperative risk, and methods of optimising high-risk patients Implications for postoperative care of type of surgery Implications for postoperative care of type of anaesthesia Anaesthetic risk factors complicating recovery: suxamethonium apnoea, anaphylaxis, malignant hyperpyrexia, difficult airway Dangers of emergency anaesthesia The interpretation of relevant preoperative investigations Effect of gastric contents, smoking, and dehydration on perioperative risk Implications for postoperative care of common medical conditions (see section on general medical conditions) Implications of current drug therapy. Need for and methods of perioperative anti-thrombotic treatment Assessment of post-operative analgesic needs Management of cyanosis, hypo- and hypertension, shivering and stridor. Assessment of pain and methods of pain management Methods of treating of postoperative nausea and vomiting Causes and management of post-operative confusion Assessment of appropriate level of postoperative care: ICU, HDU, post-anaesthesia recovery The importance of consent and the issues surrounding it *Respiratory:* Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient; the unprotected airway; upper and lower airway obstruction including epiglottitis; pneumonia, collapse or consolidation, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; pulmonary oedema; pleural effusion, pneumothorax (simple and tension); use of chest drains; factors affecting patients following thoracotomy, lung resection, oesophagectomy, cardiac surgery and thymectomy. *Cardiovascular:* Interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; operative risk factors in patients with ischaemic heart disease; pulmonary embolus; cardiac tamponade; management of patients following cardiac surgery (coronary grafting, valve replacement) and aortic surgery (thoracic descending, abdominal); heart and heart-lung transplantation *Renal:* Causes of perioperative oliguria and anuria; prevention and management of acute renal failure; consequences of nephrectomy, ileal conduits *Gastrointestinal:* Interpretation of abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea, vomiting and ileus; peritonitis; intestinal ischaemia; abdominal tamponade; pancreatitis; jaundice; management of the post-liver transplant patient; perioperative nutrition *Neurological:* Surgical causes of confusion, coma and raised intracranial pressure; determinants of cerebral perfusion and oxygenation; prevention of secondary brain injury; perioperative management of patients with neuropathies and myopathies (e.g.: thymectomy); intracranial pressure monitoring; intracerebral haemorrhage; spinal cord and brachial plexus injury *Sepsis and infection:* Pyrexia and hypothermia; wound infections; necrotising fasciitis; prophylactic antibiotics; risk of infection in patients with indwelling medical devices including intravascular and urethral catheters and heart valves; peritonitis; intestinal ischaemia *Haematology and oncology:* Care of the immunosuppressed or immunoincompetent patient; management of severe acute haemorrhage and blood transfusion; coagulation disorders and haemoglobinopathies; Jehovah's Witness patients *Metabolic and hormonal*: Perioperative management of patients with diabetes; hypo- and hyperadrenalism, surgery to thyroid, adrenal and pituitary glands; perioperative electrolyte disorders; *Musculo-skeletal:* Trauma patients (see trauma section); pressure area care; compartment syndromes; paralysed patients			
Skills			
Obtain information from sources other than the patient			
Identify airway or intubation difficulties, preoperative health status and intercurrent disease, medications, allergies, nature of anaesthetic and surgery			
Assess conscious level, status of airway and cervical spine, and conduct careful systems review			
Determine adequacy and route of administration of analgesia			
Document, monitor and manage fluid balance, circulating volume, drains, systemic oxygen supply			
Identify life-threatening cardiorespiratory complications, and manage hypovolaemia			
Differentiate and manage tension pneumothorax, cardiac tamponade, pulmonary embolus			

Attitudes & behaviour			
Establish a plan for postoperative management			
Ensure the necessary resources are available for safe postoperative care			
Communicate effectively to establish care plan with anaesthetist, surgeon, nursing staff and other professionals, and with relatives and patient where appropriate			
Workplace training objectives			
Background reading on surgical conditions as they present clinically			
Gain practical experience of intraoperative management			
Accurately assess the airway for potential difficulties with airway management			
Interpret pre-operative investigations, intra-operative findings and events, and respond to them appropriately			
Recognise when senior advice or assistance is required			
Recognise and manage perioperative emergencies until senior or more experienced assistance is available			
Consider impact of long-term and chronic treatment on acute surgical care			

