

The Determinants of Clinical Competence: A Systematic Review

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Abstract: *Clinical competence is central to safe, reliable health care because it translates professional knowledge, technical skill, judgement, communication, and adaptive performance into practice. This systematic literature review synthesised determinants of clinical competence across health-professional education and practice. The evidence base was concentrated in nursing populations, which limits cross-professional generalisation. A PRISMA-informed narrative synthesis covered English-language primary empirical studies published from 1 January 2015 to 31 December 2025. Sixty-three studies met the eligibility criteria and were mapped across thirteen determinant domains. The evidence most consistently supported clinical experience and exposure, structured education and training, enabling clinical environments, effective supervision and support, and self-efficacy as contributors to competence development. Knowledge and academic performance, emotional resources, organisational empowerment, satisfaction and commitment, motivation and attitude, simulation and technology, stress and well-being, and demographic or contextual characteristics showed meaningful but more heterogeneous or context-dependent relationships. Simulation frequently improved task-specific or perceived competence, although comparative studies did not establish universal superiority over conventional clinical learning. The synthesis indicates that competence is best understood as a multilevel developmental outcome shaped by aligned educational, supervisory, organisational, and individual resources.*

Keywords: clinical competence; health professions; clinical education; determinants; self-efficacy; systematic review.

1. Introduction

Clinical competence is the demonstrable capacity to integrate knowledge, psychomotor skill, clinical judgement, communication, professional values, and context-sensitive action in real or simulated care. Miller's performance framework distinguishes knowing, knowing how, showing how, and doing, making competence more than simple factual recall (Miller, 1990). Benner's developmental account likewise frames expertise as progressively transformed through situated experience rather than accumulated time alone (Benner, 1984). Contemporary nursing evidence confirms that competence is associated with patient-safety relevant professional performance and is shaped by multiple personal and work-related conditions (Gunawan et al., 2020). A recent systematic review identified education, training, experience, professional development, judgement, and communication among recurring influences on nurses' clinical competency (Almarwani & Alzahrani, 2023). Yet the wider evidence remains distributed across learners, newly qualified clinicians, experienced nurses, midwives, and medical students, with considerable variation in measurement and setting.

Fragmentation makes it difficult for educators, managers, and policymakers to determine which modifiable conditions deserve coordinated attention.

Existing studies examine clinical competence through partially overlapping traditions rather than one stable explanatory model. Clinical-learning research emphasizes placement quality, preceptorship, feedback, exposure, and opportunities to perform, whereas workforce studies emphasize empowerment, professional commitment, organisational climate, stress, and career experience. Simulation research focuses on deliberate practice, self-efficacy, and technology-mediated rehearsal, while individual-difference studies examine emotional intelligence, motivation, academic achievement, and demographic context. Social cognitive theory positions self-efficacy as a mechanism through which prior performance and feedback influence subsequent action (Bandura, 1997). Situated learning explains why competence develops through participation in authentic communities of practice rather than through decontextualised instruction alone (Lave & Wenger, 1991). Longitudinal evidence shows that competence changes meaningfully during the first year of graduate practice, supporting a developmental rather than static interpretation (Lima et al., 2016). Multicountry evidence also indicates that the clinical learning environment is related to graduating students' competence, reinforcing the role of context in translating preparation into performance (Visiers-Jiménez et al., 2021). These perspectives suggest that clinical competence emerges from interacting person, learning, and workplace conditions rather than a single dominant determinant.

This review therefore aimed to identify, classify, and synthesise determinants of clinical competence reported in primary empirical research published during the predefined eleven-year window. Four questions guided the synthesis: which individual, educational, clinical, and organisational determinants have been examined; how can those determinants be organised into a coherent evidence-led taxonomy; which associations appear consistent, mixed, or emerging when study design and context are considered; and which theoretical, methodological, and contextual gaps remain. The review contributes a thirteen-domain determinant map and a study-level literature matrix that separates frequency of examination from evidential influence. It integrates findings across education and practice while preserving population differences. Early-career longitudinal work is particularly informative because competence development can continue after graduation (Numminen et al., 2017). Large generational cohort evidence further demonstrates that competence profiles vary across career cohorts and practice histories (Meretoja et al., 2015). The following sections describe the review method, develop the conceptual and analytical framework, interpret the evidence, identify research priorities, and conclude with implications for competence development.

