NCCHTA

07 July 2008

I. SUMMARY OF PROPOSAL

TITLE OF PROJECT
Assessment of Surgical Skills of Trainees and Consultants in the Operating Theatre (Ref: RM05/JH32)

LEAD APPLICANT (PRINCIPAL INVESTIGATOR)

Surname(s): Beard
Forename(s): Jonathan David
Title: Mr
Post(s) held: Consultant Vascular Surgeon, Sheffield Vascular Institute; Honorary Senior Lecturer, University of Sheffield; Tutor, Raven Department of Education, Royal College of Surgeons of England; Programme Director for South Yorkshire Foundation Pilot.
Responsibility: Principal investigator, Independent assessor and member of trial management committee
Official Address: Sheffield Vascular Institute, Northern General Hospital, Sheffield, S5 7AU
Telephone Number: 0114 2715534
Fax Number: 0114 2714747
Email Address: Jonathan.D.Beard@sth.nhs.uk

OTHER APPLICANTS

Name: Dr Jim Crossley
Job title: Senior Fellow in Medical Education, Academic Unit of Medical Education, University of Sheffield
Responsibility: Statistics, analysis and member of Trial Management Committee
Official Address: Academic Unit of Medical Education, University of Sheffield, 85 Wilkinson Street, Sheffield S10 2GJ
Telephone Number: 0114 222 5372
Fax Number: 0114 222 5369
Email Address: **j.crossley@sheffield.ac.uk**

Name: Sister Helen Purdie
Job title: Senior Research Sister
Responsibility: Lead assessor and member of Trial Management Committee
Official Address: Clinical Research Facility, Royal Hallamshire Hospital, Sheffield S10 2JF
Telephone Number: 0114 2434343/ 0114 2711900 Long Range Pager
Fax Number: 0114 2714747
Email Address: Helen.Purdie@sth.nhs.uk

Name: Dr Joy Marriott
Job title: Clinical Reseach Fellow
Responsibility: Independent assessor and Obstetrics/Gynaecology lead
Official address: Academic Dept of Reproductive and Developmental Medicine, Jessop Wing, Sheffield S10 2SF
Telephone number: 0114 2711900 Bleep 920
E-mail address: joy.marriott@sth.nhs.uk

Name: Professor David Rowley

Job title: Head of Department, University Dept of Orthopaedic and Trauma Surgery, Ninewells Hospital, Dundee and Director of Education, Royal College of Surgeons of Edinburgh

Responsibility: Orthopaedic Expert and Member of Trial Management Committee

Official Address: University Dept of Orthopaedic and Trauma Surgery, Ninewells Hospital, Dundee, DD1 9SY

Telephone Number: 01382 425746

Fax Number: 01382 496200

Email Address: **d.i.rowley@dundee.ac.uk**

Name: Professor Julian Scott

Job title: Professor of Vascular Surgery, University of Leeds

Responsibility: Principal Investigator at Leeds Teaching Hospitals and member of Trial Management Committee

Department of Genetics, Health and Therapeutics, Clarendon Way, Leeds, LS2 9JT

Telephone Number: 0113 3437721

Fax Number: 0113 3922624

Email Address: **julian.scott@leedsth.nhs.uk**, **meddjas@medphysics.leeds.ac.uk**

Name: Mr Shane MacSweeney

Job title: Consultant Surgeon, Queens Medical Centre, Nottingham and Tutor, Raven Department of Education, Royal College of Surgeons of England

Responsibility: Principle Investigator at Nottingham Teaching Hospitals and member of Trial Management Committee

Official Address: : Department of Vascular and Endovascular Surgery, E Floor West Block, Nottingham University Hospitals NHS Trust, Derby Road, Nottingham NG7 2UH

Telephone Number: 0115 924 9924 ext 64224

Fax Number: 0870 0515859

Email Address: **shane.macsweeney@virgin.net**

Name: Mr William Thomas

Job title: Consultant Surgeon, Royal Hallamshire Hospital, Sheffield and Chair of Faculty Development for the Intercollegiate Surgical Curriculum Project.

Responsibility: Member of Trial Monitoring Committee

Official Address: Department of Surgery, Royal Hallamshire Hospital, Sheffield S10 2JF

Telephone Number: 0114 2712820

Fax Number: 0114 2713512

Email Address: **Bill.Thomas@sth.nhs.uk**

Name: Professor Richard Reznick

Job title: Professor of Surgery, University of Toronto

Responsibility: Member of Trial Steering Committee

Official Address: University of Toronto, The Banting Institute, Suite 311, 100 College Street
Toronto, Ontario M5G 1L5

Telephone Number: (416) 340 4110

Fax Number: (416) 978 3928

Email Address: **richard.reznick@utoronto.ca**

Name: Professor Brian Jolly

Job title: Head of Department, Centre for Medical and Health Sciences Education, Monash University, South Australia

Responsibility: Chair of Trial Monitoring Committee

Official Address: Centre for Medical and Health Sciences Education, Building 15, Clayton Campus, Victoria 3800

Telephone Number: +61 3 9905 8032

Fax Number: +61 3 9905 1273

Email Address: brian.jolly@med.monash.edu.au

SUMMARY OF RESEARCH

Aims of Project: To compare the validity, reliability and user satisfaction of three different methods of assessing surgical skills in the operating theatre.

