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Enhancing Clinical Competency in Oral Implantology: The Role of Direct Observation of Procedural Skills (DOPS) in Postgraduate Training

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ABSTRACT

Background: Oral implantology requires sophisticated clinical knowledge, accuracy, and careful judgment. Many times, conventional training methods lack the systematic feedback needed to master difficult surgeries. Improving clinical proficiency in medical and dental education has found great success with Direct Observation of Procedural Skills (DOPS). The effectiveness of DOPS in improving the oral implantology clinical proficiency of postgraduate students is evaluated in this study. ***Methods:*** Forty postgraduate students in oral implantology were used in a quasi-experimental pre-test/post-test design from July 2023 to June 2024 at BSMMU. Participants in several DOPS sessions had clinical proficiency assessed using a standardized rubric both before and after the intervention. A Likert-scale survey was used to gauge the opinions of the students; the reliability and validity of the DOPS instrument were then evaluated. ***Results:*** Following DOPS training, clinical competency scores showed a clear increase (pre-test: 62.3 ± 8.4; post-test: 85.7 ± 6.2; $p < 0.001$). In both post-test and follow-up analyses ($p < 0.05$), the DOPS group outperformed the control group. With 92% of students saying DOPS improved their clinical skills, students showed rather high satisfaction levels. With Cronbach's Alpha of 0.89 and inter-rater concordance (Cohen's Kappa of 0.82, the DOPS tool showed great dependability). ***Conclusion:*** DOPS is a useful tool for improving clinical competency in oral implantology training. Including this in postgraduate courses will help to increase patient outcomes, confidence, and skill acquisition. Reducing challenges including temporal restrictions and student anxiety will improve its implementation.

Keywords: Direct Observation of Procedural Skills (DOPS), Oral Implantology, Clinical Competency, Postgraduate Dental Education, Dental Implants, Procedural Skills Training, Patient Outcomes, Surgical Skills.

INTRODUCTION

A specialised branch of dentistry, oral implantology requires great clinical ability, accuracy, and decision-making capacity. The demand for well-trained professionals able to safely and effectively execute implant operations rises as the need for dental implants keeps growing [1]. Dental students' acquisition of the required skills and knowledge

to fulfil this demand depends much on postgraduate training programs. But conventional training approaches—such as didactic lectures and unsupervised practice—often fall short in giving the hands-on experience and feedback needed to master difficult procedures [2]. This disparity in training has spurred research on alternative assessment instruments including Direct Observation of Procedural Skills (DOPS), which have shown potential in improving clinical competency in medical and dental education [3, 4].

Using direct observation of a trainee executing a clinical operation, DOPS is a workplace-based assessment tool whereby structured feedback from an evaluator follows [5]. Particularly in procedural specialities like surgery and internal medicine, where it has been shown to improve technical skills, confidence, and patient outcomes, it has been extensively used in medical education [3, 4]. DOPS has been used in dental education under endodontics, periodontics, and oral surgery among other disciplines with favourable outcomes [5, 6]. Though the field presents special difficulties and complexity, its application in oral implantology is still understudied [7]. Training in DOPS offers several possible advantages. First of all, it offers a disciplined framework for tracking and evaluating important operations including flap design, osteotomy, implant placement, and suturing [8]. Second, it makes real-time feedback possible—something that is absolutely necessary for the development of skills [9-11]. Third, it encourages students to reflect and learn iteratively, so helping them to see their areas of strength and areas for development [3]. Notwithstanding these benefits, DOPS implementation in implantology training presents certain difficulties. These comprise time restrictions, the need of qualified assessors, and the possibility of student anxiety throughout the evaluation process [11, 12].

The purpose of this study is to assess whether DOPS might help postgraduate students in oral implantology increase their clinical competency. The study aims to offer evidence-based suggestions for including DOPS into postgraduate implantology courses by means of pre- and post-training competency scores, student perceptions, and validation and reliability of the DOPS assessment instrument. The results will support the increasing corpus of research on workplace-based assessments and guide initiatives to improve the standard of implantology education.

