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## HEALTH 4.0 IN HOSPITAL MANAGEMENT: PATHWAYS TO LOCAL DEVELOPMENT WITH HEALTHCARE QUALITY AND FINANCIAL SUSTAINABILITY

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### ABSTRACT

Health 4.0 has emerged as a strategic paradigm for transforming hospital management by integrating technological innovation with healthcare quality and financial sustainability. This study analyzes how management practices aligned with Health 4.0 principles can improve hospital efficiency and contribute to local development. The research was conducted as an exploratory case study in a medium-sized hospital located in Dourados, Mato Grosso do Sul, Brazil. A mixed-methods approach was adopted, combining qualitative analysis of management interventions with a longitudinal quantitative assessment of institutional performance indicators between 2021 and 2023. The interventions were organized according to four healthcare quality attributes: clinical effectiveness, patient safety, culture of excellence, and outcome-oriented performance. Clinical indicators included emergency department demand and patients-per-day metrics, while patient safety was assessed through adverse event reporting. Organizational culture was evaluated through data from the hospital ombudsman system, and financial performance was analyzed using indicators such as gross revenue, costs, and EBITDA. The results indicate improvements in operational efficiency, patient safety monitoring, and financial sustainability. Beyond institutional gains, these changes contributed to strengthening regional healthcare capacity, reducing patient outmigration, generating employment opportunities, and supporting local socioeconomic development.

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## INTRODUCTION

Hospital management has undergone significant transformations in recent decades, driven by the need to enhance the quality of healthcare delivery, optimize the allocation of resources, and ensure the financial sustainability of healthcare institutions. In this context, the incorporation of Health 4.0 principles has emerged as a strategic approach, fostering the integration of innovative technologies to support more efficient, automated, and data-driven hospital management, ultimately improving patient care and organizational performance. By adopting practices grounded in the principles of Health 4.0, hospital management can implement more effective mechanisms for decision-making and for the integrated monitoring of clinical and financial resources. This approach facilitates the development of more strategic and evidence-based management practices, contributing to improved operational efficiency and higher standards of healthcare delivery. The implications of this emerging managerial paradigm extend beyond the boundaries of the hospital itself, strengthening the institution's strategic role and contributing to local development. Improvements in the quality and reliability of healthcare services enhance public trust in the hospital system, which in turn promotes patient retention and reduces the need for individuals

to seek care in other regions. Such advancements also contribute to the strengthening of hospital infrastructure, creating favorable conditions for attracting new investments and stimulating regional economic development. Furthermore, these improvements foster the creation of both direct and indirect employment opportunities, expanding the healthcare sector's capacity to respond more effectively and sustainably to the growing demands of the population. In this context, the present study aims to evaluate the impacts of implementing Health 4.0 practices in hospital management and their implications for local development. The analysis focuses on a medium-sized hospital located in the city, *Dourados, Mato Grosso do Sul*, Brazil, during the period from 2021 to 2023. The initiatives examined were structured according to key healthcare quality attributes, including clinical effectiveness, patient safety, a culture of excellence, and outcome-oriented performance. This research is based on the hypothesis that the implementation of management practices aligned with the principles of Health 4.0 contributes to improving hospital management efficiency, leading to reduced operational costs, enhanced quality of care, and strengthened internal organizational processes, thereby generating positive impacts on local development. Accordingly, the guiding research question of this study is: how does the adoption of Health 4.0 practices influence hospital management, enhance healthcare quality, and promote local development in a medium-sized hospital setting?

This article is organized into several sections. First, the methodological approach adopted in the study is presented. Subsequently, the results derived from the implementation of Health 4.0 practices are described, with emphasis on healthcare quality attributes. Finally, the discussion contextualizes the findings and examines their implications for local development, followed by the concluding remarks, which summarize the main contributions of the study and outline potential directions for future research.

