

Direct Observation of Procedural Skills as an Assessment Tool for Postgraduates in Medical Microbiology

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ABSTRACT

Rationale of study: Competence forms the foundation of practice in any profession & inferred from performance. Decisions about professional competence are based on observation of the proficiency of trainees performing authentic tasks accurately related to the practice of medicine. Direct observation of procedural skills (DOPS) is the method for assessing competence in the practical procedures that trainees undertake.

Aim: To study the utility of DOPS as an assessment tool in Post Graduate (PG) students in Medical Microbiology.

Materials & Methods: All the participants were sensitized about DOPS. Standard operative procedure & checklists for core skills were prepared. 3 different procedures were selected for 1st & 2nd year PGS & 6 encounters per procedure were taken. Pretest, post test were taken for each procedure & scores were utilized for assessing learning outcome for PGs. Students' DOPS score before & after feedback & practice were compared. Feedback questionnaire was used to evaluate participants' perception about DOPS.

Result: The mean post test score improved significantly ($P < 0.05$) the absolute & relative learning gain, average normalized gain were highest for student A. t test was applied for mean \pm SD of DOPS 1 and DOPS 6 score of all the three procedure for each student and p value was found to be highly statistically significant. Feedback from the faculty & PGs suggested that they like DOPS as an assessment & learning tool.

Conclusion: DOPS was found to be acceptable and feasible method for performance assessment. Direct observation followed by contextual feedback helps postgraduate to learn and improve practical skills.

Key words: DOPS, assessment, Post graduate students.

INTRODUCTION

Postgraduate medical education and training is a dynamic field undergoing major changes around the world. Training in medicine traditionally follows an apprenticeship model and formal assessments are mainly directed towards the testing of knowledge.^[1]

Even the most ideal conventional assessments may fall short of measuring attributes such as appropriate observable response and functioning by the postgraduate trainee in real life situations.^[2]

Any assessment system for postgraduate training must now meet a number of principles laid down by the

Postgraduate Medical Education and Training Board. [3]

These fundamental principles are:

- Competency based
- Developmental
- based on the collection of evidence using an appropriate variety of methods
- triangulated
- Quality assured.

Competence forms the foundation of practice in any profession. [2] Competence is defined as “the degree to which an individual can use the knowledge, skills and judgment associated with the profession to perform effectively in the domain of possible encounters defining the scope of professional practice.” [4,5] Competence is usually inferred from performance. Decisions about professional competence are, therefore, based on observation of the proficiency of trainees performing authentic tasks accurately related to the practice of medicine. [6]

Direct observation of procedural skills (DOPS) is method for assessing competence in the practical procedures that trainees undertake. The assessor directly observes and assesses residents’ skill performance, usually focusing on a single procedural skill. [7]

With this background we decided to undertake this study with the purpose of developing DOPS checklists for selective procedures for first and second year microbiology postgraduates and evaluating its effect on their learning outcome and proficiency about various microbiological techniques.

Aim: To study the utility of Direct Observation of Procedural Skills (DOPS) as an assessment tool in Post graduate students in Medical Microbiology.

Objectives:

- To sensitize post graduates and assessors regarding Direct Observation of Procedural Skills
- To develop DOPS checklist for selective procedures in Microbiology.
- To conduct formal periodic DOPS encounters for assessment of progressive

improvement in procedural skills by the Microbiology postgraduates in selected procedure.

- To analyze learning outcome & to analyze data available by DOPS checklist forms.
- To evaluate perception of postgraduates and faculty about Direct Observation of Procedural Skills.

MATERIALS AND METHODS

This prospective interventional study was carried out in the department of Microbiology, and School for Health Professionals Education and Research (SHPER) after obtaining approval from Institutional Ethics Committee.

Two first year postgraduate students (A, B) & one second year postgraduate student (C) from the department of Microbiology participated in this study. Five senior faculty members participated in the study as assessors.

Study material:

1. Selection of the procedures for DOPS

Procedures from “core skills” of Microbiology syllabus needed for patient diagnosis and care were selected and Standard Operative Procedures were prepared by consensus in the Department as per standard text books.

For 1st year PG students A and B, procedures were

- Gram staining,
- Hanging drop preparation
- Isolation of organisms by streak culture method.

