TECHNOLOGIES FOR IMPLEMENTING THE COMPULSORY DISEASE NOTIFICATION PROCESS IN THE HOSPITAL CONTEXT: SCOPING REVIEW

TECNOLOGIAS PARA EFETIVAÇÃO DO PROCESSO DE NOTIFICAÇÃO COMPULSÓRIA DE DOENÇAS NO CONTEXTO HOSPITALAR: SCOPING REVIEW

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ABSTRACT: Aim: To map the scientific literature on technologies developed and/or validated to enhance the effectiveness of compulsory disease notification in hospital settings. **Methodology:** The review followed the Joanna Briggs Institute methodology and was guided by a research question framed using the PCC (Population, Concept, Context) model. The study included articles, theses, and dissertations identified through database searches. Data were extracted and organized into a table created by the authors. The review protocol is registered in the Open Science Framework: https://doi.org/10.17605/OSF.IO/DKR4F. **Results:** The final sample consisted of five studies, which presented technologies such as geoprocessing tools, dashboards, e-books, and educational tools focused on the disease notification process. **Conclusions:** This study highlights the need for more scientific output to address real-world challenges, given the critical importance of compulsory disease notification.

KEYWORDS: Disease Notification. Epidemiological Surveillance Services. Healthcare Professionals. Hospitals. Technology.

RESUMO: Objetivo: Mapear na literatura a produção científica sobre tecnologias desenvolvidas e/ou validadas que visem contribuir para a efetividade das notificações compulsórias de doenças no contexto hospitalar. **Metodologia:** Trata-se de uma *Scoping review* conduzida pela metodologia do *Joanna Briggs Institute*, orientada pela questão de revisão elaborada conforme o modelo conceitual do mnemônico PCC – (*Population, Concept, Context*). Foram incluídos artigos, teses e dissertações a partir de buscas em bases de dados. Os dados foram extraídos e apresentados em um quadro desenvolvido pela autora. Protocolo registrado na *Open Science Framework*: https://doi.org/10.17605/OSF.IO/DKR4F. **Resultados:** Cinco estudos compuseram a amostra final, apresentando tecnologias como geoprocessamento, *dashboard*, *e-book* e instrumentos educacionais voltados para o processo de notificação compulsória. **Conclusões:** O estudo torna-se relevante para a reflexão sobre a escassez de produções científicas para atender às reais necessidades, levando em consideração a magnitude e a importância das notificações compulsórias.

PALAVRAS-CHAVE: Hospitais. Notificação de Doenças. Profissionais de Saúde. Serviços de Vigilância Epidemiológica. Tecnologia.

INTRODUCTION

Compulsory notification, understood as mandatory communication to health authorities, must be carried out by professionals or those responsible for public or private health establishments when there is suspicion or confirmation of diseases, health conditions, or public health events. This notification can be immediate or weekly and is a key tool for health planning and defining intervention priorities.[1]

In Brazil, the organization of Epidemiological Surveillance actions related to compulsory notification was established by Law No. 6.259, on October 30, 1975.[2] Diseases on the list of Compulsory Notifiable Diseases (CND) pose significant public health risks due to their severity, potential for spreading, and capacity to trigger outbreaks and epidemics.

The notification process has since become essential for health authorities, providing the necessary data for disease control and supporting investigations and strategic decision-making.[3] Thus, the notification process has become essential for health authorities, as it provides the necessary data and information for disease control, while also supporting investigations and strategic decision-making.[4]

However, despite the preventive and control measures enabled by compulsory notification, challenges remain, particularly underreporting. A lack of reporting by health care workers contributes to gaps in understanding the real disease situation in communities, hindering the investigation, analysis of incidence and prevalence, and the planning and decision-making required to address the problem.[4]

Underreporting is closely linked to the lack of preparation and knowledge among many health professionals who are unaware of their responsibilities in this process. When properly trained, these professionals can significantly improve the notification of CNDs, making the act of reporting more effective and crucial for preventing and controlling outbreaks and epidemics.[5]

With the need to create educational resources that better prepare health professionals and fill gaps in training, the development and use of technology has emerged as an innovative way to enhance teaching. Health technologies aim to guide both management and care practices, focusing on building connections, knowledge, and information.[6]

The aim of the present study was to map the scientific literature on technologies developed and/or validated to contribute to the effectiveness of compulsory disease notification in hospital settings. This study is the result of a scientific initiation project that developed a care-educational technology to assist health professionals in performing compulsory notifications. The project was conducted at the Júlio Bandeira de Mello University Hospital (HUJB) of the Federal University of Campina Grande (UFCG), affiliated with the Brazilian Hospital Services Company (Ebserh/MEC).

