Check for updates

Original Research Article

Comparative Evaluation of Peyton's Four-step Approach and Conventional Teaching Methods for Injection Techniques: A Prospective, Interventional Crossover Study

Journal of Pharmacology and Pharmacotherapeutics
17(3) 463–470, 2026
© The Author(s) 2026
Article reuse guidelines:
in.sagepub.com/journals-permissions-india
DOI: 10.1177/0976500X261417403
journals.sagepub.com/home/pha
Sage

Rushika Modi[1], Mira Desai[2], Aparajita Shukla[3], Chetan Parikh[1], Punit Patel[4] and Jwalantkumar Joshi[4]

Abstract

Background: Traditional teaching methods can pose challenges for learners, particularly when it comes to applying theoretical knowledge in practical settings. In contrast, Peyton's four-step approach provides a structured, learner-centered framework that facilitates better understanding and skill acquisition.
Objectives: To evaluate and compare the effectiveness of Peyton's four-step approach with conventional teaching methods for teaching intramuscular and intravenous injection techniques among undergraduate medical students.
Materials and Methods: This prospective, interventional crossover study was conducted at Nootan Medical College, Gujarat, with 150 Phase II MBBS students. Participants were randomly assigned to either Peyton's approach or the conventional method for intramuscular and intravenous injection training. Assessments included multiple choice questions (MCQs), performance checklists, and feedback on a Likert scale.
Results: Peyton's approach significantly outperformed the conventional method, with higher post-test MCQ scores (Group A: 4.68 ± 0.52 vs. 3.98 ± 0.70; Group B: 4.34 ± 0.86 vs. 3.48 ± 1.14, $p < .0001$). Performance evaluations showed enhanced skill acquisition, with significant improvements in both intramuscular and intravenous injection techniques.
Conclusion: Peyton's four-step approach is an effective teaching strategy that enhances skill acquisition, retention, and student confidence, offering significant advantages over conventional methods in medical education.

Keywords

Injection techniques, medical education, Peyton's four-step approach, skill acquisition, student feedback

Received 07 July 2025; **revised** 09 December 2025; **accepted** 02 January 2026

Introduction

Acquiring basic procedural skills is a fundamental competency for medical graduates to ensure patient safety.[1] Teaching clinical skills effectively forms the backbone of medical education. Traditional methods often rely on observation and unstructured practice, which can result in inadequate skill acquisition and diminished confidence among students. This highlights the need for simple, universally adoptable teaching methods that are student-centered and capable of delivering sustainable outcomes. One such structured and widely recognized approach is Peyton's four-step approach. Introduced by R. Peyton, this method provides a systematic framework for teaching practical clinical skills through the following steps[2]:

Demonstration: The instructor performs the skill in real time without commentary, offering students a clear benchmark.

[1]Department of Pharmacology, GMERS Medical College, Vadnagar, Gujarat, India
[2]Department of Pharmacology, Dr. M.K. Shah Medical College & Research Centre, Ahmedabad, Gujarat, India
[3]Department of Community Medicine, Smt. N. H. L. Municipal Medical College, Ahmedabad, Gujarat, India
[4]Department of Community Medicine, Banas Medical College & Research Institute, Palanpur, Gujarat, India

Corresponding author:
Rushika Modi, Department of Pharmacology, GMERS Medical College, Vadnagar, Gujarat 384355, India.
E-mail: rushikamodi91@gmail.com

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Deconstruction: The instructor performs the skill slowly, dividing it into smaller, manageable steps, and provides detailed explanations for each step.

Comprehension: Students describe each step of the skill while the instructor executes it as per the student's instructions, ensuring comprehension before execution.

Execution: Students perform the skill themselves, narrating and executing each step simultaneously, reinforcing their learning through active participation.

Peyton's approach integrates multiple learning theories. Steps 1 and 2 align with Bandura's social-cognitive theory of model learning.[3] According to Jawhari et al.,[4] Step 3 is critical, as it involves actively manipulating the information from Steps 1 and 2 in working memory to transfer it into long-term memory. Step 4 involves actual procedure execution and is linked to behaviorist learning theory.

