



The Faculty of  
**Intensive  
Care Medicine**

# **FFICM Examinations SYLLABUS**

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## Change log

This document outlines the FFICM Examination Syllabus to be used by doctors completing postgraduate training in Intensive Care Medicine in the UK.

This is Version 1.0.

As the document is updated, version numbers will be changed, and content changes noted in the table below.

Version number	Date issued	Summary of changes
1.0	01 March 2022	Original publication date.

<b>Domain 1: Resuscitation and initial management of the acutely ill patient</b>	
	Recognises the importance of ensuring physiological safety as a primary aim
	Recognises the importance of timely institution of organ-system support
	Recognises the need for supportive care for all organ systems whether failing / injured or not
	Principles of oxygen therapy and use of oxygen administration devices (see 5.1)
	Recognise and manage emergencies
	seek assistance appropriately
	Order and prioritise appropriate investigations
	Professional and reassuring approach - generates confidence and trust in patients and their relatives
	Lead, delegate and supervise others appropriately according to experience and role
	Clear explanations given to patient, relatives and staff
	Consults and takes into account the views of referring clinicians; promotes their participation in decision making where appropriate
	Patient safety is paramount
	Rapid response and resuscitation
	Determination to provide best and most appropriate care possible regardless of environment
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
<b>1.1 Adopts a structured and timely approach to the recognition, assessment and stabilisation of the acutely ill patient with disordered physiology</b>	
	Early warning signs of impending critical illness
	Causes of cardio-respiratory arrest, identification of patients at risk and corrective treatment of reversible causes
	Clinical signs associated with critical illness, their relative importance and interpretation
	Clinical severity of illness and indications when organ dysfunctions or failure are an immediate threat to life
	Causes, recognition and management of emergencies and other relevant conditions e.g. <ul style="list-style-type: none"> <li>• Acute chest pain</li> <li>• Tachypnoea and dyspnoea</li> <li>• Upper and lower airway obstruction</li> <li>• Pulmonary oedema</li> <li>• Pneumothorax (simple and tension)</li> <li>• Hypoxaemia</li> <li>• Hypotension</li> <li>• Shock states</li> <li>• Anaphylactic and anaphylactoid reactions</li> <li>• Hypertensive emergencies</li> <li>• Acute confusional states and altered consciousness</li> <li>• Acute seizures / convulsions</li> <li>• Oliguria and anuria</li> <li>• Acute disturbances in thermoregulation and other relevant conditions</li> </ul>
	Treatment algorithms for common medical emergencies
	Immediate management of acute coronary syndromes
	Peri-arrest arrhythmias and the principles of their management eg bradycardia, broad complex tachycardia, atrial fibrillation, narrow complex tachycardia
	Methods for securing vascular access rapidly
	Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle
	Techniques for effective fluid resuscitation
	Principles of emergency airway management (see 5.3)
	Indications for, and methods of, ventilatory support
	Indications for not starting resuscitation or ceasing an initiated attempt
	Relevance of prior health status in determining risk of critical illness and outcome

Measures of adequacy of tissue oxygenation, e.g. base deficit, lactate, central venous saturation
Treatment strategies for abnormalities of fluid, electrolyte, acid-base and glucose balance
Criteria for admission to, and discharge from ICU – factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
Considers legal and ethical issues: patient autonomy, appropriateness of resuscitation and ICU admission
Conduct a primary survey: obtain relevant information rapidly and accurately
Monitor vital physiological functions as indicated
Recognise and rapidly respond to adverse trends in monitored parameters
Recognise and manage choking / obstructed airway
Implement emergency airway management and ventilation
Demonstrate emergency relief of tension pneumothorax
Demonstrate emergency relief of tension pneumothorax
Obtain vascular access sufficient to manage acute haemorrhage, rapid fluid infusion and monitor cardiovascular variables
Initiate emergency external cardiac pacing
Respond to an emergency in a positive, organised and effective manner.
Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
Perform a comprehensive secondary survey; integrate history with clinical examination to form a differential diagnosis.
Evaluate evidence for diagnoses already made and search for other diagnoses.
Prescribe appropriate analgesia
Examine and plan care for the confused patient
<b>1.2 Manages cardiopulmonary resuscitation</b>
Causes of cardio-respiratory arrest, identification of patients at risk and corrective treatment of reversible causes
Methods for securing vascular access rapidly
Causes and recognition of acute airway obstruction
Cardiopulmonary resuscitation
The modification of resuscitation techniques in the special circumstances of hypothermia, immersion and submersion, poisoning, pregnancy, electrocution, anaphylaxis, acute severe asthma and trauma
Risks to the rescuer during resuscitation and methods to minimise these
Treatment (algorithm) of patients in ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT)
Treatment (algorithm) of patients with non-VT/VF rhythms (asystole / PEA)
Tracheal route for drug administration: indications, contraindications, dosage
Indications, dosages and actions of drugs used in the peri-arrest period
Defibrillation: principles of monophasic and biphasic defibrillators; mechanism, indications, complications, modes and methods (manual and automated external defibrillators (AED)
Indications and methods of cardiac pacing in the peri-arrest setting
Effect of cardiorespiratory arrest on body systems
Principles of emergency airway management (see 5.3)
outcome after cardiac arrest
Indications for not starting resuscitation or ceasing an initiated attempt
Legal and ethical issues relating to the use of the recently dead for practical skills training, research and organ donation
Consider legal and ethical issues: patient autonomy, appropriateness of resuscitation and ICU admission.
Conduct a primary survey: obtain relevant information rapidly and accurately
Check and assemble resuscitation equipment
Demonstrate advanced life support skills (ALS standard or equivalent)
Recognise and manage choking / obstructed airway
Implement emergency airway management and ventilation
Act appropriately as a member or leader of the team

	Respond to an emergency in a positive, organised and effective manner.
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Protect a potentially unstable cervical spine
<b>1.3 Manages the patient post-resuscitation</b>	
	Causes of cardio-respiratory arrest, identification of patients at risk and corrective treatment of reversible causes
	Causes, recognition and management of: <ul style="list-style-type: none"> <li>• Upper and lower airway obstruction</li> <li>• Tachypnoea and dyspnoea</li> <li>• Hypoxaemia</li> <li>• Pneumothorax (simple and tension)</li> <li>• Acute chest pain</li> <li>• Pulmonary oedema</li> <li>• Hypotension</li> <li>• Shock states</li> <li>• Anaphylactic and anaphylactoid reactions</li> <li>• Hypertensive emergencies</li> <li>• Acute confusional states and altered consciousness</li> <li>• Acute seizures / convulsions</li> <li>• Oliguria and anuria</li> <li>• Acute disturbances in thermoregulation</li> <li>• other relevant conditions</li> </ul>
	Peri-arrest arrhythmias and the principles of their management (eg bradycardia, broad complex tachycardia, atrial fibrillation, narrow complex tachycardia)
	Techniques for effective fluid resuscitation
	Indications for and methods of ventilatory support
	Indications, dosages and actions of drugs used in the peri-arrest period
	Indications and methods of cardiac pacing in the peri-arrest setting
	Effect of cardio-respiratory arrest on body systems
	Principles and application of therapeutic hypothermia
	Measures of adequacy of tissue oxygenation, e.g. base deficit, lactate, central venous saturation
	Treatment strategies for abnormalities of fluid, electrolyte, acid-base and glucose balance
	Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
	Implement emergency airway management and ventilation
	Assess conscious level, status of airway and cervical spine, and conduct careful systems review
	Monitor vital physiological functions as indicated
	Recognise and rapidly respond to adverse trends in monitored parameters
	Obtain vascular access sufficient to manage acute haemorrhage, rapid fluid infusion and monitor cardiovascular variables
	Demonstrate emergency relief of tension pneumothorax
	Respond to an emergency in a positive, organised and effective manner.
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Assess, predict and manage circulatory shock
	Consider the need for and implement pre-transfer stabilisation
<b>1.4 Triage and prioritises patients appropriately, including timely admission to ICU</b>	
	Early warning signs of impending critical illness
	Causes of cardio-respiratory arrest, identification of patients at risk and corrective treatment of reversible causes
	Clinical signs associated with critical illness, their relative importance and interpretation
	Clinical severity of illness and indications when organ dysfunctions or failure are an immediate threat to life
	Indications for not starting resuscitation or ceasing an initiated attempt
	Relevance of prior health status in determining risk of critical illness and outcomes



	Triage and management of competing priorities
	Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
	Consider legal and ethical issues: patient autonomy, appropriateness of resuscitation and ICU admission.
	Conduct a primary survey: obtain relevant information rapidly and accurately
	Assess conscious level, status of airway and cervical spine, and conduct careful systems review
	Recognise and rapidly respond to adverse trends in monitored parameters
	Respond to an emergency in a positive, organised and effective manner.
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Consider legal and ethical issues: patient autonomy, appropriateness of resuscitation and ICU admission.
	Assess and communicate effectively the risks and benefits of intensive care admission
	Take decisions to admit, discharge or transfer patients
	Explain life-sustaining therapies, in clear language, and describe the expected outcome of such therapies in view of the patient's goals and wishes.
	Discuss treatment options with a patient or relatives before ICU admission
	Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)
	<b>1.5 Assesses and provides initial management of the trauma patient</b>
	Performance and interpretation of a primary and secondary survey
	Environmental hazards and injuries: e.g. <ul style="list-style-type: none"> <li>• hypo- and hyperthermia</li> <li>• near-drowning</li> <li>• electrocution</li> <li>• radiations</li> <li>• chemical injuries</li> <li>• electrical safety/micro shock</li> </ul>
	Effects and acute complications of severe trauma on organs and organ systems including: <ul style="list-style-type: none"> <li>• Respiratory – thoracic trauma; acute lung injury; tension pneumothorax</li> <li>• Cardiovascular – hypovolaemic shock; cardiac tamponade</li> <li>• Renal – acute renal failure; rhabdomyolysis</li> <li>• Neurological – altered consciousness; traumatic brain injury; post-anoxic brain injury; coup and contra-coup injuries; extra-dural and sub-dural haematomas; intracranial haemorrhage and infarction; spinal cord injury</li> <li>• Gastrointestinal – abdominal trauma; abdominal tamponade; rupture of liver or spleen</li> <li>• Musculoskeletal system – soft tissue injury; short term complications of fractures; fat embolism; crush injury and compartment syndromes; maxillofacial injuries</li> <li>• Other relevant conditions</li> </ul>
	Relevance of mechanism of injury to clinical presentation
	Secondary insults that potentiate the primary injury,
	Immediate specific treatment of life-threatening injury
	Methods for securing vascular access rapidly
	Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle
	Intraosseous cannulation
	Causes, recognition and management of shock states
	Techniques for effective fluid resuscitation
	Principles of blood and blood component therapy; principles of massive transfusion, including cell salvage
	Principles of emergency airway management (see 5.3)
	Indications for and methods of ventilatory support
	Triage and management of competing priorities
	Management of cervical spine injuries

Principles of management of closed head injury eg; coup and contra-coup injuries; methods of preventing 'secondary insult' to the brain; recognition and immediate management of raised intracranial pressure
Management of severe acute haemorrhage and blood transfusion; correction of coagulation disorders
Methods for assessing neurological function e.g. Glasgow Coma Scale
Principles, including indications, limitations and therapeutic modalities of: Basic radiological methods, CT scanning, ultrasound, MRI, ultrasound, angiography and radionuclide studies) in the critically ill patient
Indications for and basic interpretation of chest radiographs including: range of normal features on a chest x-ray; collapse, consolidation, infiltrates (including ALI/ARDS), pneumothorax, pleural effusion, pericardial effusion, position of cannulae, tubes or foreign bodies, airway compression, cardiac silhouette, mediastinal masses
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Conduct a primary survey: obtain relevant information rapidly and accurately
Assess and document Glasgow Coma Scale (GCS)
Obtain vascular access sufficient to manage acute haemorrhage, rapid fluid infusion and monitor cardiovascular variables
Implement emergency airway management and ventilation
Perform a comprehensive secondary survey; integrate history with clinical examination to form a differential diagnosis.
Review and refine diagnosis according to new information and the patient's response to treatment.
Assess conscious level, status of airway and cervical spine, and conduct careful systems review
Assess, predict and manage circulatory shock
Monitor vital physiological functions as indicated
Demonstrate emergency relief of tension pneumothorax
Prescribe appropriate analgesia
Prioritise the order of investigations and interventions for individual injuries according to their threat to life
Protect a potentially unstable cervical spine Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)
<b>1.6 Assesses and provides initial management of the patient with burns</b>
Triage and management of competing priorities
Performance and interpretation of a primary and secondary survey
Environmental hazards and injuries: hypo- and hyperthermia, near-drowning, electrocution, radiations, chemical injuries, electrical safety/micro shock
Relevance of mechanism of injury to clinical presentation
Pathophysiology and medical/surgical management of the phases of a burn injury
Calculation of area burned
Principles of calculation of fluid losses and fluid resuscitation in the burned patient
Treatment strategies for abnormalities of fluid, electrolyte, acid-base and glucose balance
Causes, recognition and management of shock states
Methods for securing vascular access rapidly
Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle
Techniques for effective fluid resuscitation
Causes and recognition of acute airway obstruction Indications for and methods of ventilatory support
Recognition and management of acute disturbances in thermoregulation
Signs, symptoms and causes of renal failure including acute kidney injury / chronic / acute on chronic) and indications for intervention
Respiratory complications of burn injuries (smoke inhalation, airway burns) - detection and management
Management of difficult or failed airway management (see 5.4)
The environmental control necessary for optimal care of the burned patient
Prevention of infection in the burned patient

	Burn-related compartment syndrome and escharotomy
	Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
	Conduct a primary survey: obtain relevant information rapidly and accurately
	Assess conscious level, status of airway and cervical spine, and conduct careful systems review
	Monitor vital physiological functions as indicated Implement emergency airway management and ventilation
	Obtain vascular access sufficient to manage acute haemorrhage, rapid fluid infusion and monitor cardiovascular variables
	Assess, predict and manage circulatory shock
	Prescribe appropriate analgesia
	Assess burn severity and prescribe initial fluid resuscitation
	Describe the endpoints of burn resuscitation and preferred fluids
	Recognise the potential for airway compromise in the burned patient
	Identification and management of carbon monoxide poisoning
	Estimate burn wound mortality from published data tables
	Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)
	Provide specialist advice before transfer to specialist cardiac or neuro ICU
	<b>1.7 Describes the management of mass casualties</b>
	Organisational principles for the coordination and management of mass casualties. Local major incident plan - the role of the ICU in hospital/community disaster plans
	Communication tasks and personal role in major incident / accident plan
	Triage and management of competing priorities
	Triage methods in use locally
	Characteristics and clinical presentations associated with major incidents caused by natural or civilian disasters, infection, epidemics or terrorist attack
	Relevance of mechanism of injury to clinical presentation
	Environmental hazards and injuries: hypo- and hyperthermia, near-drowning, electrocution, radiations, chemical injuries, electrical safety/micro shock
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Psychological support for patients and relatives
	Decontamination procedures
	Management of public relations and information
	Knowledge of alternative forms of external communication

**Domain 2: Diagnosis, Assessment, Investigation, Monitoring and Data Interpretation**

Universal precautions and preventative infection control techniques (hand washing, gloves, protective clothing, sharps disposal etc.)
Principles of aseptic technique and aseptic handling of invasive medical devices
Acquire, interpret, synthesize, record, and communicate (written and verbal) clinical information
Document investigations undertaken, results and action taken
Order and prioritise appropriate investigations
Develop a working, and limited differential diagnosis based on presenting clinical features
Professional and reassuring approach - generates confidence and trust in patients and their relatives
Lead, delegate and supervise others appropriately according to experience and role
Consults, communicates and collaborates effectively with patients, relatives and the health care team
Responds rapidly to acute changes in monitored variables
Considers patient comfort during procedures / investigations
Avoids unnecessary tests
Avoids extensive invasive procedures or monitoring which cannot be adequately interpreted at the bedside
Minimises patient discomfort in relation to monitoring devices
Ensures safe and appropriate use of equipment
Supports other staff in the correct use of devices
Demonstrates desire to minimise patient distress
Demonstrates compassionate care of patients and relatives
Promotes respect for patient privacy, dignity and confidentiality
Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)

**2.1 Obtains a history and performs an accurate clinical examination**

Clinical signs associated with critical illness, their relative importance and interpretation
Importance and principles of obtaining an accurate history of the current condition, co-morbidities and previous health status using appropriate sources of information
Sources and methods of obtaining clinical information
Relevance of prior health status in determining risk of critical illness and outcomes
Significance and impact of co-morbid disease on the presentation of acute illness
Impact of drug therapy on organ-system function
Examine patients, elicit and interpret clinical signs (or relevant absence of clinical signs) in the ICU environment
Obtain relevant information from the patient, relatives and other secondary sources.
Review notes, investigations and prior events to confirm or refute working diagnosis.
Listen effectively
Recognise impending organ system dysfunction
Integrate history with clinical examination to create a diagnostic and therapeutic plan

**2.2 Undertakes timely and appropriate investigations**

Indications for and the selection of suitable methods of monitoring or investigation taking into account their accuracy, convenience, reliability, safety, cost and relevance to the patient's condition.
Sensitivity and specificity of the investigation as related to a specific disease
Appropriate use of laboratory tests to confirm or refute a clinical diagnosis
Indications, limitations and basic interpretation of laboratory investigations of blood and other body fluids (e.g. urine, CSF, pleural and ascitic fluids):
<ul style="list-style-type: none"> <li>• Haematology</li> <li>• Immunology</li> <li>• Cytology</li> <li>• Blood grouping and x-matching</li> <li>• Urea, creatinine, glucose, electrolytes and lactate</li> <li>• Liver function tests</li> <li>• Drug levels in blood or plasma</li> <li>• Tests of endocrine function (eg diabetes, thyroid disorders, adrenal failure)</li> <li>• Blood gas samples (arterial, venous and mixed venous)</li> </ul>

	<ul style="list-style-type: none"> <li>• Microbiological surveillance and clinical sampling</li> <li>• other relevant investigations</li> </ul>
	Principles, indications, limitations and basic interpretation of: <ul style="list-style-type: none"> <li>• Respiratory function tests</li> <li>• Diagnostic bronchoscopy</li> <li>• Diagnostic ECG (EKG)</li> <li>• Echocardiography</li> <li>• Electroencephalogram (EEG) and evoked potentials</li> <li>• Intra-abdominal pressure monitoring</li> <li>• Intrathoracic pressure (oesophageal pressure) measurements</li> <li>• Fluid input-output monitoring</li> <li>• other relevant investigations</li> </ul>
	Principles, including indications, limitations and therapeutic modalities of: Basic radiological methods, CT scanning, ultrasound, MRI, angiography and radionuclide studies in the critically ill patient
	Risks to patient and staff of radiological procedures and precautions to minimise risk
	Invasive and non-invasive systems available for measuring cardiac output and derived haemodynamic variables, the principles involved and the type and site of placement of the monitoring device
	Risks to patient and staff of radiological procedures and precautions to minimise risk
	Recognise impending organ system dysfunction
	Evaluate benefits and risks related to specific investigations Interpret laboratory results in the context of the patient's condition
	Identify abnormalities requiring urgent intervention
	Recognise significant changes and the need for repeated testing (i.e. that a single normal result is not as significant as identifying trends of change by repeated testing where indicated)
	Undertake further consultation / investigation when indicated
<b>2.3 Performs electrocardiography (ECG / EKG) and interprets the results</b>	
	Principles of ECG monitoring (including for example heart rate, rhythm, conduction, PR interval, ST segment change and QT interval) – indications, limitations and techniques. Advantages and disadvantages of different lead configurations
	Sensitivity and specificity of the investigation as related to a specific disease
	Obtain and interpret data from ECG (3- and 12-lead)
	Identify deviations from normal range and interpret these in the context of the clinical circumstances
	Identify abnormalities requiring urgent intervention
	Differentiate real change from artefact and respond appropriately
<b>2.4 Obtains appropriate microbiological samples and interprets results</b>	
	Epidemiology and prevention of infection in the ICU
	Types of organisms – emergence of resistant strains, mode of transfer, opportunistic and nosocomial infections; difference between contamination, colonisation and infection
	Requirements for microbiological surveillance and clinical sampling
	Indications for microbiological sampling and interpretation of microbiological test results
	Sensitivity and specificity of the investigation as related to a specific disease
	Methods and routes of obtaining samples – associated indications and complications
	Appropriate use of laboratory tests to confirm or refute a clinical diagnosis sample
	Local patterns of bacterial resistance and antibiotic policy
	Indications for and contraindications to lumbar puncture and CSF sampling; laboratory analysis of CSF
	Obtain blood cultures using aseptic techniques
	Interpret laboratory results in the context of the patient's condition
	Integrate clinical findings with results of investigations
	Communicate and collaborate effectively with all laboratory staff
	Undertake further consultation / investigation when indicated
	Assemble clinical and laboratory data, logically compare all potential solutions to the patient's problems, prioritise them and establish a clinical management plan
<b>2.5 Obtains and interprets the results from blood gas samples</b>	
	Indications for and interpretation of arterial blood gas samples
	Methods and routes of obtaining samples - associated indications and complications

