



## What Happened to Simulation-Based Education in Outpatient Setting in The 21<sup>st</sup> Century: A Scoping Review

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### Abstract

**Introduction:** Simulation-based education (SBE) is an instructional approach that aims to accurately recreate real-life scenarios and engage learners in the practical application of lesson content. By replicating critical elements of clinical situations, SBE facilitates a deeper understanding and better preparation for managing such conditions in actual clinical practice. SBE offers promising prospects for improving medical education and patient care in various settings, such as outpatient clinics. Therefore, this scoping review aims to determine to what extent the most effective components and standards of the simulation have been considered in outpatient education.

**Methods:** The present scoping review adheres to the guidelines outlined in the “Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist” and the “Joanna Briggs Institute (JBI) Reviewers’ Manual”. This review focused on articles that specifically focused on the use of simulation in outpatient education. Google Scholar, PubMed, Scopus, Embase, and ERIC were searched for keywords related to simulation, ambulatory care, outpatient clinics, and medical education from January 1, 2001, to August 12, 2023.

**Results:** The search indicated 513 articles, which were narrowed down by title and abstract relatedness. Twenty-nine articles entered the study’s second phase, and after reviewing their full text, nine articles that explicitly reported simulation use in outpatient education remained. Based on the findings of eligible articles, the ten most frequent components of SBE that should be considered and followed discussed. These features were training facilitators, pre-briefing sessions, the type of simulation techniques, the site of simulation participation, the simulation duration, unit of participation, extent of direct participation, Simulation fidelity, feedback, and debriefing and reflection.

**Conclusion:** SBE is a contemporary method of practical training for medical students that involves realistic modeling or simulation of clinical situations. It enhances learning effectiveness and provides a safe, educational atmosphere for teaching and learning. Designing simulations adhering to established standards and carefully considering essential components improves efficiency and effectiveness.

**Keywords:** Simulation, Patient simulation, Medical education, Outpatient

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## Introduction

Over the past decade, healthcare has experienced a notable shift towards ambulatory care settings, highlighting the need for clinical education in outpatient settings alongside inpatient settings (1-3). The outpatient clinic provides trainees with valuable experiential learning opportunities to gain practical experience in managing chronic diseases and engaging in interprofessional collaboration (1, 2, 4). However, the conventional teaching program for outpatient education has several obstacles that medical schools must overcome in order to provide efficient outpatient education for students. Some of these limitations are time constraints, patients with subspecialty condition, very busy clinics, challenges in acquiring patient permission for the involvement of a student and the need to balance effective teaching and patient-safe care (1, 3-6).

Thus, to address outpatient challenges, simulation-based education (SBE) as an experiential learning tool that facilitates the development of cognitive, psychomotor, and affective competencies in individuals and teams (7) can assist. There has been a growing trend towards dedicating an increasing amount of time to engaging in simulation centers as a means to enhance the clinical skills of future doctors in various settings, including outpatient clinics (8-10). One aspect is the growing focus on patient-centeredness in ambulatory care and medical education. Therefore, integrating active learning strategies, such as simulation, has been used to enable students to actively participate in direct patient care in outpatient setting (11, 12).

Having simulated clinics in a medical curriculum provides students with reliable, structured, and well-supervised education experiences that real-world clinics may not always have access to (6, 13, 14). Based on research findings, the most important benefits of simulated clinics are the opportunity to learn from errors in a safe and supportive but challenging setting where students' failure does not result in patient harm or their punishment (13, 15-17). Providing ample time for practicing clinical skills without the constraints typically found in a crowded outpatient clinic is another strength of simulated clinics (6, 16, 17). The other advantages include sympathetic clinical cases to the students' educational needs (6) and the consistency of experience, as opposed to busy and specialty clinics (15, 16). Opportunity to perform whole consultation in the doctor role, on their own feet, without distraction is the unique feature of simulated clinics (13, 16, 17).

This promotes the development of belief, confidence, and awareness in oneself, which leads to the creation of professional identity (13, 17).

Accordingly, the simulated clinics sound to be a valuable complement that can assist medical students to be ready for their real outpatient settings and future postgraduate practice.

Despite the many benefits of simulation, many institutions still face challenges in applying it to established use. This is due to uncertainties about its reliability and validity, as well as common misunderstandings about its accessibility, affordability, and usefulness (18). Furthermore, it is crucial to comprehend the necessary steps to guarantee and optimize the educational advantages of SBE in outpatient setting (19).