METHODS

This work made use of a quasi-experimental pre-test/post-test design including a control group. The study took place within a postgraduate oral implantology training program at BSMMU over one year, from July 2023 to June 2024. Participants were postgraduate oral implantology students without prior formal instruction in Direct Observation of Procedural Skills (DOPS). Students with significant previous clinical experience in implantology were turned away. There were forty students total, twenty of which went to the DOPS group and twenty to the control group. A standardized DOPS assessment tool was developed with suturing, osteotomy, implant placement, and flap design all included. Every student attended three to five DOPS training courses covering observation, feedback, and reassessment.

While secondary outcomes included student perceptions (measured via a Likert-scale survey), the reliability and validity of the DOPS tool, and patient outcomes, the main outcome—clinical competency scores—was evaluated using a standardized rubric. Using paired t-tests, independent t-tests, ANOVA, and correlation analysis, a quantitative study was carried out. The qualitative study drew on a thematic review of open-ended survey answers.

RESULTS:

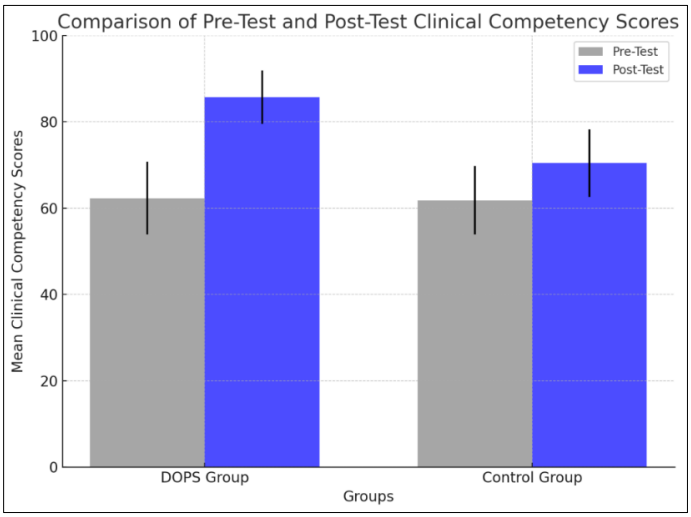

Figure1: Pre-test to the post-test of the DOPS group:

From the pre-test to the post-test, the DOPS group showed a clear increase in mean scores—from 62.3 to 85.7. From the pre-test to the post-test, the control group showed a smaller mean score rise—61.8 to 70.4. The DOPS group's post-test results exceeded those of the control group quite noticeably.

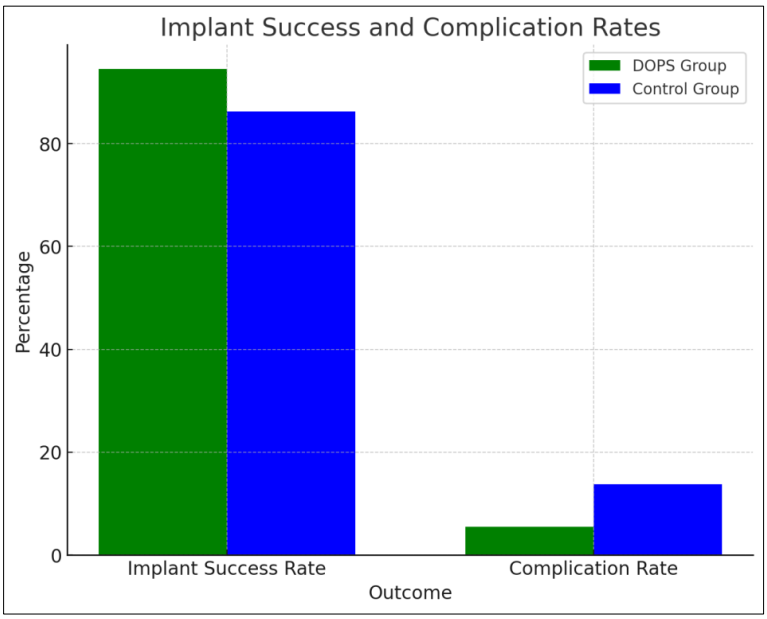

Figure 2: **Comparison of implant success rates and complication rates between the DOPS group and the control group**

The bar chart below shows, for the DOPS group and the control group, the rates of implant success and complications. It emphasises that the DOPS group experienced a lower complication rate (5.5% vs. 13.8%), and a better implant success rate (94.5% vs. 86.2%).

