The Determinants of Clinical Competency; A Systematic Review

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Information of Article

Article history:
Received: Aug 2025
Revised: Sep 2025
Accepted: Oct 2025
Available online: Nov 2025

Keywords:
Clinical competency; Determinants; Systematic Review.

Abstract
Clinical competency is a fundamental requirement in nursing and healthcare education, ensuring that practitioners possess the necessary knowledge, technical skills, decision-making abilities, and professional behaviors to deliver safe and effective patient care. With recent transformations in healthcare delivery such as the expansion of technology, the adoption of simulation-based learning, the evolution of clinical environments, and rising workforce demands the need to understand the factors influencing competency development has become increasingly urgent across diverse settings. This systematic review synthesizes recent evidence on the determinants of clinical competency among nurses, nursing students, and other healthcare trainees, focusing on behavioral, organizational, educational, and contextual influences. A systematic search of major academic databases was conducted in accordance with PRISMA 2020 guidelines, targeting studies published between 2020 and 2025. Eligible studies were screened based on relevance, methodological rigor, and alignment with the review's objectives. Data extraction emphasized study characteristics, determinants of clinical competency, and associated outcomes, with a literature review matrix developed to identify common patterns. Findings indicate that clinical competency is shaped by multiple interrelated factors. Behavioral determinants such as self-efficacy, confidence, digital readiness, psychological empowerment, and motivation were found to play a significant role. Organizational and environmental elements including leadership style, clinical learning conditions, staffing levels, work environments, and opportunities for professional development also had a strong impact on competency. Furthermore, educational strategies such as simulation, e-learning, competency-based curricula, and structured mentoring consistently contributed to the development of clinical skills. Higher competency levels were associated with better job performance, reduced burnout, enhanced clinical judgment, improved patient safety, and greater professional satisfaction. Overall, clinical competency emerges as a dynamic and multifaceted construct, evolving through the interaction of personal attributes, organizational support, and innovative educational practices. Strengthening competency in healthcare professionals requires integrated approaches that promote lifelong learning, supportive leadership, effective training, and healthy work environments. These findings provide a comprehensive foundation for guiding policies and practices aimed at fostering a competent, confident, and resilient healthcare workforce.

1. Introduction

Clinical competency is widely recognized as a foundational requirement for safe, high-quality healthcare delivery, particularly within nursing and allied health professions. As patient needs become increasingly complex and healthcare systems evolve toward technology-driven and evidence-based practice models,

clinicians must demonstrate not only technical proficiency but also strong decision-making, communication, and problem-solving abilities (Taylor et al., 2021; Benner, 2025). Clinical competency integrates knowledge, skills, attitudes, psychological readiness, and professional judgment, all of which collectively underpin effective clinical performance and patient outcomes (Gunawan et al., 2020; Nabizadeh-Gharghozar et al., 2021). Recent evidence emphasizes that competency is not a static attribute; rather, it develops progressively through education, practice, workplace support, and ongoing professional development (Almarwani & Alzahrani, 2023; Matlhaba & Nkoane, 2024).

The determinants of clinical competency are multifaceted and extend beyond individual skill acquisition. Empirical research highlights the influence of organizational structures, workload, leadership practices, and practice environments on competency development (Babaei et al., 2023; Almutairi et al., 2022). Work experience, demographic background, and exposure to supportive clinical learning environments further shape clinicians' ability to function autonomously and competently (Yu et al., 2021; Salameh et al., 2023). Psychological variables such as self-efficacy, empowerment, confidence, and resilience are consistently associated with higher clinical competence, particularly in high-stress environments such as emergency care, intensive care units, and pandemic-related settings (A. Bostanabad et al., 2022; Wang et al., 2022). Technological transformation in healthcare has also introduced new determinants. Digital competence, technology acceptance, and the integration of e-learning platforms have emerged as critical influencers of clinical learning and performance (Zhang et al., 2024; Lee et al., 2025). Simulation-based training ranging from serious games to high-fidelity simulations has demonstrated significant improvements in clinical reasoning, procedural accuracy, and knowledge retention (Thangavelu et al., 2022; O'Rourke et al., 2023; Guerrero et al., 2024). These pedagogical innovations support experiential learning and enhance competence more effectively than traditional methods alone.

