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THE ROLE OF TECHNOLOGY IN NURSING DOCUMENTATION: A CHRONOLOGICAL REVIEW

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Abstract:

This temporal literature review of The Role of Technology in Nursing Documentation aims to synthesise the trends and evolution of the digital integration in health. Although the use of technology, such as electronic health records, has been embraced, inconsistencies in their use, effectiveness, and fit with nursing processes suggest a need for a temporal perspective. To address this challenge, a thorough and sophisticated search was conducted in the Scopus database using keywords Electronic Health Records, Nursing Documentation, Digital Records, and Technology. A total of 114 primary studies were identified after reviewing the literature. The outcomes were clustered into four time periods to represent the trends in research activity and emphasis: (1) the Nascent and Exploratory Phase (2004-2008) that showed initial adoption and feasibility of the system; (2) the Initial Growth and Conceptual Expansion phase (2009-2013) that showed increasing interest and theoretical framework development; (3) the Consolidation and Fluctuating Maturity phase (2014-2022) that showed a steady state in publication output with variable effectiveness of the system and user adaptation; and (4) the Renewed Acceleration and Digital Transformation Phase (2024-2026) that showed an increase in innovation through digital transformation and integration of new technologies. The descriptive analysis of the temporal distribution of the studies shows an increasing trend in research activity, with the highest percentage in the recent phase. Overall, the review shows a dynamic trend in technology integration in nursing documentation with improvements and setbacks. The research concludes that although digital systems have greatly improved documentation, further development, user-friendly design, and policy support are needed to ensure they are being used to their full potential.

Keyword:
Digital Records, Electronic Health Records, Nursing Documentation, Technology

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Introduction

Documentation is fundamental to nursing practice and a critical measure of quality of care, patient safety, and legal defensibility. Traditionally paper-based, it is increasingly becoming electronic nursing records and electronic health record (EHR) systems, with the advent of health information technology and a global movement towards standardised, high-quality data (Kelley et al., 2011; Rouleau et al., 2017; Taneva et al., 2024). This is anticipated to improve efficiency, accessibility, and evidence-based practice, while also highlighting ongoing issues with documentation quality, information technology system usability, and nurses' informatics skills (Akhu-Zaheya et al., 2018; H. Cho et al., 2024; Kelley et al., 2011; Lavin et al., 2015; Wisner et al., 2019). Nursing documentation continues to be at risk of incompleteness, lack of structure, and poor reflection of clinical reasoning across settings and media (Akhu-Zaheya et al., 2018; Taneva et al., 2024; Wisner et al., 2019).

Integrative and systematic reviews indicate that electronic nursing documentation can have a positive impact on patient safety, quality of care, and completeness of documentation. This includes fewer errors, falls, and infections, and better information quality and availability (McCarthy et al., 2018; Rouleau et al., 2017; Taneva et al., 2024; Wahyuni et al., 2024). Electronic systems are linked with superior process and structural aspects compared to paper, though they may not have as much narrative information (Akhu-Zaheya et al., 2018). However, the design characteristics of EHRs, including segmented screens, template-based fields, redundant data, and navigation issues, can lead to increased cognitive and documentation workload, difficulty in getting a patient overview, and limited expression of clinical judgement (H. Cho et al., 2024; Lavin et al., 2015; Rouleau et al., 2017; Wisner et al., 2019). These varied impacts show technology can be a "win-lose" situation for nursing documentation. Thus, understanding the effects of different technologies, terminologies, and implementation strategies on nursing documentation, workload, and patient outcomes is essential to inform the development of next-generation nursing information systems (Alnaji & Alkhaldi, 2024; H. Cho et al., 2024; McCarthy et al., 2018; Taneva et al., 2024; Wahyuni et al., 2024).

Literature Review

Nursing documentation practices have been transformed by technology, leading to more efficient, accurate, and better-quality care. Various technologies, such as electronic health records (EHRs), artificial intelligence (AI), and speech recognition technology (SRT), have been embraced to address the problems with traditional documentation practices, which have been shown to be inefficient and error prone. Studies have shown that these innovations have improved the efficiency of documentation, reduced workload, and enhanced patient safety and care (C.-J. Chen et al., 2024; Ju et al., 2025; McCarthy et al., 2019; Wahyuni et al., 2024).

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AI-driven systems, especially generative AI (for creating new text) and clinical decision support systems, have been promising in terms of time and accuracy. For instance, AI-based systems such as "A+ Nurse" and SmartENR have reduced the time required for documentation by 40% without affecting (or improving) documentation quality (C.-J. Chen et al., 2024; Ju et al., 2025). They also follow documentation formats such as NANDA (North American Nursing Diagnosis Association) and SOAPIE (Subjective, Objective, Assessment, Plan, Intervention, Evaluation), and offer comprehensive documentation (Ju et al., 2025). But issues like errors produced by AI and the need for human oversight underline the need for further development to ensure these technologies are readily adopted into practice (do Nascimento et al., 2026; Teimouri et al., 2025).

