

# Characterization of scientific production on errors in health work

Caracterização da produção científica sobre erro no trabalho em saúde  
 Caracterización de la producción científica sobre error en el trabajo en salud

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## Descriptores

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## Abstract

**Objective:** To characterize the national and international scientific production on errors in health work from 2000 to 2020.

**Methods:** This is an integrative literature review of national and international studies, carried out in the MEDLINE, LILACS/BIREME, PubMed and SciELO databases. A total of 4164 studies were found, 148 of which were included and submitted to thematic content analysis. The searches were carried out from January to March 2020 and April 2021. The results were systematized into three thematic categories.

**Results:** In the category *Characteristics of studies on errors*, it was evidenced that the most frequent professional categories in error occurrence are nurses, physicians and pharmacists; regarding *Characteristics of error in health work*, the most reported types are medication, diagnosis and nursing care errors, including patient falls, phlebitis resulting from peripheral venous catheters, occurrence of pressure ulcers and extubation of drains, catheters and probes; and in *Context for error occurrence*, individual elements and work context were identified, highlighting the latter.

**Conclusion:** It was evident that error in health work occurs in a context of precarious work, with work processes marked by heterogeneity. From the understanding that health workers make mistakes and that the precariousness of work enhances error occurrence, it is necessary to reorganize health systems so that the opportunities for errors to occur are reduced and that learning is promoted when they occur.

## Resumo

**Objetivo:** Caracterizar a produção científica nacional e internacional sobre erro no trabalho em saúde no período de 2000 a 2020.

**Métodos:** Trata-se de revisão integrativa de literatura, de estudos nacionais e internacionais, realizada nas bases MEDLINE, LILACS/BIREME, PubMed e SciELO. Foram encontrados 4164 estudos, sendo 148 incluídos e submetidos a análise de conteúdo temática. As buscas foram realizadas no período de janeiro a março de 2020 e abril de 2021. Os resultados foram sistematizados em três categorias temáticas.

**Resultados:** Na categoria Características dos estudos sobre erros, evidenciou-se que as categorias profissionais mais frequentes na ocorrência do erro são enfermeiras(os), médicos e farmacêuticos; quanto à Características do erro no trabalho em saúde, os tipos mais relatados são erro de medicação, de diagnóstico e na assistência de enfermagem, incluindo queda de pacientes, flebites decorrentes de cateteres venosos periféricos, ocorrência de úlceras por pressão e extubação de drenos, cateteres e sondas; e no Contexto para a ocorrência do erro, foram identificados elementos individuais e do contexto do trabalho, destacando-se este último.

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Conflicts of interest: nothing to declare.

**Conclusão:** Evidenciou-se que a ocorrência de erros no trabalho em saúde ocorre em um contexto de precarização do trabalho, com processos de trabalho marcados pela heterogeneidade. A partir da compreensão de que os trabalhadores da saúde erram e que a precarização do trabalho potencializa a ocorrência de erros, faz-se necessário a reorganização dos sistemas de saúde para que sejam reduzidas as oportunidades para o acontecimento de erros e que sejam promovidos os aprendizados quando estes ocorrerem.

## Resumen

**Objetivo:** Caracterizar la producción científica nacional e internacional sobre el error en el trabajo en salud en el período de 2000 a 2020.

**Métodos:** Se trata de una revisión integrativa de literatura, de estudios nacionales e internacionales, realizada en las bases MEDLINE, LILACS/BIREME, PubMed y SciELO. Se encontraron 4164 estudios y 148 fueron incluidos y sometidos a un análisis temático de contenido. Las búsquedas se realizaron en el período de enero a marzo de 2020 y abril de 2021. Los resultados fueron sistematizados en tres categorías temáticas.

