DOI: https://doi.org/10.9771/cp.v19i3.68557

Cadernos de Prospecção, Salvador, v. 19, n. 3, e68557, July-September, 2026.

Digital Solutions in Hospital Pharmacy: a patent review

Soluções Digitais na Farmácia Hospitalar: uma revisão de patentes

Priscylla Alves[1], Grace Anne Azevedo Dória[1], João Rafael Lisboa Rêgo Brito[1], Gilton José Ferreira da Silva[1]

[1]Federal University of Sergipe, Aracaju, Sergipe, Brazil

Abstract

Digital solutions are a key tool in hospital management, contributing to cost reduction, medication errors, and adverse events. Anvisa has published guidelines and regulations focused on the safe and effective use of technologies in healthcare services, with an emphasis on medication traceability and the computerization of healthcare processes. The objective of this patent review was to map and analyze registered software applications in hospital pharmacies using national and international databases, focusing on solutions for inventory management, prescriptions, and medication traceability. Data were obtained through searches of patent databases (Espacenet, WIPO, and INPI) between March 2025 and April 2025. Eighty-nine patents were found, but only nine met the eligibility criteria, which included text available in any language, direct application to hospital pharmacies, and digital/software solutions. Exclusion criteria included no applicable technological scope, duplicates, and insufficient information for analysis. When analyzing the records, it was observed that the number of production is concentrated mainly in the United States (88.89%), followed by Canada (11.11%) and in 2021, a slight increase in the number of patent deposits was observed.

Keywords: Software; Hospital Pharmacy; Hospital.

Resumo

Soluções digitais configura-se como um instrumento primordial na gestão hospitalar, contribuindo para redução de custos, erros de medicação e eventos adversos. A Agência Nacional de Vigilância Sanitária (Anvisa) tem publicado diretrizes e regulamentações voltadas para o uso seguro e eficaz de tecnologias em serviços de saúde, com ênfase na rastreabilidade de medicamentos e na informatização de processos assistenciais. O objetivo desta revisão de patentes foi mapear e analisar *softwares* registrados com aplicação em farmácia hospitalar utilizando como base de dados nacionais e internacionais, com foco nas soluções relacionadas à gestão de estoque, prescrição e rastreabilidade de medicamentos. Os dados foram obtidos por meio de buscas em bases de patentes (Espacenet, WIPO e INPI), entre março e abril de 2025. Foram encontradas 89 patentes, porém apenas nove atingiram os critérios de elegibilidade que incluía texto disponível em qualquer idioma, aplicação direta à farmácia hospitalar e soluções digitais/*software*. Os critérios de exclusão foram sem escopo tecnológico aplicável à área, duplicatas e informações insuficientes para análise. Ao analisar os registros, verificou-se que a produção se concentra predominantemente nos Estados Unidos (88,89%), seguidos pelo Canadá (11,11%). Ademais, no ano de 2021, observou-se um discreto aumento no número de depósitos de patentes.

Palavras-chave: *Software*; Farmácia Hospitalar; Hospital.

Technological Areas: Information and Communication Technologies, Software, and Technological Foresight.

Received: July 14, 2025
Accepted: September 26, 2025

1 Introduction

Law No. 9,609/98, known as the "Software Law," governs the copyright protection of computer programs and ensures the intellectual property rights associated with software. Following the development of source code in a given programming language, registration of the software with the Brazilian National Institute of Industrial Property (INPI) is recommended as a means of providing greater legal certainty regarding ownership and proof of authorship (Brazil, 1998).

The development and protection of healthcare innovations, including software applications for hospital pharmacy, are supported by legal and regulatory frameworks in Brazil. Law No. 9,279/1996 (Industrial Property Law) establishes rules for patent protection, thereby encouraging research and technological innovation. In parallel, the Brazilian Health Regulatory Agency (Anvisa) has issued guidelines and regulations aimed at ensuring the safe and effective use of technologies in healthcare services, with particular emphasis on medication traceability and the digitalization of healthcare processes. These legal and regulatory instruments not only foster the development of innovative solutions but also ensure that such technologies are aligned with clinical requirements and patient safety standards within hospital settings.

Hospital pharmacy is defined as a clinical, administrative, and economic unit managed by a pharmacist, hierarchically linked to hospital administration, and functionally integrated with other administrative and patient care units (SBRAFH, 2017). Hospital pharmacy plays a fundamental role in ensuring the quality of healthcare delivery by guaranteeing the supply, dispensing, and rational use of medications and other health technologies. Furthermore, it seeks to develop clinical and healthcare practices that enable the monitoring of the use of these resources in order to optimize the balance among costs, benefits, and risks associated with healthcare processes (Gama *et al*., 2022).

