

EFFECTIVENESS OF SNAPPS TEACHING MODEL IN GENERAL SURGERY FOR IMPROVING CRITICAL THINKING AND CLINICAL REASONING SKILLS IN PHASE III MBBS STUDENTS – A PROSPECTIVE RANDOMIZED MIXED METHODS STUDY

General Surgery

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ABSTRACT

Background: Medical educators face many challenges in developing clinical reasoning skills in students. The newer six step SNAPPS teaching model (Summarize, Narrow, Analyze, Probe, Plan, Self-study) improves critical thinking while reducing teacher workload. **Objective:** This study aims to evaluate the effectiveness of the SNAPPS model in improving critical thinking and clinical reasoning in Phase III MBBS students compared to the traditional teaching method, and to assess the perceptions of students and preceptors. **Methodology:** Study Setting: General Surgical Department, Swamy Vivekanandha Medical College Hospital & Research Institute, Namakkal Design: Stratified randomized mixed methods study Period: September 2024 to April 2025. Participants: 50 Phase III MBBS students Procedure: Students were randomly assigned to two groups by stratified sampling, based on internal assessment marks. Group 1 (25 students) used the SNAPPS model, while Group 2 (25 students) followed the traditional method. Informed written consent obtained from all students. The preceptors and students in group 1 sensitized to SNAPPS technique before the trial by principal investigator. Each student presented 2 cases. Data were collected through validated questionnaires and feedback forms from students and preceptors. **Results:** Statistical analysis with SPSS -15 software (Mann-Whitney U test) showed that the SNAPPS model significantly reduced presentation time, improved summary consciousness, and enhanced differential diagnosis analysis ($P < 0.001$ and $P < 0.05$). The Deep Thinking Inventory (DTI) score was also higher in the SNAPPS group (86.82 vs. 83.10, $P < 0.007$). **Conclusion:** The SNAPPS model significantly outperforms the traditional method in fostering critical thinking and clinical reasoning in Phase III MBBS students during inpatient clinical teaching.

KEYWORDS

SNAPPS model, traditional teaching, critical thinking & clinical reasoning skills, Phase III MBBS students

INTRODUCTION

Clinical teaching in the Phase III MBBS program often faces several challenges, such as time constraints, lengthy unstructured case presentations, and incomplete clinical examinations. These issues hinder the ability of students to develop critical thinking and clinical reasoning skills [9, 10]. In traditional teaching, students may focus excessively on history-taking, neglecting the analytical aspects required for accurate diagnosis and management planning. Consequently, there is a pressing need for innovative teaching methods to enhance clinical reasoning and critical thinking among medical students [3, 4 & 6].

The six-step SNAPPS model (S - Summarize history and findings, N - Narrow differential diagnoses, A - Analyze the differential, P - Probe the preceptor about uncertainties, P - Plan management, S - Self-directed learning) was developed to address these challenges by promoting active student involvement in the diagnostic process. It encourages a more concise and focused presentation, fostering critical thinking and clinical reasoning while also allowing learners to explore uncertainties with their preceptors [1, 2 & 7]. SNAPPS is grounded in cognitive learning and reflective practice theory, aiming to refine diagnostic skills through an active learning approach [5, 8]. While studies have demonstrated the efficacy of SNAPPS in outpatient settings, there is limited research on its application in inpatient teaching [2]. Thus, this study aims to evaluate the effectiveness of SNAPPS in inpatient clinical teaching for Phase III MBBS students.

Objectives:

This Study Aims To:

- Assess the effectiveness of the SNAPPS model in inpatient clinical teaching in comparison with traditional case presentations, focusing on critical thinking and clinical reasoning skills.
- Explore the perceptions of students and teaching faculties regarding this new method of clinical teaching.

Methodology:

Study Setting, Period And Design:

This study was a prospective randomized mixed methods study, conducted in the inpatient wards of General Surgical Department at Swamy Vivekanandha Medical College Hospital & Research Institute, Namakkal, Tamil Nadu, from September 2024 to April 2025.

Participants And Sample Size:

50 Phase III MBBS students, selected from a cohort of 150, participated in the study. Students were ranked based on their internal assessment scores and then randomly assigned to two groups by

stratified sampling: Group 1 (SNAPPS model) and Group 2 (Traditional method), each consisting of 25 students.

Intervention And Procedure:

Informed written consent obtained from all students. No cross overs allowed until last data collection was over. Before the trial, students and preceptors in Group 1 underwent training in the SNAPPS model, which involved video clips, role plays, and hand outs in two 30-minute sessions. Fifty case presentations (2 cases per student) were conducted in each group, with cases selected based on the "must know" level for Phase III MBBS students. Data & Feedback were obtained from both students and preceptors using structured questionnaires.

