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Original Article

Technological software solution to monitor patients' pathways in hospital emergency services*

Solução tecnológica em *software* para monitoramento da jornada do paciente em serviços de emergência hospitalar

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ABSTRACT

Objective: to develop a low-cost technological software solution to monitor patients' pathways in hospital emergency services. **Methods:** a methodological study, guided by "Design Thinking" and structured in four stages: discover, define, develop, and deliver, the last of which was not completed owing to the absence of software testing. The study was operationalized through the "Double Diamond" model, with 24 professionals from a hospital emergency unit, in two workshops and two in-person meetings. **Results:** critical gaps in the assistance provided were identified, including missing data about tests, communication failures across teams, indefinition regarding patients' location and situation, prolonged waiting times and inconsistencies in diet and fasting guidelines. These findings supported developing a management system with structured registration for patients, professional profiles and recording of interventions by priority. **Conclusion:** the prototype that was developed presented diverse favorable evidence regarding face validity by expert judges. The solution showed potential to qualify data flows, favor communication and integration among professionals and support care continuity and patient safety. **Contributions to practice:** centralizing all the information in a single system may support communication among professionals and care continuity. **Descriptors:** Communication; Emergencies; Health Information Management; Biomedical Technology.

RESUMO

Objetivo: desenvolver uma solução tecnológica em *software* de baixo custo para monitoramento da jornada do paciente em serviços de emergência hospitalar. **Métodos:** estudo metodológico, guiado pelo *Design Thinking* e estruturado em quatro etapas: descobrir, definir, desenvolver e entregar, sendo a última não concluída em razão da ausência de testagem do *software*. O estudo foi operacionalizado pelo modelo *Double Diamond*, com 24 profissionais de uma unidade hospitalar de emergência, em duas oficinas e dois encontros presenciais. **Resultados:** identificaram-se lacunas críticas na assistência, incluindo ausência de informações sobre exames, falhas na comunicação entre equipes, indefinição à localização e à situação do paciente, espera prolongada e inconsistências nas orientações sobre dieta e jejum. Esses achados subsidiaram o desenvolvimento de um sistema de gestão com cadastro estruturado de pacientes, perfis profissionais e registro de intervenções por prioridade. **Conclusão:** o protótipo desenvolvido apresentou evidências favoráveis de validade de aparência por juízes especialistas. A solução mostrou potencial para qualificar o fluxo de informações, favorecer a comunicação e a integração entre os profissionais e apoiar a continuidade do cuidado e a segurança do paciente. **Contribuições para a prática:** a centralização das informações em um sistema único pode apoiar a comunicação entre profissionais e a continuidade do cuidado.
Descritores: Comunicação; Emergências; Gestão da Informação em Saúde; Tecnologia Biomédica.

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Introduction

Hospital emergency services are characterized by unpredictability and dynamism, requiring from professionals constant attention to the patients' severity[1]. For serving individuals at an imminent risk of death or experiencing high psychological or physical stress levels, they are recognized as one of the most exhausting work contexts across health services. Added to overcrowding, the high care demand in this scenario requires rigorous management, frequently resulting in high stress levels for patients, family members and the professionals involved in the assistance provided[2].

Emergency units present intense circulation of professionals from different specialties, which renders indispensable to maintain effective and ongoing communication. In this context, the fundamental role played by Nursing stands out, acting as interlocutor between patients and multiprofessional teams, in addition to assuming direct responsibility for the care provided. Ongoing training for making fast and assertive decisions in critical situations is required from these professionals[3]. Interventions must be precise and targeted at stabilizing and improving clinical conditions, as late or inadequate actions can result in impairments for patients and for care continuity alike. Thus, Nursing consolidates itself as with a leading role for essential actions in these environments[3-4].

