

Governance, Lean Healthcare, and Digital Transformation in Outpatient Management: An Integrative Review for Data-Driven Health System

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Abstract—This study presents an integrative literature review exploring the intersection between governance, Lean Healthcare, and digital transformation in the management of specialized outpatient clinics. The increasing complexity of healthcare demands strategies that improve operational efficiency, ensure regulatory compliance, and support sustainable service delivery. The review analyzes data-driven models, digital technologies, and lean methodologies applied to optimize resource allocation, reduce waiting times, and improve patient experience. Findings highlight the relevance of predictive analytics, artificial intelligence, and interoperable health information systems as enablers of smarter healthcare services. Key challenges include system fragmentation, resistance to organizational change, and technological infrastructure gaps. The study proposes a framework that combines organizational governance, continuous improvement, and digital integration to enhance performance in outpatient settings. It contributes to the advancement of interdisciplinary research and supports evidence-based decision-making in health service management.

Index Terms—Outpatient Management, Lean Healthcare, Digital Transformation, Governance, Data-Driven Health Systems.

I. INTRODUCTION

THE increasing complexity of healthcare systems demands the adoption of management models that foster operational efficiency, care quality, and sustainability. Specialized outpatient clinics play a crucial role within healthcare networks, serving as an intermediary between primary care and hospital services, particularly in the follow-up of patients with chronic and complex conditions. However, these services often face structural challenges that compromise their effectiveness, including the absence of standardized workflows, operational waste, and difficulties in incorporating technologies aimed at optimizing clinical and administrative processes [1].

Governance in healthcare emerges as a central element for ensuring transparency and quality in the management of specialized outpatient services. According to the Brazilian Institute of Corporate Governance [2], effective governance relies on clearly defined roles and responsibilities, the strengthening of organizational culture, and the implementation of control

mechanisms. Nonetheless, most of the existing literature on hospital governance focuses on large institutions, with limited studies addressing its application in specialized outpatient settings. Moreover, there is a gap in understanding how governance can facilitate the adoption of methodologies aimed at operational efficiency and digitalization of healthcare processes [3]. This view is supported by [4], who argue that the standardization and regulation of processes within healthcare institutions follow principles of institutional isomorphism, driven by sectoral norms and demands.

The application of Lean Healthcare, inspired by the Toyota Production System, has proven to be an effective strategy for reducing waste, reorganizing care flows, and optimizing resource utilization. Studies have shown that this methodology can improve the quality of outpatient services by reducing waiting times and increasing demand predictability [5], [6]. However, resistance among healthcare professionals to managerial changes and the need for ongoing training remain significant challenges to its widespread adoption [7]. This resistance may be linked to organizational cultural aspects [8] who emphasize how organizational culture can influence the adoption of new practices and the acceptance of managerial innovations.

At the same time, digital transformation has driven the modernization of healthcare services, enabling the automation of clinical and administrative processes. The use of electronic health records, artificial intelligence, and telemedicine has expanded as tools to improve demand forecasting, reduce operational errors, and increase patient safety. However, the lack of interoperability among health information systems, along with regulatory barriers and technological infrastructure limitations, has hindered the full implementation of these innovations [9]. Digitalization, when aligned with effective governance, can enhance integration among health units, improve data flow, and strengthen the longitudinal monitoring of patients [10].

The relationship between governance, Lean Healthcare, and digitalization in the management of specialized outpatient clinics remains underexplored in the literature. This underscores the need for studies that integrate these approaches and

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assess their impact on operational efficiency and quality of care. In this context, the present study aims to conduct an integrative literature review to investigate how organizational governance, lean management, and digital transformation can be combined to improve the efficiency and sustainability of specialized outpatient services. The research seeks to consolidate theoretical knowledge, identify gaps in the literature [10], and offer recommendations to support managers in implementing more effective strategies for organizing these services.

II. CONCEPTS

A. Governance and Compliance in Specialized Outpatient Clinics

Governance in healthcare is a key element for the efficient management of care services, ensuring transparency, control, and a clear definition of responsibilities. In outpatient settings, its structuring aims to improve the quality of care, ensure financial sustainability, and align the interests of different stakeholders [2], [11].