**Resultados:** En la categoría Características de los estudios sobre errores, se evidenció que las categorías profesionales más frecuentes en la ocurrencia del error son enfermeras(os), médicos y farmacéuticos; con relación a las Características del error en el trabajo en salud, los tipos más relatados son error de medicación, de diagnóstico y en la asistencia de enfermería, incluyendo la caída de pacientes, flebitis resultantes de catéteres venosos periféricos, y ocurrencia de úlceras por presión y extubación de drenaje, catéteres y sondas; y en el Contexto para la ocurrencia del error, se identificaron elementos individuales y del contexto del trabajo, destacándose este último.

**Conclusión:** Se evidenció que la ocurrencia de errores en el trabajo en salud se da en un contexto de precarización del trabajo, con procesos de trabajo marcados por la heterogeneidad. A partir del entendimiento de que los trabajadores de la salud cometen errores y que la precarización del trabajo potencia la ocurrencia de errores, se hace necesario reorganizar los sistemas de salud para que se reduzcan las oportunidades de que los errores ocurran y que se promuevan los aprendizajes cuando estos ocurran.

## Introduction

Error, according to the Human Error Theory, is understood as an unintentional act, characteristic of human nature, covering all occasions in which planned and executed actions do not reach the expected result.<sup>(1)</sup>

Also according to this theory, error is a phenomenon that is commonly associated with performing tasks in complex and poorly controlled systems. When considering that health work is structured as a complex and dynamic system characterized by the consumption of different levels of technologies and by an intense relationship and interaction between workers and users, certain contexts can become susceptible to error occurrence.

In health work, error occurrence affects the health organization's image and reliability, raises the costs of health services and puts the physical and emotional integrity of patients at risk, possibly causing them temporary, permanent and, in situations of damage, more serious, death. For health workers, error indicates vulnerability in precarious work, professional depreciation and is often related to feelings of shame and guilt, given the punitive approach adopted by organizations and local authorities that regulate professional practice.<sup>(2,3)</sup>

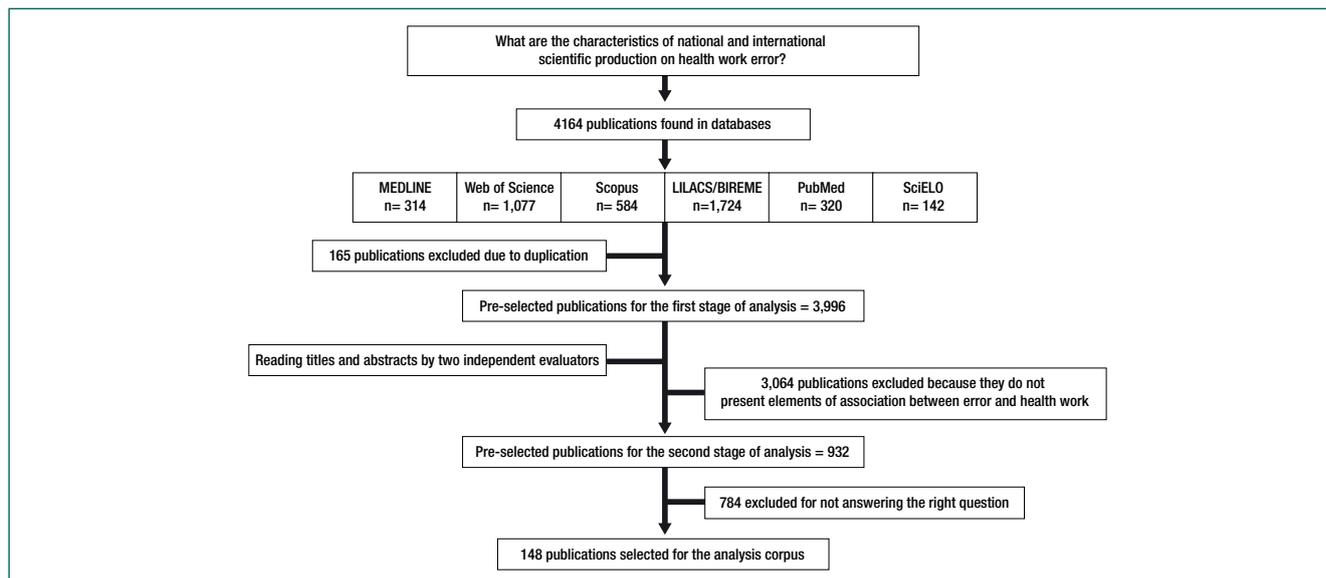
It should be noted that, in the context of production of health services, patient and worker safe-

