**INTERCOLLEGIATE BOARD FOR TRAINING IN INTENSIVE CARE MEDICINE (IBTICM)**

# THE CURRICULUM FOR THE CCT IN INTENSIVE CARE MEDICINE

# COMPETENCY-BASED TRAINING AND ASSESSMENT

## PART II

# The Educational Training Record and Syllabus

**NAME:**

**NTN:**

***Terminology and scope of this document:***
The term 'intensive care' in this document is synonymous with 'critical care', Level 3 care, or 'intensive therapy'. 'Intensive care unit (ICU)' is synonymous with critical care unit or 'intensive therapy unit (ITU)'. High dependency, Level 2 care, or step-down care is considered to be an integral part of critical care services, as is outreach management and the assessment of patients elsewhere in the hospital for suitability and need for critical care management.

# CONTENTS

# 1: INTRODUCTION FOR TRAINEES

This Educational Training Record is for the use of both the trainee and the trainer.

The aim of the Educational Training Record (ETR) is to provide a record of your training in Intensive Care Medicine (ICM) and all trainees in ICM must maintain it. It will complement the formal competency-based assessments of trainees by their Intercollegiate Board Tutors, details of which will be maintained in Parts III, IV, V and VI of the training programme documents. **The Intercollegiate Board for Training in Intensive Care Medicine (IBTICM) will not approve training unless both this ETR and the accompanying Assessments of Competency have been properly completed**. This record forms part of your intensive care attachment assessments and the annual RITA. The expanded case summaries required for satisfactory completion of Intermediate (Step 1) training also form an essential part of the Diploma in Intensive Care Medicine (UK) for those who chose to sit this examination.

The trainee should begin to fill in the ETR as soon as he or she has started training in ICM. An educational agreement should be drawn up with the trainer **within the first two weeks of starting a new attachment**. The educational agreement is a collaborative document, in which the trainer and trainee agree specific educational goals that are appropriate, achievable and measurable. The agreement may need to be revised if progress is not satisfactory, the goals cannot be met, or the trainee's objectives change. It is therefore important that the trainee has regular reviews with the trainer and that the ETR is kept up to date. This process will involve both appraisal and assessment.

Educational appraisal is a confidential, planned, two-way review during which the trainee and immediate supervisor discuss how training is going, what has gone well and where improvements could be made. There should be a discussion on what needs to be done for the trainee to meet the educational objectives. It must not be confused with 'Trust Appraisal' which is a form of performance management.

Assessment ensures that the trainee has achieved and maintained a satisfactory standard during a training attachment. The end-of-attachment assessment form describes the trainee's performance during a specific attachment and must be completed in addition to the competency documents.

The end-of-attachment trainee assessment form is the opportunity for the trainee to comment on the quality of training received. It is important that this is done in as open a manner as possible, because otherwise trainers cannot identify areas for improvement. Sub-optimal training may not be a reflection on trainers, but may indicate a need for more resources for teaching. The trainee's evaluation is therefore important and should be completed in a constructive manner.

At Intermediate (Step 1) Level, the plan should include a clear idea of which topics the trainee will cover in his or her expanded case summaries. These should be chosen to demonstrate reasonable breadth of experience within the curriculum. The trainee will be questioned on these if he or she enters the Diploma in ICM examination.

**The trainee is responsible for ensuring that this documentation is complete. It is not the responsibility of the Board Tutor or other trainers to remind trainees to maintain these documents or their competency-based training documents.**

# 2: RECORD OF TRAINING IN ICM

## 2(i): Record of Basic Training, including complementary specialties

Give details of **all** appointments before specialty registrar training (Foundation Years 1 and 2, FTSTA and any other educationally recognised posts)

| | Level | Specialty | Hospital | Start date | End date | Months |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
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Identify below by number those posts which meet the criteria for Basic Training in ICM: normally 3 months of intensive care medicine, 4-8 months of medicine, and 4-8 months of anaesthesia:

| | |
|---|---|
| | Intensive care medicine: normally 3 months (approved by IBTICM for Basic training) |
| | Anaesthesia; 4-8 months: (approved by the RCA for basic training) |
| | Medicine: 4-8 months (approved by RCP for training) |

***Note:*** These periods are indicative. It will normally still be necessary for most trainees to complete *a minimum* of 4 months in the anaesthesia and GIM[1] posts to acquire the necessary competences. However, the necessity to impose rigorously set training times may diminish with the establishment and development of competence assessment as the mechanism for monitoring appropriateness of progression through training.

