

Implementing One Minute Preceptor for Effective Teaching and Learning among Radiology Residents

Research Article

Sushil G Kachewar*

PDVVPF's Medical College, Ahmednagar, Maharashtra, India

***Corresponding author:** Dr. Sushil Ghanshyam Kachewar, MD, DNB, PhD, FICR, Professor, PDVVPF's Medical College, Ahmednagar, Maharashtra, PIN- 414 111, India; E-mail: sushilkachewar@hotmail.com

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Abstract

Context: In the clinical speciality of radio-diagnosis, it is vital that the resident (post-graduate student) makes an accurate diagnosis when performing ultrasound of patients with acute abdomen. This study is aimed at teaching residents a systematic approach towards performing ultrasound in cases of acute abdomen using a new educational tool known as One Minute Preceptor (OMP) as well as assessing the usefulness of this innovative teaching-learning tool.

Methods: Residents from the Department of Radiology participated as learners and a single teacher from the same department participated as the preceptor in this study. Response from the residents was marked on the Likert Scale. The intended end point was to introduce residents to a new teaching/facilitation tool to assist them in the process of making a definite diagnosis and to test their perceptions about the influence of the new tool. To assess the effectiveness of this research, the four-level model created by Donald Kirkpatrick and Likert Scale was utilized to measure the change in attitude. The p value was calculated using the Mann-Whitney U test.

Results: The Likert item response number 1 to 4 [pre-test] had a mean value of 3.5 and item number 8 to 9 [post-test] had a mean value of > 4.5; indicating that the residents' level of learning has significantly improved ($p < 0.001$). All the residents were able to satisfactorily rule in or rule out a definitive cause of pain in patients with acute abdomen with the use of ultrasound for diagnosis, compared to the pre-project status where the diagnosis was rarely definitive and was more often only speculative.

Conclusion: OMP encourages residents to think critically about the case and gives insight into clinical reasoning skills. It also reminds preceptors to provide feedback on performance.

Keywords: Medical Education Technology; Teaching-Learning Methods; One Minute Preceptor; Likert Scale; Kirkpatrick's evaluation model

Introduction

The radiology department is one of the busiest departments in an institution as almost every patient is referred to this department to find any demonstrable cause of his or her ailment. A very high number of ultrasound referrals make it impossible for the faculty members to scan each patient. Hence, ultrasound is most often performed by residents undergoing post-graduate training. Traditionally, patients are brought to the notice of the faculty only when the residents cannot reach a definitive diagnosis. The teacher then takes over the

case and provides a ready-made diagnosis. Ideally, however, the teacher should have guided the resident to reach a diagnosis instead of providing a ready-made diagnosis. The teacher takes appropriate history, performs relevant clinical examination and correlates ultrasound (USG) findings with those of other investigations in reaching the accurate diagnosis. Often, it is realized that, had the residents followed this systematic approach, the diagnosis would have been easily made. When one or more of these steps are missed by the residents, they cannot reach a definitive diagnosis and hence they turn to the preceptor for guidance.

This education research project was undertaken to introduce and implement a novel method of 'One Minute Preceptor'(OMP) in the place of traditional teaching. The ultimate aim was to make the residents perfect in sonographically evaluating patients of acute abdomen so that a satisfactory diagnosis could be reached. The author had previously conducted a study using OMP in patients presenting with right iliac fossa pain [1].

OMP is a learner-centered model of precepting in which during the teaching encounter, the focus is on the learner's reasoning while simultaneously gathering the necessary components of the history and physical examination and its proper correlation with other relevant laboratory findings. In traditional methods of teaching, only a small amount of the entire time is devoted for actual teaching and no constructive feedback is given [2]. OMP aims to overcome this shortcoming. The "one-minute preceptor" is a modern teaching-learning methodology for efficiently structuring an interaction with a learner [3]. It has been widely tested in the Western world but has not yet been introduced and implemented in this medical college.

The five steps of OMP [4-7] are as follows-

1. Get a commitment from the learner

In this first step, the resident (learner) is asked to evaluate the patient by himself or herself without any help from the teacher (preceptor). Resident performs a thorough USG scan of the patient to the best of his abilities. After completing the USG scan, he discloses his observations (both positive as well as negative) and commits to a diagnosis. At times, if the resident has not reached any specific diagnosis, the teacher asks him to commit to the most likely diagnosis or enlist the differential diagnosis.