The integration of simulated clinics as a teaching method for undergraduate and postgraduate medical students necessitates adherence to established standards and features. Based on the literature, the most frequent components of best practice in SBE include training facilitators, pre-briefing sessions, the type of simulation techniques, the site of simulation participation, the simulation duration, unit of participation, extent of direct participation, simulation fidelity, feedback, and debriefing and reflection (20-24).

To the best of our knowledge, a review of the literature showed that no published literature review was found that specifically addressed how simulation is used for undergraduate medical outpatient education. So, the purpose of this review was to provide a snapshot of the simulation in outpatient medical education. Specifically, the objectives of the review were to determine to what extent the most effective components and standards of the simulation have been considered in outpatient education.

## Methods

"The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist" (25) and the "Reviewers' Manual of the Joanna Briggs Institute (JBI)" (26) guided the methodology and reporting of this review.

### *Eligibility Criteria (Inclusion and exclusion criteria)*

The PCC strategy served as the basis for identifying our inclusion criteria used to determine the relevance of each reference. "P" was used for population/participants, "C" for the concept to be investigated, and "C" for context. In the present review, the population was

undergraduate medical students in the clinical educational periods; the concept addressed simulation; the context was outpatient clinics. Original quantitative, qualitative, and mixed-method research papers had to be published in English and in the twenty-first century (January 1, 2001, to August 12, 2023).

This study focused exclusively on outpatient clinics, excluding other ambulatory care settings such as emergency rooms and student-run free clinics. Excluded from the analysis were articles pertaining to pre-clinical years, as well as editorials, commentaries, letters, education, and review articles.

*Search strategy*

The search was conducted on databases including PubMed, Embase, Scopus, ERIC, and also on Google scholar as gray literature resource. The development of the search strategy was undertaken in a collaborative manner, with the active participation of a librarian. Keywords included: “Ambulatory Care Facilities”, “Outpatient Clinics, Hospital”, and “Education, Medical”, “Education, Medical, Undergraduate”, “Internship and Residency”, and “Simulation”,

“Patient Simulation”, “High Fidelity Simulation Training”, “Simulation Training”.

The search strategy incorporated word clusters and Boolean operators (AND; OR) to include related phrases and synonyms. Subsequently, during the screening phase, articles pertaining to the utilization of simulation in outpatient education were chosen. Additional relevant articles that were not identified by the database search were sought by manually searching the reference lists of articles included in the full-text screening.

*Study Selection and Data Extraction*

Data from different databases were inputted into the EndNote X8 software (Clarivate Analytics, USA), and duplicate entries were removed. Two researchers (B, M, and B, E) independently screened studies through the titles and abstracts. The full text articles, without an abstract or with an unclear abstract, was reviewed. The scholars resolved their disagreement by reaching a consensus. Following an initial screening, the two researchers independently reviewed the full text of all included articles to determine their eligibility. Disagreements

