



# Feasibility, validity and reliability of Procedure Based Assessment as a work based assessment tool in cardiothoracic surgery: A pilot study

Short Title: Procedure Based Assessment

Mr. Mahmoud Loubani

Consultant Cardiothoracic Surgeon/Honorary; Clinical Senior Lecturer; Deputy Director of Medical Education  
Department of Cardiothoracic Surgery, Castle Hill Hospital, Hull and East Yorkshire Hospitals NHS Trust

[Mahmoud.Loubani@hey.nhs.uk](mailto:Mahmoud.Loubani@hey.nhs.uk)

## Abstract

**Background:** The change in surgical training from an apprentice model to competency based model has necessitated the introduction of a number of work based assessment tools. The Procedure Based Assessment (PBA) involves assessment of trainee performance at the highest level of competence at the "does" level of competence with the trainee performing whole operations in the work place.

**Methods:** Review of the evidence for the use of workplace based assessment tools and in particular procedure based assessment with an aim to assess the feasibility, validity and reliability of a PBA of Coronary Artery Bypass Surgery (CABG) in Cardiothoracic Surgery in a pilot study.

**Results:** The literature in support of PBA as a work assessment tools is lacking and sparse. The application of PBA during ten observations of trainees performing coronary artery bypass grafts and assessment by two trainers demonstrated the feasibility, acceptability and reliability of CABG PBA assessment too. Face and content validity was confirmed although construct and

predictive validity of the assessment form could not be confirmed. The tool didn't impact significantly on time resources and was seen to be useful by the majority of trainees and trainers as formative assessment.

**Conclusions:** PBA is a useful tool in formative assessment of trainees providing a structured and reproducible form of feedback and evaluation of surgical competence. The form in use may benefit from the additional of a numerical scoring system to improve its construct validity in order to differentiate the levels of progress and be able to compare the standing of a trainee at different time points in their training.

## Introduction

Surgical training had traditionally been based on an apprentice model with surgical trainees learning their skills from experienced surgeons by spending an unspecified number of years under supervision. The limit on the number of years spent in training introduced by Calman<sup>(1)</sup> coupled with the introduction of the European Working Time Directive reducing the number of hours a trainee can spend at work to 48 hours since August 2009

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has raised significant concerns regarding the adequacy of surgical training with regard to quality and quantity to produce fully trained and qualified surgeons<sup>(2,3,4)</sup>.

The detailed Intercollegiate Surgical Curriculum Programme (ISCP)<sup>(5)</sup> based on competence as the basis for progression might arguably go some of the way to resolve these concerns. The trainees have to achieve competence at all levels to obtain a Certificate of Completion of Training (CCT) as the basis for readiness for independent practice. This can only be effective and successful if based on a comprehensive and accurate assessment of all aspects of competence.

Competence is *"the acquisition of knowledge, skills and abilities at a level of expertise sufficient to be able to perform in an appropriate work setting."*<sup>(6)</sup> and differs from performance in real life<sup>(7,8)</sup>. The complexity of measuring competence increases the more experienced the professional under assessment<sup>(7)</sup>.

There is a distinct difference between competence and competency which should be appreciated<sup>(9)</sup>. Competence although has 4 types and refers to a person while competency only refers to an observed activity<sup>(7)</sup>. However the difference is not so clear in practice and in order to measure competence it has to be broken down into smaller units<sup>(9)</sup> with the concern that this process may result in loss of the focus of the assessment.

The natural environment for teaching and assessing surgical skills is the operating theatre. However issues relating to complexity of surgery and clinical governance led to the search for alternative methods<sup>(10)</sup>. Furthermore, assessment of performance in the operating theatre is difficult and most methods have been suggested to be subjective and potentially unreliable<sup>(11)</sup>. An effective assessment should be based on the five principles of validity, reliability, feasibility, acceptability and educational impact<sup>(12)</sup>.

Validity of an assessment refers to whether it measures what it purports to measure and has a number of forms. These include face<sup>(13)</sup>, content<sup>(14)</sup>, predictive<sup>(15)</sup> and construct validity. Reliability is the *"degree of consistency between two measures of the same thing"*<sup>(16,17)</sup> and can be considered in two ways: reproducibility and internal consistency<sup>(15)</sup>.

A feasible assessment is cost effective, practical and easily applied in a busy clinical setting and incorporated into clinical practice. The assessment should also be acceptable to trainees and trainers as well as the establishment where it is being carried out. Furthermore acceptability to the public is important to assure them of producing competent fully trained surgeons<sup>(18)</sup>.