[1] When considering 'Medicine' as a complementary specialty it is understood that competences may be gained in any attachment to a medical training programme with a component of unselected take. This may be in acute medicine, or an acute medical specialty. Up to one half of this indicative period may be spent in Emergency Medicine.

## 2(ii): Specialty Registrar Intermediate Training

***Details of base Specialty***

| | |
|---|---|
| Specialty: | Deanery: |
| NTN: | Date of appointment to ST post: |
| Regional Advisor: | |

***Details of ICM training***

| | |
|---|---|
| Intermediate (Step 1: Y/N | Advanced (Step 2) Training: Y/N |
| Joint CCT training: Y/N | Date appointment to ICM ST post: |
| Regional Advisor: | Deanery: |

## 2(ii)(a): Record of Intermediate (Step I) ICM Training:

Intermediate (Step 1) Training consists of 4 to 8 (should be consistent i.e. either numerical as in 2 ii B below) months committed exclusively to ICM. It must be taken in either one or two blocks; if taken in two blocks, these must be of approximately equal length.

***Details of Intermediate (Step I) ICM training***

| Hospital | Brief details of clinical experience (No of beds, case mix, rota) | Start date | End date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

**Date of achievement of Intermediate (Step I) competences:**

……

## 2(ii)(b): Intermediate (Step I) ICM Specialty Training: Professional Development Record

Trainees should complete an educational agreement for their own and their trainers' guidance during each attachment. A copy of these agreements should be included in the trainee's portfolio, together with other documents describing educational and professional development such as weekly meetings attended or organised, lectures and other presentations given, audit projects and any other material of educational value to the trainee.

The assessments of competence in Part IV of the CCT documents, and the expanded case summaries, are mandatory components of training. They must be competed satisfactorily before a trainee can progress to Advanced (Step 2) training.

i) Brief description of experience and teaching received in ICM training attachments

ii) Courses and meetings attended:

a) *Internal meetings (including tutorials, journal clubs/grand rounds, interactive teaching sessions etc.)*

| Date/Frequency | Hospital | Educational Activity |
|---|---|---|
| | | |
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*b) External courses and meetings: regional (R), national (N), international (I):*

| Date | R, N, I | Educational Activity |
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iii) Audit:

iv) Presentations:

iv) Research, Reviews and Publications:

## 2(iii): Specialty Registrar Advanced (Step 2) Training

## 2(iii)(a): Record of Advanced (Step 2) ICM Training

Advanced (Step 2) Training consists of 8-18 continuous months of practice, with responsibilities dedicated to ICM and may include specialist ICM experience. Trainees can only progress to Advanced (Step 2) training if they have satisfactorily completed Basic and Intermediate competency assessments and the expanded case summaries. To be eligible for a joint CCT in ICM and a primary specialty, the trainee must have entered the CCT programme by a competitive entry process and be registered with the IBTICM. The Joint CCT will be awarded on satisfactory completion of the entire training programme and competency assessments, and completion of training in the primary specialty.

***Details of Advanced (Step 2) ICM Training***

| Hospital | Brief details of clinical experience (No of beds, case mix, Rota) | Start date | End date |
|---|---|---|---|
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**Date of achievement of Advanced (Step 2) competences:**

……

## 2(iii)(b) Advanced (Step 2) ICM Specialty Training: Professional Development Record

Trainees should complete an educational agreement for their own and their trainers' guidance during each attachment. A copy of these agreements should be included in the trainee's portfolio, together with other documents describing educational and professional development such as weekly meetings attended or organised, lectures and other presentations given, audit projects and any other material of educational value to the trainee.

The competency assessments are a mandatory component. They must be completed satisfactorily before a trainee can have completion of training confirmed, or be recommended for a CCT in ICM.

i) Brief assessment and description of the of the Advanced (Step 2) training you have received

ii) Courses and meetings you have attended:

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

| Date/Frequency | Hospital | Educational Activity |
|---|---|---|
| | | |
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b) *External courses and meetings: regional (R), national (N), international (I):*

| Date | R, N, I | Educational Activity |
|---|---|---|
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iii) Audit:

iv) Management:

v) Research, Reviews and Publications:

# 3: ASSESSMENT

## Assessment/Appraisal with Board Tutor

| Date | Board Tutor |
|---|---|
| | |
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## RITA

| Training Year | Date | RITA form issued |
|---|---|---|
| ST year 1 | | |
| ST year 2 | | |
| ST year 3 | | |
| ST year 4 | | |
| ST year 5 | | |
| ST year 6 | | |
| ST year 7 | | |

***Note:*** RITA Forms must be copied and attached to this record. Any form D or E must accompany the record and a statement made as to the outcome of the Form at review.