Traditionally, students learn clinical skills through observation and practice on real patients, which may risk patient safety. Simulation-based medical education provides a safe environment for practicing skills, using mannequins to avoid patient harm.[1] Studies show that simulation methods, including Peyton's approach, improve skill retention, confidence, and integration of theory and practice.[4–7]

This study compares the effectiveness of Peyton's approach and conventional methods in teaching injection techniques, assessing knowledge retention, performance, and student feedback to determine its suitability for integration into the medical curriculum.

Materials and Methods

Study Design

This comparative, prospective, interventional crossover study was conducted in the skill laboratory of the Department of Pharmacology, Nootan Medical College and Research Centre, Visnagar, Gujarat, from March to August 2021, among 150 Phase II MBBS students.

Randomization

A total of 150 students were divided into two groups: intervention group (A) using Peyton's four-step approach and control group (B) using conventional teaching. A pre-session multiple choice question (MCQ) test was conducted for both groups.

Course Concept

For the intramuscular (IM) injection skill, Group A (intervention) was taught using Peyton's four-step approach, while Group B (control) was taught using the conventional teaching method. For the intravenous (IV) injection skill, the teaching methods were swapped: Group B was taught using Peyton's four-step approach, and Group A was taught using the conventional method.

Peyton Group Training

The intervention group received a 30-min theoretical session followed by 90 min of training using Peyton's four-step approach, which included four steps: demonstration, deconstruction, comprehension, and performance. The student performed the entire procedure independently under supervision.

Conventional Group Training

The control group received a 30-min theoretical session followed by 90 min of training with the conventional method. Faculty demonstrated injection techniques on mannequins, followed by practice sessions with students working in teams.

Assessment of Skills Retention

Students' performance was evaluated using a checklist questionnaire. Post-session MCQ tests were conducted for both groups for both injection techniques. Feedback was collected from both groups using a five-point Likert scale.

Statistical Methods

Data were processed and analyzed using Epi Info 7.1 software. Descriptive statistics were used to summarize categorical variables as frequencies and percentages (%) and continuous variables as means with standard deviations (mean ± standard deviation [SD]). The Chi-square test was used to compare categorical variables between groups, while paired and unpaired *t*-tests were used to assess within-group and between-group differences in continuous variables, respectively. A p value of less than .05 was considered statistically significant.

Results

The present study evaluated the effectiveness of Peyton's four-step approach compared to the conventional teaching method in improving knowledge and performance in IM and IV injection techniques among undergraduate medical students.

Students trained using Peyton's approach for IM injection showed marked improvement in their knowledge from pre- to post-training. Similarly, those taught through conventional methods also demonstrated significant progress. However, when comparing the overall improvement between the two groups, the difference was not statistically significant, indicating that both methods were equally effective in enhancing students' skills ($p = .70$) (Table 1).

For IV injection training, both groups—those taught using the conventional method and those trained using Peyton's approach—showed significant improvement in their performance from pre- to post-training. While the Peyton group had a slightly higher gain in scores, the difference between the two groups was not statistically significant, suggesting that both teaching methods were comparably effective ($p = .52$) (Table 1).

Table 1. Comparison of Pre-test and Post-test Knowledge Scores for Intramuscular (IM) and Intravenous (IV) Injection Skills Using Peyton's Four-step Approach and Conventional Method.

Topic and Teaching Method	Pre-test	Post-test	*p* Value Between Pre- and Post-test	Knowledge Gain Compared to Pre-test
Topic: Intramuscular (IM) Injection				
Group A (*n* = 75): Peyton's approach	3.53 ± 0.79	4.68 ± 0.52	<.001	1.16 ± 0.82
Group B (*n* = 75): Conventional method	3.37 ± 1.44	4.48 ± 0.72	<.001	1.11 ± 0.88
p value between knowledge gains by Group A and Group B—0.70				
Intravenous (IV) Injection				
Group A (*n* = 75): Conventional method	2.89 ± 0.76	3.99 ± 0.71	<.001	1.09 ± 0.82
Group B (*n* = 75): Peyton's approach	3.17 ± 0.91	4.35 ± 0.86	<.001	1.17 ± 0.72
p value between knowledge gains by Group A and Group B—0.52				

These findings suggest both teaching methods are effective, with slightly higher gains observed using Peyton's approach, although not statistically significant.