7c) TRAUMA AND BURNS

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Co-ordinated team care is essential for managing the multiple trauma victim. Basic training should include knowledge of trauma management, though practical experience may not be possible at this level. Competence to the level of advanced trauma life support certification is expected at specialist trainee level.			
Knowledge Performance and interpretation of the primary and secondary survey Emergency airway management Anatomy and technique of cricothyrotomy/tracheostomy/mini-tracheotomy Establishing IV access including interosseous cannulation Immediate specific treatment of life-threatening illness or injury, with special reference to thoracic and abdominal trauma Fat embolism Recognition and management of hypovolaemic shock Effects of trauma on gastric emptying Central venous access: anatomy and techniques Vascular pressure monitoring Chest drain insertion Peritoneal lavage Principles of the management of head injury Mechanisms and effects of raised intracranial pressure: coup and contra-coup injuries Methods of preventing the 'second insult' to the brain Management of cervical spine injuries Sort tissue injury related to fractures Crush injury and compartment syndromes Calculation of area burned Prevention of infection in the burned patient Detection and management of smoke inhalation or airway compromise Fluid resuscitation in the burned patient			
Skills			
Assessment and immediate stabilisation of the trauma patient: primary survey			
Assessment and immediate stabilisation of the trauma patient: primary and secondary survey			
Calculation and documentation of Glasgow coma scale			
Recognition of need for appropriate investigations (Hb, cross-match, chest X-ray, CT scan etc)			
Assessment, prediction and management of circulatory shock			
Emergency airway management, oxygen therapy and ventilation			
Chest drain insertion and management: emergency relief of tension pneumothorax			
Cannulation of major vessels for resuscitation and monitoring			
Care and immobilisation of cervical spine			
Analgesia for the trauma patient			
Urinary catheterisation in pelvic trauma			
Differentiate and manage tension pneumothorax, cardiac tamponade, pulmonary embolus			
Attitudes & behaviour			
Rapid response and resuscitation			
Focus on the ‘golden hour’			
Communication with appropriate specialists			
Ability to take control when either appropriate or necessary			
Insist on stabilisation before transfer			
Early planning for rehabilitation			
Workplace training objectives			
Perform assessment and immediate stabilisation of the traumatised patient			
Stabilise a patient’s condition until senior / more experienced help arrives			
Know when to get senior or more experienced help			
Perform secondary survey and investigation of the traumatised patient			

7d. PAEDIATRIC CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Although this competency document refers to adult intensive care, all intensivists may be required to deliver emergency care to children with, or at risk of, critical illness until the services of a specialist paediatric or neonatal intensivist are available. This section describes the paediatric competencies expected of a practitioner in adult intensive care medicine. Basic level trainees may have little opportunity to gain direct experience of paediatric practice, but it will form part of specialist level training.			
Knowledge Anatomical differences between adults and children in the airway, head, and spinal cord Physiological differences between adults and children Haematological and biochemical changes with age Thermoregulation in infants Estimation of blood volume, replacement of fluid loss Modification of drug dosages Safe analgesia Calculation of tube sizes, selection of masks and airways Choice of breathing system Upper respiratory tract infections including epiglottitis Meningitis Surgery for congenital and acquired cardiac disease Psychological aspects of sick children Legal and ethical aspects of caring for children			
Skills			
Venous access (including local anaesthesia premedication)			
Airway management, selection of correct sized tubes and masks etc			
Uncomplicated mechanical ventilation			
Management and stabilisation of the injured child until senior / more experienced help arrives			
Paediatric resuscitation at ALS level (Resuscitation Council (UK)) if caring for children			
Attitudes & behaviour			
Communication with and reassurance of the child and parents			
Issues of consent			
Workplace training objectives			
Discuss main physiological and anatomical differences between adults & children			
Demonstrate emergency airway, respiratory and cardiovascular support in the critically ill child			