Communication in care spaces cannot always be restricted to the oral form, especially in Urgency and Emergency environments, where information timeliness and precision are determinant. In this scenario, written communication mediated by digital technologies becomes an essential tool to qualify and dynamize care. Efficient communication is a fundamental cornerstone in the provision of health services, as it sustains fast clinical decisions, team collaboration and safe information sharing. Thus, practices that strengthen interprofessional communication and relationships among team members directly contribute to patient safety and to cohesive multiprofessional work[5].

Given these requirements, it became indispensable to incorporate Information and Communication Technologies (ICTs) to health services, as they favor greater efficiency and dynamism in assistance-related processes. These technologies enable quick access to information, promote greater safety and ease communication among professionals, especially in critical scenarios. In addition to that, using ICTs contributes to reducing adverse events and communication failures by optimizing work flows and supporting timely decision-making. Consequently, they consolidate themselves as strategic tools to enhance interprofessional communication and improve care quality in Emergency services[6-7].

There are a number of technologies targeted at communication in Urgency and Emergency services are, predominantly aimed at shift handovers. The following stand out among the existing standardized communication tools: Situation, Background, Assessment, Recommendation (SBAR) and its evolved version called Identification, Situation, Background, Assessment, Recommendation (ISBAR), which adds the Identification stage to the original model and has been associated with improved communication quality, with fewer failures in conveying information and with enhanced patient safety[8-9]. The "Double Diamond" model (the framework also adopted in this study) has already been employed in the development of mobile health technologies, although still merely targeted at shift handovers without encompassing the complete logistic pathways followed by patients[10].

Given this scenario, *Rastreamento Terapêutico de Pacientes* (RTP) differentiates itself for not requiring a dedicated server or licensing in any database, as it can be maintained by technical teams holding basic knowledge. In addition, it has been developed as a co-creation along with professionals from the service itself and in full compliance with the Personal Data Protection General Law (*Lei Geral de Proteção de Dados Pessoais* – LGPD)[11].

Thus, the study objective was to develop a low-cost technological software solution to monitor patients' pathways in hospital emergency services.

Methods

Type of study

This is a technological development methodological study guided by the British Design Council "Design" model, known as "Double Diamond" and structured into four essential stages: Discover, Define, Develop and Deliver[10]. These phases do not follow any rigid linearity, can be adapted to collective needs and resumed whenever necessary[12]. In turn, the philosophical pillars in "Design Thinking" are Empathy, Definition, Ideation, Prototyping and Testing, which are articulated with the methodological stages foreseen in "Double Diamond"[13]. The methodological process was improved according to the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist, thus ensuring greater rigor and specificity.

Consequently and based on an initial problem, the methodological path to be followed is organized into inter-related stages. The first one is the "Discover" stage, in line with the Empathy phase, targeted at better understanding the context and needs of those involved. Subsequently, the "Define" stage is articulated with delimiting the problem, focusing on the requirements identified. Afterwards, possible solutions are devised in the "Develop" stage (corresponding to the Ideation phase). Finally, the "Delivery" stage integrates the Prototyping and Testing phases, culminating in the consolidation of the solution proposed. It is noted that the process is iterative, which allows revision and resumption instances across the stages according to the needs emerging from the context[14].

In the present study, the "deliver" stage comprised the construction of the prototype, with the scope of the research being delimited to this stage, without product testing, which did not compromise the achievement of the proposed objectives.

Methodological procedures

The research was structured into four fundamental phases based on the "Design Thinking" model[13], aiming to devise a user-centered technological solution.

Discover phase

The first research phase sought to understand the subjective and practical dimension of the problems experienced by the professionals, as a qualitative analysis of the reports is essential to devise effective solutions. The procedures were as follows: 1) Technological prospection in global databases to identify patient tracking software programs; and 2) Conducting collaborative workshops to identify communication weaknesses. As a result, the mapping corresponding to the patients' pathways in the Emergency service was duly structured, establishing the critical moments from admission to hospitalization. This phase contemplates an immersion into the ways in which people express, perceive and experience problems; therefore, understanding each report in depth is fundamental as the basis to develop proposals capable of exerting an impact[15].

