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Teaching in Anaesthesia

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Hiu Lam and Rob Sneyd

Introduction

Anaesthesia offers unique learning opportunities for students and clinicians. It encompasses basic & applied sciences in anatomy, physiology, pharmacology, pathophysiology and the understanding of important principles & concepts in physics, clinical measurement, and data interpretation, as well as practical skills, decision making and teamwork.

An understanding of self-directed learning theory underpins effective clinical teaching. Pedagogic developments have supported progression from large group lectures to smaller group Problem Based Learning (PBL). Unlike other specialties, clinicians in anaesthesia have the advantage of a close learner-teacher relationship – typically 1:1. This allows the trainee to be involved in the practical patient management, especially during in-theatre teaching. A structured teaching and training environment remains essential to facilitate teaching programmes for both trainees' education as well as trainers' accreditation. As anaesthetic specialty training evolves, technology enhanced learning is introduced to deliver and (in part) assess the progress of training.

Underperformance of health care workers is recognised more commonly than in the past and this may reflect improved supervision and educational governance. Deliberate reliance on trainee led engagement in training, teaching and assessment also exposes weaker trainees who lack the management & leadership skills and motivation. Appropriate support, coaching, mentorship & signposting ensure effective teaching & address stress related underperformance. Importantly, symptoms of underperformance must be recognised and

acknowledged in order to tackle these problems at an early stage, and perhaps to improve outcome for the doctor concerned. It is estimated in 2003 that 13.4 million working days were lost from stress at the workplace in the UK (Palmer, 2003).

Competency

In the recent past, apprenticeship training was the norm for UK trainees. This type of training developed trainee confidence and competence with time in post. Exposure to large numbers of patient encounters encouraged a 'pattern recognition' type of patient diagnosis and management planning; however, the 'training' acquired could be passive, haphazard and often opportunistic and unplanned.

In the UK, the Modernising Medical Careers programme (Calman, 1993), and subsequently competency based training and assessments were designed to support a more structured outcome and performance based training system. The General Medical Council (GMC) defines generic competency as: 'The knowledge, skill, attitude or combination of these, that enables one to effectively perform the activities of a particular occupation or role to the standards expected'. The GMC approved anaesthesia training curriculum defines standards & requirements for UK Specialty Training in anaesthesia (The Gold guide 2010). It emphasises acquisition of competencies in a quantifiable manner, the type & frequency of skills exposures and the duration of training required for a Certificate for Completion of Training and entry onto the Specialist Register as an accredited specialist.

Immediate senior supervision is crucial for anaesthesia trainees (and their patients) until basic competency is attained. When is an anaesthetic trainee competent to perform the first 'solo'

rapid sequence induction or even be solely in charge of a patient under anaesthesia? Is it simply the ability to perform a set of practical skills safely? Knowledge acquisition is relatively easy to assess; however, assessment of the overall performance of the trainee, as an end product of satisfactory interpretation of this knowledge and its application, is a complex process. Classically 4 stages of competence are described in reference to skill acquisition; these are unconscious incompetence, conscious incompetence, conscious competence and unconscious competence. An important task for the teacher is to reveal the initial stage to the trainee who then becomes insightful of this unconscious incompetence, which is akin to the 'blindspot' described in the Johari Window where the deficit is 'not known to self but known to others (Figure 38.1).

<insert figure 38.1 here>

In addition to the knowledge, skill and attitudes required to be a doctor, several core non-technical skills are critical to become a good anaesthetist. These include managing rapidly evolving clinical situations and addressing managerial and leadership issues. These 'professionalism' attributes were recognised in anaesthesia (Fletcher, 2003), as well as in the setting of primary care (Patterson, 2000). There is now increasing evidence that task prioritisation, team working, situational awareness, critical thinking and decision making skills are essential to anaesthetists.

In conjunction with competency based learning, the experiential learning described by Kolb (Kolb, 1975) over 40 years ago is still valuable in explaining adult learning. Kolb's adult learning cycle can be summarised into:

- Learner actively involving in the experience.

- Learner reviewing and reflecting on the experience.

- Learner conceptualising and concluding from the experience.

- Learner processing new ideas and contextualising into next stage of learning.

Here the learner builds a portfolio of experiences, derived meanings & conclusions as a foundation of future learning.