Finally, an ideal assessment should have an educational impact adding to the knowledge and experience of the trainee. It has to be formative in nature with the trainee learning through appropriate feedback about areas

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of good practice that can be encouraged and areas of poor practice that require remedial action.

The work based assessment tool introduced by the ISCP<sup>(5)</sup> to assess the technical skills of a trainee and their competencies in surgical procedures as well as whole operations is the Procedure based assessment (PBA). However despite the central role these work based assessment tools are given, the evidence of their feasibility, reliability and validity remains scarce.

## Methods

### Research Questions

The two aims of this article are to review the literature and evidence for PBA as workplace based assessments and to conduct a pilot study of one of these in Cardiothoracic Surgery to assess the feasibility, acceptability, validity and reliability and educational impact of this assessment.

CABG operation was chosen as the most common cardiac operation accounting for around 60-70% of the work of the average cardiac surgeon. Furthermore this procedure is used as a marker operation to test the competence of Consultant Cardiac Surgeons by the Society of Cardiothoracic Surgery in Great Britain and Ireland. It is the standard operation that trainees perfect first, of all the various cardiac operations.

### Literature Review

The current literature regarding PBAs will be reviewed in all databases for medical and social science.

### Pilot Study Design

This study involved ten observations of trainees performing a coronary artery bypass operation (CABG). Each observation had two observers to assess the trainee using the PBA used by ISCP<sup>(5)</sup> including a checklist and a global rating score shown as **Appendix 1 page 42**. These observations were carried out in two cardiothoracic departments in the West Midlands region, (University Hospital Birmingham and University Hospital Coventry and Warwickshire NHS Trusts). The trainees were Specialist Registrars in year 3 – 6 of their Higher Specialist Training, who would be in a position to normally complete a CABG operation. The assessors completing the assessment were consultants who are trainers in the West Midlands Cardiothoracic Surgical Training Scheme. One of them was the Clinical Supervisor of the trainee present normally in the theatre. The second observer was a consultant in another theatre on the same day of the assessment. In completing the form for CABG PBA the observer was expected to choose either not observed or not appropriate (N), unsatisfactory (U) or satisfactory (S).

For the purpose of analysis of the scores N will be replaced with 0, U with -1 and S with 1. The Global scores progress from Level 0 to Level 4 with increasing level of competence. Percentage agreement will be used to assess reliability between the scores of the two observers for the checklist items and to test for statistically significant differences in the global scores. Construct validity of the PBA

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will be tested by comparing the scores of the junior versus the senior trainees.

## Pilot Study Questionnaire

The study included a questionnaire to assess the participant's reactions and feelings in the application of this assessment given at the end for immediate completion as seen in [Appendices 2 and 3 page 45](#).

## Ethics

NHS Research and Development of University Hospital Birmingham NHS Foundation Trust approval was granted to this project as an educational audit.

## Results

## Literature Review

Educational assessment "*is the process of documenting, usually in measurable terms, knowledge, skills, attitudes and beliefs*"<sup>(19)</sup>.

It is normally divided into summative and formative assessment forms, which are often referred to as assessment of learning and assessment for learning respectively. The assessments in ISCP<sup>(5)</sup> are designed to provide formative meaningful feedback to trainees to inform and develop their practice. Evidence shows that the most effective strategies could add the equivalent of up to two grades to a student's achievement<sup>(20,21)</sup>.

The PBA materials were originally developed by the Orthopaedic Competence Assessment Group (OCAP) for Trauma and Orthopaedic Surgery<sup>(22)</sup> and this was further developed with editing and additions from the General Surgery Project (OPComp) for General

Surgery<sup>(5)</sup>. A number of PBAs have been developed by the PBA writing group in Cardiothoracic Surgery<sup>(5)</sup> of senior surgeons with one specifically designed for CABG as shown in [Appendix 1 page 42](#), among other forms covering the commonly performed cardiac and thoracic procedures.

PBA aims to test competence of trainees in the workplace and differs from the Objective Structured Assessment of Technical Skills (OSATS)<sup>(23)</sup> as a tool for the assessment of technical skills<sup>(24)</sup>. This form of assessment has been demonstrated to be valid, reliable and feasible<sup>(25,26,27)</sup> however it only measures competency in a technical skill in a simulated environment and although it may equal live animal models<sup>(28,29)</sup> it fails to simulate real life and only tests trainees at the "shows how" stage of Millers Triangle of competence<sup>(8)</sup>. The simulation loses out on a large number of other characteristics that are inherent to operating and conducting a surgical procedure with a successful outcome as identified by Yule et al<sup>(30)</sup> and shown in [Table 1 page 41](#).