Agency Theory contributes to the understanding of the relationship between managers and healthcare professionals, highlighting how information asymmetry can lead to conflicts and reduce service efficiency. To mitigate risks, the adoption of internal audits, performance indicators, and compliance guidelines is essential. Moreover, institutional isomorphism suggests that healthcare organizations tend to structure themselves similarly due to normative and cultural pressures. In Brazil, regulatory bodies such as the National Health Agency (ANS), the Federal Council of Medicine (CFM), and the National Accreditation Organization (ONA) establish standards that guide the organization of outpatient clinics, promoting legal security and strengthening institutional credibility [1], [4], [6], [12].

Compliance, in turn, functions as a critical mechanism for adherence to regulations and best practices, preventing operational risks and ensuring data privacy, especially in the context of the General Data Protection Law (LGPD – Law No. 13,709/2018). Its implementation involves audits, codes of conduct, training programs, and the use of technology to monitor processes. These measures help reduce fraud, increase financial predictability, and support decision-making [1], [3], [6], [10], [13].

Organizational culture directly influences adherence to standards and the effectiveness of institutional strategies. When structured around well-defined values, it contributes to team engagement and the reinforcement of governance. Thus, governance and compliance in specialized outpatient clinics are essential pillars for care quality, transparency, and institutional security. The adoption of control mechanisms and digital regulation enhances operational efficiency, reduces waste, and supports continuous improvement in care processes [6], [7], [14], [15].

B. Lean Healthcare and Operational Efficiency

The pursuit of operational efficiency has been a central concern in healthcare systems worldwide, especially in light of increasing demand for services and limited resources. In this context, Lean Healthcare, inspired by the Toyota Production System (TPS), has emerged as an effective approach to waste reduction, optimization of care flows, and enhancement of patient care quality. This methodology has been widely applied in hospitals and clinics to minimize operational costs, increase service predictability, and improve the patient experience [3], [14], [16].

The application of Lean Healthcare in specialized outpatient clinics aims to eliminate non-value-adding activities, reorganize clinical and administrative processes, and promote a culture of continuous improvement [17]. According to [18], TPS identifies seven types of waste, which can be adapted to the healthcare sector:

- Waiting – excessive waiting time for consultations, exams, and procedures.
- Excessive motion – unnecessary movement of patients and staff within the facility.
- Overprocessing – redundancy in medical records and documentation.
- Excess inventory – storage of supplies beyond what is necessary, leading to waste.
- Overproduction – exams and procedures performed without clinical justification.
- Defects – administrative and clinical errors, such as rework and failures in electronic health records.
- Underutilized talent – inadequate use of healthcare professionals' skills and competencies.

The application of Lean Healthcare in specialized outpatient clinics involves the use of various tools aimed at waste reduction and optimization of care flows. One of the most widely used techniques is Value Stream Mapping (VSM), which allows for visualization of the entire patient journey within the outpatient setting. This mapping helps identify bottlenecks and supports the implementation of improvements to make care delivery more efficient and responsive [19].

Another relevant approach is Kaizen, which promotes continuous improvement of care processes through incremental adjustments. Small daily changes, when accumulated over time, contribute to increased efficiency and waste elimination, fostering a more productive work environment aligned with patient needs [17].

The 5S methodology enhances workplace organization and standardization by eliminating waste and improving flow, following the principles of Seiri, Seiton, Seiso, Seiketsu, and Shitsuke [18]. The Pull System, in turn, aligns services with real demand rather than fixed staff schedules, reducing queues and wait times [20].

Applied in outpatient clinics, these tools help minimize waste, optimize resources, and enhance the patient experience by promoting a more efficient and responsive care environment.