2. Probe for underlying reasoning

Once step one is achieved and the resident commits to a diagnosis, the teacher encourages him to spell out the observations or findings which made the resident to commit to the diagnosis.

3. Provide positive feedback

After the resident discloses his reasoning behind the committed diagnosis, it is now the teacher's turn to pick up the positives from his observations and congratulate/appreciate him for not missing them.

4. Correct errors in reasoning

Now is the time for the teacher to disclose the errors made by the resident. This is an art and is strictly different from criticism. At no time in this step should the resident feel that he is being belittled.

5. Teach general rules (key teaching points)

In this last step, the teacher summarizes the entire scenario in his language and describes how the diagnosis could be successfully reached based on scientific reasoning. The session ends after the teacher highlights the key teaching points and makes sure that residents have followed them.

Methods

This scientific study aimed to investigate the utility of One Minute Preceptor for effective teaching and learning among

radiology residents. The clinical scenario of ultrasound evaluation of a patient with acute abdomen was chosen for this study. Necessary permission from the institutional and departmental research and ethical committees was obtained. In addition, written consent was obtained from every participant (resident).

The study extended over a duration of 3 months from May to July 2015. A total of 12 residents in the department of radio-diagnosis participated in this study as the learners while the author participated as the sole preceptor. Each resident had at least 12 months of experience in performing abdominal ultrasound independently, while the teacher had an experience of 14 years.

The major tasks involved in the study were the Pre-Intervention Questionnaire for Learner, Intervention detailing OMP, Post-Intervention Questionnaire for Learner and the subsequent statistical analysis. The teacher in this study had undergone a basic and advanced course in medical education technology from an authorised university of health sciences, in which he was taught OMP by the national faculty of medical education and technology unit. The teacher performed this educational exercise a total of 13 times; first as a common demonstration to all the 12 residents in the form of a PowerPoint presentation and subsequently as a demonstration to each of the 12 residents independently. The response from the residents was obtained on the Likert scale within 24 hours of the session. The intended end point was to enable residents to make a definite diagnosis after performing ultrasound in patients with acute abdomen. OMP was the new teaching/facilitation tool to assist them in this process.

For statistical analysis the Likert scale which is a psychometric scale that captures the intensity of their feelings for a given item [8], was used [9]. Table 1 shows the proforma of questionnaire using the Likert Scale to get Learners' response on a scale of 1 to 5; where a score of 1- strongly disagree, 2- disagree, 3-neutral, 4-agree and 5-strongly agree. The p value was calculated using the Mann-Whitney U test to assess the significance of the differences between the pre- and post-test results.

In order to further assess the effectiveness of this study, the four-level model created by Donald Kirkpatrick [10] was also utilised.

Level 1 - Reactions -- Evaluation at this level measures how participants in a training programme react to the programme.

Level 2 - Learning -- Evaluation at this level attempts to ascertain the extent to which students have advanced in skills, knowledge or attitude.

Level 3 - Transfer -- This level measures the transfer that occurred in learners' behaviour due to the training programme.

Level 4 - Results -- Often referred to as "the bottom line," this level addresses the success of a training programme.

Results

The response of all the residents (n=12) who willingly participated in this study to each Likert item was obtained and is summarised in Table 2. As demonstrated by average score of 4 for Likert item 1; most of the residents agreed that it was difficult for them to diagnose

PROFORMA OF LIKERT SCALE FOR RESPONSE FROM LEARNERS

Use one of the following numbers to indicate your choice for each statement

Strongly disagree = 1 Disagree = 2 Neutral = 3
 Agree = 4 Strongly agree = 5

Likert Item No.	Statement for Response	Score
Pre-Intervention Phase		
1	It is always difficult to diagnose the exact cause of pain in right iliac fossa by using ultrasound	
2	In such a situation, you always seek the help of your teacher	
3	The teacher always takes over the case, performs ultrasound and hands you a readymade diagnosis	
4	You are always satisfied when you are handed over a readymade diagnosis	
Intervention Phase		
5	You are now familiar about the 5 micro skills expected to be covered during OMP session	
6	Your Preceptor / Teacher covers all the five micro skills every time	
Post-Intervention Phase		
7	OMP has made it easy to diagnose the cause of pain in right iliac fossa in every patient by using ultrasound	
8	You wish to continue the sessions of OMP in future too and extend it to other topics for effective teaching and learning	
9	OMP is better than the traditional method of teaching and learning	