Within the hospital environment, the pharmacy is considered an essential component in promoting safe, effective, and integrated patient care (Ministry of Health, 2010). Despite recent advances, many hospitals still face challenges related to inventory control, medication traceability, and integration among different departments. These shortcomings may compromise the quality of care, generate waste, and increase operational costs. In this context, the adoption of new technologies and computerized solutions has emerged as an indispensable strategy for enhancing hospital pharmaceutical management, improving patient safety, and increasing the efficiency of healthcare services (Oliveira Santos Queiroz *et al*., 2023).

In this regard, the implementation of emerging technologies has significantly transformed hospital pharmaceutical services, particularly by strengthening clinical pharmacy practices (Vieira, Figueiredo Junior, & Liberal, 2023). Tools such as electronic prescribing software, inventory management systems, and medication tracking platforms contribute directly to safer, more efficient, and more integrated pharmaceutical practice. These technologies enable healthcare professionals to make clinical decisions more rapidly and based on robust information, while reducing medication errors, improving inventory control, and optimizing workflow processes (Neumamm, Camuzi, & Cordeiro, 2023).

In this context, one strategy for identifying innovative technologies applicable to hospital pharmacy is the review of patents and software registrations. Patent and software registration reviews represent a preliminary stage prior to software development and should involve a thorough assessment of existing technologies that have already been formally registered. This stage is essential for establishing a comprehensive overview of the current market, identifying established solutions, technological trends, and potential gaps that a new system may address. Such an investigation contributes to the design of a more innovative, efficient, and user-centered solution, ultimately resulting in a product that is more effective and competitive.

Given the prospect of developing software aimed at improving medication inventory control in hospital pharmacies, and considering the applicable legal and regulatory requirements, there is a need to investigate existing technologies through the present study. The objective of this patent and software registration review is to map and analyze patented technologies and registered software applications related to hospital pharmacy, identifying opportunities for innovation, licensing, or adaptation to local contexts, with a particular focus on inventory management, prescribing processes, and medication traceability.

2 Methodology

A prior art search aims to investigate existing technological trends in order to ensure the originality of a proposed artifact. Therefore, this process identifies inventions that are similar to the product being developed, with the purpose of determining whether they have already been disclosed or patented in existing databases (Quintella *et al.,* 2011). The present study is characterized as a patent and software registration review, following the technological prospecting model proposed by Antunes *et al*. (2018), which combines a systematic search for information organized into stages of data collection, analysis, processing, and foresight methods, a framework designed to support

the identification of emerging technologies (Antunes *et al*., 2018). Accordingly, this article aims to identify digital technological solutions applicable to hospital pharmacy, focusing on the analysis of solutions related to management, traceability, and electronic prescribing, with the objective of mapping innovations that may contribute to improving processes in this field.

The patent and software registration review was conducted through searches in the free online databases of the World Intellectual Property Organization (WIPO), the European Patent Office (EPO), and the Brazilian National Institute of Industrial Property (INPI). This approach was selected because it reflects the European context while also providing broad relevance in both national and international scenarios, particularly regarding patent registrations for innovative technologies. The search process was carried out between March 1 and April 15, 2025. The descriptors used were "software," "hospital pharmacy," "hospital," and IPC G16H. The IPC G16H code of the International Patent Classification refers to systems or methods specifically adapted for healthcare management, medical practice, healthcare delivery, or social care. In the INPI database, the filters "Computer Program Registration" and "Patents" were applied in order to identify innovative technologies relevant to the objectives of the study.

Using DeCS/MeSH descriptors, the following search strategy was developed: "software" AND "hospital pharmacy" AND "hospital" AND IPC G16H. No specific time restrictions were established regarding patent grants or the publication dates of the studies. Eligibility criteria included full-text availability in any language, direct applicability to hospital pharmacy, and the inclusion of digital solutions or software applications. Exclusion criteria comprised studies lacking a technological scope applicable to the field, duplicate records, and documents with insufficient information for analysis. The screening process was conducted manually, considering criteria such as technological relevance, filing date, and potential applicability within the hospital setting, with particular emphasis on traceability tools, electronic prescribing systems, and digital integration among pharmacy services, medical staff, and nursing teams. This approach enabled the identification of innovative trends that combine automation and artificial intelligence resources with the safe and efficient management of pharmacotherapy in hospital environments.

The search conducted across the three databases resulted in the identification of 89 patents, including 29 from the EPO database, 60 from WIPO, and none from INPI. A total of 62 patents were excluded due to duplication, while 16 were excluded for not meeting the selection criteria. Eleven patents were selected for full-text review, and following this assessment, nine inventions were ultimately included in the study. Figure 1 illustrates the patent search and screening process based on the PRISMA methodology. The PRISMA flow diagram (Page *et al*., 2021) was adapted to guide patent selection, ensuring transparency and traceability throughout the review process.

