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REVIEW

Information Technology in Nursing Practice: A Scoping Review of Assessment Tools for Evaluating Nurses' Competencies

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Introduction: The ongoing evolution of Health Information Technology has provided professionals with major challenges in maintaining the safety and quality of care provided to patients, especially when it comes to hyper-technological environments in hospital. This has driven the need to develop specific competencies and maintain a balance between ethical aspects, social and legal challenges related to privacy and data security, as well as the challenge of ensuring person-centered care practice. Then it will be important to understand what competences nurses are developing, based on what models and what instruments exist to assess them.

Purpose: Identify and map information technologies and measurement instruments used to assess nurses' competencies in technological environments in hospital.

Methods: A scoping review was carried out using the methodology presented by The Joanna Briggs Institute.

Results: Of the 101 articles extracted, 4 articles were selected where 5 instruments were identified that evaluate: (1) Informatics Competency in Nursing Leaders; (2) Technological Competence as Nursing Care – Perception and Practice dimension; (3) Self-Assessment of Nursing Informatics Skills; (4) Clinical Decision Making in Nursing, and (5) Self-Assessment Questionnaire that Assesses Nurses' Informatics Skills, for nursing informatics.

Conclusion: The development and enhancement of technological skills in nursing care provide an innovative and crucial perspective for managing and organizing healthcare delivery. This perspective is of great importance, reinforced by the reality in which nurses find themselves, with highly technological nursing practice environments that are increasingly developed. Knowledge and use of IT equipment, areas of basic IT knowledge, information literacy, wireless device skills, the role of clinical IT, and applied IT skills are some of the skills identified by this study. The use of various support tools as instruments for clinical decision-making in nursing is also fundamental to the quality of nursing care.

Keywords: clinical competency, competency assessment, information technology, instruments, nursing care, hospital

Introduction

The health care delivery system supports key tenets of person-centered care, encompassing dimensions of safety, effectiveness, efficiency, and easy accessibility. This is attributed to a combination of rapid technological advancements, rising expectations and demands for sustainability, along with staff shortages, turnover, migration, and potential geopolitical instability.[1–3] The World Health Organization views nurses as the backbone of healthcare systems across all societies; consequently, a lack of competence among nurses can significantly impact patient outcomes.[4] Nurses' competence in relation to safety and quality of care has been extensively discussed.[5–9] Indeed, Aiken et al[5] studies have demonstrated that the educational level of nurses is critical; specifically, higher competence among nurses in hospital wards leads to a lower incidence of mortality, morbidity, and adverse events.[10]

As the central theme of nursing is "caring" and if the integration of technology as a mean of collecting data and improving patient safety is reaching maturity, this moment is of particular importance in care practices. If nursing

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technology aims to improve the quality results of patient care, caring for the patient is certainly part of this equation, if not the central theme.[11] Consequently, the implementation of Nursing Information Systems[12] generated in nurses the need to acquire new skills in providing care.[13] Many countries have enhanced competency requirements with minimum standards of knowledge, skills, and attitudes for healthcare practice.[2] Technical competencies are the capabilities and skills of healthcare workers to practice and perform effectively and safely without leader supervision while applying appropriate skills, knowledge, and judgment.[14]

The most recent literature refers us to the use of different technological tools, for example, early warning systems aim to detect patients' deteriorating condition, improving the quality of nursing care and reducing the number of emergencies.[15] Barcode Medication Administration technology improves quality and safety by reducing the risk of human error and simultaneously guarantees product traceability. However, either depends on nurses' knowledge to mediate between the embedded logics of their design and the unpredictable needs of patients,[16] to reap these benefits, digital transformation in the health sector will require not only technical advancements but also adaptation of attitudes, skills, and culture within the health workforce.[17] This includes the specific knowledge and skills required for successful job performance in specialty fields. Behavioral competencies refer to the ability to engage and collaborate with others in specific practice contexts.[18] Leadership competencies include behaviors and skills that contribute to organizational performance.[2] Healthcare organizations will be more prepared to integrate information technology into care processes if teams have the appropriate knowledge and skills.

Aim of the Review

The objectives of this study were twofold, namely identify and map the information technologies and measurement instruments used to assess nurses' competencies.