ty and the development of work, in a safe environment and conditions, are faced with economic pressures, pressure of time and productivity, competition, type of service provided and the organization's work policy. They are also associated with the pressure caused by the high workload and the rigid hierarchical structure of the health work process.<sup>(4,5)</sup> Bearing in mind that error in health work should be considered a structural phenomenon, it should be examined based on the work context, changes in organizational strategies, variability and multiplicity of activities developed.

Faced with this problem, the question is: What does the national and international scientific production reveal about errors in health work? This article aimed to characterize the national and international scientific production on error in health work in the period 2000 to 2020. The characterization of health error can contribute to reveal error occurrence as a complex, systemic phenomenon and question the individual approach and moral, still hegemonic in health services.

## Methods

This is an integrative literature review based on the six steps recommended by the method,<sup>(6)</sup> following a search protocol for articles structured by the au-



**Figure 1.** Identification, selection and process of inclusion and exclusion of articles

thors with the following steps: elaboration of the guiding question; definition of inclusion and exclusion criteria for scientific manuscripts; careful analysis of the abstracts of the studies found; reading and assessment of selected manuscripts using the Critical Appraisal Checklist For Interpretive & Critical Research (JBI-QARI) checklist; data analysis and interpretation; categorization of data and synthesis of studies.

Inclusion criteria included complete manuscripts, in original article format, which addressed errors in health work, published from 2000 to 2020 and which presented abstract in English. The delimitation of the publication period, as an inclusion criterion, considered the publication of the scientific landmark on the subject the report “To Err Is Human”, by the American Institute of Medicine, in 2000. Manuscripts from literature review, systematic review and repeated in the databases were excluded. The search in the databases was performed by two authors simultaneously, with the search period being from January to March 2020 and April 2021, including the Comprehensive Medline (MEDLINE), Web of Science, Scopus and *Literatura Latinoamericana y del Caribe de Información en Ciencias de La Salud* (LILACS/BIREME), National Center for Biotechnology Formation (PubMed) and Scientific Electronic Library Online (SciELO) databases.

The search strategy was composed by the combination of the descriptors Patient safety AND Medication errors OR Medical error. The descriptors were available in the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) in English. The search was performed with the terms in English, as, regardless of language in which the articles were originally written, they all contained abstracts in English.

The survey identified 4,164 publications, and the corpus of the study consisted of 148 articles (Appendix 1) contained in the MEDLINE, Web of Science, Scopus, LILACS/BIREME, SciELO databases. The selection process consisted of two stages. Step 1: 165 duplicate publications were excluded and, after reading the titles and abstracts by two independent evaluators, 3,064 articles were eliminated for not presenting elements of association between error and health work. Step 2: the articles were read in full, excluding 784 studies for not meeting the guiding question.

Figure 1 shows the identification, selection, and process of inclusion and exclusion of the articles in this review.

Considering the critical analysis of eligible studies, the classification of the levels of scientific evidence of the Agency for Healthcare Research and Quality (AHRQ), which covers six levels, was adopted: (I) evidence resulting from meta-analysis

and systematic review; (II) evidence obtained in randomized clinical trials; (III) evidence obtained in clinical trials without randomization; (IV) evidence from cohort and case-control studies; (V) evidence from a systematic review of descriptive and qualitative studies; (VI) evidence based on descriptive or qualitative study,<sup>(7)</sup> as presented in table 1.