	Pre-analytical errors of arterial blood gas sampling (choice of sample site, sampling device, heparin, mixing, storage and transport)
	Clinical measurement: pH, pCO <sub>2</sub> , pO <sub>2</sub> , SaO <sub>2</sub> , FiO <sub>2</sub> CO <sub>2</sub> production, oxygen consumption, respiratory quotient
	Sensitivity and specificity of the investigation as related to a specific disease
	Obtain blood gas samples using aseptic techniques
	Interpret data from an arterial blood gas sample
	Interpret data from a central or mixed venous blood gas sample
	Identify deviations from normal range and interpret these in the context of the clinical circumstances
	Identify abnormalities requiring urgent intervention
	Confirm adequate oxygenation and control of PaCO <sub>2</sub> and pH
	Undertake further consultation / investigation when indicated
<b>2.6 Interprets imaging studies</b>	
	Principles, including indications, limitations and therapeutic modalities of: Basic radiological methods, CT scanning, ultrasound, MRI ,echo
	Indications for and basic interpretation of chest radiographs: e.g. range of normal features on a chest x-ray; collapse, consolidation, infiltrates (including ALI/ARDS), pneumothorax, pleural effusion, pericardial effusion, position of cannulae, tubes or foreign bodies, airway compression, cardiac silhouette, mediastinal masses
	Risks to patient and staff of radiological procedures and precautions to minimise risk
	Indications for and limitations of investigations
	Sensitivity and specificity of the investigation as related to a specific disease
	Effect of projection, position, penetration and other factors on the image quality
	Principles, including indications, limitations and therapeutic modalities of: MRI, ultrasound, angiography and radionuclide studies in the critically ill patient
	Interpret chest x-rays in a variety of clinical contexts
	Basic interpretation of radiological investigations: <ul style="list-style-type: none"> <li>• neck and thoracic inlet films</li> <li>• x-rays of abdominal fluid levels / free air</li> <li>• x-rays of long bone, skull; vertebral and rib fractures</li> <li>• CT or MRI scans of head demonstrating fractures, haemorrhage, critically raised ICP and hydrocephalus</li> <li>• Ultrasound of the abdomen (liver, spleen, large abdominal vessels, kidney, urinary bladder) chest and vascular access</li> <li>• CT thorax, abdomen, pelvis</li> <li>• radio-isotope studies</li> <li>• Angiography</li> <li>• Echocardiography (ventricular function, filling status, valve abnormality, size of the heart, any kinetic or dyskentic segments, pericardial effusion with or without evidence of tamponade)</li> </ul>
	Identify abnormalities requiring urgent intervention Identify deviations from normal and interpret these in the context of the clinical circumstances
	Undertake further consultation / investigation when indicated
	Communicate effectively with radiological colleagues to plan, perform and interpret test results
<b>2.7 Monitors and responds to trends in physiological variables</b>	
	Indications, contraindications and complications associated with monitoring and monitoring devices; advantages and disadvantages of different monitoring systems / modalities taking into account their accuracy, convenience, reliability, safety, cost and relevance to the patient's condition
	Interpretation of information from monitoring devices, and identification of common causes of error; principles of monitoring trends of change and their significance
	Hazards of inappropriate monitoring including misuse of alarms; principles of disconnection monitors
	Principles of invasive pressure monitoring devices: components and functions of an electromanometer system (catheter, tubing, transducer, amplifier and display unit); zero and calibration techniques; dynamics of the system - natural frequency and damping
	Principles of haemodynamic monitoring - invasive and non-invasive methods, indications and limitations, physiological parameters and waveform interpretation

Invasive and non-invasive systems available for measuring cardiac output and derived haemodynamic variables, the principles involved and the type and site of placement of the monitoring device
Interpretation of, relationships between, sources of error and limitations of measured and derived cardiovascular variables including pressure, flow, volume and gas transport
Methods for measuring temperature
Principles, indications and limitations of pulse oximetry
Principles of ECG monitoring (heart rate, rhythm, conduction, ST segment change and QT interval) - indications, limitations and techniques. Advantages and disadvantages of different lead configurations
Principles of monitoring ventilation: Significance of respiratory rate, tidal volume, minute volume, mean, peak, end expiratory and plateau pressure, intrinsic and extrinsic PEEP, inspired oxygen concentration, arterial blood gas and acid base status, relationship between mode of ventilation and choice of parameters monitored; airflow and airway pressure waveforms
Physical principles, indications and limitations of end tidal CO <sub>2</sub> monitoring. Relationship between end tidal CO <sub>2</sub> and arterial pCO <sub>2</sub> in various clinical circumstances
Principles of fluid input-output monitoring
Methods for assessing pain and sedation
Methods for assessing neurological function e.g. Glasgow Coma Scale
Principles, indications and limitations of intra-abdominal pressure monitoring
Systems available for intracranial pressure monitoring – indications, principles, type and site of placement of the monitoring device, data collection and troubleshooting
Indications and techniques of jugular bulb oximetry
Monitor vital physiological functions as indicated
Obtain and accurately record data from monitors
Differentiate real change from artefact and respond appropriately
Set and interpret data from ventilator alarms
Identify deviations from normal range and interpret these in the context of the clinical circumstances
Recognise and rapidly respond to adverse trends in monitored parameters
Recognise patterns in trends - early diagnosis and outcome prediction
Review the need for continued monitoring regularly
Obtain and interpret data from: invasive and non-invasive arterial blood pressure measurement ECG / EKG (3 and 12 lead) central venous catheters pulse oximetry FVC, spirometry and peak flow measurement, pulmonary artery catheter or oesophageal Doppler, inspired and expired gas monitoring for O <sub>2</sub> , CO <sub>2</sub> and NO, intracranial pressure monitoring, Jugular bulb catheters and S <sub>jv</sub> O <sub>2</sub> monitoring
Set monitor alarms appropriately
Interpret data from scoring or scaling systems to assess pain and sedation
Assess and document Glasgow Coma Scale (GCS)
Recognise changes in intracranial pressure and cerebral perfusion pressure which are life threatening
<b>2.8 Integrates clinical findings with laboratory investigations to form a differential diagnosis</b>
Sensitivity and specificity of the investigation as related to a specific disease
Appropriate use of laboratory tests to confirm or refute a clinical diagnosis
Interpretation of information from monitoring devices, and identification of common causes of error; principles of monitoring trends of change and their significance
Obtain relevant information from the patient, relatives and other secondary sources
Examine patients, elicit and interpret clinical signs (or relevant absence of clinical signs) in the ICU environment Integrate clinical findings with results of investigations
Interpret laboratory results in the context of the patient's condition Identify abnormalities requiring urgent intervention
Communicate and collaborate effectively with all laboratory staff
In emergency situations, confirm or refute early diagnoses before data collection / analysis is complete – make contingency plans based on these diagnoses to combat further threats to the patient's life
Assemble clinical and laboratory data, logically compare all potential solutions to the patient's problems, prioritise them and establish a clinical management plan

Domain 3: Disease Management	
	Impact of occupational and environmental exposures, socio-economic factors, and lifestyle factors on critical illness
	Recognises the importance of timely institution of organ-system support
	Recognises the differences between organ system support and specific treatment
	Acquire, interpret, synthesize, record, and communicate (written and verbal) clinical information
	Order and prioritise appropriate investigations
	Develop a working, and limited differential diagnosis based on presenting clinical features
	Prioritise therapy according to the patient's needs
	Define targets of therapy and review efficacy at regular intervals
	Consider modifying diagnosis and/or therapy if goals are not achieved or in light of new information
	Recognise and manage emergencies; seek assistance appropriately
	Critically appraise the evidence for and against specific therapeutic interventions or treatments
	Lead, delegate and supervise others appropriately according to experience and role
	Consults, communicates and collaborates effectively with patients, relatives and the health care team
	Adopts a problem-solving approach
	Demonstrates compassionate care of patients and relatives
	Demonstrates desire to minimise patient distress
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
	Enquiring mind, undertakes critical analysis of published literature
3.1 Manages the care of the critically ill patient with specific acute medical conditions	
	Pathophysiology, diagnosis and management of commonly encountered acute medical conditions and those relevant to critical care including (but not exclusively)
	<b>Respiratory disorders:</b> e.g. the unprotected airway; pneumonia, lung or lobar collapse, asthma, chronic obstructive airways disease, pulmonary oedema, pneumothorax (simple and tension), pulmonary embolus, pleural effusion, acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) and their causative factors; Interstitial lung disease; pulmonary haemorrhage, upper and lower airway obstruction including epiglottitis; respiratory muscle disorders
	<b>Cardiovascular disorders:</b> Common arrhythmias and conduction disturbances, shock states (anaphylactic, cardiogenic, hypovolaemic, septic); crescendo or unstable angina; acute myocardial infarction; left ventricular failure; hypotension and hypertension, valvular heart disease; vaso-occlusive diseases; pulmonary hypertension; right ventricular failure; cor pulmonale; malignant hypertension; cardiac tamponade; pacing box failure, cardiomyopathies
	<b>Neurological disorders:</b> Acute confusional states and coma; post-anoxic brain damage; intracranial haemorrhage and infarction; sub-arachnoid haemorrhage; cerebro-vascular accidents (CVA / stroke); convulsions and status epilepticus; meningitis and encephalitis, Medical causes of raised intracranial pressure; acute neuromuscular diseases causing respiratory difficulty (e.g. Guillain Barre, myasthenia gravis, malignant hyperpyrexia); critical illness polyneuropathy, motor neuropathy and myopathy
	<b>Renal and genito-urinary disorders:</b> Urological sepsis; acute kidney injury; chronic renal failure; nephrotoxic drugs and monitoring, renal manifestations of systemic disease including vasculitides; rhabdomyolysis
	<b>Gastrointestinal disorders:</b> peptic/stress ulceration; upper GI haemorrhage; diarrhoea and vomiting; acute pancreatitis; cholecystitis; jaundice; acute and chronic liver failure; fulminant hepatic failure; paracetamol (acetaminophen)-induced liver injury; inflammatory bowel diseases; peritonitis; ascites; mesenteric infarction; perforated viscus; bowel obstruction and pseudo-obstruction; abdominal trauma; intra-abdominal hypertension and compartment syndrome; short-bowel syndrome; rupture of liver or spleen.



<p><b>Haematological and oncological disorders:</b> Disseminated intravascular coagulation (DIC) and other coagulation disorders, Massive blood transfusion, acute and chronic anemia; haemolytic syndromes, immune disorders. Lymphoproliferative disorders. High risk groups: the immunosuppressed or immuno-incompetent patient, chemotherapy, agranulocytosis and bone marrow transplant patients</p>
<p><b>Infections:</b> Organisms causing specific infections: Gram positive and Gram negative bacteria, fungi, protozoa, viruses, pyrexia and hypothermia; organ-specific signs of infection including haematogenous (venous catheter-related, endocarditis, meningococcal disease), urological, pulmonary, abdominal (peritonitis, diarrhoea), skeletal (septic arthritis), nosocomial infections, pyometria; septic abortion</p>
<p><b>Metabolic disorders:</b> Electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders</p>
<p><b>Endocrine disorders:</b> Diabetes mellitus, critical illness-induced hyperglycaemia, over- and under-activity of thyroid; adrenal and pituitary disorders; sepsis-induced relative adrenal insufficiency; endocrine emergencies;</p>
<p>Implications of previous organ transplantation</p>
<p>Treatment algorithms for common medical emergencies</p>
<p>Multisystem effects of acute medical conditions and implications for clinical management</p>
<p>Therapies available for the treatment of commonly encountered medical conditions, their efficacy and potential side effects</p>
<p>Definitive / long term management of commonly encountered acute medical conditions</p>
<p>Diagnosis and management of other acute medical conditions until appropriate specialist assistance is available</p>
<p>Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile</p>
<p>Concept of risk: benefit ratio and cost effectiveness of therapies</p>
<p>Complications of the disease processes; effects of disease and its treatments on other organ systems</p>
<p>Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment</p>
<p>Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome</p>
<p>Long term effects of acute medical conditions and late complications</p>
<p>Risk factors, recognition and assessment of single or multiple organ failure</p>
<p>Define the steps of diagnostic reasoning</p>
<p>Conceptualise the clinical problem</p>
<p>Develop problem list and action plan</p>
<p>Recognise and diagnose commonly encountered acute medical conditions</p>
<p>Recognise impending organ system dysfunction</p>
<p>Establish a management plan based on clinical and laboratory information</p>
<p>Consider potential interactions when prescribing drugs and therapies</p>
<p>Identify and manage chronic co-morbid disease</p>
<p><b>3.2 Identifies the implications of chronic and co-morbid disease in the acutely ill patient</b></p>
<p>Pathophysiology, diagnosis and management of commonly encountered chronic medical conditions including (but not exclusively):</p>
<p>Respiratory disorders: Asthma; chronic obstructive airways disease; pulmonary fibrosis; pulmonary thromboembolic disease; respiratory muscle disorders</p>
<p>Cardiovascular disorders: Hypertension; angina; chronic heart failure (LVF / RVF); veno-occlusive disorders; cardiomyopathies; valvular heart disease and prosthetic valves; pulmonary hypertension; cor pulmonale; common arrhythmias and conduction disturbances; peripheral vascular disease</p>
<p>Neurological disorders: Cerebro-vascular accidents (CVA / stroke); epilepsy; dementia; neuropathy and myopathy</p>
<p>Renal disorders: chronic renal failure; renal manifestations of systemic disease including vasculitides; nephrotoxic drugs</p>
<p>Gastrointestinal disorders: chronic pancreatitis; chronic liver failure; cirrhosis; inflammatory bowel diseases</p>

	Haematological and oncological disorders: Coagulation disorders, haemolytic syndromes, platelet disorders; chronic anaemia, immune disorders, malignancy including complications of chemotherapy and radiotherapy
	Endocrine disorders: Diabetes; thyroid, adrenal and pituitary disorders
	Psychiatric disorders: depression, psychosis, personality disorder, deliberate and accidental self-harm
	Previous organ transplantation
	Causes and consequences of decompensation in chronic organ failure; diagnosis and management of acute-on-chronic organ failure
	Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
	Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
	Implications of acute illness in patients with chronic respiratory failure requiring long term home ventilation
	Use of home ventilators, cough assist devices and other aids to respiratory care in the community
	Identify and manage chronic co-morbid disease
	Consider potential interactions when prescribing drugs and therapies
	Identify and evaluate requirements for continuation of chronic treatments during and after the acute illness
	Evaluate the impact of chronic disease and prior health on outcomes
	Take chronic health factors into account when determining suitability for intensive care
	Recognise the wide range of acute and long-term presentations involving use of alcohol and other drugs (e.g. trauma, depression, hypertension)
<b>3.3 Recognises and manages the patient with circulatory failure</b>	
	Risk factors, recognition and assessment of circulatory failure
	Cardiovascular disorders: Cardiac arrest; common arrhythmias and conduction disturbances, shock states (anaphylactic, cardiogenic, hypovolaemic, septic); crescendo or unstable angina; acute myocardial infarction; left ventricular failure; hypotension and hypertension; circulatory effects of pulmonary embolism & tension pneumothorax; valvular heart disease; vaso-occlusive diseases; pulmonary hypertension; right ventricular failure; cor pulmonale; malignant hypertension; cardiac tamponade; pacing box failure; cardiomyopathies
	Cardiopulmonary resuscitation
	Effect of circulatory failure and its treatment on other organ systems
	Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
	Use of fluids and vasoactive / inotropic / anti-arrhythmic drugs to support the circulation (see 4.4)
	Complications of specific therapies, their incidence and management Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
	Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
	Use of mechanical assist devices to support the circulation (see 4.4)
	Identify patients at risk of developing circulatory failure
	Assess, predict and manage circulatory shock
	Establish a management plan based on clinical and laboratory information
	Use fluids and vasoactive / inotropic drugs to support the circulation (see 4.4)
	Consider potential interactions when prescribing drugs and therapies
	Measure and interpret haemodynamic variables (including derived variables)
	Optimise myocardial function
<b>3.4 Recognises and manages the patient with, or at risk of, acute renal failure</b>	
	Symptoms, signs and causes of renal failure including acute kidney injury / chronic / acute on chronic) and indications for intervention
	Distinguishing features of acute versus chronic renal failure and implications for management
	Causes and complications of renal failure - methods to prevent or treat these Renal and genito-urinary disorders: Oliguria and anuria; polyuria; urological sepsis; acute renal

failure; chronic renal failure; nephrotoxic drugs and monitoring, renal manifestations of systemic disease including vasculitides; rhabdomyolysis
Metabolic disorders: electrolyte disorders (notably hyperkalaemia) ; acid-base disorders; fluid balance disorders Investigation of impaired renal function
Range of therapeutic interventions available to support organ function and treat the underlying causes
Nephrotoxic drugs and adjustment of drug doses in renal impairment/failure
Indications for and basic interpretation of drug concentrations in blood or plasma
Urinary catheterisation techniques: transurethral and suprapubic Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Effect of renal failure and its treatment on other organ systems
Indications, complications and selection of renal replacement therapies (continuous and intermittent)
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Identify patients at risk of developing renal failure
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Perform aseptic urinary catheterisation: male and female (see 5.24)
Identify and avoid factors contributing to impaired renal function Initiate, manage and wean patients from renal replacement therapy (see 4.7)
<b>3.5 Recognises and manages the patient with, or at risk of, acute liver failure</b>
Functions of the liver - biosynthetic, immunologic, and detoxification
Symptoms and signs of acute liver failure and assessment of severity
Investigation of impaired hepatic function
Causes and complications of acute and acute-on-chronic liver failure, their prevention and management
Causes, recognition and management of associated disorders: Gastrointestinal disorders: Abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea and vomiting; pancreatitis; jaundice; acute and chronic liver failure; fulminant hepatic failure; paracetamol (acetaminophen)-induced liver injury; rupture of liver or spleen
Cardiovascular disorders: Hypotension and hypertension (including hypertensive emergencies); shock (cardiogenic, hypovolaemic, septic, anaphylactic); common arrhythmias and conduction disturbances.
Metabolic disorders: Electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Haematological disorders: Coagulation and fibrinolytic pathways and their associated disorders; disseminated intravascular coagulation (DIC); hemolytic syndromes, acute anaemia; complications of massive blood transfusion
Neurological disorders: acute confusional states and coma; post-anoxic brain damage; convulsions; encephalopathy; raised intracranial pressure
Pathogenesis of multiple organ dysfunction (MODS) and the inflammatory response in relation to organ system dysfunction
Methods for assessing neurological function e.g. Glasgow Coma Scale
Indications for and basic interpretation of drug concentrations in blood or plasma
Principles of blood glucose control: indications, methods, monitoring of safety and efficacy
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Principles of cerebral perfusion pressure, cerebral oxygen delivery and the methods by which they may be optimised
Factors and therapies which may influence intracranial pressure and cerebral perfusion pressure
Hepatotoxic drugs and adjustment of drug doses in hepatic impairment / failure
Principles and techniques for insertion of gastro-oesophageal balloon tamponade tube (e.g. Sengstaken-Blakemore)
Causes, recognition and management of HELLP syndrome