Although PBAs attempt to overcome the deficiencies of OSATS, the data for their validation remains lacking<sup>(31)</sup>. Furthermore Miller and Archer<sup>(32)</sup> in a systematic review of primary data from databases Journals@Ovid, Medline, Embase, CINAHL, PsycINFO, and ERIC as well as evidence based reviews (Bandolier, Cochrane Library, DARE, HTA Database, and NHS EED) via the Health Information Resources website to examine the impact of workplace based assessment



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on doctors' education and performance concluded that *"there are few published articles exploring its impact on doctors' education and performance."*<sup>(32)</sup>

## Pilot Study of Procedure Based Assessments

The study was completed between May and October 2008 with ten CABG PBAs performed. They were completed by 8 trainees with six of the assessments completed for senior trainees (years 5 and 6) and four for junior trainees (years 3 and 4). One of the trainers was scrubbed during the PBA in six of the ten observations. In the other four the trainers were present in the operating theatre to observe the operation and perform the assessment but were not directly involved in the operation.

In the assessment of the six domains, there was marked concordance between the two observers for each observation. The concordance was 100% in the consent domain observed in 11 out of a possible 20 observations, 98% in preoperative planning competencies observed in the ten assessments by two observers, 100% in preoperative preparation, 99% in the exposure and closure domain and 98% in the intraoperative technique domain. The final domain of postoperative management had 100% concordance between the observers. Furthermore, the global assessment had a 100% concordance between observers.

There was no significant difference between the groups of junior versus senior trainees in all six domains or in the global scores

although the global scores tended towards significance ( $3.33 \pm 1.03$  for senior trainees versus  $2.5 \pm 0.57$  for junior trainees,  $p=0.071$ ).

All 8 trainees and the 6 trainers confirmed they were aware of the CABG PBA forms although none had completed any before.

## Trainers

Five out of the 6 trainers confirmed the ease and user friendliness of the PBA for CABG. All trainers felt that completing the PBA added to the time of the operation especially with regard to the feedback and that this did interfere with the normal working practices. However, they all agreed that completing the form was a useful exercise. The length of the checklist and whether such detail was required was commented on by 3 of the observers while 2 suggested that these forms should be completed for the second case of the day as time can be allocated then for completing the form and giving feedback at the end of the operating list which would not interfere with the running of the list or the normal process of accompanying the patient to the intensive care unit and handing the patient care over prior to starting the second case.

## Trainees

All the trainees questioned found the PBA user friendly although it was subjectively felt that it added to their operative time. They also stated that it interfered with work but indicated that the process was useful. Five of the trainees commented that the PBA added

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to the pressure of performing the procedure and being subjected to scrutiny forced them to over-elaborate on some of the steps of the operation.

## Discussion

The use of CABG PBA is acceptable to both trainers and trainees and although the perception was that it added to the work load and to the pressure on the trainees performing the operation, it had a positive contribution in the form of the detailed feedback received by the trainees. It also provided an opportunity for a two way structured discussion encompassing technical conduct of the operation and performance of each task on the checklist. The participants' perception and acceptance of the process is important for this formative assessment to achieve its aims and objectives and be of value in their formative developmental assessment<sup>(33)</sup>.

The consent domain was the most poorly observed with just over half the expected observations completed. The completed observations were made in the majority for urgent patients referred for inpatient urgent surgery. The PBA considers consent as a one off encounter rather than a process<sup>(34)</sup> which questions the content validity of the assessment tool.

The PBA provided significant inter-observer reliability in all six domains, however it could be argued that the scoring system of only either satisfactory or unsatisfactory may have had an impact on this and a wider range of scores may have resulted in more

variability in the results achieved by each trainee. Furthermore the scoring of trainees as only competent or not competent in completing a task during an operation may be the required outcome in a summative assessment. There is conflicting evidence about which is preferable, a global score or a checklist score. The global score provides a good summary of performance, whilst the checklist allows the identification of problems areas and any consistent pattern across different operative procedures. The global rating outperformed the checklist in every dimension studied in a head to head comparison during an iteration of OSATS<sup>(35)</sup> as a more reliable form of assessment. It also appeared to account for a greater proportion of the variance of the scores when analysed in a regression analysis.