**Table 1.** Evidence based on descriptive or qualitative study

Levels of scientific evidence	Articles n(%)
I - Evidence resulting from meta-analysis and systematic review	0(0)
II - Evidence obtained in clinical trials with randomization	1(0.7)
III - Evidence obtained in clinical trials without randomization	1(0.7)
IV- Evidence of cohort and case-control studies	15(10.1)
V- Evidence from systematic review of descriptive and qualitative studies	0(0)
VI - Evidence based on descriptive or qualitative study	131(88.5)
Total	148(100)

In the selected articles, as shown in table 1, only one (0.7%) presented the level of scientific evidence II; one (0.7%) article presented the level of scientific evidence III; 15 (10.10%) articles presented the level of scientific evidence IV; and 131 (88.50%) articles presented level VI. No articles with evidence level I and V were identified.

After the analysis, the findings in the studies were organized into three categories: Characteristics of studies on errors; Characteristics of error at work in health; Context for error occurrence. For analysis of the articles, the integrative review steps and, as a method, Thematic Content Analysis were followed. The data found were discussed based on scientific literature and the Human Error Theory, proposed by James Reason, respecting the copyright and integrity of the ideas contained in the articles.

## Results

Characteristics of studies on errors showed that the articles were conducted in 36 countries, Brazil being the country with the highest number of publications (39.19%), followed by the USA (10.81%), Iran and England, with 5.40% each. South America produced 43.24% of the national and international studies identified in the review. The Asian countries accounted for 20.27%, followed by Europe

and North American countries, with 14.87% each, 5.40% by the African countries, and 1.35% by countries in Oceania. It is noteworthy that 70% of the articles were published in English, 23% in Portuguese and 7% in Spanish.

Most articles on error in health work were published in *Revista Brasileira de Enfermagem* (nine articles), in *Revista Latino-Americana de Enfermagem* (eight articles), in *ACTA Paulista de Enfermagem* (seven articles) and International Journal for Quality in Health Care (five articles), *Texto & Contexto Enfermagem* and BMC Health Services Research (four articles each).

Regarding the publication period, it was found that the theme was highlighted in publications from 2011, with 85.13% published in the period from 2011 to 2020. The year 2020 recorded the highest number of scientific production on error in health work, 25%.

The predominant approach was quantitative (56.75%) and descriptive (37.16%). Regarding the method of analysis, 68.24% of the articles used statistical analyses and, regarding the data origin, 29.72% used documents as a secondary source.

In the category error in health work, it was found that the study locus were hospitals (82.43%), primary health care units (6.75%) and outpatient clinics (1.35%). The percentage used as a media data source was 1.35% and those who did not have a defined location total 3.78%.

The predominant professional categories were nurses, who represented 27.7%, followed by physicians (26.8%) and pharmacists (9.45%). Of the 148 articles, fourteen (9.45%) did not mention which professional categories participated in the studies.

Regarding the type of error investigated, the most frequent were medication errors (89.18%), diagnostic errors (5.40%) and errors in nursing care (5.40%), which include, in addition to medication-related errors, patient fall, phlebitis resulting from peripheral venous catheters, occurrence of pressure ulcers and extubation of drains, catheters and probes. Only one article focused on error analysis in a surgical procedure.

In 51.3% of the studies, the authors took into account the individual and/or systemic approach to

error occurrence in health work. The individual and systemic approach was present, concomitantly, in 16.2% of the articles. The individual approach was identified in 18.2% of the analyzed articles and the systemic approach in 16.8% of the studies included in the review, as presented in table 2.