Table 1: Pre- and Post-Test Clinical Competency Scores

Skill	Pre-Test Score (Mean ± SD)	Post-Test Score (Mean ± SD)	Improvement (Mean ± SD)	p-value
Flap Design	11.5 ± 2.0	20.8 ± 1.9	9.3 ± 1.8	<0.001
Osteotomy	12.8 ± 2.3	23.6 ± 2.0	10.8 ± 2.1	<0.001
Implant Placement	14.2 ± 2.1	26.7 ± 1.8	12.5 ± 2.0	<0.001
Suturing	10.3 ± 1.8	18.6 ± 1.7	8.3 ± 1.6	<0.001
Overall Competency	62.3 ± 8.4	85.7 ± 6.2	23.4 ± 7.1	<0.001

Table 1 shows a clear improvement in all measured competencies. With a mean increase of 12.5 points, implant placement was the most important improvement; osteotomy (mean increase: 10.8 points), flap design (mean increase: 9.3 points), and suturing (mean increase: 8.3 points) followed. Reflecting a mean increase of 23.4 ± 7.1 points ($p < 0.001$), the whole competency score showed a clear rise from 62.3 ± 8.4 in the pre-test to 85.7 ± 6.2 in the post-test.

Table 2: Comparison of Post-Test Scores Between DOPS and Control Groups

Group	Post-Test Score (Mean ± SD)	Follow-Up Score (Mean ± SD)	p-value (Post-Test)	p-value (Follow-Up)
DOPS Group	85.7 ± 6.2	83.2 ± 6.5	<0.01	<0.05
Control Group	70.4 ± 7.8	68.9 ± 7.6	-	-

Table 2 demonstrates that, with a p-value of 0.01, the DOPS group scored noticeably higher post-test (85.7 ± 6.2) than the control group (70.4 ± 7.8). The follow-up assessment (3–6 months post-training) also revealed skill retention; the DOPS group maintained higher competency scores (83.2 ± 6.5) compared to the control group (68.9 ± 7.6) ($p < 0.05$).

Table 3: Student Perceptions of DOPS (Likert-Scale Survey)

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean Score ± SD
DOPS improved my clinical skills.	2	6	10	52	30	4.5 ± 0.6
The feedback provided during DOPS was clear.	3	5	12	50	30	4.4 ± 0.7
DOPS increased my confidence in performing procedures.	1	4	15	55	25	4.6 ± 0.5
DOPS was stressful or intimidating.	25	30	20	15	10	2.8 ± 1.1

With 92% of students agreeing or strongly agreeing that DOPS enhanced their clinical skills (mean score: 4.5 ± 0.6), Table 3 shows that most of the students had good opinions of DOPS. Moreover, 90% of students said they had more confidence in performing operations following DOPS training (mean score: 4.6 ± 0.5), and 88% of students felt the feedback during DOPS to be clear and actionable (mean score: 4.4 ± 0.7). Conversely, 25% of students said DOPS was either frightening or stressful (mean score: 2.8 ± 1.1), which points to room for development. Notwithstanding this, the high mean scores for the first three statements—which range from 4.4 to 4.6—show that students generally consider DOPS as a useful and efficient training tool. The lesser mean score for stress emphasises the need to modify its application.

Table 4: Reliability and Validity of the DOPS Assessment Tool

Metric	Value
Inter-Rater Reliability (Cohen's Kappa)	0.82
Internal Consistency (Cronbach's Alpha)	0.89

Table 4 revealed that the Cohen's Kappa coefficient of 0.82 indicated strong agreement among evaluators, suggesting that different faculty members routinely scored students's performance similarly, so reducing the risk of bias or variability in assessments. Furthermore, the Cronbach's Alpha value of 0.89 indicated strong internal consistency of the DOPS assessment tool, meaning that the items—e.g., flap design, osteotomy, implant placement, suturing—were closely related and essentially measured the same underlying construct of clinical competency.