Material and Methods

This scoping review was conducted by guidelines of Joanna Briggs Institute (JBI) updated methodology for scoping review[19] and was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist (PRISMA-ScR checklist).[20] A protocol for this scoping review has been registered and published on the Open Science Framework (https://osf.io/ey8qr/)

The research was conducted in three distinct phases, utilizing the Medline, CINAHL, Cochrane databases through the EBSCO platform, as well as ScienceDirect, Wiley Online Library, SciELO, and PubMed. Data extraction and analysis were performed using the JBI Template for Source of Evidence Details, Characteristics, and Results Extraction Instrument, which was adapted to address the specific questions of this review: What information technologies do nurses use, and what measuring instruments are used to assess their competencies in technological environments in hospitals?

Criteria for Eligibility

The inclusion criteria were based on the mnemonic PCC – Population, Concept and Context, which refers to the type of study, language, and the date of publication of the documents added.[19]

Population: Nurse/Nurse Manager

Nurse competence is connected to professional performance, showcasing the effective use of skills and knowledge that facilitate clinical judgment and decision-making in research, teaching, training, management, and consultancy, ultimately contributing to the enhancement and progression of nursing care delivery.[21]

Concept: Information Technology

Health technology refers to the application of skills and knowledge organized into devices, procedures, and systems designed to address health issues and enhance quality of life.[3] Nursing information technologies are mainly utilized to facilitate the nursing process,[22] based on technical and semantic interoperability standards.[23]

Context

Technological environments in hospitals.

Study Selection

Therefore, this study involves nurses and nurse managers in hospital settings who incorporate information technology into their caregiving practices.

Inclusion Criteria

All types of studies containing instruments that assess how nurses use information technologies in their care practice and what competencies they develop.

Types of Evidence Sources

All types of peer-reviewed studies published since January 2012 to December 2023, with abstracts in Portuguese, English and Spanish (Castilian) were considered eligible. From the perspective of the methodology of a scoping review,[24] included studies were both qualitative and quantitative, whether prospective or retrospective, encompassing randomized clinical trials, cross-sectional studies, experimental studies, literature reviews with or without meta-analysis, qualitative context analyses, expert opinions, reflections, and descriptive studies. Editorials and posters were excluded.

Strategy for Search

In December 2023, we conducted a three-step search strategy as recommended by JBI.[25,26]

1. A preliminary search of two databases
2. Analysis of keywords, titles, and abstracts
3. Manual search of pertinent materials

First, indexing terms were determined in the CINAHL and MEDLINE databases to select the most relevant words and phrases for creating the Boolean search query. The second phase involved a systematic search of electronic databases using predefined terms. The databases accessed were Medline, CINAHL, Cochrane Central Register of Controlled Trials via the EBSCO platform, ScienceDirect, Wiley Online Library, SciELO, and PubMed. The search strategy involved different combinations of descriptors, utilizing the Boolean operators 'AND' and 'OR', along with the truncation symbol '*', to capture multiple suffixes, having been established as a limiting filter, publication date of January 2012 to December 2023. To obtain documents not included in the previously mentioned databases, a search was also conducted in the gray literature, aiming to incorporate information and studies that fulfilled the predefined inclusion criteria but were absent from scientific publications - Table 1. In the third stage, the reference lists of selected articles were reviewed,

Table 1 Data Sources and Research

MEDLINE	(Health Information Systems OR Information Systems OR Information Technology OR Technology) AND (Nursing Care OR Nursing OR Patient Care Planning OR Primary Nursing OR Patient Care Management) AND (Nurses OR Nurse Clinicians OR Nurse Administrators OR Nursing, Supervisory) AND (Hospital OR Hospitalization OR Length of stay) AND (Psychometrics OR Assessment tool) AND (Professional Competence OR Clinical Competence) AND (Hospital OR Hospitalization OR Length of stay)
CINAHL	(Health Information Systems OR Information Systems OR Information Technology OR Technology) AND (Nurses OR Nurse Clinicians OR Nurse Administrators OR Nursing, Supervisory) AND (Hospital OR Hospitalization OR Length of stay) AND (Psychometrics OR Clinical Assessment OR Assessment tool OR Competency Assessment OR Instrument Validation) AND (Clinical Competence OR Professional Competence) AND (Hospital OR Hospitalization OR Length of stay)
OTHER SOURCES/ TERMS	Psychometrics; Clinical Assessment; Tools; Nursing Care; Competency Assessment; Instrument Validation; Clinical competence; Caring; Technology, Medical

examining studies deemed relevant and supplementary to enhance the research's sensitivity and encompass the broadest possible range of existing literature.

