Original Article

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Bridging Simulation and Practice in Medical History Taking: A Comprehensive Needs Assessment of Standardized Patient Competencies in Early Clinical Exposure

SANI BAIMAI[1,2*], MD, PhD; VORAWAN VANICHAROENCHAI[2], PhD; CHERDSAK IRAMANEERAT[2,3], MD, MHPE, PhD

[1]Department of Anatomy, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand; [2]Siriraj Health Science Education Excellent Center, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand; [3]Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Abstract

Introduction: Effective medical history-taking is a cornerstone of clinical practice, yet medical students often struggle due to inadequate structured training and feedback. Standardized patients (SPs) play a crucial role in early clinical exposure (ECE) by providing controlled, realistic patient interactions. However, optimizing SP effectiveness requires a systematic assessment of their competencies.

Methods: This study employed a cross-sectional survey design to identify competency gaps in SPs and key areas for improvement to enhance their role in medical training during ECE. A stratified random sampling method was used to recruit 315 medical students from both preclinical (Years 1–3) and clinical (Years 4–6) cohorts at the Faculty of Medicine, Siriraj Hospital, Mahidol University. Data were collected using a structured questionnaire comprising 36 items across three competency domains: ability, suitability, and credibility. Each item utilized a dual-response 5-point Likert scale to assess both current SP performance and expected competency levels. The instrument demonstrated high content validity, as assessed by three experts (IOC=0.67–1.00), and excellent internal consistency (Cronbach's alpha=0.976). Data analysis included descriptive statistics to summarize the responses and calculate the Modified Priority Needs Index (PNImodified) to prioritize competency gaps. All analyses were performed using SPSS Statistics Version 30.0.

Results: Preclinical students identified realistic role portrayal (PNImodified=0.445), adherence to structured guidelines (PNImodified=0.395), and accurate past medical history portrayal (PNImodified=0.371) as the most critical competency gaps. Clinical students emphasized SPs' ability to observe non-verbal cues (PNImodified=0.143), provide structured feedback (PNImodified=0.141), and give appropriate feedback to the students (PNImodified=0.126). Across both groups, the three most significant competency gaps were structured feedback on history-taking (PNImodified=0.186), realistic role portrayal (PNImodified=0.181), and appropriate feedback delivery (PNImodified=0.180).

Conclusion: Addressing these competency gaps through structured standardized patient (SP) training programs will enhance the effectiveness of medical history-taking education in early clinical exposure (ECE). Future research should prioritize the development of competency-based SP training frameworks and structured feedback models that support both learning outcomes and clinical preparedness. These findings underscore the need for targeted training strategies which aim at strengthening SP competencies, particularly in realistic role portrayal and high-quality feedback delivery, which are essential for improving student engagement, clinical reasoning, and overall performance in simulated patient encounters.

Keywords: Patient; History-taking; Simulation training; Need assessment; Medical student

**Corresponding author:*
Sani Baimai, MD, PhD;
Department of Anatomy, Faculty of Medicine Siriraj Hospital, Mahidol University, Postal code: 10700, Bangkok, Thailand
Tel: +66-822106507
Email: sanibaimai@gmail.com

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Introduction

Medical history-taking is an essential skill that forms the foundation of clinical reasoning, diagnosis, and patient management. It allows physicians to gather relevant information about a patient's health status, past medical history, lifestyle, and risk factors, which are crucial for making accurate clinical decisions (1). Despite its importance, many medical students struggle with history-taking, particularly during their early clinical exposure (ECE). Challenges such as a lack of confidence, insufficient structured practice, and limited feedback have been reported as significant barriers to developing proficiency in this skill (2, 3). Ineffective history-taking can lead to incomplete patient assessments, misinterpretation of symptoms, and delays in diagnosis, ultimately affecting patient care (4).

To address these challenges, researchers have widely used standardized patients (SPs) in medical education to provide controlled, structured, and realistic patient interactions. SPs are trained individuals who portray patient cases with consistency, allowing students to practice clinical skills in a safe and standardized learning environment (5). Studies have shown that the use of SPs can significantly improve the students' communication skills, clinical reasoning, and confidence before they interact with real patients (6, 7). Moreover, SPs provide opportunities for repeated practice and immediate feedback, which are critical components of competency-based medical education (8). However, the effectiveness of SPs in teaching history-taking depends largely on their training and competency in patient portrayal, adaptability, and feedback delivery (9). SP competencies can be categorized into three key domains: ability, suitability, and credibility. Ability refers to the SP's ability to present, remember, provide feedback, increase emotional complexity, and enhance learning (10). Suitability includes attitudes, personalities, and safety (11). Credibility is related to age, shape, authenticity, and conscientiousness of SPs (12).

