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Implementations of technology for managing beds in a teaching maternity hospital

Implementação de tecnologia para o gerenciamento de leitos em maternidade de ensino

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ABSTRACT

This study proposed the development and implementation of a technology used in hospital bed management, developed by the information technology sector of the maternity hospital researched, from the experience of another teaching hospital institution in the Northeast Region, capable of identifying, planning and intervening directly in the hospital availability of bed supply, through the Kanban methodology. Kanban is a Japanese tool, which uses visual signaling methodologies, through a panel of colors that guide the management of Health professionals in the best regulation of the supply of beds and the length of stay of this user in the hospital institution, in order to identify possible administrative and care failures in the discharge process (Negri and Campos, 2017; Felix, 2013; Heisler, 2012). The study presented 20 recommendations for adjustments of the technology implemented in the NIR. All requests were technically supported through the arguments suggested and listed in the data collection instrument. Among the recommendations, it is suggested investment in training, wide dissemination and sensitization of the multidisciplinary team regarding the handling of the tool, to standardize the process of teamwork and improvement of the internal regulation of hospital beds. The use of work routines based on strategic planning and tools that can improve, rationalize and dignify the labor process are necessary to try to equate the chaotic situation observed in much of the public units to offer users of the system a service with respect and dignity.

Keywords: Hospital beds. Kanban. Teaching maternity.





RESUMO

O presente estudo propôs a elaboração e implementação de uma tecnologia utilizada no gerenciamento de leitos hospitalares, desenvolvida pelo setor de tecnologia da informação da maternidade pesquisada, a partir da experiência vivenciada por outra instituição hospitalar de ensino da Região Nordeste, capaz de identificar, planejar e intervir diretamente na disponibilidade hospitalar de oferta de leitos, por meio da metodologia Kanban. O Kanban é uma ferramenta desenvolvida pelos japoneses que utiliza metodologias de sinalização visual através de um painel de cores, orientando a gestão de profissionais de Saúde na melhor regulação da oferta de leitos e do tempo de permanência desse usuário na instituição hospitalar, com o objetivo de identificar possíveis falhas administrativas e assistenciais no processo de alta (Negri e Campos, 2017; Felix, 2013; Heisler, 2012). O estudo apresentou 20 recomendações de ajustes da tecnologia implantada no NIR. Todas as solicitações foram tecnicamente respaldadas pelos argumentos sugeridos e elencados no instrumento de coleta de dados. Dentre as recomendações, sugere-se o investimento em treinamentos, ampla divulgação e sensibilização da equipe multiprofissional quanto ao manuseio da ferramenta, visando uniformizar o processo de trabalho em equipe e a melhoria da regulação interna dos leitos hospitalares. Vê-se que o emprego de rotinas de trabalho embasadas no planejamento estratégico e em ferramentas que sejam capazes de aperfeiçoar, racionalizar e dignificar o processo laboral são necessárias para tentar equacionar a situação caótica observada em grande parte das unidades públicas.

Palavras-chave: Leitos hospitalares. Kanban. Maternidade de ensino.

Introduction

The management of hospital beds is a process whereby they are utilized to their fullest capacity within the parameters defined by the institution, with the objective of reducing the wait for hospitalization and avoiding unnecessary inter-hospital transfers.

A study conducted by the Federal Council of Medicine (CFM) revealed that the number of hospital beds in Brazil declined by 10.5% between 2005 and 2012. The body notes that, over a seven-year period, there was a reduction of 41,713 hospital beds in the Unified Health System (SUS). In the public health network in the state of Ceará, 2,038 hospital beds were closed over the past four years (2012-2016), with 52.4% of these beds being public beds. Most specialized beds were reduced, with 129 SUS beds eliminated in the areas of clinical and surgical obstetrics and gynecology. This survey was based on data from the Ministry of Health's National Register of Health Establishments (CNES).

This reduction in hospital beds for pregnant women highlights several barriers to access to childbirth, such as the lack of places in maternity hospitals.



The absence of risk diagnoses and the linking of pregnant women to maternity hospitals based on risk generates irrational situations in which maternity hospitals with a higher technological density, suitable for the care of pregnant women at risk, always have their beds occupied by low-risk pregnant women, and neonatal intensive care unit (ICU) beds are always occupied by children with avoidable prematurity (Mendes, 2011).

