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Electronic Health Record: a systematic review of the implementation under the National Humanization Policy guidelines

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Abstract *As part of the evaluability study of the implementation of the Electronic Patient Record (EPR) evaluation, the aim of this Systematic Review (SR) was to identify the evaluation domains to be addressed. This SR, aligned with the Cochrane Handbook for Systematic Reviews of Interventions and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) encompassed articles published from 2006 to 2019. The search was carried out in the electronic databases SciELO, Oasis IBICT, BVS Regional and Scopus. The search resulted in 1,178 articles, 42 of which met the inclusion criteria. Most studies used qualitative methods for the analyses. The publications took place between 2006 and 2019, with a concentration in 2017 with 9 (21%) articles published in that year. No studies were published in 2008 and 2009. Only 10 studies included the description, analysis or results related to the domains of implementation. The main domains in which the EPR was problematized were: underutilization; professionals' resistance to its use; emphasis on usability; and EPR as an information source. Despite the inclusion of all studies that covered the principles and guidelines of the National Humanization Policy (NHP), they are still incipient.*

Key words *Systematic Review, Electronic Medical Record, Evaluation, Clinical management, Primary Health Care*

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Introduction

This article is a systematic review aimed at building the categories that will be used to evaluate the implementation of medical records in primary care, from the perspective of the principles and guidelines of the National Humanization Policy (NHP).

The Brazilian Society of Health Informatics considers the electronic health record system (EHRS) as a technology directed at health needs, which joins sociodemographic and assistance information of an individual or social group, allowing the sharing of this information between health institutions[1]. This evidence can be used in different ways and for different purposes. Some examples comprise its uses for care, epidemiological and scientific purposes, and also to support decision making, action planning and policy implementation.

In this study, the terminology "Electronic Patient Record" (EPR) is adopted as an example of an EHRS, a technology that, in the Brazilian Unified Health System (SUS, *Sistema Único de Saúde*) allows the recording of users' individual characteristics, and the consolidation of data related to diseases and health services by characteristics of people, groups and populations, at the municipal, regional, state and national levels.

From the implementation of the EPR in SUS, the monitoring of the health situation and financial management can be qualified through the facilitated production of assistance reports, situational diagnoses and epidemiological studies. Despite not being implemented in all health services in the national territory, an effort has been made by the Ministry of Health (MOH) to institutionalize it. In 2013, the MOH launched the e-SUS Primary Care, a system that includes detailed and individualized information for each Primary Health Care (PHC) user[2]. According to the national scenario for the implementation of the MOH electronic medical record in October 2017, of the 42,700 Basic Health Units (BHU) in operation distributed in 5,564 municipalities, only 18,284 BHUs used the electronic medical record (3,643 municipalities). In these municipalities, the e-SUS was adopted in 8,764 BHUs (2,572 municipalities), whereas 9,520 BHUs used their own systems or hired systems from third parties[3]. In 2019, the number of BHUs with electronic medical records (e-SUS or another EPR) increased to 23,814[4].

Therefore, it becomes crucial to understand the challenges inherent to the implementation of these systems. In a preliminary study, it was identified that studies on the implementation of EPR mainly address issues related to information technology (software development), cost-effectiveness of the implementation, epidemiological and scientific use of stored data and systemic performance of these programs[5-7]. In the initial search, issues related to the principles and guidelines of the National Humanization Policy, such as the transversality, autonomy and protagonism of the subjects, to the collective participation in the management processes and the co-responsibility of the different actors involved in the health production process are seldom addressed in the literature on EPR.

A Systematic Review (SR) study of the literature was carried out on the implementation of the EPR to identify the types of studies on this management tool, which aimed to understand the main cognitive domains through which the EPRs are analyzed, as well as the analytical categories used in these studies.

Method

The SR followed the protocol available at the Cochrane Handbook for Systematic Reviews of Interventions and the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for outcome presentation. It was conducted through seven stages of development[8,9]. Initially, the research protocol was created, with the definition of the criteria. Then, the question was created using the BeHEMoTh[10] strategy. This strategy comprises four components discriminated for the study as: *Behavior of interest*, the implementation of the EPR; *Health Context*, the health systems; *Exclusions*, the studies that do not address the existing categories in the NHP guidelines and principles; and the *Models or Theories*, which include the categories of analysis of the NHP guidelines and principles organized in cognitive domains. The defined question was: What are the cognitive domains and categories of analysis from the perspective of humanization used in studies about the EPR implementation in health systems? The third stage included the detailing of the literature search in the databases, showing the descriptors and the strategies used. The fourth stage encompassed the selection and review of studies with the application of the inclusion and exclusion criteria. Then, a critical analysis of the articles was performed. The sixth stage included article selection

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and data collection by peers through methodological validation tools. Finally, the findings were synthesized, adding the studies according to their similarities, related to the analytical categories pre-established in the protocol.

