

Kanban as a strategy for hospital bed management: analysis of strengths, weaknesses, opportunities, and threats

Kanban como estratégia de gerenciamento de leitos hospitalares: análise das forças, fraquezas, oportunidades e ameaças

Kanban como estrategia de gestión de camas hospitalarias: análisis de las fortalezas, debilidades, oportunidades y amenazas

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ABSTRACT

Objective: To analyze the strengths, weaknesses, opportunities, and threats in using the Kanban method for hospital bed management.

Method: This qualitative descriptive study was conducted with 23 healthcare professionals from a university hospital, using semi-structured interviews between August and October 2023. Data were analyzed using the Discursive Textual Analysis technique, and IRAMUTEQ® software was used for processing.

Results: Identified weaknesses included insufficient human resources, work overload, lack of continuing education, resistance to change, prioritization of direct care, high staff turnover, and limitations in information systems. Threats involved the fragility of the community care network and patients' social vulnerability, which hindered hospital discharge. Strengths included improved team communication, monitoring of length of stay, and identification of care-related issues. Opportunities highlighted Kanban's potential to enhance clinical management and improve regulation of healthcare access.

Final considerations: The identification of strengths, weaknesses, opportunities, and threats showed that the effectiveness of Kanban depends on the connection between organizational structure, team engagement, and intra- and extra-institutional support. Thus, the method should be considered part of a broader process of hospital management and healthcare networks.

Descriptors: Health Information Systems; Hospital Bed Capacity; Hospital Administration; Length of Stay.

RESUMO

Objetivo: Analisar as forças, fraquezas, oportunidades e ameaças no uso do método Kanban para gerenciar leitos hospitalares.

Método: Estudo qualitativo e descritivo realizado com 23 profissionais de saúde de um hospital universitário, usando entrevistas semiestruturadas em agosto-outubro de 2023. A técnica de Análise Textual Discursiva foi usada para análise dos dados e o software IRAMUTEQ® no processamento.

Resultados: Como fraquezas, identificaram-se: falta de recursos humanos, sobrecarga de atividades, ausência de educação permanente, resistência à mudança, priorização da assistência direta, alta rotatividade profissional e limitações nos sistemas de informação. As ameaças envolveram a fragilidade da rede de apoio extra-hospitalar e a vulnerabilidade social dos pacientes, que dificultam a alta. Entre as forças, destacaram-se a melhoria na comunicação entre equipes, o monitoramento do tempo de permanência e a identificação de pendências assistenciais. Como oportunidades, o Kanban mostrou potencial para qualificar a gestão clínica e aprimorar a regulação assistencial.

Considerações finais: A identificação de forças, fraquezas, oportunidades e ameaças permitiu compreender a efetividade do Kanban depende da articulação entre estrutura organizacional, engajamento das equipes e suporte intra e extra institucional. Assim, o método deve ser compreendido como parte de um processo amplo da gestão hospitalar e da rede de saúde.

Descritores: Sistemas de Informação em Saúde; Administração Hospitalar; Tempo de Internação; Número de Leitos em Hospital.

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RESUMEN

Objetivo: Analizar las fortalezas, debilidades, oportunidades y amenazas en el uso del método Kanban para la gestión de camas hospitalarias.

Método: Estudio descriptivo y cualitativo realizado con 23 profesionales de la salud de un hospital universitario, mediante entrevistas semiestructuradas entre agosto y octubre de 2023. Se utilizó la técnica de Análisis Textual Discursivo para el análisis de los datos y el software IRAMUTEQ® para el procesamiento.

Resultados: Las debilidades identificadas incluyeron: la falta de recursos humanos, la sobrecarga de trabajo, la ausencia de educación continua, la resistencia al cambio, la priorización de la atención directa, la alta rotación del personal y limitaciones en los sistemas de información. Las amenazas incluyeron la fragilidad de la red de atención comunitaria y la vulnerabilidad social de los pacientes, que dificultan el alta. Entre las fortalezas se destacaron la mejora en la comunicación del equipo, el monitoreo del tiempo de estancia y la identificación de pendientes asistenciales. Como oportunidades, Kanban mostró potencial para mejorar la gestión clínica y la regulación del acceso a la atención.

Consideraciones finales: La identificación de fortalezas, debilidades, oportunidades y amenazas permitió comprender que la efectividad del Kanban depende de la articulación entre la estructura organizacional, el compromiso de los equipos y el apoyo intra y extra institucional. De este modo, el método debe entenderse como parte de un proceso más amplio de la gestión hospitalaria y de la red de salud.

Descriptores: Sistemas de Información en Salud; Capacidad de Camas en Hospitales; Administración Hospitalaria; Duración de la Estancia.

INTRODUCTION

The overcrowding of public hospitals in Brazil results from a combination of factors, such as population growth, population aging, and an increase in chronic diseases and associated complications, which increase hospital occupancy rates and reduce the number of available beds⁽¹⁾. The Ministry of Health instituted the National Hospital Care Policy (*Política Nacional de Atenção Hospitalar - PNHOSP*) in 2013 to ensure access to quality healthcare services and promote patient safety, aiming to reduce patient dissatisfaction due to excessive delays in care, bed shortages, or placement in inappropriate beds in overcrowded corridors and wards⁽²⁾.

In this sense, the Hospital Bed Regulation Center (*Núcleo Interno de Regulação de Leitos - NIR*; Ordinance No.3,390/2013) was established as an element of institutional coordination. It is responsible for managing outpatient consultations and support and diagnostic services, as well as for the centralized management of beds, in coordination with other institutions and Regulatory Centers⁽²⁾.