Effect of liver failure and its treatment on other organ systems
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Supportive therapy for the failing liver including extracorporeal liver support and indications for emergency liver transplantation
Principles of measurement of jugular venous saturation, cerebral Doppler velocities and cerebral blood flow. Indications for transcutaneous and transjugular liver biopsies and transjugular intrahepatic portosystemic shunt (TIPSS)
Effects, common presentations and potential for harm of alcohol and other drugs.
Range of interventions, treatments and prognoses for use of alcohol and other drugs
Identify patients at risk of developing acute liver failure
Interpret laboratory tests of liver function
Recognise impending organ system dysfunction
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Assess and document Glasgow Coma Scale (GCS) Identify and manage coagulopathies
Prevent, identify and manage hyper / hypoglycaemia
Examine and plan care for the confused patient
Take prompt action to reduce acutely elevated intracranial pressure
Manage cardiorespiratory physiology to minimise rises in intracranial pressure
Prevent, identify and treat hyponatraemia
Make an assessment of alcohol and other drug use, including taking a history and using validated tools.
<b>3.6 Recognises and manages the patient with neurological impairment</b>
Signs and symptoms of neurological impairment
The toxic, metabolic, structural, and infectious causes of altered consciousness
Investigation of impaired neurological function; methods for assessing neurological function (e.g. Glasgow Coma Scale)
Neurological disorders: acute confusional states and coma; post-anoxic brain damage; intracranial haemorrhage and infarction; sub-arachnoid haemorrhage; cerebro-vascular accidents (CVA / stroke); convulsions and status epilepticus; meningitis and encephalitis; medical causes of raised intracranial pressure; acute neuromuscular diseases causing respiratory difficulty (e.g. Guillain Barre, myasthenia gravis, malignant hyperpyrexia); critical illness polyneuropathy, motor neuropathy and myopathy
Causes, recognition and management of associated disorders:
Metabolic disorders: Electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Signs and symptoms of acute airway insufficiency and acute respiratory failure; indications for intervention in the patient with neurological impairment
Indications, contraindications and complications of lumbar puncture (see 5.15)
Indications for urgent imaging of the brain and neurosurgical consultation
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Principles of cerebral perfusion pressure, cerebral oxygen delivery and the methods by which they may be optimised
Factors and therapies which may influence intracranial and cerebral perfusion pressure
Aetiology and management of raised intracranial pressure (ICP)
Principles of management of closed head injury including indications for decompressive craniectomy
Coup and contra-coup injuries
Methods of preventing the 'second insult' to the brain
Management of vasospasm
Application of techniques to treat or induce hypo/hyperthermia
Principles, indications and limitations of electroencephalogram (EEG) and evoked potentials
Effect of impaired neurological function and its support and treatment on other organ systems

Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Systems available for intracranial pressure monitoring - indications, principles, type and site of placement of the monitoring device, data collection and troubleshooting
Cerebral spinal fluid (CSF) drainage for raised ICP (lumbar drain and extraventricular drain)
Principles of measurement of jugular venous saturation, cerebral Doppler velocities and cerebral blood flow.
Indications for plasmapheresis or immunoglobulins in Guillain Barre and myasthenic patients (see 4.3)
Use of thiopentone infusions to induce deep coma
Identify patients at risk of neurological impairment Identify and avoid factors contributing to neurological impairment
Assess and document Glasgow Coma Scale (GCS)
Establish a management plan based on clinical and laboratory information
Perform a lumbar puncture
Examine and plan care for the confused patient
Recognise changes in intracranial pressure and cerebral perfusion pressure which are life threatening
Take prompt action to reduce acutely elevated intracranial pressure
Manage cardiorespiratory physiology to minimise rises in intracranial pressure
Undertake or assist in the insertion and maintenance of an intracranial pressure monitor
Obtain and interpret data from intracranial pressure monitoring
Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)
Consider potential interactions when prescribing drugs and therapies
<b>3.7 Recognises and manages the patient with acute gastrointestinal failure</b>
Signs and symptoms of gastrointestinal dysfunction (e.g. obstruction, ischemia, perforation, dysmotility, diarrhoea)
Causes and complications of gastrointestinal failure
Effects of critical illness and treatments on gastric emptying
Investigation of acute gastrointestinal dysfunction
Gastrointestinal disorders: Abdominal pain and distension; stress/peptic ulceration and upper GI haemorrhage; lower GI bleeding; diarrhoea and vomiting; Pancreatitis; jaundice; cholecystitis; inflammatory bowel diseases; peritonitis; mesenteric infarction; perforated viscus; bowel obstruction; ascites; intra-abdominal hypertension & compartment syndrome; short-bowel syndrome, GI fistulae
Causes, recognition and management of associated disorders: Metabolic disorders: Electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Indications for urgent imaging and surgical consultation
Factors and therapies which may influence intra-abdominal pressure; aetiology and management of raised intra-abdominal pressure
Effects of impaired gastrointestinal function and its treatment on other organ systems
Principles of nutritional assessment and support (see 4.9)
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Principles and techniques for insertion of gastro-oesophageal balloon tamponade tube (e.g. Sengstaken-Blakemore)
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Identify and avoid factors contributing to gastrointestinal dysfunction
Identify patients at risk of gastrointestinal dysfunction
Prevent, identify and manage hyper / hypoglycaemia
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies

### 3.8 Recognises and manages the patient with acute lung injury syndromes (ALI / ARDS)

Symptoms and signs of acute airway insufficiency and acute respiratory failure, and indications for intervention
Causes of respiratory failure, their prevention and management
Respiratory disorders: e.g. Tachypnoea, dyspnoea, pneumonia, lung or lobar collapse, pulmonary oedema, pulmonary embolus, pleural effusion, pneumothorax (simple and tension), acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) and their causative factors; pulmonary haemorrhage, near-drowning
Pathogenesis of acute lung injury (ALI / ARDS)
Pathogenesis of multiple organ dysfunction (MODS) and the inflammatory response in relation to organ system dysfunction
Indications for and basic interpretation of chest radiographs: range of normal features on a chest x-ray; collapse, consolidation, infiltrates (including ALI/ARDS), pneumothorax, pleural effusion, pericardial effusion, position of cannulae, tubes or foreign bodies, airway compression, cardiac silhouette, mediastinal masses Indications for and methods of invasive and non-invasive mechanical ventilation
Initial set-up and modification of ventilator settings according to the condition or response of the patient
Potential adverse effects and complications of respiratory support and methods to minimise these
Detection and management of haemo/pneumothorax (simple and tension)
Lung protective ventilation for acute lung injury (ALI)
Principles of weaning from mechanical ventilation and factors which may inhibit weaning
Modes of mechanical ventilation - indications, contraindications and expected results of each mode (CMV, IRV, PRVC, HFOV, SIMV, PS, CPAP, BiPAP, NIV)
Ventilator associated pneumonia: definition, pathogenesis and prevention
Concept of risk: benefit ratio and cost effectiveness of therapies
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Pharmacological and non-pharmacological adjunct therapies for ALI
Principles of extra-corporeal membrane oxygenation (ECMO)
Identify patients at risk of acute lung injury (ALI / ARDS)
Implement emergency airway management and ventilation
Select the appropriate type and mode of ventilation for an individual patient
Identify and avoid factors contributing to acute lung injury
Plan, implement, review and adapt lung protective approach during mechanical ventilation
Perform thoracocentesis and manage intercostal drains (see 5.7)
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Plan, perform and review lung recruitment manoeuvres

### 3.9 Recognises and manages the septic patient

Pathogenesis, definitions and diagnostic criteria of sepsis, severe sepsis, septic shock and systemic inflammatory response syndrome (SIRS)
Causes, recognition and management of sepsis-induced organ dysfunction; multisystem effects of sepsis and their impact on clinical management
Pathogenesis of multiple organ dysfunction (MODS) and the inflammatory response in relation to organ system dysfunction
Infection and its relation to the inflammatory response
Infections: Organisms causing specific infections: Gram positive and Gram negative bacteria, fungi, protozoa, viruses, pyrexia and hypothermia; organ-specific signs of infection including haematogenous (venous catheter-related, endocarditis, meningococcal disease), urological, pulmonary, abdominal (peritonitis, diarrhoea), skeletal (septic arthritis) nosocomial III - 34 infections, pyometra; septic abortion
Techniques for effective fluid resuscitation
Use of fluids and vasoactive / inotropic / anti-arrhythmic drugs to support the circulation (see 4.4)
Indications, complications, interactions, selection, monitoring, and efficacy of common antimicrobial drugs (antibacterial, antifungal, antiviral, antiprotozoal, antihelminthics)

Principles of blood glucose control: indications, methods, monitoring of safety and efficacy
Occult indicators of sepsis
Sepsis mediators Local patterns of bacterial resistance and antibiotic policy
Evidence based guidelines: sepsis care bundles - rationale and indications; principles of early goal-directed therapy Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Detection and management of adrenocortical dysfunction
Concept of risk: benefit ratio and cost effectiveness of therapies
Prognostic implications of multiple systems dysfunction or failure
Safe use of therapies which modify the inflammatory response
Assess, predict and manage circulatory shock
Resuscitate a patient with septic shock using appropriate monitoring, fluid therapy and vasoactive agents
Manage antimicrobial drug therapy (see 4.2)
Obtain and interpret results of microbiological tests (see 2.5)
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Prevent, identify and manage hyper / hypoglycaemia
<b>3.10 Recognises and manages the patient following intoxication with drugs or environmental toxins</b>
Symptoms and signs of acute intoxication associated with common intoxicants
Multisystem effects of acute intoxication and implications for clinical management
General supportive therapy and specific antidotes pertinent to individual intoxicants
Specific management of poisoning with aspirin, paracetamol/acetaminophen, paraquat, carbon monoxide, alcohol, ecstasy, tricyclic and quadricyclic antidepressants
Strategies to reduce absorption and enhance elimination (haemodialysis, haemoperfusion, gastric lavage and charcoal therapy): risks and benefits
Pharmacology of common intoxicants Indications for and basic interpretation of drug concentrations in blood or plasma
Aware of and know how to contact National Poisons Information Bureau/Toxbase
Services available to patients and families to provide emotional or psychiatric support
Causes, recognition and management of associated disorders:
Cardiovascular disorders: drug induced arrhythmias and conduction disturbances
Respiratory disorders: smoke inhalation or burned airway damage; carbon monoxide poisoning
Neurological disorders: drug induced neurological impairment
Renal disorders: nephrotoxic drugs - monitoring & adjustment of drug doses in renal impairment / failure; rhabdomyolysis
Metabolic disorders: electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Gastrointestinal disorders: drug induced liver injury; hepatotoxic drugs and adjustment of drug doses in hepatic impairment / failure; fulminant hepatic failure
Haematology: drug induced coagulopathy
Management of acute liver failure (see 3.5)
Implement emergency airway management and ventilation
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Indications and complications of hyperbaric oxygenation
Establish a management plan based on clinical and laboratory information Interpret laboratory tests of liver function
Consider potential interactions when prescribing drugs and therapies
Assess and document Glasgow Coma Scale (GCS)

Implement emergency airway management and ventilation
Identify patients at risk of developing renal failure
Identify patients at risk of developing acute liver failure
Identify and manage coagulopathies
Examine and plan care for the confused patient
Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)
<b>3.11 Recognises life-threatening maternal peripartum complications and manages care under supervision</b>
Physiological changes associated with a normal pregnancy and delivery
Cardiopulmonary resuscitation of the pregnant patient
Pathophysiology, identification and management of peripartum complications: pre-eclampsia and eclampsia; HELLP syndrome; amniotic fluid embolism; ante-partum and post-partum haemorrhage; ectopic pregnancy; septic abortion; peripartum cardiomyopathy.
Risks and avoidance of pulmonary aspiration in pregnant patients
Risk factors, identification and management of venous thromboembolism in the pregnant patient
Methods of avoiding aorto-caval compression
Indications and contraindications for treatment; circumstances when treatment is unnecessary or futile
Causes, recognition and management of associated disorders:
Cardiovascular disorders: peripartum cardiomyopathy; pulmonary hypertension
Haematological disorders: coagulation and fibrinolytic pathways and their associated disorders; disseminated intravascular coagulation (DIC); hemolytic syndromes, acute anaemia; complications of massive blood transfusion, principles of cell salvage
Metabolic disorders: electrolyte disorders; acid-base disorders; fluid-balance disorders; thermoregulation and associated disorders
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Management of critical illness in woman with concurrent pregnancy
Awareness of the psychological impact of separation on the family
Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
Liaise with obstetric, midwifery and neonatal services
Manage pregnancy induced hypertension Identify and manage coagulopathies
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Seek appropriate support and supervision in order to provide optimal patient care



**Domain 4: Therapeutic interventions / Organ support in single or multiple organ failure**

Recognise the roles of regulatory agencies involved in drug use, monitoring and licensing e.g. Committee on Safety of Medicines, National Institute for Clinical Excellence / Scottish Medicines Consortium, regional and hospital formulary – committees
Prioritise therapy according to the patient's needs
Recognise and manage emergencies; seek assistance appropriately
Define targets of therapy and review efficacy at regular intervals
Recognises the importance of resources when prescribing, including the role of a Drug Formulary and electronic prescribing systems
Consider modifying diagnosis and/or therapy if goals are not achieved
Obtain informed consent/assent from the patient where appropriate
Critically appraise the evidence for and against specific therapeutic interventions or treatments
Lead, delegate and supervise others appropriately according to experience and role
Responds rapidly to acute changes in monitored variables
Consults, communicates and collaborates effectively with patients, relatives and the health care team skill
Desire to minimise patient distress Demonstrates compassionate care of patients and relatives
Respects the expressed wishes of competent patients, even when in conflict with the views of the physician
Appreciates the differences between organ system support and specific treatment
Appreciates the importance of timely institution of organ-system support
Respects the ideas and beliefs of the patient and their family and their impact on decision making (does not impose own views)
Recognises the need for supportive care for all organ systems whether failing / injured or not
Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
Participates in adverse drug event reporting mechanisms
Remains up to date with therapeutic alerts, and responds appropriately

**4.1 Prescribes drugs and therapies safely**

Physiology of fluid, electrolyte, acid-base and glucose control
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
Drug uptake from: gastrointestinal tract, lungs, nasal, transdermal, subcutaneous, IM, IV, epidural and 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: <ul style="list-style-type: none"> <li>• Body compartments</li> <li>• Influence of specialised membranes: tissue binding and solubility</li> <li>• Materno-foetal distribution</li> <li>• Distribution in CSF and extradural space</li> </ul> Modes of drug elimination: <ul style="list-style-type: none"> <li>• Direct excretion</li> <li>• Metabolism in organs of excretion: phase I and II mechanisms</li> <li>• Renal excretion and urinary pH</li> <li>• Non-organ breakdown of drugs</li> </ul> Pharmacokinetic analysis: <ul style="list-style-type: none"> <li>• Concept of a pharmacokinetic compartment</li> <li>• Apparent volume of distribution</li> <li>• Orders of kinetics</li> </ul>

<ul style="list-style-type: none"> <li>• Clearance concepts applied to whole body and individual organs</li> <li>• Simple 1 and 2 compartmental models: concepts of wash-in and washout curves</li> <li>• Physiological models based on perfusion and partition coefficients</li> <li>• Effect of organ blood flow: Fick principle</li> </ul> <p>Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs</p> <p>Effects of acute organ failure (liver, kidney) on drug elimination</p> <p>Influence of renal replacement therapies on clearance of commonly used drugs</p> <p>Pharmacodynamics: concentration-effect relationships: hysteresis</p> <p>Pharmacogenetics: familial variation in drug response</p> <p>Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions</p> <p>Dynamics of drug-receptor interaction.</p> <p>Agonists, antagonists, partial agonists, inverse agonists.</p> <p>Efficacy and potency. Tolerance.</p> <p>Receptor function and regulation.</p> <p>Metabolic pathways; enzymes; drug: enzyme interactions; Michaelis-Menten equation</p> <p>Enzyme inducers and inhibitors.</p> <p>Mechanisms of drug action</p> <p>Ion channels: types: relation to receptors. Gating mechanisms.</p> <p>Signal transduction: cell membrane/receptors/ion channels to intracellular molecular targets, second messengers</p> <p>Action of gases and vapours</p> <p>Osmotic effects. pH effects. Adsorption and chelation.</p> <p>Mechanisms of drug interactions: Inhibition and promotion of drug uptake. Competitive protein binding. Receptor inter-actions.</p> <p>Effects of metabolites and other degradation products.</p>
Mode of action of drugs (see Basic Sciences)
Pharmacokinetics and pharmacodynamics (see Basic Sciences)
<p>Systemic pharmacology: indications, contraindications, effects and interactions of commonly used drugs including:</p> <ul style="list-style-type: none"> <li>• hypnotics, sedatives and intravenous anaesthetic agents</li> <li>• drugs used to treat delirium</li> <li>• simple and opioid analgesics; opioid antagonists</li> <li>• non-steroidal anti-inflammatory agents</li> <li>• neuromuscular blocking agents (depolarising and non-depolarising) and anti-cholinesterases</li> <li>• drugs acting on the autonomic nervous system (inotropes, vasodilators, vasoconstrictors, antiarrhythmics)</li> <li>• respiratory stimulants and bronchodilators</li> <li>• anti-hypertensives</li> <li>• anti-convulsants</li> <li>• anti-diabetic agents</li> <li>• diuretics</li> <li>• antibiotics (antibacterial, antifungal, antiviral, antiprotozoal, antihelmintics)</li> <li>• corticosteroids and hormone preparations</li> <li>• drugs influencing gastric secretion and motility; antiemetic agents</li> <li>• local anaesthetic agents</li> <li>• immunosuppressants</li> <li>• antihistamines</li> <li>• antidepressants</li> <li>• anticoagulants</li> <li>• plasma volume expanders</li> </ul>
Adverse effects and interactions of drugs and their management
Recognition and management of serious adverse reactions and anaphylaxis Local policies and procedures governing the prescription of drugs and therapies
Indications for and basic interpretation of drug concentrations in blood or plasma
Impact of drug therapy on organ-system function
Principles of blood glucose control: indications, methods, monitoring of safety and efficacy

Theoretical advantages and disadvantages of crystalloid and colloid solutions
Distinguishing features of acute versus chronic respiratory failure and implications for management
Nephrotoxic drugs and adjustment of drug doses in renal impairment/failure
Indications, limitations, methods, and complications of enteral and parenteral nutritional techniques
Risk of bleeding: indications, contraindications, monitoring and complications of therapeutic anticoagulants
Thrombolytic and anti-thrombolytic agents
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Prophylactic therapies and indications for their use
Concept of risk: benefit ratio and cost effectiveness of therapies
Complications of specific therapies, their incidence and management
Circumstances when treatment is unnecessary
Effect of critical illness upon homeostatic mechanisms and causes of homeostatic disturbances
Treatment strategies for abnormalities of fluid, electrolyte, acid-base and glucose balance
Methods to assess and monitor intravascular volume and state of hydration using clinical signs and technology
Fluid therapies: components, physical properties, distribution, and clearance of commonly used fluids; indications, contraindications, and complications of their administration
Hepatotoxic drugs and adjustment of drug doses in hepatic impairment / failure
The pathogenesis and management of anaemia, thrombocytopenia, neutropenia and pancytopenia
Nutritional formulations: indications, complications, and their management
Recognise the importance of resources when prescribing, including the role of a Drug Formulary
Establish a management plan based on clinical and laboratory information
Consider potential interactions when prescribing drugs and therapies
Administer intravenous drugs (prepare, select route and mode of administration and document)
Prescribe appropriate antimicrobial therapy based on history, examination and preliminary investigations
Choose appropriate fluid, volume, rate and method of administration
Consider and exclude unknown pathology if goals of fluid therapy are not achieved (e.g. continued bleeding)
Prescribe and manage anticoagulation therapy
Prescribe an appropriate standard enteral feeding regimen
Set realistic goals for therapy (independently or in collaboration with other teams)
Identify and avoid factors contributing to impaired renal function
Consider risk-benefit and cost-benefit of alternative drugs and therapies
Recognise when treatment is unnecessary or futile
Use IT prescribing tools where available to improve safety
Remain up to date with therapeutic alerts, and respond appropriately
Appreciate the role of non-medical prescribers
<b>4.2 Manages antimicrobial drug therapy</b>
Epidemiology and prevention of infection in the ICU
Types of organisms - emergence of resistant strains, mode of transfer, opportunistic and nosocomial infections; difference between contamination, colonisation and infection
Local patterns of bacterial resistance and antibiotic policy
Indications, complications, interactions, selection, monitoring, and efficacy of common antimicrobial drugs (antibacterial, antifungal, antiviral, antiprotozoal, antihelmintics)
Indications for and basic interpretation of drug concentrations in blood or plasma
Principles of prescribing initial empirical therapy and modification / refinement with further clinical and microbiological information
Impact of drug therapy on organ-system function