7e. OBSTETRIC CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Obstetric patients rarely require intensive care, but when they do this is nearly always attended with particular anxiety and distress. Some patients require elective peripartum admission for the monitoring and management of concurrent conditions, usually congenital cardiac disease. Specialist level trainees should obtain some experience of obstetric practice to gain practical understanding of the principles of peripartum care and maternal and neonatal physiology.			
Knowledge Physiological changes associated with a normal pregnancy Functions of the placenta: placental transfer: foeto-maternal circulation The foetus: foetal circulation: changes at birth Methods of analgesia during labour Methods of avoiding aorto-caval compression Pre-eclampsia and eclampsia HELLP syndrome Congenital heart disease complicating pregnancy Ante-partum and post-partum haemorrhage Risks and avoidance of pulmonary aspiration during anaesthesia Identification of unexpected concurrent pregnancy in a critically ill woman Amniotic fluid embolism			
Attitudes & behaviour			
Seek senior/more experienced help early			
Good communication with mother, partner, other family members			
Good communication with obstetric staff			
Compassion and kindness when the outcome of labour has been poor			
Workplace training objectives			
Background reading of obstetric critical illness			
Gain experience of peripartum obstetric and anaesthetic care			

7f. TRANSPORT CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Critically ill patients are frequently moved, either within the ICU to a different bedspace, or within hospital for diagnostic radiology or for surgical procedures, or between hospitals. The principles of safe transfer are the same, regardless of the distance travelled. All trainees should gain supervised experience in safe transfer. Interhospital transfer in particular requires a high level of expertise because additional help cannot be obtained if problems occur.			
Knowledge Principles of safe transfer of patients Understanding portable monitoring systems			
Skills			
Intra-hospital transfer of patients requiring ventilatory support alone			
Interhospital transfer of patients with single or multiple organ failure			
Attitudes & behaviour			
Insistence on stabilisation before transfer			
Pretransfer checking of kit and personnel			
Planning for and prevention of problems during transfer			
Communication with referring and receiving institutions and teams			
Insistence on adequate support from senior / more experienced colleagues			
Workplace training objectives			
Supervised intrahospital transfers of ventilated patients to theatre of for diagnostic procedures (e.g.: CT)			
Interhospital transfers of ventilated patients with or without support of other organ-systems			

7g. SEPSIS AND INFECTION CONTROL

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: The immunoinflammatory response is a fundamental mechanism in disease processes. Critical illness is frequently attended by excessive activation of the immunoinflammatory cascade combined with immunoincompetence. Patients are susceptible to, and are a source of, resistant organisms, and the most common vector between patients is a member of staff's hand or clothing. Meticulous hand disinfection is the oldest, best verified, and most effective method of preventing cross infection.			
Knowledge Universal precautions and good working practices (hand washing, gloves etc) Proper handling of medical devices including intravascular devices Cross infection: modes of transfer and common agents Autogenous infection: routes and methods of prevention Emergence of resistant strains Antibiotic policies in a hospital Activity of commonly used antibiotics Common surgical infections: antibiotic choice and prophylaxis Infections from contaminated blood Hepatitis and HIV infections: modes of infection: natural history: at risk groups Immunisation policy Sterilisation of equipment Strategy if contaminated			
Skills			
Recognition of at risk groups including the immunocompromised patient			
Administration of IV antibiotics: risk of allergy and anaphylaxis			
Aseptic techniques			
Use of disposable filters and breathing systems			
Use of protective clothing/gloves/masks etc			
Application of methods for preventing autogenous infection (e.g.: posture, mouth hygiene)			
Attitudes & behaviour			
Every patient entitled to the best care available			
Prevention of self-infection			
Prevention of cross infection is my responsibility			
Workplace training objectives			
Demonstrate routine application of skills and attitudes listed above to all patients, particularly hand washing between patient contacts			
Discussion of factors which may limit autogenous infection			
Safe use of therapies which modify the inflammatory response			