Another potential technology is speech recognition technology (SRT), which allows real-time, hands-free documentation. Research shows that SRT can greatly improve efficiency and reduce documentation time (up to 15%) and user satisfaction (Joseph et al., 2020; Newton-Mason et al., 2024). Still, issues such as the need for initial training, technical integration, and compatibility with EHR systems must be addressed (Dinari et al., 2023; Ferizaj & Neumann, 2024; Joseph et al., 2020). Despite the issues, SRT has demonstrated a reduction in mental effort and improved communication between healthcare professionals (Ferizaj & Neumann, 2024; Wolf et al., 2009).

EHRs and other electronic nursing documentation systems have become commonplace to enhance patient safety and quality of care. They reduce errors, increase data availability, and support decision-making processes by offering timely and accurate data (McCarthy et al., 2019; Simamora, 2019; Wahyuni et al., 2024). They also facilitate communication between health care providers and provide more patient-centred care by including patient feedback in the documentation process (De Groot et al., 2021). But challenges such as training, user-friendliness, and privacy must be overcome to ensure successful implementation (Ferizaj & Neumann, 2024; McDowell et al., 2008; Wahyuni et al., 2024).

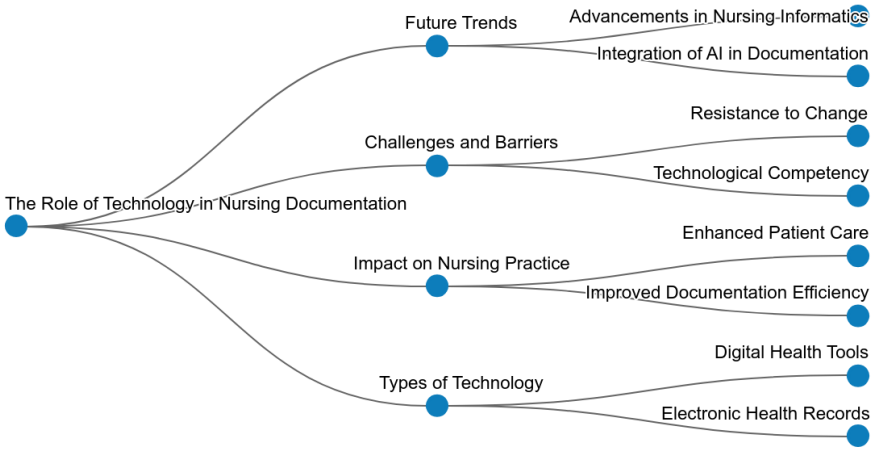

Figure 1: Mapping Concept for Literature Review

In conclusion, technology has revolutionised nursing documentation by improving efficiency, accuracy, and care quality. While the use of technologies such as AI, SRT, and EHRs has many benefits, the crucial factor for their successful use is the ability to overcome technical, operational, and ethical challenges. Further research, development, and training, as well as

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specific changes to infrastructure, are required to improve their application in nursing. This paper is a review and is broken into three parts: Part 1 is an introduction and literature review, while Part 2 is a data review. The results of this research are discussed in Section 3.

Materials and Methods

Data Collection

Electronic nursing documentation is an important part of our health systems, changing the way patient data is recorded, stored, and applied to support patient care, safety, and professional communication. The changing practices from paper-based to integrated electronic health information systems have been accelerated in the past decade by the rapid advancement of health information technology, regulatory frameworks, and the emphasis on evidence-based practice. While it is common, the growth of electronic nursing documentation is not consistent, with variations in implementation, utilisation, and evaluation. To gain insight into these transformations, this chronological review uses a systematic approach to identify patterns, milestones, and trends in literature. The study used a single-step data extraction method from the Scopus database, which provides access to a large number of high-quality peer-reviewed publications. An optimised search strategy using terms related to digital documentation and nursing was developed, and studies were selected by applying criteria for inclusion and exclusion to identify relevant, high-quality research. This efficient yet rigorous approach enabled efficient data collection of a representative sample with minimal overlap and bias. The importance of transparent and valid data collection in this type of review is imperative, as it allows for the review to be valid and reliable. The standardised search and selection process enhances the reliability of the study and reduces the risk of selection bias. Moreover, an effective data collection process allows trends over time to be interpreted appropriately, allowing for valid comparisons of time periods and contributing to the understanding of developments in the field. This, in turn, improves the validity of the review and allows for the extraction of valid evidence to inform policy, practice, and research in the area of digital nursing documentation.