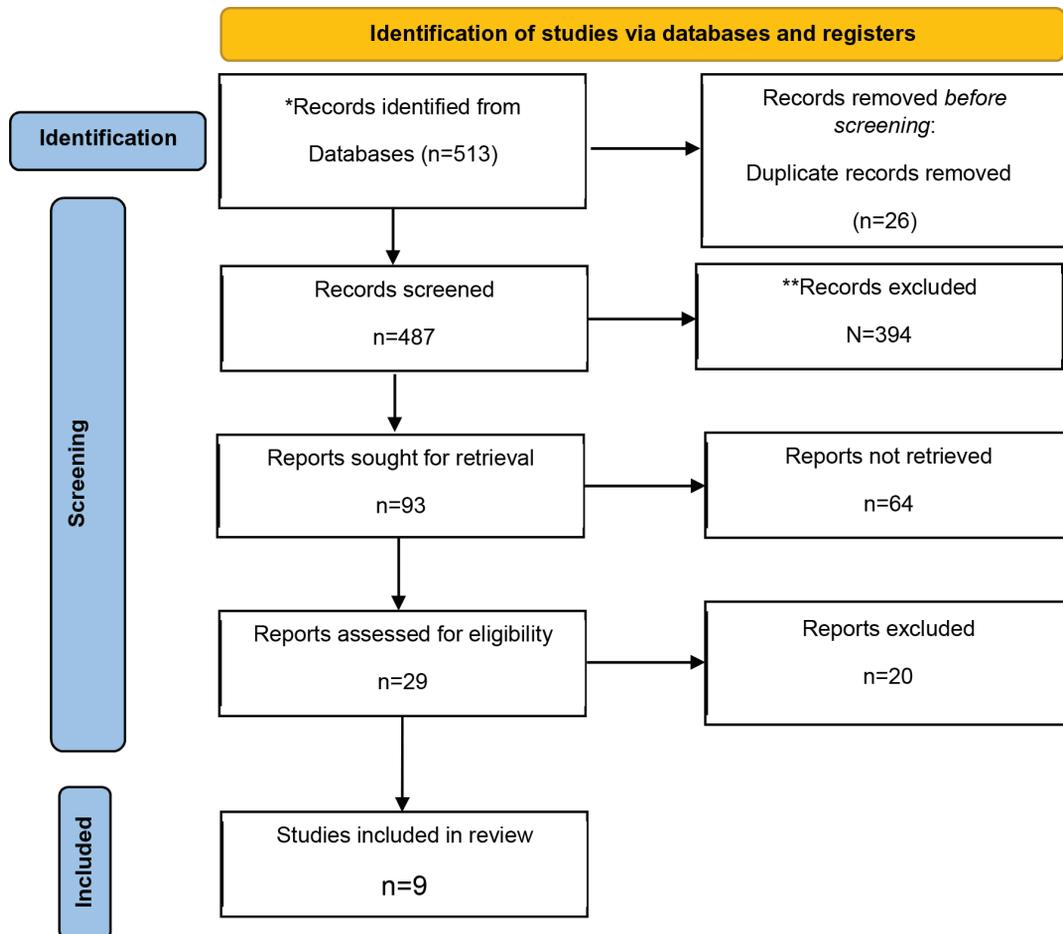


Figure 1: PRISMA diagram

among the authors were resolved through group discussion or consensus with the third member (A, M). The data collection process involved the utilization of Excel software. The collected data for each article encompassed information such as authors, publication years, project locations, study objectives, simulation evaluation methods, results, and other relevant details.

### Ethical Consideration

The ethical approval for the study was acquired from the Research Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1400.456).

## Results

### Characteristics of studies

Searches in databases yielded 513 articles. After removing duplicates, this was reduced to 487. Three hundred ninety-four publications were eliminated after abstract screening due

to unrelated contexts, participants, and other reasons. Nine of these met the review criteria. (Figure 1). The studies included in this review were conducted in five different countries, including three articles from Australia, two from Germany, two from New Zealand, one from South Korea and one from England. Regarding clerkship, four articles were related to general practice, and others were in different clerkship rotations. Demographic information of the nine articles is given in Table 1. Based on the findings of eligible articles, the ten most frequent components of SBE that should be considered and followed will be discussed below. As mentioned in the introduction, these features are training facilitators, pre-briefing sessions, the type of simulation techniques, the site of simulation participation, the simulation duration, unit of participation, extent of direct participation, simulation fidelity, feedback, and debriefing and reflection.

**Table 1:** Summary of study characteristics and extracted data

No	First Author, Year, and Country	Aim of study	Study type	Field of clerkship	Evaluation of the effectiveness of simulation	Results
1	Rasalam R, et al. (15), 2020, Australia	To illustrate the efficacy of virtual simulated general practice (GP) clinics in delivering a genuine clinical experience and to determine if these virtual clinics facilitate the development of generic Work-integrated learning (WIL) competencies.	Interventional study	General practice rotation	The Work Skill Development (WSD) framework via GoSoapBox surveys at the end of clinic.	- Demonstrating a high level of motivation to actively participate, reflect, and acquire knowledge through this medium. - Identified certain areas for improvement specifically in time management and communication skills. - An appropriate alternative for WIL clinical activity.
2	Lytton K, et al. (13), 2019, Australia	To assess the realism, effectiveness in teaching clinical skills, and adequacy in preparing students for real-life primary healthcare settings by comparing simulated General Practice clinics (simGPclinic) with real GP placements.	Cross sectional	General practice rotation	A students' survey at the end of each simGPclinic.	Scoring the simGPclinic's authenticity high (77 out of 100) and higher than the real-life GP placement in terms of its effectiveness in teaching various skills.
3	Dusch M, et al. (27), 2018, Germany	To give a description of the ambulatory care simulation, the defined competency-based learning goals, and determining its educational impact.	Interventional study	Ambulatory care	A student pre-post measurement questionnaire to evaluate the ambulatory care simulation-based teaching including learning objective and competence.	No significant impact on students' self-perceived learning progress, rating of the ambulatory care rotation, or the experience of working in an ambulatory care environment.

