



**Science, skills and safety:**  
a framework for medical student education  
in anaesthesia, intensive care, pain and  
perioperative medicine

November 2017

## **Science, skills and safety:** a framework for medical student education in anaesthesia, intensive care, pain and perioperative medicine

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The Royal College of Anaesthetists, in partnership with the Faculties of Intensive Care Medicine and Pain Medicine are fully committed to supporting the education of medical students throughout the UK. To underpin our commitment this framework document has been developed to provide guidance and support for those involved in the development of educational programmes in Medical Schools.

This document outlines how clinical attachments in anaesthesia, intensive care, pain and perioperative medicine can support medical students in developing the knowledge and skills required to successfully enter the Foundation Programme. It also provides examples of how specialists in these areas can support other aspects of learning such as basic medical sciences and the development of essential professional skills such as communication and team working.

Anaesthesia is the largest single secondary care specialty with around two thirds of all hospital patients interacting with an anaesthetist during the course of their in-patient care. The diverse nature of patient care experienced within the fields of anaesthesia, intensive care medicine, pain medicine and the rapidly evolving area of perioperative medicine provides excellent learning opportunities for medical students which are applicable in whatever career path they ultimately decide to follow.

In developing this framework the College has worked with educators from medical schools throughout the UK. We look forward to supporting all UK medical schools with the common goal of delivering high-quality education to tomorrow's doctors.



**Dr Liam Brennan**

President, Royal College of Anaesthetists

 @RCoANews



Undergraduate education acts as the foundation stone for doctors in the NHS. The vast array of learning and exposure that Medical Schools afford, sets healthcare professionals on a journey of education that never truly ends. The significant benefits that this document brings, clearly outlining how students can be supported in their learning across anaesthesia, intensive care, pain and perioperative medicine, cannot be understated. This work, begun by our colleagues at the Royal College of Anaesthetists, is essential and shows the commitment the College, our Faculty and the Faculty of Pain Medicine has to tomorrow's doctors and the important role that we all believe undergraduate training has in improving quality.

Intensive care medicine doctors, nurses and allied health professionals manage the sickest patients in the hospital and their care requires clinicians to have a high quality education across a broad range of areas, from airway to diagnostic skills. Intensive care has a place at the heart of the acute hospital, working with colleagues across anaesthesia, perioperative medicine, medical colleagues on the wards, maternity, rehabilitation, surgery, palliative care and beyond. Education in intensive care medicine therefore benefits clinicians who will practice in all those other specialties, improving the important journey of patients through hospitals and enhancing their overall care.

We all stand to benefit from the delivery of high quality undergraduate education. I echo Liam's aim to support all UK medical schools in delivering this common goal.



**Dr Carl Waldmann**

Dean, Faculty of Intensive Care Medicine

 @FICMNews



# Section 1

## Introduction and framework development

### Introduction

This document sets out a framework for medical student training in anaesthesia, perioperative medicine, pain medicine and intensive care medicine. For brevity the term 'anaesthesia' has been used to include the clinical domains of perioperative medicine and pain medicine. This framework is designed to serve as a resource for those involved in the planning and delivery of both preclinical and clinical medical student education.

The framework begins with an outline of the benefits that education in anaesthesia and intensive care medicine bring to the educational experience of medical students. It then defines eight learning domains and gives 'real life' examples of how each of these domains can be incorporated into educational programmes. The appendices provide specific examples of content for educational programmes and the clinical and professional skills that may be developed during attachments. Individual outcomes from the General Medical Council's *Outcomes for Graduates*<sup>1</sup> are mapped to each of the learning domains and there is also a list of references and useful resources.

This document provides a definitive outline of the expected areas of learning in anaesthesia and intensive care medicine as well as guidance on how anaesthetists and intensive care physicians can contribute to domains outside these clinical themes (such as preclinical physiology and pharmacology), and how to support learning. Medical school curricula are diverse and the benefits of this are well recognised. In keeping with this institutional autonomy the framework provides a resource that may be used by all medical schools whilst supporting a flexible approach to the organisation and delivery of medical student education.

The areas of knowledge and skill that are set out in this document have been designed to support the learning of all students in order to prepare them for Foundation Training posts. Almost every aspect of the learning set out within the framework is transferable to other areas of care and is of relevance to all those who are entering the medical profession.<sup>2,3</sup> The aim of the framework is to provide support and guidance for medical schools in the development of competent, well-rounded doctors who are able to provide safe, patient-centred care in all areas of medical practice.

### Framework development

This document reflects a long and open process of development. The idea for enhancing medical student education in anaesthesia and intensive care medicine arose from the Royal College of Anaesthetists' (RCoA) Perioperative Medicine programme. A short-life working party was set up in 2014 to explore the options. A survey was conducted in 2016 of UK medical schools to establish current activity,<sup>4</sup> and a draft framework for possible curriculum content was produced; this formed the basis for a workshop day in October 2016 where representatives of most of the schools were present. This face-to-face event allowed us to gauge colleagues' opinion, collect examples of current practice and identify barriers to involvement in the organisation and execution of educational programmes.