METHODOLOGY

STUDY TYPE

This is a scoping review conducted based on the methodology of the Joanna Briggs Institute – JBI Reviewer's Manual,[7] guided by a research question developed according to the PCC conceptual model (Population, Concept, Context). Following the theoretical framework proposed by Peters et al.,[8] the review followed nine stages: 1) defining and aligning the objective and research question; 2) developing and aligning inclusion criteria; 3) describing the planned approach for evidence search, selection, data extraction, and presentation; 4) searching for evidence; 5) selecting evidence; 6) extracting evidence; 7)

analyzing the evidence; 8) presenting the results; and 9) summarizing the evidence in relation to the aim of the review.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping Reviews (PRISMA-ScR) was used to guide the construction of this review.[9] Additionally, a review protocol was developed and registered in the Open Science Framework (OSF), which can be accessed via DOI https://doi.org/10.17605/OSF.IO/DKR4F.

Although compulsory notifications are the responsibility of all health professionals, in practice, they are primarily performed by nurses in hospital settings. Therefore, the guiding review question was formulated using the PCC model, where "P" refers to nurses and nursing technicians, "C" to technologies that enhance the effectiveness of compulsory disease notification, and "C" to the hospital setting. The review question that emerged was: "What technologies have been developed and/or validated to contribute to the effectiveness of compulsory disease notification in hospital settings?"

STUDY LOCATION

To identify studies that addressed the guiding review question, searches were conducted on the Coordination for the Improvement of Higher Education Personnel (CAPES) journal portal, accessed via the Federated Academic Community (CAFe) of the Federal University of Campina Grande (UFCG). Databases were MEDLINE/PubMed, Latin American and Caribbean Health Sciences Literature (LILACS/BVS), Web of Science (WoS), Scopus, and Excerpta Medica Database (Embase).

Additionally, for gray literature, studies were selected using Google Scholar, the CAPES Thesis and Dissertation Catalog, the Brazilian Digital Library of Theses and Dissertations (BDTD), and Open Access Theses and Dissertations (OATD).

To develop the search strategy, an initial exploratory search was conducted to identify the main descriptors and keywords used in studies related to the research topic. This stage was performed using national descriptor databases (DeCS), international ones (MeSH), and the Virtual Health Library (VHL), following the guidelines of the JBI manual.[7]

Boolean operators AND and OR were used to define the search strategy. In Portuguese, the search was structured in the following manner: [("Equipe de enfermagem" OR Enfermagem OR Enfermeira OR Enfermeiro) AND ("Tecnologia educacional" OR Tecnologia OR "Materiais de ensino" OR "Tecnologia em saúde") AND ("Notificação de doenças" OR "Notificação compulsória de doenças" OR "Notificação compulsória" OR "Serviços de vigilância epidemiológica" OR "Vigilância epidemiológica" OR Vigilância)]. In English, the search terms were: [("Nursing team" OR Nursing OR Nurse) AND ("Educational technology" OR Technology OR "Teaching materials" OR "Health technology") AND ("Disease notification" OR "Compulsory notification of diseases" OR "Compulsory notification" OR "Epidemiological surveillance services" OR "Epidemiological monitoring" OR Surveillance)].

Chart 1 presents the final search strategy used for each database.

Chart 1. Database search strategies related to the research. Cajazeiras, PB, Brazil, 2024.

