

Utility of Workplace-Based Assessment Among Surgical Residents: A Systematic Literature Review

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IMPORTANCE This review article aims to assess the usefulness of Workplace-Based Assessment (WBA) among surgical residents. Multiple studies have been done in the past to determine the utility of WBAs across different fields of medicine. But it hasn't been done among surgical specialties on large scale, and the present paper fills in this research gap.

METHODS Articles were searched using PubMed and Google Scholar databases up to 30th June 2022. Following headings were used for the literature search i.e work-based assessment or workplace-based assessment or WBAs or direct observation of procedural skills or DOPS or procedure-based assessments or PBA or Case-based discussion or CBD or clinical evaluation exercise or CEX or Mini CEX, and surgical training. The utility formula of Vleuten was used to assess the usefulness of WBA. It is a product of validity, reliability, educational impact, acceptability, cost-effectiveness, and feasibility.

RESULTS For reviewing purposes, 29 studies were selected. There were 8 studies on PBA, 2 on Mini-CEX, 2 on CBD, 6 on DOPS, and 11 studies on multiple methods of WBA. PBA had positive satisfaction levels and was valid, reliable, feasible, and acceptable. CBD. Mini-CEX and CBD had very few studies in which they were proved to be reliable and valid but had mixed responses in terms of satisfaction levels. DOPS had a level 1 educational impact and also proved to be valid. When all components of WBAs were used together, a negative level 1 educational impact was observed. The concerns that were identified include lack of time, training and evidence of validity, design of the tool, and perception of WBA as a summative tool.

DISCUSSION Work-based Assessments should be implemented and used properly after the training of faculty. The focus should be on the quality of the assessments, not on the quantity. Large-scale studies should be done to assess level 3 and 4 of educational impact from WBAs.

KEYWORDS Work-based assessment, Surgical resident, Utility, Procedure based assessment, Case-based discussion, Clinical Evaluation Exercise, Direct Observation of Procedural Skills

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Systematic Literature Review

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The 21st century is bringing new challenges. There are expected rapid changes in surgical knowledge and understanding of diseases, new and better technologies, and surgical procedures. To keep pace with the modern world of science, training institutions need more active scrutiny and error judgment in their training programs¹. In the modern world, the current module of surgical training has been shaped by different modifications in medical education and training like modernizing medical careers and postgraduate education².

In the past, trainee doctors were mostly assessed for their knowledge using theory examinations and stimulated

clinical assessments at the end of their training period. More emphasis was given on what a person knows rather than what he or she does in practice. However, doctors have multiple attributes besides specialty knowledge and skills, but also attitudes and generic skills like integrity, honesty, communication, and teamwork. Actual performance is the only reflection of the competence, i.e., day-to-day behavior and performance of a person in practice³. Workplace-based assessments (WBAs) are the skills that need to be assessed in clinical settings. Strong emphasis has been given to the assessment of trainees at the workplace⁴.

WBAs deal with all forms of work a resident usually does at his workplace⁵. The reason behind implementing the WBAs is to make sure that a trainee learns and develops through evidence-based progression to attain clinical competency⁶. Assessment of clinical skills in WBA correlates with the "Does" level in Miller's Pyramid (Fig 1)⁷.

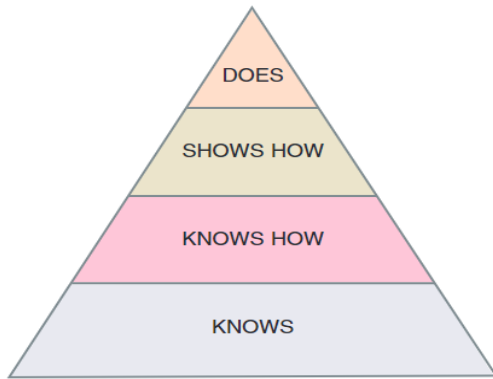


Fig 1. "Miller's Pyramid"⁷

There is always an emphasis on formative assessment of trainees and WBAs are a source of it. They provide feedback to improve trainees' development and learning⁸. Consultants or trainee's supervisors should carry out WBAs who assess skills, knowledge, and behavior during multiple daily tasks in a hospital⁹. (Fig 2)

