



DEVELOPING AN INTEGRATED MODEL FOR NURSING CREDENTIAL MONITORING, CLINICAL SUPERVISION, AND ELECTRONIC DOCUMENTATION

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ABSTRACT

Nursing credentialing ensures that nurses maintain the competencies, legal authorization, and professional qualifications required to deliver safe, high-quality care. Although digital technologies have increasingly supported documentation, competency assessment, clinical supervision, and professional development, existing systems remain fragmented, limiting interoperability across the nursing credentialing lifecycle. To synthesize current evidence on digital technologies supporting nursing credential monitoring, clinical supervision, electronic nursing documentation, electronic logbooks, and competency assessment, and to identify research gaps that inform the development of an integrated electronic nursing credentialing ecosystem. A systematic literature review was conducted following the PRISMA 2020 guidelines. Searches of PubMed, Scopus, Web of Science, ScienceDirect, SpringerLink, Frontiers, and JMIR identified English-language, open-access original studies published between 2020 and 2025. Of 2,184 records identified, 15 studies met the eligibility criteria and were included in a narrative synthesis because of methodological heterogeneity. The included studies consistently demonstrated that digital technologies improved documentation quality, competency assessment, clinical supervision, workflow efficiency, and professional development. However, cross-study synthesis showed that existing digital solutions primarily support individual functional domains and operate with limited interoperability. None of the reviewed studies described an integrated digital ecosystem that combines nursing credential monitoring, competency assessment, clinical supervision, electronic nursing documentation, electronic logbooks, and professional development within a unified platform. Current evidence supports the growing role of digital technologies in nursing management but highlights an important gap in integrated nursing credentialing. Developing interoperable electronic nursing credentialing ecosystems may strengthen continuous competency management, evidence-based nursing management, and organizational decision-making throughout the nursing credentialing lifecycle.

Keywords: clinical supervision; competency assessment; digital health; electronic nursing documentation; electronic nursing logbook; nursing credentialing; nursing informatics

INTRODUCTION

Healthcare systems worldwide are undergoing rapid digital transformation to improve healthcare quality, patient safety, and organizational efficiency (Jobst et al., 2022; Walzer et al., 2025). Electronic nursing documentation has been shown to improve documentation quality and communication among healthcare professionals (Jacques et al., 2025; Shafiee et al., 2022). Electronic nursing logbooks support competency documentation, clinical skills assessment, and continuous monitoring of learning outcomes (Barteit et al., 2022; Khalafi et al., 2023; Oxyandi et al., 2023). Digital competency assessment systems and e-portfolios facilitate standardized competency evaluation and professional development (Chuang et al., 2025; Najaffard et al., 2024; Qin et al., 2024). Mobile health applications and nursing informatics platforms have also enhanced workforce management, clinical assessment, and workflow efficiency (Aksu & Dinç, 2025; Nowicki et al., 2024). Despite these advances, existing digital nursing technologies have largely evolved as standalone solutions, providing limited support for integrated nursing credential management across the professional lifecycle. (Aksu & Dinç, 2025; Najaffard et al., 2024; Nowicki et al., 2024).

Nursing credentialing is a core component of clinical governance because it ensures that nurses maintain the competencies, legal authorization, and clinical privileges required to deliver safe and

high-quality care (Shahzeydi et al., 2024; Sommer et al., 2020). In many healthcare systems, credentialing involves professional registration, practice licensure, clinical appointment, competency assessment, and continuing professional development (Shahzeydi et al., 2024; Sommer et al., 2020). Despite its importance, credentialing processes are frequently managed through paper-based or disconnected administrative systems, resulting in fragmented competency records and duplicated administrative work (Amalia et al., 2025). Such fragmentation limits continuous competency monitoring and reduces the availability of integrated information for nursing governance and organizational decision-making (Amalia et al., 2025).

Previous studies have shown that electronic nursing documentation improves documentation quality and communication (Jacques et al., 2025; Shafiee et al., 2022). Electronic logbooks facilitate competency documentation, clinical skills assessment, and longitudinal competency monitoring (Barteit et al., 2022; Khalafi et al., 2023). Digital clinical supervision applications strengthen structured supervision and feedback (Ernawati et al., 2023), while electronic portfolios support competency development and continuing professional development (Najaffard et al., 2024). Nevertheless, these technologies have largely evolved as standalone applications with limited interoperability. Consequently, existing evidence provides limited understanding of how competency assessment, clinical supervision, electronic documentation, electronic logbooks, and professional development can be integrated to support nursing credential governance throughout nurses' professional careers.

Accordingly, an important research gap remains regarding the development of integrated digital systems that connect these functions within a unified nursing management framework. Addressing this gap may strengthen competency governance, improve organizational efficiency, reduce fragmented information, and support evidence-based nursing management. Rather than focusing on isolated applications, integrated digital ecosystems have the potential to support continuous competency monitoring across nurses' professional careers.

Therefore, this literature review synthesizes current evidence on digital technologies related to nursing credential monitoring, clinical supervision, electronic nursing documentation, competency assessment, electronic logbooks, and related nursing informatics systems. By integrating evidence across these domains, the review aims to identify existing research gaps and establish a conceptual foundation for developing an integrated model for nursing credential monitoring, clinical supervision, and electronic documentation.

METODE

Study Design

This study employed a systematic literature review to synthesize current evidence on digital technologies supporting nursing credential monitoring, clinical supervision, electronic nursing documentation, electronic nursing logbooks, competency assessment, and related nursing informatics systems. The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Statement to ensure a transparent, systematic, and reproducible review process. Owing to the considerable methodological heterogeneity of the included studies, which encompassed experimental, observational, qualitative, mixed-methods, methodological, and system development research, quantitative meta-analysis was considered inappropriate. Therefore, a narrative synthesis approach was adopted to identify recurring evidence patterns, compare the characteristics and contributions of digital nursing technologies, evaluate existing knowledge gaps, and establish the conceptual foundation for an integrated model of nursing credential monitoring, clinical supervision, and electronic documentation.