All contemporary trainees should have a paper or electronic portfolio. The content of the portfolio includes annual appraisal, procedural logs, courses attended, training and competency documents, which support both formative and summative assessment on an annual basis, or more often if necessary. The portfolio records personal development and career progression.

Education governance

Training departments should be able to provide evidence of the quality of their training. Examples of programme characteristics associated with high quality provision are:

- Training outcomes that are reliable & valid.

- Safe & effectively graded clinical and educational supervision with emphasis on induction, senior clinician availability, handover of patient care, explicit framework for consent of patients by trainees, regular structured teaching including technology enhanced training.

- Learning & training culture – optimising every available training and teaching opportunity.

- Trainer accreditation.

Suitable quality metrics could include:

- Trainee and trainer survey.

- Trainee end of placement questionnaire.

- Benchmarked competency acquisition progress.

- Postgraduate examination pass rate.

- Patient satisfaction survey.

- External review reports.

- Quality of training in 'Supervised Learning Events' (SLEs) between trainer and trainee eg ward round, out-patient clinic & operating theatre sessions.

- Each trainee has an agreed & defined learning outcome at each placement.

- Training posts are mapped to the curriculum.

Learning

Effective self-directed learning (SDL) by clinicians has been linked to high quality healthcare delivery (Lowenthal, 1981)(Westberg, 1994). It is therefore important that clinicians engage in SDL. Miller's pyramid (Miller, 1990)) demonstrates the stages of learning and assessment required to transform a novice learner into an expert (Figure 38.2). In anaesthesia and other specialties much of this learning is undertaken as SDL by gathering information, interpretation, reflection and finally demonstration of the learned skills.

<insert fig 38.2 here>

Anaesthetic teachers must be clear in their role and teaching goals. Traditionally, clinical teaching is teacher-centred, content-oriented and focused on imparting information to learners. This has been superseded by a student-centred learner-oriented approach where knowledge acquisition and application by the student becomes the primary focus of learning (Kember, 1997). Problem based learning works effectively within this scheme. In the operating theatre, student centred learning requires preparation by both teacher and learner.

How do postgraduate anaesthetists learn? The popular constructivist theory (Appleton, 2002) suggests that learners actively construct information around a personal framework of existing knowledge and experience. It acknowledges the importance of the learner's real world authentic contextual experience as an important building block for future learning (e.g. discussion of rapid sequence induction in a patient with bowel obstruction by a trainee who had prior experience of tracheal intubation). This encourages the learner to analyse and predict possible outcome based on deduction from the learner's knowledge base and experience.

Adult learning theory was introduced in 1984 (Knowles, 1987) as 'andragogy' (as opposed to pedagogy – child instruction) by Knowles. The principles can be summarised as:

- Establishment of effective safe learning environment.
- Identify learning needs.
- Formulate learning outcome.
- Learner identification of resources & strategy available.
- Support mechanism to carry out learning plans.
- Learner's evaluation of own learning (critical reflection).

SDL is central to adult learning in order for the learner to be empowered to have personal responsibility for their own learning. This mode of learning is enriched by Schon's theory of reflective practice (Schon, 1987). Unexpected events (eg critical incidents) trigger two kinds of reflection; firstly 'reflection in action' where the learner's ability to learn in real time as the event unfolds and the learner uses current and past experience (constructivism) and applies reasoning as the event is occurring. Secondly, 'reflection on action' which is consciously used in for example Mortality and Morbidity, M & M, meetings. This reflection happens later after the incident and with the learner critically appraising the sequence of events, actions, decisions made and how these change future practice. Immediately after the event, debriefing and feedback with peers and the trainer are a golden opportunity of this type of learning. Documentation of this reflection offers a further opportunity for self evaluation, a crucial component of andragogy. An understanding of adult learning and reflective practice are central to the Kolb cycle of experiential learning.

In all the different teaching methods, it is important to establish outcome based learning, which can be characterised by:

- Clearly defined outcomes which must be completed by the end of the session (flexibility needed in operating room sessions).
- Design of curriculum, strategy and opportunities to facilitate the achievement of the required outcome(s).
- Assessment of the outcomes.
- Provision of remediation as required.

The value of establishing a learning outcome is to enable targeted planning of teaching and encourage transparent objectives with well defined expectations from the learner and effective facilitation by the trainer.