Databases	Search strategies
MEDLINE/PubMed	("Tecnologia educacional" OR Tecnologia OR "Materiais de ensino" OR "Tecnologia em saúde") AND ("Serviços de vigilância epidemiológica" OR "Vigilância epidemiológica" OR Vigilância)
LILACS/BVS	("Notificação de doenças" OR "Notificação compulsória de doenças" OR "Notificação compulsória" OR "Serviços de vigilância epidemiológica" OR "Vigilância epidemiológica" OR Vigilância) AND ("Tecnologia educacional" OR Tecnologia OR "Materiais de ensino" OR "Tecnologia em saúde") AND ("Equipe de enfermagem" OR Enfermagem OR Enfermeira OR Enfermeiro)
Web of Science (WoS)	("Disease notification" OR "Compulsory notification of diseases" OR "Compulsory notification" OR "Epidemiological surveillance services" OR "Epidemiological monitoring" OR Surveillance) AND ("Educational technology" OR Technology OR "Teaching materials" OR "Health technology") AND ("Nursing team" OR Nursing OR Nurse)
Scopus	("Disease notification" OR "Compulsory notification of diseases" OR "Compulsory notification" OR "Epidemiological surveillance services" OR "Epidemiological monitoring" OR Surveillance) AND ("Educational technology" OR Technology OR "Teaching materials" OR "Health technology") AND ("Nursing team" OR Nursing OR Nurse)
Embase	("Disease notification" OR "Compulsory notification of diseases" OR "Compulsory notification" OR "Epidemiological surveillance services" OR "Epidemiological monitoring" OR Surveillance) AND ("Educational technology" OR Technology OR "Teaching materials" OR "Health technology") AND ("Nursing team" OR Nursing OR Nurse)

Source: Prepared by the authors, 2024.

INCLUSION CRITERIA

Research published as articles and experience reports, as well as theses and dissertations that addressed the guiding research question, were included. Final papers were also considered, given the low production and publication of specific articles on the topic in the initial searches.

Studies that were not related to the health field, focused on technologies in other levels of healthcare, or were not associated with professional training or continuing education were excluded. Additionally, editorials, reflective articles, and reviews of any kind were excluded, as detailed in Chart 2. No language or time filters were applied in the searches.

Chart 2. Demonstration of the standardization of exclusion reasons. Cajazeiras, Paraíba, Brazil, 2024.

Reason	Include	Exclude
1. Inadequate study type	Articles (research and experience reports), dissertations, theses, and final papers.	Editorials, reflective articles, reviews of all types (integrative review, scoping review, systematic review, meta-analysis), letters to the editor.
2. Inadequate population	Studies on the use of technologies in the hospital context to improve the compulsory disease notification process.	Studies addressing care-educational technologies for a population other than ours (nurses and nursing aides responsible for notifications) or studies that diverge from the topic.
3. Inadequate concept	Studies on health or educational technologies for continuing professional education.	Studies on health or educational technologies aimed at care and health education for users of health services.
4. Inadequate context	Studies developed in the hospital context.	Studies not conducted in a hospital setting.

Source: Prepared by the authors, 2024.

DATA COLLECTION

The search for evidence in the mentioned databases resulted in a dataset that was exported to the Rayyan software. Two independent reviewers then removed duplicate materials and reviewed the titles and abstracts of the remaining texts. Using the "blind on" feature of the software, they determined the acceptance or rejection of studies based on the pre-defined inclusion and exclusion criteria.

Discrepancies between reviewers were resolved through discussion. After this stage, which took place between April and May 2024, the selected publications were retrieved and read in full. Additionally, relevant studies were sought from the references of the selected articles. After the complete reading and inclusion decision for the final sample, evidence was extracted using a spreadsheet created in Microsoft Excel 2010.

The following data were extracted from each study: publication type, year, country, objective, methodological design, type of technology (educational/biomedical), purpose of the technology, educational level, validation of the technology, and impacts or challenges in its use.

DATA ANALYSIS PROCEDURES

Data obtained were analyzed descriptively and presented in tables, accompanied by a narrative summary. Furthermore, the results related to the selection process, eligibility, inclusion, and reasons for exclusion at each phase were presented in a flowchart, following the recommendations of PRISMA-ScR.9.

RESULTS

The database search yielded 805 articles and 15,977 documents from gray literature. After the initial screening, 55 publications were excluded due to duplication, leaving 16,727 for title and abstract