Research Subject Group and Location: Consultant and trainee surgeons in Upper GI, Colorectal, Vascular, Orthopaedic and Cardiothoracic and Obstetrics & Gynaecology Surgery at three teaching hospitals (Sheffield, Leeds and Nottingham).

Sample Size: 40-80 assessments over 16 months for each of 14 index procedures in 6 specialties: laparoscopic cholecystectomy, open inguinal hernia repair, right hemicolectomy, anterior resection, carotid endarterectomy, aortic aneurysm repair, total knee replacement, total hip replacement, coronary artery bypass, aortic valve replacement, elective caesarean section, urgent caesarean section, diagnostic laparoscopy and evacuation of uterus.

Methods of Working: Three different assessments of surgical skills: Objective Structured Assessment of Surgical Skill (OSATS), Procedure-Based Assessment (PBA) and Non-Technical Skills for Surgeons (NOTSS) will be compared using direct observation in the operating theatre by one or more independent assessors. Fourteen different procedures in six specialties will be included to check that the methodology is not procedure or specialty specific. The seniority and experience of the surgeon will be recorded as a measure of construct validity. The duration of the operation, peri-operative blood loss and post-operative surgical complications will be recorded as measures of predictive validity. Assessments will also be undertaken by the supervising consultant, theatre sister and anaesthetist to study inter-rater variation. The surgeon will also perform a self-assessment. If the surgeon is a trainee, verbal feedback will be provided by the supervising consultant. User satisfaction and educational impact will also be studied. Video recordings will be assessed by specialty experts to assess their fidelity and will be used as an adjunct to feedback.

TIMESCALE

Proposed starting date: April 2007

Proposed duration: 2 Years 4 Months

ETHICS

Is Ethics Committee approval needed? Yes

If yes, do you foresee any problems with obtaining ethical approval? No

COST

Total Research Grant Requested from this programme: £ 193 685

II. DETAILS OF PROPOSED RESEARCH

Background

Surgical training in the UK has traditionally been based upon an apprenticeship and examination model. Trainees must complete a set number of years of training and pass the Intercollegiate Examination of the Royal Colleges of Surgeons (FRCS), in order to achieve their Certificate of Completion of Specialist Training (CCST). Technical skills are not formally assessed. Log books form a useful record of experience (Galasko et al, 1997) but this does not guarantee competence, as we have shown (Thornton et al, 2003). Competence can be defined as '*what a person does in a controlled representation of professional practice'* e.g. when a trainee performs an operation under supervision (Rethans et al, 2002). Competence usually comes from experience (practice) combined with positive feedback (Reznick 1993) and positive feedback has been defined as *'an informed, non-evaluative, objective appraisal that is intended to improve clinical skills.'* (Rogers, 1969). Performance can be defined as '*what a person does in actual professional practice'* (Rethans et al, 2002). The opportunity to gain experience in the operating room is also decreasing. We, and others, have shown a reduction in the numbers of operations undertaken and the level of competence achieved by surgical trainees (Katory at al, 2001) The reasons for this reduction include shorter training time following the Calman Report (Calman et al, 1999), the European Directive on Hours of Work (DOH, 2003) and new working practices which mean that more operations are performed by consultants. Thus, the traditional apprenticeship model, where technical competence was usually achieved through many years and long hours, seems no longer appropriate.

Although attractive, measurement of the performance of consultant surgeons based on outcomes is fraught with difficulty due to variation in case-mix, and the large numbers required for reliability (Prytherch et al 2001). It is probably a good screening method, but tests of competence will be required for those consultants in whom there is cause for concern. Measurement of performance using outcomes of trainee surgeons may be even more difficult, because errors made by trainees are often corrected (masked) by their supervising consultant (Szalay et al, 2000). For this reason, the skills assessments developed by the GMC Performance Procedures (Beard et al, 2005) and by the Intercollegiate Surgical Curriculum Project (www.iscp.uk) have been competence-based. The ISCP is a collaborative venture between all the Specialty Surgical Associations and the Royal Colleges of Surgeons in the UK and Ireland. Trainees' progress through the new Intercollegiate Surgical Curriculum will be measured by an integrated framework of workplace based assessments, annual reviews (RITAs) and examinations. The various assessment instruments are designed to provide a mixture of formative feedback to trainees, and summative assessments which must be cleared in order to progress. The overall assessment strategy and the individual assessment tools conform to the assessment principles laid down by the Postgraduate Medical Education and Training Board (PMETB, 2005), and the assessment tools are designed to measure all the domains of *Good Medical Practice* (GMC, 1998).