3 Results and Discussion

The results presented below reflect the mapping and correlation of the information collected from the databases included in this study. In this context, the mapping process

Box 1 – Keywords used in the review article

Descriptors in Portuguese	Descriptors in English
Software	Software
Farmácia Hospitalar	Hospital Pharmacy
Hospital	Hospital
CIP G16H	IPC G16H

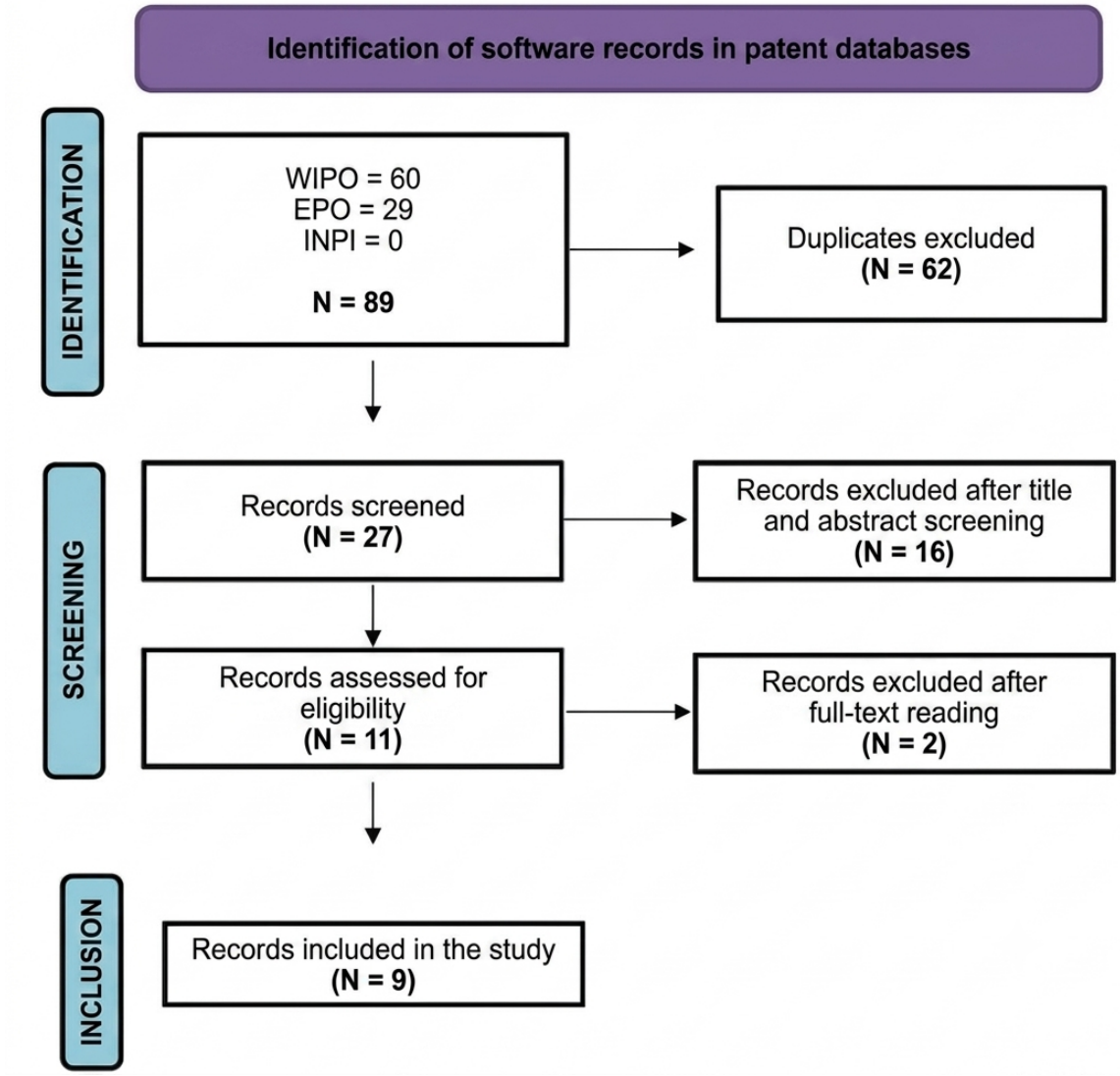
Source: Prepared by the authors (2025)

Box 2 – Search strategy applied to the databases

Databases	Search strategy	Filters	Number of Records
Espacenet	*"software" AND "hospital pharmacy" AND "hospital" AND "IPCG16H"*	-	29
WIPO	*"software" AND "hospital pharmacy" AND "hospital" AND "IPCG16H"*	-	60
INPI	*"software" AND "farmácia hospitalar" AND "hospital" AND "IPCG16H"*	"Computer Program Registration" and "Patents"	0

Source: Prepared by the authors (2025)

Figure 1 – Technology Prospecting Process Flowchart



Source: Prepared by the author (2025)

employs patent data to generate graphical representations that illustrate the technological landscape of a specific field of knowledge or invention (Nascimento & Speziali, 2020).