## Examinations and qualifications

| Date | Examinations and Higher Degrees |
|---|---|
| | European Diploma in Intensive Care Medicine |
| | UK Diploma in Intensive Care Medicine |
| | MSc |
| | MD |
| | PhD |
| | Other (specify) |

# 4: TEN EXPANDED CASE SUMMARIES

**These case summaries should be completed during Intermediate (Step I) training.**

The Board Tutor must sign to confirm that each case summary is of an acceptable standard. They will be used as topics for discussion during one of the viva voce examinations if you choose to take the UK Diploma in ICM.

A total of ten case summaries are required. An example is included below. They should be discussed with the Board Tutor and should cover a broad range of topics relevant to intensive care practice. They could be selected either to complement areas of particular interest or to help develop areas of weakness identified by the trainee or the trainee's supervisor, or simply to illustrate the learning points from a clinical case. Each expanded case summary should be between 750 and 1500 words long with a minimum of 4 and a maximum of 10 references and should be prepared on separate sheets using the following subheadings as a guide:

1. Clinical problem.
2. Relevant management.
3. Further information and discussion.
4. Learning points from this case.
5. References.

| | **Titles of case summaries** | **Board Tutor's signature** |
|---|---|---|
| 1 | | |
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I certify that these case summaries have been completed to an acceptable standard.

Name and Signature of Educational Supervisor:

## Example of expanded case summary:

### *Title:* Chronic Obstructive Pulmonary Disease: Non-invasive ventilation

**Clinical Problem**

A 60-year-old male was admitted to the Intensive Care Unit (ICU) via the Emergency Department (ED). He was an ex-smoker who suffered from chronic obstructive pulmonary disease (COPD) but was normally well managed on a 'Combivent' inhaler and had had no previous hospital admissions. He normally had a good exercise tolerance. Prior to his admission he had a four day history of a productive cough and increasing breathlessness that had become much worse in the 24 hours prior to admission. In the ED he was tachycardic (140 beats per minute) and tachypnoeic (36 breaths per minute) and was unable to complete sentences; auscultation of the chest revealed widespread wheezing. A portable chest radiograph showed hyperexpanded lungs but no focal pathology. Arterial blood gases breathing 40% oxygen showed an acute type II respiratory failure (pH 7.17, $PaCO_2$ 12 kPa, $PaO_2$ 11.5 kPa) that was refractory to a reduction in the inspired oxygen concentration. Despite initial treatment with corticosteroids, nebulised salbutamol and ipratropium, aminophylline, and antibiotics, he remained very tachypnoeic. The decision was made to admit him to the ICU.

**Relevant management**

On arrival in the ICU the patient was started on bi-level positive airway pressure (BiPAP) non-invasive ventilation (NIV) via a facemask with inspiratory and expiratory pressures of ,20 $cmH_2O$ and 5 $cmH_2O$ respectively, and a rate ~ 30 breaths per minute). He initially found the NIV extremely uncomfortable but after a number of adjustments to the ventilator settings, and a lot of psychological support, his breathing became easier. Over the next few hours he felt subjectively much better as his respiratory rate fell and the $CO_2$ retention and associated acidaemia resolved. Over the next few days the NIV was weaned and he was discharged from the ICU on the sixth day of his admission on 40% oxygen.

**Further information**

Patients with COPD are prone to respiratory failure, often resulting in admission to hospital. Between a fifth and a third of patients admitted with hypercapnic respiratory failure secondary to COPD will die in hospital despite mechanical ventilation [1].

Conventional treatment aims to improve oxygenation and to treat the cause of the exacerbation. Traditionally, patients who do not respond to conventional treatment are considered for tracheal intubation and ventilation; however, this is associated with considerable morbidity and mortality, and it may be difficult to wean the patient [1].

There is now considerable evidence for the role of NIV in the management of acute exacerbations of COPD. In 1990 Brochard *et al.* showed that pressure support ventilation, administered via a facemask, significantly reduced the need for intubation, the duration of mechanical ventilation, and the length of ICU say when compared to historically matched control subjects [2]. Subsequently, a number of randomized controlled trials have confirmed these findings.