Literature Search Strategy

A comprehensive literature search was conducted to identify original studies investigating digital technologies related to nursing credential monitoring, clinical supervision, electronic nursing documentation, electronic nursing logbooks, competency assessment, e-portfolios, and other nursing informatics systems. The search was performed in seven electronic databases: PubMed, Scopus, Web of Science, ScienceDirect, SpringerLink, Frontiers, and JMIR. These databases were selected because they comprehensively index peer-reviewed literature in nursing, healthcare, medical education, digital health, and health informatics. The search was intentionally limited to studies published up to December 2025 to ensure a complete publication year for evidence synthesis.

The search strategy combined Medical Subject Headings (MeSH), where applicable, with free-text keywords using Boolean operators (AND/OR). Search syntax was adapted to the indexing requirements of each database while maintaining a consistent conceptual framework across all searches. The primary search strategy was as follows: ("*nursing credential*" OR "credential monitoring" OR "clinical privilege") AND ("electronic logbook" OR "digital logbook" OR "electronic nursing documentation" OR "nursing documentation") AND ("clinical supervision" OR "competency assessment" OR "competency tracking" OR "e-portfolio" OR "continuing professional development" OR "digital nursing system" OR "nursing informatics" OR "mobile health"). To maximize search completeness, the reference lists of all included studies were manually screened to identify additional eligible articles that were not retrieved through the electronic database searches. Duplicate records were removed prior to the screening process, and all retrieved citations were subsequently assessed according to the predefined eligibility criteria.

Eligibility Criteria

Study eligibility was established using the Population, Intervention, Comparison, Outcome, and Study Design (PICOS) framework to ensure a transparent and consistent study selection process. The detailed inclusion and exclusion criteria are presented in Table 1.

Table 1.
PICOS Table Framework

PICOS Framework	Inclusion Criteria	Exclusion Criteria
Population	Original studies on nursing credential monitoring, clinical supervision, electronic nursing documentation/logbooks, competency assessment, e-portfolios, nursing informatics, digital nursing systems, dashboards, clinical privileges, CPD, or nursing performance.	General EMR/EHR, hospital information systems, non-nursing healthcare systems, or studies not specifically related to nursing.
Intervention	Development, implementation, evaluation, validation, or use of digital nursing systems (e.g., electronic documentation, logbooks, credential monitoring, supervision systems, e-portfolios, mobile apps, dashboards).	None.
Comparison	Electronic vs. manual/paper-based systems, pre-post implementation, or existing digital systems. Studies without comparison were included if they evaluated digital system implementation or effectiveness.	None.
Outcome	Competency, credential management, clinical supervision, documentation quality, competency tracking, usability, workflow efficiency, user satisfaction, digital competency, patient safety, professional development, or nursing performance.	Outcomes unrelated to digital nursing systems, competency, supervision, documentation, or credential management.
Study	Original research (RCT, quasi-experimental, observational, cohort, cross-sectional, qualitative, mixed methods, Delphi, instrument development/validation, R&D, case study).	Reviews, meta-analyses, protocols, editorials, letters, opinion papers, conference abstracts, and concept analyses.
Publication Year	2020–2025	Before 2020.
Language	English	Non-English.
Accessibility	Open-access articles with an active DOI.	Closed-access articles or articles without an active DOI.

No restrictions were applied regarding study design, provided that the studies met the predefined PICOS criteria and reported original empirical findings.

Quality Appraisal

The methodological quality assessment indicated that the overall quality of the included studies was satisfactory. Randomized controlled trials and quasi-experimental studies generally demonstrated good methodological rigor according to the JBI critical appraisal checklists. Qualitative studies met most JBI quality criteria, although some lacked explicit consideration of researcher reflexivity. Mixed-methods and design-based research studies fulfilled the majority of the MMAT (2018) criteria by clearly describing their methodological rationale and the integration of qualitative and quantitative components. Instrument development and methodological studies demonstrated acceptable methodological quality based on the selected JBI critical appraisal criteria, with appropriate validity and reliability testing reported where applicable. Overall, no study was excluded based on methodological quality, as all met the minimum quality requirements for inclusion in the evidence synthesis. For descriptive purposes, the included studies were classified according to their primary study design in the Results section, whereas methodological quality was assessed using the critical appraisal tool considered most appropriate for each design. Detailed appraisal results are presented in Table 2.

Table 2.
Methodological Quality Assessment of Included Studies

Author	Study Design	Appraisal Tool	Overall Quality
(Walzer et al., 2025)	Design-Based Research (Intervention Development & Feasibility Study)	MMAT (2018)	High
(Shafiee et al., 2022)	Methodological Study (System Development & Evaluation)	JBI for Analytical Cross-Sectional Studies	High
(Jacques et al., 2025)	Multimethod Analysis	MMAT (2018)	High
(Khalafi et al., 2023)	Randomized Controlled Trial (RCT)	JBI for RCTs	High
(Barteit et al., 2022)	Convergent Mixed-Methods Study	MMAT (2018)	High
(Oxyandi et al., 2023)	Research and Development (R&D) using the ADDIE model	MMAT (2018)	Moderate
(Najaffard et al., 2024)	Quasi-experimental	JBI for Quasi-Experimental Studies	High
(Chuang et al., 2025)	Exploratory Sequential Mixed-Methods Study	MMAT (2018)	High
(Qin et al., 2024)	Instrument Development and Psychometric Validation (Cross-sectional Validation Study)	JBI for Analytical Cross-Sectional Studies	High
(Aksu & Dinç, 2025)	Design-Based Research (DBR)	MMAT (2018)	High
(Nowicki et al., 2024)	Development Study (Design-Based Research/ADDIE) with Mixed-Methods Evaluation	MMAT (2018)	High
(Amalia et al., 2025)	Qualitative descriptive phenomenological study	JBI for Qualitative Research	Moderate–High
(Ernawati et al., 2023)	Mixed Methods Research & Development (R&D)	MMAT (2018)	Moderate
(Laukvik et al., 2024)	Descriptive Qualitative Study	JBI for Qualitative Research	High
(Lou et al., 2025)	Delphi Study	JBI for Text and Opinion Papers	High

Study Selection

The study selection process followed the PRISMA 2020 flow diagram. A total of 2,184 records were initially identified through database searching. After duplicate records were removed, the remaining studies underwent title and abstract screening based on the predefined eligibility criteria. Articles considered potentially relevant were subsequently retrieved in full text and assessed against the PICOS framework to determine their eligibility for inclusion. The screening and eligibility assessment were conducted by the primary author in consultation with the supervisory team to ensure consistency in the application of the predefined selection criteria. Any uncertainties regarding study eligibility were resolved through discussion until consensus was reached. Following the selection process, 15 original research articles met all eligibility criteria and were included in the final narrative synthesis. The complete study selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