The PBA tool used in this study appears to have face validity from its inception and design by senior cardiac surgeons involved in training. Furthermore both trainees and trainers in the study have agreed that the application of this tool was a useful and therefore appropriate exercise. However it failed to demonstrate construct validity by not being able to distinguish between senior and junior trainees, although the global assessment scores were tending to diverge. This may be due to the limited range of scores from 0 to 4. A larger range of scores may have allowed more differences to become evident. However this at least allowed some range of scores which is more than in the checklist scoring of satisfactory or unsatisfactory mark. Another limitation

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in this study is the small sample of trainees observed.

The predictive validity of the CABG PBA or any similar competence assessment tool may be very difficult to assess. It will require longitudinal follow up of the trainees into the post CCT stage of their careers to assess if that competence can be translated into good performance. It will require time and considerable resources in terms of staff which would form a significant barrier. This is compounded by the difficulty in deciding on how to measure success in the future and relate this back to demonstrated competence or achieving certain competencies at some stage during the training.

Content validity of the PBA relates to the ability of this assessment tool to cover all the different steps of the operation and at first glance this seems to be the case. It also blueprints to other required abilities of a surgeon such as communication skills.

This is assessed at a number of stages including communication with the patient in the consent section, communication with members of the multidisciplinary team during the preparation for the operation and the conduct of the procedure, and communication with the postoperative care team in the intensive care unit after the operation.

## Conclusions

The PBA brings back the importance of assessment of surgical competence to the operating theatre where it actually matters as all the attributes of conducting an operation are assessed and tested although the evidence is still lacking. The PBA used in this study was acceptable to all the participants involved and its application was considered feasible and reliable. Validity was evident in the form of face and content validity although construct or predictive validity could not be demonstrated.

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## References

1. Calman Report. Hospital doctors' training for the future: the report of the Working Group on Specialist Medical Training. London: Dept. of Health. 1993.
2. Chikwe, J., de Souza, A.C., Pepper, J.R. No time to train the surgeons. *BMJ* 2004; 328: 418-419.
3. Jackson, G.P., Tarpley, J.L. Analysis How long does it take to train a surgeon? *BMJ* 2009; 339: b4260
4. Schijven MP, Reznick RK, Ten Cate OT, Grantcharov TP, Regehr G, Satterthwaite L, Thijssen AS, Macrae HM. Transatlantic comparison of the competence of surgeons at the start of their professional career. *Br J Surg* 2010; 97(3): 443-449.
5. Intercollegiate Surgical Curriculum Programme. The Intercollegiate Surgical Curriculum: Educating the surgeons of the future Cardiothoracic surgery syllabus. [www.iscp.ac.uk](http://www.iscp.ac.uk), 2007.
6. Harvey, L. Analytic Quality Glossary, Quality Research International. [www.qualityresearchinternational.com/glossary](http://www.qualityresearchinternational.com/glossary), 2004.
7. Wojtczak, A. Glossary of Medical Education Terms, <http://www.iime.org/glossary.htm>, December, 2000, Revised February 2002.
8. Miller, G.E. The assessment of clinical skills/competence/performance. *Acad Med* 1990; 65(9 Suppl): S63-S67.
9. Smith, M. K. 'Competence and competencies', the encyclopaedia of informal education. [www.infed.org/biblio/b-comp.htm](http://www.infed.org/biblio/b-comp.htm), 2005.
10. Hamstra, S.J., Dubrowski, A. Effective training and assessment of surgical skills, and the correlates of performance. *Surg Innov* 2005; 12(1): 71-77.
11. Winckel, C.P., Reznick, R.K., Cohen, R., Taylor, B. Reliability and construct validity of a structured technical skills assessment form. *Am J Surg* 1994; 167(4): 423-427.
12. Hays, R.B., Davies, H.A., Beard, J.D., Caldon, L.J., Farmer, E.A., Finucane, P.M., McCrorie, P., Newble, D.I., Schuwirth, L.W., Sibbald, G.R. Selecting performance assessment methods for experienced physicians. *Med Educ* 2002; 36: 910-917.
13. Lacity, M.; & Jansen, M. A. Understanding qualitative data: A framework of text analysis methods. *Journal of Management Information System* 1994; 11, 137-160.
14. Chartered Institute of Educational Assessors. [http://www.ciea.org.uk/knowledge\\_centre/articles\\_speeches/general\\_articles/assessment\\_validity.aspx](http://www.ciea.org.uk/knowledge_centre/articles_speeches/general_articles/assessment_validity.aspx).
15. Shuttleworth, M. Predictive Validity. Retrieved from Experiment Resources: <http://www.experiment-resources.com/predictive-validity.html>, 2009.
16. Mehrens, W. A. & Lehmann, I. J. Using standardized tests in education. New York: Longman, 1987.
17. Worthen, B. R., Borg, W. R., White, K. R. Measurement and evaluation in the school. NY: Longman, 1993.
18. The Report of the Public Inquiry into children's heart surgery at the Bristol Royal Infirmary 1984-1995: Learning from Bristol. (Cm 5207).The Stationery Office. July 2001.
19. The Report of the Public Inquiry into children's heart surgery at the Bristol Royal Infirmary 1984-1995: Learning from Bristol. (Cm 5207).The Stationery Office. July 2001.
20. Earl, Lorna. Assessment as Learning: Using Classroom Assessment to Maximise Student Learning. Thousand Oaks, CA, Corwin Press. [http://www.wyoaac.org/Lit/assessment\\_for\\_learning\\_of\\_learning\\_as\\_learning-Earl.pdf](http://www.wyoaac.org/Lit/assessment_for_learning_of_learning_as_learning-Earl.pdf), January 23, 2009.
21. Black, P., William, D. Assessment and Classroom Learning. *Assessment in Education: Principles, Policy and Practice* 1998; 5(1): 7-74.
22. Petty, Geoff. Teaching Today A Practical Guide Fourth Edition, Nelson Thomas Ltd, UK, 2009.
23. Pitts, D., Rowley, D.I., Sher, J.L. Assessment of performance in orthopaedic training. *J Bone Joint Surg Br* 2005; 87(9): 1187-91.
24. Faulkner, H., Regehr, G., Martin, J., Reznick, R. Validation of an objective structured assessment of technical skill for surgical residents. *Acad Med* 1996; 71(12): 1363-1365.