It seems axiomatic that direct observation of technical skill in the operating theatre represents the 'gold standard' in terms of content and construct validity. The technical skills of trainees in the operating theatre was first assessed objectively, using a two-part structured Technical Skills Assessment Form (STSF), by Reznick's group in Toronto (Winckel et al, 1994). Part 1 consists of the essential components of the procedure (Task Specific Checklist). Part 2 is a Global Rating Form which consists of more non-specific items e.g. handling of instruments and communication with the theatre staff. The group used the same assessment methodology, renamed Objective Structured Assessment of Technical Skill (OSATS), on surgical simulations in the skills laboratory with similar results (Martin et al, 1997). They also showed that global ratings possessed slightly better construct validity when comparing a mixed group of trainees and consultants (Regehr et al, 1998). We have recently confirmed this finding but interestingly found that checklists were more discriminatory for trainees (Beard 2006). The assessment method used depends upon the purpose of assessment. One purpose is to provide feedback to aid learning (formative assessment) e.g. during training. Another is to check that a level of competence has been achieved or maintained (summative assessment) e.g. for certification or revalidation. These two purposes are not mutually exclusive – there is no reason why a 'summative' assessment should not provide feedback and a collection of formative assessments can also be viewed summatively.

Dual assessments are time consuming to perform and each method may have different roles. Global ratings seem useful when assessing more complex operations, especially when there is more than one method of performing the task correctly, or when assessing experts for the purposes of certification or revalidation. Task-specific checklists provide a trainee with detailed instructions and feedback of how to undertake the operation in an approved way. We have developed a simpler assessment tool for saphenofemoral ligation which combines task-specific and global items (Beard et al, 2005). This has been validated against the standard global rating method and seems a good test of technical skills for intermediate trainees. The Procedure Based Assessment (PBA), adopted by the ISCP as the main workplace based assessment for surgical trainees, is a similar combination of task-based and global items, together with a summary judgement about the competence of the trainees to perform that operation. However, little validation of PBA has been done, especially regarding its transferability to a wide range of specialties and procedures.

One concern about PBA and other such technical assessment, is that they may not reflect 'higher-order' skills that underpin technical proficiency, such as situation awareness, decision making, team working and leadership. The NOTTS tool has been developed by the Department of Psychology at the University of Aberdeen, in collaboration with the Royal College of Surgeons of Edinburgh, to address these areas of Non-Technical Skills for Surgeons (www.abdn.ac.uk/iprc/notts). The NOTTS system comprise a three-level hierarchy consisting of categories (at the highest level), elements and behaviours: four skills categories (situation awareness, decision making, communication and teamwork, leadership) and 12 elements make up the skills taxonomy with examples of good and poor behaviours provided for each element. The aim is to provide a common terminology that allows all those working in this area to understand each other and a framework for trainee and consultant surgeons to develop their abilities in the workplace (Yule et al, 2006).

Another question is whether such assessments can be reliably performed by other healthcare professionals, e.g. theatre nurses, as this could ease the assessment burden for consultants. A standard-setting exercise conducted by the Vascular Society suggested that theatre nurses were able to reliably discriminate between different levels of operative competence (Beard et al 2005). Multi-professional assessment has been shown to possess good reliability for the multi-source feedback tool (Mini-PAT) which has been adopted by the Foundation Programme and by the ISCP to assess aspects of professional behaviour (Archer at al, 2005). Self assessment is another important component of Mini-PAT as this provides valuable information about insight, which seems vital for the development of competence (Hays and Jolly, 2002). There have been few studies of the reliability of self-assessment and none in surgery (Fitzgerald et al, 2003).