Data Extraction

Study selection, data extraction and coding were carried out by two independent reviewers, a third reviewer was available to resolve possible discrepancies. To manage the research results, the Covidence® software was used, facilitating the process of selecting studies. Duplicate studies were automatically eliminated. Initially, the titles and abstracts of the selected studies were analyzed based on the inclusion criteria. Following this initial selection, the articles were reviewed in their entirety. Some studies were identified where both reviewers did not agree, so that each one justified their choice, and a consensus was reached, without the need for the intervention of the third reviewer. Finally, after the reading of the eligible studies in full by both reviewers, relevant data were extracted and analyzed using the JBI Template Source of Evidence Details, Feature and Results Extraction Instrument, adapted to the question of this review, validated, and accepted by both reviewers. The results of the search and selection of studies are presented in full schematized using the PRISMA-ScR – Figure 1.

A total of 101 results were identified across all sources. There were three (n = 3) duplicates identified, leaving 98 (n = 98) titles and abstracts for review. There were 86 (n = 86) articles excluded through this process due to the irrelevance of the papers to the aims of the review. Screening yielded 12 studies with potential for eligibility. Exclusion of several articles deemed to be out of scope resulted in 4 studies being included in this review.

To respond to the objective of this review, the analysis of the articles went through 3 stages, identifying the dimensions analyzed in each of the stages, represented in Tables 2–4.

The first step was to understand the design and objective of the studies under analysis, identify the information technology used by nurses in the care environment and skills developed, and the identification of instruments that allow evaluating these skills. The second stage was dedicated to checking the instruments, understanding what the instruments assess, the type of measurement scales used and identifying the methodology used when analyzing the psychometric quality of these instruments. The analysis and report of a psychological measure's internal consistency is a well-established requirement in the scientific community carried out for each instrument. Among the several available methods to estimate internal consistency, Cronbach's α ranks high in most researchers' preferences.[27] Thus, in the third stage, it was considered important to explore the methodology and results of the psychometric analysis regarding demographic data, construction validity and reliability, to safely understand the applicability of the instruments.

Results

Studies spanned over our predefined timeframe from the earliest in 2017[28] to the most recent paper, published in 2022.[29] The studies were carried out in various geographic locations: United States (n = 2); Philippines and Saudi Arabia (n = 1); West Bank and Palestine (n = 1); Türkiye (n = 1).

This research highlights methodological studies with cross-sectional quantitative approaches, through exploratory factor analyzes (n = 3).[28–31] Methodological studies aim to develop, validate, and evaluate solid and reliable measurement instruments.[32] One of the studies presents a cross-sectional, descriptive-correlational design with a quantitative and qualitative approach[28] - Table 2. Of the 4 studies included in this review, 4 of the 5 instruments under analysis conclude that the identified instruments have acceptable reliability and validity values. Aiming at a greater understanding of the identified instruments, Table 3 shows their characterization, specifically, what the instruments evaluate, items and the measurement scale, and route to evaluate the psychometric qualities of the instrument's measurement scales.

It was also considered that it was important to understand how the instruments had been tested and validated, regarding translation, validation, and consistency to understand whether the instruments were suitable and accurate for the intended application. Table 4 presents the methodology of the studies, results of the psychometric analysis of the instruments and conclusions of the studies.

