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ORIGINAL RESEARCH

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Enhancing Clinical Teaching: Evaluating the One Minute Preceptor Model in Radiology Education

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ABSTRACT

Background: Clinical education in radiology often faces challenges due to time constraints and the passive nature of conventional teaching methods, which hinder the development of students' diagnostic reasoning. The One Minute Preceptor (OMP) model offers a structured, learner-centered teaching approach that may address these gaps, particularly in time-limited settings.

Objective: This study aimed to evaluate the effectiveness of the OMP model compared to conventional teaching methods in improving the knowledge of radiographic interpretation and diagnosis among medical students during their clinical rotation in the Radiology Department at Universitas Cenderawasih (FK Uncen).

Methods: A quasi-experimental pre-test post-test nonequivalent control group design was used. Sixty professional medical students were purposively assigned to either the OMP group or the conventional group (lectures and observation), with 30 students in each. Group allocation was based on comparable cumulative GPA and clinical activeness to ensure balanced academic performance between groups. Over a one-week intervention, both groups were exposed to the same thoracic radiology cases. The OMP group received instruction following the five microskills framework, eliciting commitment, probing for evidence, teaching general rules, reinforcing correct responses, and correcting mistakes, while the control group received conventional lectures followed by tutor-led discussions without structured feedback. Knowledge improvement was measured using validated multiple-choice questions administered before and after the teaching session. Data were analyzed using independent sample t-tests and normalized gain (N-Gain) scores.

Results: Both groups showed improvement in post-test scores. The OMP group had a higher mean post-test score (71.30 vs. 63.73) and mean N-Gain (29.06 vs. 23.70), although the differences were not statistically significant (p = 0.363). These findings are consistent with trends reported in international literature, which support the use of OMP in enhancing diagnostic learning outcomes.

Conclusion: While not statistically significant, the OMP method showed a trend of greater improvement in radiographic diagnostic knowledge compared to conventional teaching. This pilot study supports the feasibility and potential of OMP as an effective instructional model in radiology education within the Indonesian clinical teaching context, warranting further research with larger samples and extended durations.

Keywords: One Minute Preceptor; Clinical Teaching; Radiology Education; Diagnostic Skills; Medical Students

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PRACTICE POINTS

- OMP is a promising alternative for clinical radiology education in time-constrained settings. The structured, learner-centered approach of OMP supports rapid, interactive teaching without compromising clinical workflow—particularly relevant in busy departments like radiology.
- The application of OMP aligns well with national competency standards.
- This method facilitates improved student performance in diagnostic reasoning and interpretation, aligning with Indonesia's SKDI (Standar Kompetensi Dokter Indonesia), suggesting its suitability for widespread use in Indonesian clinical education.
- Although not statistically significant, OMP showed a trend of higher learning gains. The observed improvement in post-test scores and normalized gains suggests that OMP may be more effective than conventional methods, warranting further research with larger samples and more extended intervention periods.
- This study provides the first localized evidence of OMP's impact on Indonesian radiology education. As a pilot study, it offers valuable insights into how international teaching models like OMP can be contextualized and adapted for use in Indonesian medical schools.
- OMP enhances feedback quality and critical thinking. Its five-step structure ensures that students receive real-time feedback and are actively engaged in clinical reasoning, supporting the development of essential diagnostic skills.

INTRODUCTION

Clinical education is the core of medical training, aiming to bridge theoretical knowledge with practical application in real-world settings. However, clinical teaching is frequently challenged by time constraints, role conflicts between caregiving and teaching, and inadequately structured methodologies that effectively address these dual demands.[1,2] In departments like radiology, where clinical workloads are intense and educational opportunities are limited, the challenge becomes even more pronounced. Conventional teaching methods in radiology often rely on passive observation and didactic lectures, which may not adequately promote the critical thinking or diagnostic reasoning skills necessary for modern clinical practice.[3,4]

