

TECHNOLOGICAL COMPETENCIES AND ORGANIZATIONAL EFFICIENCY IN DIGITAL HEALTH
MANAGEMENT: AN INTEGRATIVE REVIEW PROTOCOL

 COMPETÊNCIAS TECNOLÓGICAS E EFICIÊNCIA ORGANIZACIONAL NA GESTÃO EM SAÚDE DIGITAL:
PROTOCOLO DE REVISÃO INTEGRATIVA

 COMPETENCIAS TECNOLÓGICAS Y EFICIENCIA ORGANIZACIONAL EN LA GESTIÓN DE SALUD DIGITAL:
PROTOCOLO DE REVISIÓN INTEGRADORA

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ABSTRACT

Objective: To identify scientific evidence on technological competence and its impacts on organizational efficiency and management in digital health. **Method:** This review will be conducted following the *Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols* guidelines and the methodological recommendations of Souza, Silva, and Carvalho and the *Joanna Briggs Institute*. The research question was structured based on the PICO acronym: Population, Intervention, Comparison, and Outcome. To identify published studies on the topic of this review, the following databases will be used: *Scientific Electronic Library Online, Medical Literature Analysis and Retrieval System Online, Cumulative Index to Nursing and Allied Health Literature, Latin American and Caribbean Literature in Health Sciences*, and *Nursing Database*. Study selection will be performed by two independent reviewers, and the analysis will follow a thematic and descriptive approach, with methodological quality assessment according to the *Joanna Briggs Institute* and level of evidence classification based on the *Oxford Centre for Evidence-Based Medicine*. **Results:** The results will be presented in tables and charts; in addition, the main findings of the studies may be transcribed and organized using Microsoft Excel.

Keywords: Biomedical Technology; Professional Competence; Organizational Efficiency; Health Information Managements; Digital Health.

RESUMO

Objetivo: Identificar as evidências científicas sobre competência tecnológica e seus impactos na eficiência organizacional e na gestão em saúde digital. **Método:** A revisão será conduzida conforme as diretrizes do *Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols* e as recomendações metodológicas de Souza, Silva e Carvalho e do *Joanna Briggs Institute*. A questão de pesquisa foi estruturada com base no acrônimo PICO: População; Intervenção; Comparação; Desfecho. Para identificar estudos publicados sobre o tema desta revisão, serão utilizadas as bases de dados *Scientific Electronic Library Online, Medical Literature Analysis and Retrieval System on-line, Cumulative Index to Nursing and Allied Health Literature, Literatura Latino-Americana e do Caribe em Ciências da Saúde e Base de Dados em Enfermagem*. A seleção dos estudos será realizada por dois revisores independentes, e a análise seguirá abordagem temática e descritiva, com classificação da qualidade metodológica segundo o *Joanna Briggs Institute* e do nível de evidência conforme o *Oxford Centre for Evidence-Based Medicine*. **Resultados:** Os resultados serão apresentados por meio de quadros e tabelas; além disso, os principais achados dos estudos poderão ser transcritos e organizados com o auxílio do Microsoft Excel.

Palavras-chave: Tecnologia em Saúde; Competência Profissional; Eficiência Organizacional; Gestão em Saúde; Saúde Digital.

RESUMEN

Objetivo: Identificar las evidencias científicas sobre la competencia tecnológica y sus impactos en la eficiencia organizacional y la gestión en salud digital. **Método:** La revisión se llevará a cabo de acuerdo con las directrices del *Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols* y las recomendaciones metodológicas de Souza, Silva y Carvalho y del *Joanna Briggs Institute*. La pregunta de investigación se estructuró según el acrónimo PICO: Población; Intervención; Comparación; Resultado. Para identificar estudios publicados sobre el tema de esta revisión, se utilizarán las bases de datos *Scientific Electronic Library Online, Medical Literature Analysis and Retrieval System Online, Cumulative Index to Nursing and Allied Health Literature, Literatura Latinoamericana y del Caribe en Ciencias de la Salud y Base de Datos en Enfermería*. La selección de los estudios será realizada por dos revisores independientes, y el análisis seguirá un enfoque temático y descriptivo, con clasificación de la calidad metodológica según el *Joanna Briggs Institute* y del nivel de evidencia conforme al *Oxford Centre for Evidence-Based Medicine*. **Resultados:** Los resultados se presentarán mediante cuadros y tablas; además, los principales hallazgos de los estudios podrán ser transcritos y organizados con la ayuda de Microsoft Excel.

