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Clement Munguiko, Enos Mirembe Masereka, Joseph Atukwatse, Joseph Smitha, James Kateregga, Clare Nankinga, Alice Alum Collete, Josephine Namujju, Safina Akello & Sylvia Nalubega

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Clinical Teaching Models for the Instruction of Healthcare Trainees in the 21st Century: a Scoping Review

Clement Munguiko¹, Enos Mirembe Masereka², Joseph Atukwatse¹, Joseph Smitha³, James Kateregga¹, Clare Nankinga¹, Alice Alum Collete¹, Josephine Namujju¹, Safina Akello¹, Sylvia Nalubega³

¹Soroti University, Department of Nursing, School of Health Sciences, Soroti city, Uganda

²Mountains of the Moon University, Department of Nursing and Midwifery, Faculty of Health Sciences, Fort portal city, Uganda

³Institute of Applied Technology, Fatima College of Health Sciences, Abu Dhabi city, United Arab Emirates

Corresponding author: Clement Munguiko, Soroti University, School of Health Sciences, cmunguiko@sun.ac.ug +256771436963

Abstract

Background: In the 21st century, health professions educators are required to adopt contemporary clinical teaching models that equip trainees with competencies that are responsive to the evolving healthcare needs of the population. Efforts to standardize clinical competencies across the globe further demand aligned pedagogical frameworks to guide clinical teaching across diverse contexts. However, evidence on such remains fragmented and inadequately synthesized. This study mapped existing evidence on models guiding clinical teaching of healthcare trainees in the 21st century.

Methods: The review followed the Joanna Briggs Institute scoping review guideline. Electronic database searches were conducted between 1st and 4th January 2026 in CINAHL, PubMed, Scopus, Cochrane, and Informit to identify articles published from 1st January 2000 to 31st December 2025. Grey literature searches were conducted in google scholar and ProQuest. Studies were screened at title, abstract and full text levels, and data were extracted using a standardized Joanna Briggs Institute data extraction tool. Data was analyzed descriptively and summarized in a tabular form.

Results: The search yielded 3,526 records, of which 70 went through full text screening and 26 met the inclusion criteria. Most studies were conducted in the United States, with none from Africa, and involved medical students. Eight clinical teaching models were mapped: i) One-

Minute Preceptor Model (OMP); ii) Summarize, Narrow, Analyze, Probe, Plan, Select (SNAPPS); iii) Setting foundation, Tutor demonstrating without commentary, Explaining with repeated demonstration, Practicing under supervision, and Subsequent practice (STEPS); iv) Meeting, Introduction, In the moment, Inspection, Interruption, Independent thought, Patient care, Learner's questions, Attending agenda, and Next steps (MiPLAN); v) Bridge-in, Objectives, Pre-assessment, Participatory learning, Post-assessment, and Summary (BOPPPS); vi) Emergency Department Strategies for Teaching Any Time (ED STAT); vii) Reporter-Interpreter-Manager-Educator (RIME); and viii) Aunt Minnie. OMP and SNAPPS were the most commonly reported models.

Conclusions and recommendations: Although eight clinical teaching models were identified, supporting evidence remains geographically and methodologically uneven, with no single model emerging as universally applicable. However, structured teaching, learner engagement, reflection, feedback, and role modelling consistently appeared across the identified models as core microteaching skills. Clinical educators and training institutions should strengthen these competencies through faculty development and context-sensitive application of clinical teaching models. Future research should prioritize methodologically rigorous and contextually grounded studies on clinical teaching models, particularly in underrepresented low-resource settings.

Keywords: *Clinical competence, clinical teaching, teaching methods, teaching models, healthcare trainee*

BACKGROUND

Theory and clinical teaching sessions are typically interlinked, although each has unique approaches, strategies, methods, and intended learning outcomes [1]. Healthcare trainees often struggle to apply theoretical knowledge gained in lecture halls to clinical practice, which takes place entirely in settings such as hospitals [2]. In these clinical environments, trainees integrate theoretical knowledge with practical skills, thereby making learning complete and meaningful

[2]. Therefore, teaching with real patients in clinical areas lies at the core of training health professionals [3].

In response to the global call to standardize clinical competencies, there is a pressing need to transform health professions education in the 21st century by adopting clinical teaching approaches and models that address current educational needs [4]. In addition, increasingly complex patient needs and advancements in medical technology require a paradigm shift from traditional to contemporary approaches to clinical teaching and learning. This shift is also driven by the contemporary competencies expected of healthcare workers in 21st century, including improved clinical skills, respectful patient care, effective communication, interprofessional collaboration, self directed learning, and patient safety [5].

This transformation requires educators to adopt contemporary clinical teaching models that support the development of competencies aligned with the demands of current healthcare systems [6]. Efforts to standardize competencies across health professionals at both national and international levels necessitate a re-evaluation of clinical teaching models to promote greater consistency in teaching approaches, instructional methods, and learning outcomes [7]. Clinical teaching models provide structured frameworks for designing instructional activities, and guiding teaching and learning in clinical settings [8]. These models also assist clinical educators in identifying trainee's individual learning needs, addressing learning gaps and providing constructive feedback to enhance learning outcomes [9, 10].