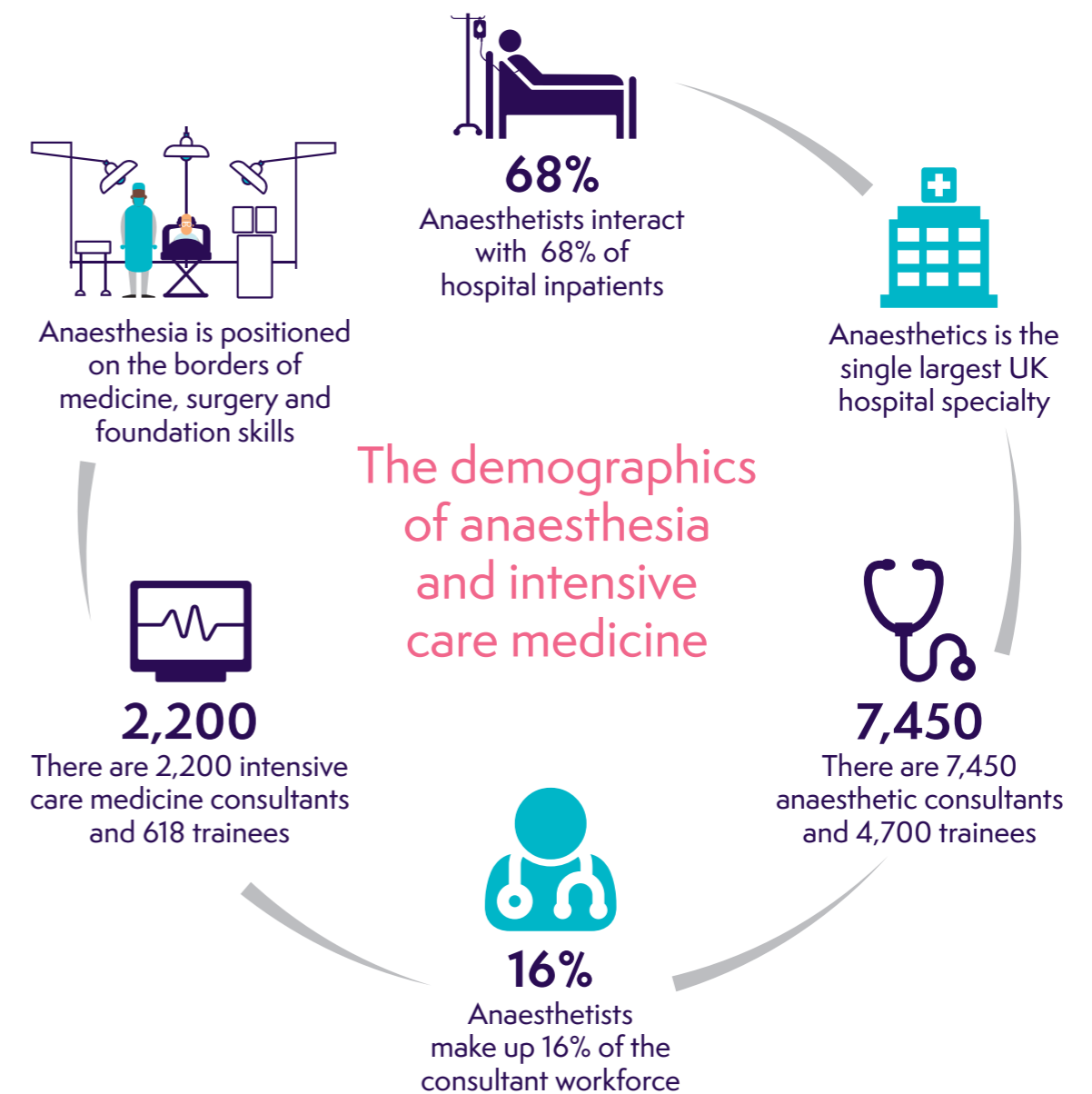
The feedback obtained from trainers who attended this event suggested that the College should produce a document which linked to the General Medical Council's *Outcomes for Graduates* but which was not too prescriptive in terms of content or approach. They also took the view that the College could usefully act as a focal point to help bring interested people together to share resources and ideas. With this in mind a network of trainers involved in medical student education has been established with the aim of providing ongoing support for these educators.

# Section 2

## Science, skills and safety: benefits to medical student education

### Rationale

Anaesthesia and intensive care medicine have much to offer and can play a unique and valuable role in medical student education. Positioned at the intersection of medicine and surgery and dealing with acutely unwell patients throughout the hospital, routine work draws on a wide range of academic and clinical disciplines.



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Anaesthetists and intensivists can equip new graduates to meet the challenges of the Foundation years.<sup>3</sup> The areas are diverse; from teaching physiology and pharmacology, through to collaborative decision-making about end-of-life care on the intensive care unit, to expert management of the airway, the circulation and pain, to demonstrating how technical skill and expert clinical judgement combine to create safe, high-quality perioperative care.

Some of these subjects could be taught by any doctor, in any setting and here anaesthetics and intensive care medicine can offer a useful complementary perspective. However, many areas of knowledge and skill are exemplified by anaesthesia and intensive care practice. One particularly worthy of mention is the specialty's long-standing preoccupation with patient safety.<sup>5</sup> Box A sets out the key capabilities of an expert working in anaesthesia or intensive care.