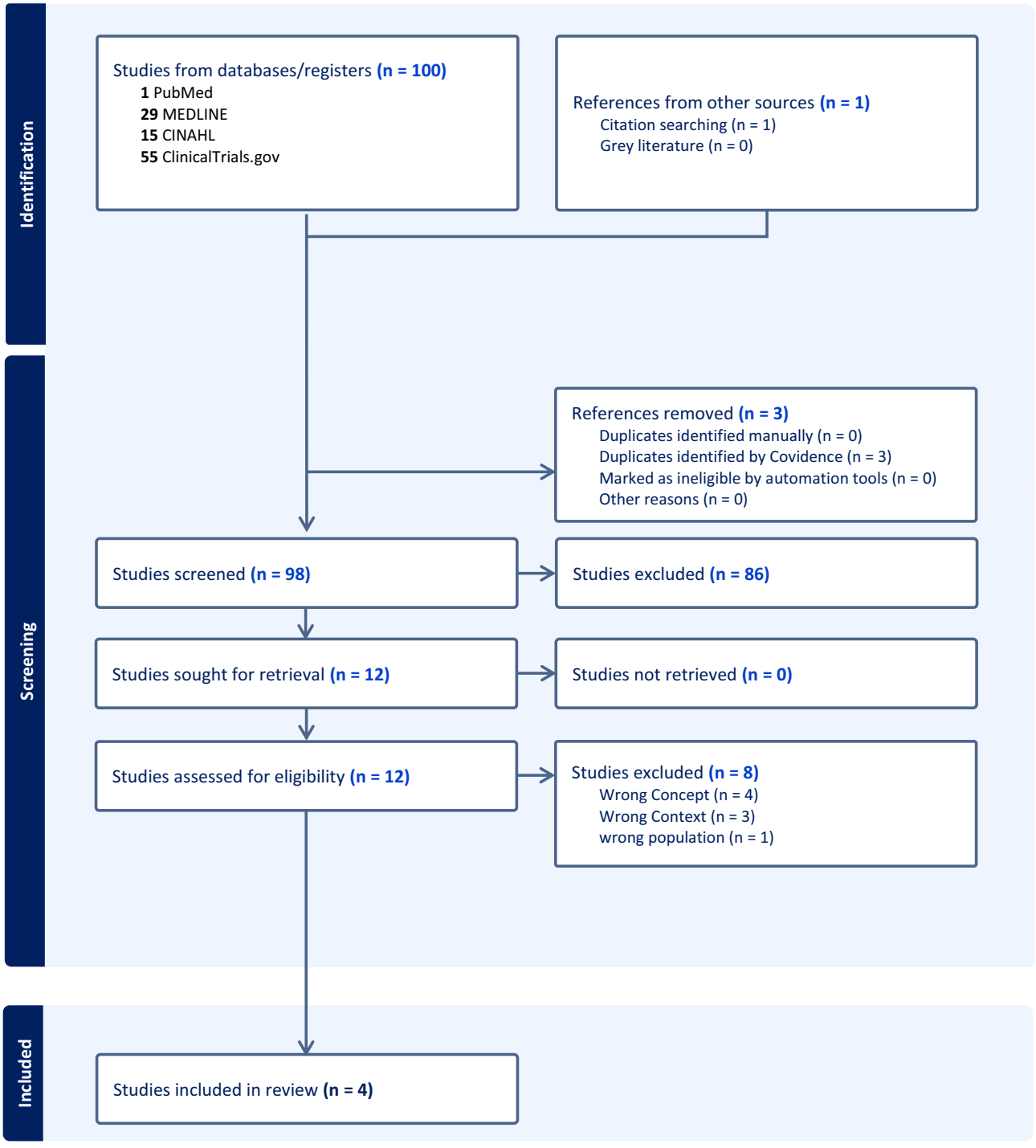

Figure 1 Flowchart of the study selection.

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Table 2 Details of Included Studies