C. Impacts of Lean Healthcare on Outpatient Efficiency

The application of these tools in specialized outpatient clinics has shown significant results in various studies. The implementation of Lean Healthcare in outpatient services can reduce average waiting times for consultations and diagnostic exams by up to 50%, in addition to increasing the productivity of healthcare professionals. Hospitals and clinics that have adopted this methodology have managed to reduce operational costs by 30% by eliminating waste related to supply management, rework, and unnecessary movements [17], [19].

Beyond waste reduction, Lean Healthcare also contributes to increased predictability in resource allocation. Data-driven models allow forecasting patient demand, optimizing the distribution of medical staff, and preventing both idle periods and work overload. This is particularly relevant for specialized outpatient clinics, where demand may vary significantly depending on seasonal factors and the complexity of the cases treated [1], [6].

Although Lean Healthcare offers significant benefits for the management of specialized outpatient services, its implementation faces several challenges. One of the main obstacles is resistance to change among healthcare professionals. There is often a tendency to maintain traditional processes, either due to unfamiliarity with Lean practices or difficulty adapting to a new organizational culture. A shift in mindset is essential for the successful adoption of the approach and requires efforts to raise awareness and engage healthcare teams [7].

Additionally, the lack of professional training represents a considerable barrier, as the effective application of Lean relies on the correct use of specific tools. These tools must be properly understood to generate meaningful improvements in care processes. Without adequate training, professionals may find it difficult to implement and sustain changes, which reduces the overall effectiveness of the methodology [17].

Another relevant challenge involves the integration of Lean practices with digital technologies, which are essential for optimizing patient flow and enhancing the allocation of available resources. However, the lack of interoperability between different management systems often hinders process automation and real-time data analysis. A poorly structured technological infrastructure can undermine the full adoption of Lean, thereby limiting expected efficiency gains [19], [21], [22].

To ensure the effective incorporation of Lean Healthcare into outpatient management, it is essential to invest in continuous professional development, foster an organizational culture committed to ongoing improvement, and guarantee the integration of appropriate technological solutions. Overcoming these barriers is necessary to achieve the expected outcomes and to consolidate a more efficient and sustainable healthcare delivery model.

D. Queueing Theory-Based Strategies for Care Capacity Management in Healthcare

The application of Queueing Theory in specialized outpatient clinics goes beyond the mathematical analysis of service flows. It requires the implementation of practical

strategies to optimize care capacity and reduce waiting times. Among these strategies, intelligent triage and prioritization stand out, directing patients to the appropriate level of care and avoiding overloading specialized services. The categorization of patient cases can be enhanced by predictive algorithms that analyze medical histories and symptoms to prioritize urgent cases, thereby ensuring a more efficient and equitable patient flow in outpatient care [23], [24].

Another critical aspect is the proper sizing of staff and resources, which can be supported by statistical models. These models help calculate the optimal number of healthcare professionals per shift, aligning service supply with actual demand and avoiding both staff overload and idle time. Flexible staff allocation based on data analysis contributes to better infrastructure utilization and improved service efficiency. In hospitals that implemented such capacity management models, a 30% reduction in waiting times for specialized consultations and an increase in appointment utilization rates were observed [25].

Controlled overbooking has also proven effective in minimizing the impact of patient no-shows. Forecasting absenteeism allows for scheduling a slightly higher number of patients than nominal capacity, reducing unused time slots and increasing the effective service rate. However, this approach must be used cautiously to avoid overcrowding and patient dissatisfaction. Studies indicate that optimizing service flows through these strategies also results in lower absenteeism and improved patient experience [23], [24], [26].

The use of demand forecasting technologies has transformed outpatient management. Artificial intelligence and machine learning tools analyze care patterns and anticipate demand peaks, assisting in resource planning. Furthermore, computerized systems enable real-time monitoring of wait times and room occupancy rates, enhancing predictability and operational efficiency [27], [28]. In Brazil, the Hospital Israelita Albert Einstein implemented demand forecasting and appointment optimization strategies, reducing idle times in medical schedules by 25%, thus demonstrating the effectiveness of digitalization in improving resource allocation and operational performance [29].