Video-recording of operations for subsequent analysis may prove useful when external assessment is required. A portfolio of recorded consultations forms part of the requirement for the Membership of the Royal College of General Practitioners (ref). Many operating theatres are now equipped with camera lights and video monitors. We have shown good inter-rater reliability between direct and video assessment of saphenofemoral ligation (Beard). However, Scott et al found that global assessment of edited videotapes of laparoscopic choleystectomies did not correlate well with direct observation (Scott). A study conducted on behalf of the Vascular Society also found that video recordings of trainees performing carotid endarterectomies could not be scored reliably without information on the amount of help provided by the trainer who was assisting (unpublished data). Reliability for more complex operations may be improved by dual recordings of the operative field and the operating room, combined with voice recordings. Video recordings, combined with structured assessment forms may provide a powerful feedback tool (Backstein et al, 2004)

Purpose of Research

The aim of this study is to compare the validity, reliability and user satisfaction of three different methods of assessing surgical skills in the operating theatre. Content validity (whether it contains all the components required), construct validity (whether it measures what it is supposed to), predictive validity (correlation with outcome) and educational validity (impact on learning) will be studied. The reliability of various assessors and video recordings (inter-rater reliability) and inter-specialty differences will also be studied as will insight, acceptability and educational impact. The information provided by this study will be of great value to the Intercollegiate Surgical Curriculum Project, the GMC Revalidation and Performance Procedures and the National Clinical Assessment Authority. It will also inform the selection of performance objectives and metrics for subsequent simulation design.

Subject Group, Location and Sample Size

Consultant and trainee surgeons in Upper GI, Colorectal, Vascular, Orthopaedic, Cardiothoracic and Obstetrics&Gynaecology Surgery at three teaching hospitals (Sheffield, Leeds and Nottingham) will be assessed. The advantage of using three hospitals is that a larger number of assessments can be obtained in the time available. 40-80 assessments over 16 months for each of the 14 index procedures will be undertaken: open hernia repair, laparoscopic cholecystectomy, right hemicolectomy, anterior resection, carotid endarterectomy, aortic aneurysm repair, total knee replacement, total hip replacement, coronary artery bypass, aortic valve replacement, elective caesarean section, urgent caesarean section, diagnostic laparoscopy and evacuation of uterus. Each surgeon will be assessed undertaking the two relevant index procedures on at least two occasions, to help compensate for variation in case complexity. The two operations will be preferably be performed on the same day, but otherwise with as little delay as possible, to avoid any significant training effect. To find a significant correlation between two variables that is different from zero can be done with about 28 subjects if that correlation is 0.7, but if it is only 0.3 the SS goes up to 136. A minimum of 50-60 subjects in each operation group will be required to estimate these curves. This will detect whether the five operations were significantly different in their learning curve characteristics, e.g. the confidence limits would not cross, or do so for only part of the curve, or two linear slopes were different. For multiple regression, the larger the sample size the better.

These major operations are all performed on a daily/weekly basis at all three centres. The lead assessor will be based in Sheffield and visit Nottingham and Leeds one day each week. Three days each week will be spent collecting assessments, one day spent collating the data and one day spent following up the in-hospital outcomes and

scheduling the next week's assessments. Support will be provided by the administrative and secretarial assistant, who will also be responsible maintaining the record of expenditure.

The reason for selecting these 14 operations is that the task analyses for these particular operations have already been developed by the PI in Sheffield for the GMC Performance Procedures (Beard). They were each subsequently validated for content by at least 10 specialist consultants and senior trainees from Sheffield, Nottingham and Leeds. PBAs for these operations have since been written by the respective Specialty Advisory Committees for the ISCP. These operations also represent typical index procedures for each specialty.

Methodology
Three different assessment methods will be compared in terms of the parameters outlined in the aims and objectives. These are the Objective Structured Assessment of Surgical Skill (OSATS), using global rating scales, the Procedure-Based Assessment (PBA) which has been adopted as the main workplace-based assessment tool for the ISCP and Non-Technical Skills for Surgeons (NOTSS). The assessment forms can be found in Appendix 1.

The lead assessor or administrative assistant will telephone the relevant surgical departments to obtain the details of potentially suitable operations at the three hospitals each week. Once suitable operations will be identified, the surgeon, assistant, theatre sister and anaesthetist will be informed. The surgeon will be asked to provide information on their age, gender, country of qualification, duration of training, the total number of operations previously performed and the number in the last 6 months (plus duration of practice if a consultant) and whether or not they have received any training in assessment, as these have all been shown to have an effect in other workplace-based assessments. The patient will also be given an information leaflet explaining the study, and consent for video recording obtained by the surgeon, principle investigator or lead assessor. Prior to the operation the recording equipment will be assembled by the lead assessor and the PBA and NOTTS forms with written instructions given to the surgeon and assistant. The patient information sheet, consent form and instruction sheet for the surgeon and assistant can be found in Appendix 2. During the operation the lead assessor will complete the PBA, NOTSS and OSATS forms as well as recording the ASA status of the patient, the duration of the operation, the difficulty of the operation, blood loss and any intra-operative complications. The surgeon and assistant will complete their assessment forms at the end of the operation and, if the surgeon is a trainee, the supervising consultant will be asked to provide feedback. They will also record how long the forms took to complete and their satisfaction with the new assessment methods, using Kirkpatrick's model for evaluating educational outcomes (Freeth 2003). The theatre sister and the anaesthetist will also be asked to complete a NOTSS form. Completion of the forms and the subsequent discussion should not impact on service delivery as there is usually plenty of time between cases. After discharge the lead assessor will examine the case records to record any postoperative complications and the length of stay.