Various levels of outcome can be agreed according to the experience & aptitude of the trainees. The lowest level can be recall of factual information and the highest evaluation of information and the management plan. Gagne introduced a systematic approach to the level of outcome as follows (Gagne, 1965):

- Factual recall of information (verbal or written) - surface approach learning.
- Intellectual skills:
  - Discriminations; recognition of different classes of things eg drugs.
  - Concrete concepts; classification by physical features eg pKa.
  - Defined concepts; classification by abstract features eg isomerism.
  - Rules; application of simple procedure to solve a problem.
  - High order rules; application complex procedure to solve a problem.
- Cognitive strategies - abilities in learning and thinking.
- Attitude – behaviour reflecting a new value or belief.
- Motor skills – performance of a physical task.

There is also evidence that personality traits correlate with learning style and hence outcome. Accordingly, when facilitating a group of trainees with different personalities (inevitably the case), allowance should be made for the heterogeneous learning processes of the trainees. Many different learning and teaching styles have been described but there is no evidence to suggest an active matching of teaching/learner style enhances effective learning; in contrast,

learners may become disinterested by a relatively unchallenging learning environment (Vaughn, 2001).

Teaching modalities

What are the different methods for teaching anaesthesia? The answer depends on the experience of the trainee and the topic being taught. This could be basic science and pathophysiology, 'hands on' skill based tasks, decision making under pressure or task prioritisation. These different domains require different teaching strategies and methods.

Strategy

Whichever method is chosen, reference must be made to the approach needed to do so. Harden's SPICES model is a useful and practical strategy framework (Harden, 1986):

Student centred

Problem based

Integrated (multidisciplinary/professional)

Community based

Elective course with a core curriculum

Systematic curriculum

Nevertheless, the student centred approach may inhibit novice anaesthetists. It is therefore prudent to decide on the 'spectrum' for each domain of the SPICES model that the session or course should follow. Additionally, anaesthetic trainees commonly commence training with varying degrees of previous anaesthetic and general medical experience.

When formulating a teaching strategy, the teacher should decide whether it is a problem based or information gathering exercise; a multiprofessional (eg anaesthetists and anaesthetic nurses) or uniprofessional group; a community based or hospital based set up (eg in a preoperative assessment clinic); a systematic approach (for novice trainees) or apprenticeship approach (more senior trainees), so the learners can reap maximum benefit from the session. In practice, a mixed approach may be used eg operating theatre team training for anaesthetists, surgeons, scrub staff and anaesthetic nurses and practitioners participating in an in-situ simulated session in a team working exercise focusing on a patient with suspected intraoperative venous air embolism. The 'problem based' domain in the SPICES model is markedly different for an anaesthetic practitioner to a scrub nurse in this scenario.

Methods

Lectures, seminars, tutorials & workshops and clinical teaching have all been incorporated into successful teaching. Contextualisation of the teaching methods is important. Concepts and theories may be explored in lectures and tutorials; skill acquisition could be taught initially in the simulation suite and skill centre and later in the operating theatre; professional core attributes can be practised in the simulation suite and an authentic clinical setting under supervision.

Lecture

This is a common and traditional way to impart information to the learner. It is difficult to individualise learning in this forum, although a well prepared, charismatic lecturer utilising effective resources may be able to engage the learner to analyse and reflect on the information delivered by the lecturer.

Seminar

Participation and engagement of the learner is the main advantage in this small group based learning. Learners need to be prepared for this type of teaching and availability of resource materials before the session is essential. Similar small group activity such as workshops may be most appropriate for multiprofessional groups.

Clinical Teaching

To be successful, the trainer needs to plan in advance and the trainee(s) and trainer both need to appreciate that the clinical environment is less predictable than that in the seminar room. Although the clinical workplace is unpredictable, for effective learning to take place the learner must feel safe in this realistic environment, which may be overstretched. Appropriate planning is therefore the key to success at the clinical interface. Several facets of clinical teaching deserve individual attention:

Role Modelling (apprenticeship)

The value of consultant and senior trainees as role models in all aspects of teaching cannot be overemphasized. A role model must be competent and confident to be an effective and convincing trainer, they should allow time to debrief the learner and facilitate reflection. The current model of competency and workplace based assessment training has partially eroded the apprenticeship learning in postgraduate training. In this time sensitive era of training it is imperative to be opportunistic in utilising every possible clinical encounter as a valuable learning experience (Grant, 2002). Senior anaesthetists must lead and encourage trainees (apprentice) to:

- Increase trainee's exposure in seeing, discussing and managing patients to build up experience.