To mitigate the issues associated with a lack of beds, the initial proposal was to establish the Internal Regulation Center and integrate it into the institution's operational framework, centralizing the administration of hospital beds and the allocation of vacancies across the entire hospital, influencing decision-making processes and improving performance indicators.

This study proposed the design and implementation of a technology used in the management of hospital beds. This technology was developed by the information technology sector of the maternity hospital under investigation, based on the experience of another teaching hospital in the Northeast. It can identify, plan, and intervene directly in the availability of hospital beds, using the Kanban methodology.

Kanban is a tool developed by the Japanese that employs visual signaling methodologies, utilizing a panel of colors (green, yellow, and red) to guide the management of health professionals in regulating the supply of beds and the length of stay of users in hospital institutions. This is done with the aim of identifying potential administrative and care failures in the discharge process (Negri and Campos, 2017; Felix, 2013; Heisler, 2012).

As outlined by Lage Júnior and Godinho Filho (2008), Kanban is a Japanese term that can be translated literally as "register," "visible sign," or "visible board." In the field of healthcare management, this method has been adapted for application in emergency and/or inpatient units with the objective of improving flow and resolving patient access problems.

Consequently, despite the dearth of empirical studies in this field, it is a pressing and imperative topic for the administration of health services. The objective of this study was to develop a product that would enable bed management to be adapted by medical and nursing professionals at the Internal Regulation Center, considering all the considerations and experiences of supply management in a tertiary maternity hospital.

It is anticipated that the technology developed will facilitate the integration of the work processes of the teams at the institution under study and other hospitals that are confronted with the challenge of overcrowding daily.



This integration will facilitate the measurement, evaluation, and monitoring of the actual capacity of internal supply about the appropriate and effective management of hospital beds. It will assist them in the decision-making process and in the consolidation of a health policy aimed at the integrality of maternal and child access, promoting the implementation of successful practices in bed management and in the organization of the regulatory process in the state.

Considering the circumstances, the objective of this research was to implement hospital bed management technology in a teaching maternity hospital.

1 Methodology

This is a methodological study with the objective of implementing a hospital bed management technology that employs the Kanban method as a strategy to optimize the efficiency of patient access. This method allows for a systematic, integrated, and collective vision of the variability of hospital occupancy by the multidisciplinary and managerial teams.

The study was conducted in three phases. The initial phase of the study involved an exploratory observation of other bed management technologies in hospitals in another state in the Northeast. The second phase of the study involved presenting the tool for adapting bed management technology to the nurses and doctors of the Internal Regulation Center (NIR) and analyzing the recommendations suggested by the professionals for adding content and resources to the tool. The third phase of the study involved the analysis of the main strengths and weaknesses identified by the NIR professionals when using the technology.

The research was conducted at a teaching maternity hospital in the city of Fortaleza, the capital of Ceará, which serves as a tertiary referral center for maternal and childcare. The maternity hospital under study is included in the linkage map for pregnant women from the Family Health Centers in the municipality of Fortaleza, serving as a reference care unit for normal births and high-risk births.

The study population is comprised of health professionals from the Internal Regulation Center, including 11 nurses and 1 doctor, for a total sample size of 12 participants. All participants have experience in managing hospital beds.

The study participants were selected based on the following criteria: they were regulatory professionals from the Internal Regulation Center, with a demonstrated understanding of the subject matter under investigation, experience in the relevant field,



and a history of managing the supply of beds. The invited participants consented to participate in the study and signed an informed consent form.

The data collection instrument was applied, and the professionals were instructed to analyze the content, presentation, clarity, and understanding of the technology used, giving it validity so that it could later be implemented in the maternity ward's clinical and surgical obstetrics, neonatology, and gynecology care units. This would help to improve and standardize the institution's work processes.

To analyze the results, the SPSS 21.0 statistical program was employed to enter the data and analyze each attribute. To prevent potential inaccuracies in the transcription of data from the instrument, the researcher conducted a preliminary evaluation of the records and notes. Thematic content analysis was employed for the subjective portion of the data collection instrument for professionals.