### Box A

#### The key capabilities of the doctor working in anaesthesia and intensive care medicine

- Manipulation of consciousness (sedation, anaesthesia and psychological techniques, e.g. anxiety management).
- Airway management.
- Circulation management.
- Pain management.
- Understanding and communication of risk and safety and discussion and decision-making relating to the appropriateness of interventions.
- Operating theatre/perioperative management and leadership.
- Specific and generic procedural skills.
- Discussions around end-of-life care.
- Recognition and care of the deteriorating patient.

There is a broader debate in undergraduate medical education about how best to prepare students to be the doctors of the future.<sup>6</sup> It is the College's and Faculties' view that medical schools are much more than simply the 'training arm' of the National Health Service; the all-round benefits of a university education and the principles of scientific enquiry play their part in ensuring that graduates are not just highly-skilled technicians, but also thoughtful, compassionate professionals.

In the past, some curriculum designs have tended to focus on facts, the 'explicit' knowledge. This is of course essential as a basis for practice, but it is not in itself sufficient. Professional practice also requires the 'tacit', informal knowledge gained from observation of others, practice and experience.<sup>7</sup> Finally, knowledge is only complete with scientific enquiry and a moral and ethical dimension.<sup>8</sup>

Anaesthetists and intensive care physicians throughout the country are successfully engaged with training students in practical procedures. But part of the role of a medical educator must be to link practical skills to patient care as a whole. Clearly, then, setting out learning objectives for factual knowledge is important, but a carefully structured session in the operating theatre, the preoperative assessment clinic, or the intensive care unit, can help students understand the totality of professional work in anaesthesia and intensive care.

## Perioperative medicine

Perioperative medicine can be defined as the holistic care of patients from the time of consideration of surgery up to the point of full recovery.<sup>9</sup> It is inherently patient-centred and multi-professional in its approach to care and links the medical and surgical specialties. There are many diverse areas of perioperative medicine developing in the UK such as preoperative assessment and anaemia clinics, investigative techniques such as Cardiopulmonary Exercise Testing (CPET) and enhanced recovery pathways. Interaction with patients is a core component utilising the concept of 'shared decision-making' with patients regarding treatment options.

This is an important and rapidly evolving area of care, especially for patients who are at high risk of developing complications. The benefits of developing effective, evidence-based perioperative care are considerable both for patients and also in reducing the huge cost associated with complications.

Introducing students to the concepts of perioperative medicine early in their training will help them to develop the knowledge and skills to work effectively in the diverse range of clinical specialties which contribute to perioperative care.<sup>10</sup> Much of this work is being led by anaesthetists in partnership with other specialties and involvement in this area of patient care will form an important part of the professional role of most doctors working in the NHS in both primary and secondary care.

## Pain medicine

Pain is the most common reason worldwide for seeking medical attention, and is usually considered as a symptom to guide diagnosis and treatment. Pain medicine focuses on the amelioration of the suffering of pain, whether it is acute/short term in nature and likely to resolve, or more chronic/long term which often proves more difficult to improve and may become a lifelong condition.

In the wider context, the biopsychosocial model takes account of the effects of a complex pain problem on the individual and the effect on their wider function, within the home, family, social and employment circumstances which can enhance and perpetuate suffering.

The core principles are currently provided to many medical students through the Essential Pain Management (EPM) UK programme.<sup>11</sup> This is a focused course, emphasising the importance of considering the pain as an issue that requires recognition, assessment and treatment (the 'RAT' model) in and of itself, while, in parallel, any underlying conditions may also be investigated and treated. This is a fundamental skill in medical practice, and an understanding of the concepts of pain management is essential for all medical students undertaking training.

## Outcomes for Graduates

As part of the framework development process, the GMC document *Outcomes for Graduates* was reviewed to explore how the outcomes might relate to the work of anaesthetists and perioperative physicians. There are 106 outcomes in all, grouped in three sections: 'The doctor as scientist', which sets out the basic science knowledge expected of new doctors; 'The doctor as a practitioner', which deals with the clinical knowledge required; and 'The doctor as a professional', which lists the attitudes and knowledge needed for practice. It also lists 32 practical procedures which new graduates should be able to perform.

The outcomes are not specialty-specific. Nevertheless, it was judged that anaesthetists and intensivists could meaningfully contribute to 63 of them. These 63 outcomes were used to devise eight domains of practice which enabled the aims of *Outcomes for Graduates* to be combined with the scope of clinical practice in anaesthesia and intensive care medicine (Box B).

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### Box B

#### Domains of practice in anaesthesia and intensive care medicine

- 1 Recognition and management of the acutely ill patient.
- 2 Applying basic sciences to clinical practice.
- 3 Supporting decision-making for optimal patient care, including end-of-life care.
- 4 Problem solving in clinical care.
- 5 Communication, collaboration and negotiation.
- 6 Practical pharmacology.
- 7 Safe and effective practical procedures.
- 8 Understanding fallibility, managing risk.

Each domain is expanded in Section 3 with reference to one or more of the GMC's domains, and illustrated with one or more examples of current practice from UK medical schools. Some of the examples relate to classroom teaching, some to simulation and some to e-learning resources. However, many arise from the clinical workplace which is, in our view, the ideal environment to demonstrate the linkage between clinical science and professional practice.