## METHODOLOGY

This study was conducted at a private healthcare institution dedicated to the supplementary health sector, located in the municipality of Dourados, in the state of Mato Grosso do Sul, Brazil. The hospital provides adult healthcare services and has an infrastructure comprising 60 beds, a surgical center, an adult Intensive Care Unit (ICU), and a 24-hour emergency department. The institution also operates an in-house clinical laboratory and a comprehensive diagnostic imaging service. According to estimates from the Brazilian Institute of Geography and Statistics (IBGE, 2024), the municipality of Dourados has an estimated population of approximately 260,640 inhabitants distributed across an area of 4,062.89 km<sup>2</sup>, with a population density of 59.9 inhabitants per km<sup>2</sup>. The municipality is the second largest in the state of Mato Grosso do Sul and has consolidated itself as a regional development hub and a reference center for hospital services. From a socioeconomic perspective, the municipality presents indicators above the national average. The local GDP per capita, estimated at R\$ 55,246.68 in 2021, is 15.6% higher than the state average and 30.7% higher than the Brazilian average of R\$ 42,247.52. The Municipal Human Development Index (HDI-M) is 0.747, classified as high and exceeding the national average of 0.727 recorded in the same year (IBGE, 2010). Additionally, the school enrollment rate among children aged 6 to 14 years reaches 98.12% (2022), above the national rate of 95.1% (IBGE, 2022).

Within the regional context, Dourados is part of the Cone Sul Health Macro-region, which encompasses 33 municipalities and approximately 879,000 inhabitants, with the city alone accounting for nearly 30% of this population (SES/MS, 2024). According to the Regional Health Plan (SES/MS, 2024), the coverage of private health insurance plans in the municipality is estimated to range between 30% and 35% of the population, exceeding the national average of 26.1% reported by the National Supplementary Health Agency (ANS, 2024). Considering the estimated population of 260,640 inhabitants (IBGE, 2024), this percentage corresponds to approximately 78,000 to 91,000 privately insured beneficiaries. According to the Institute for Health Policy Studies (IEPS, 2024), Dourados presents one of the highest levels of private healthcare coverage among inland municipalities in the state. This estimate of beneficiaries is supported by the installed capacity and the care profile of the hospital, which offers specialized services of medium and high complexity predominantly directed toward adult patients, including intensive care units, emergency services, surgical facilities, an in-house laboratory, and specialized outpatient care. Considering the patient flow originating both from the municipality itself and from neighboring municipalities with more limited access to private healthcare services, it is estimated that the institution directly serves between 70,000 and 100,000 adult patients. This estimate is consistent with the hospital's infrastructure and with the leadership role it occupies within the regional private healthcare system. The research is characterized as an exploratory and descriptive study, adopting a mixed-methods approach that integrates both qualitative and quantitative components. In the qualitative component, the study sought to understand and describe the management strategies and technological innovations applied to healthcare quality attributes, considering their alignment with the principles of Health 4.0. The quantitative component focused on measuring institutional performance through healthcare and financial indicators, enabling an objective assessment of the effects of the implemented interventions. The presentation of results that follows is based on data collected between 2021 and 2023, which are organized according to key healthcare quality attributes: clinical

effectiveness, patient safety, a culture of excellence, and outcome-oriented performance.

**Clinical Effectiveness:** Initially, the study presents the clinical governance actions aimed at process automation, visual management, reduction of clinical response times, and optimization of hospital resource utilization. The indicators used to assess the hospital's care capacity and operational efficiency include Emergency Department Visits and Patients per Day. The Emergency Department Visits indicator records the total number of individuals who sought care at the emergency department, allowing the measurement of demand for urgent and emergency services. The Patients per Day indicator represents the total number of individuals receiving hospital care within a single day and is calculated as the sum of: (i) patients treated in the emergency department, (ii) patients hospitalized in any inpatient unit of the hospital, and (iii) patients who remained hospitalized from previous days. Thus, this indicator provides an integrated measure of the number of individuals under hospital care during a 24-hour period, reflecting both patient inflow and inpatient occupancy within the institution.

**Patient Safety :** To demonstrate outcomes related to this attribute, this section presents how the adoption of hospital accreditation standards, combined with technological modernization, contributed to improvements in healthcare quality through the implementation of adverse event monitoring systems that enhanced traceability and patient safety. In this context, the total number of reported adverse events is presented as the primary indicator, allowing the analysis of its annual evolution over the study period.

**Culture of Excellence :** To demonstrate the institutional culture of excellence, the analysis considered the following criteria: the existence and level of implementation of corporate governance practices, the standardization of administrative procedures and clinical protocols, and the degree of integration of these practices into the hospital's operational routine. Additionally, following the implementation of the Hospital Ombudsman Information System, it became possible to evaluate the effectiveness of mechanisms for active listening and communication among staff, managers, and service users. The analysis therefore considered: (i) the total volume of reports or requests submitted, (ii) their distribution according to requester category, and (iii) the classification by type of manifestation, enabling an assessment of the impact of the new system on user experience and on the continuous improvement of quality management.