To support the Hospital Bed Regulation Center and address hospital overcrowding, strategies have been adopted to ensure appropriate bed utilization and turnover, shorten length of stay (LOS) and improve the safety and quality of care. These strategies include the use of healthcare technologies to support management, underpinned by scientific evidence to guide practical actions⁽³⁾.

Among several hospital bed-regulation technologies, the Kanban method has been used across hospitals in Brazil. The Kanban method is a low-cost strategy that

has been shown to be effective in reducing discrepancies between bed demand and supply⁽³⁾.

The Kanban method originated in Japan and can be translated as a *card*, a *visual signal*, or a *record*. It integrates visual tools into clinical management, following the principles of the Toyota Production System. In healthcare, it has been applied through color-coded charts (green, yellow, and red). These charts guide bed management and enable healthcare professionals to monitor LOS⁽⁴⁾. This method involves the control and monitoring of each inpatient through daily meetings of the multidisciplinary care team, highlighting treatment progress and individual care priorities and needs, and identifying potential administrative and care failures that directly affect hospital discharge⁽⁵⁾.

Globally, there is a knowledge gap regarding the use of the Kanban method. A systematic review of its application in hospital settings found that many studies were limited in scope and methodology, hindering generalizability. Furthermore, the lack of standardization in the implementation of the Kanban method across healthcare services contributes to variability in results⁽⁶⁾.

Another review identified limited evidence on the application of the Kanban method in healthcare settings, particularly regarding its use in organizing patient flow, reducing waiting times, and supporting real-time clinical decisions. The authors emphasize the need for more robust research to assess its sustained effects on hospital management, especially in critical areas such as emergency departments and surgical centers. Furthermore, they noted a lack of robust evidence demonstrating the sustained benefits of the Kanban method in healthcare, despite anecdotal reports of improvement⁽⁴⁾.

Thus, although the Kanban method has the potential to improve management processes in healthcare, a knowledge gap remains regarding its effectiveness. Future research should focus on more rigorous and standardized studies to assess its actual impact on healthcare services⁽⁷⁾.

International studies have used modeling to support hospital management, revealing its potential for admission planning, optimizing bed occupancy, and informing decision-making. Despite its relevance, modeling is a complex technique that requires technological infrastructure and specialized knowledge, which can limit its application in certain contexts. Thus, Kanban emerges as a more viable alternative because it is a simple, visual, and easily implemented for organizing patient flow and bed management⁽⁸⁻⁹⁾.

The Kanban method requires effective interaction among team members and appropriate sharing of information and decisions regarding each patient to support clinical decision-making. This technology supports the optimization of hospitalizations, helps prevent under-reporting of procedures, promotes the participation of patients and their families throughout hospitalization, ensures accurate completion of medical records, and enhances engagement and communication among healthcare team members⁽³⁾.

In the context of the Kanban method, the SWOT matrix is a valuable tool not only for identifying the method's strengths and weaknesses but also for highlighting opportunities for improvement and recognizing potential external threats. Furthermore, it provides a comprehensive overview, which is crucial for informed decision-making and the effective implementation of the Kanban method in hospital bed management. This approach underpins this study, enabling a broad and balanced evaluation of the Kanban method and supporting its more efficient application in hospital settings⁽¹⁰⁾.

The SWOT matrix is a strategic analysis tool used to assess the Strengths, Weaknesses, Opportunities, and Threats of a project or organization. It systematizes the identification of relevant strengths and weaknesses in the internal environment and highlights opportunities and threats in the external environment, allowing organizations to leverage opportunities and minimize threats⁽¹⁰⁾.

This study addressed the following research question: What are the strengths, weaknesses, opportunities, and threats of using the Kanban method for hospital bed management in a university hospital? Therefore, this study aimed to analyze the strengths, weaknesses, opportunities, and threats associated with applying the Kanban method to hospital bed management.

■ METHOD

This descriptive study used a qualitative approach to allow in-depth exploration of meanings, practices, and contexts related to daily healthcare work, and the study design enabled detailed characterization of the elements involved in implementing the tool in the hospital's care units.

The study was conducted at a university hospital in southern Brazil, managed by the Brazilian Hospital Services Company (Empresa Brasileira de Serviços Hospitalares - EBSERH). This hospital has 231 beds, all of which serve the Unified Health System (SUS), and is recognized as a referral center for medium- and high-complexity care in three main areas: care in traumatology and orthopedics, care for patients with human immunodeficiency virus (HIV) and/or acquired immunodeficiency syndrome (AIDS), and care for high-risk pregnancies.

This study included the Internal Medicine, Pediatrics, Traumatology and Orthopedics, and Surgical units, as well as the Emergency Department, all of which had already implemented the Kanban method, enabling the assessment of its implementation and continuity in hospital bed management. The Traumatology and Orthopedics Unit has 12 beds, while the Emergency Department has 20 beds dedicated exclusively to patients referred from other healthcare facilities. The Internal Medicine, Surgical, and Pediatrics units have 48, 31, and 20 beds, respectively.

The Kanban method was implemented at the study hospital in 2017 to support bed management. Patient data were updated daily on a board posted at the nurses' station after meetings of the multidisciplinary care team. These updates were recorded in the patients' electronic medical records and on the NIR bed map⁽¹¹⁾.

Participants were eligible if they had worked with or implemented the Kanban method in the Internal Medicine, Surgical, Emergency, Pediatrics, and

Traumatology units for more than 12 months. The 12-month cutoff was established in light of the high staff turnover at the facility and the need for sufficient experience with the Kanban method to evaluate its use. The selected units were those in which Kanban had been implemented at the study hospital. Units that had not implemented Kanban at the time of the study were excluded.