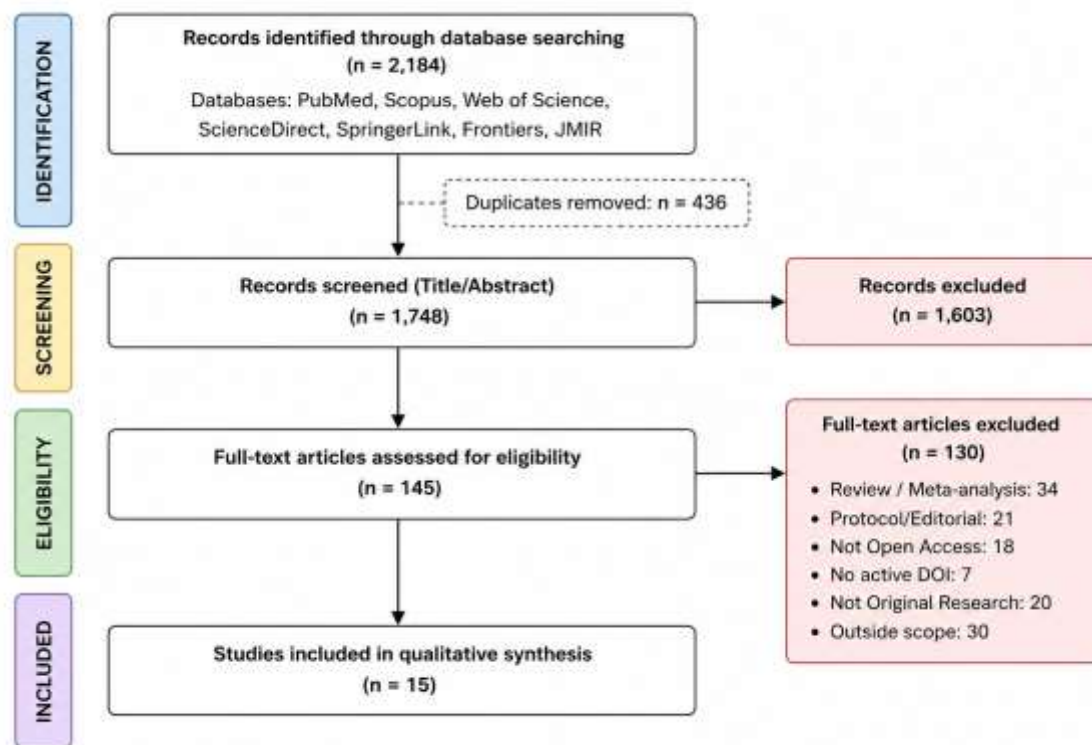


Figure 1. PRISMA Diagram

Data Extraction

Data from the included studies were systematically extracted using a standardized evidence extraction matrix developed specifically for this review to ensure consistency across all included studies. The extraction process was performed by the primary author and reviewed in consultation with the supervisory team to ensure the completeness and accuracy of the extracted information. The extracted data included the author and publication year, country, journal, study objective, study design, sample characteristics, study population, intervention or digital technology evaluated, comparison group when applicable, outcome measures, research instruments, statistical analysis, principal findings, key statistical results, study strengths and limitations, research domain, and level of evidence. The extracted evidence was subsequently synthesized to support thematic classification, cross-study comparison, and identification of research gaps, which informed the conceptual foundation of the proposed integrated electronic nursing credentialing model.

Data Synthesis

A narrative synthesis approach was adopted because of the methodological heterogeneity of the included studies, which comprised randomized controlled trials, quasi-experimental studies, cross-sectional studies, mixed-methods research, qualitative studies, methodological studies, psychometric

validation studies, and system development research. Consequently, statistical pooling and meta-analysis were not considered appropriate. The synthesis was conducted in four sequential stages. First, the included studies were classified into thematic domains according to the primary focus of the digital technology evaluated. Second, cross-study comparisons were performed to identify similarities and differences in system characteristics, functionalities, implementation approaches, and reported outcomes. Third, recurring evidence patterns were synthesized to identify the benefits, limitations, and implementation trends of digital nursing technologies across studies. Finally, the synthesized evidence was used to identify existing research gaps and establish the conceptual foundation for an integrated electronic nursing credentialing model. The findings are presented through a narrative synthesis supported by summary tables, thematic classification, feature comparison, and research gap analysis to provide a comprehensive overview of the current evidence.

RESULT

Study Selection

The systematic literature search identified 2,184 records from PubMed, Scopus, Web of Science, ScienceDirect, SpringerLink, Frontiers, and JMIR. After the removal of 436 duplicate records, 1,748 studies remained for title and abstract screening. Of these, 1,603 records were excluded because they did not meet the predefined eligibility criteria. A total of 145 full-text articles were assessed for eligibility. Following full-text review, 130 articles were excluded for the following reasons: review or meta-analysis ($n = 34$), protocol or editorial ($n = 21$), unavailable as full-text articles ($n = 18$), inactive DOI ($n = 7$), non-original research ($n = 20$), and studies outside the scope of this review ($n = 30$). Ultimately, 15 original research articles fulfilled all eligibility criteria and were included in the final narrative synthesis. The complete study selection process is illustrated in the PRISMA 2020 flow diagram (Figure 1).

Table 3.
Evidence Extraction Matrix of Included Studies

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
1	(Aksu & Dinç, 2025), Türkiye	Design: Design-based research (pilot). Sample: 12 oncology nurses. Variables: Development and usability of a mobile nurse scheduling application. Instrument: 9-item usability questionnaire and system performance tests. Analysis: Descriptive statistics.	Workforce Management; Mobile Health; Nursing Informatics	The mobile scheduling application improved perceived fairness, efficiency, and user satisfaction while accommodating nurse preferences and scheduling regulations.	Supports digital workforce scheduling through integrated shift planning, leave approval, and organizational rule management.	Limited to workforce scheduling; does not support credential monitoring, clinical supervision, or electronic documentation. Pilot study with a small single-unit sample.
2	(Barteit et al., 2022), Zambia	Design: Convergent mixed-methods study. Sample: 10 students, 2 mentors, and interviews with 5 students and 2 mentors. Variables: Feasibility and acceptability of a tablet-based electronic logbook. Instrument: E-logbook, system logs, and semi-structured interviews. Analysis: Descriptive statistics and	Electronic Logbook; Continuous Clinical Assessment; Digital Medical Education	The e-logbook improved documentation, centralized data storage, and continuous competency assessment but was constrained by usability, connectivity, mentor workload, and	Combines quantitative and qualitative evaluation; demonstrates the feasibility of e-logbooks in resource-limited settings and identifies implementation barriers.	Small single-site pilot with short implementation; focused on feasibility rather than educational effectiveness and dependent on internet connectivity.