# Section 3

## Illustrative examples of domains and vignettes

The bullet points represent key *Outcomes for Graduates* relevant to each domain. The case studies outlined below represent examples of current activity within each domain.

### Domain 1

#### Recognition and management of the acutely ill patient

- Assess and recognise the severity of a clinical presentation and a need for immediate emergency care.
- Diagnose and manage acute medical emergencies.

#### Case study – Newcastle

Students at the Wear Base Unit of Newcastle University Medical School take advantage of several learning opportunities available to them in intensive care. Medical students have several placements throughout their final years. In their first visit they discuss the work of an ICU, how and why patients are referred for expert critical care assessment and intervention, and what can and cannot be accomplished by an admission. The intensive care doctors run a simulation workshop on 'the deteriorating patient'. Their next visit is part of a larger module on infection control. During this block they shadow an intensive care nurse to learn why infection control is important, as well as what should be done every day to prevent it. Numerous students have chosen to participate in optional modules in intensive care medicine and the inter-professional nature of the specialty. The importance of the management of acutely ill patients is emphasised by assessment of this topic in the students' final exams.

#### Case study – Dundee

Dundee Medical School teaches the recognition and management of the acutely ill patient from many different perspectives. Inventively, by utilising different contexts, including the emergency department, operating theatres, the intensive care department and even GP practices and prehospital paramedic assessments, they allow insight into how different specialties manage their acutely ill patients. In addition, they use a formative OSCE assessment in 'high fidelity' simulation to drive learning. Each student receives individual comments on their assessment, with a video of their 'performance' to take away and review in their own time. To reinforce learning out of the hospital, the medical school has developed an Acute Care Guide app. This contains local and national protocols for managing various acute emergencies and many other documents used by both junior doctors and medical students.

“A programme of engaging tutorials during the acute care block simplified the care of an acutely unwell patient in a variety of settings... The OSCE in particular put into perspective the stresses and realities of using an ABCDE approach in a practical setting”

Teaching of acute medicine in a safe and familiar learning environment

Individualised feedback and modern accessible guidelines

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## Domain 2 Applying basic sciences to clinical practice

- Explain normal human structure and functions.
- Make accurate observations of clinical phenomena and appropriate critical analysis of clinical data.

### Case study – Warwick

During the first year of the undergraduate course at Warwick, anaesthetists are at the forefront of the delivery of basic science teaching. The sciences are taught both formally and in an 'ad-hoc' way by clinicians in tutorials and in the hospital setting. Later during the year, clinical anaesthetists select specific patients to further examine and explore how their physiology affects their clinical picture, and why pharmacological interventions are used. This allows students to apply their prior scientific understanding to real life situations. In the following years tutorials and simulator sessions are used to explore how to treat common and basic clinical problems such as acid-base disturbances, electrolyte abnormalities, oxygen desaturation, hypertension, hypotension and cardiac arrhythmias.

Continuity of approach to basic sciences: from theoretical understanding to complex patients

## Domain 3 Supporting decision-making for optimal patient care, including end-of-life care

- Formulate a plan for treatment, management and discharge, according to established principles and best evidence, in partnership with the patient, their carers, and other health professionals as appropriate. Respond to patients' concerns and preferences, obtain informed consent, and respect the rights of patients to reach decisions with their doctor about their treatment and care and to refuse or limit treatment.

### Case study – Lancaster

Lancaster Medical School has driven the integration of medicine, surgery and acute care to enable a patient-orientated approach to care. Students see the full patient perioperative pathway from referral to rehabilitation. For example, the students spend a session with preoperative assessment nurses seeing straightforward patients, and a session in the anaesthetist-led assessment clinic to see more complex issues. The focus during both encounters is on formulating a plan, together with patients and their carers, for anaesthetic technique and perioperative care, tailored to the patient's wishes, needs and co-morbidities.

Witnessed shared decision making at the heart of patient care. Able to witness the benefits of perioperative medicine

## Domain 4 Problem solving in clinical care

- Make clinical judgements and decisions, based on the available evidence, in conjunction with colleagues and as appropriate for the graduate's level of training and experience. This may include situations of uncertainty.

### Case study – Brighton

Brighton Medical School lays the foundations for doctors to act as problem solvers early in their students' clinical experience. During a scenario-based course, students are expected to demonstrate how they would treat a variety of common clinical situations in perioperative and intensive care settings. They are taught both the physiological and pharmacological reasons for treatments and how to recognise, and seek help with, sick patients. Each student is given the opportunity to explain how, and justify why, they acted and thus explore the complexity and variety of methods for clinical problem solving.

Teaching students to justify decision-making

## Domain 5 Communication, collaboration and negotiation

- Communicate effectively in various roles, for example, as patient advocate, teacher, manager or improvement leader.
- Contribute to the care of patients and their families at the end of life, including management of symptoms, practical issues of law and certification, and effective communication and team working.

### Case study – Plymouth

Plymouth has a novel approach to teaching airway management that demonstrates the importance of teamwork and collaboration. Following on from pre-reading, e-learning, face-to-face teaching from an anaesthetic consultant and a session at the ENT clinic, students are brought into ENT theatre. Here, students see the full spectrum of airway problems from the anaesthetic and the surgical perspective, are taught and invited to practice maintaining the patient's airway, discuss how best to manage the airway during the surgery, and then scrub for the operation. This puts theory into practice, and more importantly, highlights the different views of the surgeon and anaesthetist and how these marry together to ensure the best possible patient outcome.