This research was conducted in accordance with the recommendations set forth in Resolution 466/12 of the National Health Council (CNS), which is affiliated with the Brazilian Ministry of Health. The CNS guidelines consider the aspects of autonomy, non-maleficence, beneficence, and justice regarding the rights and duties of the researcher and study participants (CNS, 2012). The study was submitted to the Ethics Committee for Research with Human Beings of the maternity hospital and received a favorable opinion under number 2.198.194.

2 Results and discussion

2.1 1st Exploratory Stage

The exploratory moment occurred during an on-site visit to the Health Regulation and Evaluation Sector of a university hospital in the Northeast, which has developed local bed management technology. During this visit, we learned how the tool works and the progress made in implementing the technology.

Following the visit and with a record of the recommendations observed with the use of technology, the researcher requested that the maternity ward's information technology department develop a tool following the same standards used in the technology developed by the university hospital visited.

The construction period of this technology spanned six months. At the conclusion of this period, the hospital bed management technology was presented to the researcher in September 2017. This was done so that she could analyze the resources, appearance, and



content made available by the tool before the adaptation period at the Internal Regulation Center.

2.2 Stage 2 Technology Adaptation

In the second phase, the technology was presented to the nursing and medical staff at the NIR for adaptation and implementation in the maternity ward. The objective of this phase was to identify the maximum number of considerations and reformulations to be made, seeking a balance of opinions and thus facilitating the implementation of the tool in other areas of the hospital. The data collection for this phase was conducted throughout October 2017.

At this juncture, the NIR professionals were formally invited to participate in the research project through a letter of invitation. The letter of invitation explained the title of the study, the objectives of the research, the rationale for the adaptation process, and the expected contribution of the professionals who would be using the tool. The objective of this was to encourage the professionals to participate and to return the material within the proposed timeframe.

Once they had consented to participate, they signed the informed consent form and received a printout of the technology to be evaluated, called Hospital Bed Management, the evaluation tool and the guidelines to be followed. The data collection instrument was provided to the participants in person, with instructions to return it within 15 days with their considerations and suggestions.

Regarding the specific aspect of the evaluation tools utilized by nurses and doctors, these were divided into three sections. The first section contains data on the academic background and occupation of the professionals. The second section covers the evaluation items of the material, including the objectives, structure and presentation, appearance, and relevance of the technology developed. The third section of the instrument comprises questions that permit the analysis of the participants' responses and the formulation of recommendations for modifications at the information technology unit of the maternity hospital under study, with the aim of implementing these throughout the hospital's care and management areas.

The evaluation of the professionals' knowledge of the content focuses on the suitability of the proposed technology in relation to its implementation with a view to improving hospital indicators related to bed management.



The technology adaptation period at the NIR commenced in October. During the initial fifteen days, the professionals were permitted to utilize the technology daily, with the objective of evaluating the available resources and integrating them into their work processes. During the subsequent fifteen days, the professionals were instructed to record their perceptions and suggestions in accordance with the attributes specified in the data collection instrument.

The participants utilized the technology for a period of 15 days to facilitate the integration of the technology into their work processes. Subsequently, in the final fifteen days of October, the participants completed the data collection instrument. To facilitate access to the information displayed on the technology during bedside visits, two tablets were provided to NIR professionals to access the tool, thereby enabling them to become more familiar with the technology within the workspace.