Two activities were implemented to such end: conducting the workshops; and technological prospection. In addition to identifying the problems related to communication and to patient data flows, the users' pathways from their arrival at the Emergency sector to their hospitalization were outlined in the workshops. These workshops preceded the technological prospection step, as this chronology was essential to delimit what to look for in the papers since, based on the problems pointed out by the professionals, it was possible to investigate how these issues occurred and were solved by means of technologies in other places, in the same context or in similar ones to the one corresponding to the research. Consequently, the technological prospection step aimed at mapping (at the global level) already registered solutions for tracking patients in hospital environments.

Define phase

The "define" phase focused on systematizing the problems identified and refining concepts to deli-

mit the solution scope. Characterized as a convergent phase, the objective was to consolidate the project briefing based on all the evidence collected in the previous stage, which allowed co-creating alternatives in line with the actual needs[16]. The process involved extracting recurrent terms and topics, prioritized by the group of participants in the subsequent workshops. As a result of this synthesis, the set of indispensable functional and technical requirements to structure the solution proposed was defined. This phase was implemented in a more restricted way by means of informal conversations with some professionals, led with no previous scheduling along with a small group of participants in the workshops and during the breaks throughout the work activities. They were presented with the most recurrent problems for them to propose possible solutions. The researcher recorded the reports in a shared sheet and subsequently transferred them to an Excel spreadsheet.

Develop and Deliver phases

Characterized as a creative divergence stage, the Develop phase was devoted to expanding ideas to conceive the product, with grounds in the concepts validated in the previous phase. The core objective consisted in generating a broad spectrum of solutions, prioritizing the creative flow and exploring possibilities along with the co-creative team[17]. Planning of this phase involved a systematic analysis regarding the list of requirements, aiming at proposing solutions for the problems identified and at selecting the alternative to be prototyped. This stage was implemented with the assistance of an Information Technology professional, who was in charge of the prototype architecture and development based on the previously established technical and functional requirements.

Once the solutions capable of solving the problems identified were defined, they were presented to the professional responsible for developing the product; at that moment, the format the product would adopt, its components and its work mechanism were discussed. With this analysis as a starting point, it was found that a software program would be the most suitable alternative to meet the requirements surveyed, especially regarding patient logistic communication in the Emergency context.

Study setting and population

Both workshops and both meetings (conducted informally in conversation format) were developed at a large-sized public teaching hospital located in southern Brazil. The Urgency and Emergency unit of the aforementioned institution operates under an open-door system and welcomes patients from different sources.

The sample was comprised by 24 health professionals (nurses, nursing technicians, physicians, receptionists and members from the sector's security team), all selected by convenience and only accepting those that met the inclusion criteria. The inclusion criteria considered corresponded to professionals that had worked in the Emergency sector for at least six months, taking into account the relevance of previous experience in the situation researched. The following exclusion criteria were established: being away from work due to medical license or on holidays during the research period.

Data collection

For the data collection and co-creation stages, two workshops were conducted during February 2025 in a private space offered by the institution, chosen for presenting lower noise levels and less circulation of patients. The first and second meetings were respectively attended by sixteen and eight professionals, in sessions lasting approximately four hours. The choice to implement two workshops was due to the researcher defining two dates to perform the activities. The difference in the number of participants between the meetings is due to the fact that the sample was comprised by the professionals in service on each of the dates and who accepted to take part in the research. The dynamics aimed at favoring dialog and prospection of requirements for the technological

product. Due to the flow in the Emergency unit, the workshops were held intermittently in the day and night periods, allowing the participants to interact according to their availability throughout each shift. Due agreement was formalized by means of a Free and Informed Consent Form, signed in two copies. In order to ensure anonymity, the 24 participating professionals were coded with the letter "P", followed by consecutive numbers (P1-P24).