Although SPs have been successfully integrated into clinical-year training and objective structured clinical examinations (OSCEs), their use in ECE programs remains inconsistent (13). Furthermore, there is no standardized mechanism for SPs to provide structured feedback to students during history-taking training in preclinical years. Without proper training and competency evaluation, SPs may fail to meet the learning needs of medical students and may not effectively contribute to their clinical skill development (14). Cognitive load theory suggests that novice learners benefit from structured, scripted learning environments to minimize extraneous cognitive load and focus on essential clinical skills (15). In contrast, clinical students, who have developed stronger knowledge frameworks, require more dynamic and adaptive training to refine diagnostic reasoning (16).

A needs assessment is a critical step in identifying competency gaps among SPs. It helps educators understand which areas require improvement and guides the development of targeted training programs to enhance learning outcomes (16). Previous studies have emphasized the importance of structured SP training, particularly in the areas of realistic role portrayal, structured feedback delivery, and adaptability (17). However, limited research has specifically investigated the competency needs of SPs in ECE settings, where students have minimal experience with real patients. Understanding these gaps is essential for designing effective SP training programs and ensuring that SPs contribute meaningfully to the development of medical students' history-taking skills. While many studies focus on the role of SPs during OSCEs in clinical years, few have investigated the students' perspectives on SP competencies within preclinical ECE. This study is thus novel in exploring how SP performance during ECE shapes foundational clinical skills such as history taking and communication, even before formal clerkships begin.

This study aims to assess the competency gaps among SPs in medical history-taking during ECE and identify key areas for improvement. Specifically, this study will 1) evaluate SP competencies across three key domains, i.e., ability, suitability, and credibility; 2) identify the most critical competency gaps based on medical students' perceptions; 3) provide recommendations for improving SP training to enhance history-taking education in ECE programs; and 4) systematically assess SP competency needs, to improve the quality of early clinical training and better prepare medical students for real-world patient interactions.

Methods

Study Design, Study Setting and Participants

This study utilized a cross-sectional survey-based needs assessment to evaluate SP competencies in medical history-taking during ECE. We aimed to identify competency gaps among SPs and prioritize areas for improvement based on student perceptions. The study was conducted at the Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand. The participants included preclinical and clinical

medical students enrolled in the medical curriculum at the faculty. The sample size was determined using Epi Info™ StatCalc for a cross-sectional study. Based on a total population of 1,752 medical students, with a 95% confidence level (Z=1.96), a 5% margin of error, and a 50% expected frequency, the required sample size was calculated to be 315 students. It was chosen because it represents the most conservative estimate, maximizing the required sample size when the true proportion is unknown. This approach follows the guidelines recommended by the World Health Organization in Sample Size Determination in Health Studies: A Practical Manual, which advises using 50% as the expected proportion in the absence of prior estimates to ensure adequate sample size for generalizability (18). A post-hoc power analysis using G*Power confirmed that this sample size provided 85% statistical power. A total of 315 students were then recruited using stratified random sampling to ensure equal representation from both preclinical (Years 1–3) and clinical (Years 4–6) cohorts. Participation was voluntary, and all students provided informed consent according to COA No. Si 876/2024 before participating in the study.

Research Instrument

A structured questionnaire was developed based on previous studies on SP competencies (5, 10) and adapted for the ECE setting. This research was conducted via a quantitative approach using questionnaires to identify the needs for SPs' competencies in medical history-taking among medical students during ECE. The questionnaire was distributed via SivWork to medical students at the Faculty of Medicine Siriraj Hospital, Mahidol University. The SivWork is an application to assist and improve the efficiency of internal communication in an organization, minimize process complexity, raise awareness and learning channels, reduce risk, and strengthen communication security. The questionnaire was divided into four sections, as shown in Figure 1.

1. The cover page provided a detailed written description of its purpose, instructions, and consent forms with sufficient information so that participants could decide whether to participate or not.
2. Demographic information contained information such as age, gender, academic year, and prior SP exposure.
3. Need Assessment of SP competencies across three domains: ability, suitability, and credibility.

3.1 Ability contained presenting ability, memory ability, giving feedback, emotional complexity, and learning enhancement.

3.2 Suitability contained attitude and personality, and safety.

3.3 Credibility contained age and shape, ethnicity, and conscientiousness.

The questionnaire used in this study assessed standardized patient (SP) competencies across three main domains—ability, suitability, and credibility—comprising a total of 36 items (Table 1).