Both groups performed equally well in the basic steps of IM injection, such as checking prescriptions, identifying injection sites, and hand hygiene, with 100% accuracy. However, Group A, which used Peyton's approach, consistently outperformed Group B, which followed the conventional method, in technical tasks like drug loading, air bubble checks, site sterilization, plunger withdrawal for blood return, spirit cotton placement, and proper disposal of materials. Overall, Group A using Peyton's approach had a higher mean performance (94.7%) compared to Group B (79.7%), confirming that Peyton's approach is more effective for IM injection skill acquisition (Table 2).

Both groups performed equally well in the basic steps of IV injection skills, such as checking prescriptions, identifying injection sites, and hand hygiene, with 100% accuracy. However, Group B using Peyton's approach consistently had better performance compared to Group A using the conventional method in technical tasks such as drug loading, air bubble checks, site sterilization, needle insertion technique, tourniquet application, bevel-up needle insertion adjusting the needle angle, blood return checks post-injection, spirit cotton placement, and proper disposal of materials. Overall, Group B using Peyton's approach achieved a higher mean performance compared to Group A using the conventional method (93.7% vs. 76.3%), confirming Peyton's method as more effective for skill acquisition (Table 3).

Evaluation scores further supported the effectiveness of Peyton's approach over the conventional method. In IM injection training, students taught using Peyton's method achieved higher mean scores compared to those taught conventionally. A similar trend was observed for IV injection, where the Peyton group again outperformed the conventional group. These findings indicate a significant improvement in skill performance when using Peyton's structured, stepwise approach (Table 4).

The feedback questionnaire results revealed a highly positive response to Peyton's approach for learning injection techniques on mannequins. A significant majority of students found the approach to be a valuable use of their time, with 53.33% strongly agreeing and 44.66% agreeing. Most students also believed that Peyton's approach could serve as a beneficial complement to traditional teaching methods (30% strongly agreeing, 66% agreeing) and should be included in the undergraduate curriculum (50.66% strongly agreeing, 46% agreeing). In terms of engagement, 54.66% strongly agreed, and 42.66% agreed that the method increased their attention span through active participation. Additionally, many students felt that the approach helped integrate para-clinical and clinical problem-solving concepts (46.66% strongly agreeing, 47.33% agreeing). The majority also agreed that the method provided a safe environment to practice clinical skills (40.66% strongly agreeing, 56% agreeing), and that repeated practice with mannequins could enhance patient safety (60.66% strongly agreeing, 38% agreeing). Overall, the feedback indicates that Peyton's approach was well-received and regarded as an effective, engaging, and valuable learning tool, with strong support for its inclusion in the curriculum (Figure 1).

Discussion

Peyton's four-step approach effectively transitions learners from "consciously incompetent" to "consciously competent" by integrating mental representation, vocalization, observation, and performance.[8] Combining elements of social-cognitive and behaviorist learning theories, it consists of four steps: demonstration, deconstruction, comprehension, and execution. Steps 1 and 2 draw from social-cognitive theory, emphasizing observation and understanding, while Step 4 aligns with behaviorist theory,

Table 2. Comparison of Intramuscular (IM) Injection Skill Performance Between Conventional Method and Peyton's Four-step Approach.

