Educational tools in the assessment of trainees in anaesthesia

Revalidation
FOR ANAESTHETISTS
RCA Revalidation matrix
Matrix reference 1H01, 2H01

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Key points

Seamless, competency-based training in anaesthesia requires objective, reliable, and valid tools of assessment.

Current workplace-based assessments and examinations have strengths and weaknesses.

Use of multiple tools at a number of points during training can compensate for weaknesses of individual tools and increase overall validity.

Trainees need to be proactive in their training and seek meaningful feedback.

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> Teaching, training, appraising and assessing doctors and students are important for the care of patients now and in the future. You should be willing to contribute to these activities. Good Medical Practice, General Medical Council, 2006

Training in anaesthesia faces many challenges. The European Working Time Directive (EWTD) and Modernising Medical Careers (MMC) have reduced the time available for training. Similar pressures are seen in healthcare training worldwide. The population is becoming older, more obese, and with multiple co-morbidities. Surgeons have high expectations, increasingly performing complex procedures on sicker patients, whilst striving to meet service targets.

In order to address these challenges, competency-based training has been introduced.[1] The trainee has to demonstrate satisfactory competency in order to proceed to the next stage of training. This article explores the educational framework behind the assessment tools used, discussing their strengths and weaknesses. It also highlights the roles of both trainers and trainees. Although this article uses the UK curriculum and assessment process as a framework, the principles apply equally throughout the world.

Goals of assessment

The purpose of assessment is to:

(i) *Provide evidence of competence*: ensuring the trainee possesses the appropriate knowledge, skills, and attitudes required to undertake safe clinical practice at a level appropriate to their level of training, and ultimately progresses to independent professional practice.

(ii) *Determine fitness for professional practice*: ensuring the trainee possesses not only the clinical skills, but also a commitment to maintain the highest moral, ethical, and professional standards.

Competence and competency-based assessment

Epstein and Hundert[2] define competence as 'the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served'.[3] (Copyright ©2002 American Medical Association. All rights reserved.) Competence is not merely a matter of knowing and performing a task, but having the maturity to self assess, reflect upon strengths and weaknesses, and ensure knowledge is updated. The individual's level of competence evolves as the trainee grows in experience. Trainees vary in the duration of time taken to reach a specific stage, and anaesthetic training makes allowance for this, in order to address the problem time-based training posed in the past.

The term 'assessment' is derived from the Latin *ad sedere* meaning 'to sit down beside'. Thus, the aim of assessment should be to grade and help motivate and direct the trainee by providing timely, accurate feedback, and guidance. Two types of assessment exist—formative and summative. Formative assessment can be thought of as a 'practice' run. It allows feedback to the trainee so that teaching and learning can be adjusted to achieve a desired goal. Summative assessment is a judgement of whether or not a trainee has attained a particular standard at a particular time.

Competency-based assessments (CBAs) have defined criteria of the standard to be attained. The trainee is assessed against those standards, rather than against other individuals. It is a process, rather than a single event that occurs at a set time or place. CBA is a useful way of assessing visible technical skills, but

doi:10.1093/bjaceaccp/mkr017 Advance Access publication 25 June, 2011

can lead to task-orientated rather than holistic teaching. It has been criticized for being too rigid and simplistic in its approach in assessing professional practice. CBA does not always recognize the need for complex thinking, particularly in unfamiliar tasks, circumstances, and environment. There is also a danger of trainee and trainer dissatisfaction if the assessment process ends up being a tick box exercise. The trainee may demonstrate a skill perfectly, without understanding the principles behind the actions. Also, good performance during assessment does not guarantee similar performance when not being assessed. Thus, CBA should occur frequently and by several assessors.

Key stages in assessment

Trainees are assessed at a number of key stages during their programme using a combination of tools. By way of example, the system in the UK is illustrated in Table 1. Success is necessary in order to proceed to the next level.

Criteria of a good assessment tool

The following criteria can be considered when determining the quality of an assessment tool[4]:

(i) *Reliability*: the consistency or reproducibility of the result. A trainee should obtain the same mark or grade regardless of the examiner or the day that the assessment is carried out. Ideally, all assessors should be bench marked to maintain reliability. In clinical practice, this is rarely done and is a significant weakness in our current system of assessment.