7h. COMFORT CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: For many patients and most relatives the ICU is an intimidating environment. Critical illness is often attended by discomfort and pain, and sometimes by the most extreme distress. Minimising unpleasant symptoms and delivering care with compassion is an essential duty of all staff, as is supporting each other during difficult periods.			
Knowledge Causes of, and methods of minimising, distress to patients Bereavement: anticipating and responding to grief Methods of communicating with intubated patients Methods of measuring depth of sedation Stress responses Causes and management of acute confusional states Sleep deprivation and its consequences Acute pain management Patient-controlled analgesia Indications, contra-indications and complications of commonly used analgesic, hypnotic, and neuromuscular blocking drugs Pharmacokinetics and dynamics of commonly used analgesic and hypnotic agents, and neuromuscular blocking drugs in-patients with normal and abnormal organ system function. Indications, contra-indications, methods and complications of regional analgesia in critical illness Importance of mouth care			
Skills			
Identify and treat causes of distress			
Safe use of analgesic, hypnotic and neuromuscular blocking drugs			
Management of established epidural analgesia			
Minimise complications associated with opioid and non-opioid analgesics			
Attitudes & behaviour			
Desire to minimise patient distress			
Work with nurses and relatives to minimise patient distress			
Aim to communicate with and support next-of-kin			
Workplace training objectives			
Demonstrate compassionate care of patients and relatives			
Safe use of limited range of analgesic, hypnotic and neuromuscular blocking drugs			
Safe use of wide range of analgesic, hypnotic and neuromuscular blocking drugs			

8. PRE- AND POST-ICU CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: 'Outreach' care is now recognised as an essential component of the 'ICU service without walls'. It is the responsibility of the ICU staff to provide safe care to all patients regardless of environment, within the constraints of available service provision. Early intervention may reduce cardiopulmonary arrest rates and hence risk of critical illness. Optimisation of the high-risk surgical patient reduces mortality and costs of care.			
Knowledge Factors which predispose patients to critical illness, including poor nutrition Early warning signs of impending critical illness Methods of optimising high risk surgical patients Criteria for admission to and discharge from intensive and high dependency (HDU) care units Risk factors for ICU readmission following discharge to the ward Tracheostomy care outside the ICU or HDU Post-ICU mortality rate, and common reasons for death following discharge Common symptomatology following critical illness Rehabilitation: physical and psychological Long-term or home ventilation Persistent vegetative state			
Skills			
Resuscitation and initial stabilisation (see domain 1)			
Recognition and management of risk factors associated with critical illness			
Optimisation of high-risk surgical patients before surgery: site of care, management, communication			
Liaison with ward staff to ensure optimal communication and continuing care after ICU discharge			
Timely discussion of 'do not resuscitate' orders and treatment limitation decisions			
Identification of complications associated with critical illness (e.g.: nerve palsies) and appropriate referral			
Attitudes & behaviour			
Determination to provide best care possible regardless of environment			
Follow-up of patients following discharge to the ward			
Good communication and relationships with ward staff			
Workplace training objectives			
Case record analysis of pre-ICU standards of care			
Exposure to perioperative management, including intra-operative management (see Domain 7b)			
Discussion of criteria for admission to and discharge from ICU & HDU			
Taking decisions to admit or discharge patients			
Active participation in post-ICU follow-up clinics			