Risk factors for nosocomial infection and infection control measures to limit its occurrence
Ventilator associated pneumonia: definition, pathogenesis and prevention
Risks of inappropriate antimicrobial therapy on the patient and the environment
Requirements for microbiological surveillance and clinical sampling
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Prophylactic therapies and indications for their use
Circumstances when treatment is unnecessary
Concept of gastrointestinal microbial translocation
Safe use of therapies which modify the inflammatory response
Collaborate with microbiologists / infectious diseases clinicians to link clinical, laboratory and local (hospital / regional / national) microbiological data
Establish a management plan based on clinical and laboratory information
Prescribe appropriate antimicrobial therapy based on history, examination and preliminary investigations
Administer intravenous drugs (prepare, select route and mode of administration and document)
Set realistic goals for therapy (independently or in collaboration with other teams)
Recognise when treatment is unnecessary or futile
<b>4.3 Administers blood and blood products safely</b>
Indications for and basic interpretation of haematological tests (including coagulation and sickle tests)
Indications for and basic interpretation of blood grouping and x-matching Indications for, contraindication, risks and alternatives to blood transfusion
Local protocols which govern the ordering, storage and verification procedures, monitoring during administration of blood products and reporting of adverse incidents
Principles of blood and blood component therapy; principles of massive transfusion, including cell salvage
Infections from contaminated blood / body fluids; strategy if contaminated (e.g. needle stick injury)
Coagulation and fibrinolytic pathways, and their associated disorders; clinical and laboratory evaluation of haemostasis
Risk of bleeding: indications, contraindications, monitoring and complications of therapeutic anticoagulants
Recognition and management of serious adverse reactions and anaphylaxis
The pathogenesis and management of anaemia, thrombocytopenia, neutropenia and pancytopenia
Thrombolytic and anti-thrombolytic agents
Principles and practise of plasma exchange (see 3.6)
Identify and correct haemostatic and coagulation disorders
Order, check, verify and administer blood products according to local protocols
Establish a management plan based on clinical and laboratory information
Recognise when treatment is unnecessary or futile
<b>4.4 Uses fluids and vasoactive/inotropic drugs to support the circulation</b>
Physiology and pathophysiology of the heart and circulation
Pathophysiological effects of altered intravascular volume
Pathophysiology and treatment of cardiac failure
Theoretical advantages and disadvantages of crystalloid and colloid solutions
Indications for, contraindication, risks and alternatives to blood transfusion
Pathophysiology, detection, and management of shock states according to aetiology and in response to physiological data
Fluid therapies: components, physical properties, distribution, and clearance of commonly used fluids; indications, contraindications and complications of their administration
Mechanisms of assessment of response to fluid Indications and contraindications, limitations and complications of inotropic / vasoactive drug therapy
Interactions between inotropic agents and concomitant therapies and/or co-morbid diseases (eg. ischaemic heart disease)

	Principles of haemodynamic monitoring - invasive and non-invasive methods, indications and limitations, physiological parameters and waveform interpretation
	Invasive and non-invasive systems available for measuring cardiac output and derived haemodynamic variables, the principles involved and the type and site of placement of the monitoring device
	Indications and limitations of transthoracic / transoesophageal echocardiography in shocked patient Indications, limitations and complications of techniques of measurement of cardiac output (e.g. pulmonary artery catheter, oesophageal Doppler, PiCCO, LiDCO) and action to prevent them
	Integration of data from clinical examination and haemodynamic monitoring to characterise haemodynamic derangements
	Receptor-specific effects of inotropic and vasopressor agents; effects of critical illness and concomitant therapies on receptor function (e.g. down-regulation)
	Establish a management plan based on clinical and laboratory information
	Resuscitate a patient with septic shock using appropriate monitoring, fluid therapy and vasoactive agents
	Choose appropriate fluid, volume, rate and method of administration Administer and monitor response to repeated fluid challenges
	Consider and exclude unknown pathology if goals of fluid therapy are not achieved (e.g. continued bleeding)
	Administer intravenous drugs (prepare, select route and mode of administration and document)
	Use infusion pumps to administer drugs and fluids
	Measure and interpret haemodynamic variables (including derived variables)
	Select an appropriate inotrope / vasopressor - dose, physiological endpoint, rate and route of administration
<b>4.5 Describes the use of mechanical assist devices to support the circulation</b>	
	Pathophysiology and treatment of cardiac failure
	Principles and techniques of cardiac pacing
	Pathophysiology, detection and management of shock states according to aetiology and in response to physiological data
	Prophylactic therapies and indications for their use
	Principles of haemodynamic monitoring – invasive and non invasive methods, indications and limitations, physiological parameters and waveform interpretation
	Invasive and non-invasive systems available for measuring cardiac output and derived haemodynamic variables, the principles involved and the type and site of placement of the monitoring device
	Integration of data from clinical examination and haemodynamic monitoring to characterise haemodynamic derangements
	Principles of right and left ventricular assist devices
	Indications, contraindications, complications and basic principles of intra-aortic counter pulsation balloon pump
	Principles of extra-corporeal membrane oxygenation (ECMO), including indications and complications
<b>4.6 Initiates, manages, and weans patients from invasive and non-invasive ventilatory support</b>	
	Causes of respiratory failure, their prevention and management
	Symptoms and signs of acute airway insufficiency and acute respiratory failure, and indications for intervention
	Distinguishing features of acute versus chronic respiratory failure and implications for management
	Principles of oxygen therapy and use of oxygen administration devices (see 5.1)
	Indications for and methods of invasive and non-invasive mechanical ventilation
	Principles of continuous positive airways pressure (CPAP) and positive end-expiratory pressure (PEEP) and CPAP and PEEP delivery systems
	Principles of emergency airway management (see 5.3)
	Modes of mechanical ventilation - indications, contraindications and expected results of each mode (CMV, IRV, PRVC, HFOV, SIMV, PS, CPAP, BiPAP, NIV)
	Operation of at least one positive pressure ventilator, one non-invasive ventilator, and a constant positive airway pressure (CPAP) device

	A systematic approach to checking ventilator, breathing circuit and monitoring devices
	Initial set-up and modification of ventilator settings according to the condition or response of the patient
	Safe prescribing of oxygen; manifestations of pulmonary oxygen toxicity
	Principles of monitoring ventilation: significance of respiratory rate, tidal volume, minute volume, mean, peak, end expiratory and plateau pressure, intrinsic and extrinsic PEEP, inspired oxygen concentration, arterial blood gas and acid base status; relationship between mode of ventilation and choice of parameters monitored; airflow and airway pressure waveforms
	Principles of weaning from mechanical ventilation and factors which may inhibit weaning
	Measures of adequacy of tissue oxygenation, eg base deficit, lactate, central venous saturation interactions)
	Measurement and interpretation of pulmonary mechanics during mechanical ventilation
	Potential adverse effects and complications of respiratory support and methods to minimise these
	Ventilator associated pneumonia: definition, pathogenesis and prevention
	Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration
	Concept of gastrointestinal microbial translocation
	Prophylactic therapies and indications for their use
	Causes of lung injury in ventilated patients; effects and clinical manifestations of pulmonary barotrauma
	Effect of ventilation upon cardiovascular and oxygen delivery parameters, other organ function and how these effects can be monitored (heart-lung interactions)
	Principles of physiotherapy in the ICU
	Indications and contraindications to tracheostomy (percutaneous and surgical) and mini-tracheostomy
	Management of and complications associated with tracheostomy tubes
	Concept of one lung ventilation and use of double lumen endotracheal tube (see 5.2)
	Principles of extra-corporeal membrane oxygenation (ECMO)
	Establish a management plan based on clinical and laboratory information
	Select the appropriate type and mode of ventilation for an individual patient
	Identify and correct ventilator mis-assembly and disconnections
	Stabilise a patient on a constant positive airway pressure (CPAP) device
	Stabilise a patient on a non-invasive ventilator (NIV)
	Stabilise a patient on a positive pressure ventilator
	Interpret data from an arterial blood gas sample
	Confirm adequate oxygenation and control of PaCO <sub>2</sub> and pH
	Set and interpret data from ventilator alarms
	Construct, monitor and review a weaning plan
	Manages one lung ventilation via double lumen endotracheal tube (see 5.2)
	<b>4.7 Initiates, manages, and weans patients from renal replacement therapy</b>
	Physiology of fluid, electrolyte, acid-base and glucose control
	Symptoms, signs and causes of renal failure including acute kidney injury / chronic / acute on chronic and indications for intervention
	Investigation of impaired renal function
	Distinguishing features of acute versus chronic renal failure and implications for management
	Principles of haemofiltration, haemodialysis, peritoneal dialysis, haemoperfusion and plasmapheresis
	Indications, complications and selection of renal replacement therapies (continuous and intermittent)
	Function and operation of continuous haemodiafiltration devices (key components and troubleshooting)
	Placement and management of invasive devices necessary for renal replacement therapy (e.g. temporary haemodialysis catheter)
	Indications for and interpretation of fluid balance charts

Effect of renal failure and its treatment on other organ systems
Nephrotoxic drugs and adjustment of drug doses in renal impairment/failure
Fluid therapies: components, physical properties, distribution and clearance of commonly used fluids; indications, contraindications and complications of their administration
Effects of concomitant treatment and/or co-morbid conditions on an individual patient's response to treatment
Establish a management plan based on clinical and laboratory information
Modify fluid and electrolyte therapy according to clinical features and fluid balance charts
Prevent hypokalaemia Identify and correct haemostatic and coagulation disorders
Set realistic goals for therapy (independently or in collaboration with other teams)
Supervise the provision of continuous renal replacement therapy
Prescribe and manage anticoagulation therapy
Set appropriate exchange parameters and fluid balances for renal replacement therapies
Identify and avoid factors contributing to impaired renal function
Consider risk-benefit and cost-benefit of alternative drugs and therapies
Recognise when treatment is unnecessary or futile
<b>4.8 Recognises and manages electrolyte, glucose and acid-base disturbances</b>
Physiology of fluid, electrolyte, acid-base and glucose control
Pathophysiological consequences, signs and symptoms of disordered fluid, electrolyte, acid-base and glucose balance
Effect of critical illness upon homeostatic mechanisms and causes of homeostatic disturbances
Principles of blood glucose control: indications, methods, monitoring of safety and efficacy
Treatment strategies for abnormalities of fluid, electrolyte, acid-base and glucose balance
Symptoms, signs and causes of renal failure (acute / chronic / acute on chronic) and indications for intervention
Patterns of nutritional impairment; consequences of starvation and malnutrition
Fluid therapies: components, physical properties, distribution and clearance of commonly used fluids; indications, contraindications and complications of their administration
Establish a management plan based on clinical and laboratory information
Correct electrolyte disorders (e.g. hyperkalaemia, hyponatraemia)
Institute and manage a regimen to control blood glucose within safe limits
Confirm adequate oxygenation and control of PaCO <sub>2</sub> and pH Identify and treat underlying causes for a metabolic acidosis
Identify and avoid factors contributing to impaired renal function
Recognise when treatment is unnecessary or futile
<b>4.9 Co-ordinates and provides nutritional assessment and support</b>
Principles of metabolism: nutrients – carbohydrates, fats, proteins, vitamins and minerals; metabolic pathways, lactate metabolism, energy production and enzymes; metabolic rate; hormonal control of metabolism - regulation of plasma glucose; physiological alterations in starvation, obesity and stress response.
Gastrointestinal physiology: gastric function; secretions; gut motility, sphincters and reflex control; nausea and vomiting; digestive functions
Pathophysiological consequences, signs and symptoms of disordered fluid, electrolyte, acid-base and glucose balance
Methods to assess nutritional status and basal energy expenditure
Patterns of nutritional impairment; consequences of starvation, malnutrition and refeeding
Fluid and caloric requirements in the critically ill patient including electrolytes, vitamins, trace elements and principles of immunonutrition
Nutritional formulations: indications, complications and their management Indications, limitations, methods, and complications of enteral and parenteral nutritional techniques
Principles of nasogastric cannulation in the intubated and non-intubated patient

Prevention of stress ulceration
Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration
Prevention and management of constipation and diarrhoea
Principles of blood glucose control: indications, methods, monitoring of safety and efficacy
Alternative routes for enteral feeding: indications, contraindications and complications of post-pyloric and percutaneous feeding tube placement
Gut motility: effects of drugs, therapy and disease
Prokinetics: indications, contraindications, complications and selection
Antiemetics: indications, contraindications, complications and selection
Prevention and management of constipation and diarrhoea
Concept of gastrointestinal microbial translocation
Prescribe an appropriate standard enteral feeding regimen
Identify surgical and other contraindications to enteral feeding
Institute and manage a regimen to control blood glucose within safe limits
Establish a management plan (independently or in collaboration with the clinical dietician)
Prescribe and supervise safe administration of a standard / customized parenteral (TPN) preparation
Manage the transition from parenteral to enteral nutrition
Set realistic goals for therapy (independently or in collaboration with other teams)
Collaborate with nursing staff / clinical dietician in monitoring safe delivery of enteral and parenteral nutrition
Liaise with clinical dieticians / medical team to plan feeding regimens after discharge from the ICU



<b>Domain 5: Practical procedures</b>	
Patient selection - indications, contraindications and potential complications of the procedure / intervention	
Methods and routes of insertion - associated indications and complications	
Complications of the technique, how to prevent/recognise them and initiate appropriate treatment	
Principles of aseptic technique and aseptic handling of invasive medical devices	
Indications for specific monitoring to ensure patient safety during an intervention / procedure	
Detection of potential physiological alterations during the procedure	
Appropriate use of drugs to facilitate the procedure	
Universal precautions and preventative infection control techniques (hand washing, gloves, protective clothing, sharps disposal etc.)	
Methods of sterilisation and cleaning or disposal of equipment	
Management and use of the device once in situ necessary to minimise the risks of complications	
Indications and technique for removal	
Prioritise tasks and procedures,	
Seek appropriate supervision - discuss the patient and procedure with supervisor prior to undertaking it	
Exhibit sound decision making	
Obtain informed consent/assent from the patient where appropriate	
Select appropriate equipment or device and use resources efficiently	
Prepare equipment, patient and staff prior to undertaking the procedure	
Choose an appropriate route / method of insertion and position the patient accordingly	
Use protective clothing (gloves / mask / gown / drapes) as indicated	
Identify relevant anatomical landmarks	
Use drugs as indicated to facilitate the procedure	
Perform the procedure in a manner which minimises the risks of complications	
Undertake appropriate investigation to confirm correct placement of device or exclude complications	
Recognise and manage emergencies; seek assistance appropriately	
Sterilise, clean or dispose of equipment appropriately	
Lead, delegate and supervise others appropriately according to experience and role	
Considers patient comfort during procedures / investigations	
Demonstrates desire to minimise patient distress	
Promotes respect for patient privacy, dignity and confidentiality	
Supports other staff in the correct use of devices	
Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)	
Accepts personal responsibility for the prevention of cross infection and self-infection	
<b>5.1 Administers oxygen using a variety of administration devices</b>	
Symptoms, signs and causes of acute airway insufficiency and indications for intervention	
Methods of maintaining a clear airway	
Respiratory physiology: gaseous exchange; pulmonary ventilation: volumes, flows, dead space; mechanics of ventilation: ventilation/perfusion abnormalities; control of breathing, acute and chronic ventilatory failure, effect of oxygen therapy; respiratory muscle oxygen consumption and work of breathing.	
Indications, contraindications and complications of oxygen therapy	
Environmental hazards associated with storage and use of oxygen; strategies to promote safety	
Storage and use of oxygen, nitric oxide (NO), compressed air and helium, including use of gas cylinders	
Use of pipeline gas and suction systems	
Principles of nebulisers, pressure regulators, flowmeters, vaporizers and breathing systems	
Indications for and operation of fixed and variable performance oxygen therapy equipment, humidification and nebulising devices Indications for different modes of ventilation and operation of at least one positive pressure ventilator, one non-invasive ventilator, and a constant positive airway pressure (CPAP) device	

	Principles of emergency airway management (see 5.3)
	Indications for and complications of hyperbaric oxygenation
	Check pipelines; check and change portable cylinders
	Select appropriate equipment or device to deliver oxygen therapy
	Recognise and institute appropriate oxygen therapy in the management of medical emergencies; seek assistance as appropriate
	Support ventilation using bag and mask
<b>5.2 Performs emergency airway management</b>	
	Symptoms, signs and causes of acute airway insufficiency and indications for intervention
	Principles of emergency airway management (see 5.3)
	Methods of maintaining a clear airway Indications, selection and insertion of oral (Guedel) airways, nasopharyngeal airways and laryngeal mask airways (LMA)
	Tracheal intubation: selection of tube type, diameter and length; indications and techniques; methods to confirm correct placement of a tracheal tube
	Bronchoscopic appearance of the upper and lower airways
	Appropriate use of drugs to facilitate airway control
	Monitoring during sedation/induction of anaesthesia for endotracheal intubation
	Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration
	Cricoid pressure: indications and safe provision
	Principles of endotracheal suctioning (see 5.5)
	Select appropriate tracheal tube type, size and length
	Management of difficult or failed airway (see 5.4)
	Airway management in special circumstances including but not limited to : head injury, full stomach, upper airway obstruction, shock, cervical spine injury, laryngectomy
	Appropriate use of double lumen endotracheal tube for one lung isolation / ventilation
	Choose a safe environment to undertake airway management (or optimise environment as circumstances allow)
	Accurately assess the airway for potential difficulties with airway management
	Optimise the patient's position for airway management
	Maintain a clear airway using oral / nasal airways
	Support ventilation using bag and mask Insert and check correct placement of laryngeal mask airway
	Select appropriate tracheal tube type, size and length
	Perform intubation and verify correct placement of tube
	Manage and minimise cardiovascular and respiratory changes during and after intubation
	Demonstrate rapid sequence induction of anaesthesia / cricoid pressure
	Apply an end-tidal CO2 detector post-intubation and interpret a capnograph trace
	Prepare the patient for and perform extubation
	Change an orotracheal tube
	Management of complications of tracheostomy including but not limited to: blockage, displacement
	Demonstrate correct placement of double lumen endotracheal tube
<b>5.3 Performs difficult and failed airway management according to local protocols</b>	
	Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock, cervical spine injury)
	Bronchoscopic appearance of the upper and lower airways
	Management of difficult intubation and failed intubation (local algorithm or protocol)
	Indications and methods of securing an emergency surgical airway
	Anatomical landmarks for cricothyrotomy/tracheostomy/mini-tracheostomy
	Indications and techniques for needle and surgical cricothyroidotomy
	Indications and contraindications to tracheostomy (percutaneous and surgical) and mini-tracheostomy
	Accurately assess the airway for potential difficulties with airway management Optimise the patient's position for airway management
	Maintain a clear airway using oral / nasal airways
	Support ventilation using bag and mask
	Principles of oxygen therapy and use of oxygen administration devices (see 5.1)
	Appropriate use of drugs to facilitate airway control
	Prepare equipment for difficult or failed intubation