**Effective Outcomes :** To present this dimension, the study details the monitoring of the hospital's financial performance, carried out through the segmentation of the institution into clinical and support cost centers, which enables evidence-based managerial interventions. This process was made possible by the adoption of an integrated information system that ensured interoperability with the institutional cost management system, aligning with the principles of Health 4.0. Consequently, it became possible to analyze the hospital's financial performance for each reporting period with greater precision and strategic relevance. Regarding the financial indicators selected to measure changes in hospital management, the methodology includes the analysis of metrics such as gross revenue, fixed and variable costs, and EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization). These metrics were calculated on a monthly basis between 2021 and 2023, enabling the evaluation of the institution's financial performance over time in relation to the operational transformations implemented during the study period.

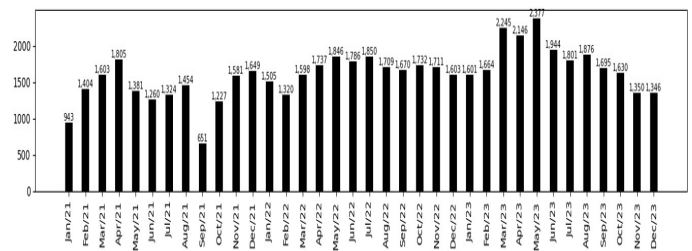
## RESULTS

This section describes the Health 4.0 management practices adopted by the hospital between 2021 and 2023, focusing on the main healthcare quality attributes. Each attribute is accompanied by the respective quantitative indicators used to demonstrate its evolution and impact.

**Clinical Effectiveness Attribute:** The strategies implemented to enhance clinical efficiency were mapped based on the patient journey within the hospital and structured into three main intervention pillars. The first intervention pillar focused on the emergency department, where strategies were implemented to optimize care efficiency. For this purpose, a visual management dashboard for the emergency department was developed, enabled by data interoperability and the hospital's digital infrastructure. This solution allowed continuous monitoring of triage time, emergency department length of stay, physician response time, and total number of visits, ensuring more agile, efficient, and well-coordinated care. Previous studies have demonstrated that the implementation of visual management dashboards in emergency departments is effective in monitoring occupancy, optimizing resource allocation, and improving operational capacity, thereby supporting real-time decision-making (Viola et al., 2014; Yoo et al., 2018). The second pillar involved improving the management of patient admission flow, through the creation of a bed management center, staffed by a nurse responsible for coordinating patient admissions and discharges from inpatient units. A bed management dashboard was developed to map bed availability, monitor bed cleaning time, and manage scheduled discharges. In addition, discharge metrics were organized using a Kanban system, in which green indicated discharge expected within three days with no need for intervention; yellow indicated discharge expected within three days but requiring greater attention; and red represented patients with a length of stay exceeding three days, requiring immediate intervention.

Bed regulation has become a key strategy in hospital management in both private healthcare and public health systems, aiming to optimize bed occupancy and ensure efficient use of available resources (Cecilio et al., 2020; Soares et al., 2024). Regarding the application of Kanban methodology in hospital management, studies highlight that this approach contributes to improved hospital flow organization, process standardization, and the harmonization of care practices, facilitating more efficient patient allocation and improving the operational capacity of healthcare institutions (Carvalho et al., 2022; Lima Rocha et al., 2018). It is important to emphasize that the emergency department visual management dashboard was also accessible via the internet and mobile application and provided updates every 20 minutes through an automated WhatsApp notification system. This allowed hospital managers to monitor demand in real time and implement rapid interventions when necessary. Additionally, the average patient length of stay was sent daily to managers through the same system, facilitating continuous monitoring of hospital patient flow. These solutions illustrate the application of Health 4.0 principles, integrating technology and management to optimize patient flow, reduce hospitalization time, and improve the allocation of hospital resources. The third pillar involved interventions in inpatient units, with the adoption of continuous monitoring of pending clinical demands, particularly focusing on patients flagged for prolonged length of stay. Furthermore, the horizontalization of care was introduced through the implementation of the hospitalist physician model, in which a dedicated physician coordinates care and ensures a continuous and integrated care pathway. Horizontal care models represent an organizational structure in which a multidisciplinary team operates continuously within the service, in contrast to traditional shift-based care models. This approach aims to ensure continuity and comprehensiveness of patient care (Džakula et al., 2023; Hoffman et al., 2016).