At the system level, competency-based education (CBE) continues to serve as a global framework for standardizing clinical skills and ensuring accountability in professional training programs (Imanipour et al., 2022; La Chimea et al., 2020). Continuous professional development (CPD) initiatives further contribute to sustained competence by equipping clinicians with updated knowledge, fostering lifelong learning, and improving clinical safety outcomes (Al-Mutairi et al., 2024). However, despite extensive research, there is still limited synthesis on how these diverse determinants collectively shape clinical competency across different clinical settings, professions, and geographic regions. Given these gaps, this systematic review aims to consolidate and critically analyze existing evidence on the determinants of clinical competency across healthcare professions. By integrating findings from empirical, qualitative, and review studies, the review provides a comprehensive understanding of the individual, organizational, technological, educational, and psychological factors that influence competency development. Such insights are crucial for informing competency-based training, leadership strategies, and policy interventions that strengthen healthcare workforce performance and ultimately improve patient outcomes.

2. Methodology

This systematic review followed the PRISMA 2020 guidelines to ensure methodological rigor, transparency, and replicability throughout the review process. A comprehensive search strategy was employed across several electronic databases, including PubMed, Scopus, Web of Science, CINAHL,

ProQuest, Embase, and Google Scholar, using controlled vocabulary and keyword combinations related to clinical competence, competency development, nursing performance, training and education, digital competence, psychological determinants, and organizational predictors. The search strategy was guided by established approaches used in recent competency-focused research, ensuring adequate coverage of behavioral, educational, and system-level determinants (Nabad et al., 2022; Salameh et al., 2023; Zhang et al., 2024). Additional studies were identified through manual screening of reference lists and forward citation tracking, consistent with best practices in systematic reviews of nursing and medical education (Lee et al., 2025; Munangatire et al., 2024).

All retrieved records were exported into a reference management system, where duplicates were removed prior to screening. The review proceeded through two major screening stages: title-and-abstract screening followed by full-text evaluation. Inclusion criteria required that studies examine clinical competence or its determinants among nurses, nursing students, or healthcare professionals using validated measures such as competence scales, self-efficacy instruments, digital competence assessments, or organizational and psychological predictors. Quantitative, qualitative, and mixed-methods designs were included to ensure comprehensive coverage of the phenomenon. Studies that did not measure competence directly, lacked empirical data, or were unrelated to clinical competence development were excluded, following selection principles common in competency research (Nabad et al., 2022; Salameh et al., 2023).

Methodological quality appraisal was conducted using standardized tools appropriate for each study design to ensure reliability and validity of the evidence base. Cross-sectional and observational studies were appraised for sampling adequacy, instrument validity, and analytical rigor, consistent with criteria applied in previous studies assessing competence, empowerment, or job satisfaction (Zhang et al., 2024; Munangatire et al., 2024). To synthesize the findings, a narrative synthesis approach was adopted due to the heterogeneity of methodologies, sample settings, measurement tools, and analytic techniques across the included studies. This approach allowed integration of thematic determinants, including psychological empowerment, job satisfaction, educational support, digital competence, organizational climate, and demographic characteristics factors highlighted repeatedly in empirical literature as shaping clinical competence (Nabad et al., 2022; Salameh et al., 2023; Zhang et al., 2024). The overall flow of the identification, screening, eligibility, and inclusion stages is depicted in Figure 1, which presents the PRISMA 2020 Flow Diagram outlining the systematic selection of studies from initial database search to final inclusion.