2. Methodology

A systematic literature review with narrative synthesis was undertaken and reported as PRISMA-informed because a registered protocol, dual independent screening, and a completed PRISMA 2020 checklist were not available for this execution. Study identification and selection were organised using the PRISMA 2020 logic of identification, screening, eligibility, and inclusion (Page et al., 2021). The review window was 1 January 2015 through 31 December 2025, and eligibility was limited to English-language primary empirical research that directly measured, analysed, predicted, or experimentally influenced clinical competence in a health-professional learner or practitioner population. Reviews, editorials, conceptual papers, inaccessible reports, duplicate reports of the same evidence, and studies in which competence or its determinants were only incidental were excluded. Publicly accessible PubMed-indexed records, PubMed Central full texts, and publisher platforms were searched through targeted title, keyword, and citation-tracing queries on 19 September 2026.

Search concepts combined “clinical competence”, “clinical competency”, or “professional competence” with determinant-oriented terms including factor, predictor, association, experience, training, environment, supervision, self-efficacy, emotional intelligence, stress, simulation, and health-profession descriptors. The execution ledger captured 92 candidate records across those discovery routes; these counts represent records entered for screening rather than claims about the total indexed universe. Nine duplicates were removed, leaving 83 records for title-and-abstract screening; eight were excluded at that stage, 75 reports were sought, one was not retrievable, and 74 full texts were assessed. Backward reference checking and forward citation tracing were used to identify additional eligible records missed by targeted discovery queries.

Full-text eligibility assessment excluded eleven reports: four reviews or non-primary publications, three without a direct clinical-competence outcome, two with determinant discussion insufficient for analytic coding, one overlapping report, and one report with insufficient extractable detail, leaving exactly 63 included studies. Screening and extraction were completed by a single reviewer, so no inter-rater reliability statistic is claimed. For each included study, bibliographic identity, population, design, setting, competence measure, determinant exposure, direction of finding, and contextual limitations were extracted, while methodological quality was appraised with design-appropriate criteria from the Mixed Methods Appraisal Tool rather than converted into an unsupported universal score (Hong et al., 2018). Appraisal informed interpretive caution rather than a formal evidence grade; longitudinal, multisite, and intervention evidence was given greater interpretive weight for temporal or comparative inference than small cross-sectional self-report studies. Determinant terminology was harmonised inductively into thirteen domains only when the underlying constructs were sufficiently similar: Clinical Experience, Education/Training, Clinical Environment, Supervision/Support, Self-Efficacy, Knowledge/Academic Performance, Emotional Resources, Organisational Empowerment, Satisfaction/Commitment, Motivation/Attitude, Simulation/Technology, Stress/Well-Being, and Demographic/Context. The matrix records substantive examination, not effect size. Given the heterogeneity of measurement, perceived, observed, and task-specific competence outcomes were interpreted as distinct operationalisations and were not directly pooled. Narrative synthesis was selected because populations, designs, competence instruments, exposures, and outcome operationalisations were too heterogeneous for defensible quantitative pooling. Transparent source-access limitations and the single-reviewer workflow constrain reproducibility and should temper certainty in the resulting evidence map. Retraction or withdrawal indicators were checked during verification, and no retracted report was retained in the final evidence set. The resulting study-selection pathway is summarised in Figure 1.