review. Based on the inclusion and exclusion criteria, 16,717 publications were discarded, leaving 10 studies for full-text reading. After reviewing the full texts, 5 studies were excluded for not meeting the inclusion criteria, resulting in a final sample of 5 studies, as shown in Figure 1.
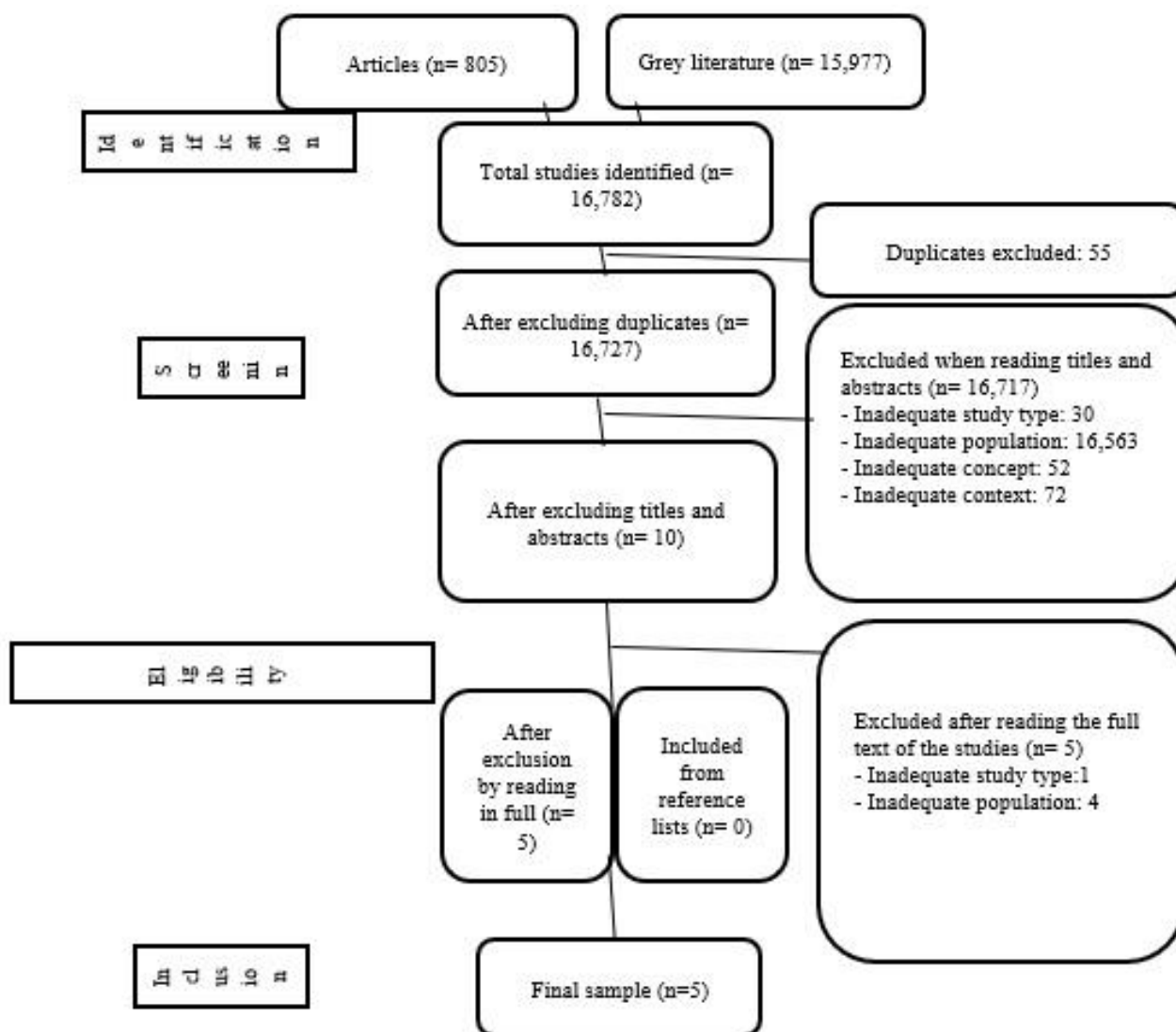

Figure 1 - Study selection flowchart adapted from the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA). Cajazeiras, Paraíba, Brazil, 2024
Source: Prepared by the authors, 2024.

With regard to the sample, although the initial number of studies identified by the search strategies was significant, most of them did not address the core topic of the research and were therefore excluded. In addition, a large proportion of the publications on mandatory reporting processes did not describe the development and/or validation of technologies to improve this process and were therefore not included in the final sample. This review focused specifically on mapping studies that presented technological products.

Thus, in Chart 3, data extracted from the studies that comprised the final sample are presented. The information includes type of publication, year, country, objective, methodological design, type of technology (educational/biomedical), purpose of the technology, educational level, validation of the technology, and impacts or challenges in its use.