Witness the collaboration between specialties

“It was very helpful to be involved rather than just observe but also at a level that I was comfortable with”



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## Domain 6 Practical pharmacology

- Calculate appropriate drug doses and record the outcome accurately.

### Case study – Edinburgh

One of the major benefits of medical students being engaged in perioperative medicine is for them to see the direct effect of pharmacological manipulation on physiology. This is a major focus of students' placements in theatres and intensive care in the Edinburgh course. This gives students a chance to become truly involved by being allowed to draw up drugs and prepare infusions under close supervision. Clinicians within the work environment also engage students by questioning before, during and after specific drugs are given, exploring the proposed benefits, risks and outcomes. Where results are not as expected, the student is encouraged to research why. This heightens the awareness of the complexity of pharmacology in the critically ill.

### Case study – Bristol

Bristol is one of many medical schools to have incorporated the Essential Pain Management (EPM) course into their curriculum, to allow their students to benefit from a standardised method of teaching both acute and chronic pain management. The half-day course consists of brief lectures to consolidate and systematise existing knowledge, with case discussions to apply the knowledge to a range of clinical scenarios. Bristol has chosen to minimise the didactic element and focus on small group discussions around clinical cases, as this had previously received excellent feedback. They chose to adapt the patient scenarios to reflect the experience of those attending the course. The course materials are freely available on the Faculty of Pain Medicine's website ([www.fpm.ac.uk](http://www.fpm.ac.uk)) and include both student and instructor manuals, slide sets and evaluation forms.

“Group sessions were great. Learnt about medication and how to manage pain using the case studies”

Practical understanding of drug management

Standardised, international format for teaching pain management, enhancing quality of teaching in this area

## Domain 7 Safe and effective practical procedures

See Appendix 2.

### Case study – Belfast

Belfast epitomises modern teaching of effective practical procedures by having a graduated exposure to clinical skills. Students start in the skills laboratory with the clinical skills team, learning the best practice of skills on manikins. Their first opportunity to use their newly acquired skills *in vivo* is under direct consultant supervision in the anaesthetic room, where the finer points of practice can be understood. Finally, students are supervised by a cohort of junior anaesthetic doctors to allow them to master their skills without compromising the patient experience. Utilising junior anaesthetic doctors is a major benefit to the students' training, as they are closer in age and experience to the students. It also allows the doctors to develop their own teaching skills.

“Fantastic. We felt like a part of the team, had plenty of opportunities to do clinical skills... I felt like I had more control over my learning, and so I got much more out of this placement. I learnt lots, saw lots and loved every minute of it. Thank you”

## Domain 8 Understanding fallibility, managing risk

- Place patients' needs and safety at the centre of the care process.
- Manage time and prioritise tasks, and work autonomously when necessary and appropriate.
- Deal effectively with uncertainty and change.

### Case study – University College London (UCL)

The medical school at UCL uses the World Health Organization (WHO) surgical safety checklist as the cornerstone of its 'Safety, Risk and Recovery' tutorial. The students are given the background to why errors are made and taught human factors in an online format. The face-to-face tutorial with an anaesthetist revolves around a wrong-site surgery scenario, exploring the role of the WHO surgical checklist in preventing harm, and how students might behave if faced with the situation. In their *Procedures* booklet, they must watch the WHO checklist in action and are then supported in leading 'the WHO' for a patient's journey, from anaesthetic room to recovery. Reflecting on this real-life experience, which builds on their knowledge from their online learning, students have a deeper understanding of the factors that contribute to patient harm. They also recognise the role of cognitive aids, such as the WHO checklist, in sharing safety-critical knowledge amongst teams and helping healthcare professionals to speak up when patient safety may be threatened.

Graduated approach to practical procedures, also engaging willing junior staff as teachers

Promotes understanding of how powerful checklists can be in modern medical practice

# Section 4

## Suggestions for educational programmes

The following areas represent examples of current practice which may help in the development or effective delivery of an educational programme

**Course content:** Teaching basic sciences, perioperative medicine and non-technical skills.

- Basic sciences can be brought to life in the clinical setting, for instance by using ultrasound to demonstrate practical anatomy, and cardio-pulmonary exercise testing to explain exercise physiology, 'prehabilitation' and risk stratification.
- More unusual topics such as global surgery and anaesthesia, disaster medicine, expedition medicine and diving medicine, can illustrate basic physiological and clinical management principles.
- Tutorials on guidelines and pathways can be invaluable in exploring patient management options, rehearsing the necessary actions and explaining how to get help with sick patients; for example, working through a 'major haemorrhage' protocol can both highlight basic science and give students confidence in managing this situation in the future.
- Using perioperative risk calculators (for instance, [www.sortsurgery.com](http://www.sortsurgery.com) or <http://riskcalculator.facs.org>) can promote the wider use of these valuable perioperative tools and open up discussion about shared decision-making with patients, active preparation for theatre and promoting recovery following surgery.
- Teaching on topics such as handovers of care can be incorporated into almost any clinical setting; incorporating such issues into students' assessments underlines the importance of these 'non-technical' aspects of care.