**Table 2.** Approach type and elements of the error occurrence context

Approach type		
Type	n(%)	
Individual	27(18.2)	
Systemic	25(16.9)	
Individual + Systemic	24(16.2)	
Not cited	72(48.7)	
Elements of the error occurrence context		
Error type	Individual	Systemic
Medication error	Patient with the same name in the same hospitalization unit; Illegible prescriptions, abbreviations and omitted items; Inexperience of the health team; Training time of less than two years; Knowledge deficit; Distraction; Stress; Young health professionals.	Sizing of health workers; Failure of communication between the health team and between the health team and patients; Excessive working hours; Inadequate supervision of nursing workers; Technological failures; Interruptions; Time pressure; Absence of routines and institutional standards; Lack of material resources; Medicinal products with similar names or labels; Double employment bond; Low-access to continuing education programs; Inadequate structure of health units; Environmental factors (humidity, noise, temperature, lighting).
Diagnostic error	Knowledge deficit; Deficit in clinical skills; Do not follow protocol or clinical guideline.	Not identified.
Error in nursing care	Carelessness by nursing workers; Omission by nursing workers.	Not identified.
Error in surgical procedure	Not identified.	Not identified.

On the elements that indicate the error approach type, studies that addressed medication error (89.18%) indicated the individual and/or systemic approach, and studies on diagnostic error and error in nursing care presented only elements of the individual approach.

In the context category for error occurrence, individual and systemic context elements were highlighted, based on the type of error made. Regarding error occurrence in the individual context, it is mainly the team's inexperience, recent training, knowledge deficit. In the systemic context, the con-

text for occurrence evidences the elements of precarious health work, absence of institutional protocols and low support and the implementation of permanent education programs.

In the types of diagnostic error and error in nursing care, only the individual elements for the occurrence of these errors were identified in the studies, such as knowledge deficit, deficit in clinical skills, not following the protocol or clinical guideline, and carelessness and omission by nursing workers. For errors in surgical procedures, the individual and systemic context elements were not identified.

## Discussion

The studies focus on quantifying, describing and estimating error frequency and types resulting from health care. This predominant approach in the articles may indicate that error in health work is a difficult object to investigate, with immersion in the practice of health workers and in their daily work. An argument, to this end, may be the predominance of the individual approach to error at work, which makes this phenomenon taboo in health organizations, considering that the culture of learning from error has no record yet.

Medication errors in health services are the object of concern in several countries. A study conducted to identify and analyze adverse events in nursing care found that 44% of the incident notification reports that occurred at the research site were medication errors.<sup>(8)</sup> This can be attributed to the fact that these errors are more easily identified and also because they present potential for immediate harm to the patient, being more frequently reported by health workers. It is worth mentioning that, although they represent one of the types of habitual errors in health services, the evidence points to complex and multifactorial causality.<sup>(9)</sup> It is also emphasized that errors in drug therapy include different stages: dispensing errors, prescription, transcription, preparation and administration, which involve several health team professionals and, among them, are nursing, medical and pharmaceutical workers.<sup>(10)</sup>

It was observed, in studies produced, that the most frequent error committed by nursing workers is the medication error involving the medication administration process.<sup>(11-16)</sup> However, patient falls, followed by medication errors, also prevailed as incidents that occurred in hospitals.<sup>(17)</sup>

Among the errors in drug therapy, incorrect dosage prescribed by a physician (28%) and non-administration of medication by the nurse (29%) were the steps cited as the most frequent error in neonatal intensive care units.<sup>(18)</sup> In a study carried out in a French university hospital and in an intensive care unit in the USA, it was identified that medication prescription errors, committed by physicians, are among those that occur most in health services and are considered serious.<sup>(19,20)</sup>

In general, research on error in health work occurred in hospitals. This scenario is expected, because, in the hospital context, the care provided is technologically denser and of a continuous nature, with multiple work processes, therefore, with greater exposure to risk of errors. Another aspect is that the notification of errors is a more common practice in the hospital environment due to the characteristics of the services produced and for incorporating patient safety practices. It should be recorded that there are few and initial studies that analyzed errors in health work outside the hospital environment.