Box 3 presents the technologies selected through the patent search, together with their respective country of origin, filing year, inventor/applicant, application area, and technology description.

Analysis of the records revealed that patent activity was predominantly concentrated in the United States (88.89%), followed by Canada (11.11%), highlighting the leading role of countries that consistently invest in digital innovation applied to healthcare.

The absence of a strong patenting culture within the hospital pharmacy sector is evident, as demonstrated by the search results obtained for the twenty-first century. This can be attributed to the fact that most technological innovations in this field are aimed at improving operational practices, implementing automated spreadsheets, and integrating information systems. As a result, these developments are generally characterized as incremental innovations that do not necessarily meet the requirements for patent protection.

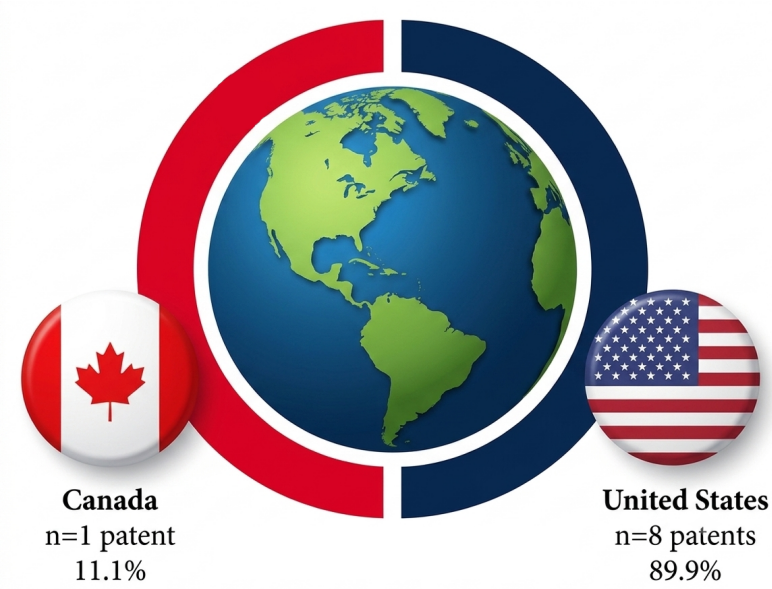
Accordingly, only one patent record was identified for each of the years 2018, 2020, 2022, and 2024. This low volume of patent activity may reflect, on the one hand, the limited knowledge of intellectual property among healthcare professionals working in hospital settings and, on the other hand, the predominantly incremental nature of innovations developed in this context, which often do not fully satisfy patentability criteria (König *et al*., 2022).

Box 3 – Technologies identified through the patent search

Technology	Country/ Year	Inventor	Applicant	Application Area	Technology Description
US2021365849A1	USA/2021	Kamen Dean	Deka Products Lp	Electronic Prescribing	Integration of medical prescriptions with electronic health records, enabling traceability and the generation of real-time clinical alerts.
US2022038430A1	USA/2022	Patrick Arthur Fagan	International Business Machines Corporation	Cloud-Based Management / APIs	Automation of longitudinal care through automated prescription renewal reminders and alerts for critical clinical situations.
US2021313027A1	USA/2021	Clarkson David	Clarkson David	Electronic Health Record Interface	Facilitation of the integration of prescribing, dispensing, and clinical monitoring data within a single interface.
US2021142876A1	USA/2021	Pla Mohan Rajica Cooray	Ontario Corp	Electronic Healthcare Services	The proposed system aims to simplify and automate the prescribing and procurement process for medical cannabis, addressing regulatory and operational challenges faced by patients, healthcare professionals, and licensed suppliers.
US20180366221A1	USA/2018	Yves Crehore	Radicalogic Tech Inc Dba Rl Solutions	Clinical and Epidemiological Surveillance	Generation of early alerts and support for preventive actions in hospitals, particularly valuable in large healthcare institutions.
AU3972295A	USA/1995	Mayaud Christian	Advanced Health Med e Systems Corp	Prescribing and Drug Interaction Management	A computerized system designed to assist healthcare professionals, especially physicians, in the creation and management of medical prescriptions.
US2007097792A1	USA/2007	Burrows Mark	Inflection Point	Therapeutic Adherence and Traceability	Generation of patient-specific reports and delivery of alerts to healthcare professionals and family members in cases of non-adherence, with the possibility of adaptation for outpatient use.
WO2024124326A1	Canada/2024	Bout de L'Epine	Odaia Intelligence Inc	Clinical Prediction / Artificial Intelligence	Clinical prediction capabilities with potential future applications in automated pharmacovigilance.
US2020357499A1	USA/2020	Do Michael	Medessist Ltd	Document Digitization	Improved prescribing accuracy and reduction of errors associated with manual interpretation.