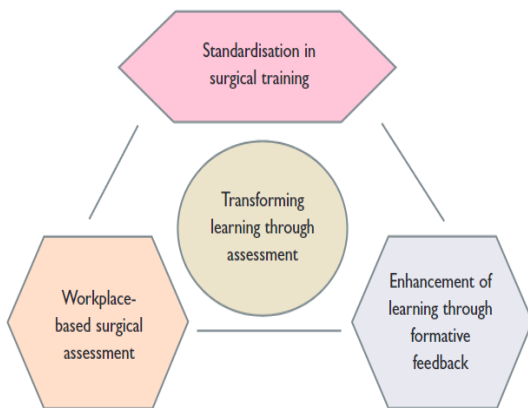


Fig 2. "Conceptual Framework of Learning Benefits Of Workplace-Based Surgical Assessment"¹⁷

The working environment for Surgical Training is unlike other training programs. The surgical resident performs multiple tasks such as treating patients in wards as inpatients as well as patients in outpatient clinics, doing surgical procedures, and seeing patients pre and postoperatively. They require special surgical skills to complete their training which is not seen in other specialties. Some of the tasks can be performed independently by the surgical trainee at workplace in which he is competent enough, but direct observation of a

consultant is required for most of the surgical procedures. All types of work that a trainee do in his day-to-day tasks, should be included in WBAs¹⁰.

The WBAs include procedure-based assessments (PBA), case-based discussion (CBD), clinical evaluation exercise (CEX), and direct observation of procedural skills (DOPS). (Table 1)^{5,11-13}.

Procedure-Based Assessment (PBA)	(Orthopedic Proficiency Assessment Project (OCAP) initially produced PBA which was then introduced in other fields of surgery. PBA form includes feedback from instructor and trainee, several competencies, and a worldwide assessment. In case a trainee can perform the procedure with no guidance and deal with it on his own, then it means that this individual has attained the highest competence degree. ⁵
Clinical Evaluation Exercise (CEX)	American Board introduced CEX in medical specialties. It was then modified to mini CEX to suit the surgical clinical activities. The trainee is evaluated while wearing interactions with patients such as taking history, medical examination, communication skills, and professionalism. ¹¹
Case-Based Discussion (CBD)	CBD is an in-depth discussion with the trainee about the management of a patient. The trainee is assessed in terms of clinical knowledge, reasoning, and judgment. ¹²
Direct Observation of Procedural Skills (DOPS)	Initially, the Royal Colleges of Physicians developed a tool to assess operative, technical and professional skills in diagnostic and interventional procedures. Several modifications have been done to include different surgical procedures in it. ¹³

Table 1: Types of Workplace-Based Assessment

For more than 10 years, WBAs have been in use in general surgery training. Since its implementation, multiple studies have been published in the literature on the utility of WBAs in training. However, in surgery, there are not a lot of studies, especially on DOPs, CBD, and Mini CEX¹⁰. Due to the heterogeneity of the methods and outcomes of the previous studies, it is expected that there are very meta-studies available in the literature. Saedon et al. stated in their systematic review that WBA provides valuable feedback which has a constructive effect on clinical practice. But it involved studies from all medical and surgical specialties⁸. Similarly systematic reviews of Barette et al. and Miler et al. also included articles from all medical specialties^{14,15}. Aryal et al. published 2 systematic reviews in 2019 and 2021 that focused on the educational impact and utility of WBAs in higher surgical training residents^{10,16}. But medical knowledge is everchanging so we needed an updated review about WBA and its components. This systematic review was done to assess the insight of the utility of WBA's among consultants and their trainees. This study reviews published articles on the utility of WBAs among residents of general surgical and surgical specialty training.

METHODS

This study has been reported following the guidelines of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)¹⁸. Literature was searched on the databases Pubmed and Google Scholar up to 30th June 2022. The literature search was done under the headings of work-based assessment or workplace-based assessment or WBAs or direct observation of procedural skills or DOPS or procedure-based assessments or PBA or Case-based discussion or CBD or clinical evaluation exercise or CEX or Mini CEX, and surgical training.