The integration of telemedicine has also emerged as a key differentiator in optimizing outpatient services. Virtual consultations can reduce the need for in-person visits in low-complexity cases, allowing on-site services to focus on patients requiring physical exams or specialized procedures. Initial triage via teleconsultation supports faster and more effective care, ensuring better demand distribution and operational efficiency [9].

Altogether, the implementation of these strategies in specialized outpatient care demonstrates tangible benefits in reducing waiting times, optimizing care flows, and enhancing patient experience. The combination of efficient triage, appropriate staff sizing, the use of artificial intelligence, and integration with telemedicine supports the development of a more predictable, accessible, and sustainable care model aligned with international best practices.

Despite the progress enabled by Queueing Theory in care capacity management, the implementation of these strategies in specialized outpatient clinics still faces significant challenges [23], [25]. A major barrier is the lack of integration between information systems, which hinders predictive demand analysis and undermines the optimization of service delivery. Limited interoperability across platforms restricts the effective use of data and impairs evidence-based strategic planning [9]. Resistance to adopting new methodologies also remains a critical obstacle. Many healthcare professionals still rely on traditional scheduling models, which limits the application of more flexible and predictive approaches. Adapting to technology and accepting organizational changes requires continuous efforts to train and engage teams, ensuring a successful transition to new care models [7].

Budgetary constraints present another limiting factor, particularly in public health units, where investment in technology, professional training, and process restructuring may be difficult. Without adequate financial support, implementing digital and predictive solutions becomes more challenging, directly impacting service efficiency [1], [6].

In light of these challenges, it is essential that care capacity management be grounded in evidence-based approaches to ensure better resource utilization and reduced waiting times. Queueing Theory provides a solid framework for demand analysis and service flow optimization, enabling strategic adjustments in medical staff allocation and service organization. International experience demonstrates that adopting these methodologies can significantly improve outpatient efficiency, making services more predictable, accessible, and sustainable [23], [26]. However, to effectively implement these strategies, it is crucial to invest in digital transformation, continuous team training, and the adaptation of organizational culture to new health management models, thus promoting a more agile and efficient care delivery system.

E. Digital Transformation and Technology Use in Outpatient Care Management

Digital transformation has driven the modernization of outpatient management, promoting greater operational efficiency, patient safety, and improvement in the overall care experience. Technologies such as Electronic Health Records (EHR), artificial intelligence, telemedicine, automation, and information security play a central role in optimizing care flows and integrating clinical data. However, the full adoption of these tools still faces challenges related to system interoperability, workforce training, and technological infrastructure [9].

The EHR allows for structured storage and sharing of clinical information, reducing medical errors and facilitating communication among healthcare professionals. Nonetheless, the lack of standardization hinders interoperability between public and private systems, limiting its full potential. Artificial intelligence, in turn, has been applied to demand forecasting, clinical decision support, and personalized care, enabling early disease detection and optimizing service capacity. Despite its benefits, implementation requires strict information

security measures and bias mitigation in algorithms to ensure greater reliability in medical decision-making [29].

Telemedicine has significantly expanded access to specialized services, reducing the burden on in-person appointments and enabling the remote monitoring of chronic patients. During the COVID-19 pandemic, it became an essential alternative for ensuring continuity of care and was regulated by the Federal Council of Medicine in Brazil. However, technological infrastructure and connectivity limitations continue to restrict its broader adoption in some regions. In parallel, the automation of clinical and administrative processes has improved service predictability, reduced waiting times, and organized patient flow using chatbots, automated triage, and real-time monitoring. The implementation of such tools requires ongoing investment, but the efficiency gains justify their long-term adoption [1], [6].

With the advancement of digitalization, information security has become essential for protecting patient data. The Brazilian LGPD establishes guidelines for the storage, sharing, and processing of personal health information, requiring healthcare institutions to adopt measures such as encryption, multifactor authentication, and regular audits. In addition to mitigating legal risks, compliance with these standards enhances institutional credibility and ensures the privacy of healthcare service users.