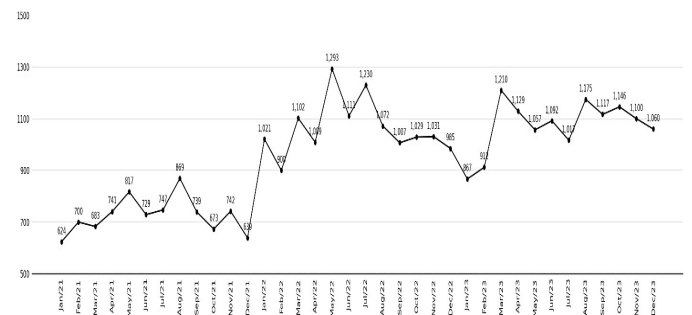
**Clinical Efficiency Indicators:** Between January 2021 and December 2023, the number of emergency department visits showed a clear upward trend, as illustrated in Figure 1. At the beginning of 2021, the hospital recorded approximately 943 monthly visits, while by December 2023 this number had reached 1,612 visits, representing an absolute increase of 669 visits and an overall growth of approximately 70.94%. This growth became more pronounced from 2022 onward, when the number of visits began to stabilize at levels exceeding 1,500 monthly visits, suggesting a sustained increase in demand for emergency services during the study period.



Source: Hospital Information System of Hospital.

**Figure 1. Number of Emergency Department Visits from January 2021 to December 2023**

The analysis of the patients/day indicator between 2021 and 2023 reflects the positive impacts of the strategies implemented, as illustrated in Figure 2. At the beginning of 2021, the number of patients per day was below 750, while bed capacity remained relatively stable. From January 2022 onward, a significant increase was observed, surpassing the threshold of 1,000 patients per day and maintaining a sustained upward trend. Throughout 2023, the hospital consolidated this growth, consistently maintaining service levels above 1,100 patients per day.



Source: Hospital Information System of Hospital.

**Figure 2. Patients per Day and Beds per Day Indicators between 2021 and 2023.**

**Patient Safety Attribute:** In the studied hospital, patient safety was progressively implemented in accordance with the Level 1 standards of the National Accreditation Organization (ONA), which establishes certification criteria for quality and safety in healthcare institutions in Brazil (Cruz; Lolato, 2021). This process was strengthened through the digitalization of processes and the automation of adverse event reporting. The implementation of an integrated information system enabled an increase in the detection and registration of such occurrences, ensuring greater traceability and faster responses to clinical incidents. Furthermore, the expansion of the system's functionalities and the training of healthcare teams reduced the time dedicated to administrative procedures, making safety management more efficient. As a result, in 2023 the hospital obtained the ONA Level 1 Accreditation Seal, which also marked an important step in the institution's strategic repositioning, consolidating its reputation as a regional reference in healthcare quality and patient safety. The approach adopted in patient safety management reinforces the application of Health 4.0 principles, which have been recognized in the literature as an essential strategy for transforming hospital management by making healthcare operations more dynamic, secure, and integrated (Balbino et al., 2024; Fadahunsi et al., 2019).

**Patient Safety Indicator:** The total number of reported adverse events between 2021 and 2023 is presented in Table 11. In 2021, a total of 89 adverse events were recorded, whereas in 2022 this number decreased to 76 events, representing a reduction of approximately 14.6%. This decline was associated with improvements in risk management practices and the implementation of more effective clinical protocols. In 2023, an increase in the number of reported events was observed, totaling 102 notifications, which represents a 34.2% increase compared to 2022. Rather than indicating a deterioration in safety conditions, this increase reflects greater

awareness and adherence among healthcare professionals to the patient safety culture, resulting in more frequent reporting and improved traceability of adverse events.

**Table 1. Number of Adverse Events**

Year	Total Adverse Events	Variation (%)
2021	89	-
2022	76	-14,6%
2023	102	+34,2%

Source: Hospital Patient Safety Information System.