Data analysis

Given the qualitative nature and the text density obtained, the data were subjected to Reflexive Thematic Analysis[18]. The analytical process was operationalized as described below: 1. Familiarizing with the data; 2. Generating initial codes; 3. Searching by topics; 4. Reviewing the topics; 5. Defining and naming the topics; 6. Producing the report.

The first step of the process was Familiarizing with the data by fully transcribing the workshops into electronic spreadsheets and concomitantly systematizing all the information from the technological prospection step. Subsequently, the step for Generating initial codes was performed by means of skimming and exhaustive reading, grouping the registration units by semantic similarity. In the stages to search, review, define and name topics, the codes were validated against the entire dataset, ensuring internal consistency and reliability of the analysis. The steps where the topics were defined and named culminated in the consolidation of two central categories: "Flawed interprofessional communication" and "Impact exerted by communication failures on care processes". Finally, Producing the report consisted in an interpretive synthesis of the findings, integrating them to the scientific literature and to the researcher's clinical experience in the study field.

Ethical aspects

The research was approved by the Research Ethics Committee of *Universidade Federal de Santa Catarina*, under Opinion No. 7.198.729/2024 and Ethical Appraisal Submission Certificate No. 81461624.1.0000.0121. In full compliance with the current resolutions, all the participants were informed about the objectives and the voluntary nature of their participation.

Results

The results are presented according to the stages proposed in the "Double Diamond" methodological framework, grounded in the "Design Thinking" framework and the categories emerging from the thematic analysis of the data collected in the co-creation workshops with the 24 health professionals (P1-P24).

In the first phase, "discover," the search of technologies for tracking patients in hospital services, the initial technological prospection step sought to answer the following guiding question: Which communication technologies are available to track and locate patients in the different spaces of hospital services?

A total of 7,476 productions were identified in the databases consulted: *Instituto Nacional da Propriedade Industrial*, Patentscope, Espacenet (European Patent Office) Google Patents and Derwent Innovations Index. The quantitative distribution by database revealed predominance in Google Patents (n=6,892), followed by Espacenet – European Patent Office (n=332), Patentscope (n=129), Derwent Innovations Index (n=115) and *Instituto Nacional da Propriedade Industrial* (n=8). The survey indicated that the existing innovations were mainly in vital signs monitoring, evidencing a gap of unified solutions for logistic and clinical traceability of patients› pathways in real time.

At the same time, the co-creation workshops with professionals (P1-P24) allowed mapping the users' pathways and identifying critical gaps. The reports evidenced systematic difficulties in locating patients, glitches in the information about tests and diets, and absence of feedback regarding treatment progression, which generates insecurity in the team and anxiety in family members.

The strategies outlined in the Empathy phase

were as follows: raising interest and sensitizing the team regarding the theme proposed; identifying the barriers faced by patients and family members in accessing information from medical records, such as tests undergone, estimated waiting times for procedures and pending issues; and analyzing the current challenges in communication among the multiprofessional team members.

Measures targeted at sharing relevant information about the patients were also adopted, namely: creating representative scenarios; defining the target population; mapping the flows in the unit; identifying situations where lack of data impairs the work process; and understanding the effects exerted by communication failures on patients and family members. As a practical strategy, the workshops employed hypothetical situations that drove the participants to recall and outline the patients' pathways from admission to the Emergency sector. During this mapping, the difficulties, the users' doubts and the information gaps in the team were specified, as well as the assistance-related implications of each scenario.

The data obtained in the workshops were synthesized to delimit the solution scope. Creating thematic maps allowed seeing the professionals' perceptions and systematizing the priority demands, as illustrated in Figure 1.