Clinical teaching models, strategies, and approaches are often used interchangeably, but they differ in level of abstraction and function. Approaches refer to broad, overarching orientations to teaching and learning. They describe how teaching is usually conceptualized. These include learner-centred, teacher-centred, competence-based education and reflect different assumptions about the role of the learner, the teacher, and the knowledge. Models are more structured than approaches and provide an organized framework or sequence of steps that guide how teaching and learning occur in practice. Models translate theories into operational processes for planning, delivering and evaluating clinical instruction. They function as blueprints that standardize how teaching should be conducted in clinical settings. These include One Minute Preceptor Model and Aunt Minnie. Similarly, strategies are the more practical and task specific. They refer to

specific methods used within the clinical teaching session to achieve learning outcomes. They include questioning techniques, demonstration-return demonstration, and constructive feedback [11, 12].

Grounded in learning philosophies and learning theories, clinical teaching models provide educators with frameworks for selecting instructional approaches and methods that enhance the acquisition of clinical skills [13]. Pragmatist educational philosophy emphasizes learning through experience, problem-solving, and reflection on real-world situations [14]. This philosophy supports the use of structured models in clinical teaching because such models provide practical frameworks that connect theoretical knowledge with actual patient care. By applying pragmatic principles, clinical teaching models enable learners develop cognitive, psychomotor and affective competences by encouraging critical thinking and reflective practice.

The use of models in clinical teaching also aligns with constructivist principles which posit that learners construct their own knowledge by integrating new knowledge with prior experience [15]. Through the guidance of structured models, educators can scaffold learners' understanding, facilitate guided practice, and support progressive development of the desired competencies. Clinical teaching models informed by the constructivist help bridge the gap between theoretical and clinical knowledge, thereby promoting deeper understanding and more effective application of knowledge in patient care [16].

Similarly, experiential learning theory emphasizes that learners acquire knowledge and skills through active engagement and practice [17]. This theory further supports the use of structured frameworks in clinical teaching by providing educators with evidence-based processes for designing interactive and experience-driven learning activities. Consequently, learners develop knowledge and skills through active participation, while educators use structured approaches to guide and optimize the learning process effectively.

Similarly, existing evidence suggests that structured clinical teaching models play an important role in improving the consistency and effectiveness of clinical education. Across studies, there is convergence in the view that the use of educational models promotes greater standardization in teaching approaches and learning experiences within clinical setting. For instance Arabshahi and

colleagues [18] argued that structured educational models help minimize variations in clinical teaching and contribute to more equitable learning opportunities among learners. Likewise, Faradhillah and S Zahara [19] demonstrated that the application of evidence-based clinical teaching models improved both instructional processes and student learning outcomes. Collectively, these findings suggest that structured clinical teaching models not only enhance the organization and delivery of clinical instruction but also strengthen competency development among learners.

Importantly, the benefits reported across studies extend beyond technical competence to include higher-order competencies required in contemporary healthcare practice, such as clinical reasoning, decision-making, communication, and respectful patient care [20]. This indicates that structured models may facilitate more holistic learning by integrating cognitive, interpersonal, and practical dimensions of clinical competence. Further more, evidence linking structured teaching models to improved patient safety, learner engagement, motivation, and satisfaction suggests that these models influence both educational and clinical outcomes [21].

Despite the widely recognized use and perceived benefits of structured models in clinical teaching, the evidence base remains fragmented and inadequately synthesized. As a result, there is limited understanding of how clinical teaching models are applied across different. Therefore, the aim of this scoping review was to systematically map and synthesize existing evidence on models used to guide clinical teaching of healthcare trainees in 21st century, with particular attention to their educational contexts and embedded microteaching skills aligned with contemporary healthcare competencies. Accordingly, the review addressed the following research question: *Which clinical teaching models are reported in the literature for guiding the clinical teaching of healthcare trainees in the 21st century, and which microteaching skills embedded within these models align with the competencies required for contemporary healthcare practice?*

METHODS

We conducted a scoping review in accordance with the guidelines established by the Joanna Briggs Institute (JBI).

Inclusion criteria: The selection of articles was guided by the Population, Concept, and Context (PCC) framework, as outlined in the JBI Manual for Evidence Synthesis [22].

For the population criterion, we included studies that involved healthcare trainees as participants or explicitly referred to them. In this study, the term "health care trainees" encompassed students enrolled in programs such as postdoctoral, doctoral, master's, bachelor's, diploma, or certificate courses in medicine, surgery, dentistry, nursing, midwifery, and allied health disciplines. Articles were included regardless of the age or gender of the study participants.

Only articles that explored the concept of clinical teaching models were included. In this study, a clinical teaching model was defined as a framework outlining specifications, steps, rules, or regulations for the effective implementation of clinical teaching. This construct prescribed deliberate actions designed to facilitate successful clinical learning. Consequently, clinical teaching models excluded clinical teaching approaches, strategies, placement practices, and modalities, as these focus on other educational constructs.

With regard to the context, this review included articles on clinical teaching models published between January 1, 2000, and December 31, 2025. This is because the study intended to document clinical teaching models that can be useful in clinical instruction of healthcare trainees in the 21st century. Additionally, articles from all countries worldwide were considered.