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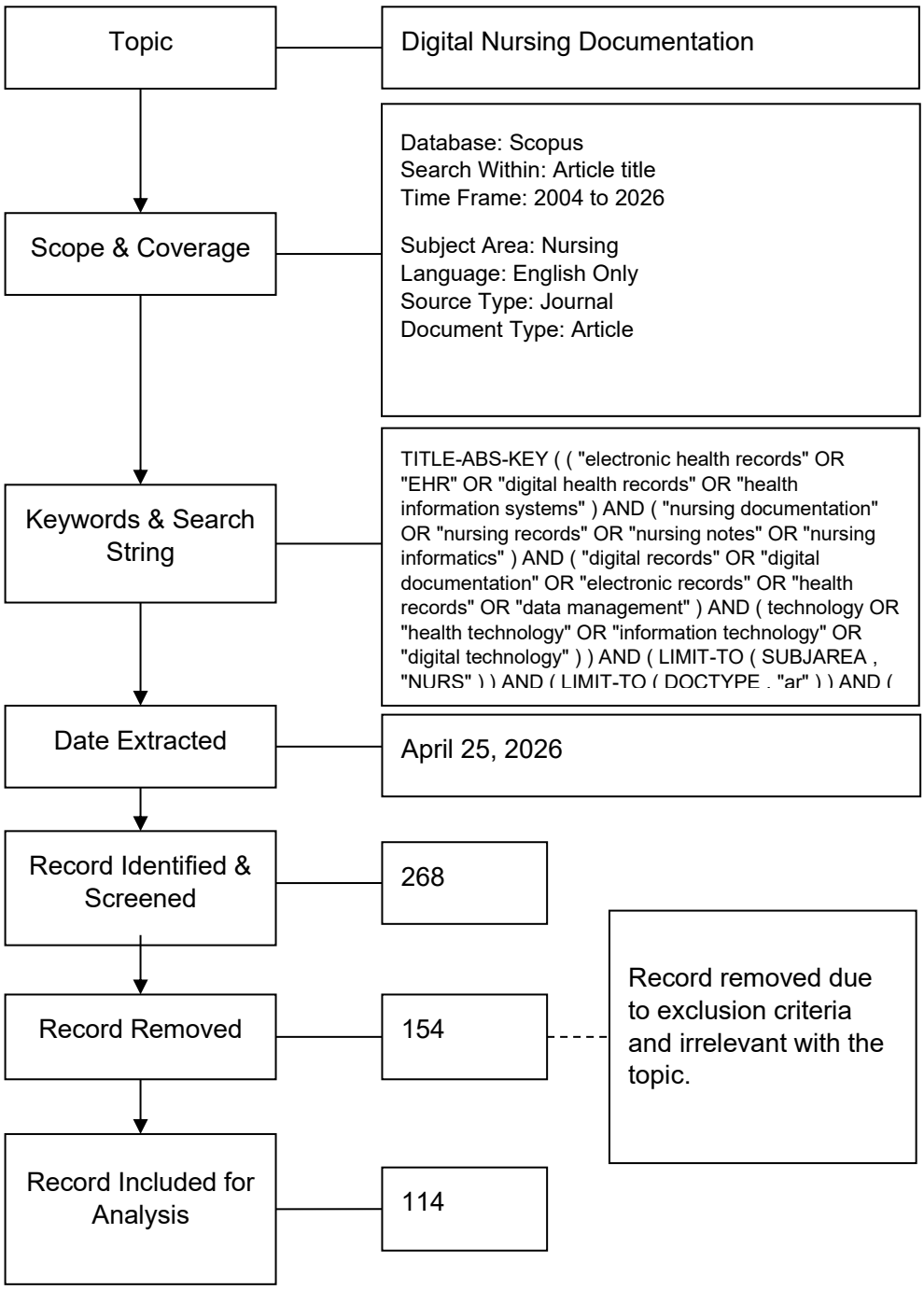

Figure 2. Flow Diagram Of The Search Strategy.

In this review, a carefully devised and systematic search strategy was undertaken in the Scopus database to yield a broad yet focused search for articles on digital nursing documentation. The search strategy was meticulously crafted to use both controlled vocabulary and keywords to capture the major conceptual themes (electronic health records, nursing documentation, digital data management, and health technology) to strike a balance of sensitivity and specificity. A search of article titles increased specificity by including only studies focused on the topic and excluding studies that were focused only incidentally. The addition of other filters, such as

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subject (nursing), document type (peer-reviewed articles), language (English), source type (journals), and publication stage (final), also improved methodological rigour, improved comparisons, and isolated high-quality, peer-reviewed literature. The time frame (2004-2026) enabled a temporal assessment, which mapped the evolution of digital documentation from the beginning of the adoption process to the current use of technology. A total of 268 records were identified, which was a comprehensive and relevant evidence base; but following screening, 154 records were excluded for a variety of reasons (duplicates, not relevant, did not meet inclusion criteria), leaving 114 articles for review. This was necessary because this process enhances the methodological rigour of the review process by limiting the inclusion of relevant and good-quality studies, thereby avoiding spurious interpretation of trends, patterns, and evolution of digital nursing documentation over time.

Data Clustering

Data clustering or grouping is a critical step in the analysis of a temporal review paper on The Role of Technology in Nursing Documentation that enhances the credibility and understanding of temporal trends. With data extracted from a large and accurate database (e.g., Scopus) using specific search terms and search strategies, clustering facilitates the grouping of publications into temporal clusters based on the year and volume of publications. This grouping allows the identification of the phases of development in the field (e.g., beginning, growth, and maturity) and so allows a greater understanding of how technology has influenced nursing documentation over time. Temporal clustering of studies based on publication volume and development enables researchers to discern patterns of research activity, content, and innovation and stagnation phases. In this way, clustering adds to the analytical rigour of the review and provides a formalised approach to representing the evolution of the field. This, in turn, allows for more detailed conclusions about the evolution and impact of technology on nursing documentation.