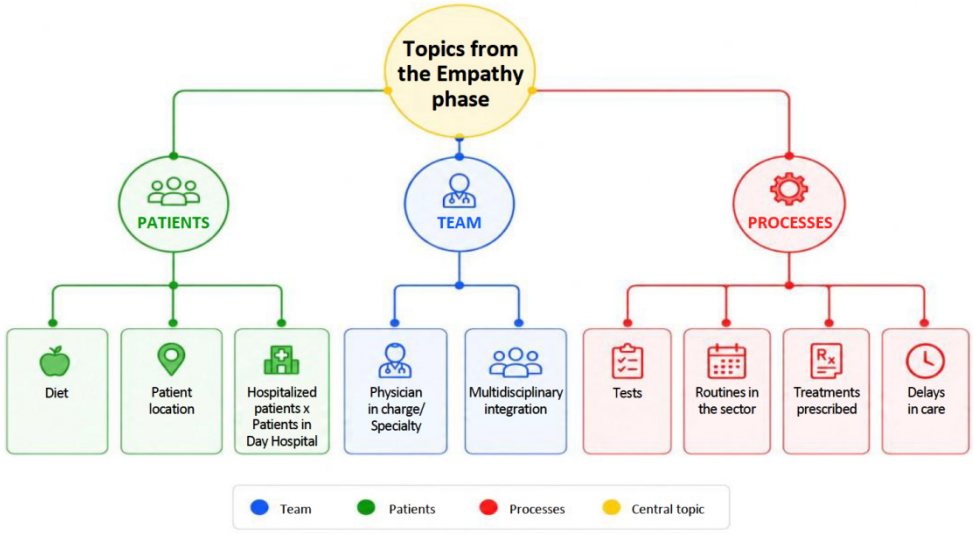


Figure 1 – Semantic map showing the priority problems in hospital emergencies. Florianópolis, SC, Brazil, 2025

Grounded in the co-creation workshops and in the clinical experience in the Emergency services, the thematic analysis allowed consolidating two central categories that sustain the development of the technological product: "Flawed interprofessional communication" and "Impact exerted by communication failures on care processes".

The professionals acknowledged the existence of communication failures and noted that, in certain contexts, their absence impairs the work flow and compromises patient care quality. In relation to the patients and their family members, the professionals observed that lack of feedback on test status tracking and about the subsequent treatment stages generates anxiety and insecurity.

The distributions corresponding to the registration units were synthesized according to the initial codes established, derived from a comprehensive analysis of the professionals' testimonies and from the criticalities identified in the "discover" (empathy) and "define" (collaboration) phases. Based on a thoughtful and exhaustive reading of the statements, the coding process allowed grouping the requirements into six prevailing thematic categories: 1. Communication and integration across teams; 2. Tests and results; 3. Patient location and status; 4. Diet, nutrition and fasting;

5. Service and waiting times; 6. Operational processes.

Figure 2 below presents 11 testimonies from the professionals, selected due to their representatives and concisely transcribed so as to reflect their individual perceptions. Spelling and punctuation adjustments were made, fully preserving the original meaning of the answers.

Testimonies provided by the professionals	Initial codes/Pre-categories
Not knowing which tests the patients will undergo (P1).	Tests and results.
Reporting the diet and if a test was performed or if the result came out (P2).	Tests and results; Diet/Nutrition and fasting.
Lack of information regarding the patients' questions during the entire stay in the Emergency sector (tests, nutrition, discharge or hospitalization guidance) (P3).	Tests and results; Diet/Nutrition and fasting; Service and waiting times;
Not knowing if a patient is in emergency or specialty care (P4).	Communication and integration across teams.
Difficulties contacting the prescribing physician when a patient is already in specialty care (P5).	Communication and integration across teams.
Where is patient "X"? (P6).	Patient location and status.
We don't know where the patient is, we keep looking for him and shouting his name throughout the Emergency sector(P7).	Patient location and status.
Family members looking for patients, when they're not in the Emergency sector anymore (P8).	Patient location and status.
The medical team comes to Nursing constantly for us to find the patients, in addition to the medical charts (P9).	Patient location and status.
Delays in serving the patients classified as green (P10).	Waiting time and flow organization.
Nursing wastes a lot of time calling the cleaning service to clean the stretchers and for other necessary tasks (P11).	Operational processes.