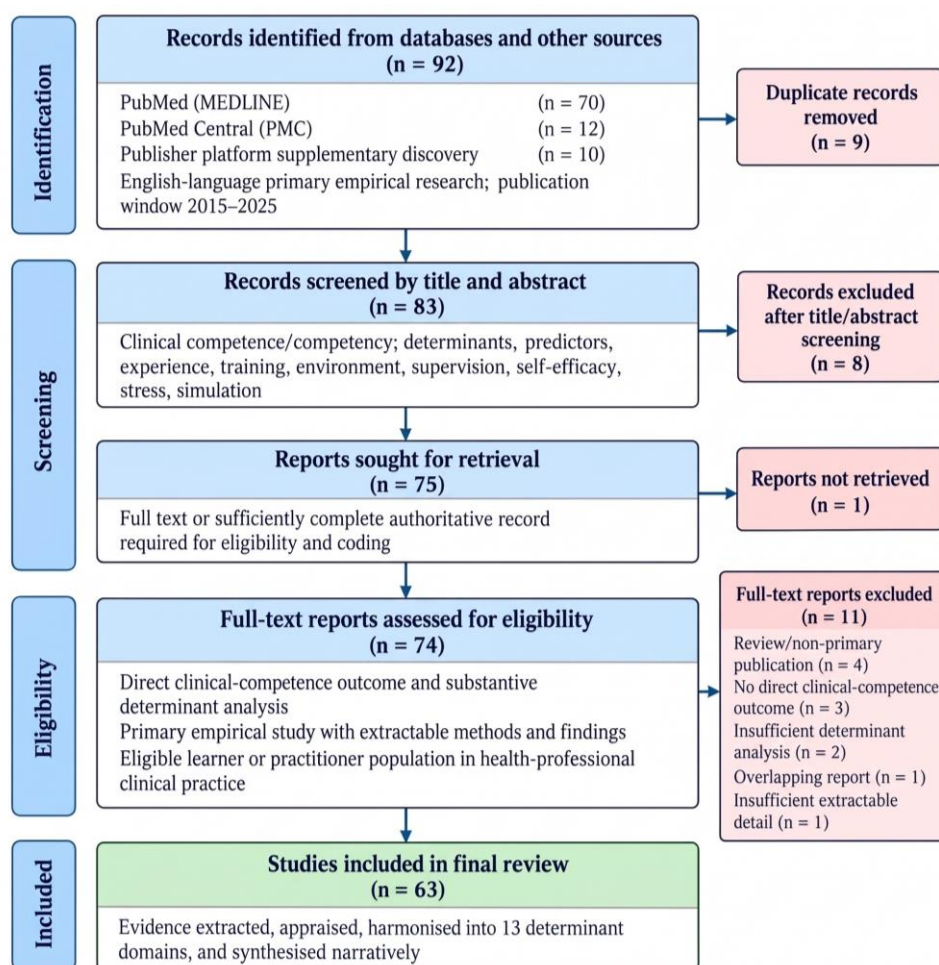


Figure 1: PRISMA Flow Diagram of Study Selection

3. Conceptual and Analytical Innovation

The first conceptual innovation is to treat clinical competence as a developmental performance system rather than a single score or stable personal trait. Competence is expressed when knowledge and technical skill can be mobilised under contextual demands, and its determinants therefore operate at multiple levels. Early-career nurses developed competence over time in practice, indicating that exposure and role transition can alter performance after formal education (Lima et al., 2016). Newly graduated nurses also showed changing competence profiles across the early career period, which supports interpreting experience as structured learning rather than elapsed time alone (Numminen et al., 2017). In neonatal intensive care, competence was associated with experience-related and contextual characteristics that extend beyond one educational variable (Mirlashari et al., 2016). Intensive-care nurses likewise displayed competence differences across professional and demographic conditions, although the cross-sectional design limits causal interpretation (Faraji et al., 2019). Newly registered nurses reported further training needs despite already entering professional practice, illustrating the gap between qualification and continuing mastery (Willman et al., 2020). Medical-student evidence extended this pattern beyond nursing by linking competence with educational and contextual factors at graduation (Dejene et al., 2024). The synthesis therefore distinguishes antecedent resources, learning processes, and contextual constraints while retaining a common outcome: the capacity to perform clinically relevant tasks and judgements competently.