Evaluation Questionnaire for IM Injection	Group A (n = 75): Peyton's Approach	Group B (n = 75): Conventional Approach	χ^2 and p Value
Checked prescription before injection?	75 (100%)	75 (100%)	NA
Injection site properly identified?	75 (100%)	75 (100%)	NA
Hands washed before injection?	75 (100%)	75 (100%)	NA
Drug loaded correctly into syringe?	68 (90.7%)	52 (69.3%)	$\chi^2 = 9.74, p = .0018$
Air bubble checked in syringe?	66 (88%)	52 (69.3%)	$\chi^2 = 7.01, p = .0081$
Injection site sterilized?	75 (100%)	61 (81.3%)	$\chi^2 = 14.06, p = .0002$
Needle inserted at proper angle (IM/IV)?	64 (85.3%)	54 (72%)	$\chi^2 = 3.79, p = .0517$
Plunger pulled back to check for blood return?	68 (90.7%)	49 (65.3%)	$\chi^2 = 12.41, p = .0004$
Spirit cotton placed post-injection?	69 (92%)	53 (70.7%)	$\chi^2 = 9.44, p = .0021$
Proper disposal of syringe, cotton, and medication?	75 (100%)	52 (69.3%)	$\chi^2 = 25.89, p < .0001$
Total correct steps performed	71 (94.7%)	60 (79.7%)	$\chi^2 = 8.54, p = .0035$

Table 3. Comparison of Intravenous (IV) Injection Skill Performance Between Conventional Method and Peyton's Four-step Approach.

Evaluation Questionnaire for IV Injection	Group A (n = 75): Conventional Method	Group B (n = 75): Peyton's Approach	χ^2 and p Value
Checked prescription before injection?	75 (100%)	75 (100%)	NA
Injection site properly identified?	75 (100%)	75 (100%)	NA
Hands washed before injection?	75 (100%)	75 (100%)	NA
Drug loaded correctly into syringe?	48 (64%)	67 (89.3%)	$\chi^2 = 12.69, p = .0004$
Air bubble checked in syringe?	46 (61.3%)	66 (88%)	$\chi^2 = 13.63, p = .0002$
Injection site sterilized?	64 (85.3%)	74 (98.7%)	$\chi^2 = 7.58, p = .0059$
Needle inserted at proper angle (IM/IV)?	49 (65.3%)	66 (88%)	$\chi^2 = 10.32, p = .0013$
Tourniquet applied? (IV)	38 (50.7%)	62 (82.7%)	$\chi^2 = 17.71, p < .0001$
Needle bevel up during insertion? (IV)	43 (57.3%)	67 (89.3%)	$\chi^2 = 18.22, p < .0001$
Needle angle reduced to 15° for vein entry? (IV)	54 (72%)	67 (89.3%)	$\chi^2 = 7.38, p = .0066$
Plunger pulled back to check for blood return?	53 (70.7%)	70 (93.3%)	$\chi^2 = 11.14, p = .0008$
Spirit cotton placed post-injection?	58 (77.3%)	75 (100%)	$\chi^2 = 17.16, p < .0001$
Proper disposal of syringe, cotton, and medication?	66 (88%)	75 (100%)	$\chi^2 = 9.29, p = .0023$
Total correct steps performed	57 (76.3%)	70 (93.7%)	$\chi^2 = 9.06, p = .0026$

Table 4. Comparison of Evaluation Questionnaire Results Between Conventional Method and Peyton's Approach.

Topic	Group A (n = 75): Peyton's Approach (Mean ± SD)	Group B (n = 75): Conventional Method (Mean ± SD)	p Value
Intramuscular (IM) injection	9.46 ± 0.74	7.97 ± 1.24	<.0001
Intravenous (IV) injection	12.18 ± 0.95	9.92 ± 1.60	<.0001