Type of articles and data sources: Relevant databases, including Scopus, Cochrane, PubMed, Informit and CINAHL were searched for articles. Grey literature was searched from google scholar and ProQuest sources. Both qualitative and quantitative research, encompassing true and quasi-experimental studies, grey literature, phenomenological and ethnographic studies, case studies, and descriptive studies were included. Only articles written in English were included due to lack of an interpreter. However, it is acknowledged that this could have introduced language bias into the study. Articles for both primary and review studies were included to comprehensively map the extent and nature of existing evidence on clinical teaching models recommended for guiding the clinical teaching of healthcare trainees in the 21st century. Including review articles enabled us to capture synthesized knowledge and broader thematic insights, while primary studies provided detailed empirical findings. This combination strengthened the comprehensiveness of the evidence map and helped to identify both well-established and under-researched areas.

Search strategy: Electronic database searches were conducted between 1st and 4th January 2026 to identify articles published from 1st January 2000 to 31st December 2025.

A three-step search strategy was employed to identify both published and unpublished literature relevant to the review topic. First, an initial limited search was conducted in PubMed and CINAHL to identify relevant keywords, index terms, and subject headings related to the review topic. Second, the identified keywords and index terms were adapted and combined using Boolean operators (“AND” and “OR”) to conduct comprehensive searches across all included databases. Search strategies were tailored to the indexing systems and search functionalities of each database. Additional search terms were incorporated where reviewers identified their relevance during the review process. Finally, the reference lists of all included studies were screened to identify additional relevant articles. One of the search strategies used in PubMed database is provided in Appendix 1. Similarly, the terms that were used to search for articles have been shared. (Table 1).

Table 1: List of the search terms used in data search

Main term	Other terms
Clinical	Clinical OR medical OR bedside OR hospital OR health facility
Teaching	Instructing, tutoring, educating, training, coaching, schooling, pedagogy*
Models	Framework, technique*, template*, structure
Application	Apply*, used, practice*, utilize*, employ*
Health care trainees	Medical student*, student nurse*, student midwife*, allied health student*, dentistry student*, pharmacy student*, orthopaedic student*, occupational therapy student*, physiotherapy student*, clinical officer student*, assistant physician student*.resident medical student* postgraduate medical student*
21 st century	Current, contemporary, revolutionary, modern, today

Screening of articles

All selected articles were imported into EndNote version 20.6 software, and duplicates were removed before starting the screening exercise. The articles were then screened to determine

whether they met the inclusion criteria. Screening was conducted in three stages: initially at the title level, followed by the abstract level, and finally at the full-text level. Two independent researchers carried out the screening. Two disagreements emerged and were resolved through consensus by referring to the definitions of terms and the study aim. The article screening process and the reporting of results followed the PRISMA flow diagram from the PRISMA statement (Appendix I) [23].

Ensuring review rigor: The study protocol was registered with the Open Science Framework and was followed as a guide throughout the study. A minor refinement to the study protocol was made during the data extraction phase. Initially, the second objective, following the objective of mapping existing models, aimed to examine the extent to which recommended models are applied in the clinical teaching of healthcare trainees in the 21st century. However, for clarity and to better align with the overall aim of the review, the second objective was refined to focus on extracting microteaching skills embedded within the identified models that correspond to competencies required for contemporary healthcare trainees. This refinement did not alter the overall scope or methodology of the review.

Articles were carefully assessed for suitability of inclusion by two independent reviewers before a final decision was made to include them into the study. Few disagreements between reviewers were resolved through discussion with the guidance of the protocol. However, being a scoping review study, critical appraisal of the articles was not done.

Data charting: Data charting (extraction) was conducted using a standardized structured tool adapted for this study from the JBI Scoping Review Methodology Guidelines (Appendix II). The charted data included general information about each article including the study title, study objective(s), author(s), year of publication, country, design, study setting, and participants. The charted data also included the name and description of the model, its application in clinical teaching, its advantages and limitations, and other relevant details. CM performed data charting, and the findings were verified by SN, a senior researcher during a research team meeting. All data sources were securely stored to facilitate easy reference tracking. The charting table was continuously updated as the data charting process progressed.

Analysis of the evidence and presentation of findings: Following extraction, the charted data were exported into Microsoft Excel for further organization and analysis. Analysis involved summarizing the extracted data using simple descriptive statistics, including frequencies and counts across all data extraction domains such as year of publication, country, healthcare discipline, type of clinical teaching model, and its context of use. Only documented stepwise frameworks or structures that guide structured clinical instruction and learner development were considered as clinical teaching models. The extracted evidence was then examined to identify patterns, similarities, and differences in how clinical teaching models were described and applied across studies. Results were then interpreted inline with scoping review methodology (Appendix II) and are presented through a narrative synthesis supported by tabular summaries.

Some primary studies were also represented within included review articles, particularly within the One-Minute Preceptor literature. To minimize duplication of evidence, review articles were mainly used to provide conceptual and contextual insights into clinical teaching models, while primary empirical studies formed the principal basis for thematic synthesis and interpretation of findings.