	Demonstrate failed intubation drill (according to local algorithm or protocol)
	Demonstrate mini-tracheostomy or needle cricothyroidotomy
<b>5.4 Performs endotracheal suction</b>	
	Symptoms, signs and causes of acute airway insufficiency and indications for intervention
	Bronchoscopic appearance of the upper and lower airways
	Method of bronchoscopy via an endotracheal tube
	Methods of broncho-alveolar lavage (BAL) in an intubated patient
	Detection and management of haemo/pneumothorax (simple and tension)
	Safety and maintenance of flexible fiberoptic endoscopes
	Undertake bronchoscopy to assess tube position including double lumen endotracheal tube
	Undertake therapeutic bronchoscopy for sputum clearance
<b>5.6 Performs percutaneous tracheostomy</b>	
	Indications and contraindications to tracheostomy (percutaneous and surgical) and mini tracheostomy
	Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration
	Anatomical landmarks for cricothyrotomy/tracheostomy/mini tracheostomy
	Techniques for percutaneous and surgical tracheostomy
	Identify patients requiring tracheostomy; discuss indications and contraindications for percutaneous tracheostomy
	Manage and minimise cardiovascular and respiratory changes during and after intubation
	Select appropriate tracheal tube type, size and length
	Perform percutaneous tracheostomy
	Manage and minimise cardiovascular and respiratory changes during and after intubation under direct supervision
	Change a tracheostomy tube electively
	Manage anaesthesia and control the airway during planned tracheostomy tube insertion in the intensive care unit (ICU)
<b>5.7 Performs chest drain insertion</b>	
	Detection and management of haemo/pneumothorax (simple and tension)
	Anatomical landmarks for intrapleural drains
	Insertion and management of chest drains and air exclusion devices
	Patient groups at risk who may require chest drain placement under ultrasound or CT guidance
	Consequences of the procedure during ventilation
	Demonstrate emergency relief of tension pneumothorax
	Demonstrate aseptic insertion of an intrapleural chest drain and connection to a one-way seal device
<b>5.8 Performs arterial catheterisation</b>	
	Principles of arterial catheterisation
	Surface anatomy: arteries of the arms and legs Allens test - application and limitations
	Ultrasound techniques for vascular localisation (see 5.9)
	Recognition and management of inadvertent intra-arterial injection of harmful substances
	Insert arterial catheters by different routes
	Minimise blood loss related to clinical investigations and procedures
<b>5.9 Describes ultrasound techniques for vascular localisation</b>	
	Basic principles of ultrasound and the Doppler effect
	Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle; arteries of the arms and legs
	Methods for securing vascular access rapidly
	Principles, routes and techniques of peripheral and central venous cannulation
	Principles of arterial catheterisation
<b>5.10 Performs central venous catheterisation</b>	
	Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle
	Principles, routes and techniques of central venous cannulation
	Chest x-ray interpretation (see 2.6)

	Ultrasound techniques for vascular localisation (see 5.9)
	Methods for securing vascular access rapidly
	Detection and management of haemo/pneumothorax (simple and tension)
	Insert central venous catheters by different routes
	Minimise blood loss related to clinical investigations and procedures
	Describe a method for tunnelled intravenous catheterisation (e.g. for parenteral nutrition)
<b>5.11 Performs defibrillation and cardioversion</b>	
	Principles of ECG monitoring (heart rate, rhythm, conduction, ST segment change and QT interval) – indications, limitations and techniques.
	Advantages and disadvantages of different lead configurations
	Basic and complex cardiac arrhythmias - recognition and management (pharmacological and electrical)
	Treatment (algorithm) of patients in ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT)
	Defibrillation: principles of monophasic and biphasic defibrillators; mechanism, indications, complications, modes and methods (manual and automated external defibrillators (AED))
	<i>Electrical safety</i> : conditions which predispose to the occurrence of macro-shock / micro-shock; physical dangers of electrical currents; relevant standards regarding safe use of electricity in patient care; basic methods to reduce electrical hazards
	Principles of emergency airway management (see 5.3)
	Obtain and interpret data from ECG (3- and 12-lead)
	Use manual external defibrillators
	Use automated external defibrillators (AED)
<b>5.12 Performs transthoracic cardiac pacing, describes transvenous</b>	
	Principles and techniques of cardiac pacing
	Principles of ECG monitoring (heart rate, rhythm, conduction, ST segment change and QT interval) – indications, limitations and techniques
	Advantages and disadvantages of different lead configurations
	Basic and complex cardiac arrhythmias - recognition and management (pharmacological and electrical)
	Principles, routes and techniques of peripheral and central venous cannulation
	Surface anatomy: structures in the antecubital fossa; large veins and anterior triangle of the neck; large veins of the leg and femoral triangle
	Methods for securing vascular access rapidly
	Detection and acute management of cardiac tamponade
	Principles of emergency airway management (see 5.3)
	Detection and management of haemo/pneumothorax (simple and tension)
	Insertion and management of chest drains and air exclusion devices
	Describe insertion of a temporary pacing wire
	Demonstrate the use of transthoracic pacing
	Demonstrate emergency relief of tension pneumothorax
	Principles of defibrillation and cardioversion (see 5.11)
	Describe emergency percutaneous pericardial aspiration
	Establish and review pacing box settings
<b>5.13 Describes how to perform pericardiocentesis</b>	
	Anatomical landmarks and technique for percutaneous pericardial aspiration
	Detection and acute management of cardiac tamponade
	Principles of ECG monitoring (heart rate, rhythm, conduction, ST segment change and QT interval) – indications, limitations and techniques. Advantages and disadvantages of different lead configurations
	Treatment (algorithm) of patients in ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT)
	Principles of emergency airway management (see 5.3)
	Principles of defibrillation and cardioversion (see 5.11)
<b>5.14 Demonstrates a method for measuring cardiac output &amp; derived haemodynamic variables</b>	
	Principles of haemodynamic monitoring - invasive and non-invasive methods, indications and limitations, physiological parameters and waveform interpretation
	Zero and calibration techniques for invasive pressure monitoring

	Invasive and non-invasive systems available for measuring cardiac output and derived haemodynamic variables, the principles involved and the type and site of placement of the monitoring device
	Interpretation of, relationships between, sources of error and limitations of measured and derived cardiovascular variables including pressure, flow, volume and gas transport
	Indications, limitations and complications of techniques of measurement of cardiac output (e.g. pulmonary artery catheter, oesophageal Doppler, PiCCO, LiDCO) and action to prevent them
	Obtain and interpret data from central venous catheters
	Prepare equipment for intravascular pressure monitoring
	Obtain and interpret data from a cardiac output measurement technique
	Measure and interpret haemodynamic variables (including derived variables)
<b>5.15 Performs lumbar puncture (intradural / 'spinal') under supervision</b>	
	Indications for and contraindications of lumbar puncture and CSF sampling; laboratory analysis of CSF samples
	Performs lumbar puncture
	Insert a lumbar drain for CSF drainage
<b>5.16 Manages the administration of analgesia via an epidural catheter</b>	
	Indications, contraindications, methods and complications of epidural catheterisation
	Pharmacokinetics, pharmacodynamics, indications and complications of opiates and local anaesthetic agents
	Indications, contraindications and complications of epidural infusion / injection; principles of safe epidural drug administration
	Physiological effects of pain and anxiety
	Recognition and methods of assessment of pain
	Contraindications, methods and complications of epidural catheter removal
	Select an appropriate epidural infusion regimen and titrate safely
	Select and determine adequacy and route of administration of analgesia
	Manage an established epidural infusion
	Administer bolus analgesia via an epidural catheter
	Minimise complications associated with opioid and non-opioid analgesics
<b>5.17 Performs abdominal paracentesis</b>	
	Anatomy of the abdominal wall; landmarks for abdominal paracentesis and abdominal drainage catheters
	Indications, contraindications, complications and technique of abdominal paracentesis
	Insert an abdominal drain
<b>5.18 Describes Sengstaken tube (or equivalent) placement</b>	
	Principles and techniques for insertion of gastro-oesophageal balloon tamponade tube (e.g. Sengstaken-Blakemore)
<b>5.19 Performs nasogastric tube placement</b>	
	Principles of nasogastric cannulation in the intubated and non-intubated patient
	Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration
	Insert a nasogastric tube in an intubated and non-intubated patient
<b>5.20 Performs urinary catheterisation</b>	
	Anatomy of the genitourinary system and anatomical landmarks for suprapubic urinary catheters
	Urinary catheterisation techniques: transurethral and suprapubic
	Urinary catheterisation in pelvic trauma: indications, contraindications and techniques
	Perform aseptic urinary catheterisation: male and female
	Confirm correct placement and exclude complications

Domain 6: Perioperative Care	
	Lead, delegate and supervise others appropriately according to experience and role
	Demonstrates desire to minimise patient distress
	Attention to and control of pain
	Consults, communicates and collaborates effectively with anaesthetist, surgeon, nursing staff, other professionals, patients and relatives where appropriate
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
6.1 Manages the pre and post operative care of the high-risk surgical patient	
	Factors determining perioperative risk
	Importance of preoperative health status on postoperative outcomes including cardiopulmonary exercise testing
	Indications for, and interpretation of pre-operative investigations
	Dangers of emergency anaesthesia and surgery
	Effect of gastric contents and volume depletion on perioperative risk
	Anaesthetic risk factors complicating recovery: suxamethonium apnoea, anaphylaxis, malignant hyperpyrexia, difficult airway
	Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
	Perioperative implications of current drug therapy
	Consent and assent in the competent and non-competent patient
	Implications for postoperative care of common acute and chronic medical conditions (see 3.1 and 3.2)
	Implications of type of anaesthesia (general/regional/local) for perioperative care
	Implications of type / site of surgery for postoperative management and potential complications within the first 24 hours of surgery
	Indications and choice of agent for antibiotic prophylaxis
	Indications for and methods of perioperative anti-thrombotic treatment
	Recognition, assessment and management of acute pain
	Triggered re-evaluation of the patient if pain worsens days after surgery eg anastomotic dehiscence
	Assessment and management of commonly encountered perioperative conditions and complications including:
	<b>Respiratory:</b> Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient; the unprotected airway; upper and lower airway obstruction including laryngeal trauma and oedema; pneumonia, collapse or consolidation, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; TRALI; pulmonary oedema; pleural effusion, haemo/pneumothorax (simple and tension); use of chest drains; factors affecting patients following thoracotomy, lung resection, oesophagectomy and oro facial surgery
	<b>Cardiovascular:</b> Interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; recognition of bleeding; management of hypo/hypertension; pulmonary embolus, operative risk factors in patients with ischaemic heart disease, significant valvular disease, cardiac tamponade; surgery for acquired and congenital cardiac disease; management of patients following cardiac surgery (coronary grafting, valve replacement) and aortic surgery (arch, thoracic, abdominal); heart and heart-lung transplantation
	<b>Renal:</b> Causes of perioperative oliguria and anuria; prevention and management of acute renal failure, rhabdomyolysis; consequences of nephrectomy, ileal conduits; management post-renal transplantation
	<b>Haematology and oncology:</b> Management of severe acute haemorrhage and blood transfusion; correction of coagulation disorders and haemoglobinopathies., care of the immunosuppressed or immunoincompetent patient, complications of chemotherapy and radiotherapy
	<b>Metabolic and hormonal:</b> Perioperative management of patients with diabetes; blood glucose control; perioperative management of electrolyte disorders, hypo- and hyperadrenalism, surgery to thyroid, adrenal and pituitary glands
	<b>Gastrointestinal:</b> Interpretation of abdominal pain and distension; peptic ulceration and upper GI haemorrhage; diarrhoea, vomiting and ileus; peritonitis; intestinal ischaemia;

perforation; abdominal hypertension; pancreatitis; jaundice; cholecystitis; Management of the pre- and post-liver transplant patient; perioperative nutrition; post-operative nausea and vomiting
<b>Sepsis and Infection:</b> Fever and hypothermia; postoperative hypoperfusion and impaired oxygen delivery; wound infection; opportunistic and nosocomial infection; perioperative infection risk and prophylactic antibiotics; necrotising fasciitis; peritonitis; Clostridium difficile
<b>Plastic Surgery:</b> Management of vascular skin grafts
<b>Neurological:</b> Causes of post-operative confusion and delirium, stroke (CVA), coma and raised intracranial pressure; determinants of cerebral perfusion and oxygen delivery; prevention of secondary brain injury; perioperative management of patients with neuropathies and myopathies; intracranial pressure monitoring; extra-dural and sub-dural haematoma; intracerebral haemorrhage; spinal cord injury and ischaemia; brachial plexus injury; complications of neuromuscular blockade
<b>Musculo-skeletal:</b> Principles and management of external fixators and casts; perioperative positioning; pressure area care; compartment syndromes and pressure monitoring; patients; on muscle relaxants; principles of salvage surgery
Methods of optimising high risk surgical patients: ERAS
Consider the impact of long-term and chronic treatment on acute surgical care
Communicate the risk of surgery to patients and family
Accurately assess the airway for potential difficulties with airway management
Ensure the necessary resources are available for safe post-operative care
Identify pre-operative health status and intercurrent disease, medications, allergies and their interaction with the nature of anaesthetic and surgery
Obtain relevant information from the patient, relatives and other secondary sources
Interpret pre-operative investigations, intra-operative findings and events/complications, and respond to them appropriately
Assess conscious level and conduct a careful systems review
Optimise high-risk surgical patients before surgery: consider site of care and management plan
Select and determine adequacy and route of administration of analgesia
Document, monitor and manage fluid balance, circulating volume, drains, systemic oxygen supply
Establish a plan for postoperative management
Identify life-threatening cardiorespiratory complications; manage hypovolaemia and impaired oxygen delivery
Manage post-operative hypo and hypertension
Differentiate and manage tension pneumothorax, cardiac tamponade and pulmonary embolus
Manage post-operative stridor
Recognise and manage perioperative emergencies and seek assistance appropriately
<b>6.2 Manages the care of the patient following cardiac surgery under supervision</b>
Factors determining perioperative risk:
Importance of preoperative health status on postoperative outcomes
Indications for, and interpretation of pre-operative investigations
Dangers of emergency anaesthesia and surgery
Perioperative implications of current drug therapy
Implications for postoperative care of common acute and chronic medical conditions (see 3.1 and 3.2)
Implications of type of anaesthesia (general/regional/local) for perioperative care
Implications of type / site of surgery for postoperative management and potential complications within the first 24 hours of surgery
Recognition, assessment and management of acute pain
Indications for and methods of perioperative anti-thrombotic treatment
Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
Assessment and management of commonly encountered perioperative conditions and complications including:

<p><b>Respiratory:</b> Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient; the unprotected airway; upper and lower airway obstruction including laryngeal trauma and oedema; pneumonia, collapse or consolidation, pulmonary infiltrates including acute lung injury (ALI) and the acute respiratory distress syndrome (ARDS) and their causative factors; TRALI; pulmonary oedema; pleural effusion, haemo/pneumothorax (simple and tension); use of chest drains; factors affecting patients following thoracotomy, lung resection, oesophagectomy and oro facial surgery.</p>
<p>Management of bronchopleural fistula; post insertion management of tracheal and bronchial stents</p>
<p><b>Cardiovascular:</b> Interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; recognition of bleeding; management of hypo/hypertension; pulmonary embolus; cardiac tamponade; surgery for congenital and acquired cardiac disease; management of patients following cardiac surgery (coronary grafting, valve replacement) and aortic surgery (arch, thoracic, abdominal); heart; principles of cardiac pacing.</p>
<p>Management of pulmonary hypertension</p>
<p><b>Renal:</b> Causes of perioperative oliguria and anuria; prevention and management of acute renal failure</p>
<p><b>Neurological:</b> stroke (CVA); causes of post-operative confusion</p>
<p><b>Gastrointestinal:</b> post-operative alterations in gut motility; perioperative nutrition; post-operative nausea and vomiting</p>
<p><b>Haematology and oncology:</b> Management of severe acute haemorrhage and blood transfusion, principles of cell salvage; correction of coagulation disorders and haemoglobinopathies, care of the immunosuppressed or immune-incompetent patient, complications of chemotherapy and radiotherapy</p>
<p>Interprets thromboelastography in post cardiac surgical patients</p>
<p><b>Metabolic &amp; Hormonal:</b> Blood glucose control; perioperative management of electrolyte disorders</p>
<p><b>Sepsis and Infection:</b> fever and hypothermia; postoperative hypoperfusion and impaired oxygen delivery; wound infection; opportunistic and nosocomial infection; perioperative infection risk and prophylactic antibiotics; intestinal ischaemia; antibiotic selection and prescribing</p>
<p>Management of cyanosis, hypo- and hypertension, hypothermia and shivering</p>
<p>Surgical interventions in patients with cardiac disease, perioperative management of the cardiovascular surgery patient and potential complications occurring within 24 hours of cardiac surgery</p>
<p>Consider the impact of long-term and chronic treatment on acute surgical care</p>
<p>Identify pre-operative health status and intercurrent disease, medications, allergies and their interaction with the nature of anaesthetic and surgery</p>
<p>Obtain relevant information from the patient, relatives and other secondary sources</p>
<p>Assess conscious level and conduct a careful systems review</p>
<p>Select and determine adequacy and route of administration of analgesia</p>
<p>Document, monitor and manage fluid balance, circulating volume, drains, systemic oxygen supply</p>
<p>Establish a plan for postoperative management</p>
<p>Identify life-threatening cardiorespiratory complications; manage hypovolaemia and impaired oxygen delivery</p>
<p>Differentiate and manage tension pneumothorax, cardiac tamponade and pulmonary embolus</p>
<p>Recognise and manage perioperative emergencies and seek assistance appropriately</p>
<p>Seek appropriate support and supervision in order to provide optimal patient care</p>
<p>Interpret pre-operative investigations, intra-operative findings and events/complications, and respond to them appropriately</p>
<p>Demonstrates management of intra-aortic balloon pump in surgical and non-surgical cardiac patients</p>
<p><b>6.3 Manages the care of the patient following craniotomy under supervision</b></p>
<p>Factors determining perioperative risk</p>
<p>Importance of preoperative health status on postoperative outcomes</p>



Indications for, and interpretation of pre-operative investigations
Perioperative implications of current drug therapy
Implications for postoperative care of common acute and chronic medical conditions (see 3.1 and 3.2)
Implications of type of anaesthesia (general/regional/local) for perioperative care
Recognition, assessment and management of acute pain
Indications for and methods of perioperative anti-thrombotic treatment
Criteria for admission to, and discharge from ICU – factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
Major neurosurgical procedures, peri-operative management of the patient undergoing major neurosurgery, and potential complications occurring within 24 hours of surgery
Assessment and management of commonly encountered perioperative conditions and complications including:
<b>Respiratory:</b> Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient
<b>Cardiovascular:</b> Interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; management of hypo/hypertension
<b>Renal:</b> Causes of perioperative oliguria and anuria; prevention and management of acute renal failure
<b>Neurological:</b> causes of post-operative confusion, stroke (CVA), coma and raised intracranial pressure; determinants of cerebral perfusion and oxygenation; prevention of secondary brain injury; intracranial pressure monitoring; therapeutic correction of raised intracranial pressure; intracerebral haemorrhage, contusion and oedema
<b>Gastrointestinal:</b> post-operative alterations in gut motility; perioperative nutrition; post-operative nausea & vomiting
<b>Metabolic &amp; Hormonal:</b> blood glucose control; perioperative management of electrolyte disorders
<b>Sepsis and Infection:</b> fever and hypothermia; postoperative hypoperfusion and impaired oxygen delivery; wound infection; opportunistic and nosocomial infection; perioperative infection risk and prophylactic antibiotics; intestinal ischaemia; antibiotic selection and prescribing
Consider the impact of long-term and chronic treatment on acute surgical care
Identify pre-operative health status and intercurrent disease, medications, allergies and their interaction with the nature of anaesthetic and surgery
Obtain relevant information from the patient, relatives and other secondary sources
Assess conscious level and conduct a careful systems review
Select and determine adequacy and route of administration of analgesia
Document, monitor and manage fluid balance, circulating volume, drains, systemic oxygen supply
Establish a plan for postoperative management
Recognise and manage perioperative emergencies and seek assistance appropriately
Seek appropriate support and supervision in order to provide optimal patient care
Interpret pre-operative investigations, intra-operative findings and events/complications, and respond to them appropriately
Monitor and manipulate cerebral perfusion pressure (CPP)
<b>6.4 Manages the care of the patient following solid organ transplant under supervision</b>
Factors determining perioperative risk
Importance of preoperative health status on postoperative outcomes
Indications for, and interpretation of pre-operative investigations
Perioperative implications of current drug therapy
Implications for postoperative care of common acute and chronic medical conditions (see 3.1 and 3.2)
Implications of type of anaesthesia (general/regional/local) for perioperative care
Solid organ-specific transplantation (heart-lung, liver, renal): peri-operative considerations, pharmacological management, post-operative care and potential complications
Immunosuppression and rejection
Implications of type / site of surgery for postoperative management and potential complications within the first 24 hours of surgery

Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
Indications for and methods of perioperative anti-thrombotic treatment
Recognition, assessment and management of acute pain
Assessment and management of commonly encountered perioperative conditions and complications including:
<b>Respiratory:</b> Interpretation of symptoms and signs of respiratory insufficiency in the surgical patient; 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, haemo/pneumothorax (simple and tension); use of chest drains; factors affecting patients following heart-lung transplantation
<b>Cardiovascular:</b> Recognition of bleeding; interpretation of symptoms and signs of cardiovascular insufficiency in the surgical patient; management of hypo/hypertension; pulmonary embolus; management of patients following heart and heart-lung transplantation
<b>Renal:</b> Causes of perioperative oliguria and anuria; prevention and management of acute renal failure; management post-renal transplantation
<b>Neurological:</b> stroke (CVA); causes of post-operative confusion.
<b>Gastrointestinal:</b> post-operative alterations in gut motility; perioperative nutrition; post-operative nausea and vomiting; management of the post-liver transplant patient.
<b>Haematology and oncology:</b> Management of severe acute haemorrhage and blood transfusion, principles of cell salvage; correction of coagulation disorders and haemoglobinopathies. Care of the immunosuppressed or immunoincompetent patient complications of chemotherapy
<b>Metabolic &amp; Hormonal:</b> blood glucose control; perioperative management of electrolyte disorders
<b>Sepsis and Infection:</b> fever and hypothermia; postoperative hypoperfusion and impaired oxygen delivery; wound infection; opportunistic and nosocomial infection; perioperative infection risk and prophylactic antibiotics; intestinal ischaemia; antibiotic selection and prescribing
Consider the impact of long-term and chronic treatment on acute surgical care
Interpret pre-operative investigations, intra-operative findings and events/complications, and respond to them appropriately
Identify pre-operative health status and intercurrent disease, medications, allergies and their interaction with the nature of anaesthetic and surgery
Obtain relevant information from the patient, relatives and other secondary sources
Assess conscious level and conduct a careful systems review
Select and determine adequacy and route of administration of analgesia
Document, monitor and manage fluid balance, circulating volume, drains
Establish a plan for postoperative management
Review and monitor perioperative immunosuppressive therapy
Identify life-threatening cardiorespiratory complications; manage hypovolaemia and impaired oxygen delivery
Recognise and manage perioperative emergencies and seek assistance appropriately
Seek appropriate support and supervision in order to provide optimal patient care
<b>6.5 Manages the pre and postoperative care of the trauma patient under supervision</b>
Factors determining perioperative risk
Importance of preoperative health status on postoperative outcomes
Indications for, and interpretation of pre-operative investigations
Dangers of emergency anaesthesia and surgery
Perioperative implications of current drug therapy
Consent and assent in the competent and non-competent patient
Implications for postoperative care of common acute and chronic medical conditions (see 3.1 and 3.2)
Indications for and methods of perioperative anti-thrombotic treatment
Recognition, assessment and management of acute pain
Implications of type of anaesthesia (general/regional/local) for perioperative care
Implications of type / site of surgery for postoperative management and potential complications within the first 24 hours of surgery

Assessment and management of commonly encountered perioperative conditions & complications including:
<b>Respiratory:</b> Interpretation of symptoms and signs of respiratory insufficiency in the trauma patient; pneumonia, collapse or consolidation, pulmonary infiltrates including acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) and their causative factors; pulmonary contusion; pulmonary oedema; pleural effusion, haemo/pneumothorax (management of simple and tension); use of chest drains
<b>Cardiovascular:</b> Interpretation of symptoms and signs of cardiovascular insufficiency in the trauma patient including cardiac contusion and tamponade; management of
<b>Renal:</b> Causes of perioperative oliguria and anuria; rhabdomyolysis; prevention and management of acute renal failure
<b>Neurological:</b> causes of post-operative confusion, stroke (CVA), coma and raised intracranial pressure; determinants of cerebral perfusion and oxygenation; prevention of secondary brain injury; intracranial pressure monitoring; therapeutic correction of raised intracranial pressure; intracerebral haemorrhage, contusion and oedema
<b>Gastrointestinal:</b> Interpretation of abdominal pain and distension; intestinal ischaemia; abdominal hypertension; risk factors, monitoring and management of abdominal compartment syndrome; perioperative nutrition; post-operative nausea and vomiting
<b>Haematology:</b> management of severe acute haemorrhage and blood transfusion, principles of cell salvage; correction of coagulation disorders and haemoglobinopathies
<b>Metabolic &amp; Hormonal:</b> Blood glucose control; perioperative management of electrolyte disorders
<b>Sepsis and Infection:</b> fever and hypothermia; postoperative hypoperfusion and impaired oxygen delivery; wound infection; opportunistic and nosocomial infection; perioperative infection risk and prophylactic antibiotics; necrotising fasciitis; peritonitis; intestinal ischaemia; antibiotic selection and prescribing
Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
<b>Musculo-skeletal:</b> principles and management of external fixators and casts; perioperative positioning; pressure area care; compartment syndromes; paralysed patients; principles of salvage surgery; management of vascular skin grafts
Consider the impact of long-term and chronic treatment on acute surgical care
Identify pre-operative health status and intercurrent disease, medications, allergies and their interaction with the nature of anaesthetic and surgery
Obtain relevant information from the patient, relatives and other secondary sources
Interpret pre-operative investigations, intra-operative findings and events/complications, and respond to them appropriately
Conduct a secondary survey following ATLS (or equivalent) principles
Communicate the risk of surgery to patients and family
Assess conscious level and conduct a careful systems review
Select & 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; manage hypovolaemia and impaired oxygen delivery
Describe the risk period for use of depolarizing neuromuscular blocking agents in patients undergoing repeated surgical procedures
Seek appropriate support and supervision in order to provide optimal patient care
Establish a plan for postoperative management including plans for further surgery

<b>Domain 7: Comfort and recovery</b>	
	Lead, delegate and supervise others appropriately according to experience and role
	Communicate effectively with relatives who may be, in denial, anxious, angry, confused, or litigious
	Desire to minimise patient distress
	Regards each patient as an individual
	Establishes trusting relationships with and demonstrates compassionate care of patients and their relatives
	Willingness to communicate with and support families / significant others
	Respects the religious beliefs of the patient and offers to liaise with a religious representative if this is the wish of the patient or family
	Acknowledges the consequences of the language used to impart information
	Fosters effective communication and relationships with medical and nursing staff in other wards / departments
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
	Recognises that intensive care is a continuum within the 'patient journey'
	Promotes appropriate and timely discharge from ICU
	Appreciates that physical and psychological consequences of critical illness can have a significant and long lasting effect for both patients and their relatives
	Early planning for rehabilitation
	Seeks to modify the stresses which the intensive care environment places upon patients, their relatives and members of staff
<b>7.1 Identifies and attempts to minimise the physical and psychosocial consequences of critical illness for patients and families</b>	
	Common symptomatology following critical illness
	Causes and methods of minimising distress in patients
	The role of patient's relatives and their contribution to care
	Physiological effects of pain and anxiety
	Stress responses
	Recognition and methods of assessment of pain
	Principles of acute pain management
	Pharmacokinetics, pharmacodynamics, indications and complications of commonly used analgesic, hypnotic, and neuromuscular blocking drugs in patients with normal and abnormal organ system function
	Sleep deprivation and its consequences
	Causes and management of acute confusional states
	Sensory deprivation / sensory overload
	Environmental and drug-related psychopathology associated with critical illness (e.g. anxiety, sleep disorders, hallucinations, drug withdrawal)
	Impact of staff-patient contact and environmental factors on patient stress
	Post-traumatic stress disorders
	Methods of communicating with patients who are unable to speak
	Relevance and methods to care for skin, mouth, eyes and bowels, and to maintain mobility and muscle strength in critically ill patients
	Fluid and caloric requirements in the critically ill patient including electrolytes, vitamins, trace elements and principles of immunonutrition
	Methods to assess nutritional status and basal energy expenditure
	Causes, prevention and management of critical illness polyneuropathy, motor neuropathy, and myopathy
	Consequences of immobilisation and mobilisation techniques (including disuse atrophy, foot-drop, ectopic calcification)
	Prevention and management of pressure sores
	Principles of rehabilitation: physical and psychological
	Resources available to patients and relatives for education and support (e.g. societies, local groups, publications, referral to allied health care professionals)
	Common risk factors for post-ICU mortality or re-admission and their minimisation
	Methods to minimise potential psychological trauma to the patient and their family of transfer from the ICU (especially with regard to long term ICU patients)

The implications for relatives of adopting a role as a carer at home
Impact of chronic illness post-ICU on socialisation and employment
Identify complications associated with critical illness
Work with colleagues and relatives to minimise patient distress
Anticipate the development of pain and/or anxiety and adopt strategies for its prevention or minimisation
Use analgesic, hypnotic and neuromuscular blocking drugs appropriately and safely
Propose and implement a plan to provide adequate sleep and rest in ICU patients
Participate in the education of patients/families
Appropriate and timely referral to specialists / allied health professionals
Take decisions to admit, discharge or transfer patients
Follow-up patients after discharge to the ward
Participate in follow-up clinics / services where available
<b>7.2 Manages the assessment, prevention and treatment of pain and delirium</b>
Physiological effects of pain and anxiety
Stress responses
Causes and methods of minimising distress in patients
Recognition and methods of assessment of pain
Principles of acute pain management
Pharmacokinetics, pharmacodynamics, indications and complications of commonly used analgesic, hypnotic, 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
Patient-controlled analgesia
Environmental and drug-related psychopathology associated with critical illness (e.g. anxiety, sleep disorders, hallucinations, drug withdrawal)
Causes and management of acute confusional states
Relevance and methods to care for skin, mouth, eyes and bowels, and to maintain mobility and muscle strength in critically ill patients
Sleep deprivation and its consequences
Potential long-term consequences of acute delirium
Anticipate the development of pain and/or anxiety and adopt strategies for its prevention or minimisation
Interpret data from scoring or scaling systems to assess pain and sedation
Select and determine adequacy and route of administration of analgesia
Use analgesic, hypnotic and neuromuscular blocking drugs appropriately and safely
Minimise complications associated with opioid and non-opioid analgesics
Propose and implement a plan to provide adequate sleep and rest in ICU patients
Work with colleagues and relatives to minimise patient distress
<b>7.3 Manages sedation and neuromuscular blockade</b>
Physiological effects of pain and anxiety
Causes and methods of minimising distress in patients
Stress responses
Causes and management of acute confusional states
Recognition and assessment of anxiety
Environmental and drug-related psychopathology associated with critical illness (e.g. anxiety, sleep disorders, hallucinations, drug withdrawal)
Sensory deprivation / sensory overload
Pharmacokinetics, pharmacodynamics, indications and complications of commonly used analgesic, hypnotic, and neuromuscular blocking drugs in patients with normal and abnormal organ system function
Methods of measuring depth of sedation; effects of over-sedation and strategies to avoid this; sedation holds
Consequences of immobilisation and mobilisation techniques (including disuse atrophy, foot-drop, ectopic calcification)
Causes, prevention and management of critical illness polyneuropathy, motor neuropathy, and myopathy
Prevention and management of pressure sores

	Sleep deprivation and its consequences
	Post-traumatic stress disorders
	Anticipate the development of pain and/or anxiety and adopt strategies for its prevention or minimisation
	Use analgesic, hypnotic and neuromuscular blocking drugs appropriately and safely
	Interpret data from scoring or scaling systems to assess pain and sedation
	Obtain and interpret data from a nerve stimulator to monitor the degree of neuromuscular blockade
	Identify complications associated with critical illness
	Propose and implement a plan to provide adequate sleep and rest in ICU patients
	Work with colleagues and relatives to minimise patient distress
	<b>7.4 Communicates the continuing care requirements, including rehabilitation, of patients at ICU discharge to health care professionals, patients and relatives</b>
	Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
	Common symptomatology following critical illness
	Common risk factors for post-ICU mortality or re-admission and their minimisation
	Post-traumatic stress disorders
	Environmental and drug-related psychopathology associated with critical illness (e.g. anxiety, sleep disorders, hallucinations, drug withdrawal)
	Consequences of immobilisation and mobilisation techniques (including disuse atrophy, foot-drop, ectopic calcification)
	Causes, prevention and management of critical illness polyneuropathy, motor neuropathy, and myopathy
	Fluid and caloric requirements in the critically ill patient including electrolytes, vitamins, trace elements and principles of immunonutrition
	Principles of rehabilitation: physical and psychological
	Methods of communicating with patients who are unable to speak
	Causes and methods of minimising distress in patients
	Resources available to patients and relatives for education and support (eg societies, local groups, publications, referral to allied health care professionals)
	Supportive services integral to the long-term rehabilitation of critically ill patients (physiotherapy, occupational therapy, orthotics, social services).
	The implications for relatives of adopting a role as a carer at home
	Management of tracheostomy: care and avoidance of complications outside the ICU
	Persistent vegetative state; locked in syndromes
	Methods to assess nutritional status and basal energy expenditure
	Impact of chronic illness post-ICU on socialisation and employment
	Methods for assessing or measuring quality of life
	Methods to minimise potential psychological trauma to the patient and their family of transfer from the ICU (especially with regard to long term ICU patients)
	Long-term ventilation outside the ICU environment (e.g. home ventilation)
	Define the role of rehabilitation services and the multi-disciplinary team to facilitate long-term care
	Understand the function of post ICU follow-up clinics, how they can be organised and what the risks/benefits are for these services
	Outline the concept of patient self-care
	Know, understand and be able to compare medical and social models of disability
	Understand the relationship between local health, educational and social service provision including the voluntary sector
	Anticipate the development of pain and/or anxiety and adopt strategies for its prevention or minimisation
	Work with colleagues and relatives to minimise patient distress
	Appropriate and timely referral to specialists / allied health professionals
	Ensure effective information exchange before patient discharge from ICU
	Liaise with medical and nursing staff in other departments to ensure optimal communication and continuing care after ICU discharge
	Communicate effectively with relatives who may be anxious, angry, confused, or litigious
	Participate in the education of patients/families

Follow-up patients after discharge to the ward
Develop a self-management plan including investigation, treatments and requests/instructions to other healthcare professionals, in partnership with the patient
Support patients, parents and carers where relevant to comply with management plans
Promote and encourage involvement of patients in appropriate support networks, both to receive support and to give support to others
Recognise the impact of long-term conditions on the patient, family and friends
Put patients in touch with the relevant agency including the voluntary sector from where they can procure the items as appropriate
Provide the relevant tools and devices when possible
Show willingness to facilitate access to the appropriate training and skills in order to develop the patient's confidence and competence to self-care
Manage follow-up effectively
Provide brief advice on use of alcohol and other drugs
Provide management and/or referral where appropriate
Support patient self-management
Recognise and respect the role of family, friends and carers in the management of the patient with a long-term condition
Recommend appropriate secondary prevention treatments and lifestyle changes on discharge
<b>7.5 Manages the safe and timely discharge of patients from the ICU</b>
Common symptomatology following critical illness
The role of patient's relatives and their contribution to care
Criteria for admission to, and discharge from ICU – factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
Common risk factors for post-ICU mortality or re-admission and their minimisation
Management of tracheostomy: care and avoidance of complications outside the ICU
Methods to minimise potential psychological trauma to the patient and their family of transfer from the ICU (especially with regard to long term ICU patients)
Long-term ventilation outside the ICU environment (e.g. home ventilation)
Potential psychological impact of inter-hospital transfer and family dislocation
Anticipate the development of pain and/or anxiety and adopt strategies for its prevention or minimisation
Work with colleagues and relatives to minimise patient distress
Appropriate and timely referral to specialists / allied health professionals
Ensure effective information exchange before patient discharge from ICU
Liaise with medical and nursing staff in other departments to ensure optimal communication and continuing care after ICU discharge
Identify discharge criteria for individual patients
Take decisions to admit, discharge or transfer patients
Follow-up patients after discharge to the ward
Change a tracheostomy tube electively
Identify discharge criteria for individual patients

<b>Domain 8: End of life care</b>	
	Bereavement: anticipating and responding to grief
	Define the standards of practice defined by the GMC when deciding to withhold or withdraw life-prolonging treatment
	Know the role and legal standing of advance directives in different UK legislations
	Outline the principles of the Mental Capacity Act (Adults with Incapacity Act in Scotland)
	Communicate effectively with relatives who may be, in denial, anxious, angry, confused, or litigious
	Appreciates that the decision to withhold or withdraw treatment does not imply the termination of care
	Desire to support patient, family, and other staff members appropriately during treatment withdrawal
	Establishes trusting relationships with and demonstrates compassionate care of patients and their relatives
	Offers psychological, social and spiritual support to patients, their relatives or colleagues as required
	Respects the expressed wishes of competent patients, even when in conflict with the views of the physician
	Respects the ideas and beliefs of the patient and their family and their impact on decision making (does not impose own views)
	Respects the religious beliefs of the patient and is willing to liaise with a religious representative if requested by patient or family
	Willingness to communicate with and support families / significant others
	Acknowledges the consequences of the language used to impart information
	Integrity, honesty and respect for the truth underpin relationships with patients, relatives and colleagues
	Values clear decision-making and communication
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
<b>8.1 Manages the process of withholding or withdrawing treatment with the multidisciplinary team</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Ethical and legal issues in decision-making for the incompetent patient: incapacity
	Difference between euthanasia and allowing death to occur: doctrine of double effect
	Withholding and withdrawing treatment: omission and commission
	Decision-making processes for withholding and withdrawing life sustaining therapies including documentation and iterative review
	The limitations of intensive care medicine – expectations of what can and cannot be achieved
	Principles of delivering bad news to patients and families
	Local resources available to support dying patients and their families, and how to access them
	Cultural and religious practices of relevance when caring for dying patients and their families
	Principles of pain and symptom management
	Procedure for withdrawing treatment and support
	Procedure for pronouncing life extinct and subsequently completion of death certification
	Responsibilities in relation to legal authorities for certifying death (e.g. coroner, procurator fiscal or equivalent), and reasons for referral
	The value of autopsy (post-mortem) examination.
	Recognise when treatment is unnecessary or futile
	Discuss end of life decisions with members of the health care team
	Willing and able to communicate and discuss issues pertaining to end of life with patients and relatives
	Discuss treatment options with a patient or relatives before ICU admission
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Relieve distress in the dying patient
	Withdraw life sustaining treatment or organ support



	Aware of the emotional needs of self and others; seeks and offers support appropriately
<b>8.2 Discusses end of life care with patients and their families / surrogates</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Ethical and legal issues in decision-making for the incompetent patient: incapacity
	Difference between euthanasia and allowing death to occur: doctrine of double effect
	With-holding and withdrawing treatment: omission and commission
	Decision-making processes for withholding and withdrawing life sustaining therapies including documentation and iterative review
	The limitations of intensive care medicine - expectations of what can and cannot be achieved
	Principles of delivering bad news to patients and families
	Local resources available to support dying patients and their families, and how to access them
	Bereavement: anticipating and responding to grief
	Principles of pain and symptom management
	Cultural and religious practices of relevance when caring for dying patients and their families
	Causes and prognosis of vegetative states
	Causes of brain stem death
	Cultural and religious factors which may influence attitude to brain stem death and organ donation
	Responsibilities in relation to legal authorities for certifying death (e.g. coroner, Procurator Fiscal or equivalent), and reasons for referral
	Procedure for pronouncing life extinct and subsequent completion of death certification
	The value of autopsy (post-mortem) examination
	Recognise when treatment is unnecessary or futile
	Willing and able to communicate and discuss issues pertaining to end of life with patients and relatives
	Discuss treatment options with a patient or relatives before ICU admission
	Differentiate competent from incompetent statements by patients
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Participate in discussions with relatives about treatment limitation or withdrawal
	Explain the concept and practicalities of brain stem death and organ donation clearly
	Lead a discussion about end of life goals, preferences and decisions with a patient and/or their relatives
	Obtain consent/assent for treatment, research, autopsy or organ donation
<b>8.3 Manages palliative care of the critically ill patient</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Ethical and legal issues in decision-making for the incompetent patient: incapacity
	Difference between euthanasia and allowing death to occur: doctrine of double effect
	Principles of delivering bad news to patients and families
	Local resources available to support dying patients and their families, and how to access them
	Cultural and religious practices of relevance when caring for dying patients and their families
	Principles of pain and symptom management
	Recognise when treatment is unnecessary or futile
	Willing and able to communicate and discuss issues pertaining to end of life with patients and relatives
	Discuss treatment options with a patient or relatives before ICU admission
	Differentiate competent from incompetent statements by patients
	Participate in timely discussion and regular review of 'do not attempt resuscitation' orders and treatment limitation decisions
	Participate in discussions with relatives about treatment limitation or withdrawal
	Lead a discussion about end of life goals, preferences and decisions with a patient and/or their relatives
	Relieve distress in the dying patient
	Aware of the emotional needs of self and others; seeks and offers support appropriately