Source: Prepared by the author (2025)

Graph 1 – Percentage distribution of patents by country



Source: Prepared by the author (2025)

In 2021, a modest increase in patent filings was observed in this field, likely driven by the logistical demands faced by hospitals during the COVID-19 pandemic. However, it is important to note that not every innovation developed during the pandemic resulted in a patent application, as many initiatives consisted of emergency solutions, internal protocols, and collaborative efforts that were not intended for commercial exploitation. (Fernandes; Gadelha; Maldonado, 2024).

The analysis of records related to the digitalization of hospital pharmacy reveals a clear concentration of solutions focused on enhancing integration, traceability, and safety throughout the prescribing process and medication use. This discussion aims to interpret the main technological features identified in the patents, highlighting their contributions, limitations, and potential applications within the hospital setting.

Regarding the types of applicants presented in Graph 3, it is noteworthy that the majority of the analyzed inventions were filed by private companies (n = 8), including Advanced Health Med and Systems Corp, Deka Products LP, Inflection Point, International Business Machines Corporation, Medessist Ltd., Odaia Intelligence Inc., Ontario Corp, and Radicalogic Tech Inc. d/b/a RL Solutions. In this context, the concentration of patent filings by private-sector organizations highlights their strategic role in the development of technologies related to patient safety, traceability, and the integration of medical prescribing systems with electronic clinical platforms.

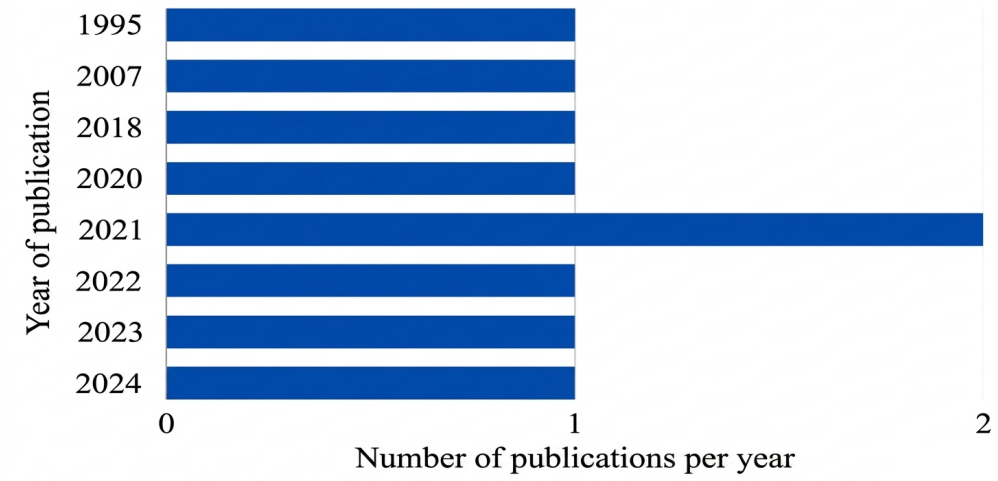
In contrast, only one patent application was filed by an independent inventor, representing a minority among the innovators involved in the development of healthcare technologies.

3.1 Digital Health Systems

The World Health Organization (WHO, 2021) defines digital health systems as technologies that promote improvements in patients' quality of life and recovery while enhancing and optimizing hospital management. Examples of such systems include electronic health records, electronic prescribing systems, automation technologies, longitudinal health management platforms, technological services related to clinical surveillance and pharmacovigilance, and technical infrastructures that support the advancement of healthcare digitalization.

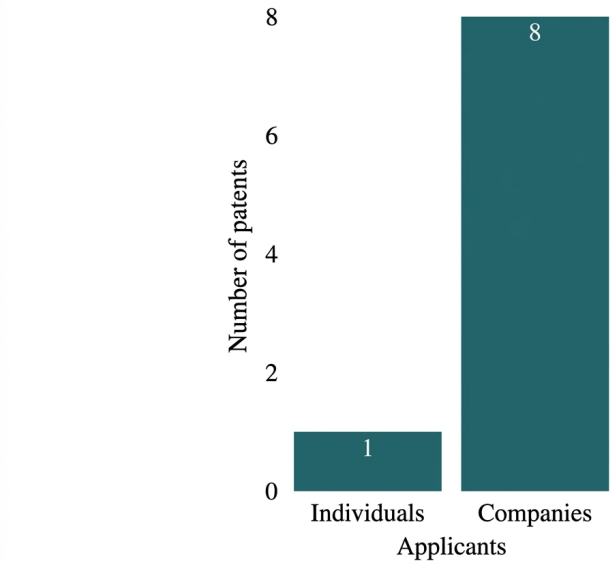
The increasing workload associated with the growing complexity of patient care is directly related to the benefits provided by technological advancements in hospitals. The importance of digital health systems lies in their ability to optimize time through the automation of manual and repetitive tasks, enable the safe and efficient monitoring of multiple patients, support healthcare professionals in clinical decision-making, and reduce medication administration errors (Carolina; Barbosa; Costa, 2023).