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25. Reznick, R. Technical Skills, Evaluation, and Measurement. Clinical Congress, Committee on Emerging Surgical Technology and Education (CESTE) of the American College of Surgeons. [www.facs.org/education/ceste/sympbook.html](http://www.facs.org/education/ceste/sympbook.html).
26. Martin, J.A., Regehr, G., Reznick, R., MacRae, H., Murnaghan, J., Hutchison, C., Brown, M. Objective structured assessment of technical skill (OSATS) for surgical residents. *Br J Surg* 1997; 84(2): 273-278.
27. Reznick, R., Regehr, G., MacRae, H., Martin, J., McCulloch, W. Testing technical skill via an innovative "bench station" examination. *Am J Surg* 1997; 173: 226-230.
28. Goff, B.A., Lentz, G.M., Lee, D., Fenner, D., Morris, J., Mandel, L.S. Development of a bench station objective structured assessment of technical skills. *Obstet Gynecol* 2002; 98(3): 412-416.
29. Saifi, J., Chang, B.B., Paty, P.S., Kaufman, J., Leather, R.P., Shah, D.M. An animal model for instructing and the study of in situ arterial bypass. *J Vasc Surg* 1990; 12(5): 538-540.
30. Christopherson, W.A., Buchsbaum, H.J., Voet, R., Lifshitz, S. The canine laboratory in the training of the oncology fellow. *Gynecol Oncol* 1986; 23: 26-34.
31. Yule, S., Flin, R., Paterson-Brown, S., Maran, N. Non-technical skills for surgeons in the operating room: A review of the literature. *Surgery* 2006; 139: 140-149.
32. Kogan, J.R., Holmboe, E.S., Hauer, K.E. Tools for direct observation and assessment of clinical skills of medical trainees: a systematic review. *JAMA* 2009; 302(12): 1316-26.
33. Miller, A., Archer, J. Impact of workplace based assessment on doctors' education and performance: a systematic review. *BMJ* 2010; 341: c5064.
34. Watling, C.J., Lingard, L. Toward meaningful evaluation of medical trainees: the influence of participants' perceptions of the process. *Adv Health Sci Educ Theory Pract* 2010; 17(2): 183-194.
35. Parliamentary and Health Service Ombudsman and Society of Cardiothoracic Surgeons of Great Britain and Ireland. Consent in Cardiac Surgery: A good practice guide to agreeing and recording consent. [http://www.ombudsman.org.uk/pdfs/informed\\_consent.pdf](http://www.ombudsman.org.uk/pdfs/informed_consent.pdf), 2005.
36. Regehr, G., MacRae, H., Reznick, R.K., Szalay, D. Comparing the psychometric properties of checklists and global rating scales for assessing performance on an OSCE-format examination. *Acad Med* 1998; 73(9): 993-997.