4	Young JE, et al. (17), 2016, New Zealand	To investigate the connections among safe learning settings, obstacles to learning, and advantageous educational experiences within a simulated GP clinic.	Qualitative study	General Practice	Students' reflective manuscripts on performance to pinpoint critical elements of the learning environment that promoted fruitful and transformational learning, following each clinic.	- Establishing a safe but stimulating learning environment. - Facilitating in-depth learning via simulated consultations.
5	Williamson M, et al. (16), 2013, New Zealand	To elucidate the design and implementation of a simulated GP clinic including distinctive characteristics aimed at facilitating the acquisition of clinical problem-solving skills.	Interventional study	General Practice	- Feedback from students and the actors as simulated patients. - Routine school evaluation processes.	- A powerful learning experience. - A notable rise in students' levels of enthusiasm and motivation towards learning.
6	Succar T, et al. (28), 2013, Australia	- To compare the effectiveness of the Virtual Ophthalmology Clinic (VOC) with typical teaching approaches in ophthalmology education on student learning. - To determine how students perceive the program and how effective VOC will be in the long.	Interventional study	Ophthalmology rotation	Three evaluation tools: - A pre-and post-test based on knowledge. - A questionnaire to assess students' satisfaction. - A 12-month follow-up assessment.	- A significant increase in knowledge. - The higher rates of knowledge retention. - A highly positive student learning experiences.
7	WünschelM, et al. (29), 2010, Germany	To delineate the integration of a web-based virtual outpatient clinic into the undergraduate medical curriculum, focusing on its impact on learning outcomes and overall students' perception.	Interventional study	Orthopedic rotation	- A student questionnaire at the end of the practicum. - The log files of the server. - Written multiple-choice exams on the first day of the practicum and at the end of the practicum.	- A notable improvement in examination results. - Positive experience with virtual patient interactions. - Acknowledged appropriate use of virtual clinic for teaching orthoepy.
8	Myung SJ, et al. (6), 2010, South Korea	To provide a comprehensive overview of the design, execution, and evaluation of the effectiveness of a simulated outpatient clinic with standardized patients in ambulatory settings.	Interventional study	Internal medicine clerkship	Student survey on their perceptions of the SP program at the end of the clerkships.	- Acknowledge informative and beneficial sessions with SPs. - The ability to engage in self-reflection and receive feedback from facilitators through video recordings.
9	Owen LE, et al. (14), 2008, UK	To explain how the integration of novel learning technologies, self-and peer assessment, and a simulated urology outpatient clinic as a whole learning package to improve student learning.	Interventional study	Urology	- A post-teaching block online student survey on the rotation's effectiveness. - A Multiple-choice test of students' knowledge before the rotation, one week, and one month afterward. - The self-reflection essays to probe the understanding of what they have learned.	- Enhancement of test scores. - Acknowledgment of the online material's efficacy in learning about fundamental clinical issues.

## Discussion

Nine articles with the focus of using simulation in outpatient education were identified in the present study (6, 13-17, 27-29). The findings of the analyzed articles indicate a growing focus on the utilization of simulation in outpatient education. The number of studies conducted between 2013 and 2023 exceeded those conducted in the previous decade. The effectiveness of simulation relies on adherence to standards and crucial elements in its design and execution (20-24). Not considering this issue can turn the effectiveness of SBE into problems and obstacles.

In accordance with these standards, the first step of simulation necessitates facilitators who have received appropriate training. It is of utmost significance for medical institutions to recognize this matter and prioritize providing faculty with sufficient training in three key areas: accurate and reliable clinical scenario development, operation of healthcare simulators, and post-simulation debriefing sessions. This training should be conducted prior to the implementation of simulation as an educational strategy (18, 30-32). Despite the fact that the absence of staff expertise and training may lead to unachieved goals, inadequate learning outcomes, and disengaged participants (18, 31), none of the included articles addressed the faculty development programs, except for one study that conducted a 20-minute brief session via Zoom videoconferencing for tutors (15).

A second crucial element for the success of SBE is the pre-briefing session (introduction, orientation, or other similarly entitled epoch) that is held before a simulation. The fundamental components of pre-briefing encompass the instructor's introduction, elucidation of the simulation environment, delineation of learner expectations and roles, clarification of learning objectives, discussion of confidentiality, explanation of the simulation's strengths and weaknesses, and addressing logistical considerations such as restrooms, food, and breaks (20, 30, 32-35). Despite special prominence on the preparation phase, just two studies provided a 15-minute session (27) and a 20-minute session via Zoom videoconferencing (15). Additionally, in Wünschel's study, the students just received an introduction to the simulator on the first day of their practicum (29). Young's study (17) also noted that students were explicitly told there was no penalty for errors or were instructed how to conclude the consultation. However, whether this training occurred during the pre-briefing session was unclear.