Figure 2 – Synthesis corresponding to the difficulties reported by the professionals in the Empathy phase. Florianópolis, SC, Brazil, 2025

Flawed interprofessional communication

This category gathers diverse evidence on the existing gaps in terms of information exchange between the medical and nursing teams. The participants (P1-P24) noted that care fragmentation is accentuated by informal or solely verbal communication methods that fail to ensure information continuity. The most frequent codes were as follows:

Transmission interferences: it was identified that critical information about clinical stability and diagnostic pending issues is lost at handovers or internal transfers.

No standardization: the reports evidenced that there is no unified monitoring tool, resulting in asking the patients the same questions twice and in insecurity among team members regarding the actual status of the assistance-related logistics.

Hierarchical and flow-related barriers: communication is predominantly reactive, which impairs preallocating beds and timely managing complications.

Impact exerted by communication failures on care processes

This category presents the direct consequences of communication failures on the patients' pathways and on the Emergency service efficiency; the most frequent codes were as follows:

Delays in the patients' pathways: invisibility regarding patient tracking (where they are and which the next step is) results in prolonged waiting times, especially in the transition from the Emergency sector to definite hospitalization.

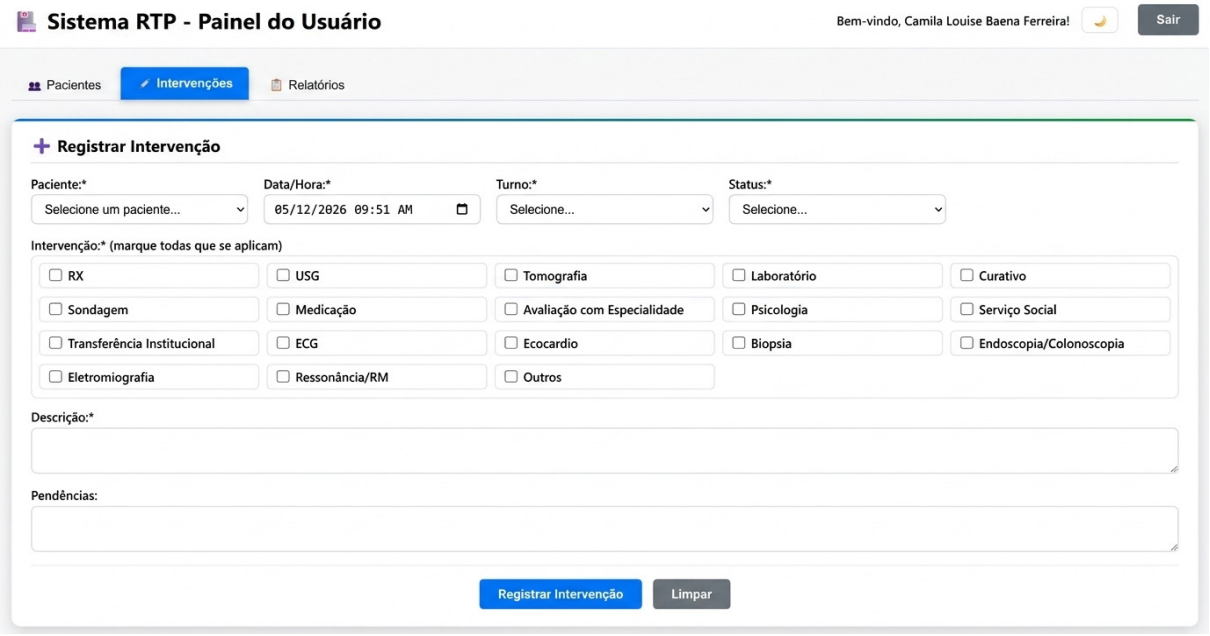
Work overload and rework: communication failures force professionals to look for fragmented information in non-integrated physical records or systems, which generates unnecessary wear out in the team and increases the risk of adverse events.