Twenty-seven professionals were invited to participate in the study, of whom 23 took part. All eligible professionals were invited in person, and none refused; however, four were on medical leave and were therefore excluded from the study.

The sample consisted of 11 nurses, 8 nursing technicians, 2 nursing aides, 1 physician, and 1 physical therapist. The participants had observed the implementation and use of the Kanban method in the hospital from its introduction in 2017 to the time of data collection. Participants were selected using nonprobability convenience sampling. Of the 23 participants, seven worked in the NIR and 16 in the care units where the Kanban method had been implemented.

The study's objective and procedures were explained to the professionals prior to data collection, and dates for the interviews were scheduled. Data were collected from August to October 2023 through semi-structured interviews, which lasted an average of 10 minutes and were audio-recorded. The interviews included four open-ended questions: What is your opinion on the implementation of the Kanban method? What are the positive aspects of using the Kanban method? What are the negative aspects of implementing the Kanban method? and What are the challenges and advantages of implementing and managing the Kanban method?

In addition to the open-ended questions, the interview collected the participants' sociodemographic and professional characteristics, including gender, age, professional background, and length of service at the hospital. These variables were included to contextualize participants' perceptions, providing a better understanding of the profiles involved in implementing the Kanban method. This section preceded the main interview questions.

Of the study's authors, three held PhDs in nursing, one had a master's degree in nursing, and one had a bachelor's degree in nursing. All researchers had

experience conducting qualitative research. The lead researcher, an RN with a master's degree in nursing, collected the data after contacting and scheduling participants in advance. The interviews were held in a private room (with only the lead researcher and the participant) and were conducted at the participants' workplace. There were no additional interviews. Interviews were conducted until data saturation was achieved. The transcripts were sent to the participants for validation, and each participant approved their transcript. The data collection instrument was previously tested with three professionals from the Internal Medicine Unit and the Emergency Department to ensure the questions were understood and aligned with the study's objectives; no adjustments were required and these professionals were included in the final sample.

After transcribing the 23 interviews into a plain text file and configuring the *corpus*, the data were processed using the R Interface for Multidimensional Text and Questionnaire Analysis (IRAMUTEQ®) software. After printing, the transcripts were validated by participants' review and signatures. IRAMUTEQ® is qualitative data analysis software that calculates word frequencies, performs Descending Hierarchical Classification (DHC), and conducts similarity analysis. It enabled the structured and coherent organization of the interview data and generated statistical outputs^(12–13).

The DHC method was the IRAMUTEQ®, analysis technique used in this study, groups text segments by lexical similarity, identifying semantic patterns and facilitating the structuring of semantic classes^(12–13). Thus, the interview *corpus* supports the formation of a reliable and effective classification for subsequent analysis.

The Discursive Textual Analysis technique was used for the analysis and interpretation of qualitative data in four stages: (1) unitization of texts (deconstruction), which separates units of meaning through transcription, reading, and rereading of the 23 interviews; (2) division of the interview texts by IRAMUTEQ® into classes with similar meanings, enabling categorization; (3) capturing new meanings or insights that clarify understanding; and (4) a self-organizing phase—a dynamic learning process that supports the interpretation of results⁽¹⁴⁾.

Categorization was defined using the SWOT (strengths, weaknesses, opportunities, and threats) matrix. Although the categories were defined *a priori*

(deductively), the use of IRAMUTEQ® in data processing enabled a quantitative and systematic analysis that complemented and validated the initial theoretical delimitations. Furthermore, it enabled the identification of emerging patterns and the empirical verification of pre-established categories, revealing nuances and relationships in the data that might otherwise go unnoticed. Thus, the use of the software not only reinforced the methodological rigor of the study but also broadened the understanding of the *corpus* analyzed, contributing to the transparency and replicability of the results in scientific research⁽¹²⁾

The Consolidated Criteria for Reporting Qualitative Research (COREQ) were used to ensure methodological quality in conducting the study and reporting of the results⁽¹⁵⁾.

The confidentiality of participants' identities was ensured by using the term "participant" followed by the number corresponding to the interview order.

Ethical principles were followed, ensuring the protection of human rights in accordance with the National Health Council (CNS) recommendations (Resolutions No. 466/2012 and No. 510/2016) for research involving human participants in the Human and Social Sciences. This study was approved by the Institutional Review Board (Opinion No. 4227467; CAAE No. 30950420.9.0000.5324).

■ RESULTS

Of the 23 participants, 20 were women (87.0%) and three were men (13.0%). Participants' ages ranged from 25 to 66 years, and their training and experience in their respective sectors ranged from 1 to 37 years and from 1 to 17 years, respectively.

The general *corpus* of this study consisted of 23 texts that yielded 429 text segments (TS), of which 372 (86.7%) were retained. The *corpus* contained 14,870 words, of which 1,949 were unique and 974 occurred once. The analyzed content was divided into five lexical classes: 1 (86 TS; 23.1%), 2 (52 TS; 14.0%), 3 (80 TS; 21.5%), 4 (85 TS; 22.9%), and 5 (69 TS; 18.6%). These classes are depicted in the dendrogram below, which shows the relationships among the classes (Figure 1).

The five classes were divided into two major branches, each further subdivided into smaller branches; the two major branches reflected distinct underlying themes. After processing the entire *corpus* and generating intermediate categories using the software, the final categories were derived through Discursive Textual Analysis.