Inclusion criteria included quantitative or qualitative studies published in the English language, involving post-graduate surgical specialties trainees or trainers. Following surgical specialties were included: General Surgery, Orthopedic Surgery, Urology, Plastic surgery, Neurosurgery, Cardiothoracic Surgery, Vascular Surgery, Pediatric Surgery, Oral and Maxillofacial Surgery, Otolaryngology, and Ophthalmology. Studies involving, gynecology, pediatrics, anesthesia, endoscopy, dental, histopathology, medical students, nursing, and other specialties were excluded.

According to the inclusion and exclusion criteria, both authors did the initial scrutiny of the articles by titles and

abstracts. Then full text of the selected articles was reviewed. Only those articles were selected which described the utility or usefulness of WBAs in surgical training. The final selection of the studies was also done by both authors. The usefulness of WBA is assessed by the utility formula of Vleuten. Utility= Validity x Reliability x Educational Impact x Cost effectiveness x Feasibility x Acceptability¹⁹.

"Extent to which a test measures what is intended to be measured and nothing else" is known as validity²⁰. Reliability is "a measure of the consistency and precision with which a test measures what it is supposed to assess"²¹. Educational impact may have 4 levels; Satisfaction, Learning, Behavior, and Results with better patient outcomes²². Cost-effectiveness of assessment means evaluating the benefits of a particular assessment against its cost⁷. Acceptability means the assessment tool is acceptable to the participants. Availability of sources, time, and personals will determine the Feasibility²³.

RESULTS

Initially, 257 studies were identified through a database search. Titles and abstracts of these articles were screened and 208 studies were excluded. Full-text review of 49 articles was done and out of which 29 were included in this study. (Fig 3)

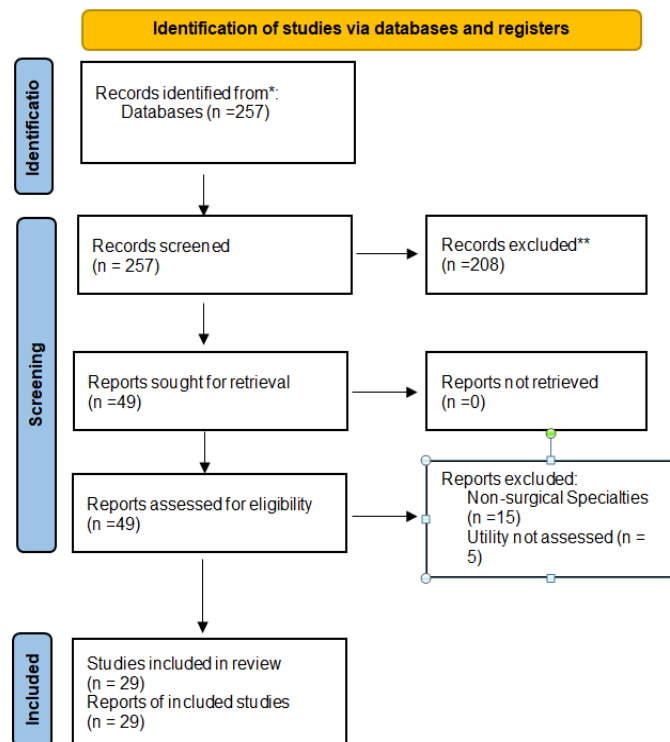


Figure 3. PRISMA 2020 flow diagram

Procedure-Based Assessment (PBA): We found 8 publications in surgical specialties describing PBAs (Table 2). Medeiros et al. showed high validity, reliability, and feasibility of PBA among urology residents²⁴. Rhamhamdany described a modified version of PBA for orthopedic trainees which had a better formative assessment of surgical skills. At the same time, it was not much acceptable due to the lengthy tick box activity²⁵. Shalhoub et al. stated that PBA has a high educational value but it should be perceived as formative tool²⁶.

Roushdi et al. found a high level of confusion among trainees and trainers regarding the use of PBA²⁷. Hunter et al. showed that PBA is a useful tool for feedback and learning but the focus should be on quality, not quantity²⁸. PBA was proved to be valid, reliable, acceptable, and feasible with a good satisfaction level in other studies^{29–31}. Overall, PBA showed excellent utility and positive satisfaction among surgical residents.