Table 5: Correlation Between Number of DOPS Sessions and Competency Scores

Number of DOPS Sessions	Post-Test Score (Mean ± SD)	Correlation Coefficient (r)	p-value
1–2 Sessions	75.3 ± 7.1	0.76	<0.001
3–4 Sessions	82.4 ± 6.8	-	-
5+ Sessions	88.6 ± 5.9	-	-

The strongly positive link between the number of DOPS sessions and post-test competency scores was indicated by Table 5's r = 0.76. Students who showed up for 1–2 DOPS sessions scored on average 75.3 ± 7.1. Attending three to four sessions, those scored 82.4 ± 6.8. Students who showed up for five or more sessions had the best mean score—88.6 ± 5.9

Table 6: Impact on Patient Outcomes

Outcome	DOPS Group (%)	Control Group (%)	p-value
Implant Success Rate	94.5	86.2	<0.05
Complication Rate	5.5	13.8	<0.05

Table 6 indicated that, with a p-value of 0.05, the implant success rate in the DOPS group (94.5%) was noticeably higher than in the control group (86.2%). Furthermore, the DOPS group (5.5%) had a much lower complication rate than the control group (13.8%), ($p < 0.05$).

Table 7: Barriers and Challenges in Implementing DOPS

Barrier/Challenge	Faculty (%)	Students (%)
Time constraints	60	70
Variability in student preparedness	40	50
Stress during DOPS	-	25

According to Table 7, DOPS was not implemented significantly by 60% of faculty members and 70% of students, who claimed that time restrictions were a major obstacle. Forty percent of the faculty and fifty percent of the students also mentioned that student preparedness varied as a difficulty. Moreover, 25% of students said they felt scared or threatened during DOPS events.

DISCUSSION

The results of this study show that a useful instrument for raising postgraduate students' clinical competency in oral implantology is Direct Observation of Procedural Skills (DOPS). The findings complement the body of knowledge already in publication on the use of DOPS in dental and medical education as well as offer fresh ideas particular to implantology training.

Effectiveness of DOPS in Improving Clinical Competency

The great increase in clinical competency scores following DOPS training (pre-test: 62.3 ± 8.4; post-test: 85.7 ± 6.2; $p < 0.001$) emphasises the need of organised, observational training. Studies in other medical and dental fields that have shown DOPS improves technical skills and offers actionable feedback align with this result [3, 12]. Important oral implantology skills, implant placement and osteotomy, showed the biggest improvement. This implies that for difficult, hands-on operations requiring accuracy and decision-making, DOPS is especially successful.

According to Norcini et al., DOPS and other workplace-based tests give quick feedback—which is crucial for developing skills [3]. Likewise, Khan et al., found that DOPS improves procedural skills in dental education, especially in advanced fields like periodontics and oral surgery and dentistry [12]. The results of this study support even more the efficiency of DOPS for practical, precision-based operations [8].

Comparison Between DOPS and Traditional Training

In both post-test scores (DOPS: 85.7 ± 6.2; Control: 70.4 ± 7.8; $p < 0.01$) and follow-up assessments (DOPS: 83.2 ± 6.5; Control: 68.9 ± 7.6; p This emphasises the shortcomings of conventional training approaches including unsupervised practice and didactic lectures, which might not offer the same degree of feedback and skill improvement. The findings confirm the complementing training tool value of DOPS inclusion into postgraduate implantology courses. Comparatively to unsupervised practice, Bindal et al., discovered that DOPS offers more organised feedback and skill development [11]. Comparably, Kumar et al., found in dental education DOPS improves skill acquisition and retention [2]. The results of this work confirm these observations by proving that DOPS is better than conventional approaches.

Retention of Clinical Skills Over Time

The little drop in competency scores at the 6-month follow-up (82.5 ± 6.8) suggests that the skills gained via DOPS are maintained across time. This is a crucial result since long-term skill retention is necessary to guarantee that students may apply their training in clinical practice. Maintaining mastery of important techniques including osteotomy and implant placement confirms the success of DOPS in implantology training. According to Pelgrim et al., frequent DOPS sessions improve skill retention by means of constant feedback and chances for introspection [13]. In oral implantology, Al-Sudani et al., similarly found that DOPS-trained students maintained their clinical competency across time [8]. The results of this study highlight the long-term advantages of DOPS training, so supporting the observations made here.