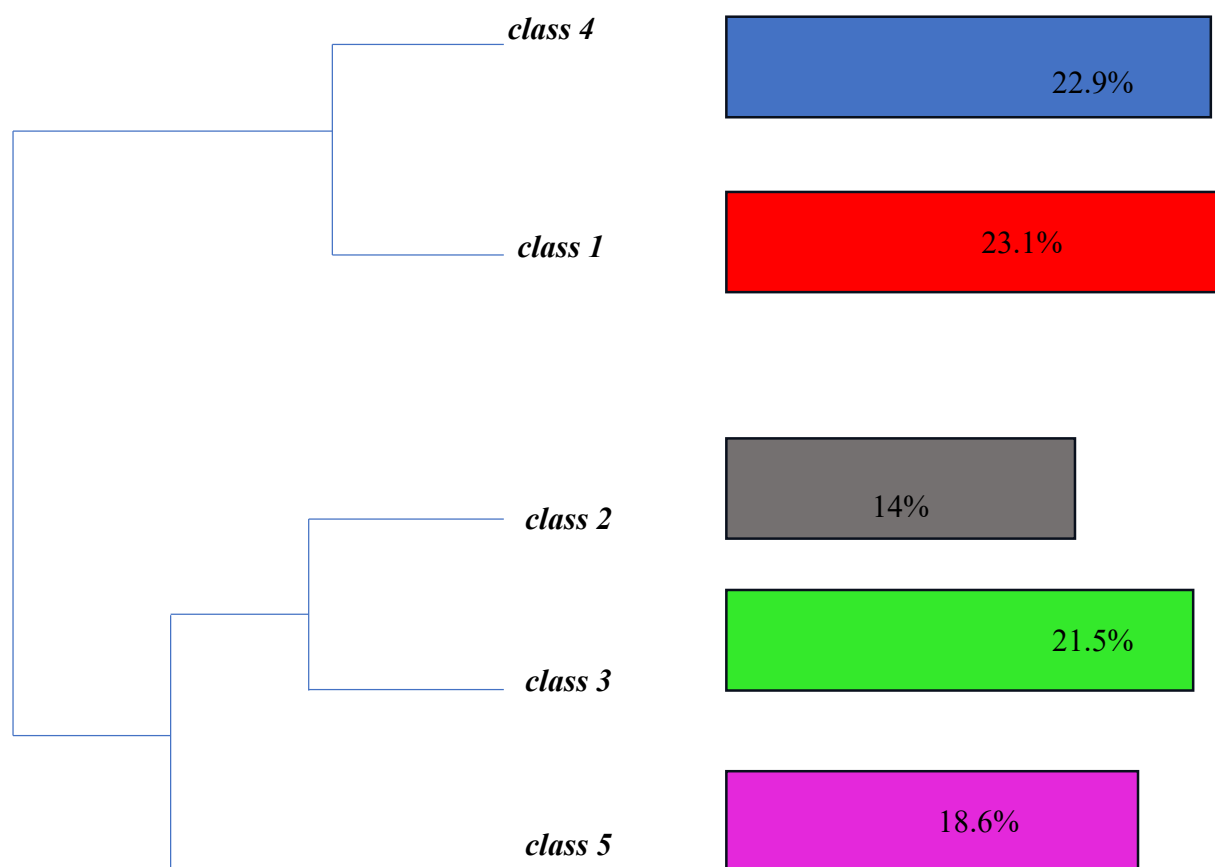
They were divided according to content similarity. Class 5 was grouped with Classes 2 and 3 into Category I, titled "Weaknesses and threats in the implementation and use of the Kanban method as a tool for bed regulation." Category II encompassed Classes 1 and 4 and was titled "Strengths and opportunities in the implementation and use of the Kanban method as a tool for bed management."

We chose the DHC method to better understand the division of classes and the definition of the final categories. This method generates a list of meaning units for each class, as shown in the dendrogram below (Figure 2), and facilitates the visualization and interpretation of content affinities among classes, supporting their grouping and final definition.

Therefore, the categories were defined not only based on the units of meaning of the text segments but also on word frequency, reflecting the study's main theme and its objectives.

The SWOT framework guided the analysis in this study. It is a strategic tool for understanding an organization's environment. The acronym stands for Strengths, Weaknesses, Opportunities, and Threats, which constitute the categories of the SWOT matrix. These factors are grouped into internal (strengths and weaknesses) and external (opportunities and threats) and characterized as positive or negative, helping to identify areas of strong positioning as well as challenges and risks. Once these factors are identified and listed, a hospital can develop strategies to capitalize on its strengths and opportunities while minimizing or overcoming its weaknesses and threats. This approach supports more efficient planning and better resource allocation. Internal factors are represented in the table below (Chart 1) by strengths and weaknesses, while external factors are represented by opportunities and threats.

Figure 1. Descending Hierarchical Classification Dendrogram



Source: IRAMUTEQ®

Weaknesses and threats in the implementation and use of the Kanban method as a technology for bed management

This category describes the weaknesses and threats identified in professionals' reports during the implementation and use of the Kanban method, drawn from Classes 2,3, and 5 generated by IRAMUTEQ®. The sub-categories related to the weaknesses include limited human resources and work overload, lack of continuing education, resistance to change and prioritization of direct care, staff turnover, and operational and bureaucratic limitations in integrating with the information system. Regarding threats, aspects such as patients'