For second year PG ‘C’

- Identification of organisms up to species level from the sample
- Identification of organisms up to species level from mixture broth
- Antibiotic sensitivity testing

2. Checklists showing different levels of competencies involved in the core skills were designed on a 6 point scale for DOPS evaluation. They were peer reviewed and validated.

The checklist had two sections:

First part - the student's and the observer's profile,
 Second part - Procedure-relevant assessment criteria according to defined standards, in which the observer was required to allocate a 1-6, score for each parameter while observing.

Grading scale [7]

- 1(Unsafe)-2-Below expectations
- 3 -Borderline
- 4-Meets expectations
- 5 -Above expectations
- 6- Well above expectations.

The assessment was carried out against the standard expected at the end of the PG's current stage of training .The total score was out of 20.

3. Pretest and Post test Questionnaire

To test the theoretical knowledge about the procedure and subsequent gain in knowledge with repeated procedures, pretest was taken before the first encounter and post test after the last encounter of each procedure.

4. Feedback Questionnaire to evaluate postgraduate students and faculty perception about DOPS

Five point Likert Scale was used to record responses for questions 1-10(Close ended questions). Question. no. 11-14 were open ended questions.

Study method:

Written informed consent was taken from PG students and assessors. All the faculty members and postgraduate students from Department of Microbiology were sensitized about DOPS by conducting a

lecture deliberating on background, concept and procedure of DOPS followed by demonstration of the DOPS.

Encounters

Three procedures each were selected for first year PGs & second year PG. Total six encounters for each procedure for each student were carried out.(Per student 18 encounters)

Pre-test was taken before each procedure for each student.

First session of DOPS was conducted by senior faculty members. All the three students were assessed on the same day. Each assessment session took around 20 minutes followed by 10 minutes for observer feedback to the PG student.

DOPS structured checklist was shared with the students after feedback was over. Students were given an opportunity to practice the skills for minimum two weeks. Students were reassessed using same checklist by same observer within next three weeks. Second session of DOPS was conducted as time permitted for the student and the respective faculty member.

The comparison of checklist scores was done by comparing the scores of the first and last encounter. Post test was taken after last encounter of each procedure. Feedback about the entire experience was taken from participating students and faculty members at the end of all encounters.

Analysis of data was carried out as per table 1

Table 1: Scheme of Analysis of data

	Instrument	Type of analysis
Assessment of learning outcome	Comparison of Pretest and Posttest scores for each procedure	Quantitative
	Learning gain <ul style="list-style-type: none"> • Absolute learning gain(ALG) (% Post test score - % Pre-test score) • Relative learning gain(RLG) (% Post test score -%Pre-test score/ %Pre-test score) • Average normalized gain(g) [% Post test score -%Pretest score/ (100- %Pretest score)] 	Quantitative
	Comparison of Students' DOPS scores of first and last encounter - used to assess improvement in competency of the PG students.	Quantitative
Evaluation of Reaction	Feedback questionnaire to evaluate students' and faculty's perception(close ended questions)	Quantitative
	Feedback questionnaire to evaluate students' and faculty's perception(open ended questions)	Qualitative

OBSERVATION & RESULTS

Observation was carried out in two parts:

A. Assessment of learning outcome

B. Evaluation of reaction

A. Assessment of learning outcome

1. Pretest and Post test analysis

To test the theoretical knowledge about the procedures and subsequent gain in

knowledge with repeated procedures, pretest and post test questionnaire were prepared on decided procedures two tailed t test was applied for difference between means of pretest and post test. $P < 0.05$ was considered statistically significant. (Table 2)

Table 2: Pre test and post test analysis

Student	Mean with S.D. of pre-test score	Mean with S.D. of post-test score	t value	Standard Error of difference between means	P value
1 st year students A	2.33 ± 0.57	9.00 ± 0.00	20.26	0.329	0.0001**
B	2.67 ± 0.58	8.67 ± 0.58	12.67	0.474	0.0002**
2 nd year student C	2.00 ± 0.00	8.33 ± 0.57	14.23	0.329	0.0001**

p value was found to be highly significant as less than 0.005

2. Learning gain:

The absolute learning gain, relative learning gain, average normalized gain were calculated from pretest and post test scores. Average normalized gain (g) of 0.3 i.e. 30% was considered as significant as per Hake's criteria for effectiveness of an educational intervention. [8] Average normalized gain was categorized as:

