Accreditation in transoesophageal echocardiography in the UK: the initial experience

H. Skinner1*, N. Morgan-Hughes2, J. Swanevelder3 and R. More4

1 Department of Anaesthesia, Nottingham University Hospitals, Hucknall Road, Nottingham NG5 1PB, UK
2 Department of Anaesthesia, Northern General Hospital, Herries Road, Sheffield S5 7AU, UK
3 Department of Anaesthesia, Glenfield Hospital, Groby Road, Leicester LE3 9QP, UK
4 Department of Cardiology, Blackpool Victoria Hospital, Whinney Heys Road, Blackpool FY3 8NR, UK

* Corresponding author. E-mail: henry.skinner@nuh.nhs.uk

UK accreditation in transoesophageal echocardiography (TOE) commenced as a joint venture between the Association of Cardiothoracic Anaesthetists (ACTA) and the British Society of Echocardiography (BSE) to advance safe practice and set standards.1 The 10th examination is hosted later this year and we describe in this editorial how accreditation has become established among TOE practitioners. Miller2 promoted the idea that assessing a clinical skill requires more than the mere test of knowledge and this is particularly relevant with a complex skill like TOE. He argued that acquisition of (in this case echocardiographic) information, the analyses and interpretation of (echocardiographic and clinical) data, and translating the information into a diagnosis (writing a report) are integral to skill assessment. Formulating a management plan remains the domain of clinicians, and not necessarily the echocardiographer, hence this is not assessed. Competency in TOE is inferred by the practitioner demonstrating sufficient knowledge, skill, and judgement to acquire accreditation. Accredited practitioners should be able to competently perform and report a comprehensive TOE in different clinical settings, as opposed to a basic or focused examination. Accreditation requires passing both the written examination and a practical competency assessment and there is no concept of partial accreditation. To date, 339 out of 468 (78.9%) candidates have passed the examination. The base speciality of candidates was anaesthesia (42%), cardiology (40%), echocardiography (8%), and other/unknown (10%). More than 200 logbooks have been submitted and 150 candidates are accredited in TOE. Approximately 15% of ACTA members are UK TOE accredited, but some members have pursued accreditation through European or other bodies instead and not all ACTA members perform TOE in their practice. In a recent survey of ACTA members, just under 30% of cardiac anaesthetists indicated that they were TOE accredited (personal communication, June 2012). The growth in the number of practitioners pursuing accreditation suggest that it is, as is its European equivalent, accepted as a benchmark of practice.3

The first curriculum for the written examination was based on the transthoracic echocardiography (TTE) curriculum, as most of the theory that underpins TTE applies to TOE. Naturally, the TOE curriculum placed emphasis on the perioperative environment with particular focus on those areas in which TOE was thought to make a difference in outcome, the so-called category I indications.4 The indications for TOE have broadened with both the European Association of Echocardiography and the Society of Cardiovascular Anesthesiologists asserting that it is reasonable to use TOE in every patient undergoing cardiac surgery.4,5 Many recent developments in technology (e.g. 3D, tissue Doppler, myocardial deformation)6 and nomenclature7 are relevant to both TOE and TTE and have been incorporated in the updated TOE curriculum of 20098 and in subsequent examinations. Accreditation in TOE and TTE fall under the remit of the same committee and as a consequence accreditation in both modalities are closely aligned.

The written examination takes place annually and consists of two parts: a theory section and a reporting section. Initial examinations consisted of 75 questions in each section, but these have been reduced. Presently, the reporting section has 50 questions each based on a digital loop or Doppler image which is projected onto a central screen. The time allocation for each question is about 2 min. There are also 50 questions in the theory section. Since 2005, all questions have been set in the ‘single best answer’ format. Questions are categorized into different domains: normal views or cardiac anatomy, diagnostics, surgical application, physics of ultrasound, and limitations of ultrasound. New questions are prepared and reviewed by the examination group during a question setting day. At least 20% of questions are new for each examination. Attempts have been made to make the examination valid by setting questions across the curriculum.
and keeping questions relevant to the practising echocardiographer while avoiding bias to any base speciality. There is a regular turnover of members of the examination group.