Compromised patient safety: the group emphasized that inefficient logistics and incomplete information are risk factors for medication errors, delays in diagnostic procedures and unfavorable clinical outcomes.

During the "develop" and "deliver" phases, it became clear which approaches could, in fact, resolve the issues identified earlier. It was at this point, through a co-creation process, that the best solution was defined as software. Thus, based on the requirements identified (rapid access, real-time updates, and data security), the Therapeutic Patient Tracking (*Rastreamento Terapêutico de Pacientes,* RTP) prototype was developed, designed to address the gaps identified through this collaborative process. Its structure allows adjustments according to professional demands or institutional norms, which ratifies applying the "Design Thinking" framework and the "Double Diamond" model.

Developed under a modular architecture in Google Apps Script, the RTP System was designed as a low-cost and high-accessibility solution. Its structure allows managing multifunctional profiles (Medicine, Nursing, Multiprofessional team and Administrative team), ensuring that each actor involved in the patients' pathways accesses data that are pertinent to their performance area, under strict safety and authorization controls.

The prototype is presented in a sequence of pages that represent the users' access flow, allowing for intuitive navigation and practical information recording (Figure 3). The first access instance is individual sign-up, cleared after due authorization from the responsible sector, aiming to ensure information safety and compliance with the LGPD.



Note: the illustrations above (screenshots from the mobile app) were only available in Portuguese

Figure 3 – Operational interface of the *Rastreamento Terapêutico de Pacientes* system: Intervention Recording screen. Florianópolis, SC, Brazil, 2025

The product organizes the patients' pathways into logical blocks: personal data, hospital-related information and clinical interventions with priority classification. This structure aims at mitigating the data fragmentation mentioned by the professionals (P1-P24), ensuring that the patients' status is updated

in real time regardless of their condition: hospitalized patients or under observation in the Emergency sector. This detailed recording allows following-up imaging and laboratory tests such as X-rays, ultrasound and tomographies, ensuring care traceability.

The The system offers a statistical monitoring interface (Figure 4) for managerial decision-making support. This functionality offers an overview of the patients in the sector, including indicators for urgent interventions and cases in isolation, thus acting as a continuity link that preserves memory of the care provided. In addition to optimizing interprofessional communication, the tool can be applied to mediating the interactions with family members, allowing conveying authorized information on status tracking for tests and care stages. The technology adheres to the public and private management modernization guidelines, presenting itself as a flexible platform for different organizational realities.

Note: the illustrations above (screenshots from the mobile app) were only available in Portuguese

Figure 4 – Reports and statistics screen: Administrative dashboard of the *Rastreamento Terapêutico de Pacientes* system. Florianópolis, SC, Brazil, 2025

Conceived by means of a co-creation process, the RTP structure allows for ongoing adjustments according to current professional demands or institutional norms, positioning itself as an incremental innovation that favors coordination across teams and contributes to patient safety in Urgency and Emergency units.

In this context, the current study proposes integrating interpersonal communication to a technology product targeted at providing real-time information about the care flow corresponding to patients in Emergency units. The software was developed from an analysis of the requirements stated by the professionals involved, which enabled devising the prototype with the aid of specialists.

Although the technological prospection step presented limitations regarding information about the interactions with family members, allowing conveying authorized information on status tracking for tests and care stages. The technology adheres to the public and private management modernization guidelines, presenting itself as a flexible platform for different organizational realities.

Discussion

Emergency environments are dynamic and intense and present significant circulation of professionals and patients, requiring dynamic and precise communication to ensure team and patient safety[19].

Nursing plays a central role in this communication in critical sectors such as Emergency, demanding structured processes with updated data and quick access to relevant information[20], thus representing a determining factor for clinical success and occupational health, as failures increase risks for patients and team wear out, requiring structural, technological and human interventions[21].