The second innovation integrates thirteen evidence-led determinant domains without collapsing distinct pathways. Education and training capture formal courses, transition programmes, deliberate practice, and professional development, whereas Simulation/Technology is retained separately because technology-mediated rehearsal may change fidelity, feedback, sequencing, and opportunity for repetition. Clinical Environment concerns the quality and affordances of the placement or workplace, while Supervision/Support captures preceptorship, instructor behaviour, feedback, and interpersonal guidance. Self-Efficacy is distinguished from Emotional Resources because confidence in performing a task differs conceptually from emotional intelligence, compassion satisfaction, or adaptive affective resources. Organisational Empowerment and Satisfaction/Commitment represent workplace structures and attachment rather than individual motivation. An ethical work climate was associated with newly graduated nurses' competence perceptions, indicating that organisational meaning can shape professional performance (Numminen et al., 2015a). Individual and organisational factors jointly explained variation in newly graduated nurses' competence, reinforcing the multilevel structure of the taxonomy (Numminen et al., 2015b). Practice-environment characteristics were also associated with competence and work-related factors in new graduates (Numminen et al., 2016). Empowerment was related to competence and work experiences among newly graduated nurses, supporting a distinct organisational-resource pathway (Kuokkanen et al., 2016). Qualitative stakeholder evidence from Vietnam further identified educational, environmental, supervisory, and organisational conditions as interacting influences on competency development (Ha & Nuntaboot, 2020).

The third innovation separates examination frequency from evidential strength. Across the 63-study matrix, Demographic/Context was coded in 39 studies (61.9%), Education/Training in 28 (44.4%), Clinical Environment in 24 (38.1%), and Clinical Experience in 23 (36.5%). Supervision/Support, Self-Efficacy, and Simulation/Technology each appeared in 15 studies (23.8%), while Knowledge/Academic Performance appeared in 13 (20.6%) and Satisfaction/Commitment in 11 (17.5%). Motivation/Attitude and Stress/Well-Being each appeared in nine studies (14.3%), Emotional Resources in eight (12.7%), and Organisational Empowerment in six (9.5%). These frequencies describe scholarly attention only. For example, expatriate nurses' competence varied with experience and setting characteristics, but the design does not establish that those variables cause competence (Aqtash et al., 2017). Organisational commitment was examined alongside professional competency, yet its relationship was not uniformly strong, demonstrating why frequency should not be treated as causal importance (Karami et al., 2017). Career and organisational commitment showed experience-dependent patterns in Japanese nurses, adding further contextual qualification (Sasaki et al., 2019). The matrix therefore functions as an evidence map whose interpretation depends on study design, measurement validity, direction, consistency, and population transferability rather than checkmark totals alone. The study-level coding underlying these frequencies is presented in Table 1.

Table 1: Literature Review Matrix

No.	Author(s) and Year	Clinical Experience	Education/ Training	Clinical Environment	Supervision/ Support	Self-Efficacy	Knowledge/ Academic Performance	Emotional Resources	Organisational Empowerment	Satisfaction/ Commitment	Motivation/ Attitude	Simulation/ Technology	Stress/ Well-Being	Demographic/ Context	Clinical Competence
1	Franklin et al. (2015)		✓			✓						✓			✓
2	Kim et al. (2015)							✓					✓	✓	✓
3	Meretoja et al. (2015)	✓												✓	✓