Author	Study Design	Values Assessed	No of Participants	Subject Area	Results
Medeiros et al., 2021 ²⁴	Prospective, action-research study	Validity, Reliability, Feasibility	6 trainees 10 trainers	Urology training	PBA has high validity, reliability, and feasibility
Ramhamadany, 2020 ²⁵	Quantitative survey	Validity and acceptability	12 trainees	Orthopedic surgical residents	A modified version of PBA is a better formative assessment of surgical skill. Lengthy tool and prolonged tick box exercise questions its acceptability
Shalhoub et al., 2017 ²⁶	Qualitative semi-structured interviews	Validity, Educational impact	10 trainees	Different Surgical Specialities	"PBA has significant educational value when used as a formative tool"
Roushdi et al. 2015 ²⁷	Quantitative survey	Validity, Educational impact	39 trainees 21 trainers	Orthopedic Surgical Training	High level of confusion among trainers and trainees about both the purpose of PBA and the correct method of using them
Hunter et al., 2015 ²⁸	Quantitative Survey	Educational Impact	616 trainees	Orthopedic Surgical Training	Most residents found PBAs useful as a learning tool for the delivery of feedback. Quality should be improved rather than quantity
Marriot et al., 2011 ²⁹	Quantitative, Observational	Validity, reliability, acceptability	81 trainees	6 surgical specialties	Overall high validity and acceptability, and reliability
Beard et al., 2011 ³⁰	Quantitative, Observational	Acceptability, Reliability, Validity	85 trainees	6 surgical specialties	High acceptability, validity, reliability, and user satisfaction.
James et al., 2009 ³¹	Quantitative, Observational	Educational impact, feasibility	3 trainers 2 trainees	Higher surgical training	Feasible "Focused feedback and targeted training"

Table 2: PBA

Clinical Evaluation Exercise (mini-CEX):

We only found 2 studies evaluating mini CEX among postgraduate trainees in general surgery (Table 3). It

proved to be a valid, reliable, acceptable, and feasible tool and showed positive satisfaction among trainees and trainers^{32,33}.

Author	Study Design	Values Assessed	No of Participants	Subject Area	Results
Deshpande et al. 2021 ³²	Quantitative Observational	Educational impact, Validity, Reliability, Acceptability, Feasibility	18 trainees 10 trainers	Orthopedic surgical training	Mini-CEX improves technical and non-technical skills It is a valid, reliable, acceptable, and feasible tool
Joshi et al., 2017 ³³	Quantitative survey	Acceptability, feasibility	16 trainees 9 trainers	Higher surgical training	Mini-CEX is feasible and well accepted by trainees and trainers

Table 3: Mini-CEX

Case-Based Discussion (CBD)

The utility of CBD has been discussed in 2 studies for surgical specialties which include only trainees (Table 4).

These studies showed that CBD is reliable and valid with good educational impact but promotes tick box mentality^{34,35}.

Author	Study Design	Values Assessed	No of Participants	Subject Area	Results
Philips et al., 2016 ³⁴	Quantitative survey	Utility, Educational impact	42 trainees	Surgical training	Provides feedback., Improves learning Promotes tick-box mentality
Awad et al., 2015 ³⁵	Retrospective database analysis	Reliability, Validity	46 trainees	Otolaryngology	Case-based discussion is a reliable and valid tool

Table 4: CBD

Direct Observation of Procedural Skills (DOPS)

Among DOPS, 6 studies are identified (Table 5). Inamdar et al. showed that DOPS is a feasible, acceptable, and effective tool³⁶. A study in Ophthalmology showed positive satisfaction among trainees³⁷. DOPS have helped improve surgical skills in multiple studies^{38,39}. Mathew et al. modified the DOPS tool into Surgical DOPS (S-DOPS) which showed

good uptake and construct validity as compared to the original version of the tool¹³. Awad et al. had a view that DOPS can differentiate between senior and junior residents⁴⁰. Overall DOPS proved to be valid, acceptable, and reliable with a good educational impact in surgical training.