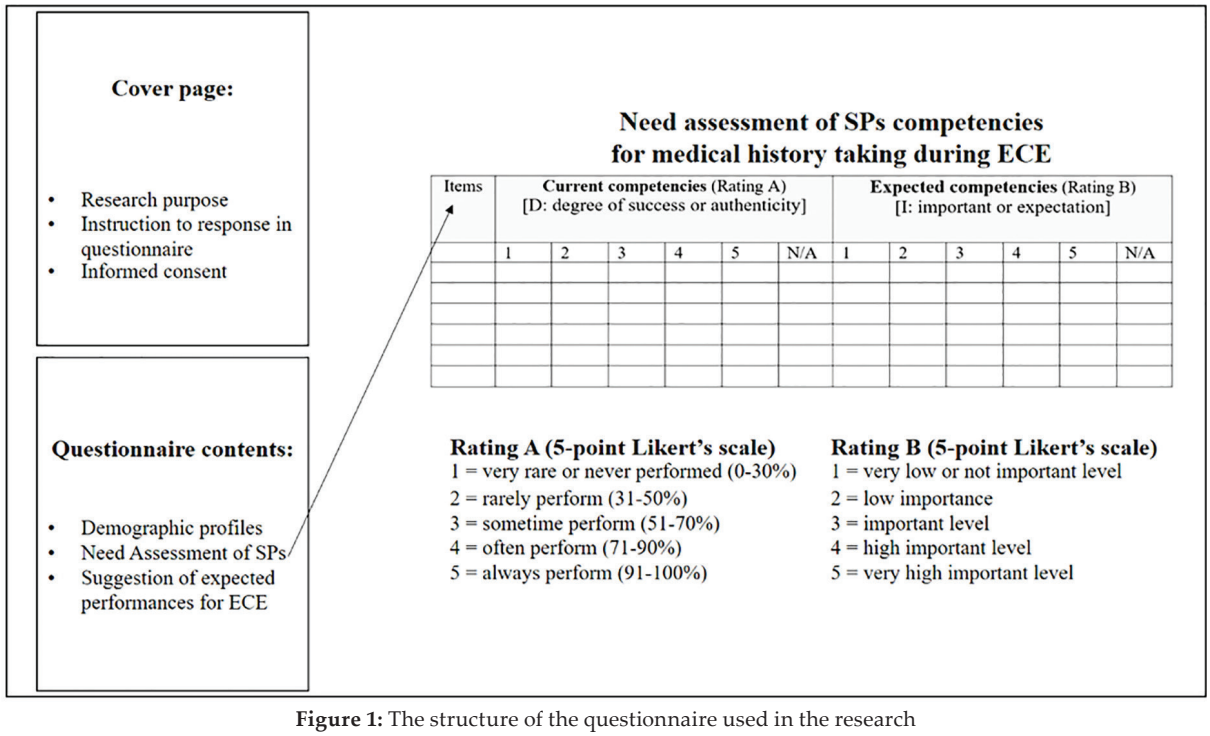

Figure 1: The structure of the questionnaire used in the research

Table 1: The content structure of the questionnaires

Domains	Sub-domains	Items
1. Ability	Presenting ability	SPs can perform a realistic role.
		SPs can perform a consistent role.
		SPs can maintain concentration on delivering roles.
		SPs can realize the importance of sticking to the script provided.
		SPs can realize the importance of sticking to the other guidance provided.
		SPs can work as members of the SP team.
		SPs can answer questions appropriately.
	Memory ability	SPs can adjust the role to real-life situations such as family status accuracy.
		SPs can adjust the role to real-life situations such as previous medical records accuracy.
		SPs can perform the standardized acting according to verbal language like other SPs.
		SPs can perform the standardized acting according to non-verbal language like other SPs.
	Giving feedback	SPs can observe the learner's verbal behavior.
		SPs can memorize the learner's verbal behavior.
		SPs can observe the learner's non-verbal behavior.
		SPs can memorize the learner's non-verbal behavior.
		SPs can manage dual tasks of performing roles and remembering the student's performance simultaneously.
		SPs can give appropriate feedback to the students.
		SPs need to know the criteria for judging performance in the assessment situations.
		SPs must get out of the patient role before the feedback.
		SPs can give specific feedback from medical history taking.
		SPs can provide other behavioral suggestions apart from medical.
	Emotional complex	SPs can play emotional-demanding roles.
		SPs can express complex emotions continuously.
	Learning enhancement	SPs can promote motivation to learn.
		SPs can promote analytic thinking in clinical reasoning.
		SPs can promote medical professionalism.
2. Suitability	Attitude and personality	SPs could have a positive attitude plus further training in medicine
		SPs could provide more comfort during medical professional training.
	Safety	Students could be safe while trying to maximize the educational experience with SPs.
		Students could be safe while trying to develop confidence with SPs.
		SPs could disclose the data if students are under the age of 18.
3. Credibility	Age and shape	SPs look as much as possible as the actual patient to be simulated.
		SPs may not be the same age as the patient role but they can play the role in a fit and appropriate manner.
		SPs should look as similar in appearance as possible to the patient's role.
	Ethnicity	If the role depends on the patient being from a particular ethnic background, recruiting SPs from that background is important.
	Conscientiousness	The institute could have reserved SPs for unexpected SP illnesses.