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
		convergent analysis.		software limitations.		
3	(Chuang et al., 2025), Taiwan	Design: sequential methods development and validation). Sample: 6 RNs, 4 experts, 353 RNs, and 22 test-retest participants. Variables: Development and validation of the Professional Nurses Competence Scale (PNCS). Instrument: PNCS questionnaire, focus groups, and psychometric testing. Analysis: Content analysis, EFA, CFA, reliability, and validity testing.	Competency Assessment; Workforce Management; Nursing Informatics	A 30-item Professional Nurses Competence Scale with six competency domains demonstrated strong validity and reliability for assessing contemporary nursing competencies.	Provides a standardized competency framework incorporating digital and legal competencies relevant to workforce evaluation.	Does not support credential monitoring, clinical supervision, workflow management, or electronic documentation integration.
4	(Ernawati et al., 2023), Indonesia	Design: Mixed-methods R&D. Sample: 40 nursing managers from three hospitals. Variables: Development and implementation of an Android-based clinical supervision application. Instrument: Needs assessment, validation forms, observation sheets, and pre-post knowledge test. Analysis: Descriptive statistics, Shapiro-Wilk test, and paired <i>t</i> -test.	Clinical Supervision; Mobile Health; Nursing Management	The Editha application improved clinical supervision knowledge, facilitated supervision scheduling, documentation, and feedback, and achieved high user satisfaction.	Provides a structured digital supervision system with expert validation, field testing, and significant improvement in supervision knowledge.	Small multi-center sample; evaluated knowledge rather than clinical outcomes; Android-only; lacks credential management and electronic logbook integration.
5	(Jacques et al., 2025), United States	Design: Multimethod analysis. Sample: 20 registered nurses from four teaching hospitals. Variables: Documentation burden, workflow, usability, and EHR use. Instrument: Focus groups, demographic survey, and EHR usage data. Analysis: Thematic and descriptive analysis.	Electronic Nursing Documentation; Nursing Informatics; Workflow Optimization	Redesigned EHR documentation improved workflow, communication, and usability but remained affected by redundant documentation and training needs.	Combines user perspectives with objective EHR usage data to identify strategies for reducing documentation burden.	Focuses on documentation optimization only; excludes credential monitoring, supervision, and competency assessment; limited to one health system.
6	(Khalafi et al., 2023), Iran	Design: Randomized controlled trial. Sample: 39 nurse anesthesia students (20 intervention, 19 control). Variables: Electronic logbook use, student satisfaction, and learning outcomes. Instrument:	Electronic Logbook; Competency Assessment; Digital Education	Smartphone-based electronic logbooks significantly improved student satisfaction, learning outcomes, real-	High-level evidence (RCT) demonstrating the effectiveness of electronic logbooks for competency	Limited to student education; no integration with electronic documentation or credential monitoring; single-center

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
		AGAH smartphone application, satisfaction questionnaire, and clinical skills checklist. Analysis: Shapiro–Wilk test, independent <i>t</i> -test, and Chi-square test.		time feedback, and competency monitoring compared with paper logbooks.	assessment and feedback.	study with short follow-up and Android-only platform.
7	(Laukvik et al., 2024), Norway	Design: Descriptive qualitative study. Sample: 14 registered nurses from dementia care units. Variables: Nurses' experiences with standardized EHR documentation. Instrument: Semi-structured interviews. Analysis: Reflexive thematic analysis.	Electronic Health Record (EHR); Nursing Documentation ; Nursing Standards	Standardized EHR documentation improved documentation quality, clinical reasoning, and ethical awareness, while implementation depended on digital competence, organizational support, and EHR usability.	Identifies human, organizational, and technical factors influencing standardized nursing documentation using a socio-technical perspective.	Small qualitative study; findings are perception-based and limited to documentation without integrating credential monitoring, supervision, or competency assessment.
8	(Lou et al., 2025), China	Design: Delphi study. Sample: 21 experts from 21 tertiary hospitals. Variables: Development of a competency evaluation index for informatics nurses. Instrument: Literature review, interviews, two-round Delphi questionnaire, and AHP. Analysis: Descriptive statistics, Kendall's W, coefficient of variation, authority coefficient, and AHP.	Nursing Informatics; Competency Assessment; Workforce Management	A competency evaluation framework comprising 6 first-level, 17 second-level, and 69 third-level indicators was developed through expert consensus to support competency assessment and workforce development.	Provides a standardized competency framework with strong expert consensus for evaluating digital nursing competencies.	Focuses on competency evaluation rather than credential monitoring; excludes clinical supervision and electronic documentation workflows; limited to the Chinese healthcare context.
9	(Najaffard et al., 2024), Iran	Design: Quasi-experimental pretest–posttest study with a non-equivalent control group. Sample: 60 nurses (30 intervention, 30 control). Variables: Google Docs–based e-portfolio, nurses' knowledge, and clinical competence. Instrument: Knowledge test, clinical governance checklists, and e-portfolio. Analysis: Paired <i>t</i> -test, independent <i>t</i> -test, ANCOVA, and Chi-square.	E-Portfolio; Competency Assessment; Clinical Supervision	The e-portfolio significantly improved nurses' knowledge, clinical competence, reflective learning, and adherence to Clinical Governance standards.	Demonstrates the effectiveness of a low-cost digital e-portfolio for competency development through structured reflection and feedback.	Does not support credential monitoring or license management; lacks integration with electronic documentation and logbook systems; short-term single-center study.
10	(Nowicki et al.,	Design: Development and pre-evaluation study	Mobile Health (mHealth);	The DiagNurse application	Applies a rigorous	Small usability sample;