The third aspect of SBE that needs to be

considered is the type of simulation techniques (18, 22, 23). Mannequins, part-task trainers, role-play (RP), standardized patients (SP), computer-based systems (CBS), virtual reality (VR), and gaming are the various types and classifications of simulation (12, 18, 23, 30). In the present study, most included studies used standardized patients (6, 13, 14, 16, 17, 27), while the others implemented virtual simulated clinics (15, 28, 29). One reason SPs are so common is that their implementation requires no special technology (18). An SP is a proficient individual, actor, nurse, or health worker who assumes the role of a real patient consistently and reproducibly for various students. They provide responses that vary depending on the student's performance (12, 18, 30, 32). Out of six studies with SPs, four stated that SPs were actors (27), semi-professional actors (6), and professional actors (16, 17), while two other studies did not mention this issue (13, 14). Direct reference to SP training was only in Dusch and Myung's studies (6, 27). In three virtual clinics, the clinics provided students' experiences without the face-to-face contact of a physical clinic via telehealth (15) or a web-based virtual outpatient clinic (28, 29).

The two additional elements to consider when designing a successful SBE are the site of simulation participation, such as a dedicated skills laboratory, home or office multimedia or actual work unit ("Insitu") (23, 36), and the duration of the simulation, which refers to the amount of time spent in the learning environment. Clinical simulations conducted in a dedicated simulation center, as opposed to in situ or the actual clinical setting, have both benefits and drawbacks. The dedicated simulation center provides a controlled and accessible environment, enabling comprehensive session recording and minimizing distractions from real activities (23). Other than Myung's study (6), which equipped a room at an outpatient clinic, in other included studies, simulation of outpatient interaction took place either face-to-face at the skills lab (13, 14, 16, 17, 27), or off-campus via the computer screen (15, 28, 29). The benefits of off-campus virtual simulated learning include the availability of educational materials even during patient visits, the flexibility of studying whenever and wherever is most convenient, and the enhancement of care quality. Naturally, this endeavor is not without its obstacles, including limited proficiency in technology, Internet connectivity challenges, and technical difficulties pertaining to hardware and software (37).

The duration of learner exposure to simulation environment was different in nine eligible articles:

within the first 14 days of the rotation (27), three to ten sessions, access to the system (28), between seven and nine 2-hr clinics (16), one week (14), five 2-h sessions (17), three 2-h session (15) two sessions (6), average four hours, spending time within four days accessibility to the system (29) and a 3-hour session (13). Although the duration of exposure should be specified when designing the simulation, there is no recommendation as to how long this should be to achieve maximum learning.

The unit of participation (for example, individual or teamwork) and the extent of direct participation are two other dimensions of SBE, based on which the simulation application can be diverse (23). In all included studies, students took responsibility for 'patient' care in its entirety. In four studies, this was without direct supervision (6, 16, 17, 29) and Rasalam and Succar provided supervision via online tutors (15, 28). Except for Owen's study (14), which was unclear, in others, students sometimes worked individually (6, 15, 16, 28, 29), sometimes in pairs (15-17), and sometimes in small groups taking turns as the doctor (13, 27).

As the eighth crucial standard, simulation fidelity must be considered in designing and implementing simulations. Also known as validity (30), realism (38), and authenticity (22), fidelity refers to the degree to which the simulator or simulation accurately replicates the appearance and behavior of the simulated system (18, 22, 30, 38). Consistently, it is stated that the realism of situations is conducive to learning. Training that is very realistic is valued since it is seen as more believable, useful, and transferrable to practice (38). Therefore, this issue is often highlighted by researchers. The two included studies did not mention the activities to make the simulation closer to reality (14, 15). In three studies, the similarity of the simulated clinic environment to the real clinic was mentioned (6, 13, 29), and four other studies stated that cases were based on real-life patients' stories, including their personalities and their medical problems while adding layers of complexity to the consultation (16, 17, 28, 29). In addition to the above, other features of outpatient care, such as time constraints (13, 15, 27) and distractors, were included in each scenario in some included studies (27). Research indicates that complete fidelity may not always be advantageous for the learning process. The degree to which simulation accurately reflects real-world practice should be carefully considered based on the expectations placed on the learners, the simulated situation's characteristics, and the environment and participants involved (22).