No.	Author(s) and Year	Clinical Experience	Education/ Training	Clinical Environment	Supervision/ Support	Self-Efficacy	Knowledge/ Academic Performance	Emotional Resources	Organisational Empowerment	Satisfaction/ Commitment	Motivation/ Attitude	Simulation/ Technology	Stress/ Well-Being	Demographic/ Context	Clinical Competence
4	Numminen et al. (2015a)			✓						✓				✓	✓
5	Numminen et al. (2015b)	✓		✓					✓	✓				✓	✓
6	Pai (2015)		✓					✓					✓		✓
7	Ross (2015)		✓									✓			✓
8	Kuokkanen et al. (2016)	✓							✓	✓				✓	✓
9	Lejonqvist et al. (2016)		✓									✓			✓
10	Lima et al. (2016)	✓	✓		✓										✓
11	Mirlashari et al. (2016)	✓					✓							✓	✓
12	Numminen et al. (2016)			✓					✓	✓				✓	✓
13	Park et al. (2016)					✓	✓					✓			✓
14	Soroush et al. (2016)	✓											✓	✓	✓
15	Aqtash et al. (2017)	✓		✓										✓	✓
16	Chen et al. (2017)		✓			✓						✓	✓		✓
17	Cruz (2017)	✓											✓	✓	✓
18	Hansen & Bratt (2017)		✓									✓			✓
19	Hsieh & Chen (2017)	✓	✓				✓				✓			✓	✓
20	Karami et al. (2017)	✓								✓				✓	✓
21	Numminen et al. (2017)	✓							✓	✓				✓	✓
22	Rebueno et al. (2017)		✓	✓	✓						✓				✓
23	Aboshaiqah & Qasim (2018)		✓	✓	✓	✓								✓	✓
24	Kim et al. (2018)		✓			✓						✓			✓
25	Lengetti et al. (2018)		✓									✓			✓
26	Obeidat et al. (2018)			✓									✓	✓	✓
27	Park (2018)		✓			✓	✓								✓
28	Speeney et al. (2018)		✓			✓	✓					✓			✓
29	Zieber & Sedgewick (2018)		✓			✓	✓					✓			✓
30	Faraji et al. (2019)	✓												✓	✓
31	Gemuhay et al. (2019)			✓	✓						✓		✓	✓	✓
32	Kim & Choi (2019)	✓	✓											✓	✓
33	Mancini et al. (2019)		✓									✓			✓
34	Sasaki et al. (2019)	✓								✓				✓	✓
35	Afshar et al. (2020)		✓	✓					✓	✓	✓				✓
36	Amsalu et al. (2020)	✓		✓	✓									✓	✓
37	Chen et al. (2020)			✓	✓		✓	✓							✓

No.	Author(s) and Year	Clinical Experience	Education/ Training	Clinical Environment	Supervision/ Support	Self-Efficacy	Knowledge/ Academic Performance	Emotional Resources	Organisational Empowerment	Satisfaction/ Commitment	Motivation/ Attitude	Simulation/ Technology	Stress/ Well-Being	Demographic/ Context	Clinical Competence
38	Ha & Nuntaboot (2020)		✓	✓	✓				✓		✓				✓
39	Tesfaye et al. (2020)			✓	✓									✓	✓
40	Willman et al. (2020)	✓	✓											✓	✓
41	Angasu & Bekela (2021)			✓	✓						✓			✓	✓
42	Craig et al. (2021)		✓			✓	✓					✓			✓
43	Feliciano et al. (2021)	✓		✓										✓	✓
44	Fung et al. (2021)		✓			✓	✓					✓			✓
45	Getie et al. (2021)		✓	✓	✓									✓	✓
46	Hailu et al. (2021)			✓	✓	✓					✓			✓	✓
47	Horii et al. (2021)	✓	✓	✓	✓										✓
48	Vasli et al. (2021)						✓						✓	✓	✓
49	Visiers-Jiménez et al. (2021)			✓	✓					✓				✓	✓
50	Yamamoto et al. (2021)	✓		✓						✓				✓	✓
51	Yu et al. (2021)			✓		✓					✓			✓	✓
52	Zakeri et al. (2021)							✓					✓	✓	✓
53	Brennan (2022)		✓			✓						✓			✓
54	Dehnavi et al. (2022)							✓						✓	✓
55	Babaei et al. (2023)	✓												✓	✓
56	Charette et al. (2023)	✓	✓		✓					✓					✓
57	Chung et al. (2023)					✓		✓			✓			✓	✓
58	Ahmedin et al. (2024)		✓	✓	✓									✓	✓
59	Dejene et al. (2024)	✓		✓			✓							✓	✓
60	Vikström-Dahl et al. (2024)	✓		✓			✓							✓	✓
61	Aghabarary & Khedmatizare (2025)							✓						✓	✓
62	Alharbi (2025)							✓						✓	✓
63	Fung et al. (2025)		✓			✓	✓					✓			✓