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
	2024), Poland	(ADDIE). Sample: 20 participants (10 nurses, 10 nursing students). Variables: Development and usability of the DiagNurse mobile application. Instrument: ADDIE framework, eye-tracking, focus group interviews, SUS, and usability questionnaire. Analysis: Thematic analysis, descriptive statistics, and SUS scoring.	Clinical Assessment; Nursing Education; Clinical Decision Support	demonstrated high usability and improved access to standardized assessment tools, learning, clinical decision-making, and patient assessment efficiency.	ADDIE framework with comprehensive usability testing and integrates 241 standardized clinical assessment instruments.	Android-only; evaluates usability rather than clinical outcomes; lacks credential monitoring, competency tracking, supervision, and electronic logbook integration.
11	(Oxyandi et al., 2023), Indonesia	Design: Research and Development (ADDIE). Sample: 30 nursing students. Variables: Development and practicality of a mobile electronic logbook. Instrument: Observation, interviews, questionnaires, and practicality assessment. Analysis: Descriptive statistics.	Electronic Logbook; Mobile Learning; Digital Education	The mobile electronic logbook achieved a practicality score of 85.05%, improving activity recording, documentation, reporting, and competency evaluation in clinical learning.	Develops a practical mobile electronic logbook that supports digital documentation, reporting, and competency monitoring using the ADDIE framework.	Small single-institution study; evaluated practicality rather than competency outcomes; limited to students without integration with supervision, credential monitoring, or hospital information systems.
12	(Qin et al., 2024), China	Design: Instrument development and psychometric validation. Sample: 14 experts, 30 nurses (pilot), and 424 registered nurses. Variables: Development and validation of the Nursing Digital Application Skill Scale (NDASS). Instrument: NDASS questionnaire, expert review, and focus groups. Analysis: CVI, EFA, CFA, AVE, CR, Cronbach's α , split-half reliability, and ICC.	Nursing Informatics; Digital Education; Competency Assessment	The 12-item NDASS demonstrated excellent validity and reliability for assessing nurses' digital competencies and supporting digital competency development.	Provides a standardized, reliable instrument for evaluating digital readiness and monitoring competency development.	Focuses on competency assessment only; does not support credential monitoring, clinical supervision, or electronic documentation integration.
13	(Amalia et al., 2025), Indonesia	Design: Qualitative descriptive phenomenology with a constructivist paradigm. Sample: Four certified clinical nurse assessors at RSUD Welas Asih, West Java, recruited using purposive and snowball sampling. Variables/Focus: Assessors' experiences	Clinical nursing competency assessment, digitalization of competency assessment, credentialing, and clinical governance.	Digital SICAKEP improved efficiency, transparency, accuracy, and data accessibility. However, implementation faced barriers related to digital	In-depth exploration of participants' experiences; methodological triangulation; member checking; audit trail; and experienced clinical nurse	Very small sample size (n=4); single-hospital setting; limited generalizability; manual data analysis; and the digital assessment instrument had not undergone

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
		with manual and digital competency assessments, workflow adaptation, barriers, organizational support, and SICAKEP utilization. Instruments: Semi-structured interviews, brief observations, document reviews, audio recordings, and reflexive notes. Analysis: Colaizzi's seven-step phenomenological analysis, supported by member checking, methodological triangulation, reflexive journaling, and an audit trail.		literacy, infrastructure, standard operating procedures (SOPs), time constraints, workload, and organizational readiness..	assessors as participants..	full psychometric validation
14	(Shafiee et al., 2022), Iran	Design: Sequential methodological study with Delphi-based content validation, system development, and user evaluation. Sample: 80 nursing experts and 150 registered nurses. Variables: Development and evaluation of the Electronic Clinical Nursing Documentation System (ECNDS). Instrument: Literature review, Delphi questionnaire, MDS, and user evaluation questionnaire. Analysis: Descriptive statistics, Chi-square, paired <i>t</i> -test, and independent <i>t</i> -test.	Electronic Nursing Documentation ; Nursing Informatics; Clinical Documentation System	The ECNDS improved documentation quality, bedside documentation, inter-shift communication, productivity, and patient care while reducing documentation errors and legal issues.	Employs a rigorous multi-phase methodology to develop and validate a standardized electronic nursing documentation system based on international nursing classifications.	Limited to nursing documentation; requires adequate infrastructure and training; lacks credential monitoring and clinical supervision functions; no long-term implementation evaluation.
15	(Walzer et al., 2025), Germany	Design: Design-Based Research (DBR). Sample: 7 nursing education providers, 5 experts, and 25 participants for feasibility testing. Variables: Development and feasibility of a digital competency support program. Instrument: Focus groups, expert feedback, demographic questionnaire, and feasibility questionnaire. Analysis: Qualitative	Digital Education; Nursing Informatics; Competency Assessment	A digital competency support program was developed and well accepted, improving participants' digital competencies despite low participation and limited perceived knowledge gain.	Uses an iterative DBR approach with expert validation to develop a practical framework for strengthening digital competencies in nursing education.	Small single-center feasibility study with low participation; uses a non-validated evaluation questionnaire; does not integrate credentialing, electronic logbooks, or clinical documentation systems.

No.	Author (Year), Country	Design, Sample, Variables, Instrument, Analysis	Domain	Main Findings	Strengths	Limitations
content analysis and descriptive statistics.						

Characteristics of Included Studies

The 15 included studies were published between 2020 and 2025 and were conducted in 10 countries: Iran, Indonesia, China, Poland, Türkiye, Zambia, Taiwan, Norway, the United States, and Germany. Most studies were published in reputable peer-reviewed journals, including *BMC Nursing*, *BMC Medical Education*, *Scientific Reports*, *Frontiers in Medicine*, and *Nurse Education Today*. Considerable methodological diversity was observed across the included studies. The review comprised one randomized controlled trial, one quasi-experimental study, three mixed-methods studies, two qualitative studies, one Delphi study, two methodological or psychometric validation studies, and five development/design-based studies. Collectively, these studies involved more than 1,000 participants, excluding expert panels used for Delphi consensus and instrument validation. The reviewed studies investigated a broad range of digital nursing technologies, including electronic nursing logbooks, electronic nursing documentation, clinical supervision, competency assessment, e-portfolios, mobile health applications, nursing informatics, digital education, and workforce management systems. A summary of the study characteristics is presented in Table 4.