The most crucial and often-mentioned component to foster successful learning in SBE is feedback (20, 23, 24, 39). Feedback is often provided during debriefing sessions and may originate from several sources, such as a skilled facilitator, the simulation device (e.g., an SP), and video or digital recordings. In the case of screen-based simulators or virtual reality systems, the simulator has the capability to provide immediate feedback regarding the participant's actions or decisions. Typically, feedback is provided by faculty members. One approach is for the instructor to review the learner's records of previous independent sessions. In various target populations and applications, instructors offer immediate guidance and feedback to participants during the simulation (23).

Different feedback sources have both strengths and limitations. Therefore, using a combination of feedback sources is expected to lead to enhanced educational outcomes (23, 24). In most included studies, feedback was given at the end of the session (6, 13, 14, 16, 17, 27-29), while three studies provided feedback after each consultation (13, 15, 16). Delaying the feedback until the completion of the scenario enables students to utilize their skills effectively without any disruptions. Subsequently, they can evaluate and deliberate their behaviors, choices, and activities (23). Based on our results, feedback was available through multiple and varied sources: from observer students (13, 27), instructor, even face-to-face or by phone (13, 14, 16, 27), the SPs, a kind of self-assessment by contrasting the notes taken by students with the SP reports (6,13,16,17), a written discussion relevant to the case scenario (16), video recording (6), peer assessment based on submitted student performance material through a software (14), an online tutor based on student saved findings into the program (28), and using the virtual simulator to monitor and log the student's input (29).

Debriefing and reflection are the key standards of effective SBE where the majority of learning occurs (20, 32, 33, 38, 40). A post-simulation debriefing is a guided conversation facilitated by an instructor that allows learners to reflect. This session aims to help learners comprehend their experience and identify ways to apply the lessons gained to their future clinical performance (20, 32-34, 38). Preserving a psychologically trusting atmosphere during the pre-briefing is crucial since reflection may be pretty personal. Common components of debriefing across various models typically involve sharing student reactions to the simulated case, which allows the teacher to gain insight into the participants' predominant

concerns. This is followed by a reflective conversation and the facilitator's directed feedback, fostering comprehension. Lastly, the facilitator prompts participants to summarize the case and list their key takeaways from the specific case (32).

In all included studies, except Succar's study, there was evidence of debriefing and reflection, some detailed and precise and some only hinting. For example, three studies only mentioned that there was a group final thought (27) or a group debrief session (13, 16, 29). While for example, in Rasalam's study, following the generalized debrief session to provide generalized feedback and discuss the main learning outcomes for each case, students were invited to reflect on the virtual clinical practice (15). In Young's study, in addition to reflection on performance in a debrief session and students' reflective essays about the rotation, there was the possibility of later self-reflection through the written form of outcomes and 'patient' feedback (17). According to Myung's research, students gained a broader understanding of their strengths and weaknesses through self-reflection prompted by SPs, tutors, and critical appraisals of videos (6). Finally, Owen, in addition to the reflection triggered by the self- and peer-assessed exercise, invited the students to submit a written reflection to promote deeper learning (14). It is important to acknowledge that debriefing and feedback are distinct concepts. Unidirectional feedback fails to facilitate comprehension of the learners' perspective, identification of the true performance deficit, and exploration of the meaning of patterns among learners (20, 33). However, in the context of skills-based or testing simulation activities, debriefing can be substituted with feedback to provide guidance for participants to enhance or validate their practice (20).

Despite its significant role, this scoping review revealed a scarcity of SBE implementation in outpatient education. Additionally, many included studies did not adequately address the minimum essential standards and criteria necessary for an effective simulation in their design and implementation.

The current study had a number of limitations. This study employed the scoping review methodology as its primary approach. Typically, the technique employed in a scoping review does not incorporate an evaluation of the risk of bias or other assessments of the included studies, as is commonly seen in a systematic review. This is because a scoping review aims to provide a broad overview of the subject matter rather than a comprehensive analysis. Despite the current study's best efforts to conduct an exhaustive

search that would ensure no references were overlooked, it is possible that some were missed.

## Conclusion

There is a growing acknowledgment of the necessity for outpatient education to adequately train medical students for their future roles as healthcare professionals. This recognition necessitates the development of innovative educational approaches to teach learners effectively. Using SBE, a well-known teaching method in medical education, there is a chance to provide medical students with appropriate experiential learning to perform these tasks. Effective implementation and enhancement of SBE require several key factors. These include thorough preparation, which involves careful planning and scenario selection. Additionally, it is crucial to engage and involve the appropriate personnel, provide timely feedback, conduct debriefing sessions, and encourage students' reflection. These elements are essential in ensuring the effectiveness of SBE.