Authors/Year	Study Design	Aim	Information Technology and Nursing Skills	Instruments
Yen et al (2017)[28]	**Methodology**: multi-method study: item reduction and psychometric analysis; quantitative analysis. **Study duration**: 2 years. **Participants**: 357 nurse leaders nationwide (United States)	Refine and validate the instrument: Nursing Informatics Competency Assessment for the Nurse Leader (NL)	Chief Nursing Officer and Nurse Leader: Specific computer and technology skills required by current: Health Information technology requirements; Concepts and management; Strategic planning; Executive leadership; Financial management; Ethical/legal concepts	• **NICA - LN** Nursing Informatics Competency Assessment for the Nurse Leader
Batran et al (2022)[29]	**Methodology**: cross-sectional, descriptive-correlational design. **Sampling**: random with clusters in hospitals with a high occupancy rate and use of electronic records for more than 5 years **Participants**: 951 government hospital nurses. (West Bank and Palestine)	Examine the relationship between nursing informatics skills and clinical decision-making, considering the individual characteristics of nurses and job-related characteristics.	Competence in nursing informatics related to clinical decision making can improve nurses' ability to engage in clinical decision making;	• **SANICS** Self-Assessment of Nursing Informatics Competencies Scale • **CDMNS** Clinical Decision-Making in Nursing Scale
Yokotani et al (2021)[30]	**Methodology**: web-based cross-sectional research design: international online survey platform **Study duration**: 2 months **Participants**: 202 nurses, hospital nurse manager, nursing instructors supervising students in clinical practice. (Philippines, United States of America, Saudi Arabia, and others)	To determine the psychometric properties of the Technological Competency as Caring Nursing Instrument Revised version in English with Practical dimension.	The use of technology as a nursing care tool: Understanding patients' needs; Improving their self-esteem; Promoting better health; Building better relationships with others.	• **TCCNI_RePract** Technological Competency as Caring in Nursing Instrument – Revised and Practice
Kaynar et al (2020)[31]	**Methodology** cross-sectional design **Convenience sample**: nurses working at University, Faculty and Hospitals. (Istanbul, Türkiye) **Study duration**: 4 months **Participants**: 518 nurses	Evaluate the psychometric properties of a Turkish version of the instrument.	Nursing informatics skills are essential for safety and effective clinical practice and are an ongoing requirement: Nursing informatics skills; Areas of basic computer knowledge; Clinical information management; Information literacy	• **TANIC-T** Technology Informatics Guiding Educational Reform–Based Assessment of Nursing Informatics Competencies Tool -

Table 3 Characterization of Instruments

Instruments	What the Instruments Evaluate	Items and the Measurement Scale	Psychometric Qualities of the Instruments
NICA - LN	Informatics Competency in Nursing Leaders: • Strategic implementation • Advanced Information • Management and education • Executive planning • Ethical and legal concepts • Requirements and system	• 26 items **5-point Likert scale**: (1) strongly disagree; (2) disagree; (3) neutral; (4) agree; (5) strongly agree, with do not understand option	1. **Delphy Study** • Identify 74 skills from an initial list of 108 skills) 2. **Quantitative study** (scaled development by DeVellis): • Identification of competencies • Clarify the concepts intended to measure • Generate a set of items • Determine the measurement format • Have the initial item pool reviewed by experts • Consider the inclusion of validated items • Administer items to a developmental sample • Evaluate the items (item performance, factor analysis and alpha) • Optimize scale length. 3. **Exploratory factor analysis (NICA-NL)** • Determine the number of factors necessary • Select an extraction and rotation method (orthogonal or oblique) to evaluate the **stability** of the factorial solution across a different number of factors • Repeat item reductions until the final solution is reached according to the item's factor loadings • Eliminate items that affect Cronbach_s reliabilities. 4. **Reliability tests** to validate internal consistency - Cronbach's alpha
TCCNI_RePract	Technological competence as nursing care - perception and practice dimension: • Knowing the Person • Technological Competency as Caring • Technology and Caring • Expression of Nursing as Caring	• 25 Items **7-point Likert scale** **Perception dimension |** values ranging from (1) Strongly Disagree to (7) as Strongly Agree **Practice dimension |** values ranging from (1) as "Never" to (7) as "Always."	1. **Content validity** - experts team in caring research were involved in administering the 50-item questionnaire of instrument and examined each item by considering the **consistency of the constructs** - translated into English. 2. **Pilot study** was administered – understanding the questions and indicate items for improvement. 3. **Demographic characteristics** - frequency (n) and percentage (%) were calculated. 4. Mean, standard deviation and 95% **confidence interval (CI)** - 95% 5. **Bartlett's sphericity tests** ($p < 0.0001$) - check whether the data fit before EFA. 6. **Sampling adequacy** - measured with the Kaiser–Meyer–Olkin (KMO) index. 7. Anti-image correlations and communalities were determined for each item. 8. **Construct validity** of the scale - assessed with EFA, performed using the maximum likelihood method with Harris-Kaiser orthoblique rotation. 9. **Reliability** - assessed using Cronbach's alpha coefficient. 10. **Paired *t*-test** to compare the total means of the perception and practical dimension and the mean of the factor points (MFP) of each item

(*Continued*)

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Table 3 (Continued).