Table 4.

Characteristics of Included Studies

Characteristics	Frequency (n = 15)
Publication year (2020–2025)	15
Countries represented	10
Randomized controlled trial	1
Quasi-experimental	1
Mixed-methods	3
Qualitative	2
Delphi study	1
Methodological / Psychometric validation	2
Development / Design-based studies	5
Main domains	Electronic Logbook, Electronic Documentation, Clinical Supervision, Competency Assessment, Digital Education, Nursing Informatics

Evidence Synthesis of Included Studies

The 15 included studies evaluated diverse digital technologies designed to support nursing practice, education, competency management, and nursing management. Despite differences in study design, implementation settings, and target populations, the findings consistently demonstrated that digital technologies improved documentation quality, competency assessment, workflow efficiency, clinical supervision, communication, and professional development. Across the reviewed literature, digital interventions primarily focused on electronic nursing documentation, electronic nursing logbooks, competency assessment, clinical supervision, digital nursing education, mobile health applications, and e-portfolios. Although these technologies differed in scope and implementation, they consistently enhanced documentation processes, structured competency evaluation, supervision quality, and nursing workflow efficiency. However, most systems were designed to address individual functional domains and operated independently, with limited interoperability across broader nursing management processes. A summary of the characteristics and principal findings of the included studies is presented in Table 5.

Table 5.
Summary of Included Studies

No	Author (Year), Country	Study Design	Main System / Tool	Primary Contribution
1	(Aksu & Dinç, 2025), Türkiye	Design-Based Research (DBR)	Mobile Nurse Scheduling Application	Improved scheduling efficiency
2	(Barteit et al., 2022), Zambia	Mixed Methods	e-Logbook	Improved competency documentation and monitoring
3	(Chuang et al., 2025), Taiwan	Mixed-Methods	Digital Competency Scale	Validated digital competency assessment
4	(Ernawati et al., 2023), Indonesia	Mixed Methods R&D	Supervision App	Improved clinical supervision
5	(Jacques et al., 2025), United States	Multimethod analysis	Electronic Health Record (EHR)	Improved documentation quality and workflow
6	(Khalafi et al., 2023), Iran	RCT	e-Logbook	Improved competency assessment and user satisfaction
7	(Laukvik et al., 2024), Norway	Qualitative	Electronic Health Record (EHR)	Improved documentation quality
8	(Lou et al., 2025), China	Delphi study	Informatics Nurse Competency Evaluation Index System	Supported competency evaluation
9	(Najaffard et al., 2024), Iran	Quasi-experimental	e-Portfolio	Improved competency and clinical performance
10	(Nowicki et al., 2024), Poland	Development Study	Mobile App	Improved clinical assessment usability
11	(Oxyandi et al., 2023), Indonesia	R&D	Mobile e-Logbook	Supported competency documentation
12	(Qin et al., 2024), China	Methodological Validation	Nursing Digital Application Skill Scale	Validated digital competency assessment
13	(Saputra et al., 2019), Indonesia	Qualitative	Nursing Logbook	Supported competency documentation
14	(Shafiee et al., 2022), Iran	Methodological Study	Electronic Clinical Nursing Documentation System (ECNDS)	Improved documentation quality
15	(Walzer et al., 2025), Germany	Design-Based Research (DBR)	Digital Competency Support Program	Supported digital competency development

Thematic Classification of Digital Nursing Solutions

Table 6 summarizes the thematic classification of the included studies. The reviewed digital nursing solutions were primarily grouped into Competency Assessment, Electronic Nursing Logbooks, Electronic Nursing Documentation, Clinical Supervision, Digital Nursing Education, and Mobile Health Applications. Several studies contributed to more than one theme because their digital solutions supported multiple aspects of nursing practice, including competency assessment, documentation, clinical supervision, and professional development. However, the reviewed systems were predominantly designed to support individual functions rather than an integrated nursing management ecosystem. None of the included studies simultaneously integrated competency assessment, clinical supervision, electronic nursing documentation, electronic nursing logbooks, professional development, and nursing credential monitoring within a single digital platform. This finding highlights an important gap in current nursing informatics and provides the conceptual foundation for developing an integrated model for nursing credential monitoring, clinical supervision, and electronic documentation.

Table 6.
Thematic Classification of Digital Nursing Technologies

Theme	Included Studies	n
Electronic Nursing Logbook	Barteit; Khalafi; Oxyandi; Saputra	4
Clinical Supervision	Ernawati; Khalafi; Najaffard; Saputra	4
Electronic Nursing Documentation	Jacques; Laukvik; Shafiee	3
Competency Assessment	Chuang; Lou; Najaffard; Qin; Khalafi; Saputra	6
Digital Nursing Education	Barteit; Khalafi; Walzer	3
Mobile Health Applications	Aksu; Ernawati; Nowicki	3

Cross-study Comparison of Integrated Features

Cross-study comparison demonstrated that digital nursing technologies consistently improved competency assessment, clinical supervision, electronic nursing documentation, electronic nursing logbooks, digital nursing education, and mobile health applications. However, the reviewed systems were primarily designed to support individual functional domains rather than integrated nursing management. Several studies combined complementary functions, such as competency assessment with structured feedback, electronic documentation with standardized nursing workflows, or digital education with competency development. Nevertheless, none of the included studies integrated competency assessment, clinical supervision, electronic nursing documentation, electronic nursing logbooks, professional development, and nursing credential monitoring within a single platform. These findings highlight an important research gap and provide the conceptual foundation for developing an integrated model for nursing credential monitoring, clinical supervision, and electronic documentation.