Chart 3. Studies included in the review, sequenced by type of publication, year, country, objective, methodological design, type of technology, purpose, educational level, validation, and impacts or challenges in use. Cajazeiras, Paraíba, Brazil, 2024.

REFERENCE	Barreto (2023)[11]	Silva (2020)[12]	Alves; Bernardino (2023)[13]
TYPE OF PUBLICATION	Thesis	Dissertation	Undergraduate thesis
YEAR	2023	2020	2023
COUNTRY	Brazil	Brazil	Brazil
PURPOSE	Develop and validate the content of an instrument aimed at guiding the correct completion of notification and epidemiological investigation forms for arboviruses	Systematize an open educational resource on compulsory notification for students and health care workers	Develop a solution for visualizing and monitoring compulsory notification data on domestic violence
STUDY DESIGN	Methodological study of technological development	Exploratory descriptive study	Exploratory study for solution development
TYPE OF TECHNOLOGY	Educational technology	Educational technology	Educational technology
PURPOSE	Guide the correct completion of arboviruses notification and epidemiological investigation forms	Address the lack of knowledge among Brazilian health students and professionals about compulsory notification	Mitigate the limitation of access to information for health managers through visual dashboards for monitoring domestic violence cases
EDUCATIONAL LEVEL	Continuing education	Continuing education	Continuing education
VALIDATION	Content validation	Validation by ad hoc reviewers (language, illustration, interactivity, and relevance)	Not validated
IMPACTS OR CHALLENGES IN USE	Instrument not yet applied in practical care	E-book made available in CAPES repository for both health care workers/students and the general public interested in the topic	Dashboard integrated into the regional compulsory notification system, positively impacting the monitoring and planning of actions
REFERENCE	Joshi (2012)[14]	Silva (1999)[15]	-
TYPE OF PUBLICATION	Article	Dissertation	-
YEAR	2012	1999	-
COUNTRY	Brazil	Brazil	-

PURPOSE	Examine the perception of telehealth users using GeoVisualization as a proof of concept to facilitate visual exploration of telehealth data in Brazil	Analyze the spatial distribution of compulsory notifiable diseases using geoprocessing techniques	-
STUDY DESIGN	Cross-sectional study	Exploratory descriptive study	-
TYPE OF TECHNOLOGY	Educational technology	Educational technology	-
PURPOSE	Facilitate visual exploration of telehealth data for more informed decision-making	Provide information to support decision-making in public health through geoprocessing	-
EDUCATIONAL LEVEL	Continuing education	Continuing education	-
VALIDATION	Not validated	Not validated	-
IMPACTS OR CHALLENGES IN USE	Despite its applicability, it remains underused for public health data visualization	Geographic Information System (GIS) not implemented in health services due to the need for improved compulsory notification data	-

Source: Prepared by the authors, 2024.

DISCUSSION

This scoping review mapped studies conducted in Brazil, highlighting national interest in the topic, despite disease control being a global public health concern. Additionally, there has been a noticeable increase in research on compulsory disease notification over the years, particularly after 2020. This surge may be linked to the drop in notifications during the COVID-19 pandemic, which had significant repercussions on the country's health system.[16]

Despite the increased visibility of the topic post-pandemic, the number of studies available in the scientific literature remains limited and insufficient to meet real-world needs, considering the importance and scope of compulsory notifications. Among the technologies mapped, only two underwent validation, underscoring the challenges faced in technological development. Validation and application with the target audience are crucial steps that ensure greater robustness and reliability of the developed products.[17,18]

The technologies identified in the publications offer innovative alternatives, such as tools to guide the completion of notification forms, open educational resources in the form of e-books, dashboard creation, and the use of geoprocessing and geovisualization to facilitate visual data exploration. These tools support decision-making and strengthen epidemiological surveillance.

These technologies aim to educate health care workers and health students about the significance and impact of compulsory notification. They help health authorities understand the true

health situation in cities, states, and across the country, while also guiding the implementation of prevention and control measures. Compulsory notification is crucial in combating diseases, conditions, and public health events.[1]

While these technologies show great potential for enhancing compulsory notification, the studies highlight several barriers to their development and application, particularly the lack of information among health care workers. This leads to the non-completion, incomplete, or incorrect completion of notification forms, resulting in inaccurate data. The inadequacy of information creates a distorted epidemiological scenario, making it difficult for health authorities to implement effective measures.[11]

A notable example is the study by Barreto,[11] which highlighted the absence of important data, such as patient address and educational level, which are often neglected because they are not mandatory fields. However, these details are crucial for outlining the sociodemographic profile of the population.