(ii) *Validity*: the extent to which the assessment tool measures what is intended. External validity is a measure of how transferable or generalizable the results are, while internal validity is a measure of how reliable the causal relationship between the findings are. Face validity is the extent to which an assessment tool covers important areas and the appropriateness of the assessment method. Construct validity is the ability of the test to differentiate between groups with differing ability (e.g. a beginner and an expert). Predictive validity is a measure of how a test predicts future outcome (e.g. success after graduation).

(iii) *Educational benefit*: the method of assessment drives learning and influences performance of students. Thus, the assessment tool must be acceptable to both the trainee and trainer alike and help motivate the trainee to perform.

(iv) *Feasibility and cost*: the number of people, equipment, time, and money required to organize the assessment. It should be possible within the financial and time constraints of the health system.

Table 1 Key stages and assessment tools used in anaesthetic training in the United Kingdom*

Core trainee (CT) 1 and 2
Initial assessment of competence (IAC) (3 months)
Initial assessment of competence in obstetric anaesthesia (IACOA) (year 2)
Basic level training certificate (BLTC)
Workplace-based assessments (WPBA) linked to clinical units of training
Satisfactory annual review of competency progression (ARCP)
Primary FRCA
Specialist trainee (ST) 3 and 4
Intermediate level training certificate (ILTC)
WPBA of essential and optional units of training
Satisfactory ARCP
Final FRCA
ST 5, 6 and 7
Higher and advanced level training
WPBA of essential, optional and advanced units of training
Satisfactory ARCP
Recommendation to the GMC for the award of Certificate of Completion of Training (CCT)
Tools used to facilitate assessment
Direct observation of procedural skills (DOPS)
Anaesthetic clinical evaluation exercise (A-CEX)
Anaesthetic list/clinic/ward management assessment tool (ALMAT)
Case-based discussion (CBD)
Multi-source feedback (MSF)
Clinical supervisors end-of-unit assessment form (CSAF)

*The Royal College of Anesthetists offers guidance on which tool(s) can be used to assess a particular competency, and how the competency maps to the anaesthetic curriculum. Some flexibility in the tools used is allowed due to differences in workplace training opportunities.

Tools of assessment: their strengths and weakness

Miller's triangular framework of clinical assessment proposed four stages of learning that a novice or beginner goes through as they acquire a new skill.[5] Figure 1 illustrates how the tools used in anaesthesia fit along these stages. A summary of the tools together

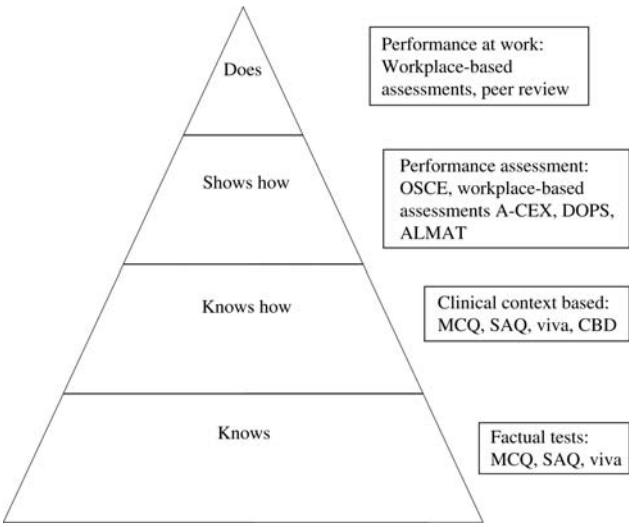

Fig 1 Miller's triangular framework of assessment of clinical competence, together with the appropriate assessment tools used in anaesthesia. For explanation of acronyms see text. Modified with permission from Lippincott Williams & Wilkins.

Table 2 Assessment tools in anaesthesia and their strengths and weaknesses (Modified from Epstein)[3]