9. END-OF-LIFE CARE

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Death is a common event in intensive care; it may also be inevitable, and a dignified death a desirable though sad outcome. Sustained organ system support of patients who are certain to die is unkind, unethical, inappropriate, and depletes the medical commons. Withdrawal of support does not mean withdrawal of care, and a kind death does much to resolve guilt and unhappiness persisting for years in the surviving family. Brain death and organ donation must be handled with sensitivity and strictly according to national guidelines. Autopsy (post-mortem) examination often provides important opportunities for learning.			
Knowledge Basic ethical principles: autonomy, beneficence, non-maleficence, justice Ethical and legal issues in decision-making for the incompetent patient Surrogate decision making Advance directives Difference between consent and assent for treatment and research Methods for assessing or measuring quality of life Confidentiality With-holding and withdrawing treatment: omission and commission Difference between euthanasia and allowing death to occur: doctrine of double effect Procedure for withdrawing treatment and support Attitude of major religions to brain death and organ donation Preconditions, exclusions and tests for the diagnosis of brain death Responsibilities and activities of transplant co-ordinators Management of the organ donor Completion of death certification Responsibilities of coroner (procurator fiscal or equivalent), and reasons for referral			
Skills			
Communicating with relatives			
Discussing treatment options with patient or family before ICU admission			
Making substituted judgements and differentiating competent from incompetent statements by patients			
Obtaining consent/assent for treatment, research or autopsy			
Obtaining information on which to make assessments of quality of life			
Relieving distress in the dying patient			
Implementation of procedure for withdrawing treatment and support			
Performance of tests of brain stem function, including preconditions and exclusions			
Attitudes & behaviour			
Respect for the truth			
Respect for the expressed wishes of competent patients			
Liaison with religious representative (pastor, vicar, priest, chaplain, rabbi, monk) if requested by patient or family			
Liaison with transplant co-ordinators			
Desire to support patient, family, and other staff members appropriately during treatment withdrawal			
Workplace training objectives			
Attendance at discussions with family about treatment limitation or withdrawal			
Involvement in discussions with family about treatment limitation or withdrawal			
Management of procedure for withdrawing treatment and support			
Obtaining consent/assent for treatment, research or autopsy			
Performance of tests of brain stem function, including preconditions and exclusions			
Attendance at surgical organ harvesting			

10. PROFESSIONALISM

Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCST)	**B**	**I**	**A**
Overview: Professionalism implies high standards, commitment to quality, patient care before self-interest, transparent evaluation of service delivered, and the conditional privilege of self-regulation.			
Knowledge Published standards of care at local, regional and national level Requirements for training Local policies and procedures Methods of audit and translating findings into sustained change in practice Recent advances in medical research relevant to intensive care			
Skills			
Self-directed learning Enquiring mind, self-prompted search for knowledge			
Proper use of learning aids where available			
Contribution to departmental activities			
Participation in audit			
Participation in educational activities and teaching other groups appropriate to level of knowledge			
Maintenance of education and training record			
Understands research methodology			
Actively participating in research			
Communication Able to achieve appropriate information transfer.			
Understands that communication is a two-way process			
Calls for senior/more experienced help in difficult situations			
Effective multidisciplinary communication and collaborative practice			
Organisation and management Structured approach to developing individual patient care plans			
Effective member of the ICU team			
Effective leadership of ICU team			
Organise multidisciplinary care for groups of patients in the ICU			
Organise long-term multidisciplinary care for all patients in the ICU			
Strategic planning of the ICU service within the wider environment			
Principles of workforce planning			
Practical application of equal opportunities legislation			
Attitudes & behaviour			
Caring and compassionate with patients and relatives			
Ethical behaviour			
Functioning within competence			
Accepts appropriate advice from other health care professionals			
Supportive of colleagues			
Demonstrates initiative in analysing problems and critically evaluating current practice			
Professional and reassuring approach			
Attentive to detail, punctual, clean, tidy, polite and helpful			
Workplace training objectives			
Maintain education and training record			
Present topics at staff educational meetings			
Present topics at regional or national meetings where possible			
Active participation in research projects			
Experience and discuss staff-relative interactions (e.g.: breaking bad news)			
Lead ICU ward round with consultant supervision			
Lead ICU ward round without direct supervision			
Arrange ICU educational meetings			
Attend management meetings as appropriate			
Discuss cost-effective care in the ICU			
Attendance as observer (with permission from trainee) at SHO training assessments			

11. SCIENCES

Overview: Only knowledge competencies are documented in this section.