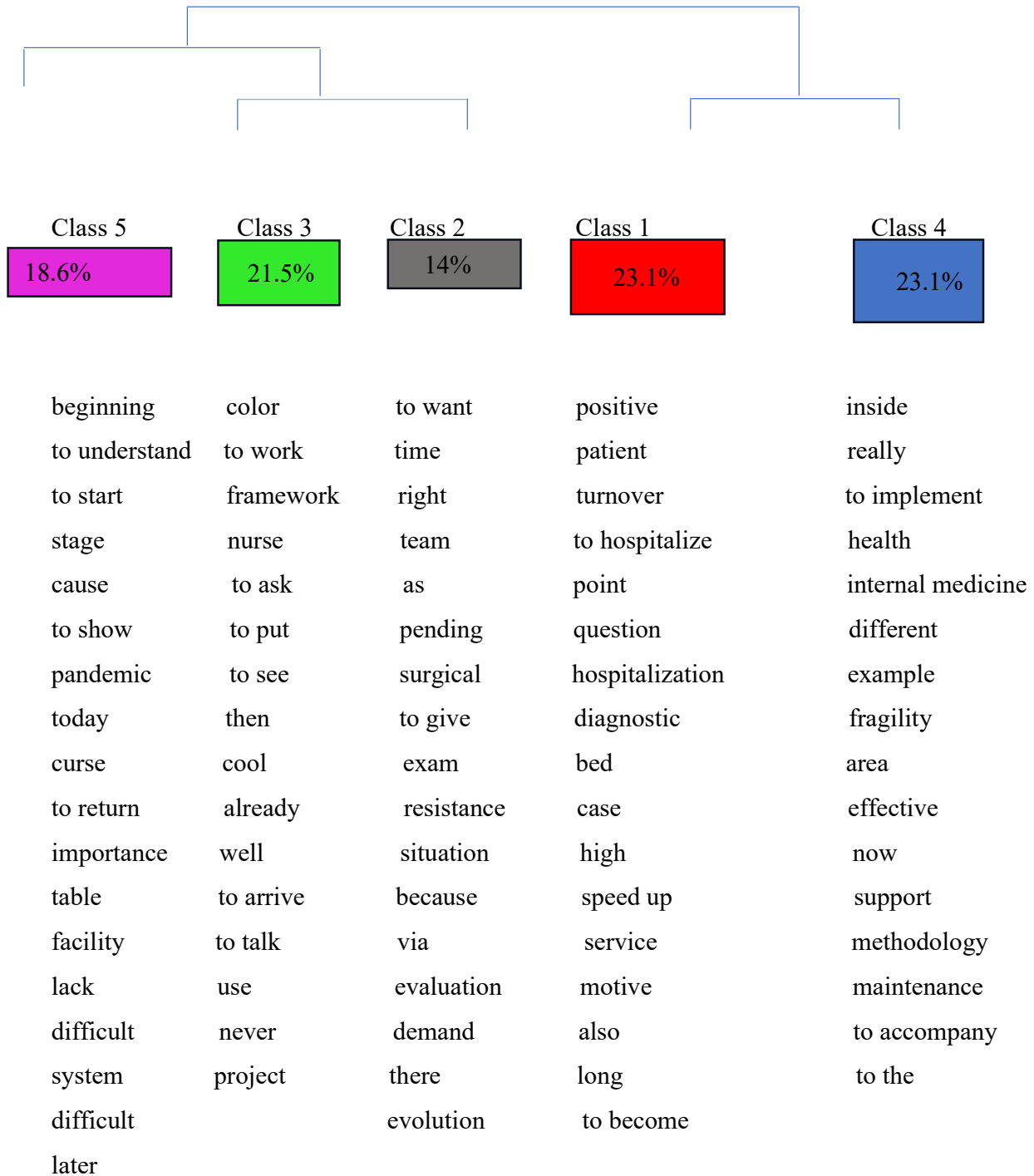
social vulnerability and lack of community-based support emerged.

Limited human resources and work overload

Teams often face challenges due to a shortage of human resources, with insufficient staff to meet care demands. According to participants, the study hospital does not have enough personnel to ensure continuous updating of information, which results in work overload.

In this context, professionals reported dissatisfaction with the accumulation of tasks and responsibilities assigned to the team as a result of the implementation of the Kanban method.

Figure 2. Dendrogram showing class divisions and final category definitions.



Source: IRAMUTEQ®

Chart 1. SWOT matrix of the Kanban method as a strategy for hospital bed management. Rio Grande, RS, Brazil, 2024.

NEGATIVE FACTORS		POSITIVE FACTORS	
INTERNAL FACTORS	WEAKNESSES	STRENGTHS	
	Limited human resources; Work overload; Lack of continuing education; Resistance to change and prioritization of direct care; Staff turnover; Operational and bureaucratic limitations in integrating with the information system.	Increased bed turnover; Monitoring and control of hospital length of stay (LOS); Greater diagnostic agility; Improved communication among multidisciplinary team members; Perceived reduction in infection exposure; Perceived optimization of financial resources.	
EXTERNAL FACTORS	THREATS	OPPORTUNITIES	
	Social vulnerability of patients and lack of community-based support;	Improvement in clinical patient management; Improved regulation of access to care.	

Source: Study data.

[...] because it requires time, attention, evaluation, and interpretation; we don't always have that time because of other demands [...]. (Participant 10)

[...] the biggest challenge in keeping the Kanban method effective is the lack of staff to carry out what it actually requires. (Participant 7)

They were supposed to share the knowledge [...] but they didn't [...]. I haven't received much guidance on it [...], so I couldn't understand the framework. (Participant 14)

I think the biggest difficulty was that no one knew what it was; later, they began to understand it. (Participant 13)

Lack of continuing education

Participants identified the lack of effective training and continuing education as a weakness that undermines the effectiveness of the Kanban method. Their reports pointed to gaps in initial training and practical guidance, which hinder understanding and proper use of the system.