- Integrate teaching into service commitment.

- Do small 'bite size' teaching episodes which promote information processing and reflection, including 'what if' scenarios.

- Being questioned about actions & clinical decisions about patients (by trainees and to trainees).

- Encourage trainees to summarise and present cases and receiving real-time feedback.

- Learning from role models in team interactions, obtaining consent, assessing and explanation of risks.

- Listening to a consultant's thought processes in management, about practice and patients.

Patient-Centred clinical teaching

Over the years, it has been commonplace to encounter patient-centred teaching. As a result of increases in ambulatory care in-patients are now more likely to be frail and in a more advanced state of their disease, which may make them less appropriate to be the 'subjects' of clinical teaching.

Clinical Skill Centre for technology enhanced teaching (TEL)

Due to the increasing emphasis of patient-centred learning and the reduction in 'exposure' of trainees especially to rarer clinical conditions, many medical students and postgraduate anaesthetic trainees are now routinely offered the opportunity to be taught practical skills such as nasal or orogastric tube insertion, urinary catheters insertion, arterial and venous punctures and cannulations, tracheal intubation, lumbar puncture, ultrasound guided regional

analgesia on part-task training manikins. In addition, role play with simulated standardised patient actors for consultation skills including breaking bad news may be valuable.

High fidelity simulator training on a full size advanced manikin to rehearse and practise scenarios of difficult intubations, rapid sequence induction and failed intubation drills as well as major obstetric haemorrhage are now standard training in many centres worldwide. This type of TEL allows trainees to learn in a safe environment, for both patients and trainees. The learners' emotional involvement and the opportunity to be prepared for rare clinical encounters are essential for trainees' experience. In addition to the clinical aspects of learning, TEL simulator training has been useful in crisis resource management by highlighting issues around medical leadership (Fletcher, 2003). To be successful, this training must be realistic and therefore fully resourced as it is demanding on infrastructure such as purpose built facilities & computer hardware. Tailor made trainer training and accreditation (for sensitive and imaginative trainers) is essential to have a reliable and consistent faculty approach. Trainers must be skilled in facilitating learner debriefing so reflection becomes an integral component, and for which the learners can build on as part of experiential learning (Fanning, 2007). Simulation is covered in more detail in Chapter 1.5.5

Computer Assisted Learning or Electronic Learning

This can be an effective component of SDL. Being primarily a knowledge based system it is especially useful for some subjects eg basic science. Elsewhere it can support competency-based training but cannot replace practical experience. The Royal College of Anaesthetists has an e-learning platform (RCOA), "e-Learning Anaesthesia" which allows trainees to undertake curriculum based e-learning sessions and provides an e-Library for reference and an on line storage facility for e-Continuing Professional Development and e-Assessment.

<u>Multiprofessional teaching</u>

Different healthcare professionals have traditionally been taught in different learning environments, yet when working together in a team they are expected to cooperate, collaborate and achieve common patient and organisational goals. Sharing a common learning experience, such as high fidelity simulation training, can promote team interaction in delivering high quality patient care.

<u>Clinical settings</u>

There is increasing pressure to deliver healthcare in or close to the community (exemplified by the English Health & Social Care Bill) (Lansley, 2011). Today most patients arrive on the morning of the scheduled operation and are assessed and consented both by the anaesthetic and surgical teams in a limited period of time. This does not provide a meaningful learning environment. Previously, complex patients were brought in the day before surgery and preoperative assessment including risk assessment & optimisation, interpretation of results in relation to the patient's co-morbidities and finally formulation of an anaesthetic plan were all used as valuable learning opportunities. The current model of ambulatory healthcare restricts the trainee's ability to practise their clinical reasoning and may have a detrimental effect on their anaesthetic experience.

The preoperative assessment and optimisation of a patient is an important and often difficult task for the trainee, as crucial decisions regarding surgery and anaesthetic management are made. One way to address this deficiency is by routine allocation of trainees to the preoperative assessment clinic. If well planned, this can be a rewarding learning opportunity.