Study Tools:

The effectiveness of the case presentations was measured using a validated structured questionnaire (free access from open access journal article - Jain et al. BMC Medical Education (2019) 19:224 <https://doi.org/10.1186/s12909-019-1670-3>) focusing on 13 dependent variables, including the conciseness of summaries, number of diagnoses considered, and student engagement in discussions. Additionally, the Diagnostic Thinking Inventory (DTI) (copyright permission obtained from stakeholder Noel Entwistle, Professor Emeritus, University of Edinburgh, UK on 27th Aug. 2024 through reply email) was used to assess clinical reasoning skills, specifically cognitive flexibility and memory structure focussing on 20 items (with domain-wise scores). Both DTI scores and Feedbacks (focused on 10 points) were rated as per five-point Likert scale.

Statistical Analysis:

Data were analyzed using SPSS version 15. Comparisons between groups were made using unpaired t-tests, Mann-Whitney U tests, and chi-square tests, with a significance level set at $p < 0.05$.

RESULTS:

Table 1: Results Of Outcome Based On Dependent Variables

O	Sl. NO	DEPENDENT VARIABLES	SNAP PS	TRADIT IONAL	p value (MW-U)
S	1	Total presentation length (in minutes) (Mean $\pm$ SD)	14.08 $\pm$ 2.06	20.68 $\pm$ 1.70	< 0.001
	2	Summary conciseness (max.5)	4.04 $\pm$ 0.67	3.6 $\pm$ 0.64	
	3	Duration of summary (in minutes) (Mean $\pm$ SD)	7.92 $\pm$ 0.75	11.68 $\pm$ 1.37	< 0.001
	4	Duration of discussion (in minutes) (Mean $\pm$ SD)	8.12 $\pm$ 1.09	10.64 $\pm$ 1.03	< 0.001

N	5	Summary thoroughness (Mean $\pm$ SD)	3.92 $\pm$ 0.64	3.56 $\pm$ 0.65	< 0.05
	6	Number of diagnoses kept(D) in DD (Mean $\pm$ SD)	4.08 $\pm$ 0.49	3.44 $\pm$ 0.50	< 0.001
A	7	Number of basic attributes in support of D (Mean $\pm$ SD)	3.76 $\pm$ 0.77	3.6 $\pm$ 0.50	
	8	Number of justified D in the DD (Median-IQR)	4.16 $\pm$ 0.85	3.6 $\pm$ 0.50	< 0.01
	9	Number of comparisons made between diseases (Median-IQR)	4 $\pm$ 0.76	3.48 $\pm$ 0.51	< 0.05
P	10	Number of uncertainties & clarifications (Mean $\pm$ SD)	4.2 $\pm$ 0.64	3.56 $\pm$ 0.50	< 0.01
	11	Percentage of students seeking clarification	76%	48%	< 0.001
P	12	Percentage of students initiating management plan	84%	72%	< 0.002
S	13	Percentage of students identifying topics for Self-study	80%	60%	< 0.003

Table 2: Feed Back Form For Preceptors

Parameters	Group I SNA PPS	Group II Traditional	p value (Mann-Whitney U) Asymp. Sig. (2-tailed)
1. Concisely covered all aspects of history taking	4 (4-5)	4 (4-5)	1
2. Performed all the steps of general examination	4 (4-5)	4 (4-5)	1
3. Systemic examination findings were relevant and in accordance with history	5 (4-5)	5 (4-5)	1
4. Sequencing and formulation of differential diagnosis were well organized	5	4	0.025
5. Hypothesis of differential diagnosis matching with history and examination	5 (4-5)	4 (4-5)	0.456
6. Able to speak out all the difficulties faced while case discussion	4 (4-5)	3 (3-4)	0.099
7. Narration of patient management plan – realistic and appropriate to differential diagnosis	5 (4-5)	4 (4-5)	0.456
8. Identified sufficient case based learning issues for self-study	5 (4-5)	4 (4-5)	0.456
9. Time management during case presentations	5 (4-5)	4 (3-4)	0.09
10. Uniformity and skills of presentation	5 (4-5)	4 (4-5)	0.456
Overall rating of case presentation (%)	94%	80%	0.05

Table 3: Feed Back Form For Students - Consolidation

Parameters	Group I SNA PPS	Group II Traditional	p value (Mann-Whitney U) Asymp. Sig. (2-tailed)
1. Concisely covered all aspects of history taking	4 (4-5)	4 (2-4)	0.197
2. Performed all the steps of general examination	4 (4-5)	4 (3-4)	0.197
3. Systemic examination findings were relevant and in accordance with history	4 (4-5)	4 (4-4)	0.317
4. Sequencing and formulation of differential diagnosis were well organized	3 (3-4)	2 (2-3)	0.239
5. Hypothesis of differential diagnosis matching with history and examination	4 (4-5)	3 (2-4)	0.105
6. Able to speak out all the difficulties faced while case discussion	4 (4-5)	2 (2-3)	0.043
7. Narration of patient management plan – realistic and appropriate to differential diagnosis	3 (3-4)	3 (2-3)	0.099
8. Identified sufficient case based learning issues for self-study	4 (4-5)	3 (3-4)	0.197