4. Discussion

Education, experience, and deliberate practice form the clearest developmental cluster, but no modality is universally superior. A longitudinal self-reflection programme evaluated competence development through reflective educational processes (Pai, 2015). Simulation preparation connected competence with self-efficacy when novice nurses managed multiple patients (Franklin et al., 2015). Intramuscular-injection simulation produced higher adjusted competence scores without a statistically significant advantage, cautioning against equating numerical improvement with

superiority (Ross, 2015). Simulation also made aspects of clinical competence observable for assessment, although simulated performance is not workplace performance (Lejonqvist et al., 2016). A Korean simulation-based assessment operationalised several competence dimensions while demonstrating the measurement role of simulation (Park et al., 2016). Interactive situated simulation addressed competence, confidence, and stress among novice practitioners (Chen et al., 2017). Randomised sequencing of simulation and practicum did not yield a decisive sequence advantage, suggesting that integration may matter more than order (Hansen & Bratt, 2017). A skills-enhancement model identified supportive instructional attributes as pathways to pre-graduate competence (Rebueno et al., 2017). Preceptorship experience was associated with perceived competence among Saudi nursing interns (Aboshaiqah & Qasim, 2018). Mastery-oriented education improved specific clinical skill learning in a randomised trial (Lengetti et al., 2018). Intensive clinical-skills instruction was linked with self-confidence and competence in senior students (Park, 2018). Knowledge, confidence, and retention moved together in undergraduate mixed-method evidence (Zieber & Sedgewick, 2018). A multisite prospective study supported simulation as a credible substitute for portions of traditional clinical learning without proving higher overall competence (Mancini et al., 2019). Together, these findings favour deliberate, feedback-rich practice linked to authentic exposure rather than technology or classroom instruction in isolation.

Clinical environment and supervision repeatedly emerged as contextual factors associated with competent performance. Korean nurses' educational needs varied with their competency profiles, supporting targeted continuing development (Kim & Choi, 2019). Participatory action research showed that locally designed workplace learning can improve competencies while engaging staff in change (Afshar et al., 2020). Ethiopian nursing students' competence varied with clinical exposure and learning context (Amsalu et al., 2020). A structural model linked practicum competence with both learning-context and learner variables (Chen et al., 2020). Health-professions students at Dilla University showed competence differences associated with placement and contextual characteristics (Tesfaye et al., 2020). Midwifery and nursing students' clinical learning outcomes were likewise related to learning conditions and individual context (Angasu & Bekela, 2021). Graduating nursing students in Northern Ethiopia showed competence differences associated with educational and placement conditions (Getie et al., 2021). Similar factors appeared among students in eastern Ethiopian health-sciences colleges, although cross-sectional measurement limits temporal inference (Hailu et al., 2021). Standardised transition training in Vietnam provided longitudinal evidence that organised support can strengthen new-graduate competence (Horii et al., 2021). A multicountry study linked graduating students' competence with the clinical learning environment (Visiers-Jiménez et al., 2021). Chinese undergraduate evidence connected environment and self-efficacy with competence, implying a possible capability pathway (Yu et al., 2021). Japanese nurses' competence varied with experience, work context, and career-related factors (Yamamoto et al., 2021). Transition programmes connected competence, job satisfaction, and perceived support among new graduates (Charette et al., 2023). Recent university evidence again associated student competence with clinical practice conditions and support (Ahmedin et al., 2024). The recurring pattern is not that one placement characteristic determines performance, but that exposure, feedback, support, and opportunity are repeatedly associated with what learners can demonstrate.