Postgraduate examination orientated teaching

Many countries have postgraduate anaesthetic examinations for trainees. This is an important milestone for progression in training towards becoming an anaesthetic specialist. These examinations commonly include multiple choice questions, short answer questions, short essays, objective structured clinical examinations and oral examinations, reflecting Miller's pyramid of assessment (Figure 38.2). Trainees often prepare for these examinations by SDL with peers, attending local teaching sessions as well as regional and national examination orientated courses. The candidates must commit themselves to a substantial period of study. One effective method of small group learning comprises presenting and summarising to one another a chosen topic and aiming to progressively cover the curriculum. Practising the format of the examination questions, eg essay, MCQs, oral examinations and OSCEs is important. It is through this practice that the timing and structuring of the answers can be fine tuned.

Assessment

The purpose of assessment is to measure the trainee's progress and performance against nationally agreed standards and criteria. Assessment is broadly divided into formative and summative. The competency based training in the UK has a formative component followed by an annual summative assessment.

With competency based assessment, trainees need to complete a defined number of assessments in order to progress in their training. The most commonly used workplace based assessment (WPBA) tools in anaesthesia are:

Clinical evaluation exercise (mini CEX)

This represents a doctor/patient interaction which is then assessed by a trainer who has been trained in using the tool. The trainee is assessed for several attributes which could include communication (obtaining consent) & technical skill (spinal anaesthetic). Time must be set aside for discussion of the encounter for feedback to the trainee. Trainees are assessed on a number of occasions preferably with different trainers to ensure reliability.

Direct observation of procedural skills (DOPS)

This allows the trainee to demonstrate a skill. The trainee is observed whilst carrying out a procedure with a patient (eg arterial puncture). Afterwards, the trainee's performance is scored by the assessor, and feedback provided.

Multi-source feedback (MSF)

The trainees are assessed over a period of time by their multiprofessional colleagues. As a 360° assessment, feedback is obtained from co-workers, including doctors, nurses and other allied healthcare workers. The assessors complete a questionnaire on the performance of the trainee, and the trainee also provides a self-assessment. The questionnaires are sent to an assessment centre and information is fed back usually to the trainee's educational supervisor.

Case based discussion (CBD)

This WPBA is based on discussion of clinical materials with the trainee. Trainees choose a number of recent cases in which they have been. The trainer selects one case considered educationally appropriate for discussion. The trainer probes the clinical reasoning behind the decisions that the trainee has made and then provides feedback.

Portfolios

Portfolios are used usually at the end of the academic year as collections of information that evidence the achievements of trainees. In the UK, the portfolio is used for the summative annual review of competence progress (ARCP). It includes a section with the relevant documents to demonstrate that the trainee has completed the DOPS, mini-CEX, MSF and CBD assessments. Increasingly in the reflective section of the portfolio, trainees are encouraged to obtain feedback from the 'teaching' sessions that they have led; in doing so they would gain valuable insight into the process of experiential learning and prepare themselves for future lifelong learning and continuing professional development.

In addition to competency based assessment, summative assessment such as high fidelity simulation has been used successfully in high stakes postgraduate specialty recruitment (Gale, 2010) and postgraduate anaesthetic examinations in the UK. There appears to be a relationship between performance at specialty recruitment selection and subsequent professional examinations in anaesthesia (Roberts, 201X).

Underperformance of trainees

There are numerous reasons why a trainee may underperform and in order to improve performance, the factors affecting underperformance must be recognised and considered by all concerned (Figure 38.3). Once identified, underperforming trainees must be supported through a robust management framework (Figure 38.4) during a difficult and stressful period of. Where health issues are contributing to underperformance, a period of recuperation away from the workplace could be beneficial for the trainee to reflect and focus on returning to health.

<insert fig 38.3 here>

<insert fig 38.4 here>

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Figure captions

Figure 38.1 The Johari Window. Reproduced from Luft, J. *Of Human Interaction*. Los Angeles: Mayfield, 1969.
Figure 38.2 Miller's Pyramid of Assessment. Reproduced with permission from Miller, G. The assessment of clinical skills/competence/performance. *Academic Medicine*, Volume 65, Issue 9, pp. s63-s67, Copyright © Wolters Kluwer Health 1990.
Figure 38.3 Factors affecting underperformance in trainees. Reproduced from Price 2006
Figure 38.4 Management framework. Reproduced with permission from South West Deanery