Table 7.
Comparison of Functional Features Across Included Studies

Functional Feature		Evidence from Included Studies (n = 15)	Identified Gap
Electronic Logbook	Nursing	✓	Limited integration with other nursing systems
Electronic Documentation	Nursing	✓	Limited linkage with competency management
Clinical Supervision		✓	Not integrated with documentation and competency management
Competency Assessment		✓	Predominantly implemented as standalone assessment tools
Digital Education	Nursing	✓	Limited integration with competency governance
Mobile Applications	Health	✓	Primarily designed for specific nursing functions
Credential Monitoring		✗	Not addressed in the included studies
Integrated Management Platform	Nursing	✗	No study integrated documentation, supervision, competency assessment, credential monitoring, and professional development within a single platform

Quantitative Evidence

Several studies reported statistically significant improvements following the implementation of digital nursing technologies. A randomized controlled trial demonstrated that a smartphone-based electronic logbook significantly improved learner satisfaction (4.04 ± 0.59 vs. 3.48 ± 0.88 ; $p = 0.027$) and learning outcomes (87.66 ± 9.61 vs. 78.68 ± 14.58 ; $p = 0.028$) compared with conventional paper-based logbooks (Khalafi et al., 2023). Similarly, a quasi-experimental study reported significant improvements in nurses' knowledge ($F = 104.20$; $p < 0.001$) and clinical performance ($F = 30.29$; $p < 0.001$) following implementation of an electronic portfolio (Najaffard et al., 2024). The Nursing Digital Application Skill Scale demonstrated excellent psychometric properties, with Cronbach's $\alpha = 0.968$, Composite Reliability = 0.964, and 74.79% explained variance (Qin et al., 2024). In addition, more than 90% of nurses positively evaluated an electronic nursing documentation system for documentation quality, bedside documentation, and communication (Shafiee et al., 2022).

Research Gap Analysis

Despite the consistently positive outcomes reported across the included studies, important gaps remain in the current evidence. Most digital nursing technologies were developed to support individual functional domains, including electronic nursing logbooks, electronic nursing documentation, competency assessment, clinical supervision, digital nursing education, and mobile health applications, with limited integration across these functions. Cross-study comparison showed that none of the reviewed systems integrated competency assessment, clinical supervision, electronic nursing documentation, electronic nursing logbooks, continuing professional development and nursing credential monitoring within a unified nursing management platform. Furthermore, no included study addressed digital nursing credential monitoring or its integration with these existing digital functions. Consequently, important components of the nursing credentialing lifecycle—including monitoring of professional credentials, competency governance, and organizational oversight—remain insufficiently explored in the current literature. These findings indicate that existing digital nursing technologies remain functionally fragmented and primarily address isolated aspects of nursing practice. This evidence provides a clear rationale for developing an integrated model that connects credential monitoring, competency assessment, clinical supervision, electronic documentation, and professional development to support continuous nursing governance and evidence-based management.

DISCUSSION

Digital Transformation as the Foundation of Contemporary Nursing Governance

Digital transformation has become a fundamental driver of contemporary nursing governance by extending the role of digital technologies beyond electronic record-keeping to support competency assessment, clinical supervision, workforce management, professional development, and organizational decision-making (Ernawati et al., 2023; Khalafi et al., 2023; Nowicki et al., 2024; Shafiee et al., 2022). The evidence synthesized in this review indicates that digital technologies are increasingly supporting not only clinical documentation but also competency development, supervision, and broader nursing management processes. This evolution reflects a shift from using digital tools for isolated clinical tasks toward leveraging integrated information to strengthen competency management and evidence-based decision-making. Electronic documentation systems have improved documentation quality, communication, and workflow efficiency, while electronic logbooks, competency assessment tools, and mobile applications have enhanced competency monitoring, supervision, and clinical workflow (Aksu & Dinç, 2025; Barteit et al., 2022; Chuang et al., 2025; Jacques et al., 2025; Khalafi et al., 2023; Laukvik et al., 2024; Lou et al., 2025; Najaffard et al., 2024; Nowicki et al., 2024; Qin et al., 2024; Shafiee et al., 2022).

Despite these advances, most digital solutions remain function-specific with limited interoperability among documentation, competency assessment, and clinical supervision systems (Ernawati et al., 2023; Najaffard et al., 2024; Nowicki et al., 2024; Shafiee et al., 2022). Consequently, information generated from these systems remains fragmented, limiting its value for continuous competency monitoring and evidence-based nursing management. The absence of an integrated platform across the reviewed studies highlights the importance of interoperable digital systems capable of connecting key nursing management functions within a unified framework (Barteit et al., 2022; Jacques et al., 2025; Khalafi et al., 2023).

Electronic Nursing Logbooks for Competency Monitoring and Professional Development

Electronic nursing logbooks emerged as one of the most widely investigated digital technologies in this review, reflecting their important role in competency documentation, clinical skills assessment, and professional development. Compared with conventional paper-based logbooks, electronic logbooks provide structured documentation, real-time recording of clinical activities, easier access to competency records, and more efficient supervision throughout clinical education and professional practice (Barteit et al., 2022; Khalafi et al., 2023; Oxyandi et al., 2023). The reviewed studies

consistently demonstrated that electronic logbooks improve competency monitoring, learning outcomes, documentation efficiency, and structured feedback. Collectively, these findings suggest that electronic logbooks extend beyond documentation tools by creating a longitudinal record of competency development that supports continuous assessment across education and professional practice (Saputra et al., 2019). This capability enables competency evidence to accumulate over time, facilitating more objective performance evaluation and supporting lifelong professional development.

Despite these benefits, existing electronic logbook systems remain largely documentation-oriented and operate independently from other digital nursing applications. None of the reviewed systems integrated competency assessment, clinical supervision, electronic documentation, workforce management, and credential governance within a unified platform. Consequently, competency information remains fragmented, limiting its value for continuous competency management and organizational decision-making. These findings highlight the importance of developing interoperable electronic logbook systems capable of integrating competency assessment, clinical supervision, electronic documentation, and credential management throughout nurses' professional careers.

Clinical Supervision, Competency Development, and Continuing Professional Development

Clinical supervision is a key component of competency development because it promotes structured feedback, reflective learning, and continuous professional improvement. The evidence synthesized in this review demonstrates that digital technologies have strengthened supervision by supporting standardized documentation, competency assessment, and continuous monitoring of professional performance. Digital supervision systems therefore extend beyond administrative oversight to facilitate ongoing competency development throughout nurses' professional practice (Ernawati et al., 2023; Najaffard et al., 2024).