Educational tool	Domain(s) tested	Strength	Weakness
Written			
- MCQ (including Single Best Answer)	Knowledge Problem solving	• Test wide breadth of knowledge • Can be marked quickly • Reliable	• Difficult to design appropriate context/ clinical decision making MCQs • Risk of suggesting answers
- SAQ	Knowledge Structure information	• Test decision making • Writing skills • Ordered thinking • Can be context specific • Marking can be objective	• No correlation with clinical situation or future success • Reliability depends on assessor • Takes time to mark answers
Oral- Viva - CBD	Knowledge Clinical Reasoning	• Test knowledge/ understanding/ application	• Marking is subjective • Risk of race/ sex discrimination
OSCE A-CEX DOPS	Skill performance Communication Interpersonal behaviour Clinical performance	• It is objective and structured assessment of what trainee 'can do' • Large numbers of OSCE stations and work place assessments ensure skills are tested more than once • Check list and global marking ensure reliability of assessment • Performance can predict future success (face validity) • Feedback can be structured if standardised checklists are used	• Large numbers of OSCE stations and work place assessments are time consuming and tiring for both student and examiner. Fatigue leads to error by both • Skills are tested in isolation (compartmentalisation), different to real life where several skills performed simultaneously • Snap shot of one performance at one specific time • Cost substantial if trained standardised patients or high fidelity simulators are used
Simulation	Team working Communication Leadership Decision making Situational awareness Empathy	• Recreates real life eg breathing, heart sounds • Allows trainee to practise common and/or rare critical incidents in a non life threatening environment	• Expensive • No proof that high fidelity is more beneficial than low fidelity simulation
Multi-source feedback			
Self assessment	Knowledge of self Attitude Behaviour	• Teaches importance of self reflection as part of professional life	• May dishearten trainee who thinks they are doing well, but find out that they are not
Peer assessment	Interpersonal skills Communication Team working Behaviour	• Peer is at the same level and can appreciate and explain worries in terms that trainee can understand	• Requires training to be effective and of use • Peer may be jealous and give negative feedback
Patient	Patient interaction Patient satisfaction Professional behaviour	• Gives an assessment of the overall benefit of the care given by the trainee	• High marks with little variability • Sickest patients cannot complete assessment • Need 50 patient views to have reliability[6]
Nurses/ ODP	Interpersonal skills Communication Team working Behaviour	• Reliable with10 or more nurse reviews[7] • Able to give views on team working, communication, leadership skills	• Can be biased towards assessors that the trainee gets on with

Abbreviations. MCQ, multiple choice questions; SAQ, short answer questions; CBD, case based discussion; OSCE, objective structured clinical examination; A-CEX, anaesthetic clinical evaluations exercise; DOPS, direct observation of procedural skills; ODP, operating department practitioner

with the domains tested, their strengths, and weaknesses are outlined in Table 2.

Assessing knowledge and 'knows how'

In most countries, knowledge is assessed by a written exam in the form of either multiple choice questions (MCQs) or short answer questions (SAQs). Demonstrating that the trainee 'knows how' to apply that knowledge is assessed by the objective structured clinical examination (OSCE) and vivas. Usually, the examination is in two parts, one to allow the trainee to pass from basic to intermediate training and the next to allow them to pass from intermediate to higher level.

Workplace-based assessments

The names used below are from the UK lexicon, but the principles are generic.

Direct observation, video review, anaesthetic clinical evaluation exercise (A-CEX) or anaesthetic list/clinic/ward management assessment tool (ALMAT)

Trainees and patients interact in a variety of settings, including ward, theatre, labour suite, and intensive care with differing degrees of urgency, from elective to emergency. A consultant or higher trainee can observe and comment on a specific focus of the interaction (e.g. history taking, management of the anaesthetic, or overall progress of the clinical situation). The assessor also asks questions to understand the thought processes and management decisions of the trainee. Feedback and discussion at the end of the assessment focuses on the assessed aspect. The aim is for the trainee to be assessed in several clinical settings and by different assessors.

Directly observed procedural skills (DOPS)

The trainee performs a procedure and the assessor scores based on set criteria. Success depends on the whole performance, not just, for example, whether the correct vein was cannulated during central venous cannulation. Ultimately, it should determine if the trainee is competent and safe to perform the skill independently.

Case- or chart-based discussion (CBD)

The trainee brings a number of anaesthetic records of cases that they have been involved in and the assessor picks one for discussion. The emphasis is upon the decision-making involved in the management of the case, rather than the depth of knowledge. A self-assessment form can be completed before the meeting to help the trainee reflect, develop self-awareness, and gauge how their thoughts compare with the assessor.

Multi-source ('360-degree') feedback (MSF)

Anaesthetists work as part of a team and must show respect, behave appropriately, and be able to communicate effectively with patients and colleagues. Feedback from multi-disciplinary team members, especially non-medical staff, is invaluable in helping the trainee gain insight into how their interaction is perceived by others. Extreme care needs to be taken that a personality clash does not cloud the assessor's feedback and cause ill feeling between the trainee and assessor. Patient feedback can be valuable, but studies show that patients give overly positive feedback for fear of causing detriment to their treatment. Anonymous feedback may help to avoid these errors. This type of assessment should be performed frequently and at different stages of training. Trainees in whom difficulties are identified should be offered help, initially at a local training or educational support system.