The ability domain consisted of 26 items and encompassed five subdomains: presenting ability, memory ability, giving feedback, emotional complexity, and learning enhancement. Presenting ability (7 items) evaluated the SPs' skills in performing realistic and consistent roles, maintaining concentration, adhering to scripts and guidance, collaborating as team members, and responding appropriately to questions. Memory ability (4 items) assessed the SPs' capacity to adjust roles based on real-life situations, such as ensuring the accuracy of family and medical histories, and maintaining verbal and non-verbal consistency. Giving feedback (10 items) focused on the SPs' ability to observe and recall students' verbal and non-verbal behaviors, manage dual tasks during performances, and deliver specific, structured feedback, particularly in medical history-taking, while appropriately transitioning out of the patient role before offering feedback. Emotional complexity (2 items) assessed the SPs' ability to portray emotionally demanding roles with consistent emotional expression, while learning enhancement (3 items) referred to their ability to promote student motivation, analytic thinking, and medical professionalism.

The suitability domain comprised 5 items and included two subdomains: attitude and personality, and safety. Attitude and personality (2 items) evaluated the SPs' positive attitudes and their capacity to provide a supportive learning environment. The safety subdomain (3 items) emphasized ensuring student safety during SP-student interactions, including protocols for the

protection of students under the age of 18.

The credibility domain included 5 items, divided into three subdomains: age and shape, ethnicity, and conscientiousness. Age and shape (3 items) addressed the importance of SPs resembling the patients they portrayed, both in age and appearance. Ethnicity (1 item) emphasized recruiting SPs from appropriate backgrounds when necessary to ensure authenticity. Conscientiousness (1 item) referred to institutional provisions for maintaining a reserve of SPs to manage unforeseen absences, ensuring the reliability of training activities.

In this study, the questionnaire for needs assessment of standardized patient (SP) competencies was designed using a dual-response format. Each item required participants to provide two separate ratings using a 5-point Likert scale:

The first rating indicated the current performance (Degree of success, D).

The second rating indicated the expected importance (Importance level, I).

The dual-response format enabled the calculation of a performance gap by comparing the mean difference between the current and expected levels for each competency. Larger gaps indicated greater need for improvement

Students' perceptions of competency gaps were measured using a dual-response 5-point Likert scale, where 1 indicated "Not Important" and 5 indicated "Very Important." Participants were asked to assess both the current level of SP performance and the expected level of importance for each competency item. This approach enabled the identification of discrepancies between perceived performance and expectations, allowing for the subsequent calculation of performance gaps and prioritization of training needs through the Modified Priority Needs Index (PNImodified).

Ranking of priority needs was estimated using the modified priority needs index (PNImodified) (19). The study used a PNImodified to prioritize the competency gaps. The formula applied was:
PNImodified=I−D/ D
where:
I=Importance or expected level (ideal state)
D=Degree of success or current performance (current state)

The PNImodified value provides a relative measure of the gap by adjusting for variability and scaling, making it suitable for ranking and prioritizing needs across different competency items. Moreover, the use of the PNImodified method was guided by the work of Wongwanich (18), which recommends this approach for a more accurate reflection of needs by incorporating data variability.

Example of PNImodified Calculation:
If I=4.5I=4.5I=4.5 and D=3.5D,
Then PNImodified=(4.5–3.5)/3.5=0.29

This result indicates a 29% gap between the current competency level and the expected competency level.

The dual-response format employed in the questionnaire design was informed by the principles of cognitive load theory, which suggests that novice learners benefit from structured and simplified interactions to reduce extraneous cognitive burden and enhance learning efficiency (20). The structured Likert scale enabled students to assess both current and expected SP competencies, thus supporting the prioritization of training needs in a cognitively manageable way.

The questionnaire was validated by a panel of three medical education experts for content validity and clarity. Three experts assessed the content validity, including a general practitioner with over 5 years of experience in medical education in Thailand, a specialist doctor with over 5 years of experience with SPs, and a specialist doctor with over 5 years of experience in both SPs and medical education. The experts evaluated each item by assigning a rating of +1 (clearly measuring), -1 (not measuring), or 0 (no measure). The Index of Item-Objective Congruence (IOC) was calculated, with an acceptable score of 0.67-1.00 for each item (21).

To assess the reliability of the questionnaire used in this study, we employed Cronbach's Alpha analysis, using SPSS 30.0. This method evaluates internal consistency, determining how well a set of items correlates when measuring the same construct. It is widely used in questionnaire validation to ensure that items intended to assess the same factor are consistent and aligned.

Cronbach's Alpha values range from 0 to 1, with higher values indicating greater reliability. The interpretation is as follows:
$\alpha > 0.9$: Very high reliability
α 0.8–0.9: Good reliability
α 0.7–0.8: Acceptable reliability
$\alpha < 0.7$: Low reliability (revision may be required).

A pilot test of this study was conducted with 30 students to ensure reliability, yielding a Cronbach's alpha of 0.976 which indicates strong internal consistency and very high reliability.