Author	Study Design	Values Assessed	No of Participants	Subject Area	Results
Inamdar et al., 202136	Quantitative	Educational Impact, Feasibility, Effectiveness, Acceptability	30 trainees	Surgical training	DOPS is a feasible, acceptable, and effective tool
Sethi et al., 201937	Quantitative	Educational impact	115 trainees	Ophthalmology	Improvement in clinical skills with repeated DOPS
Hussain Waqar et al., 201638	Sequential mixed-method study	Educational impact, validity, feasibility	48 trainees	Surgical training	Improved surgical skills. Shortage of time and lack of training are the main concerns
Ali et al., 201939	Comparative study	Educational impact, Effectiveness	20 trainees 4 trainers	Urology training	DOPS is an effective tool for assessing and improving the surgical skills
Matthew et al., 201413	Quantitative	Construct validity, DOPS uptake	Phase 1, 1370 trainees Phase 2, 16 assessors and 15 trainees Phase 3, 3525 trainees	Surgical training	Good uptake and construct validity of the new S-DOPS.
Awad et al., 201440	Quantitative	Validity, Reliability	767 DOPS Trainees not mentioned	Otolaryngology	Reliable and internally consistent. Differentiates between junior and senior trainees

Table 5: DOPS

Multiple WBA Methods

When we searched for WBAs having all or maximum of its components within the same study, a total of 11 studies were found that highlighted the use of all or most of the components of WBAs within the same settings (Table 6). All of these studies highlighted several problems including negative satisfaction levels on educational impact. PBA was

identified as the most useful tool of assessment among all WBAs and CBD was at the 2nd spot. There were concerns about lack of time, training and evidence of validity, design of the tool, and perception of WBA as a summative tool. Multiple WBAs when used together can lead to confusion and negative satisfaction levels among trainers and trainees^{17,41-50}.

Author	Study design	Type of WBA	Value assessed	No. of Participants	Subject Area	Results
Aryal et al., 202041	Mixed method study	CEX, CBD, PBA, DOPS	Educational impact, Validity	Phase 1 - 27 trainers, 38 trainees Phase 2 - 5 trainers and 5 trainees	General surgical training	PBA was the most useful WBA. Useful when practiced with face-to-face validation, and trainer trainee engagement. Require time and training
Nathoo et al., 202042	Qualitative	WBA	Educational impact	4 trainees 9 trainers	Ophthalmology	WBA is an excellent feedback tool but needs to be designed well
Gaunt et al., 201743	Qualitative interviews	PBA, DOPS, CBD, mini-CEX	Educational impact	42 trainees	Surgical specialties	Negative feedback by trainees.
Gaunt et al., 201644	Quantitative survey	PBA, DOPS, CBD, mini-CEX	Perception of WBA	178 trainees 147 trainers	General Surgical training	Both trainers and trainees perceive WBA as a summative assessment tool
Pentlow 201545	Quantitative survey	PBA, DOPS, CBD, CEX	Educational impact	61 trainers 46 trainees	Orthopedics Training	Only PBA was perceived to be educationally valuable
Philips et al., 201546	Quantitative survey	PBA, DOPS, CBD, mini-CEX	Utility	64 trainers	General Surgical training	PBA and CBD were the most useful tools
Eardley et al., 201347	Qualitative	PBA, DOPS, CBD, mini-CEX	Validity, Reliability, Educational impact	No. of trainees not mentioned	Surgical specialties	PBA is the best tool for assessment. Concerns include proper training, time management, and lack of reliability and validity
Ali et al., 201248	ISCP portfolio	DOPS, PBA	Educational impact	170 trainees	Surgical specialties	Lack of feedback is recorded and when recorded, it is not of good quality
Pereira et al.,	ISCP portfolio	PBA, DOPS,	Educational	359 trainees	General surgical	Negative satisfaction.

201349	Quantitative Survey	CBD, mini-CEX	impact		training	Inadequate evidence of validity
Stepathy et al., 201117	Qualitative interviews	PBA, DOPS	Educational impact	4 trainees 14 trainers	General surgical training	Concerns about validity and feasibility of assessment tools
Pereira et al., 200950	ISCP portfolio Quantitative Survey	PBA, DOPS, CBD, mini-CEX	Educational impact	539 trainees	General surgical training	Poor validity. 41% reported a negative impact overall upon their training

Table 6: WBA

DISCUSSION

There is a vital role of assessment in trainees' progression. To improve their clinical skills, several tools have been developed. Their cognitive knowledge has been assessed by Written and oral exams, while their clinical skills are assessed by work-based assessment (WBA) methods. These methods either use real-life patients or simulated patients or also provide constructive feedback⁵¹.