Furthermore, the increase in the reporting of adverse events highlights the adoption of the digital reporting system as a strategy aligned with the Health 4.0 framework, promoting greater traceability, improved risk management efficiency, and enhanced patient safety through the use of digital technologies.

**Culture of Excellence Attribute:** Acting on hospital governance is essential to strengthen leadership structures, consolidate institutional strategies, and promote a continuous culture of process improvement (Abu Orabi et al., 2024; Rosen et al., 2018). In the hospital analyzed in this study, a restructuring of hospital governance was carried out to strengthen decision-making at the tactical and operational levels, adopting a more participatory and efficient leadership model. This restructuring made it possible to improve coordination between different departments, optimize the management of clinical protocols and administrative processes, and align the actions of healthcare teams with institutional objectives, thereby strengthening transparency and consistency in the implementation of organizational guidelines. The standardization of clinical protocols and operational procedures enables the establishment of clear and well-defined workflows, promoting greater predictability and efficiency in hospital operations (Nugraha; Untari, 2025). Another key component of organizational culture is the active participation of staff and service users in improvement initiatives and corrective actions, fostering a more participatory and collaborative institutional environment (Almeida et al., 2018). In this context, the hospital implemented a digital ombudsman (patient feedback) system aligned with the principles of Health 4.0, introduced in 2023. The system provides access through an online interface and a Quick Response Code (QR code), facilitating accessibility and streamlining communication between users and hospital management. Additionally, a dedicated nurse was assigned exclusively to manage and investigate the submitted reports, ensuring faster response times and more efficient resolution of requests and complaints. This model enabled the rapid processing of feedback, both positive and negative, thereby strengthening trust among healthcare professionals and patients.

**Culture of Excellence Indicators:** Data from the hospital's ombudsman system show a total of 260 reports recorded between January and December 2023, as presented in Table 2. The majority of reports were submitted by patients (108 reports, 41.5%), followed by family members and visitors (96 reports, 36.9%).

**Table 2. Ombudsman Reports (2023)**

Category	Quantity	Percentage (%)
Patients	108	36,92%
Family Members / Visitors	96	-14,6%
Hospital staff	55	21,15%
Physicians	1	0,38%

Source: Hospital Ombudsman Information System.

Hospital staff also contributed significantly, with 55 reports (21.1%), while physicians registered only one report (0.4%). These figures indicate that direct users of hospital services represent the primary source of feedback, highlighting the importance of active listening mechanisms in promoting the

continuous improvement of patient experience and healthcare quality. Table 3 presents the nature of the reports submitted to the ombudsman system. Complaints accounted for the majority of records (182 cases, 68.9%), indicating opportunities for improvements in both processes and healthcare delivery. Formal reports or complaints of misconduct (31 cases, 11.7%) also highlight the need for attention to potential non-compliance or ethical issues. Conversely, compliments (29 cases, 11.0%) reflect positive aspects of care recognized by service users, while suggestions (18 cases, 6.8%) demonstrate community engagement in the pursuit of service improvement. Additionally, four reports (1.5%) related to information security incidents were recorded, reinforcing the importance of data protection within the hospital environment.

**Tabela 3. Ombudsman Reports in 2023 According to Their Nature**

Type	Quantity	Percentage (%)
Complaints	182	68,9%
Misconduct Reports	31	11,7%
Compliments	29	11,0%
Suggestions	18	6,8%
Information Security Incidents	4	1,5%

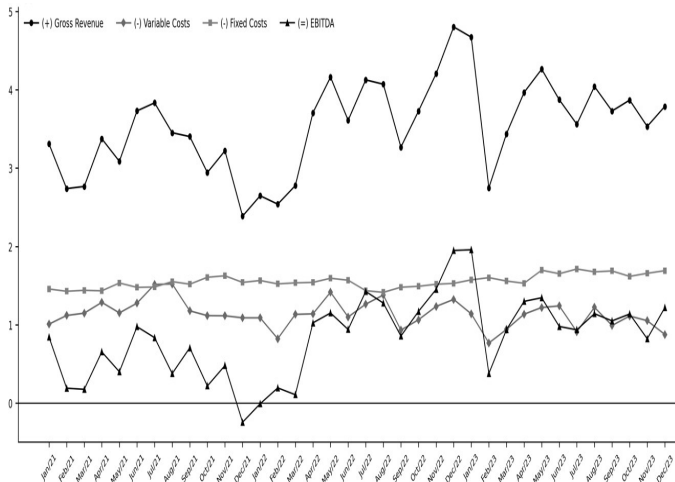
Source: Hospital Ombudsman Information System.