Since 2005, examination papers have been independently analysed by London University. The quality of questions is closely monitored as questions that are very difficult can dishearten students and questions at either end of the difficulty spectrum tend not to discriminate well between stronger and weaker candidates. Questions that consistently correlate well with a candidate's total exam score have been retained in the question bank. The Cronbach's $\alpha$ is an indication of the internal consistency of the test items within a test. A value of $>0.7$ indicates good reliability. A value of $0.6-0.7$ suggests that there are a few questions that could be improved. A value of $<0.6$ suggests need for revision of the test and a value of $<0.5$ brings into question the reliability of the test. The $\alpha$-value for the reporting section has varied between 0.62 and 0.78 and for the theory between 0.66 and 0.88 since the examination's inception (Table 1). This would suggest that the examination has been reliable, but with scope for improvement. Candidates have to pass both sections of the exam to gain an overall pass. The pass mark is set by a combination of norm referencing and criterion referencing. A provisional pass mark is set by the examination group, but it may be adjusted after the examination depending on the difficulty of the new questions. The strength of each cohort is measured by comparing performance in repeat questions to previous years. Apart from the initial 3 yr while the process was established, the pass rates have varied between 69% and 81%. The Accreditation Committee endeavours to ensure the examiners have the necessary knowledge to pass or fail a candidate. Question sets are reviewed annually by an external group of examiners. The case-mix is kept to ensure a broad exposure to TOE including in the perioperative environment. Ten randomly selected reports are judged, using a set checklist and scoring sheet, for clarity, presence of minimum data sets, and Doppler data to support findings. From 2011, to increase the validity of logbook assessment, candidates are also required to submit five digitally stored studies. Validity is the ability of the assessment to test what it sets out to test. In this case, logbook assessors checked if image acquisition met the expected standard, if there was appropriate use of different imaging modalities, if cases contained a minimum data set, and if the report concurred with the recorded images. The gold standard for assessing anaesthetic skills is considered to be a combination of checklists and global rating scales.