I didn't take the course [...]; it was offered before we were hired. Those who passed the entrance exams at the same time I did were hired after the course.

Resistance to change and prioritization of direct care

The reports show that professionals prioritize care activities and struggle to incorporate Kanban into their routines, particularly due to a lack of clarity about who is responsible for its maintenance. Resistance seems to be more closely associated with work overload and the perception that the method interferes with established routines.

We didn't have just one person for this [...]; our work isn't limited to that. In a department with few people to handle everything, we end up prioritizing what impacts direct care [...]; that's a priority [...]. (Participant 4)

[...] resistance from professionals [...]; so the entire team has to be involved [...]. (Participant 10)

[...] there's resistance to anything new that affects comfort [...]; teams tend not to welcome change [...]. (Participant 21)

Reports indicate that resistance is linked to prioritizing tasks considered more urgent in direct care and to the lack of a clear definition of who is responsible for completing and updating the Kanban. This situation contributes to only partial adoption and hinders the consolidation of the tool as an institutional routine.

Staff turnover

Frequent staff turnover was identified as a significant weakness that directly affects the effectiveness of the Kanban method. Interviewees highlighted that the frequent replacement of team members in the study hospital disrupts workflow, leading to discontinuity and challenges in the effective use of the Kanban method.

[...] we rotate teams a lot [...]; we start the week with one team, and by the end of the week it's not the same. [...] the teams rotate, of course, but this happens constantly. You welcome a colleague, show them where things are, give them some guidance, and [...] two weeks later they've been moved to another department, changed their schedule, and it all starts again. (Participant 15)

It's this staff turnover within the hospital. I think this is a weakness that affects the Kanban method, care, and teaching, [...] the people we trained are no longer in the units, or they've changed departments or shifts, or they're already leaving because they've been moved [...]; it feels like we have to go back to the beginning, start all over again [...]; it's very difficult because we always have to share some knowledge to someone new. (Participant 5)

Operational and bureaucratic limitations in integration with the information system

Participants reported bureaucratic hurdles, technical difficulties, and slow data entry processes that undermine the full use of Kanban as a tool integrated with clinical information. Although some improvements were noted, persistent obstacles remain in automating, updating, and visualizing data.

[...] people started improving their information processes; we can generate reports [...], and work more with this method because of the need to streamline admissions. (Participant 7)

[...] to this day, I haven't been able to put up some signs on a board for the staff [...] There's a lot of bureaucracy, very time-consuming; you have to go step by step, review procedures, and then review them again. It's difficult; it's not something that gets done quickly and is ready. (Participant 4)

The information coming from the system wasn't always available for all patients; there was a problem every day. It was a long time ago—I think it was through the AGHUX system—we used to get the data, the colors, from there. Some didn't come through; it was very complicated. It didn't facilitate or work as it should. (Participant 18)

Patients' social vulnerability and insufficient community care support

The participants' reports highlight that the lack of adequate community care support is one of the main threats to the effectiveness of the Kanban method. Poor coordination with the primary healthcare network, absence of support services, and insufficient social resources often prevent patients from being discharged, even when hospitalization is no longer clinically necessary.

Situations of extreme poverty, absence of caregivers, inadequate or nonexistent housing, and lack of access to medication and food exacerbate problems after discharge. These conditions reveal structural weaknesses in the healthcare system that unnecessarily prolong hospital stays, hinder bed turnover, and disrupt the flow of care, thereby significantly reducing the expected benefits of Kanban in hospital management.

And sometimes there's the social aspect. We work with a population that is often socially vulnerable [...]; I was discussing this at the internal medicine unit. I heard about a patient who was ready for discharge and could complete treatment at home; however, he remains hospitalized for social reasons. (Participant 3)

We don't have a community network that provides adequate support [...]; for example, a home care service that offers assistance. (Participant 5)

[...] social admissions [...]; people who don't need hospital care for clinical reasons but remain hospitalized for reasons such as providing shelter for some homeless patients [...]. (Participant 23)

Strengths and opportunities in the implementation and use of the Kanban method as a technology for bed management

This category addresses the positive aspects reported by professionals, based on Classes 1 and 4 generated by the IRAMUTEQ®. The subcategories related to strengths included increased bed turnover, monitoring and control of LOS, more timely diagnostics, improved communication among multidisciplinary team members, and the perception of reduced infection exposure and resource optimization. Regarding opportunities, aspects such as enhanced clinical patient management and better regulation of access to care emerged. Together, these elements highlight Kanban's potential as an instrument that bridges care and management.

Increased bed turnover

According to participants, the Kanban method has been effective in optimizing hospital stays and increasing bed turnover. By ensuring that admissions last only as long as necessary for safe treatment, the method helps streamline resources and improve care flow.

It's important for bed turnover and better utilization, especially when patients remain in the hospital for long periods, often for administrative rather than healthcare reasons. (Participant 3)

This optimizes hospital stays and makes patient's time in the hospital more productive. It also brings significant benefits to the institution [...]; you can reduce hospital stays. (Participant 7)

Monitoring and control of length of stay

Professionals reported that the Kanban method facilitates monitoring patient LOS, enabling greater control and helping to identify potential bottlenecks in the discharge process. Although these reports alone do not in themselves confirm an objective reduction in hospital stay, they reflect a consistent perception of heightened vigilance regarding delays and bottlenecks in the care flow.