Bott *et al.* randomised 60 patients with exacerbations of COPD, who had similar levels of arterial blood gas abnormalities, to receive conventional therapy or conventional therapy plus NIV via a nasal mask [3]. The NIV group had significantly greater improvements in $PaCO_2$ as well as in dyspnoea scores within the first hour. There was a reduction in 30-day mortality (10% *vs.* 30%) in the NIV group; however, this was not statistically significant unless four patients who were randomised to NIV, but did not actually receive it, were excluded from the analysis.

Kramer *et al.* randomised 31 patients with hypercapnic respiratory failure and found that in the subjects with COPD the incidence of tracheal intubation was reduced from 67% in the control group to 9% in the NIV group ($P<0.05$); however, they did not show a difference in hospital length of stay or mortality rates [4]. Physiological derangements (heart rate, respiratory rate, $PaO_2$) improved more quickly in the NIV treated group.

In a large study of 85 patients with hypercapnic respiratory failure due to COPD, Brochard *et al.* randomised patients to receive facemask pressure support ventilation or standard therapy alone; both groups had similar baseline physiology [5]. The study demonstrated a more rapid improvement in vital signs, arterial blood gases, and encephalopathy scores in the group allocated to NIV. They also found that intubation rates (26% *vs.* 74%), hospital lengths of stay (17 days *vs.* 35 days), total complications rate (16% *vs.* 48%), and mortality rates (9% *vs.* 31%) was significantly lower in the NIV group.

In the largest randomised controlled trial to date Plant *et al*. treated 236 patients with either BiPAP NIV or conventional therapy administered by nursing and physiotherapy staff on the general medical wards [6]. Patients were eligible for the study if they fulfilled the following criteria:

1. Admitted as an emergency with an acute exacerbation of COPD (on the basis of the clinical history, physical examination, and chest radiograph)
2. On arrival on to the medical ward they were tachypnoeic (respiratory rate > 23 breaths per minute) and had a pH 7.25-7.35 and a $PaCO_2$>6 kPa

Standard therapy included oxygen to maintain $SpO_2$ 85-90%, nebulised salbutamol (5 mg every 4 hours) and ipratropium bromide (500 µg every 6 hours), corticosteroids (prednisolone 30 mg every day for a minimum of 5 days), and an antibiotic. The NIV group received standard therapy plus BiPAP NIV with a PEEP of 4 cm $H_2O$ and a minimum inspiratory pressure of 10 cm $H_2O$. Oxygen was entrained to maintain $SpO_2$ 85-90%. Patients were encouraged to use NIV as much as possible on day 1, for 16 hours on day 2, and 12 hours on day 3. NIV was routinely discontinued on day 4. The primary endpoint of the study was the 'need of intubation' that was defined by a set of objective criteria: pH <7.2, pH 7.2-7.25 on two occasions 1 hour apart, hypercapnic coma (Glasgow coma score <8 and $PaCO_2$ > 8 kPa), $PaO_2$ <6 kPa despite maximum tolerated $FiO_2$, and cardio respiratory arrest. The two groups had similar characteristics at enrolment. The use of NIV significantly reduced the 'need for intubation' (15% *vs.* 27%) and the in-hospital mortality rate (10% *vs.* 20%) without dramatically increasing the nursing workload. NIV led to a more rapid improvement in pH, respiratory rate, and breathlessness. On subgroup analysis there was a much higher mortality in patients whom had a pH <7.3 on enrolment, whether they received NIV or not; the authors concluded that these patients may benefit from treatment in a higher dependency setting.

The above studies all suggest that NIV is effective therapy in patients with COPD exacerbations, not only bringing symptomatic and physiological improvements but also significantly reducing the need for intubation, mortality rate, and hospital length of stay. These benefits are also associated with a reduced level of overall complications, despite the propensity of NIV to cause nasal bridge ulceration and gastric distension; most complications are related to intubation suggesting that avoidance of intubation is the major benefit of NIV [7].