Graph 2 – Number of patents published per year



Source: Prepared by the author (2025)

Graph 3 – Patent applicants



Source: Prepared by the author (2025)

3.2 Electronic Health Records (EHRs)

The ISO/TR 20514 standard defines Electronic Health Records (EHRs) as repositories of patient health information in a computer-processable format, securely stored and accessible to multiple authorized users through a standardized logical information model (SBIS, 2020). In addition to ensuring continuity of care and facilitating secure access to patient information, this digital tool offers several advantages, including remote access, legal security, enhanced interprofessional communication, and support for hospital epidemiological surveillance activities (Wosny; Strasser; Hastings, 2023).

Dean *et al*. (2021) proposed a system structured around a client-server architecture, incorporating a centralized medication library that can be customized according to user profiles. This customization allows different levels of access to be assigned to prescribers, pharmacists, and nurses, thereby enhancing action traceability and contributing to error reduction. Furthermore, the system features direct integration of prescribing functions with the EHR, including traceability mechanisms and clinical alerts, which improved information exchange among hospital pharmacies. The system also strengthened data security through encryption and multi-factor authentication while providing real-time surveillance data to support hospital management. Particular

attention was given to ensuring interoperability among electronic health records (Dean *et al*., 2021).

Clarkson (2021) expanded upon this concept by developing a single interactive interface capable of integrating heterogeneous patient data, including medical prescriptions, medication dispensing records, and clinical monitoring information. As an innovation, the author proposed a standardized chronological visualization of the patient's clinical evolution, specifically designed for hospital pharmacy practice, enabling pharmacists to systematically monitor pharmacotherapy throughout the course of care.

By improving and facilitating access to patient data among healthcare professionals, the inventor emphasized the ease of use and adoption of the system. The invention supports efficient medication management through clear prescription displays, reduces medication errors, and enhances clinical decision-making by means of an intuitive and interactive interface (Clarkson, 2021).

Within the field of electronic health records, the identified patents complement one another in terms of interprofessional communication, pharmacotherapy management, and traceability. Dean's 2021 invention highlights the structuring of clinical and operational data to facilitate communication among healthcare professionals, strengthen data encryption, and improve patient traceability. In contrast, Clarkson's innovation introduces a standardized, chronological, and interactive representation of patient clinical histories and pharmacotherapy information, promoting more effective communication among healthcare professionals and hospital pharmacies.

3.3 Electronic Prescribing Systems

Electronic prescribing is one of the most established solutions within the digitalization of hospital pharmacy services (Cordeiro, 2023). This tool is a functionality associated with Electronic Health Records (EHRs) that enables healthcare professionals to digitally issue, manage, and document medication orders and treatment plans. It promotes more efficient communication among prescribers, helping to prevent handwriting-related errors, duplicate information, dosing mistakes, and drug interactions while ensuring patient traceability throughout the care process (Cassiani, Freire, & Gimenes, 2015).

Mayaud and Jonathan (1995) described a computerized desktop-based system designed to assist healthcare professionals, particularly physicians, in the creation and management of prescriptions. The system was intended to improve prescribing accuracy, efficiency, and compliance by integrating relevant information regarding medications, patient conditions, and health insurance guidelines. According to the authors, healthcare professionals reported improvements in the quality of care through faster and more accurate clinical decision-making, reductions in costs associated with repeated diagnostic tests and hospital admissions, and enhanced patient empowerment, as individuals gained access to records concerning their own health status (Mayaud & Jonathan, 1995).

Twenty-six years later, the invention developed by Cooray and colleagues represented both an advancement and an extension of the earlier system. Their innovation enabled the creation of a data integration platform connected to smart devices and equipped with interfaces for prescription receipt, data storage, user account identification, patient data verification, prescription validation, and automated remote management of purchasing orders. Furthermore, the system could recommend appropriate medical cannabis products based on patient-specific information, including usage history, preferences, and medical conditions. The invention also monitored prescribing and medication use patterns to identify unusual activities and potential interactions, generating alerts for healthcare professionals whenever necessary. The authors reported positive outcomes, including reductions in medication errors, decreases in product losses and wastage, and significant savings in pharmacist overtime expenditures, which fell from R$26,798.82 to R$4,327.35 per year (Cooray, Coutinho, & Binh-Hao, 2021).

Both patents were designed to improve prescribing accuracy and patient safety, although they achieved these objectives through different technological approaches that reflect the time period in which they were developed. The system proposed by Mayaud was innovative for its time but has become technologically limited when compared with the solution developed by Cooray and colleagues. The former depended exclusively on desktop-based environments, whereas the latter incorporates intelligent remote service systems that provide greater flexibility, automation, and support for healthcare professionals in contemporary clinical practice.