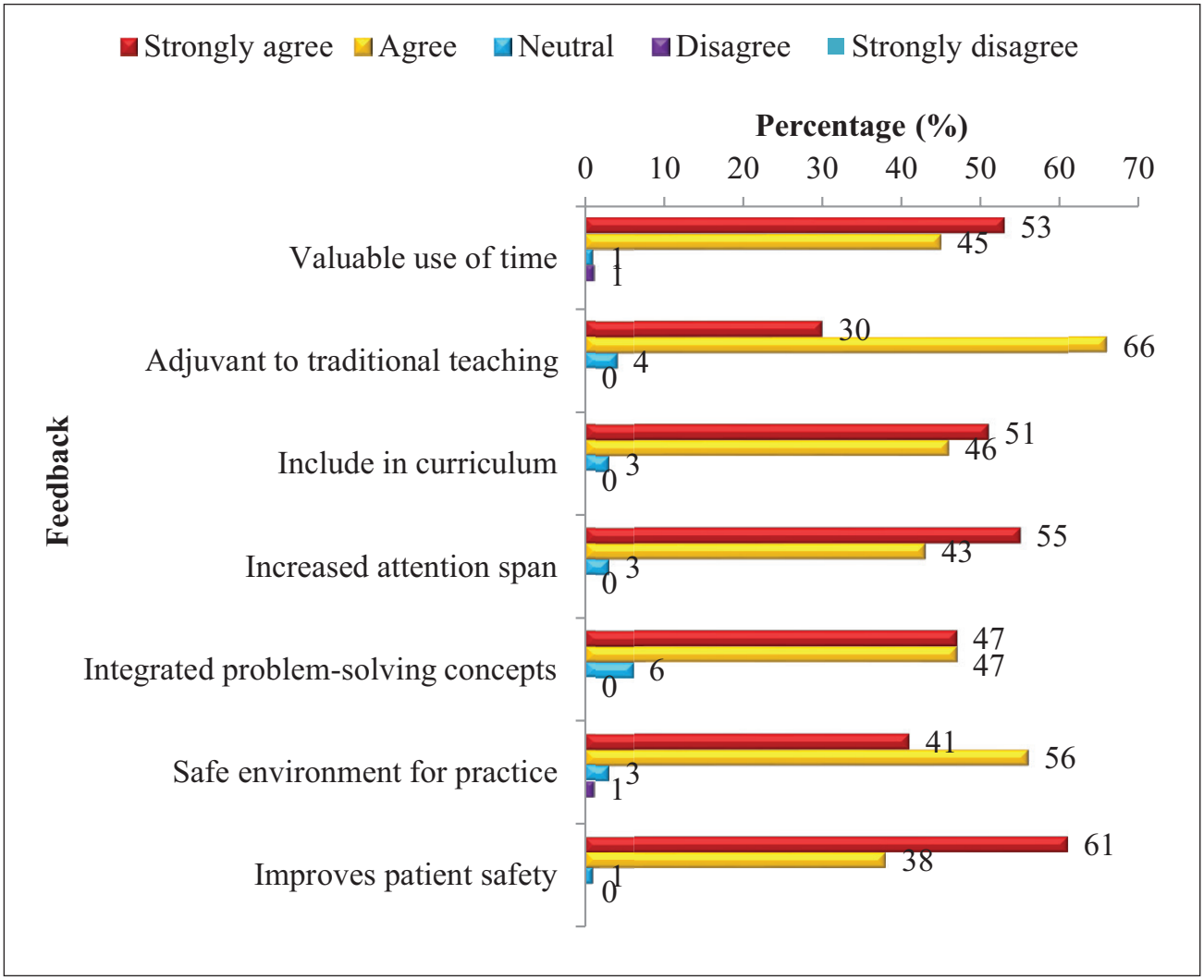


Figure 1. Response Distribution (%) for Feedback on Peyton's Approach in Learning Injection Techniques.

focusing on skill reinforcement through practice. This structured approach enhances both cognitive and psychomotor skill acquisition, ensuring better retention and mastery.[9]

Effectiveness of Peyton's Approach on Knowledge Improvement

In the present study, both groups in IM and IV injection training demonstrated statistically significant improvements from pre- to post-test scores, indicating that each method had a positive impact on student learning. However, students trained using Peyton's approach showed slightly greater mean score gains in both IM and IV skills; the differences between the groups were not statistically significant. These findings align with previous literature, where Peyton's approach has been shown to enhance skill acquisition and retention due to its structured, stepwise process.[2] The cognitive load is effectively managed by breaking down the procedure into manageable steps, which aids better comprehension and performance.[5] Although the knowledge gain between the groups did not differ significantly in our study, the higher post-test scores in the Peyton group suggest a trend favoring this method for procedural understanding. Similar results were reported by Nikendei et al.,[10] who found that Peyton's method improved both the knowledge and performance of learners in procedural skills.