Table 1: Pro forma of questionnaire using the Likert Scale to get Learners' responses.

the exact cause of pain inpatients presenting with acute abdomen using ultrasound. In such a situation, the majority of them (8 out of 12) sought the help of their teacher who then took over the case, performed ultrasound himself and handed them a ready-made diagnosis (9 out of 12). This left most of the residents unsatisfied as shown by the reply to Likert item 4 which has an average score of just 2.16. After demonstration of OMP, all the residents became familiar with its 5 steps (Likert item 5; average score of 4.5) and they also agreed to the fact that their teacher covered all 5 steps of OMP each time (Likert item 6; average score of 4.5). Most of the residents agreed that implementation of OMP made it easier for them to diagnose the cause of pain in such cases referred for ultrasound (Likert item 7; average score of 4.3), and wished to continue sessions of OMP in the future with extension into other topics as well (Likert item 8; average score of 4.58) and felt that OMP was better than the traditional methods of teaching and learning (Likert item 9; average score of 4.5).

Figure 1 compares as well as demonstrates the improvement in average scores on Likert Scale following the introduction and implementation of OMP by showing a comparison of pre-intervention (3.5) and post-intervention (4.5) average scores.

Donald Kirkpatrick's four-level evaluation model showed the following results:

Level 1 - Reactions -- All 12 residents as well as the single

Table 2: Likert Scale Score Summary to evaluate One Minute Preceptor in teaching and learning among radiology residents.

Likert Item No	n	Score 1	Score 2	Score 3	Score 4	Score 5	Average Score
1	12	0	1	2	5	4	4.00
2	12	0	1	3	4	4	3.91
3	12	0	1	2	4	5	4.08
4	12	3	5	3	1	0	2.16
5	12	0	0	1	4	7	4.50
6	12	0	0	1	4	7	4.50
7	12	0	0	1	6	5	4.33
8	12	0	0	1	3	8	4.58
9	12	0	0	1	4	7	4.50
Average Likert Score in Pre-Intervention Phase i.e. Score of Likert Item 1-4						14.15 4	3.53
Average Likert Score in Post-Intervention Phase i.e. Score of Likert Item 8-9						9.08 2	4.54

A score of 1 stands for strongly disagree, 2- disagree, 3-neutral, 4-agree and 5-strongly agree.

preceptor actively participated in this training programme.

Level 2 - Learning -- As is evident from Likert item response number 1 to 4 [pre-test] having a mean value of 3.5 and item number

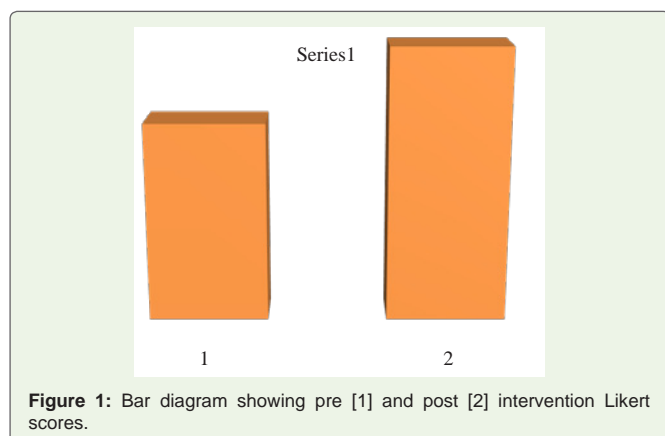


Figure 1: Bar diagram showing pre [1] and post [2] intervention Likert scores.

8 to 9 [post-test] having a mean value of 4.54, the learners' level of learning and confidence in accurate diagnosis has significantly improved ($p < 0.01$).

