
EDUCATION IN ANAESTHESIA - PART 1

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BASIC PRINCIPLES IN SETTING UP AN EDUCATIONAL PROGRAMME

When planning an educational program it is important to first **define the aims**. What do you want the students to learn? In anaesthesia the broad aim is to train people so that they have adequate, appropriate knowledge and skills to give anaesthesia safely to their patients and to enable them to keep the patient alive and unharmed during surgery. Perioperative care extends this to teach pre and postoperative care of the patient. This requires good knowledge of medical and surgical principles, including intensive care and pain management.

Having decided on the **aims** the next step is to work out what the students need to know, and how they are going to learn it - objectives. Anaesthesia requires both a **theoretical syllabus** and **practical training** to perform the various procedures that are undertaken.

The theoretical course is wide ranging. A **good basis of physiology and pharmacology** with their practical applications is invaluable, and really essential in a good program. Unfortunately in some parts of the world these basic sciences are not particularly well taught so that students learn the job by rote, without a clear understanding of why and what they do. Within this type of framework misconceptions are common, for example some students might believe that since hypovolaemia results in tachycardia, someone who is bradycardic is unlikely to be hypovolaemic. Knowledge of basic physiological principles allow the student to understand the basic mechanisms involved and to adapt their anaesthetic skills around the patient's physiology and pathophysiology. A good understanding of the physiology of cardiac output, and its distribution will help the student understand

why certain cardiovascular events occur and how best to manage them. The further implications of pathological processes and can be built on to sound basic knowledge.

Teaching complex topics to students of different backgrounds requires considerable teaching skills. Techniques vary from one country to the next, and it is hoped that within this short series some useful principles will be described. One technique when teaching large topics such as blood flow, cardiac output and systemic vascular resistance is to teach by breaking down the subject to components and building on prior knowledge. Often a complex topic may then be successfully taught. Where students have an understanding of secondary school physics teaching may be helpful. $\text{Pressure} = \text{Flow} \times \text{Resistance}$ transforms to $\text{Blood Pressure} = \text{Cardiac Output} \times \text{Peripheral Resistance}$. The latter can be further broken down to its components in Poiseuille's equation which brings in the influence of length, viscosity (haematocrit) and the 4th power of the radius (vasodilated or constricted). These can also be applied to flow in the airways and in intravenous infusions. When these basics are understood more complex issues such as oxygen delivery can be introduced and mastered. The concepts of a high cardiac index associated with pregnancy, small babies and anaemic patients may be better appreciated, and the anaesthetic principles in looking after these patients developed with the student in the practical setting.

Understanding distribution of cardiac output also allows the student to understand why reduced doses of depressant drugs should be used in hypovolaemic patients (the amount of blood going to the brain and heart is kept the same, while the proportion to other non essential tissues, including muscle, is decreased). This means intramuscular administration is ineffective in shock and may even be dangerous because it forms a depot of drug which is released when the patient is resuscitated. Alternatively the apprehensive patient needs more induction agent to compensate for the increased proportion of cardiac output which goes to muscle where it has no effect. Premedication may counteract this by relieving apprehension. All of these theoretical physiological and pharmacological topics may not be considered as essential topics for anaesthesia training, but without them, the student is impoverished. The syllabus needs to cover aspects of many subjects, which should always be made relevant to clinical practice. Reinforcing these lessons in theatre is helpful.

Practical training is usually undertaken in the operating theatre, although some centers have access to clinical skills rooms where techniques such as intubation and airway care may be practiced. The importance of being taught correctly and consistently at the start of training cannot be overemphasised so that the student

acquires good technique and understands the ergonomic principles that apply. When training a practical technique a good teacher will let the student watch while they demonstrate the method, explain the steps involved and then guide the student through the process. Unfortunately many who teach have not analysed the separate steps clearly, and therefore this valuable component of the process is lacking. The result is that the student will take longer to learn and may not learn to do the procedure well. This applies to common procedures such as intubation, ventilation and intravenous cannulation as well as regional and local anaesthetic techniques.

When detailed **Aims and Objectives of Training** have been drawn up, as they were by the Australian and New Zealand Faculty, now College, of Anaesthetists in 1976, there are **General Instructional Objectives** and much more detailed **Specific Instructional Objectives** which give a more detailed account of how the learning may be achieved. The important point is that the syllabus should be relevant, practical and define what the students should learn to accomplish the aims of the course. Some anaesthesia curriculums are available on the internet.

Finally there should be **assessment** to ensure that the students have achieved the learning that was planned. This may take the form of written examinations or practical assessments. If the course is well designed, the students are well taught, have sufficient ability to learn and have covered the course syllabus, the final examination should be passed. If many candidates fail, the students may not be up to standard required, the examination may not be assessing what was laid out in the syllabus, or the teaching has been ineffective. Ideally repeated assessments are better than one final examination. A logbook or portfolio of experience should be maintained by the student throughout their career and be inspected regularly by the teacher to ensure that each student has covered the practical elements of the course appropriately. Students should be encouraged to develop personal learning plans and develop the ability to learn independently from the teacher. Assignments are a useful way of encouraging this. Reflecting with the help of the teacher over their day to day work and particularly critical incidents will help the student TO mature in their practice.

Further information

Useful information regarding anaesthesia training is available from a variety of sources including:

- <http://www.rcoa.ac.uk>
- <http://www.anzca.edu.au>