Reflexivity

The authors are affiliated with African universities and have experience in health professions education within resource-constrained settings. This positionality informed the review's interest in examining the representation of African evidence in the literature on clinical teaching models and identifying contextual gaps relevant to low and middle-income settings.

RESULTS

Screening process for the included articles

The search retrieved 3,526 articles of which 3,458 were considered for screening after removing 68 duplicates. During title screening, 2,952 articles were excluded, leaving 506 articles for further screening. Following abstract screening, 436 abstracts were excluded, leaving 70 at full text level. At full text screening, 44 articles were excluded because they described teaching methods, strategies, and approaches, rather than models. Ultimately, 26 articles met the inclusion criteria and were included into the study (Appendix 1).

Characteristics of the included studies

Most studies were conducted in the United States of America (n = 17) [24-37], followed by South Asia (n = 5) [38-41]. China (East Asia), Iraq (Middle East), the United Kingdom (Western Europe), and Colombia (Latin America) each contributed one article, while no studies originated from Africa. Most of the articles were for the studies that involved medical students and published between 2015 and 2024. Charting table, indicating detailed information has been shared as supplementary material.

Teaching models for guiding clinical instruction of healthcare trainees in the 21st century

The scoping review identified eight (08) structured models recommended for guiding clinical teaching of healthcare trainees in the 21st century (*Table 2*). The reviewed clinical teaching models share several common features, including structured stepwise approaches, learner-centred instruction, active participation, feedback, and the promotion of clinical reasoning and competency development. Most models aim to improve teaching effectiveness, diagnostic accuracy, and learner engagement through experiential and reflective learning approaches.

However, the models differ in their primary focus, target learners, and clinical application settings. Models such as OMP, SNAPPS, and Aunt Minnie mainly enhance clinical reasoning and diagnostic skills, whereas STEPS and BOPPPS emphasize procedural skills acquisition. Some models are better suited for junior learners, while others are more appropriate for advanced learners or specific settings such as outpatient clinics, bedside teaching, or emergency departments. Additionally, the strength of supporting evidence varies across models, with OMP (n = 16/26) and SNAPPS (n = 6/26) being the most extensively studied compared to models such as STEPS (n = 1/26), RIME (n = 1/26), Aunt Minnie (n = 1/26), BOPPPS (n = 1/26), ED STAT (1/26) and MiPLAN (1/26). Two articles reported more than one model. Overall, the models reflect a shift toward structured, competency-based, and learner-centred clinical teaching practices.

Table 2: Summary of clinical teaching models, their benefits, uses, and limitations

Name of model	Model Description	Benefits	Uses	Limitations

OMP	The most studied and applied model. The model has five microteaching skills: Students take stand, probe for supporting evidence, teach general rules, reinforce what is done well, and correct errors	Follows systematic approach and experiential learning cycle: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), Active Experimentation (AE). Stimulates learners to learn and saves time, improves diagnostic accuracy. Improves students' academic rating. Better compared to traditional approaches. Promotes feedback and critical thinking. Is easy to learn and apply	Used by both students and teachers. Effective for teachers with groups of learners such as multiheaded scope sessions. Is effective for both junior and senior learners	Requires faculty training
SNAPPS	The second most studied and applied model. Has six micro-teaching skills: Summarize, Narrow, Analyse, Probe, Plan, and Select	Provides stepwise structured approach to clinical teaching. Promotes active participation of the team members, collaborative learning, attention to group dynamics, saves time, encourages reflective SDL and feedback. Improves diagnostic efficiency than traditional methods. Superior to OMP in enhancing clinical reasoning.	Used to teach at outpatient department. Used when teaching multiple skills and is ideal when teaching advanced learners	May not meet the educational needs of all students
STEPS	Has five structured steps: Setting foundation, Tutor demonstrating without commentary, Explaining with repeated demonstration, Practicing under supervision, Subsequent practice	Enhances mastery of skills, minimizes anxiety among students and assists in evaluation of teaching and learning	More effective to teach junior learners who are still mastering low and mid-level clinical procedures	Has limited supportive credible studies
MiPLAN	Three-phased	Enhances teacher's	Applied during	Has limited

	teaching model: Meeting, Introduction, In the moment, Inspection, interruptions, Independent thought, Patient care, Learner's questions, Attending agenda, and Next steps	confidence. Improves teaching and learning outcomes.	bedside teaching	supportive evidence for generalizability
BOPPPS	Six microteaching skills: Bridge-in, Objectives, Pre-assessment, Participatory learning, Post-assessment, and Summary	Stimulates interns' learning interest and initiative, enhance their self-study ability, and improve their clinical skills	Teaching interns on ward. Is more effective while teaching junior learners	Not reported
ED STAT	Described as: Emergency Department Strategies for Teaching Any Time	Improves teaching strategies and behaviour	Preferred while teaching in emergency department	Validity not adequately tested
RIME	Described as: Reporter-Interpreter-Manager-Educator	A model useful in guiding learner development, clinical interactions, supervision, feedback, and assessment of clinical competencies. Feasible and acceptable	Useful in assessing clinical skills and providing feedback to improve mastery of clinical competences	Not reported
Aunt Minnie	Aligns with pattern recognition paradigm. Model relies on the common patterns of the illness.	Effective in making accurate diagnosis. Easy to apply	Works best for subspecialties with large numbers of small repetitive procedures or patterns	Trainees may learn to make snap judgments and would refer a slower more Socratic method