Effectiveness of Peyton's Approach in Skill Acquisition

This study highlights the superiority of Peyton's four-step approach in enhancing the acquisition of both IM and IV injection skills among undergraduate medical students. While both groups performed equally well in foundational steps such as checking prescriptions, identifying injection sites,

and hand hygiene—with 100% accuracy—students trained using Peyton's method consistently outperformed those taught by the conventional method in technical aspects of the procedure. Performance evaluations also showed marked improvement with Peyton's approach, IM injection scores increasing from 7.97 ± 1.24 to 9.46 ± 0.74 ($p < .0001$) and IV injection scores rising from 9.92 ± 1.60 to 12.18 ± 0.95 ($p < .0001$). The time required for teaching using Peyton's approach was comparable to that of the conventional method. This may reflect that both teaching methods effectively convey theoretical content through structured lectures, whereas Peyton's sequential, hands-on format primarily strengthens procedural memory and motor coordination.

These findings align with Varghese and Abraham,[11] who observed comparable efficacy of Peyton's approach and conventional teaching during initial assessments but noted significantly better retention with Peyton's method in subsequent evaluations for skills like tone examination and deep tendon reflex elicitation.[8,12,13] Sethuraman et al.[14] also reported superior performance with Peyton's approach after the first training session, further supporting its effectiveness as a teaching strategy. Notably, skill retention remained consistent across groups following the crossover intervention, underscoring Peyton's approach's role in long-term skill retention.

Garg et al.[15] demonstrated the impact of Peyton's method on psychomotor skill acquisition, reporting higher success rates in procedures like blood pressure measurement (88% vs. 52%), hand washing (96% vs. 48%), and greater satisfaction and confidence among students (88% vs. 24%). Similar findings by Sabaq et al.[16] highlighted improvements in students' knowledge, performance, and confidence, with reduced anxiety and enhanced communication skills.

Studies by Mohammed et al. and Zentz et al. further corroborate our findings, reporting increased satisfaction, reduced anxiety, and enhanced confidence with Peyton's approach in peer-assisted learning settings.[17,18] These studies emphasize the utility of structured teaching methodologies in fostering professional development and facilitating skill acquisition.

Previous studies highlight the benefits of Peyton's four-step approach for complex motor skills like laparoscopic suturing and simulation-based training.[19,20] However, its advantages are less evident for simpler skills, such as chest compressions or laryngeal mask insertion.[21,22]

The cognitive reinforcement in Step 3, involving verbalization and instruction, likely contributes to the method's effectiveness. This cognitive engagement ensures deeper skill comprehension, setting Peyton's approach apart from conventional methods.[14]

Students' Perceptions of Peyton's Approach

The present study revealed overwhelmingly positive feedback for Peyton's four-step approach in teaching injection techniques on mannequins. Most students valued the approach as a worthwhile use of time, with 53.33% strongly agreeing and 44.66% agreeing. A large majority (96%) supported its inclusion in the undergraduate curriculum, while 96.66% found it an excellent complement to traditional teaching methods. Students also reported enhanced engagement, with 54.66% strongly agreeing and 42.66% agreeing that the method increased their attention span through active participation. The approach was noted to effectively integrate paraclinical and clinical problem-solving concepts (94% agreement) and provide a safe environment for practicing clinical skills (96.66% agreement). Additionally, repeated mannequin practice was perceived to enhance patient safety (60.66% strongly agreeing, 38% agreeing), solidifying its value as a pedagogical tool.