Surgeons will be sent a questionnaire by email about one month after their assessment to further evaluate the educational impact of the new assessment methodology, after a period for reflection, again using Kirkpatrick's model. Some surgeons may be subsequently asked to perform a simulated operation in the skills laboratory (e.g. the carotid endarterectomy model manufactured by Limbs & Things) to study the correlation between simulation and reality.

Videos of the operating field and operating room will be recorded screen-in-screen, together with sound onto DVD. Specialty experts will perform the same assessments from the DVDs and will not be informed of the identity, seniority or experience of the surgeon. The specialty experts will also be asked to comment on any discrepancy between the assessments recorded the lead assessor and the surgeons. It is likely that the experts might recognise some of the surgeons and trainees but a previous study showed no evidence of any halo effect using this method. The recordings can be assessed in fast playback mode, which we have used successfully for the analysis of operative recordings in the past. The videos will also be reviewed by some of the trainees and supervising consultants as an adjunct to the verbal feedback provided.

Any concern about poor surgical practice expressed by the lead assessor or the specialty expert will be reported to the lead investigator. The lead investigator will review the evidence and notify the relevant clinical director, if indicated, after discussion with the Chair of the Trial Monitoring Committee.

Analysis
Satisfaction will be judged according to a simple presentation of the responses from the surgeon and the assistant. This will be presented as a proportion of responses in each response category and a digest of unstructured comments.

Reliability indicates how well an assessor's score of the surgeon's performance (using each assessment method) would reflect any assessor's score when the surgeon undertakes the procedure on any patient. It will be presented as the standard error of measurement of a single score, and as the number of assessors and cases that need to be combined to reach a pre-determined level of reliability. Its calculation depends on comparing the effect of assessor-to-assessor variation and case-to-case variation in scores (sources of error) with overall surgeon-to-surgeon variation in scores. The analysis will be conducted using generalisability theory. The G-study, or variance component analysis, will be conducted using the VARCOMP procedure in SPSS. The MINQUE method will be used because of its

superior handling of unbalanced data. The model will assume that all effects are randomly sampled from an infinite universe, and will estimate the effect on score of surgeon, case (nested within surgeon), assessor (partially crossed with surgeon), assessor designation (lead assessor, assistant, nurse, anaesthetist), and the second-order effects of assessor and surgeon designation. Redundant effects will be excluded by reverse stepwise regression. The variances obtained will be combined using the standard formula for standard error of measurement and using Cronbach's equations to estimate the effect of multiple assessors or cases.

Validity indicates how well the score reflects the intended construct of 'surgical performance'. The study provides many sources of information about validity and these will all be presented in evidence for or against the validity of the two methods. If valid, the following hypotheses will be fulfilled:

1 Scores obtained by each assessment method will correlate with the other assessment method.

2 Scores will increase with duration of training, number of similar procedures performed (experience), and duration of practise if a consultant (seniority).

3 Higher-scoring operations will result in less peri-operative blood loss and in fewer peri-operative and post-operative complications and shorter length of stay.

4 Mean scores, and scores for each element, will not be significantly different across the nine different procedures.

Each of these hypotheses will be tested. Pearson's method will be used for hypothesis 1 and 2. A cross-tabulation method will be used for hypothesis 3. A one-way ANOVA will be used for hypothesis 4.

Secondary outcomes will include:

1 The relationship between assessed scores and self-scores as a measure of insight of the surgeon. Scores will be compared for correlation using Pearson's method.

2 The validity (fidelity) of video as an indicator of directly observed performance. Scores will be compared for correlation using Pearson's method.

3 The validity (fidelity) of simulators as an indicator of directly observed performance. Scores will be compared for correlation using Pearson's method.

4 The educational impact of the assessment on trainees. The satisfaction of the trainee, immediately after feedback, will be compared with the lead assessor and consultant supervisor's scores using Pearson's method. Links between identified learning objectives, other comments and the scores will also be studied using qualitative methods of analysis. Ideally, we would like to demonstrate that performance on the procedures improved over time in a group being given feedback from the assessments, compared to a control group not being given such feedback. We hope that this will be the subject of a subsequent randomised trial.

5. Educational impact at one month in terms of progression to higher levels on Kirkpatrick's model e.g. have the surgeons used the assessment methods again?