11 a) Anatomy

Respiratory System
Mouth, nose, pharynx, larynx, trachea, main bronchi, segmental bronchi, structure of bronchial tree: differences in the child
Airway and respiratory tract, blood supply, innervation and lymphatic drainage
Pleura, mediastinum and its contents
Lungs, lobes, microstructure of lungs
Diaphragm, other muscles of respiration, innervation
The thoracic inlet and 1st rib
Interpretation of a normal chest x-ray

Cardiovascular system
Heart, chambers, conducting system, blood and nerve supply.
Pericardium
Great vessels, main peripheral arteries and veins
Foetal and materno-foetal circulation

Nervous system
Brain and its subdivisions
Spinal cord, structure of spinal cord, major ascending and descending pathways
Spinal meninges, subarachnoid and extradural space, contents of extradural space.
Cerebral blood supply
CSF and its circulation
Spinal nerves, dermatomes
Brachial plexus, nerves of arm
Intercostal nerves
Nerves of abdominal wall
Nerves of leg and foot
Autonomic nervous system
Sympathetic innervation, sympathetic chain, ganglia and plexuses
Parasympathetic innervation.
Stellate ganglion
Cranial nerves: base of skull: trigeminal ganglion
Innervation of the larynx
Eye and orbit

Vertebral column
Cervical, thoracic, and lumbar vertebrae
Sacrum, sacral hiatus
Ligaments of vertebral column
Surface anatomy of vertebral spaces, length of cord in child and adult

Surface anatomy
Structures in antecubital fossa
Structures in axilla: identifying the brachial plexus
Large veins and anterior triangle of neck
Large veins of leg and femoral triangle
Arteries of arm and leg
Landmarks for tracheostomy, cricothyrotomy
Abdominal wall (including the inguinal region): landmarks for suprapubic urinary and peritoneal lavage catheters
Landmarks for intrapleural drains

11 b) Physiology and biochemistry

General
Organisation of the human body and homeostasis
Variations with age
Function of cells; genes and their expression
Mechanisms of cellular and humoral defence
Cell membrane characteristics; receptors
Protective mechanisms of the body

Biochemistry
Acid base balance and buffers
Ions e.g. Na^{+}, K^{+}, Ca^{++}, Cl^{-}, HCO_3^{-}, Mg^{++}, PO_4^{-}
Cellular metabolism
Enzymes

Body fluids and their functions and constituents

Capillary dynamics and interstitial fluid
Osmolarity: osmolality, partition of fluids across membranes
Lymphatic system
Special fluids especially cerebrospinal fluid: also pleural, pericardial and peritoneal fluids

Haematology and Immunology

Red blood cells: haemoglobin and its variants
Blood groups
Haemostasis and coagulation
White blood cells
The inflammatory response
Immunity and allergy

Muscle

Action potential generation and its transmission
Neuromuscular junction and transmission
Muscle types
Skeletal muscle contraction
Smooth muscle contraction: sphincters
Motor unit

Heart/Circulation

Cardiac muscle contraction
The cardiac cycle: pressure and volume relationships
Rhythmicity of the heart
Regulation of cardiac function; general and cellular
Control of cardiac output (including the Starling relationship)
Fluid challenge and heart failure
Electrocardiogram and arrhythmias
Neurological and humoral control of systemic blood pressures, blood volume and blood flow (at rest and during physiological disturbances e.g. exercise, haemorrhage and Valsalva manoeuvre)
Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle
Autoregulation and the effects of sepsis and the inflammatory response on the peripheral vasculature
Characteristics of special circulations including: pulmonary, coronary, cerebral, renal, portal and foetal

Renal tract

Blood flow and glomerular filtration and plasma clearance
Tubular function and urine formation
Endocrine functions of kidney
Assessment of renal function
Regulation of fluid and electrolyte balance
Regulation of acid-base balance
Micturition
Pathophysiology of acute renal failure

Respiration

Gaseous exchange: O_2 and CO_2 transport, hypoxia and hyper- and hypocapnia, hyper-and hypobaric pressures
Functions of haemoglobin in oxygen carriage and acid-base equilibrium
Pulmonary ventilation: volumes, flows, dead space.
Effect of IPPV on lungs
Mechanics of ventilation: ventilation/perfusion abnormalities
Control of breathing, acute and chronic ventilatory failure, effect of oxygen therapy
Non-respiratory functions of the lungs