The punitive culture also stands out in the face of error occurrence as an approach type recorded in the articles. One study identified the adoption of the punitive approach for nursing workers who make mistakes.<sup>(21)</sup> However, the authors' considerations are directed only to patient safety, not to mention the need for structural reorganization of health services, since the imputed punishment does not consider the context of the work to which workers are submitted. This approach type encourages the feeling of fear of punishment and the imposition of guilt on the professionals involved, being, in general, the countermeasures adopted for the adequacy of human behavior.<sup>(22)</sup>

However, some studies that presented a mixed approach (individual and systemic) in error management stand out.<sup>(23,24)</sup> This may represent a breakthrough for paradigm shift when error in health

works occur. The punitive culture is in transition, while health workers perceive the non-punitive purpose of notifying the error.<sup>(25)</sup> It is important to note that the search for guilty and the punishment of workers have no impact on reducing errors and implementing strategies to prevent them.

Regarding the elements of the context for error occurrence, we highlight the inexperience of the health team, illegible record of prescriptions, use of abbreviations, less than two years of professional training, knowledge deficit, stress, distraction and younger professionals, these factors being related to individual characteristics of professionals.<sup>(18,25-29)</sup>

In other studies,<sup>(30-33)</sup> the precariousness of work was revealed. The precariousness of work is a political system that aims at the domination and dissemination of fear, creating a context of permanent insecurity in the worker, subjecting him to exploitation.<sup>(28)</sup> The health work process is developed in a context of precariousness, regardless of the particularities of the context of each country, each time and place. Although widespread, the precariousness of work does not affect all countries and all workers in the same way.

A scenario that reveals the influence of precariously in error occurrence was pointed out in a study conducted in 44 Japanese psychiatric hospitals, which showed that incorrect administration of medications was common in units with fewer nurses.<sup>(15)</sup> In a study on experiences with errors and their possible causes, in two teaching hospitals, it was shown that the most frequent cause for error occurrence was excessive working hours (19%).<sup>(31)</sup>

There is also a study carried out in a Brazilian hospital, which showed that adverse event occurrence were attributed to work overload, increasing the number of days of hospitalization for patients and risk of death.<sup>(32,33)</sup>

The context elements for error occurrence may also be related to the organization of the work process in health and nursing. The absence of institutional routines and standards allows patient care to be produced in a heterogeneous way, leaving each worker to decide what they consider appropriate and best for each patient, which can condition error occurrence.

Inadequate supervision of nursing workers is a problem pointed out. It should be considered that nursing work is organized differently for the different categories and that the managerial-care nature of nurses' work is a unique feature of their work process that, in the daily life of health services and produces an overload of activities, making it difficult for nurses to supervise the work of the team of nursing assistants and technicians.<sup>(2)</sup>

Another factor that should be considered is the low compliance with continuing education programs in health organizations. This low compliance is associated with the precarious work scenario due to inadequate physical structure, difficulty in understanding the methodology and the multiple working hours of workers.<sup>(34)</sup>

In terms of diagnostic errors and errors in nursing care, only contextual elements centered on individuals and on human failures were recorded in the articles analyzed. For errors in surgical procedures, individual and systemic factors were not mentioned.

The analysis also points to maintenance, in the scientific production on errors in health work, of the individual approach paradigm, with a fragile approach to systemic aspects that affect its occurrence, considering the heterogeneity and complexity of work and production of health services in different contexts.

The study limit refers to available publications. It is known that health error is still a taboo in health organizations, which can limit the amount of research conducted.

The results of this study can contribute to the contextual elements being considered and investigated in research on errors and provide subsidies for the use of a systemic approach in error occurrence to overcome the punitive approach, giving meaning to the safety culture in health services.

## Conclusion

The study demonstrates that error occurrence in health work is part of a context of precariousness of work, with distinct work processes and marked by heterogeneity, with insufficient work instru-

ments and deficit in work management processes and training for work. Thus, in addressing error in health work, one should focus less on improving individual behavior but on systemic approaches. The incipient development of research on errors at work indicates that the investment should be directed towards knowledge of the causes and determinants of error, aiming to support health organizations that take over the safety of patients and workers as strategic themes to achieve their goals.

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