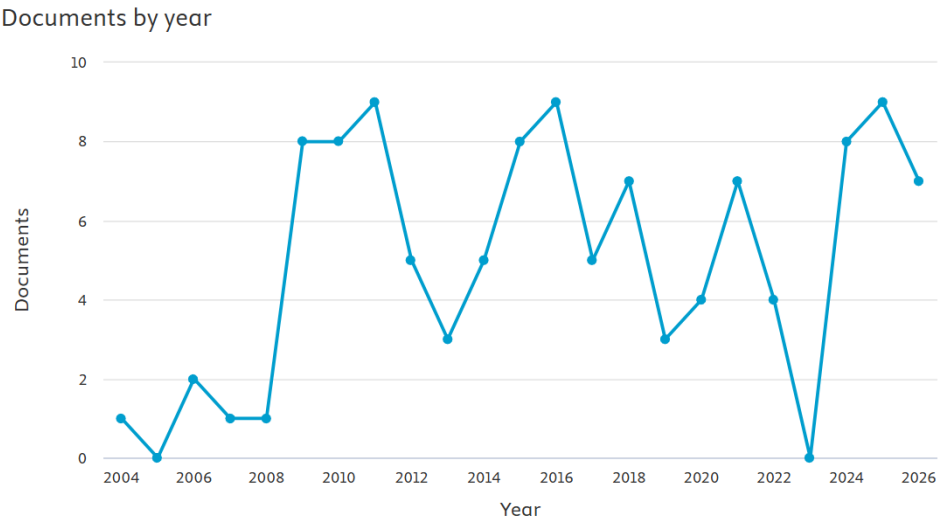

Figure 3: Number Of Documents Per Year

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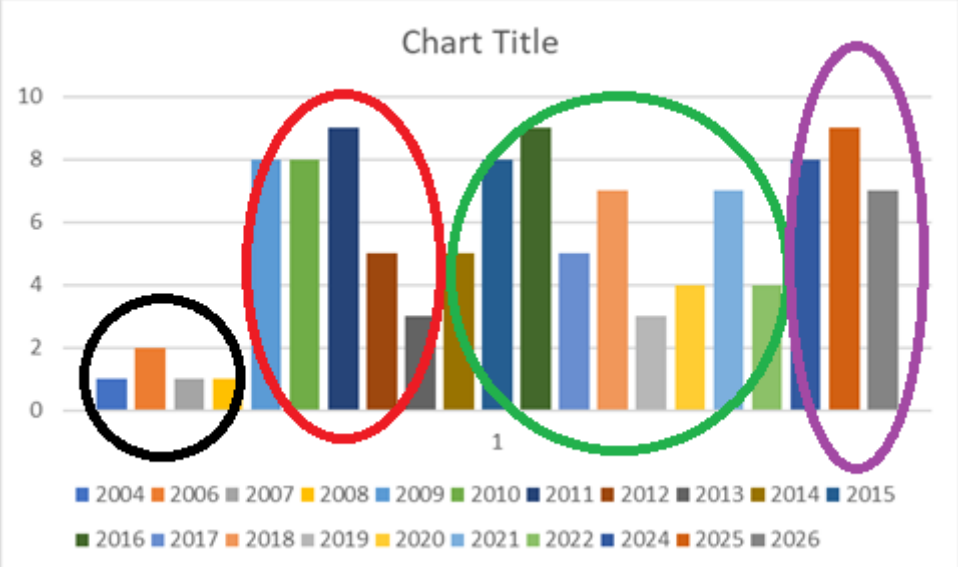

Figure 4: Number Of Documents Per Year

Based on the data retrieved from Scopus, there is an evident evolution in the publishing trend of "The Role of Technology in Nursing Documentation" from a handful of research articles to a recent rapid growth. Three periods can be distinguished according to the research output:

Phase 1: Nascent and Exploratory Phase (2004–2008)

This is evident in very few sporadic publications, which reflect initial interest in technology in nursing documentation. This suggests research was mainly exploratory, with limited theoretical and empirical research. The Exploratory Phase (2004-2008) is the first phase of research, in which technology in nursing documentation began to be researched. This period was marked by intermittent, mainly conceptual research, with initial awareness of the topic. This demonstrates the newness of the topic of electronic documentation and the absence of technology in nursing.

Phase 2: Initial Growth and Conceptual Expansion (2009–2013)

There is a dramatic start in 2009, followed by continued moderate-to-high production. This may reflect growing interest and involvement among researchers and clinicians, perhaps encouraged by the first use of electronic health records (EHR) and by digitalisation policies. The Phase of Early Growth and Development of Concepts (2009-2013) reflect a transition from descriptive early research to more targeted, focused research. The large increase in the number of publications reflects the increasing awareness of the impact of technology on nursing processes. In this phase, research began to focus on implementation issues, user experience, and the effects of electronic documentation on patient outcomes, suggesting the development of a clear research focus.

Phase 3: Consolidation and Fluctuating Maturity (2014–2022)

This is the longest phase and has stable but variable productivity. Research is still ongoing, though productivity has been variable, so this is a time for consolidation. It seems established but dynamic, with changing emphases rather than growth. The Consolidation and Fluctuating

Maturity Phase (2014-2022) is a time when research on technology in nursing documentation became mature but had variable annual research activity. This variability implies an expansion in the focus areas of system optimisation, interoperability, user satisfaction, and data integrity. The field exhibits intellectual maturity, with research refining and building on previous knowledge and studying the intricate implementation issues in health systems.