Medical students at Universitas Cenderawasih (FK Uncen) undergoing clinical clerkship in radiology, frequently face difficulty translating their theoretical learning into practical diagnostic competence. The conventional methods fail to sufficiently foster interactive, feedback-rich environments where students can develop and refine their diagnostic reasoning. This creates a significant gap between expected competencies—such as those outlined in the Indonesian Medical Competency Standards (SKDI)—and actual student performance.[5–7]

Innovative teaching models that facilitate quick yet meaningful interactions between clinical preceptors and students are needed to address this gap. Among the prominent strategies is the One Minute Preceptor (OMP) model, a micro-skills-based teaching technique designed to enhance learning through brief, structured, learner-centered engagements.[8,9]

OMP has gained traction globally as an effective method for clinical education, particularly in time-pressured environments. It incorporates five strategic steps—eliciting student commitment, probing for evidence, teaching general rules, reinforcing what was done well, and correcting mistakes, allowing for focused, formative feedback and higher learner engagement.[10,11] Studies across various disciplines, including pharmacology and nursing, have demonstrated OMP's positive impact on student performance, feedback quality, and critical thinking skills.[12–14] Particularly in radiology, OMP has been shown to significantly enhance interpretive skills, with studies reporting notable improvements in post-test scores following its implementation.[15]

Despite promising results from international contexts, few studies have explored the specific application and effectiveness of OMP within undergraduate radiology education in Indonesia. Most existing research focuses on general clinical settings or specialties other than radiology.[16,17] Moreover, there is limited evidence evaluating how well OMP aligns with national competency standards in radiographic interpretation and diagnosis among Indonesian medical students. This leaves a gap in the literature concerning the contextual relevance and impact of OMP on diagnostic training in radiology for Indonesian undergraduate medical education.

This study aims to compare the effectiveness of the OMP model with conventional clinical teaching methods in enhancing the knowledge of radiographic interpretation and diagnosis among clerkship students in the Radiology Department at FK Uncen, based on SKDI standards.

This is the first known study to explore the application of the OMP model, specifically in radiology education at FK Uncen, and evaluate its impact on undergraduate diagnostic skills within the Indonesian clinical teaching context. It is a pilot initiative to inform broader educational strategies across other clinical departments.

METHODS

This quasi-experimental study used a pre-test and post-test nonequivalent control group design to evaluate the effectiveness of the OMP method compared to conventional teaching in improving medical students' knowledge of radiological image interpretation and diagnosis. The research was conducted over four months, from May to August 2024, in the Radiology Department of Abepura Regional General Hospital (RSUD Abepura), affiliated with the FK Uncen.

The study involved professional medical students (co-assistants) undertaking their clinical rotations in the radiology department during the 2023/2024 academic year. Sixty students were selected using purposive sampling, ensuring balanced academic performance between groups based on their cumulative GPA. The participants' allocation also considered their activeness during previous clinical rotations to minimize performance bias. The students were then divided into two groups: the experimental group, which received instruction using the OMP method, and the control group, which was taught through conventional approaches such as lectures and clinical observations. In the experimental group, the OMP method was applied following the five-microskills framework, eliciting a commitment, probing for supporting evidence, teaching general rules, reinforcing correct responses, and correcting mistakes. The control group received instruction through conventional teaching methods, which consisted of short didactic explanations followed by tutor-led case discussions. In contrast to the OMP approach that integrates immediate, stepwise feedback throughout the teaching process, the conventional group received feedback only at the end of each teaching session. This delayed feedback was provided without structured questioning or real-time correction. During the teaching sessions, both groups were presented with the same set of thoracic imaging cases (e.g., tuberculosis, pneumothorax, pneumonia). In the experimental group, tutors applied the five-microskills framework and provided structured, continuous feedback as students worked through each case. In the conventional group, however, feedback was delivered only after the session had concluded, without interactive probing or immediate correction.