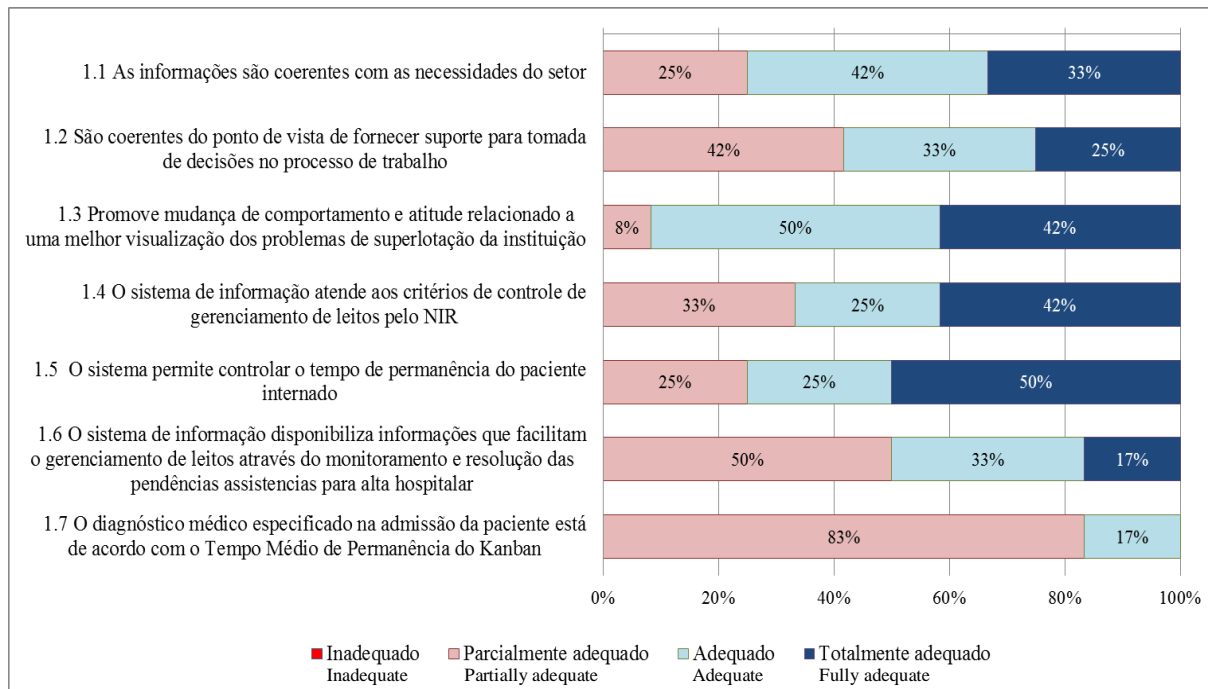
The subsequent stage, after the training and distribution of the data collection instruments, was designed to achieve the objective of adapting the content and technical characteristics of this technology. This involved an analysis of the instruments based on the evaluation of the attributes, with a particular focus on the participants' vision during the work process. It is noteworthy that 100% of the questionnaires were completed in their entirety, thereby facilitating the analysis of the data.

The initial inquiry pertained to the congruence of the information presented in the technology with the requirements of the sector. Forty-two percent of respondents rated the technology as adequate, indicating that the information provided in the tool is coherent with the needs of the NIR. Thirty-three percent rated it as totally adequate, and 25% rated it as partially adequate.

The evaluations indicated that 100% of the participants considered the technology to be partially adequate. The respondents indicated that the tool is adequate for the needs of the regulation sector. However, they noted the need for the inclusion of additional information and technological resources to assist the team in locating beds within the institution, thereby enhancing the reliability of decision-making processes. This is illustrated in Graph 1.



Graph 1 - Analysis of attribute I in relation to technology objectives.



Source: Prepared by the researchers.

Captions: 1.1 The information is consistent with the sector's needs; 1.2 Consistent from the point of view of providing support for decision-making in the work process; 1.3 Promotes a change in behavior and attitude related to better visualization of the institution's overcrowding problems; 1.4 The information system meets the NIR's bed management control criteria; 1.5 The system makes it possible to control the length of stay of hospitalized patients; 1.6 The information system provides information that facilitates bed management by monitoring and resolving pending care issues for hospital discharge; 1.7 The medical diagnosis specified on the patient's admission is in line with the Kanban Average Length of Stay.

The objective of this attribute was to assess the coherence of the information to support decision-making in the work process. Forty-two percent of the participants rated the information as partially adequate, indicating a need to include the information mentioned in Graph 1 for the NIR's regulatory professionals to make safe decisions related to bed management at the institution. Of the 33% of participants who responded as adequate and the 25% as totally adequate, 100% recommended adjustments to the technology, which is designed to support decision-making by the entire team at the institution. Among the recommended adjustments are the insertion of access to the visualization of vacant maternity beds, the insertion of the gestational age of patients admitted to obstetric observation beds, and the standardization of the average length of stay for all obstetric pathologies that require a prolonged hospital stay, differentiating them from those practiced in the SUS Procedures, Medicines and OPM Table Management System (SIGTAP), given the reality experienced by the maternity ward's professionals and patients.