Across the reviewed models, the identified microteaching skills demonstrated strong alignment with principles of Competency-Based Education (CBE), which increasingly underpins 21st-century health professions education. Common competencies emphasized across the models included planning, clinical reasoning, communication, learner-centred engagement, reflective practice, feedback, professionalism, self-directed learning, and progressive development of clinical competence. Models such as OMP, SNAPPS, and RIME particularly emphasized clinical reasoning, decision-making, and formative assessment, while STEPS and BOPPPS focused more on deliberate practice, structured supervision, and skills mastery. Similarly, MiPLAN and ED STAT highlighted adaptive supervision, role modelling, teamwork, and contextual workplace-based learning. Overall, the models collectively reflected a shift from traditional knowledge transmission toward structured development and assessment of observable competencies required in contemporary healthcare practice. (Table 3).

Table 3: Embedded microteaching skills in clinical teaching models supporting 21st century healthcare practice

Clinical Teaching Model	Embedded microteaching skills	Educational purpose of the skills	Competences supported in the 21st century healthcare practice
One-Minute Preceptor (OMP)	Questioning, probing for evidence, feedback, reinforcement, correction of mistakes, reflective prompting	Promote rapid clinical reasoning and formative learning during clinical encounters	Clinical reasoning, diagnostic judgment, reflective practice, evidence-informed decision-making, learner-centred feedback
SNAPPS	Case summarization, analytical questioning, learner articulation, self-directed inquiry, reflective discussion	Encourage learner-led clinical reasoning and active participation	Self-directed learning, metacognition, communication, analytical thinking, clinical decision-making
RIME	Observation, guided interpretation, feedback, progressive supervision, reflective evaluation	Support staged cognitive and professional development of learners	Interpretation of clinical data, synthesis of patient information, progressive competence development, professionalism
Aunt Minnie	Pattern recognition, rapid hypothesis generation, confirmation questioning, focused feedback	Facilitate efficient diagnostic reasoning through experiential recognition	Diagnostic efficiency, adaptive expertise, rapid clinical assessment, decision-making under time constraints

STEPS	Demonstration, stepwise instruction, supervised practice, repetition, corrective feedback	Develop procedural competence through structured practice	Psychomotor skills, procedural accuracy, deliberate practice, technical competence
BOPPPS	Structured presentation, questioning, learner engagement, assessment, feedback, lesson summarization	Enhance organized teaching and active learner participation	Competency-based instruction, formative assessment, learner engagement, skills acquisition
MiPLAN	Bedside demonstration, coaching, role modelling, contextual questioning, learner-centred supervision	Promote workplace-based learning and contextual clinical teaching	Communication, professionalism, patient-centred care, adaptive supervision, collaborative practice
ED STAT	Real-time questioning, role modelling, brief feedback, team-based instruction, situational coaching	Support teaching and learning within fast-paced clinical environments	Team communication, situational awareness, interprofessional collaboration, workplace adaptability, professionalism

DISCUSSION

Characteristics of existing evidence on clinical teaching models

In reference to the mapped evidence, this scoping review shows that scholarship on clinical teaching models for healthcare trainees in the 21st century is extensive in scope but uneven in depth and methodological quality. The studies that were reviewed span over two decades, with a noticeable growth in publications from the year 2010 onwards, reflecting increasing interest in understanding frameworks and models that guide clinical teaching, especially at the time when the globe is becoming more concerned about the employable competencies among graduates as opposed to the simply acquisition of abstract knowledge.

Therefore, this trend indicates the gradual paradigm shift of the clinical educational approach from traditional apprenticeship-based teaching toward more explicit and model-driven frameworks that align with contemporary educational expectations of the 21st century employable skills, including critical thinking, problem solving, and interprofessional education [42].

The geographical distribution of the source of evidence reveals a strong concentration of studies from high income countries, especially in United States and Canada, while contributions from the low- and middle-income countries remain comparatively limited. Nevertheless, inclusion of articles for the studies from Asia and Middle East indicates a growing global awareness of the relevance of clinical teaching models, although contextual adaptations in low resource settings still remains poorly represented. Important to note, this imbalance may have implications on the transferability of the recommended models across diverse healthcare systems and educational contexts. The clinical environments in low- and middle-income countries are often marked by high patient load, staff shortages, limited infrastructure, and competing service demands which may hinder effective application of the structured, time-intensive, and feedback demanding clinical teaching models [43]. Without empirical evidence demonstrating adaptation and effectiveness in such contexts, the transferability of such models may be ineffective.

Across all the reviewed studies, there is convergence around key principles underpinning effective clinical teaching in the 21st century, including student-centredness, structured steps and supervision, timely feedback, reflective practice, and deliberate role modelling in authentic clinical settings. These are widely recognized as core elements of effective clinical teaching and learning which training programs and policy frameworks should prioritize while designing or evaluating clinical teaching interventions [44]. These principles may serve as benchmarks for quality improvement initiatives and curriculum reform in clinical teaching. Emphasizing these principles can also help to standardize clinical teaching practices across various clinical settings. These principles cut across cadres of trainees, including undergraduate doctors, nurses and other healthcare trainees. Therefore, this highlights the broad applicability of clinical teaching models beyond a single discipline. However, the diversity of student populations and contexts also introduces variability in how these models are conceptualized and implemented, which may partly explain the inconsistencies in reported models. This focus also highlights gaps where future research could strengthen the evidence base, especially in experimental studies that deeply tackle these clinical teaching models, their principles and outcomes.