### Table 1 Number of candidates ($n$), scores (%), pass marks (%), and internal consistency (Cronbach's $\alpha$; proportion) for the reporting and theory sections. Numbers are mean (SD). Overall pass rate (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Venue</th>
<th>n</th>
<th>Reporting Score</th>
<th>Pass mark</th>
<th>Cronbach's $\alpha$</th>
<th>Theory Score</th>
<th>Pass mark</th>
<th>Cronbach's $\alpha$</th>
<th>Pass rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Birmingham</td>
<td>50</td>
<td>72.2 (7.1)</td>
<td>50</td>
<td>84.7 (5.5)</td>
<td>50</td>
<td>96.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Edinburgh</td>
<td>54</td>
<td>60.6 (8.8)</td>
<td>50</td>
<td>65.8 (10.8)</td>
<td>50</td>
<td>86.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Birmingham and Belfast</td>
<td>41</td>
<td>65.5 (12.9)</td>
<td>54</td>
<td>66.9 (13.5)</td>
<td>50</td>
<td>80.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Bournemouth</td>
<td>31</td>
<td>69.6 (10.5)</td>
<td>64</td>
<td>73.2 (11.4)</td>
<td>64</td>
<td>72.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Edinburgh</td>
<td>58</td>
<td>64.4 (11.3)</td>
<td>55</td>
<td>70.9 (10.4)</td>
<td>62</td>
<td>69.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Harrogate</td>
<td>68</td>
<td>67.2 (9.1)</td>
<td>58</td>
<td>65.0 (12.8)</td>
<td>54</td>
<td>69.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Liverpool</td>
<td>36</td>
<td>69.8 (11.7)</td>
<td>60</td>
<td>68.8 (10.0)</td>
<td>60</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Brighton</td>
<td>70</td>
<td>66.6 (12.9)</td>
<td>54</td>
<td>63.1 (11.6)</td>
<td>54</td>
<td>72.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Candidates who spoke English as their first language (67%) had a pass rate of 79.6% compared with 58.3% for those who spoke English as a second or third language ($P=0.004$; $\chi^2$ test). The aim of the examination is not just to test knowledge. It also aims to test the higher domains of learning such as application, analysis, reasoning, and judgement; thus command of English is naturally beneficial. The number of years' experience in TOE made no difference to success in the examination. Candidates who performed 50 or more assessments in the year before the examination (49%) had a pass rate of 79.6% compared with 67.6% in those who performed <50 assessments in the preceding year ($P=0.04$). This suggests that the intensity of training/practice is more important and relevant than the total time of training. Fifty TOE assessments per year is the minimum number generally accepted as the minimum to retain competence and is the number required for re-accreditation. Similar to previous reports, we have confirmed that examination performance is related to the intensity of practice in echocardiography. Candidates have to complete a logbook of 125 cases within 2 yr of passing the written examination. The candidate's local supervisor has to confirm in writing that the candidate has performed the assessments and completed the reports and is competent to do so. The case load required was reduced from 150 to make the process more feasible within the time-frame. The specified case-mix ensures a broad exposure to TOE including in the perioperative environment. Ten randomly selected reports are judged, using a set checklist and scoring sheet, for clarity, presence of minimum data sets, and Doppler data to support findings. From 2011, to increase the validity of logbook assessment, candidates are also required to submit five digitally stored studies. Validity is the ability of the assessment to test what it sets out to test. In this case, logbook assessors checked if image acquisition met the expected standard, if there was appropriate use of different imaging modalities, if cases contained a minimum data set of images and measurements, and if the report concurred with the recorded images. The gold standard for assessing anaesthetic skills is considered to be a combination of checklists and global rating scales.
would suggest that if skills assessment is not performed against set criteria then it lacks reliability and validity. Logbooks are double marked by two blinded assessors. A third assessor arbitrates if one of the assessors has failed the logbook and the other has awarded a pass. From data available, 73% of submitted logbooks passed assessment. The turnaround times for processing logbooks varied widely. The median (range) time was 37 (4–210) days. It is of some concern that only 60% of candidates who pass their examination submit a logbook. Naturally, there is a time lag between a candidate passing the examination and collecting a sufficient number of cases for their logbook. However, some candidates may not be able to perform 125 examinations within the 2 yr period. This could be due to the lack of equipment, low volume of practice, or time constraints. It is felt by the Accreditation Committee that reducing the number of examinations required for the logbook would compromise the validity of accreditation.

The first logbook marking workshop for existing and prospective logbook supervisors and markers was hosted at the BSE 2011 annual conference in Edinburgh. There was a wide range of scores for the same studies by assessors before the workshop. This variance (SD) was significantly reduced after moderation during the workshop. The workshop showed the value of assessor training, and emphasized the future need to monitor the inter-grader variability of logbook assessors, identify outliers, and thereby increase the reliability of logbook marking. Certification in echocardiography has also been a long and intensive process in Europe and the USA. Working groups on TOE have published extensive practice and training guidelines on both sides of the Atlantic and in Japan over the past two decades. The Society of Cardiovascular Anesthesiologists launched their first formal examination in Perioperative TOE in 1998. They combined forces with the American Society of Echocardiography to establish the National Board of Echocardiography, which had the responsibility for examinations and was to develop a certification process in clinical echocardiography. It has been suggested that optimal evaluation may be accomplished by direct observation of the ability to perform and interpret the echocardiographic examination or may take the form of a practical or written examination, or both. Europe followed a similar route with the European Association of Cardiothoracic Anaesthesiologists and European Association of Echocardiography producing a TOE examination and accreditation process in 2005. In 2004, the Japanese Society of Cardiovascular Anesthesiologists launched their first TOE competency examination. Australasia does not have an accreditation process in TOE but maintain their standards through diplomas and degree qualifications from specific institutions. Collaboration between the Intensive Care Society and BSE should lead to similar success for accreditation of echocardiography in critical care—the inaugural examination is planned for the end of 2012.