These findings reinforce the role of the hospital ombudsman system as a strategic mechanism for monitoring healthcare quality and user satisfaction. The continuous analysis of these reports enabled the implementation of corrective and preventive actions, strengthening hospital management and promoting a safer and more efficient environment for patients, family members, and healthcare professionals.

**Effective Outcomes Attribute:** The adoption of a cost management system integrated with the interoperability of hospital data and financial analytics platforms represents one of the strategies grounded in the Health 4.0 framework (Sousa, 2022; Tortorella et al., 2021). In the hospital analyzed in this study, financial performance monitoring was conducted through the individual evaluation of direct clinical cost centers, such as the surgical center, intensive care unit (ICU), emergency department, and inpatient units, as well as support cost centers, including laboratory and diagnostic imaging services. This level of analytical precision enabled a detailed mapping of expenses and revenues across cost centers, facilitating strategic decision-making aimed at optimizing resource allocation and improving operational efficiency. Importantly, these processes were implemented while maintaining a strong focus on patient-centered care and healthcare quality, ensuring that financial improvements remained aligned with clinical excellence and patient safety. For example, in the surgical center, improved scheduling and room occupancy management, combined with monitoring of surgical material usage, reduced waste and increased financial predictability. In the intensive care unit, bed management was enhanced through real-time data integration, enabling better planning of bed occupancy and length of stay for critically ill patients. The emergency department, in turn, demonstrated improvements in operational efficiency, reflected in shorter waiting times and a reduction in unnecessary hospital admissions.

**Financial Indicators:** The financial performance of the hospital between 2021 and 2023 is illustrated in Figure 3. A significant increase in gross revenue was observed, with an approximate growth of 14.4% when comparing January 2021 to January 2023. In several months of 2023, revenue growth exceeded 20% compared to the same period in 2021, highlighting the effectiveness of the management changes implemented from a financial perspective. Overall costs followed the variation in revenue but were subject to more rigorous control from 2022 onward. While variable costs increased on average by 9.4%, gross revenue grew at a higher rate, allowing for improved operational margins. Fixed costs, in turn, remained relatively stable, with an average growth of 8.1%, indicating efficient resource

management. This balance between increased revenue and controlled costs led to a substantial improvement in the hospital's financial performance, reducing budgetary pressure and strengthening the institution's economic sustainability. EBITDA, a key indicator used to assess operational performance, showed negative results in some months of 2021, reflecting financial challenges faced during that period. However, in 2022 and 2023, the hospital was able to reverse this trend, achieving an average growth of 54% compared to the performance observed in 2021.



Source: Hospital Cost Management System.

Figure 3. Evolution of Financial Indicators from 2021 to 2023

## DISCUSSION

The implementation of Health 4.0 practices in the studied hospital promoted significant advances in both clinical and financial management, with direct implications for local development. Evidence suggests that the adoption of digital technologies and process optimization plays a fundamental role in ensuring the sustainability of healthcare systems by improving operational efficiency, healthcare quality, and strategic resource allocation (Al-Jaroodi et al., 2020; Li;Carayon, 2021; Sony et al., 2023; Sousa, 2022). In this context, the consolidation of these practices in the hospital located in *Dourados* represented a strategic axis for institutional transformation, contributing to the strengthening of infrastructure, the qualification of human capital, and the repositioning of the institution within the regional healthcare landscape. It is also noteworthy that the efficiency of hospital infrastructure is directly related to bed turnover and bed availability, which optimize the use of installed capacity. The literature demonstrates that data-driven management combined with the digitalization of processes positively impacts operational efficiency and reduces the burden on healthcare services (Li et al., 2017; Tortorella et al., 2022). Regarding hospital financial management, Health 4.0 practices can be applied through predictive analytics and data interoperability (Tortorella et al., 2021). In this way, the digitalization and integration of real-time information support more accurate decision-making, enabling efficient cost control and the identification of opportunities for continuous improvement (Bianchi et al., 2022; Crowe et al., 2017; Langenberger et al., 2023). This approach was clearly demonstrated in the hospital analyzed in this study and resulted in the achievement of financial balance alongside improvements in healthcare quality.