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## Authors' Contribution

M.B and SA. F designed the study, then M.D wrote the search strategy and performed the literature search. Data acquisition and analysis were done by M.B and then reviewed by E.B. The authors finally categorized the articles and prepared the manuscript. All authors contributed to the discussion, read, and approved the manuscript and agree to be accountable for all aspects of the work.

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## Conflict of Interests

The authors declare no conflicts of interest.

## References

1. Almushait YB, Alabdajabar MS, Alkhani K, Abdalla HM, Alhayaza R, Temsah MH, et al. Challenges Facing Undergraduate Medical Education in Ambulatory Care

- Clinics at Tertiary Care Hospitals. *Healthcare* (Basel, Switzerland). 2022;10(3):496.
2. Blair M, Wortley E, McGuff K. Placing education at the centre of the outpatient clinic improves learning and experiences for everyone using the multilevel attainment of learning, teaching and support (MALTS) approach. *Archives of disease in childhood Education and practice* edition. 2020;105(1):2-6.
  3. Zuo SW, Hueppchen NA, Salas RME, Gamaldo CE, Patel S. It's a Win-Win: The Effect of Medical Students on Clinic Productivity. *PRiMER* (Leawood, Kan). 2022;6:21.
  4. Logan AA, Rao M, Evans G. Twelve tips for teaching and supervising post-graduate trainees in clinic. *Med Teach*. 2022;44(7):720-4.
  5. Shaheen AW, Fedoriw KB, Khachatryan S, Steiner B, Golding J, Byerley JS, et al. Students Adding Value: Improving Patient Care Measures While Learning Valuable Population Health Skills. *American journal of medical quality*. 2020;35(1):70-8.
  6. Myung SJ, Kang SH, Kim YS, Lee EB, Shin JS, Shin HY, et al. The use of standardized patients to teach medical students clinical skills in ambulatory care settings. *Med Teach*. 2010;32(11):e467-70.
  7. Carr D, Gormley GJ. 'Visiting uncertainty': an immersive primary care simulation to explore decision-making when there is clinical uncertainty. *Educ Prim Care*. 2022;33(4):237-43.
  8. Kruhliak I, Trefanenko I, Solovyova O. Overview of simulation teaching methods in graduate students education [Internet]. 2022 [Cited 20 Jun 2022]. Available From: <http://dspace.bsmu.edu.ua/>.
  9. Blackmore A, Kasfiki EV, Purva M. Simulation-based education to improve communication skills: a systematic review and identification of current best practice. *BMJ simulation & technology enhanced learning*. 2018;4(4):159-64.
  10. Lebensohn-Chialvo F, Sudano LE, Terry M. Out of textbook and [almost] into the clinic: Case simulation in integrated care training. *Fam Syst Health*. 2022;40(4):533-9.
  11. Gantayet-Mathur A, Chan K, Kalluri M. Patient-centered care and interprofessional collaboration in medical resident education: Where we stand and where we need to go. *Humanities and Social Sciences Communications*. 2022;9(1):206.
  12. Korayem GB, Alshaya OA, Kurdi SM, Alnajjar LI, Badr AF, Alfahed A, et al. Simulation-Based Education Implementation in Pharmacy Curriculum: A Review of the Current Status. *Advances in Medical Education and Practice*. 2022;13:649-60.
  13. Lytton K, Woolley T, Rasalam R, Gorton S, Heggarty P. Benefits of simulated General Practice clinics in the preparation of medical students for primary healthcare. *Educ Prim Care*. 2019;30(5):275-81.
  14. Owen LE, Byrne DJ, Ker JS. A learning package for medical students in a busy urology department: design, implementation, and evaluation. *Urology*. 2008;72(5):982-6.
  15. Rasalam R, Bandaranaike S. Virtual WIL Clinics in Medicine: Overcoming the COVID-19 Challenge. *International Journal of Work-Integrated Learning*. 2020;21(5):573-85.
  16. Williamson M, Walker T, Egan T, Storr E, Ross J, Kenrick K. The Safe and Effective Clinical Outcomes (SECO) Clinic: Learning Responsibility for Patient Care Through Simulation. *Teaching and Learning in Medicine*. 2013;25(2):155-8.
  17. Young JE, Williamson MI, Egan TG. Students' Reflections on the Relationships between Safe Learning Environments, Learning Challenge and Positive Experiences of Learning in a Simulated GP Clinic. *Adv Health Sci Educ Theory Pract*. 2016;21(1):63-77.
  18. Ayaz O, Ismail FW. Healthcare Simulation: A Key to the Future of Medical Education – A Review. *Advances in Medical Education and Practice*. 2022;13:301-8.
  19. Chacko T. Simulation-based medical education: Using best practices and curriculum mapping to maximize educational benefits in the context of shift toward competency [Internet]. 2017 [Cited 3 Apr 2017]. Available from: <http://journals.lww.com/>.
  20. Committee IS. INACSL standards of best practice: SimulationSM simulation design. *Clinical Simulation in Nursing*. 2016;12:S5-S12.
  21. Motola I, Devine LA, Chung HS, Sullivan JE, Issenberg SB. Simulation in healthcare education: A best evidence practical guide. *AMEE Guide No. 82*. *Med Teach*. 2013;35(10):e1511-e30.
  22. Chernikova O, Heitzmann N, Stadler M, Holzberger D, Seidel T, Fischer F. Simulation-Based Learning in Higher Education: A Meta-Analysis. *Review of Educational Research*. 2020;90(4):499-541.
  23. Gaba DM. The future vision of simulation in health care. *Quality and Safety in Health Care*. 2004;13(suppl 1):i2-i10.
  24. McGaghie WC, Issenberg SB, Petrusa ER, Scalese RJ. A critical review of simulation-based medical education research: 2003–2009. *Med Educ*. 2010;44(1):50-63.
  25. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med*. 2018;169(7):467-73.
  26. Peters MD, Godfrey CM, McInerney P, Soares CB, Khalil H, Parker D. The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews. Australia: Joanna Briggs Institute; 2015.
  27. Dusch M, Narciß E, Strohmer R, Schüttpeitz-Brauns K. Competency-based learning in an ambulatory care setting: Implementation of simulation training in the Ambulatory Care Rotation during the final year of the MaReCuM model curriculum. *GMS journal for medical education*. 2018;35(1):Doc6.
  28. Succar T, Zebington G, Billson F, Byth K, Barrie S, McCluskey P, et al. The impact of the Virtual Ophthalmology Clinic on medical students' learning: a randomised controlled trial. *Eye*. 2013;27(10):1151-7.
  29. Wünschel M, Leichtle U, Wülker N, Kluba T. Using a web-based orthopaedic clinic in the curricular teaching of a German university hospital: analysis of learning effect, student usage and reception. *International journal of medical informatics*. 2010;79(10):716-21.
  30. Elshama SS. How to apply simulation-based learning in medical education? *Iberoamerican Journal of Medicine*. 2020;2(2):79-86.
  31. Ferguson J, Astbury J, Willis S, Silverthorne J, Schafheutle E. Implementing, embedding and