Each group consisted of 30 students, and both were exposed to the same radiological cases over a one-week teaching period under the supervision of two clinical tutors who were radiology specialists. To minimize potential bias, two clinical tutors were assigned, one for the experimental group and another for the control group. Both tutors were radiology experts and were given a standardized briefing before the study. This helped them ensure a consistent application of their teaching methods. The briefing was carried out by the research team and helped them understand teaching processes and learning objectives. Furthermore, the groups were scheduled in separate sessions to prevent interaction or information exchange between students in the experimental and control groups during the study period.

Inclusion criteria included students entering the radiology rotation for the first time, officially registered in the professional education program, and consented to participate throughout the study. Students with a GPA below 2.75 or those absent for one or more sessions during the clinical teaching were excluded from the study. However, all participants fulfilled the inclusion criteria and completed the study; therefore, no exclusions were made.

To measure students' knowledge before and after the intervention, a test consisting of 15 multiple-choice questions (MCQs) in clinical vignettes was administered as both a pre-test and a post-test. The test items were developed and validated through content and construct validation by medical education and radiology experts. Pilot testing was conducted on students not part of the main study. The validity of the test was evaluated using Pearson's product-moment correlation, while the reliability was assessed using the Spearman-Brown formula with SPSS version 26.

Data collection began with administering a pre-test for both groups before their respective instructional sessions. The same test was used as a post-test to assess knowledge improvement after the intervention. All participating students provided informed consent, and the study was approved by the Health Research Ethics Committee of Jayapura (Ethical Approval Number: EC55.30-0424).

The data were analyzed to assess the differences in knowledge scores before and after the intervention and between the two groups. The normalized gain (N-Gain) was calculated to determine the extent of knowledge improvement. Independent sample t-tests were used to compare mean score differences, and Levene's test was employed to test for homogeneity of variance. A p-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The analysis of student characteristics revealed no significant differences in ethnicity, learning style, and GPA between the OMP and conventional groups, except for a borderline difference in gender distribution ($p = 0.05$) (Table 1). This balanced distribution was achieved through the purposive allocation of participants, while maintaining comparable profiles in terms of cumulative GPA, gender, ethnicity, and learning style to ensure baseline equivalence between the two groups. This general homogeneity aligns with findings from Seki et al. (2016), who reported no significant demographic differences between the SNAPPS and OMP groups.[18] Similarly, Naik & Umarani (2015) found no significant differences in age or prior training between intervention and comparison groups, indicating balanced group characteristics at baseline.[15]

Both groups showed improved post-test scores, with the OMP group averaging 71.30 and the conventional group 63.73 (Table 2). Although the difference was not statistically significant in this study, other studies strongly support the effectiveness of OMP. Ramteke et al. (2024) reported a significant post-test score improvement and a normalized learning gain of 0.83 with OMP use.[19] Similarly, Ali et al. (2018) and Chandra et al. (2020) confirmed significantly higher post-test scores for the OMP group, indicating superior diagnostic knowledge acquisition compared to conventional methods.[20,21] While our results align with these studies in trend, they contrast in statistical significance, possibly due to a smaller sample size and shorter intervention duration.

D et al. (2018) also acknowledged the positive impact of OMP on educational outcomes, even though specific score differences were not statistically emphasized.[17] Gatewood & De Gagne (2019) noted improvements in using medical facts and feedback quality post-OMP, highlighting the method's educational value, though lacking direct comparison scores.[22]

Iyer et al. (2022) added that OMP produced more substantial improvements in diagnostic knowledge than conventional methods, supporting our observed trend of higher post-test means in the OMP group.[23]

Table 1. Distribution of Student Characteristics by Teaching Method

Student Characteristics	OMP Method (n)	%	Conventional Method (n)	%	Total (n)	%	p
Gender							
Female	24	60	16	40	40	66.7	0.05
Male	6	30	14	70	20	33.3	
Ethnicity							
Papua	20	47.6	22	52.4	42	70	0.778
Non-Papua	10	55.6	8	44.4	18	30	
Learning Style							
Visual	8	53.3	7	46.7	15	25	
Auditory	2	40	3	60	5	8.3	0.731
Kinesthetic	2	33.3	4	66.7	6	10	
Mixed	20	51.3	19	48.7	39	65	
GPA							
Excellent (3.50–4.00)	3	10	1	4	4	6.7	0.612
Satisfactory (2.75–3.50)	27	48.2	29	51.8	56	93.3	