Instruments	What the Instruments Evaluate	Items and the Measurement Scale	Psychometric Qualities of the Instruments
SANICS and **CDMNS**	**Self-Assessment of Nursing Informatics Competencies Scale**: basic computer knowledge and skills, wireless device skills, clinical informatics role, clinical informatics attitudes, and applied informatics skills: clinical informatics. **Clinical Decision-Making in Nursing Scale** - evaluates clinical decision making. Describes nurses' perception of clinical decision-making based on self-expression: search for alternatives or options, survey of objectives and values, evaluation and reevaluation of consequences, search for information and impartial assimilation of new information.	• 30 Items **5 point Likert scale** (5) alway (4) frequently (3) occasionally (2) seldom (1) never	**Questionnaire** consists of the following parts: • Socio-demographic data, • Nursing informatics competency, • Clinical decision-making.
		• 40 Items **5 point Likert scale** (5) always (4) frequently (3) occasionally (2) seldom (1) never	1. **The validity of the content**, the instruments were translated following the translation protocol of the World Health Organization - translated into Arabic 2. **Pilot Study** - to interpret and/or clarify the content of the instruments. 3. **Reliability**was evaluated using internal consistency reliability with Cronbach's α
TANIC-T	**Self-assessment questionnaire that assesses** nurses' informatics skills - nursing informatics	• 85 Items **4 point Likert scale** Ranging from 1 = beginner/NA to 4 = expert	1. **Self-assessment questionnaire** (paper and online): socio-demographic data and Technology Informatics Guiding Educational Reform–Based Assessment of Nursing Informatics Competencies Tool (TANIC-T) 2. **The validity of the content**, the instruments were translated following the translation protocol of the World Health Organization - translated into Turkish. 3. **Experts team** - to assess the CVI. 4. **Pilot Test** - determined that there was no problem in understanding the items. 5. **The reliability** of the TANIC-T was assessed with item-total subset correlations and Cronbach's α coefficients. The criteria of item-total correlation greater than 0.30 and Cronbach's α levels of.80 or higher were considered desirable. 6. **The stability** of the measure was tested using intraclass correlation coefficients (ICCs) construct validity of the tool, an exploratory 7. **Factor analysis (EFA)** with varimax with Kaiser normalization was performed to identify the factor structure of the data fit. Only items with factor loadings above 0.40 were considered significant. 8. **The statistical analysis** was performed utilizing IBM SPSS Statistics version 21 (IBM, Armonk, NY) and $P < 0.05$ was considered statistically significant.

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Table 4 Psychometric Analysis of the Instruments