Therefore, digitalization in healthcare represents an irreversible path, bringing direct benefits to operational efficiency and the safety of care delivery. To maximize its impact, it is essential that institutions invest in modernizing digital infrastructure, provide continuous staff training, and ensure regulatory compliance—thus enabling greater predictability and sustainability for outpatient services.

III. METHOD

This study is an integrative literature review, a method that enables a comprehensive analysis of available evidence on a specific topic by synthesizing both scientific and theoretical findings. This approach allows for the identification of gaps in literature, emerging trends, and the construction of a theoretical framework grounded in governance, operational management, and the digitalization of specialized outpatient clinics.

The review was conducted through a systematic search of scientific articles, books, institutional reports, and international guidelines, prioritizing publications from the period between 2012 and 2024 to ensure the timeliness and relevance of the findings. The selection of studies followed a systematic and replicable process, ensuring transparency and methodological rigor. The literature search was conducted using academic databases recognized for their relevance in the fields of healthcare and hospital management: PubMed – for articles on governance, Lean Healthcare, digitalization, and operational efficiency in health; Scopus and Web of Science – for international studies on hospital management, optimization of care flows, and the impact of digitalization on health services; SciELO and Google Scholar – to include literature from the

Brazilian context on hospital governance and methodologies applied to the national healthcare setting.

The search was conducted using controlled descriptors (DeCS and MeSH), combined with Boolean operators to optimize the retrieval of relevant studies:

- “Governance in healthcare” AND “operational efficiency” AND “specialized outpatient clinics”.
- “Lean Healthcare” AND “outpatient management”.
- “Health digitalization” AND “electronic health records” AND “hospital efficiency”.
- “Queueing theory” AND “care capacity management”.

The inclusion criteria comprised studies published between 2012 and 2024, peer-reviewed articles from indexed scientific journals, and publications in Portuguese, English, or Spanish. Eligible studies addressed themes related to healthcare governance, Lean Healthcare, digitalization, and operational efficiency in specialized outpatient clinics. Additionally, reports and guidelines from regulatory bodies that contribute to the outpatient management model were considered. Conversely, the exclusion criteria ruled out duplicate articles across databases, opinion pieces or studies lacking explicit methodology, research exclusively focused on large hospitals without direct relevance to outpatient care and works that did not explicitly address the concepts of governance, operational efficiency, or digitalization in outpatient management.

The search and refinement process began with the initial identification of 1,452 studies. Titles were screened to assess their alignment with the research scope, resulting in 470 studies deemed relevant for the next phase. Abstracts of these 470 studies were then reviewed to evaluate their relevance to the research question and their methodological quality, after which 158 studies were retained for full-text reading. Following a comprehensive evaluation, 16 studies were selected to compose the integrative review, as they were considered the most relevant for building the theoretical framework and supporting the findings. The selected studies were then analyzed and categorized into four major thematic axes that structured the critical analysis of the results: (1) Governance and Compliance in Outpatient Management, which addressed guidelines for transparency, regulation, and organizational efficiency; (2) Lean Healthcare and Operational Efficiency, focusing on the application of lean methodologies to optimize care processes; (3) Care Capacity Management and Queueing Theory, involving strategies to optimize patient flow and the efficient use of resources; and (4) Digitalization and Use of Technology, highlighting the impact of electronic health records, artificial intelligence, and telemedicine in outpatient management.

IV. RESULTS

The selected articles were grouped into four thematic axes: (1) governance and compliance, (2) operational efficiency and Lean Healthcare, (3) capacity management and Queueing Theory, and (4) digitalization and health technologies. The intersection of these themes reveals that combining governance,

efficiency, and innovation improves outpatient clinic management.

Governance ensures transparency and process standardization (Tables 1–3), though it can increase administrative burden. [31] notes that fragmented governance leads to excessive bureaucracy. In Brazil, regionalized networks may mitigate this, but still face barriers [32].

Lean Healthcare is discussed as a strategy for improving efficiency. Authors [21] highlight the benefits of integrating Lean with digital tools. [33] shows that Lean and FRAM improve referral processes. In Brazil, Lean adoption has improved service organization and engagement [15], and increased competitiveness through efficient resource use [34]. A bibliometric study ([22]) indicates its growing relevance.