**Table.1: Proposed draft non-technical skills taxonomy**

Interpersonal skills	Cognitive skills
Communication	Situation awareness
Leadership	Mental readiness
Teamwork	Assessing risks
Briefing/planning/preparation	Anticipating problems
Resource management	Decision making
Seeking advice and feedback	Adaptive strategies/flexibility
Coping with pressure/stress/fatigue	Workload distribution

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## Appendices

### Appendix.1: Procedure Based Assessment

#### Cardiothoracic Surgery PBA: Coronary Artery Bypass Grafting

APPROVED SURGICAL TEMPLATE Jun 06

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

The Trainee should explain what he/she intends to do throughout the procedure  
 The Assessor 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
<b>I.</b>	<b>Consent</b>		
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 perioperative process to the patient and/or relatives or carers and checks understanding		
C5	Explains likely outcome and time to recovery and checks understanding		
<b>II.</b>	<b>Pre operative planning</b>		
PL1	Demonstrates recognition of anatomical and pathological abnormalities (and relevant comorbidities) and selects appropriate operative strategies/techniques to deal with these e.g. nutritional status		
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		
PL6	Ensures post operative facilities are available		
PL7	Ensures that all staff know number of grafts, proposed targets and conduit for each graft		
PL8	Demonstrates sufficient conduits		
PL9	Discusses with perfusionist and anaesthetist the method of myocardial protection		
<b>III.</b>	<b>Pre operative preparation</b>		
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 supporting equipment (e.g. image intensifiers) effectively		

PBA Assessment: Produced by OCAP, OpComp & the SAC for Cardiothoracic Surgery 1/3

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Competencies and Definitions		Rating N/D/S	Comments
<b>IV.</b>	<b>Exposure and closure</b>		
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		
E5	Assesses cannulation site		
E6	Checks that Heparin is given prior to cannulation		
E7	Demonstrates safe cannulation technique		
E8	Institution of cardiopulmonary bypass		
E9	Myocardial protection		
E10	Weaning from cardiopulmonary bypass		
E11	Protamine administration		
E12	Haemostasis		
E13	Pharmacological and/or mechanical support where appropriate		
E14	Sternal fixation		
<b>V.</b>	<b>Intra operative Technique</b>		
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)	Assesses target coronary arteries		
IT13 (T)	Correct positioning of the heart for each distal anastomosis		
IT14 (T)	Uses an agreed/accepted anastomotic technique		
IT15 (T)	Demonstrates a satisfactory distal anastomosis		
IT16 (T)	Measures the length of the "free" aorto coronary graft appropriately		
IT17 (T)	Positions IMA appropriately		
IT18 (T)	Communicates removal of cross clamp with the perfusionist and anaesthetist		
IT19 (T)	Checks haemostasis of anastomoses		
IT20 (T)	Demonstrates correct use of internal DC cardioversion (if necessary)		
IT21 (T)	Demonstrates appropriate use of epicardial pacing wires		

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Competencies and Definitions		Rating N/D/S	Comments
<b>VI.</b>	<b>Post operative management</b>		
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		
PM5	Completes database accurately		
PM6	Gives effective briefing to intensive care team		
PM7	Ensures supporting equipment and materials etc are deployed safely and appropriate drugs administered		
PM8	Explains operative and post operative process to relatives and checks understanding		

## 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)	

Comments by Assessor (including strengths and areas for development):

Comments by Trainee:

Trainee Signature:

Assessor Signature:



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Question	Yes	No
Are you familiar with Procedure based assessment?		
Have you used it before?		
Did you find the PBA user friendly?		
Did the PBA add time to the operation?		
Did completing the form interfere with normal work activities?		
Did the feedback interfere with normal work activities?		
Is the PBA a useful exercise?		
Further comments		
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**Appendix.2: Questionnaire to trainers**

Question	Yes	No
Are you familiar with Procedure based assessment?		
Have you used it before?		
Did you find the PBA user friendly?		
Did the PBA add time to the operation?		
Did completing the form interfere with normal work activities?		
Did the feedback interfere with normal work activities?		
Is the PBA a useful exercise?		
Did PBA have an impact on your performance?		
Further comments		
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**Appendix.3: Questionnaire to trainees**

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