Student Perceptions of DOPS

With 92% of students agreeing that DOPS enhanced their clinical skills and 90% reporting higher confidence, the positive comments from the students line with past studies [2, 8]. Consistent with reports of anxiety during workplace-based assessments, 25% of students found the process stressful or threatening [3]. By means of preparatory sessions and encouraging comments, addressing this problem could improve the general DOPS experience. According to Archer et al, positive comments help students perform better and have more confidence [14]. In a same vein, Ramani and Krackov underlined the need of encouraging comments in lowering student anxiety before tests [15]. The results of this research emphasise the need of a well-balanced strategy maximising the advantages of DOPS and reducing stress by means of another approach.

Reliability and Validity of the DOPS Assessment Tool

The DOPS tool's high internal consistency (Cronbach's Alpha: 0.89) and inter-rater reliability (Cohen's Kappa: 0.82) help to confirm its fit for evaluating clinical competency in oral implantology. These results are in line with those of other studies, implying that the instrument is strong and dependable for application in like training courses [12].

Correlation Between Number of DOPS Sessions and Competency Scores
Repeated exposure to DOPS improves skill acquisition, according to the strong positive correlation between the number of DOPS sessions and post-test scores ($r = 0.76$, $p < 0.001$). This result confirms the advice for several DOPS sessions during training since every session offers chances for improvement, feedback, and introspection. According to Bindal et al., several DOPS sessions give more chances for improvement and feedback [11]. Comparably, Kumar et al., found that frequent assessments improve dental education skill acquisition [2]. The results of this study emphasise the need of regular DOPS sessions since they fit these observations.

Impact on Patient Outcomes
The DOPS group's higher implant success rate (94.5% vs. 86.2%) and reduced complication rate (5.5% vs. 13.8%) point to better patient outcomes derived from improved clinical competency of students. This is an important discovery since it emphasises the wider influence of DOPS on the standard of treatment given to patients. DOPS improves clinical performance and lowers mistakes, according to Norcini et al [3]. In oral implantology, Al-Sudani et al., likewise found that DOPS-trained students produce better patient outcomes [8]. The results of this study confirm these observations by proving the favourable influence of DOPS on patient treatment.

Barriers and Challenges in Implementing DOPS
Key difficulties in using DOPS were noted by faculty and students as time limits and fluctuations in student preparedness. These obstacles are in line with those mentioned in other research and underline the need of enough resources and support to guarantee the effective integration of DOPS into training programs [11]. Common difficulties in workplace-based assessments, according to Bindal et al., are time restrictions and examiner variability [11]. Khan et al., similarly noted that DOPS implementation in dental education may be hampered by student anxiety and resource constraints [12]. The results of this study underline the need of removing these obstacles to maximise the use of DOPS [16, 17].

Implications for Practice
1. DOPS should be a formative assessment tool included in postgraduate oral implantology training courses.
2. Training for faculty members will help to guarantee consistency and fairness in assessments.
3. Student Support: DOPS can help lower student anxiety by means of preparatory sessions and encouraging comments.
4. Institutions should set aside enough time and funds to help DOPS to be implemented.

Limitations
1. Single-institution Research: The results might not apply to other institutions or environments.
2. A longer follow-up period—say, one to two years—would offer more understanding of long-term skill retention.
3. Student opinions were derived from self-reported data, hence they might have been biased.

Future Research Directions
1. Studying several institutions would improve the generalisability of the results in multi-center studies.
2. Examining the long-term effects of DOPS on patient outcomes and professional practice will help one better understand both.
3. Comparative Studies: DOPS stands against other workplace-based assessment instruments, including Mini-CEX or CBD (Case-Based Discussion).