**Methods of delivery:** Online, in tutorials and in and around the hospital.

- Online materials offer great potential. For instance, it is possible to post a curriculum outline with a learning booklet including practical procedures. 'Flipped learning': regular emails with linked podcast/article. e-Learning is also useful as it is easy to access; many educational materials can be posted including podcasts, 'learning cases' and examples of assessment questions. This can be updated every year as the curriculum changes.
- Electronic lectures and modules may be created by the course providers, or chosen from the well-recognised e-Learning for Health and e-Learning Anaesthesia. These resources provide up-to-date materials and allow the student to learn at their own pace, as well as self-assess and explore other related content.<sup>12</sup>
- Students can benefit from the use of case-based scenarios to stimulate discussion of basic sciences. It is also possible to invite senior students or junior anaesthetists to teach, though this might need careful facilitation to make sure all benefit from the experience.
- During hospital attachments students can shadow enthusiastic trainees and consultants; join in on-call shifts in emergency operating theatres; and carry bleeps and be bleeped to simulations of situations they will encounter as Foundation doctors (e.g. a 'collapsed' patient, or completion of a discharge prescription).
- Prepare 'packs' of learning materials to keep in the operating theatre (e.g. arterial blood gases, ECGs, discussion cases) to refer to or for students to read.
- Teaching can be a challenge when time is short and service pressures keenly felt. However, there is published advice on teaching in such conditions<sup>13</sup> and it must also be borne in mind that formal teaching does not need to take place for students to learn; role modelling and observation are powerful tools, especially when one considers the importance of unarticulated knowledge and clinicians' personality and behaviour in their work.<sup>14</sup>
- Students can benefit from attendance in a variety of out-of-theatre perioperative settings including preoperative assessment clinics (both nurse and medically led), CPET testing sessions, acute pain rounds and multidisciplinary meetings.

**Organisational:** Courses, hospital arrangements and allowing students to go beyond the curriculum.

- Advanced life support-type courses can be designed and set up for students.
- Multidisciplinary 'Trauma weekends' where students are exposed to the theory and practice of major trauma management have also been tried.
- Identifying a 'named consultant' for undergraduate education can be helpful – this is then the person to whom problems and queries can be directed and acts as a central consistent point of contact.
- Experienced nurses should take part in medical education; for instance, specialist pain nurses can undertake pain teaching and resuscitation training staff can teach acute care topics and skills.
- Emergency medicine, intensive care and ENT can be integrated for a broader perspective on teaching about airway problems and management.
- Education and Simulation Fellow posts can be created which both allow trainees to develop their educational portfolio in a structured manner and at the same time provide useful teaching within clinical departments.
- It is very helpful to have clear arrangements linking the undergraduate funding coming into a department with the provision of time within teachers' job plans and the expectations for delivery of teaching.
- Anaesthetists and intensive care physicians can promote their specialties and complement teaching within the curriculum by encouraging and supporting a perioperative medicine/anaesthesia/intensive care medicine society and by contributing to medical school careers events.
- Gathering and distributing timely feedback to teachers about their educational activities allows teaching quality to be maintained and improved but also provides supporting material for doctors' educational appraisals.
- Within departments of anaesthesia, intensive care and pain medicine, some teachers are more enthusiastic than others. If possible, they can be 'rotated' in and out of teaching to avoid overburdening the more enthusiastic ones and avoiding 'fatigue'.
- Many schools have established Student Selected Modules and intercalated degrees in anaesthesia, perioperative medicine and related specialties with considerable popularity and success for the organising departments and the students themselves. These options allow students to further explore anaesthetics, participate in research, or enter academia through presentations, attending conferences and making academic posters. These courses act to establish anaesthetics as both a clinical and academic subject.

## Section 5 Recommendations

- 1 Medical schools, especially those in the early stages of development, should ensure that anaesthetists are involved in curriculum development and review. This document supports the development and provision of educational programmes but there must also be local specialty-specific educational and academic expertise.
- 2 Anaesthesia and intensive care medicine are large secondary-care specialties and the work undertaken within these fields must be represented within medical schools' curricula. Some areas of learning are specific to the specialties and cannot be learnt solely from exposure to learning in other areas of medical practice.
- 3 There is also considerable overlap between anaesthesia and intensive care medicine and many other areas of care. Anaesthetists and intensive care physicians are ideally placed to facilitate learning in a wider context, including basic sciences and many facets of clinical medicine. This should be considered within all areas of medical student education, using the expertise available from anaesthetists and intensive care physicians whenever it is appropriate to assist in ensuring that the requirements of *Outcomes for Graduates* are met and that students are optimally prepared to meet the demands of Foundation Training posts.
- 4 All staff involved in the planning and enacting of teaching should be provided with an appropriate amount of time for such duties. This may be supported through Service Increment For Teaching (SIFT) funding and the use of job planning to identify specific responsibilities and the manner in which time is allocated.
- 5 Medical schools with research staff in anaesthesia and intensive care medicine should promote opportunities for medical students to become involved with such activities including specific projects, intercalated study and Masters' type courses. This was one of the main recommendations of the RCoA Academic Strategy Report.<sup>15</sup> The benefits of working with academic groups are multiple but may be considered in two distinct groups. Firstly, incorporating academic principles supports the establishment of those skills in the student and provides insight into academic medicine in a broader sense. Secondly, there are considerable organisational benefits to be gained by working closely with academic networks in anaesthesia and intensive care medicine and this is of fundamental importance as part of a wider academic strategy for universities. Schools without significant academic underpinning in the specialty might usefully consider how this could be developed.