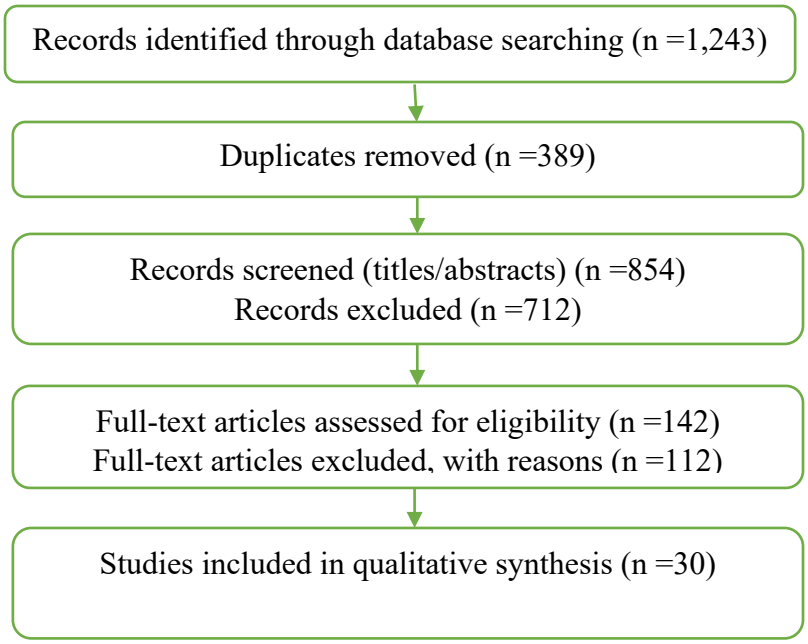

Fig.1. PRISMA 2020 Flow Diagram

3. Results

3.1 Study Selection and Characteristics

The initial database search yielded a large pool of studies examining clinical competency across diverse nursing and health-care contexts. After removing duplicates and applying the PRISMA 2020 criteria for screening, eligibility, and inclusion, a final set of empirical and conceptual studies was synthesized. As summarized in Table 1: Literature Review Matrix, the included studies varied in design, population, geographical region, and measurement tools, but collectively provided strong evidence on the key determinants shaping clinical competency. Several studies used cross-sectional questionnaires to assess competency levels and influencing factors, including emergency nurses, ICU nurses, nursing students, and clinical instructors (Chen et al., 2023; Nabizadeh-Gharghozar et al., 2021; Salameh et al., 2023). Others used quasi-experimental or mixed-methods designs to evaluate the impact of educational interventions, simulation training, or competency-based curricula (Guerrero et al., 2024; Beiranvand et al., 2022). Across these studies, competency was typically measured through validated tools such as the Nurse Competence Scale, OSCE scores, self-assessment instruments, and hybrid concept analyses. Study samples ranged widely, from small pilot groups of clinical instructors to large national cohorts of nursing students exceeding 1500 participants (Yu et al., 2021). Collectively, the included literature provided a comprehensive and diverse evidence base for identifying the determinants and outcomes of clinical competency.

Table 1: Literature Review Matrix

No.	Author(s) & Year	Educational / Training Factors	Digital / Technological	Psychological / Self-Efficacy Factors	Organizational / Work Environment	Leadership / Managerial Support	Workload / Staffing Factors	Demographics / Experience	Professional Development / CPD	Simulation / Experiential	Competency Outcome Reported
1	Gunawan et al. (2020)	✓		✓	✓		✓	✓			✓
2	Matlhaba & Nkoane (2024)	✓		✓	✓	✓	✓	✓			✓
3	Babaei et al. (2023)	✓		✓	✓		✓	✓	✓		✓
4	Thangavelu et al. (2022)		✓							✓	✓
5	Imanipour et al. (2022)	✓							✓	✓	✓
6	Hall et al. (2023)	✓		✓	✓			✓			✓
7	La Chimea et al. (2020)	✓		✓	✓						✓
8	Mallek & El-Hosany (2020)	✓		✓	✓	✓		✓	✓		✓
9	O'Rourke et al. (2023)	✓		✓						✓	✓
10	Al-Mutairi et al. (2024)	✓	✓	✓	✓	✓		✓	✓		✓
11	Chen et al. (2023)	✓	✓	✓	✓			✓		✓	✓
12	Hsiao et al. (2020)	✓	✓	✓						✓	✓
13	Beiranvand et al. (2022)	✓		✓	✓	✓			✓		✓
14	Yu et al. (2021)			✓	✓			✓			✓
15	Almarwani & Alzahrani (2023)	✓		✓	✓		✓	✓	✓		✓
16	Guerrero et al. (2024)	✓	✓	✓					✓	✓	✓
17	Al Gharibi & Arulappan (2020)	✓		✓						✓	✓