Pedagogical orientation and conceptual trends across clinical teaching models

Mapped models demonstrate important microteaching skills that can support the development of competences expected of healthcare workers within internationally recognized competence-based health professions education frameworks, including those promoted by World Health Organization (WHO), Canadian Medical Education Directives for Specialists (CanMEDS), and Competence-Based Education and Training (CBET) approaches [45-47].

The reviewed clinical teaching models demonstrate a clear shift from traditional apprenticeship-based instruction toward structured, learner-centred, and competency-oriented educational approaches. Although the models differ in focus and implementation strategies, they can broadly be grouped according to their dominant pedagogical orientation, namely learner-centred reasoning models, procedural and skills-based models, and workplace-based reflective teaching models. This thematic grouping provides deeper insight into how contemporary clinical teaching frameworks operationalize competency development in health professions education.

Learner-centred reasoning models such as OMP, SNAPPS, RIME, and Aunt Minnie primarily emphasize clinical reasoning, diagnostic thinking, metacognition, and active learner participation [35, 48-50]. These models reflect the increasing prioritization of higher-order cognitive competencies required in 21st-century healthcare practice, including critical thinking, problem solving, diagnostic accuracy, and reflective decision-making. Their prominence in the literature may partly be explained by the growing educational emphasis on competency-based education (CBE), which values observable reasoning processes, learner autonomy, and formative feedback. Additionally, these models are relatively adaptable to busy clinical environments because they provide concise, structured teaching interactions that can be integrated into routine patient care without requiring extensive additional resources. This practicality may explain why OMP and SNAPPS appear more extensively studied and implemented compared with other models.

In contrast, models such as STEPS and BOPPPS are more strongly oriented toward procedural skills acquisition, deliberate practice, and structured instructional sequencing [33, 38]. These models align closely with psychomotor learning theories and scaffolded skills training approaches commonly required in nursing, surgery, and procedural disciplines. Their emphasis on repetition, supervision, and progressive independence reflects competency-based expectations that learners demonstrate measurable clinical performance before advancing toward

unsupervised practice. However, despite their pedagogical strengths, these models may be more resource-intensive because effective implementation often requires smaller learner groups, adequate equipment, direct observation, and protected teaching time. Such demands may limit feasibility in under-resourced clinical environments.

A third category includes workplace-based and relational teaching models such as MiPLAN and ED STAT which emphasize contextual learning, communication, professionalism, role modelling, and adaptive supervision within authentic clinical settings [36, 51, 52]. These models reflect increasing recognition that competence extends beyond technical knowledge and procedural skills to include interpersonal communication, teamwork, ethical practice, and patient-centred care. Their focus on role modelling and situated learning aligns with social learning theory and contemporary views of clinical education as a socially negotiated process occurring within complex healthcare systems. Importantly, these models acknowledge the realities of modern clinical workplaces, including time pressure, competing service demands, and interprofessional collaboration.

The uneven distribution of evidence across models also warrants critical reflection. Models such as OMP and SNAPPS dominate the literature partly because they emerged earlier, were developed within academically resource-rich environments, and lend themselves more readily to educational research and faculty development initiatives. In contrast, models such as MiPLAN, STEPS, and ED STAT have comparatively limited empirical evaluation despite apparent practical relevance. This imbalance highlights an important research gap in contemporary clinical education literature, where pedagogically promising models may remain underexamined because of contextual, financial, or methodological barriers to rigorous evaluation.

Contextual factors appear to strongly influence the applicability of clinical teaching models. Most reviewed studies originated from high-income countries where faculty development structures, learner-teacher ratios, simulation resources, and protected teaching time are relatively more available. In low- and middle-income settings, however, heavy patient volumes, workforce shortages, and constrained infrastructure may limit implementation of highly structured or feedback-intensive models [43]. Consequently, direct transferability of models across contexts should not be assumed without adaptation. Future research should therefore move beyond

evaluating whether models work in ideal settings toward understanding how they can be modified, simplified, and sustainably integrated within resource-constrained clinical environments.

Another important observation is that no single model appears sufficient to address all dimensions of clinical competence. Models emphasizing diagnostic reasoning may inadequately address procedural mastery, whereas highly procedural models may insufficiently cultivate reflective thinking, communication, or professional identity formation. This suggests that effective clinical teaching may require deliberate integration of complementary models rather than reliance on a single framework. Hybrid approaches that combine reasoning, procedural competence, feedback, reflection, and workplace learning may therefore offer greater educational value in competency-based curricula.