## Section 6 References

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- 9 Perioperative medicine: the pathway to better surgical care. RCoA, London 2015 (<http://bit.ly/RCoAPerioperativeMedicine>).
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# Appendices

## Appendix 1 Suggested content for teaching programmes<sup>9</sup>

<b>Pharmacology and physiology</b>	Analgesics – use and side effects. Antibiotics. Anticoagulants. Concurrent medication. Antiemetics. Elements of cardiovascular, respiratory and neurophysiology. Fluid and electrolyte balance and nutritional management.
<b>Perioperative care</b>	Preoperative assessment and active preparation for theatre. Assessment and mitigation of risks. Lifestyle modification. Consent, capacity, communication of risk and benefit. Expected and complicated postoperative course. Transfusion of blood products. Promoting recovery following surgery.
<b>Intensive care</b>	Interpretation, recognition and scoring of deterioration, and management of the acutely ill. Core critical care topics: shock, hypoxia, sepsis, organ failure and support. Organ donation. Treatment limitation/withdrawal. Plan and communication of management of postoperative course. Identification and management of complications. Principles of invasive monitoring. Arterial blood gas analysis.
<b>'Patient safety', staff safety and other non-clinical topics</b>	Non-technical skills – task management, teamwork strategies; decision-making theory, cognitive error, conflict, communication, prioritisation. Use of (and cognitive science behind) checklists. Handover, briefings, debriefings and continuity. Pathways, improvement science.
<b>Traditional 'anaesthesia'</b>	Anaesthetic and resuscitation drugs; drugs acting on the autonomic nervous system. Local anaesthesia. Sedation. Medical gases. Medical equipment/monitoring; principles. Physics and electrical safety. Measurement principles and practice.

## Appendix 2 Practical procedures relevant to anaesthesia, intensive care, pain and perioperative medicine from GMC's *Outcomes for Graduates*<sup>1</sup>

- Airway maintenance.\*
- Cardiopulmonary resuscitation.\*
- Measuring body temperature, pulse rate, blood pressure and oxygen saturation.
- Venepuncture.
- Measuring blood glucose.
- Nutritional assessment.
- Administering oxygen.
- Establishing peripheral venous access.
- Making up drugs for parenteral administration.
- Dosage and administration of insulin.
- Subcutaneous and intramuscular injections.
- Blood transfusion.
- Use of local anaesthetics.
- Correct techniques for 'moving and handling.'
- All five 'general aspects of practical procedures' (information and consent, handwashing, use of personal protective equipment, infection control and safe disposal of waste).

\*Not in *Outcomes for Graduates*.

## Appendix 3

# Outcomes relevant to anaesthesia, intensive care, pain and perioperative medicine from GMC's *Outcomes for Graduates*

### Recognition and management of the acutely ill patient

- 13c Perform a full physical examination.
- 14b Make an initial assessment of a patient's problems and a differential diagnosis. Understand the processes by which doctors make and test a differential diagnosis.
- 16a Assess and recognise the severity of a clinical presentation and a need for immediate emergency care.
- 16b Diagnose and manage acute medical emergencies.
- 16d Provide immediate life support.
- 16e Provide cardio-pulmonary resuscitation or direct other team members to carry out resuscitation.

### Applying basic science to clinical practice

- 8a Explain normal human structure and functions.
- 8f Demonstrate knowledge of drug actions: therapeutics and pharmacokinetics; drug side effects and interactions, including for multiple treatments, long-term conditions and non-prescribed medication; and also including effects on the population, such as the spread of antibiotic resistance.
- 8g Make accurate observations of clinical phenomena and appropriate critical analysis of clinical data.
- 12a Critically appraise the results of relevant diagnostic, prognostic and treatment trials and other qualitative and quantitative studies as reported in the medical and scientific literature.

### Supporting decision-making for optimal patient care, including end-of-life care

- 9d Explain psychological factors that contribute to illness, the course of the disease and the success of treatment.
- 9e Discuss psychological aspects of behavioural change and treatment compliance.
- 9f Discuss adaptation to major life changes, such as bereavement; comparing and contrasting the abnormal adjustments that might occur in these situations.
- 9g Identify appropriate strategies for managing patients with dependence issues and other demonstrations of self-harm.
- 13e Assess a patient's capacity to make a particular decision in accordance with legal requirements and the GMC's guidance.
- 13f Determine the extent to which patients want to be involved in decision-making about their care and treatment.
- 13g Provide explanation, advice, reassurance and support.
- 14g Formulate a plan for treatment, management and discharge, according to established principles and best evidence, in partnership with the patient, their carers, and other health professionals as appropriate. Respond to patients' concerns and preferences, obtain informed consent, and respect the rights of patients to reach decisions with their doctor about their treatment and care and to refuse or limit treatment.
- 20c Be polite, considerate, trustworthy and honest, act with integrity, maintain confidentiality, respect patients' dignity and privacy, and understand the importance of appropriate consent.