Nervous System

Functions of nerve cells: action potentials, conduction and synaptic mechanisms
The brain: functional divisions
Intracranial pressure: cerebrospinal fluid, blood flow
Maintenance of posture
Autonomic nervous system: functions
Neurological reflexes
Motor function: spinal and peripheral
Senses: receptors, nociception, special senses
Pain: afferent nociceptive pathways, dorsal horn, peripheral and central mechanisms, neuromodulatory systems, supraspinal mechanisms, visceral pain, neuropathic pain, influence of therapy on nociceptive mechanisms
Spinal cord: anatomy and blood supply, effects of spinal cord section

Liver

Functional anatomy and blood supply
Metabolic functions
Tests of function

Gastrointestinal
Gastric function; secretions, nausea and vomiting
Gut motility, sphincters and reflex control
Digestive functions
Nutrition: calories, nutritional fuels and sources, trace elements, growth factors

Metabolism
Nutrients: carbohydrates, fats, proteins, vitamins and minerals
Metabolic pathways, energy production and enzymes; metabolic rate
Hormonal control of metabolism: regulation of plasma glucose, response to trauma
Physiological alterations in starvation, obesity, exercise and the stress response
Body temperature and its regulation

Endocrinology
Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors
Hypothalamic and pituitary function
Adrenocortical hormones
Adrenal medulla: adrenaline (epinephrine) and noradrenaline (norepinephrine)
Pancreas: insulin, glucagon and exocrine function
Thyroid and parathyroid hormones and calcium homeostasis

Pregnancy
Physiological changes associated with normal pregnancy
Materno-foetal, foetal and neonatal circulation
Functions of the placenta: placental transfer
Foetus: changes at birth

11 c) Pharmacology

General Pharmacology

Applied chemistry
Types of intermolecular bonds
Laws of diffusion. Diffusion of molecules through membranes
Solubility and partition coefficients
Ionization of drugs
Drug isomerism
Protein binding
Oxidation and reduction

Mode of action of drugs
Dynamics of drug-receptor interaction.
Agonists, antagonists, partial agonists, inverse agonists.
Efficacy and potency. Tolerance
Receptor function and regulation.
Metabolic pathways; enzymes; drug: enzyme interactions; Michaelis-Menten equation
Enzyme inducers and inhibitors.
Mechanisms of drug action
Ion channels: types: relation to receptors. Gating mechanisms.
Signal transduction: cell membrane/receptors/ion channels to intracellular molecular targets, second messengers
Action of gases and vapours
Osmotic effects. pH effects. Adsorption and chelation.
Mechanisms of drug interactions:
Inhibition and promotion of drug uptake. Competitive protein binding. Receptor inter-actions.
Effects of metabolites and other degradation products.

Pharmacokinetics and pharmacodynamics
Drug uptake from: gastrointestinal tract, lungs, transdermal, subcutaneous, IM, IV, epidural, intrathecal routes
Bioavailability
Factors determining the distribution of drugs: perfusion, molecular size, solubility, protein binding.
The influence of drug formulation on disposition
Distribution of drugs to organs and tissues: Body compartments
Influence of specialised membranes: tissue binding and solubility.
Materno-foetal distribution.
Distribution in CSF and extradural space
Modes of drug elimination:
- Direct excretion
- Metabolism in organs of excretion: phase I & II mechanisms
- Renal excretion and urinary pH
- Non-organ breakdown of drugs

Pharmacokinetic analysis:
- Concept of a pharmacokinetic compartment
- Apparent volume of distribution

Clearance.
Clearance concepts applied to whole body and individual organs
Simple 1 and 2 compartmental models: concepts of wash-in and washout curves
Physiological models based on perfusion and partition coefficients
Effect of organ blood flow: Fick principle
Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs.