Feedback from earlier studies aligns with these findings. Varghese and Abraham[11] reported a statistically significant preference for Peyton's approach, with students finding it more engaging and interesting than conventional methods. Similarly, Sethuraman et al.[14] highlighted that students rated Peyton's method higher for interactivity, understanding, and confidence, with scores averaging 9/10 compared to 6/10 for the conventional method. However, they also noted that students and faculty found Peyton's method more time-intensive, scoring it 9/10 for time requirements versus 4–5/10 for conventional methods.

Limitations

The study only assessed immediate performance and knowledge retention, without evaluating long-term retention or the impact on real-world clinical practice.

The control group was exposed to conventional methods for only one skill, which may have been influenced by a carryover effect due to the crossover design.

Due to time constraints, performance using the checklist was not assessed before the implementation of the intervention. As a result, a pre- and post-intervention comparison of practical skills could not be conducted.

Future research should also focus on assessing long-term retention and the transferability of skills acquired through Peyton's approach to clinical settings.

The crossover design may have introduced a carryover effect, where exposure to one teaching method influenced performance in the subsequent session. Although skill retention remained comparable after crossover, this potential confounder must be acknowledged, as it may have affected independent group comparisons.

Conclusion

Both Peyton's four-step approach and the conventional method effectively improved students' knowledge of injection techniques. However, Peyton's approach demonstrated superior performance compared to the conventional method

in the technical skill of injection administration. The positive feedback from students further suggests that Peyton's method is not only effective but also engaging and valuable for clinical skill development. Given its significant impact on student performance and engagement, Peyton's approach should be incorporated into the undergraduate curriculum for teaching injection techniques. It can also be applied to other clinical procedures to improve engagement and skill retention. Adequate access to mannequins and faculty training is essential to ensure safe, standardized practice.

Abbreviations

IM: Intramuscular; **IV:** Intravenous; **MBBS:** Bachelor of Medicine, Bachelor of Surgery; **MCQ:** Multiple choice questions; **SD:** Standard deviation.

Acknowledgments

The authors express their sincere gratitude to the Department of Pharmacology, Nootan Medical College and Research Centre, Visnagar, Gujarat, for providing the necessary facilities to conduct this study. We are also thankful to all the participating students for their enthusiastic involvement and valuable feedback during the training sessions.

Authors' Contributions

RM: Conceptualization, study execution, formal analysis, writing—original draft and revision; MD: Study design and execution, writing—reviewing and editing, AS: Study design; CP and PP: Data collection and analysis; JJ: Statistical analysis.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval and Informed Consent

The study protocol was reviewed and approved by the Institutional Ethics Committee of Nootan Medical College and Research Centre, Visnagar, Gujarat (Approval No.: IEC/NMCRC/Approval/26/2021). Written informed consent was obtained from all participating students prior to inclusion in the study.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Punit Patel https://orcid.org/0000-0001-8770-004X