No.	Author(s) & Year	Educational / Training Factors	Digital / Technological	Psychological / Self-Efficacy Factors	Organizational / Work Environment	Leadership / Managerial Support	Workload / Staffing Factors	Demographics / Experience	Professional Development / CPD	Simulation / Experiential	Competency Outcome Reported
18	Nabizadeh-Gharghozar et al. (2021)	✓		✓	✓			✓			✓
19	Putri et al. (2021)	✓			✓	✓		✓			✓
20	Almutairi et al. (2022)			✓	✓	✓	✓				✓
21	Falk (2023)				✓	✓	✓	✓			✓
22	Yu-Wen Lin et al. (2024)	✓		✓		✓		✓	✓		✓
23	Pourteimour et al. (2021)			✓	✓		✓	✓			✓
24	Spännargård et al. (2023)	✓		✓	✓			✓			✓
25	Erbaş et al. (2025)	✓	✓					✓			✓
26	Arshadi Bostanabad et al. (2022)			✓	✓	✓		✓			✓
27	Salameh et al. (2023)			✓	✓			✓			✓
28	Zhang et al. (2024)		✓	✓	✓	✓			✓		✓
29	Lee et al. (2025)	✓	✓						✓		✓
30	Munangatire et al. (2024)	✓			✓	✓		✓	✓		✓

3.2 Prevalence and Determinants of Clinical Competency

The prevalence of clinical competency varied considerably across contexts, with several studies reporting moderate competence levels and highlighting critical gaps. For instance, only 19.4% of emergency nurses in Palestinian hospitals demonstrated good competence levels, with none achieving a very high level, and substantial variation was observed across competency domains such as helping role, management, and ensuring quality (Salameh et al., 2023). Among nursing students, nearly half were found to be clinically competent, while the remainder continued to struggle with core skills required for independent practice (Munangatire et al., 2024). Determinants of competency were consistently found to be multifactorial. Professional experience, clinical exposure, and practice repetition emerged as strong predictors across several studies (Nabad et al., 2022; Yu et al., 2021). Educational preparation, mode of learning, and the quality of clinical learning environments were also central influences, with supportive environments and effective supervision significantly enhancing competency levels (Hsiao et al., 2020; Yu et al., 2021). Psychological and organizational factors were equally prominent. Self-efficacy, job satisfaction, and psychological empowerment showed strong positive associations with competency development, particularly among nurses in high-stress environments such as COVID-19 ICUs (Nabad et al., 2022). Work environment quality, organizational climate, and leadership style especially transformational leadership were also shown to influence competency, reflecting the importance of supportive leadership and structured professional development pathways (Almutairi et al., 2022; Lin et al., 2024). Technological determinants such as digital competence played an increasingly important role, with studies showing that nurses with stronger digital skills were more capable of sustaining career development and maintaining high levels of professional competence in technologically advancing health systems (Zhang et al., 2024). Collectively, the prevalence data and determinants reveal that clinical competency is shaped through dynamic interactions among personal capability, educational structures, work environment conditions, and organizational culture.