Clinical supervisors' end-of-unit assessment form (CSAF)

The trainee's educational supervisor collates the completed WPBAs into a summary form (CSAF). In the UK, this is submitted towards the Annual Review of Competence Progression (ARCP) assessment.

Feedback

Feedback is a two way process. It can be informal (e.g. by clinical supervisors giving feedback after a theatre list) or formal by workplace assessments and feedback from educational supervisors. To be useful and help guide the trainee, feedback needs to be factual, honest, specific, and timely. It should encourage self-reflection, reinforce good medical practice, and provide strategies for improving performance.

Practical problems with assessment tools

Each WPBA takes time to perform, provide objective assessment, and feedback to the trainee. Careful planning is essential. A busy theatre list where service delivery takes priority is not ideal; assessment may not follow the correct structure and the result not representative of the trainee. Trainers are currently not benchmarked or standardized upon their assessment. Conflict of personalities may therefore have a bearing upon the result. A trainee is not obliged to show any unsatisfactory WPBAs that have occurred, thus they may 'cherry pick' the good ones and provide an incorrect view of their competence. Poor organization may lead to several assessments occurring within a short space of time. This may force errors to be made by the trainee and trainer.

Role of the trainee and trainer

A significant cultural change has occurred in the way trainees are assessed. With the reduction in training time, the emphasis has moved from demonstrating sufficient case load/skills have been acquired to providing objective evidence of achievement in a wide range of knowledge, skills, and attributes.

The trainee should understand the principles behind the assessment tools and be proactive in directing their training. He or she should ensure assessments occur frequently, at different times during training, and by different people. This will enable triangulation, where multiple methods of assessment, performed at different times and by different trainers, ensure a representative view of the trainee to be formed.

The trainer should ensure they comply with the GMC Generic standards for specialty including GP training.[8] He or she should take steps to acquire the skills of a competent teacher (e.g. ensure adequately trained to use assessment tools and complete 'teaching the trainer' courses). The consistency of their assessment should be regularly monitored to ensure validity and credibility.

Benchmarking, as part of the GMC remit in faculty development, should ensure their result is consistent with that of other assessors.

Ensuring assessment has been performed

A system to ensure that (i) assessment has occurred and (ii) trainees requiring further focused training are identified at an early stage is essential. The organizations responsible for managing the local educational programme should provide a framework and structure for this to occur. A paper and/or electronic trail (e-portfolio) should exist to provide evidence of appropriate training.

Anaesthetists' non-technical skills (ANTS)[9]

Non-technical skills enhance a worker's technical skills and can help reduce error. A group of anaesthetists and psychologists at Aberdeen University have designed an assessment tool called anaesthetists' non-technical skills (ANTS). It assesses four key attributes integral to professionalism—situation awareness, decision-making, team work, and leadership. The ANTS skills system has been incorporated by the Royal College of Anaesthetists (RCoA) in the assessment of anaesthetic trainees and as a possible attribute for national recruitment of future anaesthetists.[9] Assessors require training in the use of ANTS to increase its validity and credibility.

Future assessments

The goal of future assessment is to identify future clinical performance rather than pure theoretical knowledge. Assessment tools are as good as the assessors, thus their training is paramount and should guarantee validity and credibility. Simulation will play an increasing role in assessing technical and non-technical skills of future trainees and form part of the recruitment process. The UK Primary FRCA exam already has two simulation stations dedicated to simulation and task assessment.

Conclusions

Current CBAs ensure trainees reach a minimum standard of training. Multiple tools used at different points in the training ensure that the weakness of one tool is compensated by another. The future should concentrate on developing tests to ensure safe practice, assess team working skills and on standardizing assessments across the training schemes within a country or indeed a group of countries. A move towards assessing clinical performance rather than theoretical knowledge should be the aim. The value of these tools in predicting future performance is currently being investigated as part of a national recruitment process in anaesthesia. The new RCoA curriculum incorporates technology as a teaching and assessment tool.

Conflict of interest

A.K. is Deputy College Tutor at King's Mill Hospital and L.W. was College Tutor at Nottingham City Hospital and Deputy Training Programme Director of the Nottingham and East Midlands School of Anaesthesia.

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Please see multiple choice questions 21–24.