The reviewed studies further indicate a growing emphasis on standardized competency assessment. Digital supervision applications improved supervision quality, scheduling, documentation, and supervisor feedback, while electronic portfolios enhanced nurses' knowledge, clinical competence, reflective learning, and adherence to Clinical Governance standards. In addition, validated competency frameworks and digital competency assessment instruments provide reliable approaches for evaluating professional and digital nursing competencies (Chuang et al., 2025; Lou et al., 2025; Qin et al., 2024). Collectively, these findings demonstrate that digital technologies support more objective and evidence-based competency evaluation while facilitating continuing professional development. Despite these advances, competency assessment, clinical supervision, professional development, and electronic documentation remain implemented through separate digital systems with limited interoperability. Consequently, competency evidence generated across different stages of nurses' professional careers remains fragmented across multiple digital systems, reducing its value for organizational learning, continuous competency monitoring, and evidence-based nursing management.

Electronic Nursing Documentation, Clinical Decision Support, and Digital Workflow Integration

The evidence synthesized in this review indicates that electronic nursing documentation has become a key component of digital nursing practice by improving documentation quality, communication, workflow efficiency, and organizational performance (Jacques et al., 2025; Laukvik et al., 2024; Shafiee et al., 2022). These systems enhance documentation standardization, reduce documentation burden, and strengthen communication among healthcare professionals compared with conventional paper-based approaches (Jacques et al., 2025; Shafiee et al., 2022). Standardized digital documentation has also been reported to support more consistent clinical reasoning and improve the quality of nursing records (Laukvik et al., 2024). Beyond documentation, digital technologies also support clinical assessment and decision-making. The DiagNurse mobile application demonstrated high usability while facilitating standardized clinical assessment and improving nursing workflow

(Nowicki et al., 2024). Collectively, these findings suggest that digital technologies are evolving beyond documentation tools toward broader support for clinical practice and organizational management.

Despite these advantages, the reviewed studies indicate that electronic documentation systems remain poorly integrated with competency assessment, clinical supervision, and electronic nursing logbooks (Ernawati et al., 2023; Najaffard et al., 2024; Nowicki et al., 2024; Shafiee et al., 2022). Consequently, documentation data remain isolated within individual applications and are not fully utilized to support evidence-based nursing management and organizational decision-making. These findings highlight the importance of interoperable documentation systems that integrate documentation with competency assessment, clinical supervision, and professional development to strengthen evidence-based nursing management and continuous quality improvement.

Research Gaps and Future Directions for Digital Nursing Credentialing

Although digital nursing technologies have demonstrated substantial benefits across multiple functional domains, the synthesized evidence consistently indicates that these innovations remain fragmented and poorly integrated. The primary research gap identified in this review is the limited integration among digital nursing technologies. Although individual studies successfully developed electronic documentation systems, competency assessment tools, electronic logbooks, supervision applications, and e-portfolios, these technologies generally operate as independent systems with limited interoperability. Consequently, competency records, supervision outcomes, and documentation data remain fragmented across multiple digital platforms, reducing their organizational value for continuous competency management and evidence-based decision-making.

A second gap concerns nursing credential governance. None of the reviewed studies addressed digital nursing credential monitoring or integrated competency assessment, clinical supervision, electronic documentation, and professional development into a unified credential management process. As a result, current evidence provides limited guidance on supporting continuous competency management throughout nurses' professional careers. Future research should prioritize the development and evaluation of interoperable digital ecosystems that connect these functions and examine their impact on competency management, organizational efficiency, and quality improvement through multicenter implementation studies.

Toward an Integrated Electronic Nursing Credentialing Ecosystem

The evidence synthesized in this review indicates that, although digital nursing technologies have evolved considerably, their implementation remains fragmented across multiple functional domains. Consequently, the full potential of digital transformation has yet to be realized because documentation, competency assessment, clinical supervision, professional development, and nursing credential monitoring continue to operate as separate systems. Based on the cross-study synthesis, an integrated electronic nursing credentialing ecosystem should connect competency assessment, clinical supervision, electronic nursing documentation, electronic logbooks, professional development, and nursing credential monitoring within a unified digital environment. Such integration would enable competency evidence generated during routine nursing practice to be reused throughout the nursing credentialing lifecycle, supporting evidence-based nursing management and organizational decision-making while reducing fragmented records and administrative duplication.

This conceptual synthesis extends current knowledge by emphasizing that the value of digital nursing technologies lies not only in improving individual functions but also in connecting multiple nursing management processes within an interoperable system. Future research should evaluate integrated electronic nursing credentialing ecosystems through multicenter implementation studies to determine their effectiveness, scalability, interoperability, and contribution to evidence-based nursing management and healthcare quality improvement.

Strengths and Limitations

This review has several strengths. It synthesized evidence from multiple domains of digital nursing, including electronic nursing documentation, electronic nursing logbooks, competency assessment, clinical supervision, digital nursing education, mobile health applications, and nursing informatics, providing a comprehensive overview of current digital transformation in nursing. The review also followed the PRISMA 2020 guidelines and applied a structured evidence extraction process to ensure methodological transparency and consistency. Furthermore, cross-study synthesis enabled the identification of research gaps and informed the development of a conceptual framework for integrated nursing credential management, providing a foundation for future digital nursing innovation. Several limitations should be acknowledged. Only English-language, full-text studies published between 2020 and 2025 were included, potentially excluding relevant evidence from other languages or publication periods. The methodological heterogeneity of the included studies precluded quantitative meta-analysis, requiring a narrative synthesis. In addition, the proposed integrated nursing credentialing model remains conceptual and requires empirical validation through implementation studies in diverse healthcare settings.

CONCLUSION

This literature review demonstrates that digital technologies have substantially advanced nursing practice by improving documentation, competency assessment, clinical supervision, professional development, and related nursing management processes. However, the reviewed evidence consistently indicates that existing digital nursing technologies remain fragmented and primarily support individual functions with limited interoperability. None of the reviewed studies described an integrated digital ecosystem capable of combining nursing credential monitoring, competency assessment, clinical supervision, electronic documentation, and professional development within a unified platform. This finding highlights an important gap in current nursing informatics. The synthesized evidence supports the development of interoperable digital ecosystems capable of integrating these functions throughout the nursing credentialing lifecycle. Such integration has the potential to strengthen competency management, improve administrative efficiency, support evidence-based nursing management, and enhance healthcare quality through continuous credential monitoring. Future research should evaluate integrated digital credentialing ecosystems through multicenter implementation studies to determine their effectiveness, scalability, interoperability, and organizational impact.

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