Psychometric Analysis ***(Statistical Analysis was Performed using IBM SPSS Statistical - Versions 27, 25, 21)***						
Article	**Demographic Data**	**Construction Validity**		**Reliability**		**Conclusions**
Instruments / Studies	**Percentage (%) | Frequency (n)**	**Content Validity Index (CVI)**	**Exploratory Factor Analysis (EFA)**	**Internal Consistency Coefficient (Cronbach α)**		**Study / Instruments**
				Instrument	**Factors / Subscales**	
Nursing Informatics Competency Assessment for the Nurse Leader: Instrument Refinement, Validation, and Psychometric Analysis.	**Demographic characteristics of the study subjects**: age ranges from 21 to 76 years, with an average of more than 26 years of working experience. Most have a master's degree and are nurse managers, directors, or chief nursing officers	Translate **>** back translate **>** instrument test **>** panels of experts **>** pilot study **>** interpreting or clarifying the contents of the instruments **>** test	**Nursing Informatics Competency Assessment for the Nurse Leader** (6 factors | 26 items)	–	Strategic implementation management = **0.96**	This study established a **valid and reliable** NI competency assessment instrument with sufficient specificity for NLs
					Advanced information management and education = **0.91**	
					Executive planning = **0.9**	
					Ethical and legal concepts = **0.83**	
					Information systems concepts = **0.92**	
					Requirements and system selection = **0.82**	
Psychometric Testing of the Technological Competency as Caring in Nursing Instrument - Revised (English Version Including a Practice Dimension)	**Demographic characteristics of the study subjects**: included 202 respondents female nurses (66.8%), aged 30 to less than 40 years (43.6%), and 83.6% of the subjects were nurses from the Philippines.	Experts **>** 50-item questionnaire **>** examined each item **>** considering the consistency of the constructs **>** pilot study **>** understanding the questions **>** reviewed **>** revised **>** test	**Technological Competency as Caring in Nursing Instrument_perception and practice** (4 factors | 25 Items)	**0.94**	Knowing the Person = **0.93**	The TCCNI-RePract is an **acceptable** tool that can **reliably** measure nurses' perception and practice of TCCN.
					Technological Competency as Caring = **0.87**	
					Technology and Caring = **0.83**	
					Expression of Nursing as Caring = **0.82**	
The Relationship Between Nursing Informatics Competency and Clinical Decision-Making Among Nurses in West Bank, Palestine.	**Participants' characteristics**: age of nurses was 33.2 years, 64.8% were males. 65.4% had a bachelor's degree, and 38.6% had 11–25 years of nursing experience. 56.8% reported working either day or evening shifts. 37.1% of the nurses were from medical/surgical departments. 54.0% spent 5–10 hours on documentation using EHRs	Translate > back translate > instrument test > panels of experts > pilot study > interpreting or clarifying the contents of the instruments > test	**Self-Assessment of Nursing Informatics Competencies Scale** (5 subscales | 30 items)	**0.92**	Clinical informatics role = **0.91** Basic computer knowledge and skills = **0.94**	The **study is cross-sectional,**which does not reflect the direct influence of nursing informatics competency on clinical decision-making.
					Applied computer skills: clinical informatics = **0.89,**	
					Nursing informatics attitudes = **0.94,**	
					Wireless device skills = **0.90**	
			Clinical Decision-Making in Nursing Scale (4 subscales | 40 items)	**0.89**	Alternatives or options	
					Canvassing of objectives and values	
					Valuation and re-evaluation of consequences	
Psychometric Testing of the Turkish Version of the Technology Informatics Guiding Educational Reform-Based Assessment of Nursing Informatics Competencies Tool.	participant characteristics and each competency: 412 participants, (79.5%) females, ages ranged from 19 to 62 years, with the average age as 32.23 years. 70% of the participants held a bachelor's degree, and 17% held a master's or a doctorate in nursing.	translate > back translate > instrument test > panels of experts > pilot study > evaluated each item using a 4-point rating scale to assess the CVI > evaluating the CVI > minor modifications in expression were necessary > test	**Technology Informatics Guiding Educational Reform-Based Assessment of Nursing Informatics Competencies Tool (3 factors | 85 itens)**	**0.99**	Basic computer skils = **0.98**	TANIC-T showed excellent psychometric properties among practicing nurses. Study findings suggest that the tool appears to demonstrate evidence of acceptable reliability and validity values.
					Clinical Information Management = **0.97**	
					Information Literacy = **0.98**	

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Discussion

Monitoring the development of nursing technologies is a consequence of the growing dependence on technologies that critically influence human life and impact the experience of care recipients. Thus, it is important to develop a look at technological competence as nursing care, guided by a model of practice formalized as technological competence and care in nursing theory.[33]

After analysis, the four articles included in this review highlight the importance of instruments for assessing nurses' skills, given the growing integration of information technology in health organizations, with great representation in the contexts of care practice at different levels. One of the instruments is a specific instrument for nurse leaders, focusing on specific areas such as, concepts and management, strategic planning, executive leadership, financial management and ethical/legal concepts - The *Nursing Informatics Competency Assessment for the Nurse Leader (NICA – LN)*,[28] will enable nurse leaders to acknowledge the competencies required in their role, help create solutions to address potential gaps and improve patient care delivery.

Two of the instruments focusing on IT skills related to the knowledge and use of the equipment itself, namely, areas of basic computer knowledge, information literacy - *Technology Informatics Guiding Educational Reform–Based Assessment of Nursing Informatics Competencies Tool - TANIC-T*,[31] and wireless device skills, clinical informatics role, and applied informatics skills: clinical informatics, by using the *Self-Assessment of Nursing Informatics Competencies Scale (SANICS)*.[29] In this study Batran,[29] sought to relate technological skills, with clinical decision-making, also presenting an instrument on Clinical Decision-Making in Nursing - *Clinical Decision-Making in Nursing Scale (CDMNS)*,[34] which essentially focuses on the assessment of clinical decision-making, describing the nurse's perception of clinical decision-making based on self-expression, therefore, none of these instruments correspond to what was intended.