Suggestions for ECE's expected performance**:** Participants could provide suggestions as needed.

Data Collection

The survey was distributed via Google Forms from August to October 2024**.** The participants were given 7-13 minutes to complete the questionnaire.

Data collection was conducted anonymously to minimize bias and encourage honest responses. Participants (preclinical and clinical students) were invited via announcement through the Faculty of Medicine Siriraj Hospital's official communication channels, including student SivWork and classroom announcements. Voluntary participation was emphasized, and informed consent was obtained before the survey. No exclusion criteria were applied in this study. All preclinical and clinical medical students who voluntarily agreed to participate were eligible. Participants were informed that their involvement was entirely voluntary, and they could withdraw from the study at any time without any consequences. Considering the response rate, the average response rate for electronic surveys in needs assessments was approximately 40% (22). Therefore, the study distributed questionnaires among 788 medical students.

Data Analysis

Descriptive statistical analyses were performed using SPSS Version 30.0 Copyright © 2025 | Powered by MUIT Mahidol University.

Descriptive statistics

The mean and standard deviation were used to summarize the demographic data and competency ratings. PNImodified was calculated to identify the most critical competency gaps, using the following formula: PNImodified=I-D/D (I: important or expectation, D: degree of success or authenticity current). For example, the PNI modified values for items 1, 2, and 3 are 0.29, 0.25, and 0.11, respectively. When interpreting the modified PNI for the needs in the area of ability, it indicates that the development rate from the current competency to the expected competency is 29%. In comparison, the development rate in the credibility area is 11%. This suggests that the need for improvement in ability should be prioritized before that in credibility. Higher PNI-modified values indicated greater training needs. Cronbach's alpha was used for internal consistency analysis.

Ethical Considerations

This study was approved by the Institutional Review Board (IRB) of the Faculty of Medicine, Siriraj Hospital, Mahidol University (Certificate No. 786/2567/IRB2). Participation was voluntary, and informed consent was obtained. All data were anonymized, and confidentiality was maintained following the Human Subjects according to Belmont (23).

Results

Demographic Data

A total of 315 medical students participated in this study, including 158 preclinical students (50.16%) from Years 1–3 and 157 clinical students (49.84%) from Years 4–6. The mean age of the participants was 21.8±1.7 years, with preclinical students being younger **(**19.6±0.9 years**)** than clinical students (23.4±1.2 years**)**. There was a slight predominance of female participants, with 56.2% females and 43.8% males. Concerning prior exposure to SPs**,** 100% of clinical students had encountered SPs in structured clinical skills training and OSCEs, whereas only 68.4% of preclinical students had prior SP experience through ECE sessions.

Preclinical Students

Among preclinical students, the domain with the highest PNI-modified score was credibility (0.298), followed by ability (0.293) and suitability (0.242), (Table 2). For specific competency items (Table 3), the three items with the highest PNImodified scores were realistic role portrayal **(**0.445**)** and the ability of SPs to convincingly act as real patients. Following structured guidelines **(**0.395**)**, we ensured that SPs adhered to case frameworks provided for training. Accurate history portrayal **(**0.371**)**–The ability to present past medical history consistently.

Table 2: PNImodified scores of the domains for pre-clinical, clinical, and combined groups

Groups	Domains	I: Expected competencies	D: Current competencies	NA: PNImodified I-D/D	PNI
		Mean±SD	Mean±SD		
Preclinical	Ability domain	4.324±0.707	3.349±0.801	0.293	2
	Suitability domain	4.473±0.684	3.599±0.775	0.242	3
	Credibility domain	4.367±0.762	3.367±0.851	0.298	1
Clinical	Ability domain	4.559±0.677	4.203±0.778	0.084	1
	Suitability domain	4.572±0.684	4.365±0.718	0.046	3
	Credibility domain	4.335±0.863	4.022±0.899	0.076	2
Combined	Ability domain	4.500±0.715	3.968±0.858	0.134	1
	Suitability domain	4.547±0.667	4.154±0.796	0.093	3
	Credibility domain	4.344±0.880	3.839±0.811	0.130	2

Table 3: PNImodified scores of the items for preclinical, clinical, and combined groups

Groups	Items	I: Expected competencies	D: Current competencies	NA: PNImodified I-D/D	PNI
		Mean±SD	Mean±SD		
Preclinical	SPs can perform a realistic role.	4.115±0.891	2.846±0.360	0.445	1
	SPs can realize the importance of adhering to the other guidance.	4.346±0.616	3.115±0.640	0.395	2
	SPs can adjust the role to real-life situations such as previous medical records accuracy.	4.384±0.624	3.200±0.938	0.371	3
Clinical	SPs can observe the learner's non-verbal behavior.	4.486±0.687	3.924±0.892	0.143	1
	SPs can give specific feedback from medical history taking.	4.480±0.747	3.923±0.928	0.141	2
	SPs can give appropriate feedback to the students.	4.592±0.740	4.075±0.915	0.126	3
Combined	SPs can give specific feedback from medical history taking.	4.376±1.055	3.688±1.087	0.186	1
	SPs can adjust the role to real-life situations such as previous medical records accuracy.	4.529±0.668	3.835±0.881	0.181	2
	SPs can give appropriate feedback to the students.	4.529±0.670	3.835±1.030	0.180	3

Clinical Students

For clinical students, the ability domain had the highest-priority competency gap (PNImodified=0.084), followed by credibility (0.076) and suitability (0.046) domains (Table 2).