[...] it ends up shortening hospital stays, identifying where the system's flaws and bureaucracy lie; it focuses on addressing the real problems that make hospitalizations so long [...]. (Participant 10)

Its main advantage is providing control over bed occupancy, as it triggers an alert when a patient exceeds the time required for their condition and improves visibility into bed use. (Participant 8)

More timely diagnostics

Participants also associated the adoption of the Kanban method with improvements in patient care control and management, particularly in achieving more timely diagnostics and monitoring clinical progress. The systematic use of the method enabled a more structured daily analysis of patients' clinical status, supporting earlier and more targeted interventions.

Before, we were very lost even regarding patient progress [...]; now everything is specific, directed to that area [...]. Patient registration during hospitalization has improved significantly. I've been working in the emergency room since they implemented it, and it's been much better there. We started to monitor patient length of stay, how long they could remain based on their illnesses, and how long their hospital stay could be extended. (Participant 2)

[...] see where the problems are and how they change over time [...]; there was a problem with assessments that took too long [...]. This service was centralized here in regulation, and what happened? We can now manage and monitor things better. (Participant 3)

Improved communication among multidisciplinary team members

Statements indicated that implementing the Kanban method improved communication both within the multidisciplinary team and between these professionals and the Hospital Bed Regulation Center (NIR). The method clarified and integrated information flows, enabling joint case discussions, identification of pending care needs, and faster decision-making, with a direct impact on hospitalizations.

Because what we do, the weekly meeting... [...] brings together the doctor, the social workers, the nutritionist—everyone—to discuss patients' issues. From the meeting, the NIR can track pending issues and expedite them (Participant 1)

... it ends up promoting more discussions about the cases under treatment; turnover increases, and this can be positive... (Participant 23)

Perception of reduced infection exposure

It was evident that by reducing unnecessary hospital stays, the Kanban method can indirectly lower patients' exposure to infectious risks. Prolonged hospitalization is a well-known risk factor for new infections and related complications. This reduction leads to better health outcomes for patients and more efficient use of hospital resources.

I also think that hospital infections decrease; [...] it allows the patient to be discharged at the appropriate time, avoiding unnecessary exposure to viruses and bacteria present in the hospital environment. (Participant 21)

Perceived optimization of financial resources

Participants reported that the use of Kanban can generate positive financial impacts, particularly through faster bed availability and reduced waste. Although not measured in this study, this effect was perceived as relevant in the teams' daily practice.

It's one of the most important things in a hospital because it affects the entire financial aspect of the institution, including hospitalization. (Participant 1)

[...] the financial aspect would be a positive point [...]; the time patients spend here has a cost. (Participant 9)

I believe it also generates cost reductions [...]. The hospital will receive payment for a reason [...]; among the conditions that led to hospitalization, we choose the one that lasts the longest and is most expensive [...]; the hospital then receives slightly better reimbursement [...]; I think these are the reasons [...]; turnover, infections, and the financial aspect. (Participant 23)

[...] the hospital's expenses significantly affect its financial aspect [...]; I think shorter hospitalization time is reflected in everything: food, cleaning, medication, and the time of the staff who care for the patient. (Participant 21)

Improved clinical management of patients

Professionals' reports indicated that the Kanban method contributes to the organization and continuous monitoring of hospitalized patients' clinical progress. The method provides greater clarity regarding each patient's condition, facilitates the identification of pending care issues, and promotes coordination among the different professionals involved. This structure supports more timely and effective interventions, improving therapeutic management and strengthening overall clinical management in the hospital setting.

It also allows you to visualize what's happening. When you look at that board and see that a patient is waiting longer than they should, you contact the multidisciplinary team and try to resolve the situation [...]. With the Kanban method, you can see that the patient is yellow; so we'll look at the situation [...]. (Participant 22)

Some things are missing. This patient is more chronic and will need to take antibiotics for a long time. If they need a test, we have to follow up—see why they didn't have the test or didn't take the medication. They might be missing medication. Will the purchase be made? No? Will the hospital receive support from the local government? [...] Those on the front line can see this clearly. (Participant 1)

Before, we had patients here who would wait many days, even a month, for tests. When the Kanban method was introduced, it made things easier. You could go there and see why a patient was red—because they were waiting. They were waiting for a test scheduled for two weeks later. Then a solution would be found to expedite the test. (Participant 13)

Improved regulation of healthcare access

The Kanban method offers a significant opportunity to improve the regulation of healthcare access. It facilitates efficient communication and optimizes hospital bed management, strengthening care coordination and resource allocation. As a result, patients can access services in a timely manner, and a greater number of patients benefit from services, leading to more efficient healthcare regulation.

The Kanban method stems from an implementation policy that goes beyond internal use, encompassing regulation and understanding of hospitalization, billing issues, and its broader scope. Sometimes we think it's just about bed regulation—but it's not. Bed regulation is the bare minimum. Its full breadth, which includes hospital billing and SUS policy, is very important. (Participant 4)

■ DISCUSSION

The qualitative analysis based on the SWOT matrix identified factors that positively and negatively influence the implementation and use of the Kanban method in hospital bed management. This discussion is organized around the four dimensions of the matrix—weaknesses, threats, strengths, and opportunities—linking the empirical findings to current scientific literature.

Insufficient human resources were highlighted as one of the main factors hindering the operationalization of Kanban. This limitation compromises staffing and overloads teams, who must balance care with administrative tasks. Studies indicate that the absence of professionals dedicated exclusively to bed management undermines the effectiveness of methods like Kanban by creating discontinuity in the flow of information^(3,16).

Another weakness is the lack of systematic team training. The absence of continuing education limits the proper use of the method, restricting its functionality and preventing professionals from fully understanding its objectives and mechanisms⁽¹⁷⁾. This training gap also contributes to resistance among some teams toward integrating Kanban into their routine, particularly in contexts of high demand and frequent staff turnover.