Palabras clave: Tecnología Biomédica; Competencia Profesional; Eficiencia Organizacional; Gestión en Salud; Salud Digital.

INTRODUCTION

Technological advancements and the digitization of healthcare processes have driven significant structural changes in management and care ⁽¹⁾. The integration of Digital Information and Communication Technologies in Health (DICTs), such as electronic health records, hospital information systems, big data, m-health, and artificial intelligence, has proven essential for improving the quality of care, communication between teams, and organizational efficiency ^(1,2).

However, the implementation of these technologies requires specific digital skills, as well as digital literacy and technical expertise on the part of professionals ⁽³⁾. Recent studies indicate that a lack of preparedness in the use of DICTs constitutes an obstacle to safe clinical practice, process management, and the adoption of innovations ^(4,5). This training gap is reflected not only in the quality of care but also in the organizational capacity of health services to optimize resources and outcomes ⁽⁶⁾.

Government initiatives, such as the Telehealth Brazil Networks Program, have sought to promote the digital literacy of professionals, but inequality in access and training is still observed, especially in public institutions ⁽³⁾. Literature also highlights the need to rethink health training curricula, incorporating technological and digital skills as a structuring axis of learning ⁽⁵⁾.

Although there is evidence on the role of digital technologies in improving care processes, there is a scarcity of integrative reviews that

systematize the impact of technological knowledge gaps on organizational efficiency and the management of health services. Thus, this integrative review aims to investigate the impact of training gaps in the use of digital technologies by health professionals on efficiency and management processes, in order to support qualification and innovation strategies in the area.

METHODS

Research Type

This is an integrative literature review, which will consist of the following steps: development of the guiding question, search and selection of primary studies, evaluation of included studies, data analysis and synthesis, and presentation of the review ⁽⁷⁾. The writing and structure of the study will follow the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) ⁽⁸⁾, in accordance with the methodological guidelines of the Joanna Briggs Institute (JBI) ⁽⁹⁾, ensuring methodological rigor, transparency, and reproducibility of results. This review protocol was developed and registered in the Open Science Framework (OSF), with Digital Object Identifier (DOI): 10.17605/OSF.IO/SZJA4. Any methodological modifications made during the development of the protocol will be documented in the final version of the review.

Research Location

The review will be conducted at the Pontifical Catholic University of Minas Gerais (PUC Minas), Poços de Caldas campus, in the city of Poços de Caldas, Minas Gerais.

Research Question of the Review

To formulate the research question, a strategy was adopted that considers aspects of the population, interest, and context of the object to be researched, using the acronym PICO: Population (P): healthcare professionals involved in management processes and technological competence; Intervention (I): use, adoption, or incorporation of digital technologies and innovations in the management and organization processes of

healthcare services; Comparison (C): institutional contexts with limited, inefficient, or absent use of digital technologies in management processes; Outcome (O): impacts on organizational efficiency, service quality, and the performance of management processes in healthcare. Thus, the review question will be formulated as follows: "How do technological competence gaps among healthcare professionals impact organizational efficiency and management processes in digital healthcare services?"

Eligibility Criteria

Chart 1 presents the inclusion and exclusion criteria scheme, defined according to the research question (PICO - Population, Interest, Context), for the selection of studies to be considered in the integrative review.

Chart 1 - Study eligibility criteria, according to the PICO strategy, Poços de Caldas, MG, Brazil, 2025.