A systematic Cochrane review and meta-analysis of eight studies on the use of NIV to treat exacerbations of COPD has recently been published [1]. This confirmed the benefits of NIV in reducing mortality (relative risk 0.41, 95% confidence intervals 0.26 to 0.64), the need for intubation (relative risk 0.42, 95% confidence intervals 0.31 to 0.59), and the likelihood of treatment failure (0.51, 95% confidence intervals 0.38 to 0.67). NIV resulted in greater improvements at 1 hour for pH, $CO_2$ and respiratory rate; fewer complications and a shorter hospital stay.

The major mechanism causing acute respiratory failure in COPD is dynamic hyperinflation as a result of increased airways resistance. This results in increased levels of intrinsic PEEP ($PEEP_i$) and thus an increase in the work of breathing, wasted ventilation, carbon dioxide retention, and respiratory muscle fatigue. NIV offsets $PEEP_i$ and provides inspiratory support, and so reduces the work of breathing.

**Learning Points**

I am now aware that there is a place for NIV in the management of respiratory failure secondary to exacerbations of COPD. NIV should be instigated early in the course of respiratory failure and before severe acidosis ensues.

**References**


1. Lightowler JV, Wedzicha JA, Elliott MW, Ram FS (2003) Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. BMJ 326: 185-
2. Brochard L, Isabey D, Piquet J, et al. (1990) Reversal of acute exacerbations of chronic obstructive lung disease by inspiratory assistance with a face mask. N Engl J Med 323: 1523-30
3. Bott J, Carroll MP, Conway JH, et al. Randomised controlled trial of nasal ventilation in acute ventilatory failure due to chronic obstructive airways disease. Lancet 341: 1555-1557
4. Kramer N, Meyer TJ, Meharg J, Cece RD, Hill NS (1995) Randomized, prospective trial of noninvasive positive pressure ventilation in acute respiratory failure. Am J Respir Crit Care Med 151: 1799-1806
5. Brochard L, Mancebo J, Wysocki M, et al. (1995) Noninvasive ventilation for acute exacerbations of chronic obstructive pulmonary disease. N Engl J Med 333: 817-22
6. Plant PK, Owen JL, Elliott MW (2000) Early use of non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease on general respiratory wards: a multicentre randomised controlled trial. Lancet 355: 1931-35
7. Liesching T, Kwok H, Hill NS (2003) Acute applications of noninvasive positive pressure ventilation. Chest 124: 699-713


**Guidance on expanded case summaries, along with a submission example, can be found at www.ibticm.org. More examples are available on the trainee division of the Intensive Care Society website: www.ics.ac.uk**

## 5: EDUCATIONAL AGREEMENT

**Attachment: Hospital & ICU:** ……. **Date:** / /

**Duration of attachment:** ……

**OBJECTIVES**

**Clinical management:**

**Practical procedures:**

**ICU management:**

**Examinations:**

**Audit, research, presentations:**

**Teaching:**

**Assessments to be held at:** ……... months

I agree to complete and keep up to date the appropriate training documents relevant to this ICM attachment and that the result of any assessment of this attachment can be passed on to my next training supervisor

**Date of review of progress in achieving educational goals:**

**Signature Trainee:** ……

**Signature Trainer:** ……

## 6: TRAINEE APPRAISAL

**Attachment: Hospital & ICU:** ……. **Date:** / /

**Duration of attachment:** ……..

**Review of Educational Agreement:**

**Trainee's concerns:**

**Feedback to trainee:**

**Progress with ETR:**

**Educational objectives:**

**Date of next appraisal:**

**Signature Trainee:** ……

**Signature Trainer:** ……

## 7: END OF ATTACHMENT TRAINEE ASSESSMENT

**Attachment: Hospital & ICU:** …….. **Date:** / /

**ST Year:** ……... **Duration of attachment:** ……..

**ETR Review:**

**Achievements during attachment:**

i) Competences:

ii) Audit, research, presentations:

iii) Other:

**Overall assessment of trainee:**

**Areas for development during next attachment:**

**Advice to trainee:**

**Signature Trainee:** ……

**Signature Trainer:** ……

# 8: ASSESSMENT OF TRAINING ATTACHMENT BY TRAINEE

***Instructions to Board Tutors and Trainees:***
Please complete this form at the end of an ICM module or attachment, and keep it in your educational portfolio. You may be asked to show it at your annual RITA, and educational programme visits. Give a copy to your Intercollegiate Board Tutor.