The instrument, *TCCNI_RePract*,[30] evaluate the use of technology as a nursing care tool: comprehending patients' needs, enhancing their self-esteem, encouraging improved health, and fostering stronger relationships with others. The understanding of technological competence as nursing care is anchored in Rozzano Locsin's theory – Technological Competency as Caring in Nursing, which essentially focuses on knowing the person, through technological competence and understanding this competence as an instrument of care.[35,36] This instrument allows not only to evaluate how nurses perceive technological competence as nursing care but also how they use these skills in their daily practice, particularly in highly technological practice environments. According to the authors, The TCCNI-RePract is a tool that reliably assesses nurses' perceptions and practices in relation to the TCCN.[30] This scale effectively and consistently measures nurses' perceptions and practices across four dimensions: 1) Knowing People, 2) Technological Competence as Caring, 3) Technology and Caring, and 4) Nursing Expression as Caring. Therefore, it is deemed suitable for guiding the training of hospital nursing teams[30] Nursing informatics skills are essential for safe and effective clinical practice. Throughout the studies, it was noticed that knowledge and skills regarding information systems are a focus of attention for health organizations that invest in technology and have a major impact on the quality of care provided. Ongoing education and training are considered vital for enhancing the quality of care provided by nurses.[37] Although it is recognized that to increase nursing informatics competencies it is critical to assess nursing informatics competence levels and given that informatic technologies skills are necessary and should be an ongoing requirement, one of the recommendations is to use tools with nursing students to identify their computer knowledge, skill gaps and to better prepare them for practice in contemporary care environments. However, skills and knowledge are crucial for nurses in fostering relationships with their patients, as these relationships rely on trust in each nurse's technical abilities. As nurses gain proficiency with technology, they significantly enhance their efficiency in utilizing it.[35] Nurses and healthcare professionals in general must be specifically recognized and involved in the escalation of digital development in healthcare, preparing themselves for the required skills development, increasing their involvement in digital competence in healthcare development methods, such as guidance, mentoring or coaching, and contributing to the design of models that support high-quality care practice. Additionally, as already mentioned by other authors, managers must take a stronger role in supporting different areas of digital health competence.[38] The International Council of Nurses also encourages national nurses' associations, in collaboration with their governments, to contribute to the development of

digital health competency frameworks to inform nursing education and ensure their integration into continuing nursing education at national and international level.[17]

Conclusion

With the growing use of technology and the consequent dependency experienced by care recipients, it is important to provide the acquisition and development of technological competences as nursing care, guided by a model of practice such as technological competence and caring in nursing theory. This importance is reinforced by the reality in which nurses find themselves with highly technological and increasingly developed nursing practice environments. These include knowledge and use of their own IT equipment, areas of basic IT knowledge, information literacy, wireless device skills, the role of clinical IT, and applied IT skills. These applied informatics skills should consider clinical informatics, using various support tools such as the Nursing Clinical Decision-Making tool, which essentially focuses on the evaluation of clinical decision-making, describing the nurse's perception of clinical decision-making based on self-expression.

Evaluating the use of technology as a nursing care tool is crucial for understanding patients' needs, enhancing their self-esteem, promoting better health, and fostering stronger relationships with others. But computer skills in nursing are also essential for safe and effective clinical practice.

Information systems knowledge and skills are a focus of attention for healthcare organizations that invest in technology and significantly influence the quality of care delivered. Continuing education and training are recognized as essential to improving the care provided by nurses. Although nurses are aware of the importance of using technology as a support to profoundly understand patients and promote their recovery, building a better relationship with patients, they sometimes fail to do so for various reasons.

Therefore, more studies are needed to better understand the obstacles and challenges that hinder nurses from delivering effective nursing care in technological environments, as well as how the organization and management of nursing care should be viewed so that care is supported by technology, but without losing the essence of care. Caring for the person as a unique and individual being, with their own values, experiencing a health experience that is also unique in a moment, aware that the current moment is not the next one. Hospitals and organizations that promote a human caring environment should support nurses' ongoing professional development, such as acquiring new competencies based on the latest evidence that support the practice of nursing care, for better health outcomes and a better patient experience. We noted the scarcity of studies in the review area. This emphasizes the great relevance and importance of this review for scientific evidence.

Data Sharing Statement

The findings of this study are supported by data that can be requested from the corresponding author under reasonable circumstances.

Ethical Approval

This review does not engage with human subjects, materials, tissues, or data, so ethics committee approval was not necessary.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest.

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