Among the specific competency items (Table 3), the top three were 1.observe the learner's nonverbal behavior (0.143), 2.give specific feedback from medical history taking (0.141), and 3.give appropriate feedback to students (0.126).

Combined Analysis (Preclinical + Clinical Students): Table 2

When preclinical and clinical students' responses were combined, ability remained the most critical domain **(**PNImodified=0.134**)**. This was followed by credibility (0.130) and suitability (0.093). For specific competency gaps (Table 3), the top three items with the highest PNI modified scores across both groups are shown in GI. Providing structured feedback from medical history taking **(**0.186), and adapting roles to real-life situations, such as previous medical record accuracy **(**0.181**)**, and appropriate feedback delivery (PNImodifie =0.180).

Responses to the open-ended questions provided additional insights into students' perceptions of SP performance during ECE. Many preclinical students expressed concerns about inconsistency in SP role portrayal, particularly in the emotional presentation and accuracy of medical history, which they felt led to confusion during history-taking practice. Some clinical students also noted that SP responses appeared overly scripted, limiting opportunities for dynamic, adaptive questioning. Several students across both preclinical and clinical years commented on the lack of detailed, structured feedback. Feedback was often described as too general, such as "Good job" or "Try to ask more questions", without specific suggestions for improvement. Clinical students recommended that SPs should be trained to give more targeted feedback, especially regarding communication skills, tone, and rapport-building. In addition, students noted that SP responses were not always well adjusted to the learner's level. Preclinical students reported feeling overwhelmed when SPs assumed prior clinical knowledge, while clinical students found that SPs sometimes provided responses that were too simple or too complex. Some students suggested that SPs should modify their responses based on the learner's level of experience to support more progressive skill development.

Discussion

Demographic Data: Implications for Standardized Patient Training

The demographic characteristics of the 315 participating medical students provided valuable context for interpreting their perceptions of SP competencies in ECE. The cohort was evenly distributed between preclinical (Years 1–3) and clinical (Years 4–6) students, representing a broad spectrum of training stages. Their mean age was 21.8 years, with clinical students being older than preclinical students, reflecting the natural progression in clinical training. This age range aligns with previous findings suggesting that students in their early twenties are particularly receptive to experiential learning approaches, such as SP encounters, which enhance communication and clinical reasoning skills (6). The gender distribution in this study revealed a slight predominance of female students (56.2%); consistent with current trends in medical school enrollment globally. Although gender was not a variable analyzed for its impact in this study, prior research has shown that communication

preferences and feedback receptivity may vary by gender, indicating a potential area for future investigation (4). For prior SP exposure, all clinical students had experience interacting with SPs through structured clinical skills training and OSCEs. In contrast, only 68.4% of preclinical students had been exposed to SPs during ECE sessions. This discrepancy emphasizes the uneven distribution of experiential learning opportunities in early training and reinforces the importance of systematically integrating SP-based activities into the preclinical curriculum. Prior exposure to SPs may influence students' expectations, particularly in areas such as role realism and feedback quality. As noted by Kraemer et al., repeated engagement with SPs has been shown to improve students' communication skills and confidence in clinical encounters. These demographic insights underscore the need for SP programs to be responsive to student diversity and training levels. Tailoring SP competencies and training to accommodate variations in student experience, gender, and developmental stage may enhance the effectiveness of SP-based teaching and optimize learning outcomes across the medical education continuum.

The identified competency gaps can be mapped onto Miller's pyramid, with SPs supporting students' progression from "knows how" to "shows how."

Preclinical Part: Key Competency Gaps in SPs

Among preclinical students, the most critical competency gap identified was the ability of SPs to perform realistic patient roles (PNImodified=0.445). This finding is consistent with prior studies emphasizing the importance of role authenticity in medical training (5). Additional high-priority areas included adherence to structured guidance (PNImodified=0.395) and the ability to portray accurate past medical history (PNImodified=0.371). These results suggest that preclinical students require SPs to exhibit greater consistency and accuracy in their portrayals to facilitate effective learning.

Moreover, the qualitative data revealed concerns about the variability in SP performance, with some students reporting inconsistencies in symptom portrayal and emotional responses. Addressing these issues through enhanced SP training programs and standardized role-playing protocols could improve the reliability of SP interactions for preclinical learners.