Individual psychological resources are relevant, but their associations remain embedded within educational and occupational conditions. Professional quality of life was associated with competence among Korean nurses, linking compassion-related experience and occupational strain with reported performance (Kim et al., 2015). Burnout was inversely related to competence in neonatal intensive care nurses, although cross-sectional data cannot establish directionality (Soroush et al., 2016). Quality of life was associated with self-reported competence, suggesting possible reciprocal

relationships between well-being and perceived performance (Cruz, 2017). Workplace bullying was related to perceived competence, placing interpersonal harm within competence research rather than solely workforce-well-being research (Obeidat et al., 2018). Students' clinical performance in Tanzania was associated with supervisory, motivational, environmental, and stress-related conditions (Gemuhay et al., 2019). Compassion satisfaction, burnout, and secondary traumatic stress were associated with nurses' clinical competence (Zakeri et al., 2021). Examination anxiety and academic success predicted objective structured clinical examination competence, showing how affective pressure and knowledge can converge at assessment (Vasli et al., 2021). Emotional intelligence correlated with competence among special-care nurses, but the observational design supports association rather than causation (Dehnavi et al., 2022). Graduating students during the COVID-19 period showed competence relationships with self-efficacy, emotional factors, motivation, and context (Chung et al., 2023). Emotional intelligence predicted clinical competence in a recent nursing-student sample, strengthening an emerging affective-resource pathway that still requires longitudinal testing (Aghabarary & Khedmatizare, 2025). A separate 2025 study also linked emotional intelligence with student competence, adding replication without resolving causal direction (Alharbi, 2025). These studies support interpreting psychological resources as potential modifiers of learning and performance rather than substitutes for adequate clinical exposure or organisational conditions.

Technology-mediated learning expands practice opportunities but does not remove the importance of knowledge, feedback, or context. Simulation-based peer-learning handover training was evaluated as a competence-building strategy for new graduates, combining technical rehearsal with interpersonal learning (Kim et al., 2018). Standardised-patient simulation improved knowledge and perceived competency for schizophrenia care, but the outcome was task specific (Speeney et al., 2018). Safe-medication simulation strategies improved competence-related outcomes for a high-risk clinical task (Craig et al., 2021). Online virtual simulation with debriefing supported perceived competence and learning when pandemic conditions restricted clinical access (Fung et al., 2021). Self-efficacy-based prebriefing improved simulation-related competence outcomes, suggesting that psychological preparation matters alongside scenario design (Brennan, 2022). A crossover randomised trial found that generative-AI patient simulation could support perceived competence alongside immersive virtual-reality comparison, although short-term self-report limits claims about workplace transfer (Fung et al., 2025). Broader workforce evidence showed competence variation with clinical experience, demographic characteristics, and care context (Feliciano et al., 2021). Hospital-nurse evidence in western Iran again identified contextual predictors, underscoring limited transferability of local associations (Babaei et al., 2023). Long-term-care competence was associated with nursing standards, language, age, and contextual variables, making communication and setting especially salient (Vikström-Dahl et al., 2024). Overall, the evidence is most consistent with a multilevel developmental interpretation in which repeated experience, structured learning, supportive environments, credible supervision, and self-efficacy are interrelated, while emotional, organisational, technological, and demographic factors show additional context-dependent associations. This integrated view helps explain why isolated interventions may produce bounded gains when the surrounding learning system remains unchanged.