Phase 4: Renewed Acceleration and Digital Transformation Phase (2024–2026)

There is renewed high publication output following a decline in previous years. This is possibly linked with new technological innovations (e.g., artificial intelligence, advanced health informatics) and the digital transformation of health care post-pandemic. The renewed growth and digital transformation period (2024-2026) represent a renewed growth in research, with high publication output. This may be indicative of the use of the most recent technological advances, such as artificial intelligence, data analytics, and interoperable health information systems, in nursing documentation. The resurgence may be due to the rise of an innovative research focus, with a focus on efficiency, automation, and strategic deployment of technology to improve decision-making and documentation quality.

This growth reflects the shift from a research theme to a rapidly growing and influential field, which is in line with global developments in artificial intelligence and the growing concern with the sustainability of the health workforce.

Results and Discussion

Nascent and Exploratory Phase (2004–2008)

In the early years of the identified phase, the results and discussion are reflective of a conceptual and strategic approach to technology use in nursing documentation. The results analysis suggests that health care organisations were assessing a range of new technology systems (clinical information systems, decision support systems) primarily from a strategic and administrative point of view (Smith, 2004). The discussion highlights that technology was not yet integrated into the day-to-day nursing documentation process; it was used to enable change in clinical practice. The results demonstrate that decision-making was based on institutional factors such as cost allocation, technological readiness, and engagement of leadership, rather than empirical evidence of effectiveness.

From 2006, there has been a slight shift in emphasis towards patient safety and evidence-based use of technology. The findings presented highlight that the use of technology, such as electronic health records and medication safety systems, was related to enhanced error detection and prevention strategies in perinatal care (McCartney, 2006). But the discussion highlights the lack of empirical evidence specific to nursing documentation, indicating that the move to electronic documentation was more based on perceived benefits than outcome studies. Likewise, the results presented by Jenkins, Hewitt, and Bakken demonstrated the need for increased emphasis on informatics education and practice in nursing (Jenkins et al., 2006). The discussion reveals that electronic documentation, coupled with decision support, had the potential to improve evidence-based practice, but was still in the early stages of implementation. Electronic encounter logs also suggest that initial trials of informatics technologies to support documentation and workflow were also being explored.

Towards the end of the phase, the results show a shift from the conceptualisation of ideas to the implementation and evaluation of user experience. The findings suggest that electronic health record (EHR) software implementation brought new issues to the fore in patient-clinician interaction (Wolf et al., 2007). The creation of a patient sensitivity tool is an indication of increasing recognition of the communicative and social aspects of using technology for bedside documentation. The discussion reveals that while electronic systems provide nurses with better access to patient information, they also required nurses to change their behaviour to ensure patient-centred care. This suggests a shift in focus towards integrating technological efficiency with interpersonal nursing care.

By 2008, empirical studies of nurses' experience of electronic documentation systems were more apparent. These studies indicate that nurses considered electronic health records helpful in terms of access to information, organisation of tasks, and efficiency (Kossman & Scheidenhelm, 2008). Yet, the debate also highlights a number of unintended negative effects, including decreased critical thinking, decreased communication between health care disciplines, and increased documentation time. Although patient safety was perceived to have improved, there were concerns about a decrease in quality. This indicates that while systems have been adopted, the process of improving system usability and integration into workflows had not been fully developed. The discussion reveals administrative recommendations to include nurses in the development of systems, to improve technical support, and standardise documentation practices to achieve improved outcomes.

Initial Growth and Conceptual Expansion (2009–2013)

This chronological evolution of research during the phase Initial Growth and Conceptual Expansion (2009-2013) shows an advancement from attitudinal and conceptual research to the implementation, usability, and efficiency of the system in nursing documentation technologies. The findings and discussion sections of the abstracts examined reveal three significant chronological groupings: the early conceptual and attitudinal phase (2009), the system integration and policy alignment phase (2010-2011), and the efficiency and outcome-oriented phase (2012-2013).

The early conceptual and attitudinal phase (2009) is marked by a focus on nurses' attitudes, ethical issues, and fundamental problems with the use of information technology. The results reported show that nurses have a positive attitude towards the use of technology in their work environment, but also highlight issues related to the use of technology and training (Eley et al., 2009). Likewise, a lack of information technology skills was identified, with a need for formal education programs (Fetter, 2009). Theoretical issues related to electronic health records were discussed, where the debate highlighted issues of conflicting priorities between standardisation and individualised care (Petrovskaya et al., 2009). Standardised nursing language systems had the potential to enhance documentation practices, but needed considerable change management (Klehr et al., 2009). An electronic documentation system could streamline documentation, but how this would free up time for patient care was unclear (Banner & Olney, 2009). Patient perspectives also emerged, focusing on patient satisfaction with different data entry methods (Vallée-Smejda et al., 2009), and Simpson raised the need for child-friendly electronic records (Simpson, 2009). This period reflects initial exploratory studies on acceptance, ethical issues, and initial system features.