Table 2. Student Knowledge Pre-Test and Post-Test Scores

Student Characteristics	Knowledge			
	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD
OMP Method	42.23	16.93	71.30	20.56
Conventional Method	40.03	17.56	63.73	23.34

Table 3. Comparison of Knowledge Differences (N-Gain) between Student Groups

No	OMP Group			Conventional Group		
	Pre-Test	Post-Test	N-Gain	Pre-Test	Post-Test	N-Gain
1	60	33	-27	47	87	40
2	7	100	93	20	67	47
3	47	80	33	53	80	27
4	53	100	47	27	60	33
5	40	67	27	40	67	27
6	40	100	60	40	100	60
7	40	87	47	7	53	46
8	27	47	20	27	73	46
9	40	80	40	60	67	7
10	53	93	40	40	93	53
11	40	73	33	47	60	13
12	40	67	27	40	73	33
13	33	60	27	27	33	6
14	27	53	26	7	27	20
15	33	73	40	33	67	34
16	27	60	33	80	93	13

No	OMP Group			Conventional Group		
	Pre-Test	Post-Test	N-Gain	Pre-Test	Post-Test	N-Gain
17	53	87	34	60	40	-20
18	40	73	33	40	73	33
19	40	53	13	27	33	6
20	27	67	40	53	40	-13
21	93	100	7	60	80	20
22	47	53	6	20	40	20
23	33	87	54	33	47	14
24	27	47	20	47	33	-14
25	53	73	20	53	80	27
26	40	33	-7	47	73	26
27	67	80	13	53	67	0
28	47	80	33	73	73	0
29	67	87	20	33	93	60
30	40	53	13	27	13	-14

Despite several students in both groups showing negative N-Gain values, the OMP group demonstrated a broader and often higher range of gains (Table 3). This mirrors the findings of Ramteke et al. (2024) and Shambharkar et al. (2021), who reported significantly greater N-Gain in OMP participants.[14,19] Naik & Umarani (2015) found a post-test score of 22±5.34 in the OMP group versus 12.37±3.80 in the control group (p=0.00001), confirming the OMP model's superior impact on learning.[15] Chandra et al. (2020) also observed significantly better knowledge gain with OMP in cognitive learning.[21]

Interestingly, despite both groups improving, Iyer et al. (2022) also showed OMP as more effective.[23] This supports the observation in our study that, although the gain was not statistically significant, OMP still produced greater average improvements.

Our study found a mean N-Gain of 29.06 in the OMP group and 23.70 in the conventional group ($p = 0.363$), indicating no statistically significant difference (Table 4). However, numerous studies report otherwise. For example, Shambharkar et al. (2021) reported a significant gain, with the OMP group scoring 46.50 (SD = 2.46) compared to 35.60 (SD = 3.60) in the control group ($p < 0.05$).[14] Similarly, Ali et al. (2018) found that although specific statistical values were not disclosed, the average gain was greater in the OMP group.[20]

Table 4. Difference in Knowledge Scores Between Groups

Method	Knowledge Difference				
	N	Mean	SD	p	95% CI
OMP Method	30	29.06	21.64	0.363	-6.34 - 17.07
Conventional Method	30	23.70	23.60		

Chandra et al. (2020) also documented a significantly higher gain with OMP, further echoed by Iyer et al. (2022), who noted meaningful improvements from pre- to post-test with OMP.[21,23] Naik & Umarani (2015) found a mean gain difference of 9.63 ($p = 0.00001$) in favor of OMP, strongly supporting its impact on radiographic interpretation skills.[15] Ramteke et al. (2024) reinforced this with a significant post-test score difference and a normalized learning gain of 0.83 in the OMP group.[19]