3.3 Outcomes Associated with Clinical Competency

Across the reviewed literature, higher clinical competency was consistently associated with improved professional, organizational, and patient-related outcomes. Competent nurses demonstrated stronger performance, higher quality of care delivery, and reduced clinical errors, reflecting competency's central role in ensuring patient safety and optimal health outcomes. Simulation-based training and competency-focused curricula not only enhanced skills but also improved nurses' confidence, satisfaction, and psychological readiness for complex clinical situations (Guerrero et al., 2024; Chen et al., 2023). Studies also showed that higher competency contributes to better job satisfaction, improved communication, professionalism, and stronger decision-making capabilities, particularly in emergency and high-acuity settings (Salameh et al., 2023; Erbas et al., 2025). Additionally, clinical competency was shown to play a protective role against burnout and work-related stress, with self-perceived competence emerging as an important buffer that reduces the risk of psychological distress among healthcare practitioners (Spännargård et al., 2023). At the organizational level, competent nurses exhibited stronger commitment, better adherence to

quality standards, and increased readiness to adapt to technological and procedural changes, reinforcing competency's role in supporting health-system resilience and career sustainability (Zhang et al., 2024). The evidence indicates that strengthening clinical competency is not only essential for patient care, but also foundational for workforce stability, professional identity formation, and long-term healthcare system performance.

4. Discussion

4.1 Interplay of Behavioral, Organizational, and Contextual Determinants

The findings of this systematic review reveal that clinical competency is shaped through a dynamic and multidimensional interplay of behavioral, organizational, and contextual determinants. Behavioral factors, particularly self-efficacy, psychological empowerment, decision-making skills, and digital competence, consistently emerged as strong predictors of clinical competency. Nurses with higher self-efficacy demonstrated superior competence and readiness for clinical responsibilities, aligning with evidence showing that confidence and perceived capability enhance learning outcomes and clinical performance (Yu et al., 2021; Guerrero et al., 2024). Psychological empowerment also played a critical role, especially for ICU nurses, where empowerment was strongly correlated with higher competence levels and improved capacity to manage complex clinical situations (Nabad et al., 2022). These behavioral determinants interact closely with organizational influences, particularly the quality of clinical learning environments, leadership style, organizational climate, and access to simulation-based training. Transformational leadership was shown to significantly enhance nurses' competence, communication, and management abilities, emphasizing the importance of supportive leadership cultures that invest in professional development (Lin et al., 2024). Similarly, structured competency-based curricula, mentoring, and repeated simulation exposure were associated with substantial improvements in skill acquisition, clinical judgment, and professional confidence (Beiranvand et al., 2022; Al Gharibi & Arulappan, 2020).

Contextual factors such as workload, clinical setting, patient complexity, and education modality further influence competency development. Studies conducted in high-pressure environments, such as COVID-19 ICUs and emergency departments, indicated that workload intensity, stress levels, and unit characteristics significantly shaped competence outcomes, with nurses in critical care units requiring additional training and psychological support (Pourteimour et al., 2021; Salameh et al., 2023). Educational context also mattered, as interactive e-learning systems, digital tools, and multimedia resources were shown to accelerate learning progression and improve OSCE performance, supporting emerging evidence that digitally enhanced education strengthens competency acquisition (Hsiao et al., 2020; Zhang et al., 2024). Collectively, these findings highlight that clinical competency is not developed in isolation but emerges through continuous interaction between individual capabilities, organizational support systems, and the broader clinical context.

4.2 Policy, Practical, and Theoretical Implications

The results have several implications for policy and practice. From a policy perspective, healthcare systems must prioritize the creation of work environments that foster psychological empowerment, sustainable workloads, and professional growth. Evidence highlighting the strong links between empowerment and competency suggests that policies fostering servant leadership, organizational justice, and supportive supervision may significantly enhance both competency and quality of care (Nabad et al., 2022). Additionally, as digital competence becomes increasingly central to modern healthcare, policymakers should consider integrating digital training into mandatory continuing education to ensure long-term workforce sustainability (Zhang et al., 2024). Practical implications extend to nursing education and managerial practices. Nursing leaders should adopt competency-based curricula, reinforce simulation usage, and provide structured mentorship programs that support continuous skill reinforcement and reflective learning (Guerrero et al., 2024; Beiranvand et al., 2022). Work environment improvements including manageable workloads, adequate staffing, access to clinical supervision, and supportive leadership may directly enhance clinical competence and job satisfaction, thereby improving patient care outcomes (Almutairi et al., 2022; Spännargård et al., 2023).