The system integration and policy alignment phase (2010-2011) demonstrates a shift in a more structured implementation, integration, and policy fit. Alexander et al. showed the variability in the level of technological sophistication in nursing homes, suggesting different levels of adoption (G. L. Alexander et al., 2010). Moore and Stonham found privacy concerns with electronic records and recommended enhanced governance policies (Moore & Stonham, 2010). It was found that the electronic health record system improved communication and research activities, suggesting system benefits (Rantz et al., 2010). The concept of "meaningful use" was discussed, noting its role in guiding technology use (Murphy, 2010; Sensmeier, 2010). Point-of-care technologies were discussed and were reported to support real-time documentation to enhance workflows (Carlson et al., 2010). The TIGER initiative highlighted the need for informatics skills (Walker, 2010), and showed the ability of data systems to detect care patterns (Monsen et al., 2010).

In 2011, the emphasis shifted to areas of usability, satisfaction, and education. It was demonstrated that integrated systems enhanced medication administration safety (Levy et al., 2011), while Martin et al. stressed the importance of the use of standardised systems such as the Omaha System in practice and research (Martin et al., 2011). Kelley et al. found that electronic documentation was a way to improve care quality by improving the accuracy and availability of patient data (Kelley et al., 2011). Issues with the use of electronic systems were noted, showing students struggled with electronic documentation (Jones & Donelle, 2011). Sockolow et al. created a questionnaire for clinician satisfaction and had mixed results (P. S. Sockolow et al., 2011). The introduction of technology, such as touch-screens, was linked to longer patient consultations (Davis, 2011). Also, the importance of informaticians (McLane & Turley, 2011) and data use and digital communication in niche areas (Johnson & Bergren, 2011; Rutledge et al., 2011) was highlighted. This stage shows a close connection between technological development and policy frameworks, together with a focus on user experience and education.

The efficiency and effectiveness phase (2012-2013) shows a shift in research towards the effects of technology on the efficiency and effectiveness of documentation and care. Munyisia et al. demonstrated the efficiency of electronic documentation by decreasing the time taken for manual documentation (Munyisia et al., 2012). The use of decision support systems was discussed, showing their potential to support clinical decision making and meaningful use goals (Harrison & Lyerla, 2012; Huryk, 2012). At the same time, the conversation was widened to include communication technologies, and the potential and pitfalls of social media in health care (Weaver et al., 2012). Harper connected health information technologies with evidence-based staffing, proposing that it can assist in staffing decisions (Harper, 2012).

In 2013, the focus of research shifted to innovation and educational uses. Huston outlined the fast-moving technological changes affecting nursing care, implying a speeding up of change (Huston, 2013). Kowitlawakul et al. created an electronic health record system for nursing education, showcasing the use of technology in education (Kowitlawakul et al., 2013). Subsequent studies confirmed the benefits of improved caregivers' time management after system introduction, confirming previous findings of improved productivity (Munyisia et al., 2013). This period, as a whole, illustrates a shift toward outcome-based assessments, particularly in terms of efficiency, integration in education, and system design.

Overall, the 2009-2013 period shows a shift from theoretical to practical considerations, from initial concepts to system implementation and evaluation. Initial considerations around attitudes, ethics, and system restrictions evolved into systematic integration in line with policy, and empirical assessments of efficiency and effectiveness. This is indicative of the maturation of technology use in nursing documentation, with a shift in focus towards usability, support for decision-making, and care quality.

Consolidation and Fluctuating Maturity (2014–2022)

The time period defined as consolidation and fluctuating maturity (2014-2022) shows an improvement in the use of technology in nursing documentation, with a shift in emphasis from initial acceptance and system evaluation to optimisation, integration, and efficiency. Through chronological grouping of years of publication, three sub-phases can be identified: early consolidation (2014-2016), expansion and usability problems (2017-2019), and optimisation using advanced technologies (2020-2022).

The early consolidation sub-phase (2014-2016) shows that the focus was on acceptance, perceptions, and basic system evaluation. Research in 2014 shows that attitudes toward electronic health records (EHRs) were varied and influenced by the system's usefulness and usability (Kowitlawakul et al., 2014; Secginli et al., 2014). Other research indicates that EHR systems were used in education to enhance nursing students' understanding of the system, but technical issues were apparent (Vana & Silva, 2014). Also, system design and data structuring methods, such as mining techniques and terminologies, were investigated for consistency in documentation (Liao et al., 2014; McCormick et al., 2015; Nogueira et al., 2015). In 2015, findings began to address patient safety and accuracy of clinical documentation, where health information technologies were shown to improve documentation completeness, but also disrupt workflows (Lavin et al., 2015; Mountain et al., 2015). Debates also stressed the importance of designing for nursing and the disconnect between technology and clinical practice (Staggers et al., 2015). In 2016, research increasingly focused on usability, ergonomics, and system reliability, especially in intensive care and mobile documentation systems (de Almeida et al., 2016; Rezende et al., 2016). There was also evidence of unintended effects of EHRs, such as cognitive load and workflow issues (Chang et al., 2016; Gephart et al., 2016). Theory was applied to explain technology use behaviours, and suggested social and cognitive factors impacted system use (Strudwick et al., 2016).