Low gain- 0.1 to 0.29

Medium gain- 0.3 to 0.69

High gain- 0.7 to 1.0

Table 3: learning outcome by assessment of learning gain

Score	A(%)	B(%)	C(%)
Absolute learning gain(ALG)	66.67	60	56.67
Relative learning gain(RLG)	89	85.67	82.35
Average normalized gain(g)	0.908 (90%)	0.818 (81%)	0.772 (77%)

Table 4: Evaluation of DOPS scores in various procedures performed by PG student A, B,C

Student	Mean with S.D. of DOPS 1 score	Mean with S.D. of DOPS 6 score	T value	Standard Error of difference between means	P value
1 st year students A	5 ± 1.73	17.67 ± 0.58	12.027	1.053	0.0003*
B	4 ± 1.0	17.0 ± 1.0	20.481	0.667	0.0001*
2 nd year student C	4.33 ± 1.15	16.0 ± 1.0	13.263	0.880	0.0002*

B. Evaluation of reaction: Feedback analysis

i) Analysis of close ended questions to evaluate postgraduate students' and Assessors' (faculty's) perception about DOPS (Figure 1)

1. 100% PG students and 80% assessors felt that the sensitization about DOPS provided prior to actual encounter was adequate and helpful.

Table 3 shows the learning outcome by assessment of learning gain.

The absolute learning gain, relative learning gain, average normalized gain were highest for student A.

3. Comparison of Students' DOPS scores of first and last encounter:

t test was applied for mean ± standard deviation of Dops 1 and Dops 6 score of all the three procedure for each student A,B,C and p value for the difference between mean was found to be highly statistically significant.(Table-4)

2. 100% participants felt that the conduct of each encounter was new learning experience.

3. 100% participants found that the encounters were helpful in learning the correct principle & protocol for the selected procedure.

4. 66.66% PG students and all the assessors felt that the duration and frequency of encounters were adequate.

5. 100% participants were of opinion that these encounters helped improve overall skills of performing the selected procedure.
6. All the PG students and 80% assessors were of opinion that DOPS can be implemented as a routine during Medical Microbiology postgraduate training.
7. 100% participants felt that after each encounter, the mistakes corrected, helped for better performance in subsequent encounter.
8. 66.66% PG students (two) and all the assessors felt that the assessment was carried out in an unbiased manner. One PG student gave neutral response.
9. All 100% participants were of opinion that DOPS provide opportunity for reflection & self assessment.
10. All the PG students and 80% assessors felt that DOPS has positive impact in preparing students for summative practical examination.