Staff turnover was another recurring factor, causing discontinuity in the application of the method and in the transfer of institutional knowledge. Studies indicate that high turnover compromises the implementation of organizational innovations in healthcare by reducing team stability and the accumulation of experience⁽¹⁸⁾.

Furthermore, bureaucratic difficulties and limitations in the hospital information systems were reported as barriers to the effective integration of Kanban into institutional routines. Slow registration processes and lack of system interoperability undermine agility in decision-making, contradicting the principles of visual and rapid management that underpin Kanban^(4,19).

The social vulnerability of patients and the fragility of the community care network pose external threats that directly affect the efficiency of bed management. The inability to discharge patients due to poor social conditions, lack of family support, or discontinuity of home care unnecessarily prolongs hospital stays, disrupting the flow of admissions^(20,21).

In addition to structural barriers, it is worth noting that the study hospital serves a significant number of patients in socioeconomically vulnerable patients, which contributes to “social admissions”, *i.e.*, prolonged hospitalizations caused by inadequate conditions for continuing care after discharge. In these cases, patient stays exceed the average lengths recommended by the SUS Procedure, Medication, and Orthoses, Prostheses, and Special Materials (OPM) Table Management System (SIGTAP) and institutional protocols, not because of clinical criteria but due to social factors such as homelessness, lack of family support, or the inability to ensure home treatment.

This context is aggravated by fragile referral flows to the primary health care network, delaying the development and implementation of hospital discharge plans⁽¹⁷⁾. Insufficient coordination between primary care services, the hospital, and the patients’ families compromises continuity of care, revealing a structural gap in the network organization and in the counter-referral process⁽²⁰⁾.

The literature indicates that the lack of coordination between services across different levels of care contributes to prolonged hospital stays and inefficient use of hospital beds. Although effective in visualizing internal processes, the Kanban method depends on a connected regulatory system that ensures effective counter-referral and community-based support⁽²²⁾.

Among the strengths identified, the Kanban method’s potential to enhance communication among multidisciplinary team members stands out. Visibility of clinical information helps organize care priorities, supports case resolution, and prevents unnecessary delays. The method enables professionals to better understand patients’ clinical status, needs, and pending procedures, promoting more coordinated and safer care⁽²³⁾.

Another relevant aspect was the continuous monitoring of hospital LOS, which began to be tracked more systematically. Although this qualitative study did not primarily aim to measure indicators, a retrospective documentary analysis of 13,637 medical records from the same hospital revealed a significant reduction in the average LOS after the implementation of the Kanban method, between August 2018 and September 2022⁽²⁴⁾. These findings demonstrate a concrete improvement

in bed utilization efficiency and reinforce professionals’ reports of the method’s operational benefits.

Furthermore, the ability to identify pending care issues and coordinate team actions was highlighted as an important contribution of Kanban to patient safety and care management. These aspects align with the principles of clinical management and hospital governance, which emphasize efficiency, traceability of actions, and integration of care processes^(21,25). The presence of a visual board in inpatient units makes information on LOS, pending tests, and treatment plans more accessible, enabling the team to act proactively to mitigate risks and streamline procedures.

In terms of opportunities, the study found that Kanban can improve healthcare management and the regulation of access by providing an objective view of each patient’s LOS, clinical status, and pending care needs. This visualization supports faster and more informed decision-making, particularly in situations of bed shortages^(26–29).

The implementation of Kanban was also identified as an opportunity to strengthen the systematization of care processes, foster intersectoral alignment, and improve hospital governance. Studies indicate that the use of visual tools combined with agile management can generate gains in performance, patient safety, and efficient use of resources⁽³⁰⁾.

Finally, it is important to emphasize that hospital regulation depends not only on operational tools but also on an organizational culture oriented toward continuous improvement and collaboration. In this context, Kanban serves as a facilitating device that must be supported by stable institutional structures, continuing education, and integration with other levels of the healthcare system⁽²⁷⁾.

Although the results contribute to expanding knowledge on the use of the Kanban method in hospital bed management, some limitations should be acknowledged. The study was conducted in a single university hospital, whose organizational structure and institutional processes may not represent other healthcare settings, limiting the generalizability of the findings. The self-reported nature of the accounts raises the possibility of social desirability bias, which may have influenced how participants expressed their perceptions. Finally, the absence of triangulation with

institutional quantitative data during the collection phase is noteworthy, as this could have strengthened the validity of the findings and provided a deeper understanding of the phenomenon under study.

■ FINAL CONSIDERATIONS

The analysis of the strengths, weaknesses, opportunities, and threats of the Kanban method revealed that its effectiveness depends not only on the adoption of the method itself but also on structural and relational factors that support its application. Kanban has shown potential to improve work organization, increase the visibility of clinical information, and enhance communication among multidisciplinary team members, thereby fostering integrated bed management.

However, significant weaknesses were also identified, including insufficient human resources, lack of systematic training, and staff turnover, which hinder the consolidation of the method as an institutional strategy. External factors, such as patients' social vulnerability and the fragmentation of the care network also emerged as threats to the effectiveness of Kanban-based bed management.

In this context, the nursing team plays a central role in supporting the method, particularly through direct and continuous communication with patients and the management of essential clinical information. Strengthening continuing education, enhancing information systems, and fostering greater intersectoral coordination are key measures for consolidating Kanban as a care technology in the hospital setting.

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■ Availability of data and materials

The dataset is available from the corresponding author upon reasonable request.

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