The adoption and usability issues phase (2017-2019) marks a shift in focus to understanding challenges and enhancing integration of EHRs in clinical and educational settings. Research from 2017 shows ongoing issues with EHR adoption, such as system complexity, lack of training, and fit with workflows (Heidarizadeh et al., 2017; McBride et al., 2017). Research also highlighted institutional factors (e.g., organisational incentives and policies) affecting EHR uptake and meaningful use (Lippincott et al., 2017). This era also focused on the disconnect between technology and its use, with the evaluation of technologies such as hands-free charting, but not always delivering on their promise (Wheatley, 2017). In 2018, research began exploring interactive, patient-focused technologies related to EHR systems, including new pain assessment and collection technologies (Aldekhyyel et al., 2018; Bosse et al., 2018). Research also demonstrated the improvements in structured documentation, such as the Omaha System, to integrate informatics into public health nursing (Eardley et al., 2018). However, there were unintentional consequences of risks to patient safety and quality of documentation, particularly in neonates (Dudding et al., 2018). Research also highlighted the importance of

attitudes and training for successful implementation (S. Alexander et al., 2018). In 2019, attention turned to usability assessment and educational approaches, such as dashboard systems and new teaching approaches, that were shown to improve documentation efficiency and teaching quality (Dowding et al., 2019; Malane et al., 2019). EHRs were also shown to be useful in clinical practice for students to integrate theory with practice.

The advanced technology and optimisation phase (2020-2022) is marked by the use of new technologies and a focus on efficiency, data use, and system optimisation. Studies conducted in 2020 report the growing need for nurses to be cyber aware, to support their digital roles (Kamerer & McDermott, 2020). This phase of usability studies shows the need for quick and flexible decision support systems, particularly in the context of infectious diseases (Hoelscher & McBride, 2020). Furthermore, patient engagement via portals and other digital technologies was explored, revealing differences in meaningful use based on population factors (Strudwick et al., 2020). The integration of evidence-based practice into EHRs was also shown to help advance clinical decision-making (Chipps et al., 2020). In 2021, studies shifted towards big data analytics and sociotechnical approaches, highlighting that health information systems are complex and require a multidisciplinary approach (Deckro et al., 2021; P. Sockolow & Yang, 2021). Research also identified variations in documentation of patient data and the difficulties in keeping data up-to-date and consistent across systems (P. Sockolow & Yang, 2021). Machine learning and artificial intelligence methods, like narrative record classification, showed promise for enhancing the efficiency and consistency of documentation (Aoki et al., 2021). In 2022, research increasingly focused on decreasing documentation workload and improving workflow efficiency with new technologies such as wearable devices and automated monitoring (Cheng et al., 2022; Rose et al., 2022). Participants highlighted the need for tailoring interventions to enhance EHR usability and minimise documentation time (Strudwick et al., 2022). Enhanced technology acceptance models showed that user perceptions, support for technology use, and system design continued to be the key factors in successful technology use (Gaughan et al., 2022).

Renewed Acceleration and Digital Transformation Phase (2024–2026)

The renewed acceleration and digital transformation phase (2024-2026) reflect a rapid shift toward intelligent, data-driven, and highly integrated technological systems in nursing documentation. Based on chronological clustering, three sub-phases are identified: early transformation (2024), integrative artificial intelligence expansion (2025), and advanced automation with future-oriented systems (2026). In these eras, studies and conversations demonstrate an evolution from competency assessment and system improvement to predictive analytics, automation, and less administration.

In the early transformation phase (2024), we find a strong focus on informatics competence, system performance, and the integration of artificial intelligence into nursing documentation processes. Research indicates nurses' informatics competency is a major predictor of quality and completeness of electronic documentation, especially in critical care (Akhu-Zaheya & Etoom, 2024). Similar findings suggest differences in competency levels among nurses, with a need for training and preparation for e-health (le Roux et al., 2024). Training and clinical interventions, including academic EHRs for mental health professionals, were found to enhance documentation and clinical decision-making (Mountain & Hill, 2024). Research comparing the use of clinical decision support systems with conventional documentation practices shows increased diagnostic performance and documentation quality with digital

interventions (Bertocchi et al., 2024). At the same time, studies highlight variations in documentation practices at the bedside, including differences between real-time and retrospective documentation (Gauthier-Wetzel, 2024). Novel technological methods, such as deep neural networks using nursing notes, show high predictive accuracy for patient outcomes, such as the risk of death after discharge (Huang et al., 2024). Another dimension of conceptual and methodological discussion provides a basic understanding of generative artificial intelligence and data-centric machine learning, signalling a shift towards new computational approaches in nursing informatics (Ball Dunlap et al., 2024; Ross et al., 2024).

In the integrative artificial intelligence expansion phase (2025), results show greater integration of artificial intelligence and clinical decision support in nursing practice. Research reports show that collaborative electronic documentation systems affect nurse-patient communication, with both positive improvements and potential drawbacks related to decreased interactions (Iwuchukwu et al., 2025). The creation of clinical decision support systems that combine predictive models with home care demonstrates enhanced care planning and risk assessment, especially in the context of chronic conditions like heart failure (Chae et al., 2025). Furthermore, language models in adverse event reporting show enhanced detection and reporting, indicating that natural language processing technologies can support patient safety efforts (I. Cho et al., 2025). Research also shows that nurses' attitudes towards electronic documentation systems are mixed, with factors such as workload, system design, and user-friendliness impacting use and satisfaction (Jacques et al., 2025). Analytical reviews in specific domains, such as pediatric palliative care, identify the advantages and challenges of electronic documentation for capturing individualised care information (Beghè et al., 2025). Additional analyses highlight that artificial intelligence in symptom phenotyping and interpretation of data offer practical solutions for improving clinical understanding and decision-making (Pinto & Jackson, 2025). Yet, qualitative research demonstrates that documentation practices continue to fall short in fully capturing individualised care needs, especially in cancer care (Hynnekleiv et al., 2025). Contextual investigations of health information technology in care transitions reveal both enablers and challenges, highlighting the need for integration with systems and processes (You et al., 2025). Conceptual analyses also confirm the historical and theoretical roots of computing in nursing informatics, suggesting the field has matured (Newton & Maas, 2025).