Level 3 - Transfer -- The preceptor himself saw that the newly acquired skills, knowledge and attitude have shown a significant positive change. All the cases were real-life cases on which the residents performed ultrasound, participating in this programme during their individual emergency hours when the preceptor was called to opine. Of the 12 cases, 3 were of acute Cholecystitis, 5 were of appendicitis, 2 were of mesenteric lymphadenitis, 1 was of left ureteric calculus and 1 was of diverticulitis.

Level 4 - Results -- All the learners can now satisfactorily come out with a definitive cause of pain in patients with acute abdomen with the use of ultrasound for diagnosis, compared to the pre-project status where the diagnosis was rarely definitive and was more often only speculative.

Possible bias in this programme from the preceptor's end [teacher] is in interpreting the response as satisfactory (nevertheless, the preceptor tried to be as neutral as is possible for a human being in this position) and from the resident's end is in always giving a positive response.

Discussion

Medical residents are supposed to do multiple tasks simultaneously. Apart from learning for their educational goals, they are also expected to manage patients in a busy setting. It is therefore appealing if a way can be found to teach individual residents in the busy clinical setting itself so that the teacher and resident can interact and take care of the patient simultaneously. This type of teaching-learning activity is highly desirable as the teacher can have one-on-one time with residents, directly observe them, monitor patient involvement, and educate them in a relevant, real-life scenario [11]. This ideal approach needs proper planning as the time available with individual patients and/or with individual residents is limited.

"One Minute Preceptor" (OMP) has emerged as an effective model for teaching in such clinical settings [4]. Within a short span of time, OMP enables the efficient "shaping" of educational discussions so that the teacher as well as the student can both benefit [5,12]. The

beauty of OMP is that it can be taught in a single one- to two-hour seminar. It focuses on a few teaching behaviors that the resident as well as the teacher can easily perform [4]. So, at the same time, while OMP is being practised, the teacher as well as the resident can "diagnose" the patient and can simultaneously teach the resident by using the five micro skills of OMP.

As shown in the results of the present study, the use of OMP for radiology residents in an ambulatory setup, like ultrasound out-patient department, has positively contributed in achieving its objectives of developing the thought process to reach the exact diagnosis by utilizing medical history, and clinical examination and proper ultrasound analysis. The 'commitment part' encourages the residents to read more and also increases their contact time and interaction with the patients. It also helps them to write better reports and achieve better diagnostic skills.

OMP makes the preceptors aware of the learners' strong and weak areas of need so that they can focus on those areas and bring out the best in the learners. OMP has thus emerged as a satisfactory approach and a problem-solving tool in this scenario. It is quite possible that other educational interventions could have been even more effective, but a comparative study was not carried out.

The first step of getting a commitment from the resident improves the resident's confidence and encourages their analytical and self-expression skills. The second step in which the preceptor probes the residents' underlying reasoning enables the residents and preceptor to understand the gaps in the learning process so that they can be appropriately addressed in the third step of giving positive feedback, fourth step of correcting errors in reasoning and in the fifth and final step of teaching general rules which are the key teaching points on that particular topic.

An initial experience with OMP [1] has now enabled and encouraged the preceptor as well as the residents, to use the concept of OMP in other topics that residents find difficult to master.

OMP has thus paved a way for a fruitful and satisfactory teaching-learning experience for the residents and their teacher that ultimately manifests as an improved diagnosis of the patient's ailment, which is the prime aim of this speciality.

The limitations of this study are the small sample size ($n=12$) and the limited scope, which was restricted to the utility of ultrasound in evaluating patients with acute abdomen. Larger comparative studies are therefore needed for drawing statistical inferences. Moreover, although it is possible that the significant positive outcome ($p < 0.01$) on Likert Scale might be due to false response by the residents to please the faculty, Kirkpatrick's evaluation method reflects the changes in their day-to-day approach which cannot be missed by any preceptor.

Studies have reported that both residents and teachers rate OMP as a more effective model of teaching than traditional methods [3,13]. The results of interactive faculty - resident development workshops focused on OMP - have shown modest improvements in the quality of faculty feedback delivered in the ambulatory setting [6] and resident teaching skills in the inpatient care setting [3]. The effectiveness of

OMP faculty development workshops can be enhanced with the introduction of highly-scripted cases and standardised learners as it helps participants overcome dissatisfaction with role-playing and provides increasingly challenging and at the same time authentic clinical teaching scenarios for skills practice [14].

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