- sustaining simulation-based education: What helps, what hinders. *Med Educ.* 2020;54(10):915-24.
32. Morse C, Fey M, Kardong-Edgren S, Mullen A, Barlow M, Barwick S. The Changing Landscape of Simulation-Based Education. *AJN The American Journal of Nursing.* 2019;119(8):42-8.
  33. Kolbe M, Grande B, Spahn DR. Briefing and debriefing during simulation-based training and beyond: Content, structure, attitude and setting. *Best practice & research Clinical anaesthesiology.* 2015;29(1):87-96.
  34. Rudolph JW, Raemer DB, Simon R. Establishing a Safe Container for Learning in Simulation: The Role of the Presimulation Briefing. *Simulation in Healthcare.* 2014;9(6):339-46.
  35. Somerville SG, Harrison NM, Lewis SA. Twelve tips for the pre-brief to promote psychological safety in simulation-based education. *Med Teach.* 2023;45(12):1349-56.
  36. Tapia V, Waseem M. Setup and Execution of In Situ Simulation. Treasure Island (FL): StatPearls Publishing LLC.; 2023.
  37. Barzegar M, Boushehri E, Amini M, Tabari P. Advantages and Challenges of Virtual Outpatient Education: A Review Article. *Acta Medica Iranica.* 2022;60(8):457-64.
  38. Connolly F, De Brún A, McAuliffe E. A narrative synthesis of learners' experiences of barriers and facilitators related to effective interprofessional simulation. *Journal of interprofessional care.* 2022;36(2):222-33.
  39. Campbell KK, Wong KE, Kerchberger AM, Lysikowski J, Scott DJ, Sulistio MS. Simulation-Based Education in US Undergraduate Medical Education: A Descriptive Study. *Simulation in Healthcare.* 2022;10:1097.
  40. Mattila A, Martin RM, Deluliis ED. Simulated fieldwork: A virtual approach to clinical education. *Education Sciences.* 2020;10(10):272.