In the future and future systems (2026) phase, evidence suggests a strong emphasis on minimising documentation tasks with automation, smart systems, and integrated systems. Research shows that new innovations in perioperative nursing practice improve accuracy and integration of documentation and workflows, and use of digital technologies (Macieira et al., 2026). Evaluation studies show progress in informatics skills among specialised groups of nurses, but with limitations in keeping pace with emerging technologies (Nemati et al., 2026). Theoretical discussions suggest that artificial intelligence will play a major role in significantly reducing or removing documentation tasks, with automation and real-time data capture (Michalowski et al., 2026). This is consistent with empirical findings, where smart control systems demonstrate improved efficiency and accuracy in documentation (R. Chen et al., 2026). Qualitative studies emphasise the balance between technology and human interaction skills, suggesting that as electronic systems are used more, clinical and interpersonal skills need to be developed (Krel & Vrbnjak, 2026). Research using technology acceptance models validates that usefulness, ease of use, and education are still influencing the intention to adopt technologies among nursing students (Alrashedi et al., 2026). Furthermore, preliminary trials of automatic speech recognition systems demonstrate positive results in minimising manual

data entry and improving real-time documentation, but there are still issues with accuracy and integration (Jeun et al., 2026).

In conclusion, the chronological evolution from 2024 to 2026 demonstrates a shift from competency-based adoption and system improvement to smart, automatic, and predictive documentation systems. The results consistently show that although technological features have improved rapidly, issues of usability, training, integration, and ensuring patient-centred care are essential elements to consider in the future development of nursing documentation systems.

Conclusions

This chronological review sought to analyse the development of research on the use of technology in nursing documentation between 2004 and 2026 from a dataset obtained from the Scopus database. This review aimed to identify time-related trends, categorise phases of development, and explore the impact of technological advancement on nursing documentation over time. Through categorisation of 114 studies over the years into four phases, the study offers a holistic view of the evolution of research activity and themes in this field.

The consolidation of temporal trends displays a pattern of development. The initial phase (2004-2008) involved scattered and exploratory studies, mostly centred on the conceptual and technical feasibility of adopting the technology. This was succeeded by a development phase (2009-2013) with a rising volume of publications, and a shift in focus towards the implementation, user experience, and policy fit of systems. The maturity phase (2014-2022) experienced stagnation in productivity, with a diversification of the focus on a wide range of topics, such as system performance, interoperability, and user interface problems. The latest phase (2024-2026) reveals renewed growth as a result of the accelerated pace of digital transformation and technology adoption, such as artificial intelligence, predictive analytics, and automation. Over time, research designs have transitioned from exploratory and descriptive to more sophisticated, data-driven, and outcome-focused designs.

A number of trends and innovations are observed. A transition from simple e-documentation systems to smart and integrated digital systems is evident. The emphasis of research has shifted from acceptance and adoption to efficiency, usability, and effectiveness. The research methods reflect increasingly sophisticated technology with the use of machine learning, natural language processing, and decision support. However, ongoing issues with usability, workflow integration, and documentation continue to be a focus. Such trends suggest a shift from an emerging research field to an established and innovative field.

The temporal organisation of the literature makes an important contribution to knowledge through its temporal lens on the evolution of the field. Organising research by temporal blocks allows for a better understanding of stages of development, growth rates, and research trends. This improves interpretability, as it places results in the context of particular time periods and thus identifies underlying trends that might not be apparent in thematic reviews. It also allows for a better understanding of the interaction between technological advances and healthcare needs and how they have shaped nursing documentation.

The identified trends have practical and research implications. The growing use of sophisticated technologies underscores the opportunities to enhance documentation efficiency,

effectiveness, and quality of patient care. From a practical standpoint, the trends highlight the importance of a user-centred design approach, ongoing training, and integration with clinical processes for implementation. From a research perspective, the development underlines the importance of a multidisciplinary approach. This includes healthcare providers, informaticists, and technology providers, to facilitate the design and development of sustainable solutions.

Although this review has brought some new insights, it is not without its limitations. Using only one database may influence the scope of the literature review, the inclusion and exclusion criteria, and the keywords that were used may have skewed the results. The timeframe may also not have captured all of the latest technological developments in digital health. In response, future reviews should consider additional databases, keywords, and multidisciplinary approaches to improve the review. There is also a need for more empirical studies to determine the long-term success of the technologies used for nursing documentation.

In summary, this historical overview highlights technology's growing importance in nursing documentation, from basic computerised systems to more complex, smart, and integrated digital technologies. The historical approach is essential for comprehending the dynamics of this field and understanding its past and future. This helps to understand the past and provides a basis for future innovation, policy, and evidence-based practice in nursing documentation.

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