An aspect that is in line with the findings of this paper is that no information about the patients' health-disease process is passed on to nursing technicians[2], as most of it circulates among physicians and nurses, limiting technicians' involvement in courses of action and information recording. Although the clinical and social data collected at admission are essential for safe actions, recording failures are frequent, as the intense routine and the absence of a uniform documentation system impair data continuity, resulting in assistance-related risks and delays in team decisions[22].

The challenges inherent to Urgency and Emergency Nursing are not restricted to Brazil. In a study conducted in Jordan, excess work, scarce qualified resources, communication failures and relational difficulties with family members were evidenced, resulting in delays and impairing patient safety[23].

Adopting technologies that aid communication is not necessarily linked to their complexity. Especially in services with limited resources, simple and low-cost technologies are usually more efficient and accessible, providing clear communication without requiring high investments[6].

New technologies consolidate themselves as allied in information transmission and health care management[24], which drove the creation of the RTP software to integrate teams and enhance emergency care efficiency, with tests in controlled environments foreseen for the next stage. Centralizing diverse information in a single system favors data flow and patient safety, reducing fragmentations and inconsistencies[25].

Despite the potential of informatization to qualify care, there are challenges in the assistance practice such as maintaining direct contact between professionals and patients and the professionals' digital literacy[26], as frequent failures or scarcely intuitive interfaces impair work flows and the assistance provided.

Interprofessional communication and interaction with patients should be prioritized as with the same relevance as patient safety, with technology acting as care support and not as a distancing or overload element. Communication tools should be focused on the users and coherent with verbal communication, as their absence generates inconsistency, informational interferences and assistance-related confusion risks[27].

The RTP system offers a low-cost solution because it waives licensing of complex databases and using physical or cloud servers, as it employs standard technologies such as HTML5, CSS3 and JavaScript vanilla no frontend instead. These characteristics allow professionals (even with basic knowledge) to maintain and manage the system. In addition, its traceability capacity allows performing audits and contributes to meeting the legal requirements set forth in the LGPD law[11].

The importance of the methodological framework is noted, which enabled the co-creation process with the active participation of the research subjects in a search for solutions to the recurrent problems found in the Emergency setting. The semantic maps were essential to clearly see the problems and key aspects inherent to the topic, stimulating creativity and the identification of relationships between the parts involved in structuring the central topic[28].

Study limitations

As for limitations, incompleteness of the technological prospection step stands out, as it may have restricted identifying similar solutions and already existing technologies, in addition to not having tested or validated the software in a real environment, which precludes evaluating its performance in the dynamic conditions inherent to Emergency units. Furthermore, the small number of participants and the fact that the research was conducted in a single hospital, with

no involvement from managers or final users, limit generalization of the findings. More studies are required to analyze how the technology performs in terms of usability, integration to work flows and impact on care quality.

Contributions to practice

Although still not tested in a real environment, the solution developed presents high potential to support the way in which the patients' logistical pathways in Emergency sectors are organized, favoring communication among professionals, patients and family members. Its application tends to qualify assistance flows, optimize decision-making and contribute to patient safety, rendering information more accessible and integrated to the care provided. The workshops evidenced problems gathering information during these pathways, which affects professionals and users alike, thus reinforcing pertinence of the solution proposed and the expectation that it will prove efficient in the assistance context once validated.

Conclusion

The prototype that was developed presented diverse favorable evidence regarding face validity by expert judges. The solution showed potential to qualify data flows, favor care integration and contribute to patient safety. Thus, although evaluation stages in real use contexts are still required, the results obtained indicate that the solution proposed can provide significant benefits to the assistance offered in Emergency services.

Authors' contributions

Conception and design or data analysis and interpretation: **Ferreira IF, Gelbcke FL**. Writing of the manuscript or relevant critical review of the intellectual content. Final approval of the version to be published and agreement to be responsible for all aspects of the manuscript, ensuring that any and all issues are properly investigated and solved: **Ferreira IF, Gelbcke FL, Souza SS, Zanotto DF, Stein M**.

Data availability

The data are available in the text of the article; if additional information is required, it can be obtained upon due request to the corresponding author.

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