3.4 Automation and Longitudinal Health Management

Automation is defined as the use of technology to perform tasks and processes automatically, thereby reducing the need for human intervention. Its implementation requires the identification of the target task, the deployment of systems or machines, integration with shared data sources, such as directing information to electronic health records, laboratories, or pharmacies within large hospitals, and, finally, the continuous monitoring of system performance (Williams *et al*., 2022).

The use of technology in longitudinal health management is understood as a patient-centered approach to

monitoring and follow-up throughout the entire continuum of care by means of digital systems capable of facilitating medical, pharmaceutical, and multidisciplinary healthcare services. In this context, technology-enabled systems, including mobile applications, promote individualized and personalized patient tracking and management (Rodrigues *et al*., 2025).

Arthur, Brian, and Luke (2022) developed an Application Programming Interface (API) within a robust digital infrastructure capable of connecting multiple cloud-based services, including clinics, pharmacies, and patient applications. This architecture facilitates the automation of reminders and interventions based on real-time data, supports large-scale operations, and reduces the need for manual data entry. The outcomes reported by the authors include enhanced data security through compliance with data protection standards, as well as improved quality of care resulting from better communication among systems. This interoperability helped prevent the loss of relevant patient information across different levels of care (Arthur, Brian, & Luke, 2022).

In contrast, Mark (2007) described a more clinically oriented invention focused on individual patient management. The system enables the monitoring of treatment adherence by identifying failures, such as missed medication administration, through the delivery of personalized reminder notices generated from desktop-based systems. Its primary value lies in personalization and outpatient care management, particularly for monitoring high-risk populations such as older adults, patients with chronic diseases, and individuals undergoing rehabilitation. The results reported by Mark (2007) include reductions in preventable therapeutic failures and improvements in treatment continuity, as the system also supports post-dispensing follow-up and facilitates ongoing coordination across different levels of patient care.

Although the inventions are based on distinct technological approaches, they complement one another in terms of automation and patient monitoring. Arthur, Brian, and Luke (2022) introduced a large-scale service automation model using APIs and cloud technologies capable of creating an interconnected digital ecosystem among healthcare professionals and multiple patients. Conversely, Mark (2007) proposed a personalized clinical system based on customized desktop-generated reminders in outpatient settings, focusing on individual patients and promoting adherence to prescribed pharmacological treatments.

3.5 Clinical Surveillance and Pharmacovigilance

According to the Pan American Health Organization (PAHO, 2015), clinical surveillance encompasses a set of systematic actions and activities related to the monitoring, identification, and prevention of adverse events associated with patient care. Pharmacovigilance is an integral component of these activities and is concerned with the detection, assessment, understanding, and prevention of adverse effects or any other medication-related problems.

Yves, Tom, and Jason (2018) described a context-based surveillance platform that integrates infection data with demographic, clinical, and environmental information to generate early alerts and support preventive actions in hospital settings. The inventors also proposed the integration of prescribing data and real-time monitoring information, enabling continuous follow-up of patients receiving antibiotic therapy while simultaneously supporting pharmacovigilance activities. In this context, the patented technology contributed to reducing medication administration errors, improving operational efficiency in the distribution of healthcare supplies, and enhancing patient safety during the treatment of infectious diseases (Yves, Tom, & Jason, 2018).

Six years later, Emmanuel, Jahangiri, and Kenneth (2024) developed an intelligent robotic system designed to provide traceable clinical data for clinical surveillance purposes. Artificial intelligence was incorporated into the system to support medication organization, predictive analyses of medication consumption, and the generation of alerts that prevent the dispensing of expired medications or the execution of incorrect prescriptions. The solution also featured dynamic integration with electronic prescribing systems and their associated review processes. As a result, the technology improved medication availability without delays, reduced prescribing errors, and strengthened clinical surveillance activities through a more operational and systematic approach to patient monitoring (Emmanuel, Jahangiri, & Kenneth, 2024).

These technologies complement one another in the prevention of hospital emergencies and large-scale adverse events through the implementation of real-time alert systems designed to prevent clinical deterioration. With ongoing technological advances, Bout (2024) incorporated artificial intelligence into pharmacovigilance processes, demonstrating its considerable potential as a tool for clinical surveillance more broadly. This innovation further enhanced the capabilities introduced by the earlier invention, reinforcing the role of intelligent technologies in patient safety and healthcare monitoring.

3.6 Technical Foundations and Digitalization

Technical foundations represent the structural and operational architecture that supports the functioning of healthcare technology systems, including hardware infrastructure, software platforms, cybersecurity

mechanisms, and interoperability standards (Ferauche *et al*., 2024). Digitalization, supported by these technical foundations, is the process of converting records, health records, data analyses, data integration processes, and manual workflows into digital formats. According to World Health Organization guidelines, these elements constitute two essential pillars of healthcare digital transformation and are particularly important for organizations that are in the early stages of adopting modern technologies to improve efficiency, safety, and scalability (WHO, 2021).