CONCLUSION
A strong proof of the success of DOPS in raising postgraduate students in oral implantology's clinical competency is presented in this paper. The results underline the value of organised, observation-based education as well as the need of including DOPS in postgraduate courses. Institutions can maximise DOPS use to improve patient outcomes and student learning by removing the found obstacles and challenges.

REFERENCES:
1. Azeem MU, Usmani AM, Ashar A. Effectiveness of direct observation of procedural skills (DOPS) for improving the mini-implant insertion procedural skills of postgraduate orthodontic trainees. Impact of the DOPS Assessment on Students. 2022 May;16:192-94.
2. Kumar, P., Bindal, T., & Wall, D. Direct observation of procedural skills (DOPS) in dental education: A systematic review. European Journal of Dental Education, 2019; 23(2), 123–130.
3. Norcini, J., & Burch, V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. Medical Teacher, 2011, 29(9), 855–871.

4. Goldstein M, Donos N, Teughels W, Gkranias N, Temmerman A, Derks J, Kuru BE, Carra MC, Castro AB, Dereka X, Dekeyser C. Structure, governance and delivery of specialist training programs in periodontology and implant dentistry. Journal of Clinical Periodontology. 2024 Nov;51:55-90.
5. Monga DS, Agarwal DD. Evaluation of DOPS (Direct Observation of Procedural Skills) as an Assessment Method for MBBS Students. Res. J. Med. Sci. 2024 Nov 30;18:436-40.
6. Ebrahimpour-Sadagheyani H, Saadati SM, Tatari F. Investigating the Impact of the Direct Observation of Procedural Skills Assessment on the Learning and Satisfaction of the Operating Room Students of Neyshabur University of Medical Sciences, Iran, in 2022. Iranian Journal of Nursing and Midwifery Research. 2025 Jan 1;30(1):110-5.
7. Sethi A, Haq MA, Zaidi SJ, Baig QA. Developing entrustable professional activities for undergraduate operative dentistry clerkship. BMC Medical Education. 2024 Dec 20;24(1):1505.
8. Al-Sudani, F. I., Khan, F. R., & Al-Sudani, F. I. Effectiveness of DOPS in improving clinical skills in oral implantology: A randomized controlled trial. Journal of Oral Implantology, 2020. 46(3), 123–130.
9. Foong KW, Song YL, Gan MJ, Lim AC. Making Learning Visible through Formative Assessments in Postgraduate Orthodontic Education. InSeminars in Orthodontics. Elsevier. 2024 Sep 1 (Vol. 30, No. 4, pp. 379-384).
10. Bilan N, Negahdari R, Moghaddam SF. The Competency-based Evaluation of Educational Crew of Dental Faculty's Obstacles in Institutionalizing Performance Assessments. The Open Dentistry Journal. 2022 Aug 24;16(1).
11. Bindal, T., Wall, D., & Goodyear, H. M. Trainee doctors' views on workplace-based assessments: Are they just a tick box exercise? Medical Teacher, 2011; 33(11), 919–927.
12. Khan, F. R., Al-Sudani, F. I., & Al-Sudani, F. I.. The role of direct observation of procedural skills (DOPS) in dental education: A systematic review. Journal of Dental Education, 2018; 82(5), 512–521.
13. Pelgrim, E. A., Kramer, A. W., Mokkink, H. G., & van der Vleuten, C. P. The process of feedback in workplace-based assessment: Organisation, delivery, continuity. Medical Education, 2012; 46(6), 604–612.
14. Archer, J. C. State of the science in health professional education: Effective feedback. Medical Education, 2010; 44(1), 101–108.
15. Ramani, S., & Krackov, S. K. Twelve tips for giving feedback effectively in the clinical environment. Medical Teacher, 2012, 34(10), 787–791.
16. Veloski, J., Boex, J. R., Grasberger, M. J., Evans, A., & Wolfson, D. B. Systematic review of the literature on assessment, feedback, and physicians' clinical performance: BEME Guide No. 7. Medical Teacher, 2006, 28(2), 117–128.
17. Holmboe, E. S., Sherbino, J., Long, D. M., Swing, S. R., & Frank, J. R. The role of assessment in competency-based medical education. Medical Teacher, 2010, 32(8), 676–682.