Scheduling

COREC and Local Research Ethics Committee approval will be obtained prior to the commencement of the study in April 2007. The Trial Management Committee and Monitoring Committee will also meet or teleconference, initially separately, and then together. Purchase of the audiovisual equipment and training of the lead assessor in its use, and in the assessment methodologies and giving feedback will also be undertaken before this time. Site visits to the operating theatres, meetings with the specialty departments involved, identification of consultants and trainees plus some preliminary data collection will be undertaken during the first two months of the study. This process will be facilitated by the PIs at Sheffield, Leeds and Nottingham. Data collection will then continue for 16 months, leaving 6 months for data analysis and writing.

Output of Study

Day-to day management of the trial will be the responsibility of the PI and lead assessor, helped by the other members of the Trial Management Committee when required. The Trial Monitoring Committee will provide overall supervision to ensure that the study is conducted to according to the DH's research governance framework and the MRC's Guidelines for Good Clinical Practice, including trial progress, adherence to protocol and patient safety. Interim reports on progress will be provided to the sponsor at 6, 12 and 18 months. A final report will be issued within 24 months. The interim and final reports will comply with the requirements for such reports. Presentation to learned societies such as the Association of Surgeons AGM and the Annual Ottawa Medical Education Conference, as well as

publication in related journals such as the British Journal of Surgery and Medical Education, is planned, subject to approval.

References

Archer J.C., Norcini J., Davies H.A. (2005) Use of SPRAT for peer review of paediatricians in training. *BMJ*, 330, 1251-3.

Backstein D, Agnidis Z, Regehr G, Reznick RK: The effectiveness of video feedback in the acquisition of orthopedic technical skills. American Journal of Surgery 2004: 187: pp 427-432.

Beard J.D., Jolly B.C., Southgate L.J., Newble D.I., Thomas W.E.G. Rochester J. (2005) Developing assessments of surgical skills for the GMC Performance Procedures. *Ann R Coll Surg Engl*, 87, 242-247

Beard J.D. on behalf of the Education and Training Committee of the Vascular Society. (2005) Setting standards for the assessment of operative competence. *Eur J Vasc Endovasc Surg*, 30, 215-218

Beard J.D., Jolly B.C., Newble D.I., Thomas W.E.G., Donnelly J., Southgate L.J. (2005) Assessing the technical skills of surgical trainees. *Br J Surg*, 92, 778-782

Calman K.C., Temple J.G., Naysmith R., Cairncross R.G., Bennett S.J. (1999) Reforming higher specialist training in the United Kingdom – a step along the continuum of medical education. *Medical Education,* 33, 28-33

Department of Health. (2003) *European Working Time Directive* www.doh.gov.uk/workingtime/index.htm

Fitzgerald J.T., White C.B., Gruppen L.D.(2002) A Longitudinal study of self-assessment accuracy. *Med Educ*, 37, 645-649

Freeth D., Hammick M., Reeves S., Barr H. (2003) Critical review of evaluations of interprofessional education. *Higher Education Academy Learning and Teaching Support Network for Health Sciences and Practice,* London.

General Medical Council. (1998) Good Medical Practice. *General Medical Council*, London.

Galasko C. Mackay C. (1997) Unsupervised surgical training: logbooks are essential for assessing progress. *British Medical Journal*, 315, 1306-1307

Hays RB, Jolly BC. (2002) Is insight important? Measuring capacity to change performance. *Med Educ,* 36, 967-971

Joint Committee on Postgrad Training for General Practice (2004) www.jcptgp.org.uk/certification/assessment.asp

Katory M., Singh S., Beard J.D. (2001) Twenty Trent trainees: a comparison of operative competence after BST. *Ann R Coll Surg Engl (Suppl,),* 83, 328-330

Martin J.A., Regehr G., Reznick R. MacRoe H., Murnaghan J., Hutchinson C. (1997) Objective structured assessment of technical skill (OSATS) for surgical residents. *Br J Surg,* 84, 273-278

PMETB (2005) Guidance from the Examinations in Postgraduate Medicine and the Workplace Based Assessment Subcommittees of the Postgraduate Medical Education and Training Board. Quality Assurance, Quality Control and Assessment Systems.
www.pmetb.org.uk/media/pdf/1/a/PMETB_quality_assurance_quality_control_and_assessment_systems_guidance_(1_August_2005).pdf

Prytherch D.R., Ridler B.M.F., Beard J.D. Earnshaw J.J. on behalf of the Audit and Research Committee of the Vascular Society of Great Britain & Ireland. (2005) A model for national outcome audit in vascular surgery
Eur J Vasc Endovasc Surg, 21, 477-483

Regehr G., MacRae H., Reznick RK., Szalay D (1998) Comparing the psychometric properties of checklists and global rating scales for assessing performance on an OSCE-format examination. *Acad Med*, 73, 993-997.