Collectively, these findings reinforce the broader paradigm shift in health professions education toward competency-based, learner-centred, and workplace-integrated clinical teaching. However, the current evidence base remains limited by methodological weaknesses, inconsistent outcome measures, and inadequate representation of low-resource settings. Future research should prioritize robust comparative studies, contextual adaptation research, longitudinal learner outcomes, and evaluation of how clinical teaching models influence not only knowledge acquisition but also professional identity formation, patient outcomes, and long-term clinical competence.

CONCLUSIONS AND RECOMMENDATIONS

This scoping review suggests that contemporary clinical teaching in health professions education is increasingly characterized by a shift from traditional apprenticeship-style instruction toward more structured, learner-centred, and competency-oriented educational approaches. The reviewed models collectively reflect broader transformations in healthcare education, where greater attention is given to clinical reasoning, reflective practice, communication, professionalism, feedback, and the progressive development of observable competencies within authentic clinical environments.

Although the reviewed models differ in pedagogical orientation, they appear to converge around three complementary domains of clinical competence development namely, clinical reasoning and decision-making, procedural and skills-based learning, and workplace-based professional practice. Models such as OMP, SNAPPS, RIME, and Aunt Minnie primarily aim to support diagnostic reasoning and metacognitive development, whereas STEPS and BOPPPS emphasize structured skills acquisition and deliberate practice. In contrast, MiPLAN and ED STAT focus on contextual learning, communication, professionalism, and adaptive supervision within real clinical settings. The diversity observed among models highlights the multidimensional nature of clinical competence development and suggests that different models may address different educational needs and contexts.

The review further highlights important inequities and methodological limitations within the existing evidence base. The predominance of studies from high-income countries raises questions regarding the transferability of highly structured and feedback-intensive models to low and middle-income settings where clinical teaching often occurs under conditions of workforce shortages, high patient volumes, and limited educational resources. Additionally, much of the literature remains descriptive and theoretically oriented, with relatively few robust comparative or longitudinal studies examining educational outcomes, implementation processes, or contextual adaptability. Consequently, evidence regarding the effectiveness and contextual applicability of these models remains limited in many settings.

These findings may have implications for clinical education practice, faculty development, and future research. The review highlights the potential value of flexible, context-sensitive combination of clinical teaching models rather than reliance on a single framework. Faculty development initiatives may support educators in integrating learner-centred teaching, formative feedback, reflective practice, and competency-based assessment within routine clinical care. Future research should focus on rigorous empirical evaluation of clinical teaching models across diverse healthcare settings, particularly in low-resource environments, while also exploring hybrid and contextually adaptable approaches capable of addressing the complex competency demands of contemporary healthcare practice.

STUDY LIMITATIONS

The review was limited to English-language articles, which may have introduced language bias through exclusion of potentially relevant studies published in other languages. Although multiple databases were searched and some grey literature sources were considered, relevant studies indexed elsewhere or contained within unpublished or regional grey literature sources may not have been identified. Furthermore, no studies from Africa were identified, which may reflect limitations in database coverage and search strategy, particularly the non-inclusion of African-specific databases such as African Journals Online (AJOL), Sabinet, and regional institutional repositories, rather than a true absence of relevant research from the continent.

DECLARATIONS

Ethical approval

Not applicable

Consent for publication

Not applicable

Trial registration

Protocol was registered with Open Science Framework. DOI 10.17605/OSF.IO/6KY3H.

Competing interests

We declare no competing interests

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This study did not have any external funding. It was done by university lecturers out of curiosity to contribute knowledge to the field of clinical teaching and learning.

Data availability

The dataset used to generate results is available from the corresponding author on request

Authors' contributions

CM- Idea conceptualization, writing and publishing protocol, searching and screening of articles, data extraction and analysis, manuscript writing and submission to the journal for publication.

JK- Idea conceptualization, data charting and analysis, reviewing protocol and manuscript. JA- Idea conceptualization, reviewing the protocol and manuscript. EMM- Idea conceptualization, reviewing the protocol and manuscript. JN- Idea conceptualization, reviewing the protocol and manuscript. CN- Reviewing the protocol and manuscript. SA- Reviewing the protocol and manuscript. ACA- Reviewing the protocol and manuscript. JS- Reviewing manuscript. SN- Providing expert guidance to the whole research process.

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Appendix 1: Strategy used to search articles

PubMed

("Clinical Teaching"[Mesh] OR clinical education[tiab] OR clinical instruction[tiab] OR clinical learning OR bedside teaching[tiab] OR hospital-based teaching[tiab] OR clinical pedagogy*[tiab])