Effects of acute organ failure (liver, kidney) on drug elimination.
Influence of renal replacement therapies on clearance of commonly used drugs
Pharmacodynamics: concentration-effect relationships: hysteresis
Pharmacogenetics: familial variation in drug response
Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions

Systematic Pharmacology

Hypnotics, sedatives and intravenous anaesthetic agents
Simple analgesics
Opioids and other analgesics; and opioid antagonists
Non-steroidal anti-inflammatory drugs
Neuromuscular blocking agents (depolarising & non-depolarising), and anticholinesterases.
Drugs acting on the autonomic nervous system: cholinergic and adrenergic agonists and antagonists
Drugs acting on the heart & cardiovascular system (including inotropes, vasodilators, vasoconstrictors, antiarrhythmics, diuretics)
Drugs acting on the respiratory system (including respiratory stimulants & bronchodilators)
Antihypertensives
Anticonvulsants
Anti-diabetic agents
Diuretics
Antibiotics
Corticosteroids and other hormone preparations
Antacids. Drugs influencing gastric secretion and motility
Antiemetic agents
Local anaesthetic agents
Plasma volume expanders
Antihistamines
Antidepressants
Anticoagulants
Vitamins A-E, K, folate, B_{12}

11 d) Physics and clinical measurement

Mathematical concepts: relationships and graphs
Concepts only of exponential functions and logarithms: wash-in, washout and tear away
Basic measurement concepts: linearity, drift, hysteresis, signal: noise ratio, static and dynamic response
SI units: fundamental and derived units
Other systems of units where relevant to anaesthesia (e.g. mmHg, bar, atmospheres)
Simple mechanics: Mass, Force, Work and Power

Simple mechanics: mass, force, work and power

Heat: freezing point, melting point, latent heat.
Conduction, convection, radiation.
Mechanical equivalent of heat: laws of thermodynamics
Measurement of temperature and humidity

Colligative properties: osmometry

Physics of gases and vapours.
Absolute and relative pressure.
The gas laws; triple point; critical temperature and pressure.
Density and viscosity of gases.
Laminar and turbulent flow; Poiseuille's equation, the Bernoulli principle
Vapour pressure: saturated vapour pressure
Measurement of volume and flow in gases and liquids.
The pneumotachograph and other respirometers.
Principles of surface tension

Basic concepts of electricity and magnetism.
Capacitance, inductance and impedance
Amplifiers: bandwidth, filters.
Amplification of biological potentials: ECG, EMG, EEG.
Sources of electrical interference
Processing, storage and display of physiological measurements.
Bridge circuits
Basic principles and safety of lasers
Basic principles of ultrasound and the Doppler effect

Principles of cardiac pacemakers and defibrillators

Electrical hazards: causes and prevention.
Electrocution, fires and explosions.
Diathermy and its safe use

Principles of pressure transducers.
Resonance and damping, frequency response
Measurement and units of pressure.
Direct and indirect methods of blood pressure measurement.
Principles of pulmonary artery and wedge pressure measurement
Cardiac output: Fick principle, thermodilution

Measurement of gas and vapour concentrations, (oxygen, carbon dioxide, nitrous oxide, and volatile anaesthetic agents) using infra-red, paramagnetic, fuel cell, oxygen electrode and mass spectrometry methods
Measurement of pH, pCO_2 , pO_2
Measurement CO_2 production/ oxygen consumption/ respiratory quotient

Simple tests of pulmonary function e.g. peak flow measurement, spirometry.
Capnography
Pulse oximetry
Measurement of neuromuscular blockade
Measurement of pain

11 e) Statistical methods

Trainees will be required to demonstrate understanding of basic statistical concepts, but at basic level will not be expected to have practical experience of statistical methods. Emphasis will be placed on methods by which data may be summarised and presented, and on the selection of statistical measures for different data types. Specialist (CCST) trainees will be expected to understand the statistical background to measurement error and statistical uncertainty.

Data Collection.
Simple aspects of study design
Defining the outcome measures and the uncertainty of measuring them
The basic concept of meta-analysis and evidence based medicine

Descriptive statistics
Types of data and their representation.
The normal distribution as an example of parametric distribution
Indices of central tendency and variability

Deductive and inferential statistics
Simple probability theory and the relation to confidence intervals.
The null hypothesis.
Choice of simple statistical tests for different data types
Type I and type II errors.
Inappropriate use of statistics