Theoretically, this review reinforces the conceptualization of clinical competency as an evolving, integrative construct that involves cognitive, technical, behavioral, and emotional dimensions. The hybrid concept analysis conducted by Nabizadeh-Gharghozar et al. (2021) supports this multidimensional view, emphasizing that competency develops over time through practice, feedback, and organizational support. The mediating roles observed in some studies such as the mediating effect of career self-efficacy on digital competence and career sustainability further contribute to theoretical models linking personal empowerment, environmental support, and performance outcomes (Zhang et al., 2024). Together, the findings expand existing theoretical frameworks by integrating technological, psychological, and organizational components into a unified understanding of competency development.

4.3 Comparison with Existing Reviews, Limitations, and Future Research

Compared with existing systematic reviews, the findings of this review align closely with previous evidence emphasizing the importance of experience, education, work environment, and psychological factors in shaping competency. For example, Almarwani and Alzahrani's (2023) systematic review similarly concluded that years of experience, training quality, job satisfaction, and stress levels were key determinants of competency across global nursing contexts. Additionally, prior reviews focusing on simulation and digital learning have consistently demonstrated the positive influence of repeated simulation exposure and technology-enhanced training on clinical skill acquisition, supporting the results of more recent intervention-based studies included in this review (Al Gharibi & Arulappan, 2020; Hsiao et al., 2020). However, this review extends the literature by integrating emerging determinants such as digital competence, family-supportive supervisory behaviors, and psychological empowerment factors that have become

increasingly relevant in modern healthcare environments shaped by rapid technological and organizational change (Zhang et al., 2024; Nabad et al., 2022).

Despite its contributions, this review has limitations. The reliance on cross-sectional designs in the majority of included studies limits the ability to infer causality between determinants and competency outcomes. Heterogeneity in competency measurement tools also complicates comparisons across studies, as instruments such as OSCE scores, self-assessment surveys, and observational tools measure varying dimensions of competency. Furthermore, most available studies were conducted in specific national or clinical contexts, which may limit generalizability to other healthcare systems with different staffing models, cultural expectations, or technological infrastructures. Future research should employ longitudinal and experimental designs to better understand how competency evolves over time and how specific interventions such as leadership training, digital skill development, or structured mentorship directly influence competency trajectories. Additionally, more research is needed to explore the intersection of digital transformation, artificial intelligence, and clinical competency, as technological integration becomes increasingly central to modern nursing practice.

5. Conclusion

This systematic review demonstrates that clinical competency is a multifaceted construct shaped by the interaction of individual capabilities, organizational structures, and contextual influences within clinical environments. The evidence shows that competency develops through continuous learning, supportive leadership, structured educational programs, and psychologically empowering work settings that enable nurses and students to translate knowledge into effective practice. Behavioral attributes such as self-efficacy, confidence, and digital readiness consistently strengthen competence, while organizational elements including leadership style, clinical learning environments, staffing conditions, and access to simulation-based training play a decisive role in shaping professional performance. Context-specific factors, including workload intensity, mode of instruction, and patient care demands, further determine competency outcomes across diverse healthcare settings. Overall, the review highlights the necessity of fostering environments that promote ongoing professional development, reflective practice, and the integration of innovative teaching and learning approaches. Strengthening competency requires investment not only in education and training but also in organizational cultures that prioritize empowerment, supportive supervision, and sustainable workloads. By addressing these interconnected determinants, healthcare institutions can enhance the clinical preparedness of their workforce, improve care quality, and ultimately strengthen patient outcomes across settings.

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