Clinical Part: Emphasis on Feedback and Non-verbal Cues

For clinical students, the competency domain with the highest priority was the ability to observe and respond to non-verbal cues during history-taking (PNImodified=0.143). Effective non-verbal communication is a critical component of patient-centered care, and studies have shown that clinicians who are adept at recognizing body language and emotional cues provide higher-quality care (7).

Another significant competency gap was the ability of SPs to provide specific feedback on history-taking (PNImodified=0.141). While clinical students had prior experience with SPs, they emphasized the need for structured, detailed feedback that goes beyond generic comments such as "good job" or "ask more questions". This finding supports previous research indicating that high-quality feedback is a key factor in competency development (8).

Finally, the SPs' ability to deliver appropriate feedback was ranked as another critical gap (PNImodified=0.126). Clinical students preferred constructive feedback tailored to their questioning techniques, interpersonal communication, and rapport-building skills. These results underscore the importance of training SPs to provide targeted and structured feedback that aligns with best practices in medical education (16).

Differences between the Preclinical and Clinical Parts

A comparison of preclinical and clinical students' responses revealed key differences in SP competency needs. While pre-clinical students prioritized realism and adherence to structured case frameworks, clinical students focused on SPs' ability to adapt dynamically and provide high-quality feedback. This divergence aligns with cognitive load theory, which suggests that novice learners benefit from structured, scripted interactions, whereas advanced learners require more adaptive and nuanced learning experiences (15).

These differences highlight the need for a tiered SP training approach. For pre-clinical students, SP programs should emphasize role standardization, case consistency, and historical accuracy. In contrast, training for clinical students should focus on dynamic patient portrayals, responsiveness to student cues, and structured feedback delivery.

The findings, particularly the emphasis on structured feedback, can also be interpreted through the lens of Vygotsky's Zone of Proximal Development (ZPD). SPs, when trained effectively, act as scaffolders who support learners just beyond their current level of competence, facilitating growth in complex skills such as

clinical communication (24). This aligns with the role of SPs in early clinical exposure, where students require structured guidance before transitioning to real patient interactions.

Combined Part: Overall Implications and Future Directions

When the findings from both groups were combined, the top three SP competency gaps were as follows:

Providing structured feedback on medical history-taking (PNImodified=0.186).

Adjusting roles to real-life situations, such as accurate past medical records portrayal (PNImodified=0.181).

Delivering appropriate and meaningful feedback (PNImodified=0.180).

These findings suggest that improvements in SP training should focus on structured feedback mechanisms and adaptability in role portrayal. Future research should explore competency-based SP training frameworks that incorporate structured feedback models, such as the Pendleton feedback model or the SET-GO method (14). These models provide SPs with a framework to deliver clear, balanced, and constructive feedback, fostering learner development, especially at the novice level.

Additionally, integrating digital simulations alongside SP interactions may enhance training effectiveness by providing students with diverse learning experiences. Hybrid approaches that combine SPs with virtual patient encounters have shown promise in enhancing clinical skill acquisition (9).

To further contextualize our findings, we compared the identified SP competencies with internationally recognized educational frameworks, including CanMEDS and the AAMC Core Entrustable Professional Activities (EPAs). The key competencies highlighted in this study,particularly realistic role portrayal and structured feedback delivery, align closely with the "Communicator" and "Professional" roles in the CanMEDS framework (25). These roles emphasize active listening, empathetic communication, and professional responsibility, all of which are supported by well-trained SPs. Similarly, the AAMC Core EPAs stress the importance of gathering accurate patient histories, demonstrating clinical professionalism, and communicating effectively within healthcare teams (26), the competencies that SPs directly facilitate during simulation-based training. By identifying performance gaps in SP feedback and credibility, this study provides evidence to support the alignment of SP training with global medical education standards and highlights the educational value of implementing targeted SP development programs to reinforce core clinical skills.

Comparison with International SP Training Models

Similar findings regarding the importance of standardized patient (SP) competencies have been reported in medical education programs in various countries. For example, in comparison to the current study findings, the University of Ottawa in Canada has implemented a competency-based residency training program under the CanMEDS Competence by Design (CBD) framework, which emphasizes frequent feedback and structured clinical performance assessment through standardized tools such as the Clinical Case Assessment Tool (25). Similarly, Queen's University in Canada adopted an SP-exclusive model for first-year clinical skills training, demonstrating that SP-centered approaches can sustain educational outcomes even in settings with limited faculty resources (11). In the United States, training with virtual standardized patients within the Department of Veterans Affairs and military settings significantly improved students' motivational interviewing skills, compared to conventional academic instruction, highlighting a comparable emphasis on SP feedback and realistic role portrayal as critical for competency development (27). These international implementations align with and support the findings of the present study, which underscores the global recognition of SPs in enhancing communication, clinical reasoning, and professionalism during early clinical exposure.