Another relevant aspect was the segmentation of financial performance assessment according to clinical cost centers, which enabled more precise and sustainable planning without compromising the quality of services provided. This approach reinforces the understanding that financial management should be the result of clinical efficiency rather than an end in itself. The distinction among different types of cost centers made it possible to identify areas with greater budgetary impact, allowing strategic adjustments aligned with

the continuous improvement of care. Consequently, resource allocation became guided by objective metrics, ensuring that investments were directed toward sectors with the greatest potential benefit to patients and promoting safer and more efficient healthcare delivery. At the same time, the implementation of quality management systems in hospitals should not be limited to regulatory compliance but must be integrated into organizational strategic planning and financial sustainability (Balding; Leggat, 2021). When quality is incorporated as a competitive advantage in hospital management, direct impacts on financial performance can be observed, strengthening institutional sustainability and ensuring that communities have access to more efficient healthcare services. In this context, the hospital begins to absorb healthcare demands that were previously directed to reference centers in other regions, thereby reducing patient outmigration and preventing the transfer of financial resources to other localities. This dynamic of economic retention favors the local circulation of resources, stimulates commerce, strengthens the regional economy, and supports productive chains associated with the healthcare sector, such as pharmacies, laboratories, diagnostic support services, and hospital suppliers. In addition, the expansion of installed capacity and the increased resolution capacity of the hospital attract more qualified professionals, particularly medical specialists, strengthening regional healthcare networks and expanding the availability of medium- and high-complexity services. This process also generates positive impacts on the local labor market through the creation of direct and indirect jobs in technical, administrative, and support areas, contributing to income generation and regional socioeconomic development. More specifically, the evaluation of healthcare quality attributes based on Health 4.0 practices demonstrated that the implementation of structured clinical governance resulted in greater clinical effectiveness, improved resource allocation, and increased care capacity. Patient safety was strengthened through the digitalization and automation of adverse event reporting, aligned with the ONA Level 1 hospital accreditation standards, contributing to the reduction of clinical incidents and the strengthening of the institution's reputation, which in turn favored patient retention within the region. The consolidation of a culture of excellence was driven by the new corporate governance model, which encouraged professional engagement, promoted a collaborative environment, and fostered leadership development. The standardization of clinical and administrative practices, combined with the appreciation and recognition of healthcare professionals, contributed to talent retention and the attraction of qualified professionals. Additionally, the creation of a structured ombudsman and feedback channel strengthened user participation in continuous improvement processes. In the financial domain, data interoperability and analytical platforms enabled precise monitoring of costs and investments, providing robust support for strategic decision-making.

## CONCLUSION

The experience presented in this study demonstrates that the adoption of Health 4.0 practices represents a strategic driver for the transformation of hospital management by integrating technological innovation, healthcare quality, and financial rationality. The alignment of processes, people, and digital systems enabled a more analytical and responsive management model, enhancing the institution's capacity to generate value in healthcare delivery. Beyond operational gains, the effects extend beyond organizational boundaries, contributing to the strengthening of regional healthcare infrastructure, the creation of employment opportunities, and the expansion of access to specialized healthcare services. In this sense, Health 4.0 emerges as a powerful instrument for stimulating local development, improving healthcare delivery while simultaneously contributing to regional economic dynamism through the recognition of healthcare as a strategic development sector. However, the replication of the practices described in this study may face several challenges, including the need for continuous professional training, resistance to organizational change, and investments in technological infrastructure. Additionally, the heterogeneity of healthcare systems

and variations in hospital structures require context-specific adaptations for successful implementation. As a future perspective, the expansion of these strategies in hospital management is recommended for other institutions, both public and private, provided that they are supported by incentive policies, strong commitment from senior leadership, and structured strategic planning. Consolidating this transformation requires more than the adoption of digital technologies; it demands cultural change, strategic vision, and institutional confidence in the sustainability of the model. By aligning healthcare quality with financial balance, a virtuous cycle is created that strengthens care delivery capacity, improves hospital infrastructure, and promotes local development. In this sense, Health 4.0 should not be understood merely as a technological evolution, but as a viable pathway for repositioning hospital management in response to the contemporary challenges of healthcare systems.

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