Rethans J-J., Norcini J.J., Baron-Maldonado M., Blackmore D., Jolly B.C., LaDuca T., Lew S., Page G.G., Southgate L.H. (2002) The relationship between competence and performance: implications for assessing practice performance. *Med Educ,* 36, 901-909.

Reznick R.K. (1993) Teaching and testing technical skills. *Am J Surg,* 165, 358-361

Rogers C.R. (1969) *Freedom to learn*. Merrill, 103-105. Columbus, Ohio

Scott D.J., Rege R.V., Bergen P.C., Guo W.A., Laycock R., Tesfay S.T., Valentine R.J., Jones D.B. (2000) Measuring operative performance after laparoscopic skills training: edited videotape versus direct observation. J *Lap Adv Surg Tech,* 10, 183-190

Szalay D., MacRae H., Regehr G., Reznick R.. (2000) Using operative outcome to assess technical skill. *Am J Surg*, 180, 234-237

Thornton M., Donlon M., Beard J.D. (2003) The operative skills of higher surgical trainees: measuring competence rather than experience undertaken. *Ann R Coll Surg Engl,* 85, 190-193.

Winckel C.P., Reznick R.K., Cohen R., Taylor B. (1994) Reliability and construct validity of a structured technical skills assessment form. *Am J Surg*, 167, 423-427

Yule S., Flin R., Paterson-Brown S., Maran N., Rowley D. (2006) Development of a rating system for surgeons' non-technical skills. *Medical Education,* 40, 1098-1104.

Version 8 18/10/2007

Appendix 1

OSATS

CRITERIA FOR THE GLOBAL RATING OF SURGICAL PERFORMANCE

PROCEDURE: **DATE: / /**

Aseptic Technique

1	2	3	4	5
Sloppy technique with high risk of contamination		Reasonable technique but some lapses that risk loss of sterility		Careful technique with little risk of compromising sterility

Respect for Tissue

1	2	3	4	5
Frequently uses unnecessary force on tissue or caused damage		Careful handling of tissue but occasionally causes inadvertent damage		Consistently handles tissue well with minimal damage to tissue

Haemostasis

1	2	3	4	5
Poor control of bleeding by wrong method or causing tissue damage		Haemostasis usually competent but some lapses of control or choice of method		Prompt control of bleeding by appropriate method with minimal tissue damage

Knotting & Suturing

1	2	3	4	5
Defective techniques resulting in poor tissue apposition and unsafe knots		Knotting and suturing usually reliable but sometimes awkward		Sound techniques with smooth action

Time & Motion

1	2	3	4	5
Slow with many unnecessary moves and instrument changes		Makes reasonable progress but some unnecessary moves		Clear economy of movement and maximum efficiency

Instrument Handling & Safety

1	2	3	4	5
Repeatedly makes tentative, awkward or unsafe moves with instruments		Competent use of instruments but occasionally awkward or tentative		Fluid movements with instruments and no stiffness

Knowledge of Instruments

1	2	3	4	5
Frequently asks for or uses wrong instrument		Knows names of most instruments and uses them appropriately		Obviously familiar with all instruments and their names

Use of Assistant

1	2	3	4	5
Consistently places assistant poorly or fails to use them		Appropriate use of assistant most of the time		Uses assistant to the best advantage at all times

Knowledge of Specific Procedure

1	2	3	4	5
Requires specific instruction for most steps of the procedure		Knows all the important steps of the procedure		Demonstrates familiarity with all steps of the procedure

---

Quality of Final Product

1	2	3	4	5
Final product well below standard and likely to fail		Final product has deficiencies but would probably function adequately		Excellent final product with no flaws and likely to function well

TOTAL SCORE (MAX 50):

Name and role of person completing form (Independent Assessor, Specialty Expert, Surgeon or Assistant) **Name:** **Role:**
Comments (including strengths and areas for development):

Version 8 18/10/2007

[Specialty] PBA: [Procedure]

Surgeon:	**Assistant:**	**Date:**
Start time:	**End time:**	**Duration:**
Operation more difficult than usual? Yes / No **(If yes, state reason)**		

The Surgeon should explain what he/she intends to do throughout the procedure
The Assistant (if supervising) should provide verbal prompts, if required, and intervene if patient safety is at risk.