References

1. Lavanya SH and Kalpana L. Mannequin-based simulation as an educational tool for learning injection techniques: medical students' viewpoints. *Int J Basic Clin Pharmacol* 2018; 7(8): 882–887.
2. Peyton JWR. *Teaching and Learning in Medical Practice*. London: Manticore Europe Limited; 1998.
3. Bandura A. *Learning Through Modeling: Approaches to a Social-cognitive Learning Theory*. Stuttgart: Klett-Verlag; 1976.
4. Jawhari J, Krautter M, Dittrich R, et al. Instruction in the skills lab: differential effects of Peyton's steps on memory performance. *GMS Z Med Ausbild* 2012; 29(5): DocV568. doi:10.3205/12gma199
5. Krautter M, Dittrich R, Safi A, et al. Peyton's four-step approach: differential effects of single instructional steps on procedural and memory performance—a clarification study. *Adv Med Educ Pract* 2015; 6: 399–406. doi:10.2147/AMEPS81923
6. Krautter M, Weyrich P, Schultz JH, et al. Effects of Peyton's four-step approach on objective performance measures in technical skills training: a controlled trial. *Teach Learn Med* 2011; 23(3): 244–250. doi:10.1080/10401334.2011.586917
7. Gradl G, Luebke C, Muenker R, et al. Teaching complex manual therapy skills—conventional teaching or Peyton's four-step method: a prospective randomized study. *German Med Sci GMS Publ House* 2015; 13: DocV534.
8. Giacomino K, Caliesch R, and Sattelmayer KM. The effectiveness of the Peyton's 4-step teaching approach on skill acquisition of procedures in health professions education: a systematic review and meta-analysis with integrated meta-regression. *PeerJ* 2020; 8: e10129. doi:10.7717/peerj.10129
9. Naseem S, Fatima D, Ghazanfar H, et al. Four-step approach by Peyton's as a tool for teaching SPSS among undergraduate medical students: an experience from Pakistan. *IOSR J Dent Med Sci* 2020; 19(5): 48–52.
10. Nikendei C, Huber J, Stiepak J, et al. Modification of Peyton's four-step approach for small group teaching—a descriptive study. *BMC Med Educ* 2014; 14: 68. doi:10.1186/1472-6920-14-68
11. Varghese S and Abraham L. Comparison of Peyton's four-step approach with the conventional bedside technique in teaching clinical examination skills to medical students. *Cureus* 2024; 16(2): e54397. doi:10.7759/cureus.54397
12. Charan J and Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med* 2013; 35(1): 121–126. doi:10.4103/0253-7176.116232
13. Münster T, Stosch C, Hindrichs N, et al. Peyton's 4-steps-approach in comparison: medium-term effects on learning external chest compression—a pilot study. *GMS J Med Educ* 2016; 33: Doc60. doi:10.3205/zma001059
14. Sethuraman D, Revwathy S, and Thangaraj P. An educational interventional study to compare conventional versus Peyton's method in training medical students on antenatal examination skills. *Int J Reprod Contracept Obs Gynecol* 2021; 10(1): 198–202.
15. Garg R, Sharma G, Chaudhary A, et al. Evaluation of Peyton's four-step approach for skill acquisition in undergraduate medical students: a prospective randomized study. *medRxiv* 2023: 2023-07. doi:10.1101/2023.07.12.23293187
16. Sabaq AG, Farouk M, and Ismail SS. Effect of peer teaching versus traditional teaching method on nursing students' performance regarding pediatric cardiopulmonary resuscitation. *Tanta Sci Nurs J* 2016; 10(1): 7–25.
17. Mohammed AA, Mohammed NY, Ouda MM, et al. Effect of peers' application of modified Peyton's four-step approach versus traditional learning on pediatric nursing students' performance. *J Heal Med Nurs* 2019; 6: 965–977.

18. Zentz SE, Kurtz CP, and Alverson EM. Undergraduate peer-assisted learning in the clinical setting. *J Nurs Educ* 2014; 53(3): S4–S10.
19. Romero P, Günther P, Kowalewski KF, et al. Halsted's "see one, do one, and teach one" versus Peyton's four-step approach: a randomized trial for training of laparoscopic suturing and knot tying. *J Surg Educ* 2018; 75(2): 510–515. doi:10.1016/j.jsurg.2017.07.019
20. Tutdibi E, Gortner L, Volk T, et al. Simulation-based neonatal resuscitation training of medical students: is Peyton's 4-stage approach more effective than traditional 2-stage technique? *Mol Cell Pediatr* 2014; 1(1): 1–6. doi:10.1186/s13854-014-0019-4
21. Jenko M, Frangež M, and Manohin A. Four-stage teaching technique and chest compression performance of medical students compared to conventional technique. *Croat Med J* 2012; 53(4): 486–495.
22. Orde S, Celenza A, and Pinder M. A randomized trial comparing a 4-stage to 2-stage teaching technique for laryngeal mask insertion. *Resuscitation* 2010; 81(12): 1687–1691. doi:10.1016/j.resuscitation.2010.08.015