PICO Strategy	Inclusion	Exclusion
Population	Studies involving healthcare professionals who have knowledge gaps regarding technological innovations in healthcare.	Studies involving exclusively managers, academics, or other categories unrelated to healthcare practice.
Interest	Studies that address the impact of the use of digital technologies on organizational efficiency and management processes in healthcare services.	Studies that address technologies without an organizational focus or that analyze only isolated clinical aspects.
Context	Research conducted in healthcare services, focusing on the quality and efficiency of services provided.	Studies developed outside the context of health services, without a direct relationship to management or organizational efficiency.

PICO Strategy	Inclusion	Exclusion
Types of sources of evidence	Peer-reviewed scientific articles, published between 2015 and 2025, in Portuguese, English, or Spanish, available in full.	Non-scientific documents (editorials, abstracts, conference proceedings, dissertations, theses, and opinion pieces), duplicate articles, or articles unrelated to organizational impact.

Source: Prepared by the authors, 2025

The ten-year time frame is justified by the rapid technological evolution in the health field, requiring the analysis of updated evidence to ensure the applicability of the results.

Research Strategy

Initially, a preliminary survey on the topic was conducted to identify the main terms in Portuguese and English used as descriptors and keywords in the studies. Subsequently, the search strategy for this integrative literature review was developed, based on the identification and selection of descriptors in the controlled vocabularies Medical Subject Headings (MeSH), available in the MEDLINE database, and in the Health Sciences Descriptors (DeCS). The construction of the search strategy was based on the previously defined PICO acronym, ensuring coherence between the research question, the terms used, and the specificities of the databases consulted.

In order to ensure the greatest sensitivity and retrieve the largest number of relevant studies, the combination of descriptors was carried out in a staggered manner. First, the descriptors corresponding to Population (P) and

Intervention (I) were combined, then the descriptors of Intervention (I) and Context (Co), and finally, the three components of PICO (P + I + Co) were used together. The search strategy was developed using a combination of descriptors and the Boolean operators OR and AND, as shown in Chart 2.

The search for studies was conducted in the following databases: Scientific Electronic Library Online (SciELO), Medical Literature Analysis and Retrieval System online (MEDLINE), via the National Library of Medicine (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL) via the Elton B. Stephens Company (EBSCOhost), Latin American and Caribbean Literature in Health Sciences (LILACS), and Nursing Database (BDENF) via the Virtual Health Library (BVS).

The searches were carried out on June 10, 2024, using remote access to the databases through the journal portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), accessed via the Federated Academic Community (CAFe) with the login of the



Pontifical Catholic University of Minas Gerais (PUC Minas).

Chart 2 - Search strategies used according to the information source. Poços de Caldas, Minas Gerais, Brazil, 2025.

Database	Search strategy	Results
SciELO	<p>P + I = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Technology" OR "Information Systems" OR "Health Care Technology" OR "Innovation in Health Care" OR "Biomedical Technology")</p> <p>I + Co = ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction" OR "Health Care Quality Indicators")</p> <p>P + I + Co = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Technology" OR "Information Systems" OR "Health Care Technology" OR "Innovation in Health Care" OR "Biomedical Technology") AND ("Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction")</p>	<p>P + I= 20</p> <p>I + Co= 5</p> <p>P + I + Co= 2</p> <p>Total: 27</p>
MEDLINE via PubMed	<p>P + I = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care")</p> <p>I + Co = ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction" OR "Health Care Quality Indicators")</p> <p>P + I + Co = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction")</p>	<p>P + I= 146</p> <p>I + Co= 347</p> <p>P + I + Co= 4</p> <p>Total = 497</p>