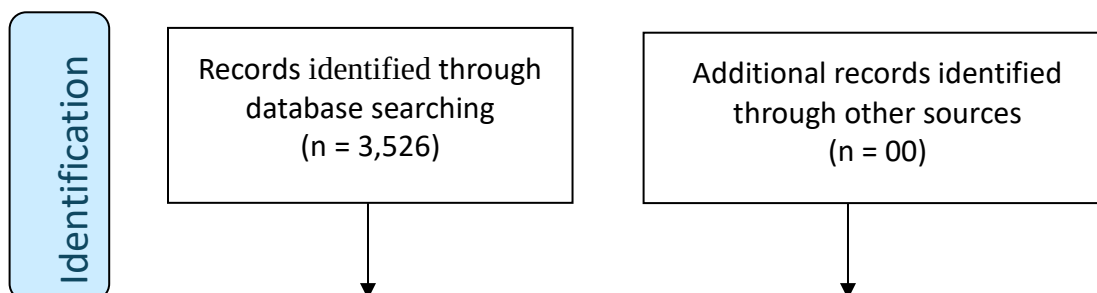
AND

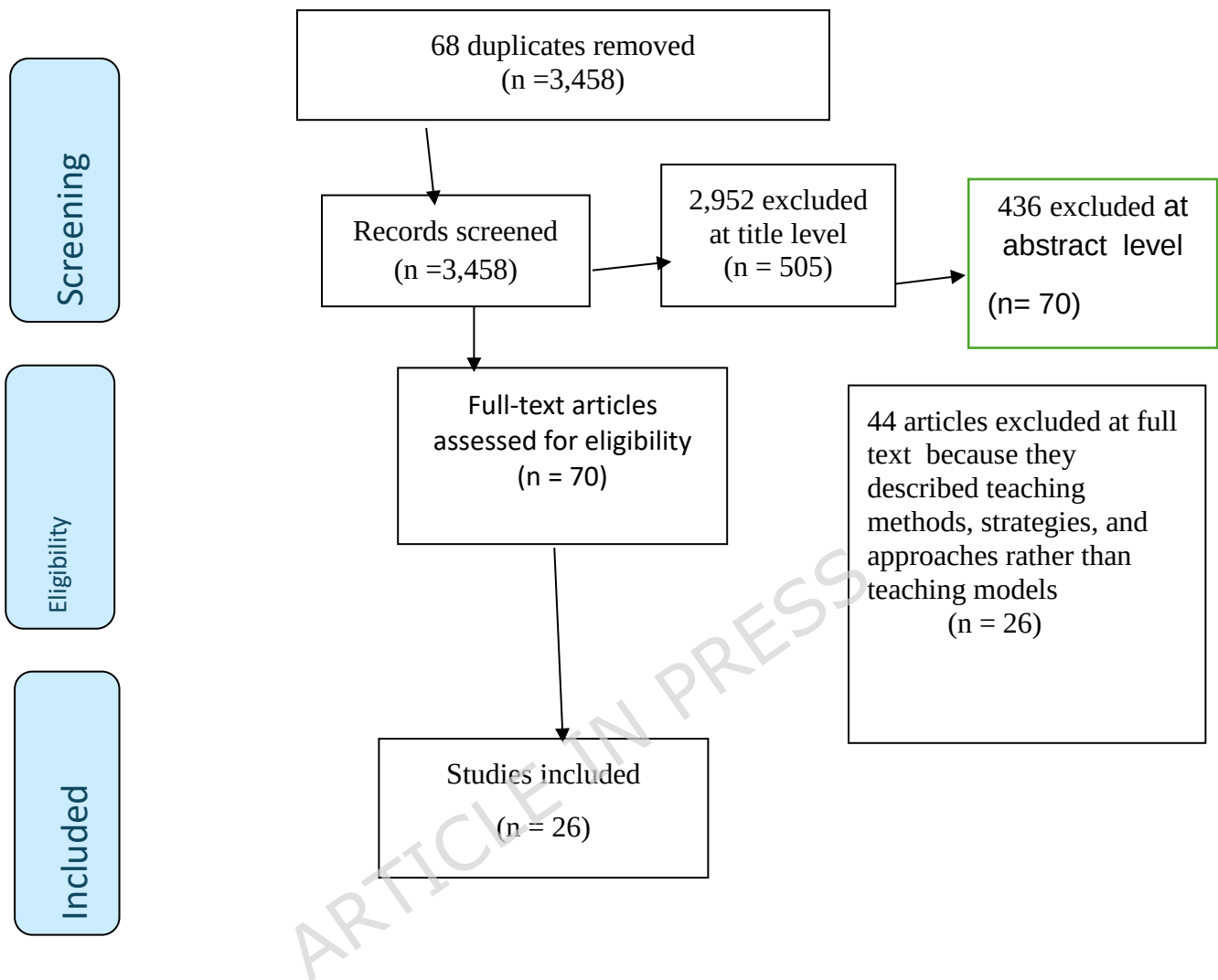
(teaching model*[tiab] OR framework*[tiab] OR structure*[tiab] OR technique*[tiab]) OR educational model*

AND

("Students, Nursing"[Mesh] OR nursing student*[tiab] OR medical student*[tiab] OR healthcare trainee*[tiab])

Appendix 1: Flow diagram for the scoping review process adapted from the PRISMA statement by the Moher and colleagues (2009)





Appendix II: Data extraction template adapted from Peters and Colleagues (2020)

Scoping Review Details	
Scoping Review title:	
Review objective/s:	
Review question/s:	

Inclusion/Exclusion Criteria	
Population	
Concept	
Context	
Types of evidence source	
Evidence source Details and Characteristics	
Author(s)	
Date (year)	
Journal	
Country (developed, developing, Continent	
Professional background of study participants	
Sample size	
Study design/ type of the study	
Methodology	
Details/Results extracted from source of evidence (in relation to the concept of the scoping review)	
Clinical teaching model(s) identified	
Application of clinical teaching mode(l)	