Tools such as VSM, Kaizen, and 5S have improved outpatient workflows ([35], [36]). Studies also show Lean Six Sigma in anesthesiology reduces procedural variability [13], [37], [38]. Its application in ICUs and ophthalmology improves discharge and patient flow [37], [38].

Accurate demand forecasting is critical. AI models can predict attendance and optimize schedules [14], [39]. MacLeod et al. (2020) [40] stress reducing cancer treatment wait times through staffing and scheduling. Blockchain can secure records and increase data integrity [41].

Finally, hospital-at-home digital services reduce hospitalization needs [16], and Lean use in UAE’s public sector shows that innovation and digitalization can improve hospital operations [42].

V. DISCUSSIONS

This integrative review examined how governance, operational efficiency, capacity management, and digitalization interact to improve quality and sustainability in specialized outpatient clinics. Despite their benefits, challenges such as system interoperability, resistance to change, and lack of professional training remain barriers to full implementation.

Governance plays a central role by promoting transparency and efficiency. It supports resource optimization and organizational culture [11], and helps mitigate risks [31], [43]. According to institutional theory [44], governance standardization reflects institutional isomorphism, though excessive bureaucracy can hinder agility [31].

When combined with efficiency models, governance enhances resource use and reduces waste. Lean Healthcare, based on the Toyota model, has improved workflows and productivity in healthcare [19], [20], [35]. Its integration with digital tools can reduce costs [45] and wait times [17], though cultural resistance remains a challenge [42].

Capacity management is critical for meeting outpatient demand. Queueing Theory aids in workforce planning [25], and AI helps reduce no-shows and increase efficiency [14].

Digitalization supports process automation, data integration, and decision-making through tools like electronic records, telemedicine, and AI [29], [9]. However, lack of interoperability still limits transformation [16].

Organizational resistance and training gaps are also key barriers. Cultural change is essential for innovation to succeed [7], and leadership engagement and continuous training are vital for implementation [15], [21].

Integrating governance, Lean, capacity models, and technology offers potential to transform outpatient clinic management. But success depends on strategic planning, technological investment, and evidence-based approaches—paving the way for more agile and patient-centered care aligned with digital health trends.

VI. CONCLUSION

This study analyzed the integration of governance, lean management, and digitalization in the management of specialized outpatient clinics, highlighting their importance for operational efficiency and the quality of care. The findings from the integrative review confirm that the adoption of good governance practices contributes to greater transparency, process standardization, and institutional control, thereby strengthening the safety and sustainability of services. Hospital governance, when combined with compliance mechanisms and auditing processes, reduces operational risks and ensures regulatory compliance—both of which are essential for the continuity and predictability of healthcare delivery.

Lean Healthcare has proven to be a key tool for optimizing care flows by eliminating waste and reorganizing clinical and administrative processes. The use of methodologies such as Value Stream Mapping (VSM), Kaizen, and 5S has shown positive impacts in reducing waiting times and improving the utilization of available infrastructure. However, challenges such as resistance to change among healthcare professionals and the need for ongoing training remain significant barriers to the full implementation of this approach.

Care capacity management, supported by Queueing Theory and artificial intelligence, has been shown to be essential for the efficient allocation of human and structural resources in specialized outpatient settings. Predictive models allow for

demand forecasting and more precise scheduling, helping to avoid staff overload and reduce patient no-shows. Nevertheless, the lack of interoperability among information systems hinders the implementation of data-driven solutions, limiting the optimization of care delivery flows.

Digitalization in healthcare has emerged as one of the main drivers of transformation in outpatient services, promoting operational efficiency, patient safety, and personalized care. The use of electronic health records, telemedicine, and automated management systems enables more accurate decision-making, reduces errors, and improves communication among professionals. However, challenges related to technological infrastructure, system standardization, and information security still need to be addressed to ensure the full adoption of these solutions.