Furthermore, a study on the completeness of dengue notification and investigation forms showed that, although mandatory fields such as "investigation date," "final case classification," and "confirmation/discarding criteria" had relatively high completion rates (94%, 89.2%, and 88.4%, respectively), the "serotype" field was filled out in only 1.3% of cases. The lack of such data complicates the epidemiological analysis and proper closure of cases.[19]

Therefore, it is of paramount importance that health care workers receive ongoing training and updates on how to correctly complete the reporting process. In this context, continuing education technologies play a fundamental role in providing information and training to professionals, thereby facilitating the mandatory reporting process. With the global expansion of Internet access, these technologies have proven valuable in disseminating knowledge and promoting learning among students and health care workers.[12]

Alves and Bernardino[13] also highlight the complexity faced by health managers when analyzing large volumes of data. They emphasize the need for tools that improve the visualization and understanding of information, making it easier to analyze the epidemiological scenario and, consequently, make better decisions.

Silva[12] identifies underreporting as one of the main obstacles in Brazil's surveillance system, attributing it to a lack of professional knowledge, difficulties in filling out notification instruments, and delays in reporting. The author suggests that adopting educational technologies to train health professionals is an effective way to address these issues.

In hospital settings, it is important to note that compulsory disease notification is carried out by the Hospital Epidemiology Center (NHE), a service established by Ordinance MS/GM No. 2.529/04, which also created the National Hospital Epidemiological Surveillance Subsystem (SNVE). This system is integrated into all hospitals operating in Brazil, regardless of their nature.[20]

The Ministry of Health has established criteria for selecting hospitals to be part of the SNVE Hospital Referral Network. These include university hospitals, those specializing in infectious diseases, hospitals in the Severe Acute Respiratory Syndrome Reference Network, sentinel hospitals for the National Health Surveillance Agency (ANVISA), and strategic hospital units for the State Health System.[20]

The primary objective of the NHE is to conduct epidemiological surveillance activities within the hospital setting, focusing on compulsory notifiable diseases. The quality of patient records, especially in confirmed or suspected cases under surveillance, is essential. The clarity and authenticity of these records are critical, as epidemiological surveillance relies on the data collected from these records to perform its activities.[21]

However, despite the ethical and legal obligation of notifications, epidemiological surveillance in hospitals continues to face underreporting, which is one of the greatest challenges in disease control.

There are many reasons why this is the case, including a lack of knowledge among health care workers, a lack of awareness, and a lack of priority given to reporting, which is fundamental to public health.[22] Additionally, the hospital culture, which often does not value or understand the importance of epidemiology, contributes to the reluctance of professionals to make spontaneous notifications.[23]

In practice, the responsibility for carrying out notifications in hospital settings largely falls on nurses. These professionals play crucial roles in organizing, planning, directing, and controlling daily activities, standing out within the multidisciplinary health care team.[24] Consequently, nurses are fundamental, both in their clinical and administrative roles, especially in epidemiological surveillance activities related to compulsory notifiable diseases.

The results of this study reveal a scarcity of research and technologies focused on this subject, as indicated by the small sample size, which also represents a limitation. This highlights the urgent need for further research and the development of technological products that increase the visibility of compulsory disease notification. Strengthening this process among healthcare professionals in hospitals will help overcome the current challenges, thereby enhancing hospital epidemiological surveillance and improving public health.

CONCLUSION

This study mapped the scientific production on the creation and/or validation of technologies aimed at improving the compulsory disease notification process. The innovations identified, such as the use of geoprocessing, dashboards, e-books, and tools focused on continuing education for professionals, have proven to be promising solutions for addressing the gaps that undermine the effectiveness of notifications.

The scoping review successfully achieved its goal by identifying and presenting technologies that can be applied in health services, generating positive outcomes and encouraging the development, validation, and implementation of new technological solutions in areas of great importance to public health.

Furthermore, data from this scoping review have contributed to the development of a nursing education technology that can support and promote the process of mandatory reporting in the hospital setting. The research findings highlight the lack of comprehensive studies and technologies on this topic, as well as the low visibility and dissemination of such an important issue for epidemiologic surveillance and public health.

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