In our view, the current accreditation process for TOE is valid and reliable in terms of testing knowledge and data interpretation. However, quality assurance of logbook marking is required to enhance the reliability of assessing image acquisition and report writing. The examination group should avoid setting overly complex questions that could discriminate against those who do not speak English as their first language. Consideration should also be given to host computer-based examinations with individual work stations, but this would increase the cost. Greater emphasis on criterion referencing in the examination will help to judge candidates on what they know rather on what their colleagues know. More candidates who are successful in the written examination ought to be encouraged to complete accreditation. Candidates who find it difficult to acquire the required number of cases within their hospital should be encouraged to visit high-volume units to increase their case load and it is hoped that service leads would support this professional development. Online submission of logbooks would simplify the submission process and reduce the turnaround time of logbook marking.

Accreditation in TOE defines achievement of a standard of practice that is consistent with competency and BSE and ACTA deserve credit for agreeing common goals and combining resources to achieve this. However, it is the number of candidates who engage in the accreditation process that gives it credibility and this number is increasing year on year. Accreditation has been widely embraced by those practising TOE and especially those with training responsibilities. Attainment of accreditation increases career prospects and proficiency in TOE is a desirable if not essential prerequisite for a consultant post in cardiac anaesthesia and for a consultant cardiologist post in non-invasive imaging. There is great responsibility resting on any clinician performing a diagnostic TOE, including those in the perioperative setting. This accreditation process not only enables recognition of special competence in TOE against an objective standard, but helps to raise the standard of our practice and patient care.

Declaration of interest

H.S. and N.M-H. have served on the ACTA/BSE TOE Accreditation Committee and J.S. is a current member. R.M. is the past chair of the ACTA/BSE TOE Accreditation Committee.

References

Critical care echocardiography: cleared for take up

S. N. Fletcher* and R. M. Grounds

Department of Critical Care, St Georges Healthcare NHS Trust, Blackshaw Road, London SW17 0QT, UK

* E-mail: nick.fletcher@stgeorges.nhs.uk

Ever since Lewis Fry Richardson, an English physicist, registered a patent for the acoustic echolocation of objects in water in 1912, ultrasound has proved an invaluable technology, and nowhere more so than in medicine. Cardiac ultrasound, or more commonly echocardiography, has been a major component of cardiology practice for nearly half a century. More recently, anaesthetists in the cardiac theatre and the cardiac intensive care unit (ICU) have adapted the transoesophageal technique to perioperative practice. This has facilitated the development of more complex cardiac surgery and improved management of postoperative complications. Most cardiothoracic anaesthetists who are appointed to substantive posts in the UK are now expected to have significant advanced training in echocardiography. The evolution of this development has taken close to two decades to achieve and the first 10 yr of the UK accreditation process is described in detail in the accompanying editorial.1 2

In general ICUs in the UK, echocardiography has remained largely a cardiology delivered service. However, this is certainly not related to a lack of evidence of the efficacy of echocardiography. It is a well-established technique and its diagnostic use is universally recognized. Recently, the volume of the voices calling for intensive care physician delivered echocardiography has been louder, with a number of recommendations and consensus statements appearing in print.3–5 The conundrum has remained of how to move from desire to delivery in a considerably larger specialist group. There are a small number of well-known intensivist echocardiography experts and a larger group of echo ‘probe positive’ enthusiasts looking for either guidance or supervision. Critical care trainees have sought learning opportunities in the excellent FEEL (Focused Echocardiography Evaluation in Life support) and FATE (Focused Assessment with Transthoracic Echocardiography) programmes and