**Grade of Training post:**

**Hospital:** **Attachment:**

Please rate 1-5 (1 very poor, 2 poor, 3 fair, 4 good, 5 excellent)

| | *I received or was offered:* | |
|---|---|---|
| **Induction**<br><br>*During first week* | • Tour of hospital<br>• Introduction to unit staff<br>• Provision of written guidelines / protocols<br>• Educational agreement drawn up<br>• Demonstration & training in use of medical equipment in routine use<br>• Adequate supervision (not working "out of hours")<br>• Mandatory Training in line with Trust requirements<br>• Review of current competences | |
| **Appraisal** | • Regular appraisals (formal and informal) every 2-3 months<br>• Educational agreement adhered to<br>• Appraisals: constructive, helpful, productive | |
| **Teaching** | • Mix of teaching ward rounds, tutorials and lectures<br>• Journal clubs<br>• Morbidity & mortality meetings<br>• Teaching of an acceptable standard and frequency<br>• Adequate training in performing practical procedures | |
| **Clinical exposure** | • Exposure to an adequate numbers of cases<br>• Adequate variety of case mix (if appropriate) | |
| **Supervision** | • Direct consultant supervision during "office" hours<br>• Easy access to consultant at all times | |
| **Audit & Research** | • Explanation of audit/ICNARC and data entry<br>• Opportunity to undertake original audit projects<br>• Opportunity to participate in research | |
| **Library facilities** | • Access to suitable sources of clinical information, whether online or in hard copy | |
| **Information technology** | • Access to a computer<br>• Education and experience in public presentation using audio-visual aids<br>• Access to online research databases | |
| **Hotel services** | • Adequate rest facilities/office<br>• Catering facilities – including "out of hours" | |

***Overall, how would you assess this attachment? (identify one)***

| | | | |
|---|---|---|---|
| Fails on nearly all aspects | Some deficiency | Satisfactory, mainly succeeds | Outstanding |

***Are there any improvements you would recommend?***

## APPENDIX A:

# SYLLABUS

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

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

### DEFINITIONS OF LEVELS OF COMPETENCE

| | Basic (ST1-2) | Intermediate (ST3-5) | Advanced (ST6-7) |
|---|---|---|---|
| **Overview** | Basic level trainees would be expected to understand the general principles of intensive care medicine, to be familiar with the more common conditions and reasons for admission, to be able to identify patients at risk of organ system failures, and to resuscitate and stabilise critically ill patients. They will also know the degree of urgency required in summoning senior help. Intermediate level trainees will have developed these skills further, often in relation to their base speciality (anaesthesia, medicine, surgery, and accident & emergency medicine). Specialist level (CCT) trainees will have acquired broad knowledge of general and specialist aspects of ICM. They will also have skills in management and service organisation, in teaching and audit, and well developed integrative skills. | | |
| **Knowledge** | Presentation and treatment of common life-threatening emergencies | Detailed knowledge of general aspects of critical care | General and specialist aspects of critical care, including management of the service |
| **Skills** | Manages initial assessment and stabilisation of emergencies safely. Provides continuing care under supervision. | Stabilisation, assessment, routine management and investigation of critically ill patients on a daily basis. | Defines and supervises long-term collaborative management plans for larger numbers of patients. Leads whole ICU team effectively. Teaches and supervises junior colleagues. Integrates information. |
| **Attitudes** | Recognises limitations, refers and communicates promptly and effectively. | Proactive, able to co-ordinate and supervise care delivered by junior trainees. Recognises limits of expertise and summons help appropriately | Ensures that critical care service functions effectively within wider environment. Supports service development and research. Plans personal professional development |

## *Domains in ICM:*

### 1. RESUSCITATION AND INITIAL STABILISATION

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

## 2. CLINICAL ASSESSMENT

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

## 3. INVESTIGATION, DATA INTERPRETATION AND DIAGNOSIS

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

## 4. ORGAN SYSTEM SUPPORT AND RELATED PRACTICAL PROCEDURES

| Competency topic and level (**B** = basic, **I** = intermediate, **A** = advanced/CCT) | **B** | **I** | **A** |
|---|---|---|---|
| **Overview:** Intensive care started with the co-ordinated provision of ventilatory support to polio victims. Multiple organ failure and multiple organ system support are now a routine part of clinical practice. Organ system support is not just equipment: it also includes drugs and the co-ordinated provision of multidisciplinary care. Basic level trainees must be able to provide emergency resuscitation, and know the principles of management of commonly used modalities of organ system support. No practitioner of whatever grade should undertake an elective practical procedure without due consideration for patient safety. | | | |