The absence of a statistically significant difference between the present study's OMP and conventional teaching groups could be attributed to several contextual factors. First, the short duration of the intervention (one week) may not have been sufficient for students to fully internalize the structured feedback and reasoning strategies promoted by the OMP method. Second, both groups had comparable baseline knowledge and prior clinical exposure, which could have reduced measurable post-test differences. Third, variations in tutor facilitation styles and the limited number of OMP teaching sessions might have influenced the consistency of method implementation. Finally, since this study involved a relatively small sample size from a single institution, the statistical power to detect subtle learning gains was limited.

Nevertheless, the higher mean N-Gain observed in the OMP group indicates a positive learning trend and suggests that the method may still enhance students' clinical reasoning and interpretative abilities when applied over a longer duration or across multiple rotations. Future research with larger and more diverse samples is warranted to further explore the potential of OMP in radiology education.

CONCLUSION

The findings of this study suggest that while both the OMP method and conventional clinical teaching approaches contributed to an increase in students' knowledge of radiographic interpretation and diagnosis, the OMP method demonstrated a higher mean post-test score and a greater average normalized gain. Although the difference was not statistically significant, the trend aligns with prior studies that support OMP's positive impact on clinical teaching and diagnostic skill development. The broader range and higher frequency of knowledge gains in the OMP group highlight its potential as an effective, learner-centered teaching strategy, particularly in time-constrained clinical environments such as radiology. These results, though preliminary, indicate the need for further studies with larger sample sizes and longer intervention durations to establish the method's effectiveness in the Indonesian context. As a pilot study, this research provides valuable insight into the feasibility and relevance of implementing the OMP model in radiology education at FK Uncen. It may inform broader educational reforms across other clinical departments.

RECOMMENDATION

Based on the findings of this study, it is recommended that the OMP model be more widely applied across various clinical departments, not only in radiology, to enhance student engagement, critical thinking, and diagnostic reasoning skills, especially in busy clinical teaching environments. Future studies should be conducted with larger sample sizes, more extended intervention periods, and a broader range of clinical cases to capture OMP's effectiveness and achieve statistically significant results. It is also suggested that multicenter studies involving multiple institutions and different clinical specialties be carried out to increase the generalizability of the findings within the Indonesian medical education context. To support effective implementation, clinical tutors and preceptors should receive structured training in the OMP method through faculty development programs to ensure consistency and quality in clinical teaching practices. Furthermore, adaptations of the OMP model should be refined to align more closely with the SKDI, particularly by mapping the five microskills of OMP to the relevant SKDI competency domains. These domains include clinical reasoning, diagnostic decision-making, professionalism, and communication skills, core competencies expected from medical graduates. By aligning the OMP's feedback structure and learning objectives with these competency domains, tutors can ensure that clinical teaching develops students' immediate knowledge and directly supports competency achievement as outlined in the national framework. This integration would enable medical schools to use OMP as a structured, competency-based teaching and assessment tool promoting reflective learning and self-directed student improvement. Finally, future research should also investigate the long-term impacts of OMP, not only on immediate knowledge gains but also on clinical performance, reasoning accuracy, and patient care outcomes, to provide a more comprehensive evaluation of its educational value.

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COMPETING INTEREST

The authors acknowledge no conflicts of interest regarding the topics or resources used in this manuscript.

AUTHORS' CONTRIBUTION

Elisa Nugraha Haryadi Salakay – developed the research proposal, collected data, prepared the publication manuscript, and conducted the research.

Grace Fitriana Primasari Hau Mahu – contributed to the development of the research proposal, performed data analysis, reviewed the manuscript, and participated in the research.

Gregorius Adista Enrico Astawa – contributed to the development of the research proposal and data analysis, edited and reviewed the manuscript.

Samdei Carolina Rumbino – provided input on research and reviewed the manuscript.

Astuti Tamher – provided input on preparing the research proposal and collecting data.

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