<b>8.4 Performs brain-stem death testing</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Causes of brain stem death
	Legal aspects of brain stem death diagnosis
	Applied anatomy and physiology of the brain and nervous system including cerebral blood supply, base of skull, autonomic nervous system and cranial nerves
	Physiological changes associated with brain stem death
	Preconditions and exclusions for the diagnosis of brain stem death
	Clinical, imaging and electrophysiologic tests to diagnose brain death: applicability
	Cultural and religious factors which may influence attitude to brain stem death and organ donation
	Responsibilities in relation to legal authorities for certifying death (e.g. coroner, procurator fiscal or equivalent), and reasons for referral
	Document pre-conditions and exclusions to brain stem death testing
	Consult and confirm findings of brain stem function tests with colleagues as required by local / national policy or as indicated
	Perform and document tests of brain stem function
<b>8.5 Manages the physiological support of the organ donor</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Causes of brain stem death
	Role of national organ/tissue procurement authority and procedures for referral
	Responsibilities and activities of transplant co-ordinators
	Physiological changes associated with brain stem death
	Principles of management of the organ donor (according to national / local policy)
	Common investigations and procedures undertaken in the ICU prior to organ donation
	Explain the concept and practicalities of brain stem death and organ donation clearly
	Liaise with transplant co-ordinators (local organ donation authority) to plan management of the organ donor
	Monitor vital physiological functions as indicated
	Recognise and rapidly respond to adverse trends in monitored parameters
	Aware of the emotional needs of self and others; seeks and offers support appropriately
	Obtain consent/assent for treatment, research, autopsy or organ donation
<b>8.6 Manages donation following cardiac death</b>	
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Common investigations and procedures undertaken in the ICU prior to organ donation
	Procedure for pronouncing life extinct and subsequent completion of death certification
	Responsibilities in relation to legal authorities for certifying death (e.g. Coroner, Procurator Fiscal or equivalent), and reasons for referral
	Legal and ethical framework for decision making
	Role of national organ/tissue procurement authority and procedures for referral
	Transplant team members and their roles
	Responsibilities and activities of transplant co-ordinators
	Recognise when treatment is unnecessary or futile
	Identify potential non heart beating donors
	Lead a discussion about end of life goals, preferences and decisions with a patient and/or their relatives
	Participate in discussions with relatives about treatment limitation or withdrawal
	Liaise with transplant co-ordinators (local organ donation authority) and retrieval teams to plan management of the organ donor

<b>Domain 9: Paediatric care</b>	
	Impact of occupational and environmental exposures, socio-economic factors, and lifestyle factors on critical illness
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
<b>9.1 Describes the recognition of the acutely ill child and initial management of paediatric emergencies</b>	
	Key stages of physical and psychological development
	Major anatomical and physiological differences between adults and children
	Pathophysiology and principles of management of disorders which are life-threatening to paediatric patients (may include: acute respiratory failure, cardiac failure, trauma, severe infections including meningitis and epiglottitis, intoxications, metabolic disorders, seizures, croup, diarrhoea)
	Paediatric management of conditions common to both children and adults (e.g. acute severe asthma, renal failure, trauma)
	Paediatric resuscitation and the differences between adult and paediatric resuscitation
	Principles of paediatric airway management: methods and techniques; calculation of tube sizes; selection of masks and airways
	Principles of mechanical ventilation in a child
	Preparation for and methods of securing venous access
	Intraosseous cannulation
	Estimation of blood volume, replacement of fluid loss
	Paediatric dosing of common emergency drugs
	General principles for stabilising the critically ill or injured child until senior or more experienced help arrives
	Operation of local paediatric referral /retrieval services
	Principles of communication (verbal and non verbal) with children of different ages; awareness of the consequences of the language used to impart information
	Issues of consent in children
	Paediatric resuscitation at advanced life support level (APLS, PALS or equivalent)
	Prepare equipment and drugs for paediatric intubation
	Demonstrate paediatric tracheal intubation
	Secure venous access (including local anaesthesia pre-medication)
	Manage mechanical ventilation in a critically ill child
	Communicate effectively with, and attempt to reassure the child and parents
	Recognise and manage paediatric emergencies until senior or more experienced help arrives
	Manage and stabilise the injured child until senior or more experienced help arrives
<b>9.2 Describes the national legislation and guidelines relating to child protection and their relevance to critical care</b>	
	Key stages of physical and psychological development
	Principles of communication (verbal and non-verbal) with children of different ages; awareness of the consequences of the language used to impart information
	Legal and ethical aspects of caring for children
	Issues of consent in children
	National child protection guidelines

<b>Domain 10: Transport</b>	
	Lead, delegate and supervise others appropriately according to experience and role
	Anticipates and prevents problems during transfer
	Appreciates the importance of communication between referring, transporting and receiving staff
	Desire to minimise patient distress
	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
<b>10.1 Undertakes the transport of the mechanically ventilated critically ill patient outside the ICU</b>	
	Indications, risks and benefits of patient transfer (intra / inter hospital)
	Criteria for admission to, and discharge from ICU - factors influencing intensity and site of care (ward, high dependency unit (HDU), intensive care unit (ICU))
	Principles of safe patient transfer (before, during and after)
	Ethical issues surrounding transfer
	Strategies to avoid transfer-use of other facilities
	Strategies to manage the unique problems associated with patient transfer - limitations of space, personnel, monitoring and equipment
	Advantages and disadvantages of road ambulance, fixed and rotary wing aircraft including problems associated with altitude, noise, lighting conditions, vibration, acceleration and deceleration
	Selection of mode of transport based upon clinical requirements, distance, vehicle availability and environmental conditions
	Determination of required number of physicians / nurses / others during transfer and the role of paramedical personnel
	Selection and operation of transport equipment: size, weight, portability, power supply/battery life, oxygen availability, durability and performance under conditions of transport
	Principles of monitoring under transport conditions
	Homeostatic interaction between patient and environment (e.g. thermoregulation, posture / positioning)
	Communication prior to and during transport
	Operation of locally available retrieval services
	Physiology associated with air transport
	Potential psychological impact of inter-hospital transfer and family dislocation
	Take decisions to admit, discharge or transfer patients
	Communicate with referring and receiving institutions and teams
	Check transfer equipment and plan transfers with personnel prior to departure
	Select appropriate staff based upon patient need
	Prepare patients prior to transfer; anticipate and prevent complications during transfer - maintain patient safety at all times
	Adapt and apply general retrieval principles where appropriate to pre-, intra-, and inter-hospital transportation.
	Consider the need for and implements pre-transfer stabilisation before transfer
	Undertake intra-hospital transfer of ventilated patients to theatre or for diagnostic procedures (e.g. CT)
	Undertake inter-hospital transfers of patients with single or multiple organ failure
	Maintain comprehensive documentation of the patient's clinical condition before, during and after transport including relevant medical conditions, therapy delivered, environmental factors and logistical difficulties encountered
	Determine when the patient's needs exceed local resources or specialist expertise (requirement for transfer)

Domain 11: Patient safety and health systems management	
	Purpose and process of quality improvement activities such as evidence-based practice, best practice guidelines and benchmarking and change management
	Understand: <ul style="list-style-type: none"> <li>the factors involved in clinical decision making such as knowledge, experience, biases, emotions, uncertainty, context</li> <li>the critical relationship between CDM and patient safety</li> <li>the ways in which we process decision making: dual process theory: system 1 and system 2</li> <li>the place of algorithms, guidelines, protocols in supporting decision making and potential pitfalls in their use</li> <li>the pivotal decisions in diagnosis, differential diagnosis, handing over and receiving diagnoses and the need to review evidence for diagnosis at these times</li> </ul>
	Confidentiality and data protection - legal and ethical issues
	Principles of risk prevention
	Critical incident or error monitoring and reporting
	Professional responsibility and duty of care to patients placed at risk by the actions of fellow clinicians
	Methods of effective communication of information (written; verbal etc)
	Electronic methods of accessing medical literature and learning modalities
	Principles of aseptic technique and aseptic handling of invasive medical devices
	Methods of sterilisation and cleaning or disposal of equipment
	Universal precautions and preventative infection control techniques (hand washing, gloves, protective clothing, sharps disposal etc.)
	Understand the role of Notification of diseases within the UK and identify the principle notifiable diseases for UK and international purposes
	Define local and national 'significant event reporting systems' relevant to specialty
	Keep abreast of national patient safety initiatives including NCEPOD / SASM reports, NICE and SIGN guidelines etc
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Professional and reassuring approach - generates confidence and trust in patients and their relatives
	Acquire, interpret, synthesize, record, and communicate (written and verbal) clinical information
	Consults and takes into account the views of referring clinicians; promotes their participation in decision making where appropriate
	Inform colleagues, patients and relatives as applicable, of medical errors or adverse events in an honest and appropriate manner
	Manage inter-personal conflicts which arise between different sectors of the organisation, professionals, patients or relatives
	Maximise safety in everyday practice
	Document adverse incidents in a timely, detailed and appropriate manner
	Collaborate with other team members to achieve common goals
	Use electronic retrieval tools (e.g. PubMed) to access information from the medical and scientific literature
	Demonstrate an interest in quality control, quality improvement and reflective practice
	Lead, delegate and supervise others appropriately according to experience and role
	Demonstrate routine application of infection control practices to all patients, particularly hand washing between patient contacts
	Use protective clothing (gloves / mask / gown / drapes) as indicated
	Desire to minimise patient distress
	Consults, communicates and collaborates effectively with patients, relatives and the health care team
	Ensures effective information transfer
	Adopts a problem-solving approach
	Enquiring mind, undertakes critical analysis of published literature
	Recognises impaired performance (limitations) in self and colleagues and takes appropriate action
	Act appropriately on any concerns about own or colleagues' use of alcohol and/or other drugs.

	Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
	Accepts responsibility for patient care and staff supervision
	Establishes collaborative relations with other health care providers to promote continuity of patient care as appropriate.
<b>11.1 Leads a daily multidisciplinary ward round</b>	
	Roles of different members of the multidisciplinary team and local referral practices
	Triage and management of competing priorities
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Demonstrate initiative in problem solving
	Confirm accuracy of clinical information provided by members of the health care team with particular emphasis on that information which is handed over at admission and at shift changes
	Summarise a case history
	Assemble clinical and laboratory data, logically compare all potential solutions to the patient's problems, prioritise them and establish a clinical management plan
	Establish a management plan based on clinical and laboratory information
	Consider potential interactions when prescribing drugs and therapies
	Listen effectively
	Consider risk-benefit and cost-benefit of alternative drugs and therapies
	Organise multidisciplinary care for groups of patients in the ICU
<b>11.2 Complies with local infection control measures</b>	
	Epidemiology and prevention of infection in the ICU
	Types of organisms – emergence of resistant strains, mode of transfer, opportunistic and nosocomial infections; difference between contamination, colonisation and infection
	Risk of colonisation with potentially pathogenic micro-organisms and the factors associated with patient, staff, equipment and environmental colonisation
	Recognition of patient groups at high risk of developing infectious complications
	Autogenous infection: routes and methods of prevention
	Cross infection: modes of transfer and common agents
	Ventilator associated pneumonia: definition, pathogenesis and prevention
	Requirements for microbiological surveillance and clinical sampling
	Benefits and risks of different prophylactic antibiotic regimens
	Local patterns of bacterial resistance and antibiotic policy
	Infections from contaminated blood / body fluids; strategy
	Local policies and procedures relevant to practice
	Published standards of care at local, national and international level (including consensus statements and care bundles). Has a critical approach to bundles and their component parts.
	Understand the role of Notification of diseases within the UK and identify the principle notifiable diseases for UK and international purposes
	Accept personal responsibility for the prevention of cross infection and self-infection
	Apply methods to prevent autogenous infection (e.g. posture, mouth hygiene)
	Implement prophylactic regimens appropriately
	Prescribe antibiotics safely and appropriately
<b>11.3 Identifies environmental hazards and promotes safety for patients and staff</b>	
	Physical requirements of ICU design
	Staff safety: susceptibility to harmful physical, chemical and infectious hazards in the ICU
	Environmental control of temperature, humidity, air changes and scavenging systems for waste gases and vapours
	Measurement of gas and vapour concentrations, (oxygen, carbon dioxide, nitrous oxide, and volatile anaesthetic agents) - environmental safety
	Hazards associated with ionising radiation and methods to limit these in the ICU
	<i>Electrical safety</i> : conditions which predispose to the occurrence of macro-shock / micro-shock; physical dangers of electrical currents; relevant standards regarding safe use of electricity in patient care; basic methods to reduce electrical hazards
	Equipment requirements and selection: clinical need and priority; accuracy, reliability, safety and practical issues (ease of use, acceptance by staff)
	Local policies and procedures relevant to practice

Published standards of care at local, national and international level (including consensus statements and care bundles)
Identification and critical appraisal of literature; integration of findings into local clinical practice
Epidemiology and prevention of infection in the ICU
Risk of colonisation with potentially pathogenic micro-organisms and the factors associated with patient, staff, equipment and environmental colonisation
Types of organisms – emergence of resistant strains, mode of transfer, opportunistic and nosocomial infections; difference between contamination, colonisation and infection
Cross infection: modes of transfer and common agents
Requirements for microbiological surveillance and clinical sampling
Infections from contaminated blood / body fluids; strategy if contaminated (e.g. needle stick injury)
Benefits and risks of different prophylactic antibiotic regimens
Outline human factors theory and understand its impact on safety
Understand root cause analysis
Understand significant event analysis
Seek expert help to ensure all equipment in the ICU conforms with and is maintained to the relevant safety standard
<b>11.4 Identifies and minimises risk of critical incidents and adverse events, including complications of critical illness</b>
Common sources of error and factors which contribute to critical incidents / adverse events (ICU environment, personnel, equipment, therapy and patient factors)
Pathogenesis, risk factors, prevention, diagnosis and treatment of complications of ICU management including: <ul style="list-style-type: none"> <li>• nosocomial infection</li> <li>• ventilator associated pneumonia (VAP)</li> <li>• ventilator associated lung injury - pulmonary barotrauma/volutrauma</li> <li>• pulmonary oxygen toxicity</li> <li>• thromboembolism (venous, arterial, pulmonary, intracardiac)</li> <li>• stress ulceration</li> <li>• pain</li> <li>• malnutrition; refeeding syndromes</li> <li>• critical illness poly-neuropathy, motor-neuropathy and myopathy</li> </ul>
Modification of treatment or therapy to minimise the risk of complications and appropriate monitoring to allow early detection of complications
Recognition of patient groups at high risk for developing complications
Risk of bleeding: indications, contraindications, monitoring and complications of therapeutic anticoagulants
Epidemiology and prevention of infection in the ICU
Types of organisms - emergence of resistant strains, mode of transfer, opportunistic and nosocomial infections; difference between contamination, colonisation and infection
Autogenous infection: routes and methods of prevention
Local patterns of bacterial resistance and antibiotic policy
Requirements for microbiological surveillance and clinical sampling
Benefits and risks of different prophylactic antibiotic regimens
Staff safety: susceptibility to harmful physical, chemical and infectious hazards in the ICU; psychological
Factors that determine the optimum staff establishment for specialist and junior medical staff, nurses and allied professional and non-clinical ICU staff
Principles of crisis management, conflict resolution, negotiation and debriefing
Equipment requirements and selection: clinical need and priority; accuracy, reliability, safety and practical issues (ease of use, acceptance by staff)
Local policies and procedures relevant to practice
Published standards of care at local, national and international level (including consensus statements and care bundles)
Purpose and methods of clinical audit (e.g. mortality reviews, complication rates, National Audits) and quality improvement
Plan of action / local procedures to be followed when a health care worker is noticed to be in distress, whether or not patients are considered to be at risk

	Identification and critical appraisal of literature; integration of findings into local clinical practice
	Assemble clinical and laboratory data, logically compare all potential solutions to the patient's problems, prioritise them and establish a clinical management plan
	Consider potential interactions when prescribing drugs and therapies
	Record relevant clinical information accurately
	Monitor complications of critical illness
	Accept personal responsibility for the prevention of cross infection and self-infection
	Aware of relevant guidelines and consensus statements and apply these effectively in everyday practice under local conditions
<b>11.5 Organises a case conference</b>	
	Roles of different members of the multidisciplinary team and local referral practices
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Summarise a case history
	Plan long-term multidisciplinary care for patients in the ICU
<b>11.6 Critically appraises and applies guidelines, protocols and care bundles</b>	
	Purpose and process of quality improvement activities such as evidence-based practice, best practice guidelines & benchmarking and change management
	Purpose and methods of clinical audit (e.g. mortality reviews, complication rates) and quality improvement
	Published standards of care at local, national and international level (including consensus statements and care bundles)
	Local policies and procedures relevant to practice
	Treatment algorithms for common medical emergencies
	Recent advances in medical research relevant to intensive care
	Identification and critical appraisal of literature; integration of findings into local clinical practice; critical appraisal of whether this evidence is relevant to this particular patient.
	Principles of appraisal of evidence: levels of evidence; interventions; diagnostic tests; prognosis; integrative literature (meta-analyses, practice guidelines, decision and economic analyses)
	Principles of applied research and epidemiology necessary to evaluate new guidelines / forms of therapy
	Research methods (see basic sciences)
	Statistical concepts (see basic sciences)
	Aware of relevant guidelines and consensus statements and apply these effectively in everyday practice under local conditions
	Implement and evaluate protocols and guidelines
	Recognise the need for clinical audit and quality improvement activities to be non-threatening and non-punitive to individuals
<b>11.7 Describes commonly used scoring systems for assessment of severity of illness, case mix and workload</b>	
	Principles of outcome prediction / prognostic indicators and treatment intensity scales; limitations of scoring systems in predicting individual patient outcome
	Process and outcome measurement
	Principles of general and organ-specific scoring systems and their usefulness in assessing likely outcome of an illness (e.g. Glasgow Coma Scale, APACHE II and III, PRISM, MEWS, organ system failure scores, injury severity scores)
	One general method for measuring severity of illness (severity scoring systems)
	Influence of injury or illness being considered on the validity of a scoring system as a predictor of likely outcome (e.g. Glasgow Coma Score (GCS) in head injury versus drug overdose)
	Principles of case-mix adjustment
<b>11.8 Demonstrates an understanding of the managerial and administrative responsibilities of the ICM specialist</b>	
	Principles of resource management; ethics of resource allocation in the face of competing claims to care
	Concept of risk: benefit ratio and cost effectiveness of therapies
	Principles of national / local health care legislation applicable to ICM practice
	Principles of crisis management, conflict resolution, negotiation and debriefing