Out of these 29 studies, only 10 studies discussed purely general surgery. PBA has been discussed in most of them. Among these WBAs, PBA appears to be most useful and then CBD⁴⁶. PBA is designed to assess the surgical competencies of trainees by direct observation and to provide feedback. PBA is a reliable, valid, acceptable, and feasible tool to assess trainees learning. PBA has significant educational value when used as a formative tool. Trainees perceive it as a means of targeted feedback and training²⁴⁻³¹.

But still, a high level of confusion among trainers and trainees exists about both the purpose of PBA and the correct method of using them. Many of them perceive PBA as a lengthy tool and prolonged tick box exercise which questions its acceptability. Emphasis should be on quality rather than quantity^{27,28}.

CBD is a performance-based assessment tool that is used to evaluate clinical assessment and reasoning, management, communication, and professionalism. CBD is regarded as a tool for learning because it allows discussion of complicated cases, and promotes higher-order thinking. CBD is regarded as a reliable and valid tool. It promotes feedback and evidence-based learning^{34,35}.

DOPS is used to test the "Does" level of the Miller's Pyramid. In DOPS, a trainee is observed for consent taking, the indication of the procedure, clinical awareness, handling complications, and communication skills, and then immediate constructive feedback is provided by the assessor. According to the Royal College of Physicians, DOPS is a valid and reliable tool in contrast to the old methods of assessments such as logbooks. DOPS is an effective tool for assessing and improving surgical skills.

DOPS is a feasible, acceptable, and effective tool. Major concerns were the shortage of time and lack of proper training^{13,36-40}.

MINI-CEX tool has been suggested for clinical assessment as well as teaching because it allows the observation of a trainee by different observers at different stages of their training and it also provides effective feedback. As a formative assessment tool, MINI-CEX is well accepted by the trainers and trainees. Mini-CEX improves technical and non-technical skills. It is a valid, reliable, acceptable, and feasible tool^{32,33}.

In most of the centers, 40 WBAs per year are being used. One study suggested that 18 WBAs were used in their training program every year²⁸. Their quantity should be adequate to maintain reliability as well as their quality. Some centers use 80 numbers but they may decrease their quality¹⁰. These studies showed that WBAs should be used as a formative tool to improve their value.

Miler and Archer stated in their review that WBA leads to improved performance of residents but several factors like the presence of facilitation and the design of the feedback tool can have effects on the response. When multiple tools (PBA, CBD, DOPS, Mini-CEX) were used together, it did not show any improvement in the performance although it had a positive educational impact¹⁵. Saedon et al. had a view that if feedback from workplace-based assessments is well implemented, it can lead to a positive effect on practice⁸.

The concept of WBAs among trainees and trainers is gaining popularity day by day. As most of their users are certain that they help to develop and improve their clinical skills if used correctly. WBAs, when used alone or as a component, they had an excellent validity, utility, reliability, acceptability, and high educational impact. But it is not the same scenario when these tools are used together. The possible reasons for this are that WBAs are not used properly, there is always a shortage of time, avoidance of face-to-face feedback, lack of faculty training, and use of WBA as a summative feedback tool^{17,41-50}.

The medical field is an everchanging world, which always demands you to improve yourself and one of the best ways

to improve is by feedback and assessment. There will always be a need for a professional assessment of the trainee and WBAs should be used for this assessment so that there will be continuous development of clinical skills. But the point is that they should be properly used so that most of the benefits can be achieved. We need studies on larger scales to assess these tools and to define their role in the training of general surgery residents.

CONCLUSION

Work-based Assessments should be implemented and used properly after the training of faculty. All components or methods of WBAs should not be incorporated or used

simultaneously. The focus should be on the quality of the assessments, not on the quantity. Large-scale studies should be done to assess level 3 and 4 of educational impact from WBAs.

Recommendation: We recommend that WBA should be implemented in all public and private hospitals. The model of WBA in the UK can be used as a template for this purpose. Specialty-based relevant methods and tools should be opted and utilized rather than implementing all tools together. We also suggest that undergraduate students should also be included in this setup.

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