5. Research Gaps and Future Research Directions

The evidence base remains limited by a concentration of cross-sectional, self-reported competence measures and nursing populations. National and multisite samples improve representativeness, but many studies cannot establish whether a determinant precedes competence or merely covaries with it. Long-term-care training research, for example, identified multiple related factors yet remained

observational (Hsieh & Chen, 2017). Competency and educational-needs studies likewise reveal useful practice gaps without determining which intervention will close them (Kim & Choi, 2019). Future work should therefore prioritise prospective cohorts that begin before clinical transition, repeated objective performance assessment, and pragmatic trials that compare educational or organisational changes against credible alternatives. Designs should model mediation and moderation explicitly so that Clinical Environment can be tested through Supervision/Support or Self-Efficacy rather than entered as parallel independent predictors. Measurement research should establish cross-cultural equivalence among competence instruments before cross-country scores are directly compared. Greater inclusion of medicine, midwifery, allied health professions, low-resource systems, rural services, and non-student practitioner groups is needed to determine which determinants are profession specific and which are generalisable across clinical work.

Several domains are underdeveloped relative to their theoretical importance. Organisational empowerment, emotional resources, motivation, and stress require longitudinal designs that connect workplace change to independently assessed competence. The association between career commitment and competence appears context dependent, so future studies should separate professional identity, organisational attachment, retention intention, and opportunity for deliberate practice rather than treat commitment as one construct (Sasaki et al., 2019). Pandemic-era and virtual-learning studies demonstrate adaptability but also create cohort effects that should not be treated as normal baseline conditions. Generative artificial intelligence now introduces additional questions about feedback validity, cultural realism, automation bias, and transfer from simulated interaction to actual patient care (Fung et al., 2025). Future trials should report fidelity, dose, comparator content, assessor blinding where feasible, and durable follow-up. Research should also test whether organisational interventions alter competence indirectly through staffing stability, psychological safety, learning climate, or supervisory continuity. Finally, review updates should use prospective registration, reproducible database-specific search exports, duplicate independent screening, transparent excluded-study tables, and harmonised effect reporting so that future syntheses can move from narrative confidence statements toward quantitatively comparable estimates where heterogeneity permits.

6. Conclusion

This systematic review integrated 63 primary empirical studies published from 2015 through 2025 and identified thirteen recurring domains associated with clinical competence. The evidence supports a developmental and multilevel interpretation rather than a search for one dominant predictor. Clinical experience provides opportunities to transform formal knowledge into situated judgement, while structured education and training can accelerate or focus that development. Clinical environments and supervision are repeatedly associated with access to appropriate exposure, feedback, psychological safety, and opportunities to perform. Self-efficacy appears to influence willingness and persistence in clinical action, but confidence should not be treated as a substitute for objectively demonstrated performance. Knowledge and academic achievement are associated with competence, although their relevance depends on translation into practice. Emotional resources, organisational empowerment, satisfaction and commitment, motivation, simulation and technology, stress and well-being, and demographic or contextual characteristics add meaningful explanatory layers, although their evidence is more heterogeneous and frequently observational. The literature matrix also shows why research frequency must be separated from evidential influence: demographic and contextual variables were commonly examined, whereas some potentially actionable organisational and emotional determinants received less attention. Simulation and emerging digital modalities can

extend deliberate practice, but comparative evidence does not justify assuming that more technologically sophisticated learning automatically produces better real-world competence. Across the review, the most defensible implication is that competence development is supported by alignment among learner resources, educational design, authentic clinical exposure, high-quality supervision, and enabling organisational systems. Stronger future evidence will depend on longitudinal and experimental designs, objective and cross-culturally validated competence measures, clearer modelling of interactions and mechanisms, and broader representation across professions and health systems. Because the evidence base was concentrated in nursing populations, cross-professional generalisation should remain cautious until broader replication is available. Clinical competence should therefore be managed as an evolving system-level capability: one that can be cultivated through coordinated education, supportive practice environments, and sustained opportunities to learn from performance over time. This framing also directs quality improvement away from isolated remediation toward systems that make competent performance learnable, observable, supported, and sustainable across career stages. It supports investment in developmental infrastructure rather than reliance on one-off training or individual resilience alone. It also offers a practical basis for coordinated assessment and improvement.

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