<p>CINAHL via EBSCOhost</p>	<p>P + I = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care")</p> <p>I + Co = ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction" OR "Health Care Quality Indicators")</p> <p>P + I + Co = ("Professional Practice Gaps" OR "Clinical Competence") AND ("Biomedical Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction" OR "Health Care Quality Indicators")</p>	<p>P + I= 40</p> <p>I + Co=136</p> <p>P + I + Co= 0</p> <p>Total: 176</p>
<p>LILACS E BDENF via BVS</p>	<p>P + I= ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Technology" OR "Information Systems" OR "Health Care Technology" OR "Innovation in Health Care" OR "Biomedical Technology")</p> <p>I + Co = ("Health Information Systems" OR "Biomedical Technology" OR "Health Care Technology" OR "Innovation in Health Care") AND ("Outcome Assessment, Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction" OR "Health Care Quality Indicators")</p> <p>P + I + Co = ("Professional Competence" OR "Knowledge, Attitudes, Practice" OR "Professional Practice Gaps" OR "Clinical Competence") AND ("Technology" OR "Information Systems" OR "Health Care Technology" OR "Innovation in Health Care" OR "Biomedical Technology") AND ("Health Care" OR "Organizational Efficiency" OR "Patient Reported Outcome Measures" OR "Patient Satisfaction")</p>	<p>P + I= 127</p> <p>I + Co= 11</p> <p>P + I +Co= 21</p> <p>Total: 159</p>

*Search conducted on June 10, 2025.

Source: Prepared by the authors, 2025.

Selection of Evidence Sources

The results identified in the selected databases will be initially exported to EndNote software ⁽¹⁰⁾ and subsequently imported into Rayyan CQRI Systems ⁽¹¹⁾, both of which assist in detecting and excluding duplicates, as well as in selecting the studies included in the review. Exceptionally, Zotero software ⁽¹²⁾ will be used

for exporting and managing productions from the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database.

The selection of studies will be carried out independently by four reviewers on the Rayyan CQRI Systems platform ⁽¹¹⁾. In the first screening phase, titles and abstracts will be read, applying the established eligibility criteria. Articles that show agreement among at least



three of the four reviewers will be considered eligible for the subsequent stage. Any disagreements will be resolved through joint discussion among the authors.

This stage will be carried out in accordance with the PRISMA recommendations⁽⁸⁾. This diagram will allow for the transparent presentation of all phases of study selection, including identification, screening, eligibility, and inclusion of studies selected for review.

Data Collection and Data Extraction

Data collection regarding the characterization of the included studies will be carried out in a standardized manner using a structured spreadsheet in Google Drive. The following variables will be extracted: title, author(s), year of publication, country, type of study, objective, main results, conclusions, methodological quality, level of evidence, and critical analysis. This stage will be conducted by two independent reviewers, with cross-checking to ensure reliability and minimize bias. Disagreements will be resolved by consensus or, when necessary, by a third reviewer.

Data Processing and Analysis

The extracted data will be processed through descriptive analysis and integrative thematic synthesis, according to the recommendations of Souza, Silva and Carvalho⁽⁷⁾ and the Joanna Briggs Institute⁽⁹⁾. The findings will be grouped according to thematic

convergences, allowing the identification of patterns related to technological gaps, organizational efficiency, and capacity-building strategies.

The methodological quality of the studies will be assessed using the Joanna Briggs Institute (JBI) critical appraisal instruments, selecting the specific checklist according to the methodological design of each article. The level of evidence will be classified according to the hierarchy proposed by the Oxford Centre for Evidence-Based Medicine⁽¹³⁾, which organizes studies into five levels, according to scientific robustness and type of research question.

The consolidated information will be presented in summary tables, containing: author/year, country, objective, design, main findings, JBI instrument applied, methodological quality, and level of evidence.

Presentation of results

The results of the review will be presented descriptively and in summary tables, allowing a clear visualization of the available evidence. The descriptive text will highlight the main trends observed in studies regarding the technological skills of health professionals, the impacts on management and organizational efficiency, and the strategies adopted to overcome digital gaps.

Convergences and divergences between research will be highlighted, as well as the most addressed areas of knowledge, countries with the highest production, and types of technologies analyzed. The presentation will follow the

PRISMA 2020 flowchart ⁽⁸⁾, including the number of studies identified, selected, excluded, and included in the final synthesis.

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Data Availability Statement

No databases were generated in this study. The information presented is described in the body of the article.

Authorship Criteria

The authors contributed to all stages of the article's production.

Conflict of Interest Statement

Nothing to declare.

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