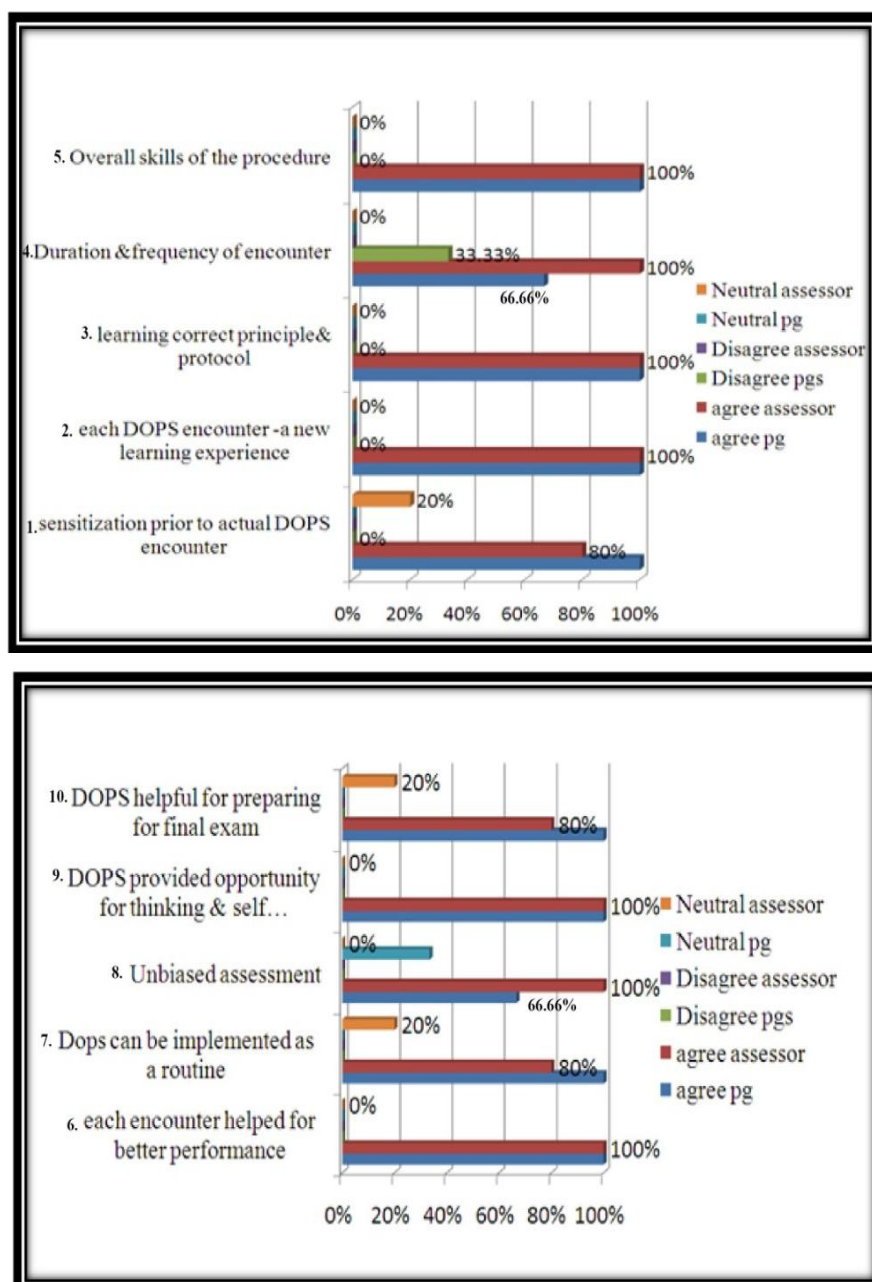


Fig.1: Feedback analysis of close ended questions to evaluate postgraduate students' and Assessors' (faculties') perception about DOPS

ii) Analysis of open ended questions:

Feedback from the faculty and postgraduate students suggested that DOPS can be utilised as an assessment and learning tool. Faculty liked the technique as they found excellent correlation between this assessment method and relevance to curriculum. Postgraduate students liked this assessment method as this technique helps learning the correct procedures in easy and non threatening way and opportunity of having one to one verbal and written feedback from the faculty.

DISCUSSION

DOPS is unique in that it tests the trainee's ability to apply his knowledge to a particular procedure and provides an assessment of the practical work performed by the trainee under the supervision of an experienced assessor. [9]

In present study, Pretest/post test analysis showed significant improvement in post test scores.

Nazari Roghieh [10] conducted pre & post test in control & intervention groups. Difference between the mean values of pre and post-test scores of the two procedures for both intervention and control groups was significant ($P < 0.001$).

This study showed that using DOPS improved the students' scores in the final encounter over the baseline. It leads to improvement in trainees' performance for the chosen procedure.

Same findings i.e. improvement in DOPS score on repeated encounters were seen in study by Habibi et al [9] Shahgheibi et al [11] Dabhadkar et al [12], Amini et al. [13]

In present study, analysis of close ended questions was in accordance with other authors like Shahgheibi et al [11] Dabhadkar et al, [12] Amini et al, [13] Shahid Hasan et al, [14] T. Singh et al [15] and Kundra S. and Singh T et al. [16]

We analyzed strengths and limitations of this study. Strong points in favour of this method again unanimously turned out to be the structured checklist,

learning the correct procedures in easy and non threatening way, opportunity to give immediate individual feedback and reassessment after practice.

We faced some limitations like limited number of postgraduate students (only three postgraduate students), time constraint (multiple encounters to be assessed during routine busy schedule).

CONCLUSION

DOPS was found to be an acceptable and feasible method for performance assessment. Direct observation followed by contextual feedback helps postgraduate to learn and improve practical skills. DOPS requires initial faculty and trainee sensitization, faculty training as an assessor and for giving meaningful feedback, extra time for preparation of checklists and for conducting encounters.

RECOMMENDATIONS

1. DOPS should be used as a complement to traditional methods of assessment.
2. Training programmes for assessors and trainees should be carried out before implementation of DOPS. It should be planned and executed with utmost careful planning. Proper training, awareness and planning about DOPS will increase its acceptability.
3. Besides for formative assessment DOPS can be used for training PG students in routine. This will benefit students for better learning and performing the skills with more confidence and competence which will lead to safe and effective patient care.

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