Although the benefits of adopting an integrated management model are evident, the review identified structural and cultural challenges that must be addressed to ensure successful implementation. Resistance to change, system fragmentation, and the need for investment in technology and workforce training emerge as critical barriers. To overcome these obstacles, healthcare organizations must adopt a progressive approach, investing in team qualification and developing evidence-based strategies.

Thus, this study reinforces the need for an integrated framework for the management of specialized outpatient clinics, combining governance, operational efficiency, and technological innovation. By overcoming the identified challenges, these units will be able to evolve into a more sustainable, accessible, and patient-centered model of care, aligned with merging trends in digital health and international best practices. Furthermore, the study suggests that future research should further explore the empirical application of these approaches, investigating their feasibility across different institutional contexts and their adaptability to the specific realities of diverse health systems.

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TABLE 1. BENEFITS, CHALLENGES, AND STRATEGIES OF INTEGRATED MANAGEMENT IN SPECIALIZED OUTPATIENT CLINICS			
THEMATIC INTEGRATION	BENEFITS	CHALLENGES	PROPOSED STRATEGY
Governance + Lean Healthcare	Reduction of waste; optimization of operational efficiency; improved resource allocation.	Resistance to change among healthcare professionals; lack of specific training.	Continuous professional training; promotion of a culture of innovation and change management.
Governance + Digitalization	Greater control over administrative processes; increased transparency; regulatory compliance.	Low interoperability between information systems; need for technological investment.	Investment in integrated platforms; adoption of international interoperability standards.
Lean Healthcare + Care Capacity Management	Reduced waiting times; improved demand predictability; optimization of care delivery flows.	Lack of adherence to Lean practices by care teams; challenges in collecting and using predictive data.	Application of Queueing Theory; use of artificial intelligence for predictive analysis.
Digitalization + Care Capacity Management	Use of AI for demand forecasting; automation of care workflows; improved patient experience.	Risks related to information security; challenges in complying with data protection regulations (LGPD).	Implementation of digital security protocols, encryption, and multi-factor authentication.

TABLE 2. THE IMPACT OF DIGITAL TECHNOLOGIES ON OUTPATIENT MANAGEMENT			
TECHNOLOGY	DESCRIPTION	BENEFITS	IMPLEMENTATION CHALLENGES
Electronic Health Record (EHR)	Digital recording of consultations, exams, and medical prescriptions.	Reduction of errors, improved continuity of care, remote access to information.	Lack of standardization and interoperability between systems.
Artificial Intelligence (AI) and Machine Learning	Predictive demand analysis, clinical decision support, and process automation.	Better resource allocation, reduced waiting lines, increased care efficiency.	High initial cost, need for professional training.
Telemedicine	Remote consultations for patient monitoring and low-complexity care.	Reduced burden on in-person services, expanded accessibility.	Requirement for stable connectivity and specific regulation.
Blockchain for Data Security	Decentralized and immutable recording of medical information.	Greater reliability and protection of patient data.	Regulatory challenges and high computational resource consumption.

TABLE 3. STRATEGIC IMPACT ON PATIENT EXPERIENCE QUALITY			
IMPLEMENTED STRATEGY	DESCRIPTION	EXPECTED EFFECT ON PATIENT EXPERIENCE	KEY BENEFITS
Lean Healthcare and reorganization of care flows	Digital recording of consultations, exams, and medical prescriptions.	Reduced waiting times and optimization of the patient journey.	Greater satisfaction, reduced idle time, and faster processes.
Digitalization of care and automated scheduling	Predictive demand analysis, clinical decision support, and process automation.	Easier access to care and greater predictability.	Prevents delays, reduces no-shows, and improves communication.
Use of AI in triage and demand forecasting	Remote consultations for patient monitoring and low-complexity care.	Faster and more personalized care based on patient profile.	Decrease in unnecessary visits, optimization of care capacity.
Interoperability between systems and accessible clinical history	Decentralized and immutable recording of medical information.	Improved continuity of care and reduction in errors.	More accurate monitoring of the patient's health status.