Purpose and methods of clinical audit (e.g. mortality reviews, complication rates) and quality improvement
Recent advances in medical research relevant to intensive care
Identification and critical appraisal of literature; integration of findings into local clinical practice
Principles of appraisal of evidence: levels of evidence; interventions; diagnostic tests; prognosis; integrative literature (meta-analyses, practice guidelines, decision and economic analyses)
Local policies and procedures relevant to practice
Published standards of care at local, national and international level (including consensus statements and care bundles)
Understand the legislative framework within which healthcare is provided in the UK – in particular death certification and the role of the Coroner/Procurator Fiscal. child protection legislation; mental health legislation (including powers to detain a patient and giving emergency treatment against a patient's will under common law); advanced directives and living Wills; withdrawing and withholding treatment; decisions regarding resuscitation of patients; surrogate decision making; organ donation and retention; communicable disease notification; medical risk and driving; Data Protection and Freedom of Information Acts; provision of continuing care and community nursing care by a local authorities
Manage resistance to change in the ICU / hospital environment in order to optimise the outcome of a task
Respect, acknowledge and encourage the work of others

Domain 12: Professionalism	
	Methods of effective communication of information (written; verbal etc)
	Confidentiality and data protection - legal and ethical issues
	Outline and follow the guidance given by the GMC on confidentiality
	Purpose and process of quality improvement activities such as evidence-based practice, best practice guidelines and benchmarking and change management
	Impact of occupational and environmental exposures, socio-economic factors, and lifestyle factors on critical illness
	Electronic methods of accessing medical literature
	Aware that how bad news is delivered to a patient can affect them for the rest of their lives in terms of emotions, perception of the condition and their ability to cope. It also irretrievably affects the subsequent relationship with the patient
	Aware that 'breaking' bad news can be extremely stressful for the professional involved
	Understand the legislative framework within which healthcare is provided in the UK and/or devolved administrations, in particular – death certification and the role of the Coroner/Procurator Fiscal; child protection legislation; mental health legislation (including powers to detain a patient and giving emergency treatment against a patient's will under common law); advanced directives and living Wills; withdrawing and withholding treatment; decisions regarding resuscitation of patients; surrogate decision making; organ donation and retention; communicable disease notification; medical risk and driving; Data Protection Act and Freedom of Information Act; provision of continuing care and community nursing care by a local authorities
	Outline the relevance of professional bodies e.g. Royal Colleges, NHSMEE, GMC, Postgraduate Dean, BMA, specialist societies, medical defence societies etc
	principles of crisis management, conflict resolution, negotiation and debriefing
	Acquire, interpret, synthesize, record, and communicate (written and verbal) clinical information
	Professional and reassuring approach - generates confidence and trust in patients and their relatives
	Communicate effectively with relatives who may be anxious, angry, confused, or litigious. In preparing to break bad news: <ul style="list-style-type: none"> <li>• Sets aside sufficient uninterrupted time</li> <li>• Chooses an appropriate private environment and ensures that there will be no unplanned disturbances</li> <li>• Has sufficient information regarding prognosis and treatment</li> <li>• Ensures the individual has appropriate support if desired</li> <li>• Structures the interview</li> <li>• Is honest, factual, realistic and empathic</li> <li>• Aware of relevant guidance documents</li> </ul>
	Collaborate with other team members to achieve common goals
	Lead, delegate and supervise others appropriately according to experience and role
	Participate appropriately in educational activities and teaching medical and non-medical members of the health care team
	Manage inter-personal conflicts which arise between different sectors of the organisation, professionals, patients or relatives
	Maximise safety in everyday practice in part by good quality decision making sustained by critical thinking, reflection and metacognition
	Use electronic retrieval tools (e.g. PubMed) to access information from the medical and scientific literature
	Consults, communicates and collaborates effectively with patients, relatives and the health care team
	Acknowledges the consequences of the language used to impart information
	Recognises that communication is a two-way process
	Sensitive to the reactions and emotional needs of others
	Remains calm in stressful or high-pressure situations and adopts a timely, rational approach
	Desire to minimise patient distress
	Regards each patient as an individual

Establishes trusting relationships with and demonstrates compassionate care of patients and their relatives
Sensitive to patients' expectations and responses; considers their perspective in order to understand their conduct and attitudes
Respects the expressed wishes of competent patients, even when in conflict with the views of the physician
Respects the cultural and religious beliefs of the patient; demonstrate an awareness of their impact on decision making
Recognises and manages circumstances where personal prejudices or biases may affect behaviour, including cultural, financial and academic aspects skill
Promotes respect for patient privacy, dignity and confidentiality
Willingness to communicate with and support families / significant others
Integrity, honesty and respect for the truth underpin relationships with patients, relatives and colleagues
Approachable and accessible when on duty
Well-being of the patient takes precedence over the needs of society or research
Generates enthusiasm amongst others
Fosters effective communication and relationships with medical and nursing staff in other wards / departments
Participates in and promotes continuing education of members of the multi-disciplinary healthcare team.
Contributes effectively to interdisciplinary team activities.
Accepts responsibility for patient care and staff supervision
Recognises impaired performance (limitations) in self and colleagues and takes appropriate action
Act appropriately on any concerns about own or colleagues' use of alcohol and/or other drugs.
Takes responsibility for his/her personal physical and mental health, especially where impairment may affect patient care and professional conduct and seeks appropriate help if required
Recognises personal limitations, seeks and accepts assistance or supervision (knows how, when and who to ask)
Desire to contribute to the development of new knowledge
Enquiring mind, undertakes critical analysis of published literature
Adopts a problem solving approach
Recognises and uses teaching and learning opportunities arising from clinical experiences, including errors
Desire and willingness to share knowledge
Assesses, communicates with, and supports patients and families confronted with critical illness
Recognises personal strengths and limitations as a consultant to other specialists
Seeks to modify the stresses which the intensive care environment places upon patients, their relatives and members of staff
Seeks to recognise those changes in the specialty, medicine or society, which should modify their practice and adapt their skills accordingly.

<p><b>12.1 Communicates effectively with patients and relatives</b></p> <p><b>12.2 Communicates effectively with members of the health care team</b></p> <p><b>12.3 Maintains accurate and legible records / documentation</b></p>
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Consent and assent in the competent and non-competent patient
Principles of the guidance given by the GMC on consent, in particular: <ul style="list-style-type: none"> <li>• Understand that consent is a process that may culminate in, but is not limited to, the completion of a consent form</li> <li>• Understand the particular importance of considering the patient's level of understanding and mental state (and also that of the relatives/carers where relevant) and how this may impair their capacity for informed consent</li> </ul>
Principles of delivering bad news to patients and families
Principles of crisis management, conflict resolution, negotiation and debriefing
Strategies to communicate to the general population critical care issues and their impact on the maintenance and improvement of health care.

	Communicate with patients and relatives - give accurate information and re-iterate to ensure comprehension; clarify ambiguities
	Discuss treatment options with a patient or relatives before ICU admission
	Differentiate competent from incompetent statements by patients
	Listen effectively
	Use non-verbal communication appropriately
	Use available opportunities and resources to assist in the development of personal communication skills
	Communicate effectively with professional colleagues to obtain accurate information and plan care
	Obtain consent/assent for treatment, research, autopsy or organ donation
	Preparation of patient lists with clarification of problems and ongoing care plan
	Communicate changes in priority to others
	Work in a supportive, empathic and non-judgemental manner without collusion
	Be confident and comfortable discussing alcohol and drug use with patients
	<b>12.4 Involves patients (or their surrogates if applicable) in decisions about care and treatment</b>
	<b>12.5 Demonstrates respect of cultural and religious beliefs and an awareness of their impact on decision making</b>
	<b>12.6 Respects privacy, dignity, confidentiality and legal constraints on the use of patient data</b>
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Consent and assent in the competent and non-competent patient
	Ethical and legal issues in decision-making for the incompetent patient
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Principles of delivering bad news to patients and families
	Communicate with patients and relatives - give accurate information and re-iterate to ensure comprehension; clarify ambiguities
	Involve patients in decisions about their care and treatment when appropriate
	Discuss treatment options with a patient or relatives before ICU admission
	Differentiate competent from incompetent statements by patients
	Obtain consent/assent for treatment, research, autopsy or organ donation
	Listen effectively
	<b>12.7 Collaborates and consults; promotes team-working</b>
	<b>12.8 Ensures continuity of care through effective hand-over of clinical information</b>
	<b>12.9 Supports clinical staff outside the ICU to enable the delivery of effective care</b>
	<b>12.10 Appropriately supervises, and delegates to others, the delivery of patient care</b>
	Management of information
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Principles of professional appraisal and constructive feedback
	Act appropriately as a member or leader of the team (according to skills and experience)
	Communicate effectively with professional colleagues to obtain accurate information and plan care
	Consult and take into account the views of referring clinicians; promote their participation in decision making where appropriate
	Liaise with medical and nursing staff in other departments to ensure optimal communication and continuing care after ICU discharge
	Respect, acknowledge and encourage the work of others
	Contribute to professional meetings - understand their rules, structure and etiquette
	Listen effectively
	<b>12.11 Takes responsibility for safe patient care</b>
	<b>12.12 Formulates clinical decisions with respect for ethical and legal principles</b>
	<b>12.13 Seeks learning opportunities and integrates new knowledge into clinical practice</b>
	<b>12.14 Participates in multidisciplinary teaching</b>
	<b>12.15 Participates in quality improvement under supervision</b>
	Basic ethical principles: autonomy, beneficence, non-maleficence, justice
	Ethical and legal issues in decision-making for the incompetent patient
	Management of information
	Principles of crisis management, conflict resolution, negotiation and debriefing
	Principles of professional appraisal and constructive feedback

Principles of adult education and factors that promote learning
Methods of quality improvement and translating findings into sustained change in practice
Use of information technology to optimize patient care and life-long learning
Identification and critical appraisal of literature; integration of findings into local clinical practice
Principles of appraisal of evidence: levels of evidence; interventions; diagnostic tests; prognosis; integrative literature (meta-analyses, practice guidelines, decision and economic analyses)
Principles of applied research and epidemiology necessary to evaluate new guidelines / forms of therapy
Principles of medical research: research questions; protocol design; power analysis, data collection, data analysis and interpretation of results; manuscript preparation and publication rules.
Ethical principles involved in conducting research (including subject protection, consent, confidentiality and competing interests) and national ethical approval processes
Ethical management of relationships with industry
Participate in the processes of clinical audit, quality improvement, peer review and continuing medical education
Use a systematic approach to locate, appraise, and assimilate evidence from scientific studies relevant to a patient's health problem and make an individual assessment of whether this evidence is relevant to this patient.
Demonstrate initiative in problem solving
Listen effectively
Attentive to detail, punctual, reliable, polite and helpful
Take decisions at a level commensurate with experience; accept the consequences of these decisions
Identify clinical and clerical tasks requiring attention or predicted to arise
Recognise the most urgent / important tasks and ensure that they are managed expediently
Organise and manage workload effectively

## Basic sciences

Anatomy	
	<p><b>Respiratory system:</b> 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, innervations The thoracic inlet and 1st rib Interpretation of a chest x-ray</p>
	<p><b>Cardiovascular system:</b> Heart, chambers, conducting system, blood and nerve supply Congenital deviations from normal anatomy Pericardium Great vessels, main peripheral arteries and veins Foetal and materno-foetal circulation</p>
	<p><b>Nervous system:</b> 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 innervations Stellate ganglion Cranial nerves: base of skull: trigeminal ganglion Innervation of the larynx Eye and orbit</p>
	<p><b>Vertebral column:</b> Cervical, thoracic, and lumbar vertebrae Interpretation of cervical spinal imaging in trauma Sacrum, sacral hiatus Ligaments of vertebral column Surface anatomy of vertebral spaces, length of cord in child and adult</p>
	<p><b>Surface anatomy:</b> 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 and emergency pleurocentesis Landmarks for pericardiocentesis</p>
	<p><b>Abdomen:</b> Gross anatomy of intra-abdominal organs Blood supply to abdominal organs and lower body</p>
Physiology & Biochemistry	
	<p><b>General:</b> 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</p>

	Protective mechanisms of the body Genetics & disease processes
	<b>Biochemistry:</b> Acid base balance and buffers Ions e.g. Na <sup>+</sup> , K <sup>+</sup> , Ca <sup>++</sup> , Cl <sup>-</sup> , HCO <sub>3</sub> <sup>-</sup> , Mg <sup>++</sup> , PO <sub>4</sub> <sup>-</sup> Cellular and intermediary metabolism; variations between organs Enzymes
	<b>Body fluids:</b> Capillary dynamics and interstitial fluid Oncotic pressure Osmolarity: osmolality, partition of fluids across membranes Lymphatic system Special fluids: cerebrospinal, pleural, pericardial and peritoneal fluids
	<b>Haematology &amp; Immunology:</b> Red blood cells: haemoglobin and its variants Blood groups Haemostasis and coagulation; pathological variations White blood cells Inflammation and its disorders Immunity and allergy
	<b>Muscle:</b> Action potential generation and its transmission Neuromuscular junction and transmission Muscle types Skeletal muscle contraction Motor unit Muscle wasting Smooth muscle contraction: sphincters
	<b>Renal tract:</b> Blood flow, 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
	<b>Respiration:</b> Gaseous exchange: O <sub>2</sub> and CO <sub>2</sub> 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 and PEEP on lungs and circulation Mechanics of ventilation: ventilation/perfusion abnormalities Control of breathing, acute and chronic ventilatory failure, effect of oxygen therapy Non-respiratory functions of the lungs Cardio-respiratory interactions in health & disease
	<b>Nervous system:</b> Functions of nerve cells: action potentials, conduction, synaptic mechanisms and transmitters 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
	<b>Liver:</b> Functional anatomy and blood supply Metabolic functions Tests of function Effects of alcohol and other drugs on the unborn child, children and families Recommended limits on alcohol intake

	<p><b>Gastrointestinal system:</b> Gastric function; secretions, nausea and vomiting Gut motility, sphincters and reflex control Digestive functions and enzymes Nutrition: calories, nutritional fuels and sources, trace elements, growth factors</p>
	<p><b>Metabolism &amp; Nutrition:</b> Nutrients: carbohydrates, fats, proteins, vitamins, minerals and trace elements 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</p>
	<p><b>Endocrinology:</b> Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors Central neuro-endocrine interactions Adrenocortical hormones Adrenal medulla: adrenaline (epinephrine) and noradrenaline (norepinephrine) Pancreas: insulin, glucagon and exocrine function Thyroid and parathyroid hormones and calcium homeostasis</p>
	<p><b>Pregnancy:</b> Physiological changes associated with a normal pregnancy and delivery Materno-foetal, foetal and neonatal circulation Functions of the placenta: placental transfer Foetus: changes at birth</p>
<p><b>Pharmacology</b></p>	
	<p><b>Applied chemistry:</b> 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</p>
	<p><b>Principles of pharmacology:</b> 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 interactions Effects of metabolites and other degradation products.</p>
	<p><b>Pharmacokinetics &amp; Pharmacodynamics</b> Drug uptake from: gastrointestinal tract, lungs, nasal, transdermal, subcutaneous, IM, IV, epidural and intrathecal routes Bioavailability Factors determining the distribution of drugs: perfusion, molecular size, solubility, protein binding The influence of drug formulation on disposition <b>Distribution of drugs to organs and tissues:</b></p> <ul style="list-style-type: none"> <li>• Body compartments</li> <li>• Influence of specialised membranes: tissue binding and solubility</li> <li>• Materno-foetal distribution</li> <li>• Distribution in CSF and extradural space</li> </ul>



	<p><b>Modes of drug elimination:</b></p> <ul style="list-style-type: none"> <li>• Direct excretion</li> <li>• Metabolism in organs of excretion: phase I &amp; II mechanisms</li> <li>• Renal excretion and urinary pH</li> <li>• Non-organ breakdown of drugs</li> </ul> <p><b>Pharmacokinetic analysis:</b></p> <ul style="list-style-type: none"> <li>• Concept of a pharmacokinetic compartment</li> <li>• Apparent volume of distribution</li> <li>• Orders of kinetics</li> <li>• Clearance concepts applied to whole body and individual organs</li> <li>• Simple 1 and 2 compartmental models: concepts of wash-in and washout curves</li> <li>• Physiological models based on perfusion and partition coefficients</li> <li>• Effect of organ blood flow: Fick principle</li> <li>• Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs</li> </ul> <p>Effects of acute organ failure (liver, kidney) on drug elimination Influence of renal replacement therapies on clearance of commonly used drugs</p> <p>Pharmacodynamics: concentration-effect relationships: hysteresis Pharmacogenetics: familial variation in drug response</p> <p>Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions</p> <p>Addictive potential of alcohol and other drugs, including prescribed and over-the-counter medicines</p>
	<p><b>Systemic Pharmacology:</b></p> <p>Hypnotics, sedatives and intravenous anaesthetic agents</p> <p>Simple analgesics</p> <p>Opioids and other analgesics; Opioid antagonists</p> <p>Non-steroidal anti-inflammatory drugs</p> <p>Neuromuscular blocking agents (depolarising and non-depolarising) and anti-cholinesterases</p> <p>Drugs acting on the autonomic nervous system (including inotropes, vasodilators, vasoconstrictors, antiarrhythmics, diuretics)</p> <p>Drugs acting on the respiratory system (including respiratory stimulants and bronchodilators)</p> <p>Antihypertensives</p> <p>Anticonvulsants</p> <p>Anti-diabetic agents</p> <p>Diuretics</p> <p>Antibiotics</p> <p>Corticosteroids and other hormone preparations</p> <p>Antacids. Drugs influencing gastric secretion and motility</p> <p>Antiemetic agents</p> <p>Local anaesthetic agents</p> <p>Immunosuppressants</p> <p>Principles of therapy based on modulation of inflammatory mediators indications, actions and limitations</p> <p>Plasma volume expanders</p> <p>Antihistamines</p> <p>Antidepressants</p> <p>Anticoagulants</p> <p>Vitamins A-E, folate, B12</p>
<p><b>Physics &amp; Clinical Measurement</b></p>	
	<p><b>Mathematical concepts:</b></p> <p>Relationships and graphs</p> <p>Concepts of exponential functions and logarithms: wash-in and washout</p> <p>Basic measurement concepts: linearity, drift, hysteresis, signal: noise ratio, static and dynamic response</p> <p>SI units: fundamental and derived units</p> <p>Other systems of units where relevant to ICM (e.g. mmHg, bar, atmospheres)</p> <p>Simple mechanics: Mass, Force, Work and Power</p>
	<p><b>Heat:</b></p> <p>Freezing point, melting point, latent heat</p>

	<p>Conduction, convection, radiation Mechanical equivalent of heat: laws of thermodynamics Measurement of temperature and humidity</p>
	<p><b>Gases &amp; Vapours:</b> 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</p>
	<p><b>Electricity &amp; Magnetism:</b> 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</p>
	<p><b>Electrical safety:</b> Principles of cardiac pacemakers and defibrillators Electrical hazards: causes and prevention Electrocution, fires and explosions Diathermy and its safe use Basic principles and safety of lasers Basic principles of ultrasound and the Doppler effect</p>
	<p><b>Pressure &amp; Flow Monitoring:</b> Principles of pressure transducers Resonance and damping, frequency response Measurement and units of pressure Direct and indirect methods of blood pressure measurement; arterial curve analysis Principles of pulmonary artery and wedge pressure measurement Cardiac output: Fick principle, thermodilution</p>
	<p><b>Clinical measurement:</b> Measurement of gas and vapour concentrations, (oxygen, carbon dioxide, nitrous oxide, and volatile anaesthetic agents) using infrared, paramagnetic, fuel cell, oxygen electrode and mass spectrometry methods Measurement of H<sup>+</sup>, pH, pCO<sub>2</sub>, pO<sub>2</sub> Measurement CO<sub>2</sub> production/ oxygen consumption/ respiratory quotient Colligative properties: osmometry Simple tests of pulmonary function e.g. peak flow measurement, spirometry Capnography Pulse oximetry Measurement of neuromuscular blockade Measurement of pain</p>
	<p><b>Data collection:</b> Simple aspects of study design (research question, selection of the method of investigation, population, intervention, outcome measures) Power analysis Defining the outcome measures and the uncertainty of measuring them The basic concept of meta-analysis and evidence-based medicine</p>
	<p><b>Descriptive statistics:</b> Types of data and their representation The normal distribution as an example of parametric distribution Indices of central tendency and variability</p>
	<p><b>Deductive &amp; inferential statistics:</b> 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</p>



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