9. Time management during case presentations	4 (4-5)	2 (2-3)	0.043
10. Uniformity and skills of presentation	4 (4-5)	4 (3-4)	0.099
Overall rating of case presentation (%)	76%	62%	0.05

Quantitative analysis revealed several significant differences between the two groups. The SNAPPS group demonstrated a significantly shorter presentation time (14.08 $\pm$ 2.06 minutes vs. 20.68 $\pm$ 1.70 minutes, $p < 0.001$), higher summary conciseness (4.04 $\pm$ 0.67 vs. 3.6 $\pm$ 0.64, $p < 0.05$), and a greater number of differential diagnoses considered (4.08 $\pm$ 0.49 vs. 3.44 $\pm$ 0.50, $p < 0.001$). Additionally, SNAPPS students were more likely to seek clarification from their preceptors (76% vs. 48%, $p < 0.001$) and initiate management planning (84% vs. 72%, $p < 0.002$). [Table 1]

Feedback from both students and preceptors favoured the SNAPPS model. Preceptors rated the SNAPPS group higher in terms of the organization of differential diagnoses and the ability to formulate a realistic management plan. Similarly, students in the SNAPPS group reported better time management and clearer case presentations. [Table 2 & 3]

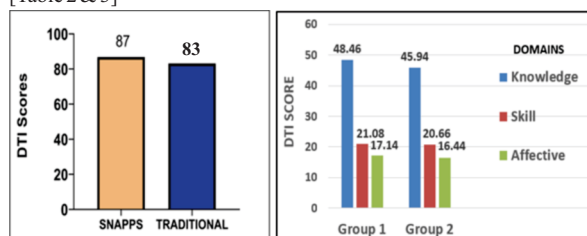


Fig. 1A & 1B: Comparison of DTI Scores & Domain wise DTI Scores

The Diagnostic Thinking Inventory (DTI) scores indicated that the SNAPPS group exhibited better clinical reasoning (86.82 $\pm$ 6.55 vs. 83.10 $\pm$ 7.37, $p < 0.007$), with superior performance in knowledge, skills, and affective domains. [Fig. 1A & 1B]

Qualitative analysis was based on the feedback obtained through structured questionnaires and the overall interactions observed during the study.

Table 4: Qualitative analysis report in table format with Themes, Subthemes and Description:

Theme	Subtheme	Description
1. Student Experience with SNAPPS Model	Enhanced Engagement	Active participation, critical thinking in case discussions
	Structured Presentations	Concise case summaries, improved time management (14.08 $\pm$ 2.06 min vs 20.68 $\pm$ 1.70 min)
	Clarity & Communication	Higher number of clarification requests (76% vs. 48%), expressing uncertainties
2. Preceptor Experience with SNAPPS Model	Self-Directed Learning	80% of students identified self-study topics
	Improved Case Organization	Structured, organized presentations, better differential diagnosis (5/5 vs 4/5)
	Enhanced Student Participation	Students more willing to express doubts, fostering collaborative learning
3. Comparison with Traditional Clinical Teaching	Improved Presentation Skills	Clearer, deeper presentations and clinical reasoning
	Lower Engagement	Passive participation, fewer clarification requests (48% vs. 76%)
	Disorganized Presentations	Longer, less focused presentations, lower clarity in traditional group
	Limited Clarifications	Fewer students sought clarification
	Lower Self-Directed Learning	60% of traditional students identified self-study topics (compared to 80%)

4. Impact on Clinical Reasoning and Critical Thinking	Enhanced Clinical Reasoning	Broader differential diagnoses, increased diagnostic comparisons (4.08 ± 0.49 vs 3.44 ± 0.50)
	Self-Reflection	Greater self-reflection and identification of study topics for further learning
5. Limitations and Challenges	Additional Training	Time-consuming, required for both students and preceptors
	Study Timeframe	Short duration may have limited depth of feedback

DISCUSSION:

Our findings highlight the effectiveness of the SNAPPS model in enhancing clinical reasoning and critical thinking among Phase III MBBS students. Students in the SNAPPS group were able to present concise, well-organized cases and engage more actively in discussions compared to those in the traditional group. The SNAPPS model provided an opportunity for students to clarify uncertainties, facilitating better communication with preceptors and enhancing their learning experience.