Moreover, several international studies have emphasized the importance of structured SP programs in competency-based medical education. For example, programs at Maastricht University and Harvard Medical School have demonstrated that SP training, when aligned with educational frameworks such as CanMEDS or the AAMC EPAs, leads to measurable improvements in student performance and confidence (28). These findings corroborate the necessity of developing SP competencies in realism, structured feedback, and professional behavior.

Strengths

This study has several strengths that support its validity and relevance. It is the first comprehensive needs assessment of SP competencies in ECE, addressing key gaps in existing research. The study included a large and diverse sample (n=315), ensuring balanced representation from

both pre-clinical and clinical student groups. A major strength of this study is the use of the PNImodified method, which provides an objective ranking of competency gaps, allowing for a data-driven approach to identifying training priorities. The high internal consistency of the questionnaire (Cronbach's alpha=0.976) further ensures the reliability of the findings. Moreover, combining quantitative analysis with qualitative insights from open-ended responses allows for a more in-depth understanding of student needs.

Limitations

Despite its strengths, this study has some limitations. As it was conducted at a single institution, the findings may not be directly generalizable to medical schools with different SP training frameworks or clinical exposure models. Future studies should validate these results in diverse educational settings to determine whether these competency gaps are widespread. This study has limitations related to the reliance on self-reported data, which may introduce subjective bias and cause discrepancies between students' perceptions and actual SP competencies. The absence of objective performance assessments further restricts the ability to validate these perceptions against observed SP behaviors, thereby limiting the robustness and generalizability of the findings. The cross-sectional design also limits the ability to track how students' views evolve over time or in response to curriculum changes. Lastly, the study did not assess the long-term impact of addressing these competency gaps on students' clinical performance.

Conclusion

This study systematically identified critical competency gaps among SPs involved in medical history-taking during early ECE. Pre-clinical students emphasized the need for enhanced realism in role portrayal and greater adherence to structured guidelines, whereas clinical students prioritized the provision of structured, high-quality feedback and adaptability during role simulation. Across both cohorts, the most salient gaps included deficiencies in structured feedback delivery, flexibility in patient role portrayal, and the ability to provide targeted, actionable feedback. These findings highlight the need for developing targeted SP training interventions focusing on strengthening competencies in realism and feedback provision—skills essential for fostering student engagement, enhancing clinical reasoning, and improving overall performance in simulated clinical encounters. Addressing these competency gaps through structured, stage-appropriate SP training programs can substantially enhance the effectiveness of medical history-taking education and better prepare medical students for authentic clinical practice.

Implications for Medical Education

The findings from this study have important implications for curriculum design, SP training, and competency-based medical education. SP training should be tailored to different learning stagestTo enhance medical history-taking education. Pre-clinical students benefit from structured, scripted SP encounters that help them develop foundational history-taking skills, while clinical students require adaptive, feedback-driven interactions that reflect real-world complexity. Additionally, SPs should receive structured training to provide targeted, constructive feedback, moving beyond generic comments to guide students in refining their questioning techniques. Adaptability in role portrayal is also essential, as SPs must adjust their responses based on students' experience levels to support progressive skill development. Medical schools should implement standardized SP feedback frameworks aligned with competency-based education to ensure students receive consistent, high-quality feedback. Furthermore, integrating high-fidelity SP encounters with realistic clinical scenarios will better prepare students for complex patient interactions. By addressing these competency gaps through structured training and simulation-based learning, medical education programs can enhance student learning experiences, strengthen patient communication skills, and ultimately contribute to improved healthcare outcomes. These findings support the inclusion of SP-led ECE sessions as part of competency-based curriculum reforms in Thai medical schools. Doing so would standardize early skill development and align training practices with WFME guidelines and global best practices

To further enhance SP performance and optimize the educational impact of clinical encounters, it is recommended that medical education institutions develop structured retraining workshops tailored for SPs. These workshops should focus on enhancing role realism, maintaining simulation consistency, and strengthening the quality of feedback delivery. Incorporating evidence-based feedback models, particularly the Pendleton model, can significantly improve the effectiveness of SP feedback. The Pendleton model provides a learner-centered

approach by first encouraging self-reflection on strengths before offering constructive, specific suggestions for improvement, thereby fostering a psychologically safe and constructive learning environment (29). Implementing retraining programs that integrate such structured feedback frameworks is likely to enhance SP competencies and, in turn, improve the clinical communication and reasoning skills of medical students.

Future Research Directions

Future research should explore SP competency gaps in different educational settings through multi-institutional studies across various countries and curricular structures. Investigating whether targeted SP training programs lead to measurable improvements in medical students' history-taking skills is also essential. Additionally, longitudinal studies tracking changes in student perceptions and clinical skill development over time will help evaluate the long-term impact of SP training modifications.

Authors' Contribution

All authors contributed to the discussion, read and approved the manuscript, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest

The authors declare that they have no conflicts of interest.

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