About the evaluation of the technology in terms of providing information that facilitates bed management by monitoring and resolving pending care issues for hospital discharge, 50% of the participants evaluated the technology as partially adequate. This suggests that the technology should be enhanced by the insertion of pictograms, which are representations of objects and concepts translated into an extremely simplified graphic form. The utilization of this resource is typically associated with the conveyance of instructions, guidelines, and other forms of information. The deployment of this resource would facilitate and standardize the team's work process. The remaining participants rated this question as satisfactory (33%) or highly satisfactory (17%). The participants unanimously agreed that the multi-professional team should have broad access to the visualization of the pending issues that keep the patient in bed. This would enable the team to work together to promote timely hospital discharge.

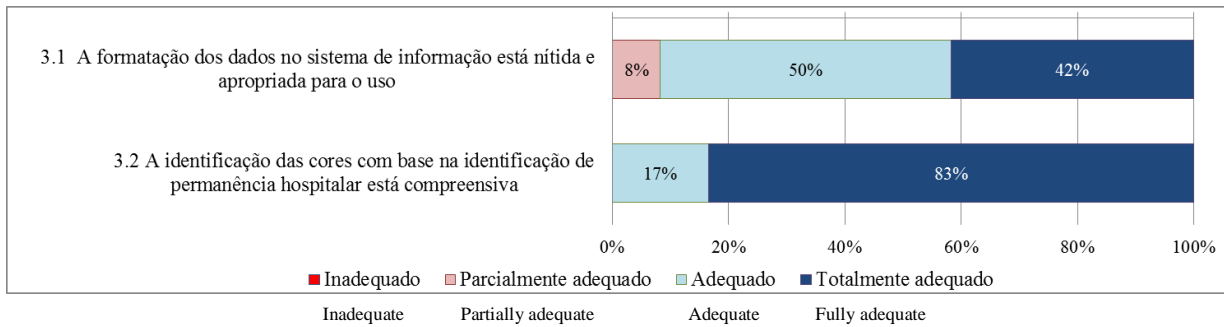
Regarding this attribute, it is recommended that certain considerations be made that do not pertain to the adaptation of the tool by the Information Technology Sector. These considerations relate to the reliability of the data presented by the technology and thus propose that the researcher make prior adjustments before implementing this tool in the hospital.

About the analysis, structure, and presentation of the tool, the general organization, structure, presentation strategy, coherence, and sufficiency of the information presented in the technology were considered. Regarding this attribute, four requests for adaptation of the technology were identified, presented in descending order of priority. These are shown in Chart 9. It is crucial to emphasize the participation of the research participants, as evidenced by their examination of the tool and the recommendations proposed.

Figure 1 presents the analysis of the technology's appearance. The initial inquiry pertained to the formatting of the data within the technology, with the objective of determining the clarity and appropriateness of the information for use by the institution's health professionals. Most participants (50%) rated the technology as adequate, while 42% rated it as totally adequate and 8% rated it as partially adequate. These participants requested the inclusion of the adjustments in the objective attributes.



Figure 1 - Analysis of Attribute III related to the technology's appearance.



Source: Prepared by the researchers.

Captions: 3. 1 The formatting of the data in the information system is clear and suitable for use.

3.2 The identification of colors based on the identification of hospital permanence is comprehensive.

After consolidating the information and analyzing the instruments, the researcher met with the information system analysts who developed the study's technology. The meeting was held with the objective of suggesting the adaptation of the new content and technological resources recommended based on the analysis of the data collected by the participants.

The recommendations were accepted by the manager of the Information Technology Sector, who facilitated their implementation by adapting the requested content for use in the Internal Regulation Center by the end of December this year.

The adjustment of the tool will facilitate decision-making and optimize the effective implementation of hospital bed management technology in all care units of the researched institution, with multidisciplinary access and intervention to data that hinders the discharge of hospitalized patients. This will optimize regulation and better use of beds in the institution.

2.3 Third Phase: Main Strengths and Weaknesses

The third phase aimed to analyze the main strengths and weaknesses in the use of technology for hospital bed management, based on the subjective responses of each participant.