| | | | |
|---|---|---|---|
| **Knowledge**<br><br>*<u>Respiratory system</u>*<br>Indications for and methods of tracheal intubation<br>Appropriate use of drugs to facilitate airway control<br>Tube types (oral, nasal, tracheostomy etc), diameter and length<br>Management of difficult intubation and failed intubation<br>Methods of confirming correct placement of the endotracheal tube<br>Insertion and use of oral airways, face masks and laryngeal mask airway<br>Indications and contraindications to tracheostomy and minitracheostomy<br>Management of and complications associated with tracheostomy tubes<br>Causes of regurgitation and vomiting; prevention and management of pulmonary aspiration<br>Cricoid pressure: indications and safe provision<br>Airway management in special circumstances, (head injury, full stomach, upper airway obstruction, shock, cervical spine injury)<br>Indications for and methods of mechanical ventilation<br>Ventilatory modes: CMV, IRV, PRVC, SIMV, PS, CPAP, BiPAP, Non-invasive ventilation<br>Principles of extra-corporeal membrane oxygenation (ECMO)<br>Detection and management of complications of mechanical ventilation<br>Detection and management of pneumothorax (simple and tension)<br>Insertion and safe management of chest drains<br>Indications and methods of bronchoscopy via an endotracheal tube<br>Indications and methods of bronchoscopy in a conscious non-intubated patient<br>Principles of weaning from mechanical ventilation<br>*<u>Cardiovascular system</u>*<br>Cardiopulmonary resuscitation to ALS provider level<br>Peripheral and central venous cannulation<br>Arterial catheterisation<br>Pulmonary arterial catheterisation, oesophageal Doppler, transoesophageal echo<br>Principles of transvenous cardiac pacing<br>Use of inotropic, chronotropic, vasodilator and vasoconstrictor drugs<br>Use of intravenous fluids: crystalloids, colloids, blood and blood products<br>Principles of intra-aortic counterpulsation balloon pump<br>*<u>Renal system</u>*<br>Safe urinary catheterisation<br>Methods of preventing renal failure<br>Investigation of impaired renal function<br>Knowledge of nephrotoxic drugs<br>Adjustment of drug doses in renal impairment/failure<br>Renal replacement therapies<br>*<u>Gastrointestinal system and nutrition</u>*<br>Principles of adequate nutrition in the critically ill patient, including vitamins, trace elements, immunonutrition<br>Assessment of nutritional status (e.g.: skin-fold thickness, muscle wasting)<br>Selection of enteral or parenteral routes for nutrition<br>Nasogastric cannulation<br>Nasojejunal and percutaneous feeding tube insertion<br>Sengstaken tube insertion<br>Principles of support for the failing liver<br>Prevention of stress ulceration<br>Techniques for preventing microbial translocation<br>*<u>Nervous system</u>*<br>Principles of management of closed head injury<br>Principles of management of raised intracranial pressure<br>Principles of management of vasospasm<br>Indications for and use of information from intracranial pressure monitoring devices<br><br>*<u>Musculoskeletal system</u>*<br>Prevention of pressure sores<br>Principles of management of fluid losses following burns<br>Short-term complications of fractures<br>Consequences of muscle wasting<br>*<u>Sepsis and infection</u>*<br>Requirements for microbiological surveillance and clinical sampling<br>Relation between lab results and patient's condition<br>Appropriate use of antibiotics<br>Proper handling of invasive medical devices | | | |
| **Skills** | | | |
| Maintenance of a clear airway using bag and mask | | | |
| Orotracheal intubation | | | |
| Nasotracheal intubation | | | |
| Percutaneous tracheostomy | | | |
| Minitracheostomy or needle cricothyrotomy | | | |
| Changing an orotracheal tube | | | |

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

## 5. MONITORING AND CLINICAL MEASUREMENT

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

## 6. SAFE USE OF EQUIPMENT

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

## 7. SPECIFIC CIRCUMSTANCES

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

### 7(a) GENERAL MEDICAL CONDITIONS

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

## 7(b) PERIOPERATIVE CARE

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

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

## 7(c) TRAUMA AND BURNS

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

## 7(d). PAEDIATRIC CARE

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

## 7(e). OBSTETRIC CARE

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

## 7(f). TRANSPORT CARE

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

## 7(g). SEPSIS AND INFECTION CONTROL

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

## 7(h). COMFORT CARE

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

## 8. PRE- AND POST-ICU CARE

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

## 9. END-OF-LIFE CARE

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

## 10. PROFESSIONALISM

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

## 11. SCIENCES

**Overview:** Only knowledge competencies are documented in this section.

## 11(a) Anatomy

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

*Cardiovascular system*
Heart, chambers, conducting system, blood and nerve supply
Pericardium
Great vessels, main peripheral arteries and veins
Fetal and materno-fetal circulation