Rating: **N = Not observed or not appropriate** **D = Development required**
S = Satisfactory standard for CCT (no prompting or intervention required)

	Competencies and Definitions	Rating **N/D/S**	Comments
1.	Consent		
C1	Demonstrates sound knowledge of indications and contraindications including alternatives to surgery		
C2	Demonstrates awareness of sequelae of operative or non operative management		
C3	Demonstrates sound knowledge of complications of surgery		
C4	Explains the procedure to the patient / relatives / carers and checks understanding		
C5	Explains likely outcome and time to recovery and checks understanding		
1.	Pre operative planning		
PL1	Demonstrates recognition of anatomical and pathological abnormalities (and relevant co-morbidities) and selects appropriate operative strategies / techniques to deal with these		
PL2	Demonstrates ability to make reasoned choice of appropriate equipment, materials or devices (if any) taking into account appropriate investigations e.g. x-rays		
PL3	Checks materials, equipment and device requirements with operating room staff		
PL4	Ensures the operation site is marked where applicable		
PL5	Checks patient records, personally reviews investigations		
1.	Pre operative preparation		
PR1	Checks in theatre that consent has been obtained		
PR2	Gives effective briefing to theatre team		
PR3	Ensures proper and safe positioning of the patient on the operating table		
PR4	Demonstrates careful skin preparation		
PR5	Demonstrates careful draping of the patient's operative field		
PR6	Ensures general equipment and materials are deployed safely (e.g. catheter, diathermy)		
PR7	Ensures appropriate drugs administered		
PR8	Arranges for and deploys specialist equipment (e.g. image intensifiers) effectively		
7.	Exposure and closure		
E1	Demonstrates knowledge of optimum skin incision / portal / access		
E2	Achieves an adequate exposure through purposeful dissection in correct tissue planes and identifies all structures correctly		
E3	Completes a sound wound repair where appropriate		
E4	Protects the wound with dressings, splints and drains where appropriate		

	Competencies and Definitions	Rating N/D/S	Comments
7.	Intra operative technique: global (G) and task- specific items (T)		
IT1(G)	Follows an agreed, logical sequence or protocol for the procedure		
IT2(G)	Consistently handles tissue well with minimal damage		
IT3(G)	Controls bleeding promptly by an appropriate method		
IT4(G)	Demonstrates a sound technique of knots and sutures/staples		
IT5(G)	Uses instruments appropriately and safely		
IT6(G)	Proceeds at appropriate pace with economy of movement		
IT7(G)	Anticipates and responds appropriately to variation e.g. anatomy		
IT8(G)	Deals calmly and effectively with unexpected events/complications		
IT9(G)	Uses assistant(s) to the best advantage at all times		
IT10(G)	Communicates clearly and consistently with the scrub team		
IT11(G)	Communicates clearly and consistently with the anaesthetist		
IT12 (T)	Task-specific item (add as many task-specific items as required)		
I.	Post operative management		
PM1	Ensures the patient is transferred safely from the operating table to bed		
PM2	Constructs a clear operation note		
PM3	Records clear and appropriate post operative instructions		
PM4	Deals with specimens. Labels and orientates specimens appropriately		

Global summary

Level at which completed elements of the PBA were performed on this occasion		Tick as appropriate
Level 0	Insufficient evidence observed to support a summary judgement	
Level 1	Unable to perform the procedure, or part observed, under supervision	
Level 2	Able to perform the procedure, or part observed, under supervision	
Level 3	Able to perform the procedure with minimum supervision (needed occasional help)	
Level 4	Competent to perform the procedure unsupervised (could deal with complications that arose)	

Name and role of person completing form (Independent Assessor, Specialty Expert, Surgeon or Assistant)

Name:

Role:

Comments (including strengths and areas for development):

Version 8 18/10/2007

NON TECHNICAL SKILLS FOR SURGEONS (NOTSS)

PROCEDURE: DATE: / /

Category	Category rating*	Element	Element rating*	Feedback on performance and debriefing notes
Situation Awareness		Gathering information		
		Understanding information		
		Projecting and anticipating future state		
Decision Making		Considering options		
		Selecting and communicating option		
		Implementing and reviewing decisions		
Communication and Teamwork		Exchanging information		
		Establishing a shared understanding		
		Co-ordinating team activities		
Leadership		Setting and maintaining standards		
		Supporting others		
		Coping with pressure		

* 1 Poor; 2 Marginal; 3 Acceptable; 4 Good; N/A Not Applicable

1 Poor	Performance endangered or potentially endangered patient safety, serious remediation is required
2 Marginal	Performance indicated cause for concern, considerable improvement is needed
3 Acceptable	Performance was of a satisfactory standard but could be improved
4 Good	Performance was of a consistently high standard, enhancing patient safety; it could be used as a positive example for others
N/A	Not Applicable

Name and role of person completing form (Independent Assessor, Specialty Expert, Scrub Nurse, Anaesthetist, Surgeon, Assistant)

Name:

Role:

Comments (including strengths and areas for development):

-