The final question on the data collection instrument requested that participants provide feedback on the technology proposed for implementation in the service, including any criticisms, negative points, positive points, and suggestions.

This question was of great significance to the research, as it enabled the researcher to gain insight into the involvement of NIR professionals in utilizing the tool, their motivation



and the relevance of the technology for bed management within the institution. All 12 participants in the study responded to this question.

The analysis of the positive points revealed that all professionals participating in the study positively evaluated the technology in terms of its relevance to integrating the work process and decision-making. This technology has the potential to optimize the updating of beds and integrate the work process, as it will allow different sectors of the hospital to interact. As a suggestion, it would be beneficial to introduce the tool in conjunction with an awareness-raising process.

We believe that this technology is fundamentally important not only for the Regulation Sector but for all professionals who deal directly and indirectly with patients, as it presents the hospital's current panorama.

[...] It is an excellent tool for organizing beds and managing patient flow. We can quickly identify when overcrowding occurs. This technology provides us with up-to-date information, enabling more agile decision-making.

The purpose of the technology is to facilitate direct visualization of hospital capacity, bed reservations, and overcrowding, while standardizing information for professionals and promoting shared responsibility to reduce service-related obstacles:

[...] The proposed technology is excellent for visualizing the current situation, and adding more data could enable faster decision-making.

[...] I think this technology enhances visualization and increases interest in resolving difficulties, thereby facilitating the flow of processes.

[...] I believe it will significantly ease the dissemination and sharing of information, making everyone co-responsible for managing user flow.

[...] Positive points include easy visualization of pending issues and enabling more agile interventions for bed management. It identifies obstacles to bed turnover.

Many suggestions were made for adapting the content, structure, and appearance of the technology. Analyzing participants' individual perceptions will allow the tool to be tailored to the institution's needs. This study will help adapt a bed management technology based on the regulation practices experienced by NIR professionals.



Final considerations

The indicators showed that the maternity hospital under study is one of the main entry points for users, is the hospital unit with the highest number of deliveries in the Fortaleza SUS network and receives and provides care to pregnant women referred by the six regional secretariats of the municipality, regardless of the health unit to which they are affiliated. The number of obstetric beds has been reduced in the last four years of the implementation of the Stork Network, as well as the number of neonatal intensive care beds, which makes it difficult to regulate high-risk pregnant women to tertiary maternity hospitals due to overcrowding in the neonatal units.

Strategically, the maternity hospital under study developed bed management technology based on the successful experience of a university hospital in the northeast. The technology developed was adapted in the maternity hospital's internal regulation center, the sector responsible for restructuring the access regulation service through internal bed management, with the aim of making patients' hospital stays more appropriate. This adaptation took place with the contribution of the regulatory nurses and doctors of this sector, who evaluated the technology for one month, recording their perceptions, analyses and recommendations for adjustments to the tool according to the needs experienced by the institution's professionals, representing the second phase of the research.

The study made 20 recommendations for adjustments to the technology implemented at the NIR. All the requests were technically supported by the arguments proposed and listed in the data collection tool.

Among the recommendations, we suggest investing in training, wide dissemination and sensitization of the multiprofessional team on the use of the tool, with the aim of standardizing the teamwork process and improving the internal regulation of hospital beds. In addition to investing in training, sensitize the staff of the inpatient units to the correct and timely use of the AGHU information system, so that it reflects on the correct updating of the hospital bed management technology. The proposed recommendations make it possible to meet the demands of the NIR professionals, favoring teamwork and multidisciplinary responsibility by including tools for clinical management.

The third phase aimed to evaluate the positive and negative points of the technology. It is considered an important phase for the research, since it identifies the evaluations perceived by the professionals, who were unanimous in reporting that the technology is an important working tool for management, as it allows greater visibility of the factors that



interfere in the regulation of the supply of beds, integrates teamwork, as all professionals become responsible for the administrative, social and care factors that prevent hospital discharge within the recommended period of hospitalization. The recommendations of the adapted technology were then analyzed and adapted by the Technology Sector Information so that the tool could be implemented according to the needs of the maternity ward.

The use of work routines based on strategic planning and tools capable of improving, rationalizing and dignifying the work process are valid and necessary to try to remedy the chaotic situation observed in most public units and to offer the users of the system a service with respect and dignity.

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