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

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

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

## 11(b) Physiology and biochemistry

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

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

### *Body fluids and their functions and constituents*
Capillary dynamics and interstitial fluid
Osmolarity: osmolality, partition of fluids across membranes
Lymphatic system
Special fluids especially cerebrospinal fluid: also pleural, pericardial and peritoneal fluids

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

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

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

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

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

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

### *Liver*
Functional anatomy and blood supply
Metabolic functions
Tests of function

### *Gastrointestinal*
Gastric function; secretions, nausea and vomiting

Gut motility, sphincters and reflex control
Digestive functions
Nutrition: calories, nutritional fuels and sources, trace elements, growth factors

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

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

### *Pregnancy*
Physiological changes associated with normal pregnancy
Materno-fetal, fetal and neonatal circulation
Functions of the placenta: placental transfer
Fetus: changes at birth

## 11(c) Pharmacology

## General Pharmacology

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

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

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

Pharmacokinetic analysis:
- Concept of a pharmacokinetic compartment
- Apparent volume of distribution
- Clearance
- Clearance concepts applied to whole body and individual organs
- Simple 1 and 2 compartmental models: concepts of wash-in and washout curves

Physiological models based on perfusion and partition coefficients
Effect of organ blood flow: Fick principle
Pharmacokinetic variation: influence of body size, sex, age, disease, pregnancy, anaesthesia, trauma, surgery, smoking, alcohol and other drugs
Effects of acute organ failure (liver, kidney) on drug elimination
Influence of renal replacement therapies on clearance of commonly used drugs
Pharmacodynamics: concentration-effect relationships: hysteresis
Pharmacogenetics: familial variation in drug response
Adverse reactions to drugs: hypersensitivity, allergy, anaphylaxis, anaphylactoid reactions

### Systematic Pharmacology

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

## 11(d) Physics and clinical measurement

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

Simple mechanics: mass, force, work and power

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

Colligative properties: osmometry

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

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

Principles of cardiac pacemakers and defibrillators
Electrical hazards: causes and prevention
Electrocution, fires and explosions

Diathermy and its safe use

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

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

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

## 11(e) Statistical methods

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

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

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

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

## APPENDIX B:

# LOGBOOK

The logbook does not form part of the competency based assessment and is not required at the RITA. The aim is to give guidance to trainees as to those procedures that they feel confident to perform **and** to identify any gaps in their experience that need to be addressed in future training. The list of procedures is not exhaustive and is not intended to be a list of the minimum procedures in which a practitioner in intensive care should be competent.

The procedures have not been recorded as successful or unsuccessful. The trainee should decide whether they gained sufficient experience from doing the procedure to record it. You may complete a separate form for each ICM attachment.

S=supervised, U=unsupervised

| Procedure | S | U |
|---|---|---|
| Insertion of central venous cannula: internal jugular | | |
| Insertion of central venous cannula: subclavian | | |
| Insertion of central venous cannula: femoral | | |
| Ultrasound guided central venous cannulation | | |
| Insertion of arterial cannula | | |
| Insertion of pulmonary artery catheter | | |
| Initiation of minimally invasive cardiac output monitoring | | |
| Transthoracic echocardiography | | |
| Transoesophageal echocardiography | | |
| Insertion of transvenous pacing wire | | |
| Orotracheal intubation | | |
| Fibreoptic intubation | | |
| Fibreoptic bronchoscopy and BAL | | |
| Percutaneous dilatational tracheostomy | | |
| Minitracheostomy or needle cricothyrotomy | | |
| Insertion of chest drain | | |
| Diagnostic chest ultrasound | | |
| Insertion of renal replacement therapy cannula | | |
| Insertion of Sengstaken Blakemore tube or similar | | |
| Abdominal paracentesis | | |
| Insertion of intracranial pressure monitoring device | | |
| Insertion of jugular bulb catheter | | |
| Lumbar puncture | | |
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