Michael (2020) focused on improving the quality and accuracy of digitized data entry by implementing Optical Character Recognition (OCR) technology, a tool capable of reading printed prescriptions, scanning them, and converting their content into editable and searchable digital text. This type of innovation is fundamental to the digital transformation of multiple sectors, including healthcare, where accurate and efficient data entry is essential for supplying modern systems with reliable information, particularly in hospital pharmacy settings. Reported outcomes included reductions in manual errors associated with reading and interpreting medical prescriptions, increased speed of clinical data processing, enhanced information security, fewer document losses, and improved traceability and auditing capabilities (Michael, 2020).

The invention optimized workflow processes through the establishment of a digitalization-oriented technical foundation within the hospital pharmacy environment, particularly regarding medical prescribing and the management of critical clinical documents. By integrating these processes with OCR technology, the solution consolidated the role of digital document processing as a key tool for improving data-processing speed and operational efficiency.

4 Final Considerations

Although technological advances in healthcare have been substantial, particularly in the development of digital solutions, the number of scientific publications related to health information technologies has not yet reflected this growth. The present survey revealed a strong focus on technologies aimed at medication traceability and electronic prescribing, with the United States emerging as the leading center of innovation. Clinical surveillance and pharmacovigilance technologies, integrated with electronic health records and prescribing systems, were primarily designed to optimize healthcare processes, reduce prescribing errors, and enhance patient safety.

The adoption of electronic prescribing software, traceability systems, and clinical integration platforms has had a transformative impact on the Brazilian hospital environment, particularly in light of longstanding challenges related to infrastructure, interoperability, and patient safety.

Despite the advances identified, this review also highlights limitations that create opportunities for further investigation and the development of new approaches in future research. The absence of technological products that fully meet the specific requirements established in this study reinforces the relevance of developing a system specifically designed for inventory management in hospital pharmacies.

Based on the findings of this investigation, it can be concluded that, although several solutions addressing prescription management are currently available, none of them focuses specifically on hospital medication inventory management. This finding supports the originality and relevance of the technological proposal developed in the present study.

5 Future Perspectives

The present review of hospital pharmacy software patents revealed a field that is still in its developmental stages. Nevertheless, it highlights a promising landscape for the advancement of innovations related to system integration, interoperability among digital platforms, the use of artificial intelligence to support clinical decision-making, and technologies designed to enhance the patient experience.

In this context, future perspectives indicate the need for studies that further investigate the relationship between registered technological solutions and their effective implementation in hospital environments. In addition, it is important to encourage the development of evidence-based software solutions that are aligned with the actual needs of healthcare services, with a focus on safety, efficiency, and personalized care.

Another important consideration is the expansion of collaboration among researchers, healthcare professionals, software developers, and healthcare managers in order to guide the creation of solutions that are more closely aligned with the realities of hospital practice. An increase in the number of patents associated with academic institutions is also expected, which may strengthen knowledge transfer and technology transfer to the healthcare sector.

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About the Authors

Priscylla Alves

E-mail: priscyllalves@hotmail.com
ORCID: https://orcid.org/0009-0001-5020-6854
Master's Degree in Health Technology Management and Innovation, Federal University of Sergipe, 2023. Pharmacist.
Professional Address: University Hospital of the Federal University of Sergipe (HU-UFS), Rua Cláudio Batista, s/n, Palestina District, Aracaju, Sergipe, Brazil. ZIP Code: 49060-025.

Grace Anne Azevedo Dória

E-mail: graceanne26@gmail.com
ORCID: https://orcid.org/0000-0002-2454-6775
Ph.D. in Health Sciences, Federal University of Sergipe, 2015. Pharmacist.
Professional Address: University Hospital of the Federal University of Sergipe (HU-UFS), Rua Cláudio Batista, s/n, Palestina District, Aracaju, Sergipe, Brazil. ZIP Code: 49060-025.

João Rafael Lisboa Rêgo Brito

E-mail: rafaellisboadm@gmail.com
ORCID: https://orcid.org/0009-0005-1914-5669
Pharmacist, Federal University of Sergipe, 2023.
Professional Address: University Hospital of the Federal University of Sergipe (HU-UFS), Rua Cláudio Batista, s/n, Palestina District, Aracaju, Sergipe, Brazil. ZIP Code: 49060-025.

Gilton José Ferreira da Silva

E-mail: gilton.ferreira@academico.ufs.br
ORCID: https://orcid.org/0000-0002-2281-9426
Ph.D. in Intellectual Property Science, Federal University of Sergipe, 2020. Information Systems Specialist.
Professional Address: Federal University of Sergipe (UFS), Department of Computing (DCOMP), Av. Marechal Rondon, s/n, Jardim Rosa Elze, São Cristóvão, Sergipe, Brazil. ZIP Code: 49100-000.