These results align with previous studies by Jain et al. (2019) [5], Kapoor et al. (2017) [4], and Mukhopadhyay et al. (2024) [10], which also demonstrated the benefits of SNAPPS in improving clinical reasoning. Unlike traditional teaching methods, SNAPPS encourages active student participation, critical analysis, and self-directed learning, which are essential for developing independent clinical reasoning skills.

Strengths And Limitations

The strengths of this study include the use of a validated teaching tool, the involvement of trained faculty, and the support of the institution's administration. However, the study faced several limitations, such as time constraints and faculty workload, which may affect the scalability of the intervention. Additionally, the study was conducted over a short period, and long-term effects were not assessed.

Future studies could address these limitations by incorporating larger sample sizes, extended study periods, and additional faculty development programs to support widespread adoption of the SNAPPS model.

CONCLUSION:

Our Short-term Study Results Conclude That –

- The SNAPPS model significantly outperforms the traditional method in fostering critical thinking and clinical reasoning in Phase III MBBS students during inpatient general surgical clinical teaching.
- The SNAPPS model was well-received by both students and preceptors, offering a more structured, engaging, and effective approach to clinical teaching.

Ethical Concerns (If Any): NIL

IEC approval letter obtained. IEC-SVMCHRI File no.EC/NEW/ INST/2022/2913 Ref. No. SVMCHRI/IEC/JUNE/2024/ 001 dated 27.08.2024

Informed written consent obtained from all the participants of this study before the trial.

Copy right permission obtained from the concerned author for using their DTI validated questionnaire format through reply mail dated 27th Aug.2024. [Approaches and Study Skills Inventory for Students (ASSIST) (incorporating the Revised Approaches to Studying Inventory - RASI) Report of the development and use of the inventories (updated March, 2013) Noel Entwistle, Velda McCune (University of Edinburgh) and Hilary Tait (Napier University)]

Conflict Of Study: NIL

Budget Of The Study: NIL

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REFERENCES:

1. Using SNAPPS to facilitate the expression of clinical reasoning and uncertainties: a randomized comparison group trial. Wolpaw T, et al. Acad Med. 2009; 84(4):517-524. PMID: 19318792 Clinical Trial.
2. Expressing clinical reasoning and uncertainties during a Thai internal medicine ambulatory care rotation: does the SNAPPS technique generalize? Sawanyawisuth K, et al. Med Teach. 2015. PMID: 25156235 Clinical Trial.
3. Pascoe JM, Nixon J, Lang VJ. Maximizing teaching on the wards: review and application of the one-minute preceptor and SNAPPS models. J Hosp Med. 2015; 10(2):125–130. doi: 10.1002/jhm.2302. - DOI - PubMed
4. Kapoor A, Kapoor A, Kalraiya A, Longia S. Use of SNAPPS model for pediatric outpatient education. Indian Pediatr. 2017; 54:288–290. doi: 10.1007/s13312-017-1090-6. - DOI - PubMed
5. Jain V, Rao S, Jinadani M. Effectiveness of SNAPPS for improving clinical reasoning in postgraduates: randomized controlled trial. BMC Med Educ. 2019 Jun 21; 19(1):224. doi: 10.1186/s12909-019-1670-3. PMID: 31226996; PMCID: PMC6588865.
6. Flores-Cohaila JA, Vizcarra-Jiménez SF, Bermúdez-Peláez MF, Vascones-Román FF, Rivarola-Hidalgo M, Taype-Rondan A. Effects of SNAPPS in clinical reasoning teaching: a systematic review with meta-analysis of randomized controlled trials. Diagnosis (Berl). 2024 Mar 7. doi: 10.1515/dx-2023-0149. Epub ahead of print. PMID: 38446132.
7. Connell KJ, Bordage G, Chang RW, Howard BA, Sinacore J. Measuring the promotion of thinking during precepting encounters in outpatient settings. Acad Med. 1999; 74:S10–S12. doi: 10.1097/00001888-199910000-00025. [PubMed] [Cross Ref] [Google Scholar]
8. Jones UF. The reliability and validity of the Bordage, Grant & Marsden diagnostic thinking inventory for use with physiotherapists. Medical Teacher. 1997; 19(2):133–140. doi: 10.3109/01421599709019366. [Cross Ref][Google Scholar]
9. 2. Zayapragassarazan Z, Menon V, Kar SS, et al.: Understanding Critical Thinking to Create Better Doctors. J. Adv. Med. Educ. Res. 2016; 1(3):9–13. [Google Scholar]
10. Mukhopadhyay DK, Choudhari SG. Critical Thinking and Clinical Reasoning in Undergraduate Medical Course: A Mixed-Methods Study in a Medical College in Kolkata, West Bengal, India. F1000Res. 2024 Apr 11; 13:259. doi: 10.12688/f1000research.146009.1. PMID: 38779311; PMCID: PMC11109580.