- 20d Respect all patients, colleagues and others regardless of their age, colour, culture, disability, ethnic or national origin, gender, lifestyle, marital or parental status, race, religion or beliefs, sex, sexual orientation, or social or economic status. Graduates will respect patients' right to hold religious or other beliefs, and take these into account when relevant to treatment options.
- 20e Recognise the rights and the equal value of all people and how opportunities for some people may be restricted by others' perceptions.

### Problem solving in clinical care

- 8c Justify the selection of appropriate investigations for common clinical cases.
- 12c Apply findings from the literature to answer questions raised by specific clinical problems.
- 13a Take and record a patient's medical history, including family and social history, talking to relatives or other carers where appropriate.
- 13b Elicit patients' questions, their understanding of their condition and treatment options, and their views, concerns, values and preferences.
- 14a Interpret findings from the history, physical examination and mental-state examination, appreciating the importance of clinical, psychological, spiritual, religious, social and cultural factors.
- 14d Interpret the results of investigations, including growth charts, x-rays and the results of the diagnostic procedures in Appendix 2.
- 14e Synthesise a full assessment of the patient's problems and define the likely diagnosis or diagnoses.
- 14f Make clinical judgements and decisions, based on the available evidence, in conjunction with colleagues and as appropriate for the graduate's level of training and experience. This may include situations of uncertainty.

### Communication, collaboration, negotiation

- 14j Contribute to the care of patients and their families at the end of life, including management of symptoms, practical issues of law and certification, and effective communication and team working.
- 15a Communicate clearly, sensitively and effectively with patients, their relatives or other carers, and colleagues from the medical and other professions, by listening, sharing and responding.
- 15b Communicate clearly, sensitively and effectively with individuals and groups regardless of their age, social, cultural or ethnic backgrounds or their disabilities, including when English is not the patient's first language.
- 15c Communicate by spoken, written and electronic methods (including medical records), and be aware of other methods of communication used by patients. The graduate should appreciate the significance of non-verbal communication in the medical consultation.
- 15d Communicate appropriately in difficult circumstances, such as when breaking bad news, and when discussing sensitive issues, such as alcohol consumption, smoking or obesity.
- 15e Communicate appropriately with difficult or violent patients.
- 15f Communicate appropriately with people with mental illness.
- 15g Communicate appropriately with vulnerable patients.
- 15h Communicate effectively in various roles, for example, as patient advocate, teacher, manager or improvement leader.
- 19a Keep accurate, legible and complete clinical records.
- 19b Make effective use of computers and other information systems, including storing and retrieving information.
- 19c Keep to the requirements of confidentiality and data protection legislation and codes of practice in all dealings with information.
- 19d Access information sources and use the information in relation to patient care, health promotion, giving advice and information to patients, and research and education.



### Science, skills and safety:

a framework for medical student education in anaesthesia, intensive care, pain and perioperative medicine

- 22a Understand and respect the roles and expertise of health and social care professionals in the context of working and learning as a multi-professional team.
- 22b Understand the contribution that effective interdisciplinary team working makes to the delivery of safe and high-quality care.
- 22c Work with colleagues in ways that best serve the interests of patients, passing on information and handing over care, demonstrating flexibility, adaptability and a problem-solving approach.
- 22d Demonstrate ability to build team capacity and positive working relationships and undertake various team roles including leadership and the ability to accept leadership by others.

### Practical pharmacology

- 17a Establish an accurate drug history, covering both prescribed and other medication.
- 17b Plan appropriate drug therapy for common indications, including pain and distress.
- 17d Calculate appropriate drug doses and record the outcome accurately.
- 17f Access reliable information about medicines.
- 17g Detect and report adverse drug reactions.
- 17h Demonstrate awareness that many patients use complementary and alternative therapies, and awareness of the existence and range of these therapies, why patients use them, and how this might affect other types of treatment that patients are receiving.

### Carry out practical procedures safely and effectively

- 18a Be able to perform a range of diagnostic procedures, as listed in Appendix 2 and measure and record the findings.
- 18b Be able to perform a range of therapeutic procedures, as listed in Appendix 2.
- 18c Be able to demonstrate correct practice in general aspects of practical procedures, as listed in Appendix 2.

### Understanding fallibility, managing risk

- 14i Identify the signs that suggest children or other vulnerable people may be suffering from abuse or neglect and know what action to take to safeguard their welfare.
- 21d Manage time and prioritise tasks, and work autonomously when necessary and appropriate.
- 21e Recognise own personal and professional limits and seek help from colleagues and supervisors when necessary.
- 23a Place patients' needs and safety at the centre of the care process.
- 23b Deal effectively with uncertainty and change.
- 23d Promote, monitor and maintain health and safety in the clinical setting, understanding how errors can happen in practice, applying the principles of quality assurance, clinical governance and risk management to medical practice, and understanding responsibilities within the current systems for raising concerns about safety and quality.
- 23e Understand and have experience of the principles and methods of improvement, including audit, adverse incident reporting and quality improvement, and how to use the results of audit to improve practice.
- 23j Recognise the duty to take action if a colleague's health, performance or conduct is putting patients at risk.

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