It should be noted that the research protocol aimed at providing subsidies for the development of cognitive domains and analysis categories for the evaluation of electronic medical record implementation in SUS.

The search for the SR was carried out in the SciELO, Oásis IBICT, BVS Regional and Scopus electronic databases in October 2019. The retrieved studies were systematized and entered in an electronic spreadsheet (Microsoft Excel software), organized by article code, source of literature search, search string, date of search, year of publication, language, title, author and abstract. In this spreadsheet, in addition to the exclusion criteria, the excluded studies were considered and described. The keywords and descriptors are shown in Chart 1. Given the specificity of each database, it was necessary to use different descriptors and keywords between searches. It should be noted that the definition of search strategies, keywords and descriptors was carried out after several discussions between the authors, with the support and technical assistance of the librarian at the Public Health Library of ENSP/Fiocruz.

Chart 2 shows the cognitive domains and categories of analysis used. It should be noted that the cognitive domains are described by Bloom et al.[11] as processes related to learning and understanding of the world and involve interpretation and critical thinking. For the author, cognitive domains are constructs that assign meaning to the assessed object. The analytical categories are groups of ideas with similar or different characteristics that generate a given classification, aiming to organize them and structure the information related to them[12]. Studies that addressed the domains or categories as the expected functions for the humanization policy were considered for this review.

To explore the cognitive domains in the literature, content analysis was performed using the Atlas Ti software (version 7.5.18), where each study was explored by the categories included in the research protocol and detailed in Chart 2.

Results

The PRISMA international guidelines were used to describe the performance and the results obtained in this study (Figure 1).

At the eligibility stage, the 147 articles were independently analyzed by two reviewers (an external researcher and the main author) who read them in full and assessed the articles to select those that would be included in the synthesis. They were systematized in a spreadsheet and organized according to the data extraction form that considered the following information: year of publication; study type; study objectives; study sample; methodology used; cognitive domains/categories of analysis; main outcomes; study conclusions; study limitations; propositions or recommendations deriving from it.

Chart 1. Record of literature searches.

Record of literature searches		
Search Source	**Keywords, Descriptors and Boolean Operators (String)**	**Results**
BVS Regional	(("prontuario eletronico" OR "registro eletronico de saúde" OR "sistema de registro de saúde" OR "electronic health records") AND (avaliacao OR evaluation OR assessement OR "atenção primária à saúde" OR "atenção básica à saúde" OR "gestão clínica" OR "governança clínica" OR "clinical governance")) AND (instance:"regional")	494
SciELO	("prontuario eletronico" OR "registro eletronico de saude") AND (avalia* OR "gestao da clinica")	33
OASIS IBICT	("prontuario eletronico" OR "registro eletronico de saude") AND (avaliação OR "gestao da clinica")	119
Scopus	(TITLE ("electronic health records") AND TITLE -ABS-KEY (evaluation OR assessment OR "clinical governance"))	532
Total		1,178

Source: Created by the authors.

Chart 2. Cognitive domains and analytical categories.

Cognitive domains (NHP Principles and Guidelines)		Analytical categories	Description
Guidelines	**Principle**		
	Transversality	Changes in practices	Changes in the types of relationships and communication between the subjects involved in the health production processes, having the effect of destabilizing the frontiers of knowledge, the territories of power and the methods established in the creation of labor relations.
		Intra- and intergroup communication capacity	Extended and open dialogue between subjects and collectives.
		Exchange of knowledge and experiences	Exchange of knowledge and experiences between subjects and collectives.
		Horizontalization of labor relations	Organization of a matrix service network to support reference teams. Reference teams, instead of being an episodic space for horizontal integration, become the permanent and core structure of health services.
	Inseparability between management and care		Changes in the ways of care are inseparable from changes in the ways of managing and appropriating work. The inseparability between clinic and politics, between health production and subject production. Integrality of care and integration of work processes.
	Protagonism, co-responsibility and autonomy of subjects and collectives	Democratization of health actions and services	Democratization of the service management and the expansion of comprehensive health care, promoting intra and intersectoriality with sanitary responsibility agreed between managers and workers.
		Co-responsibility of care	The changes in care attain greater effectiveness when produced by the affirmation of the autonomy of the involved subjects, who contract among themselves the shared responsibilities in the care processes.
		Responsibility of professionals, managers and users	The changes in management are more effective when produced by the affirmation of the autonomy of the involved subjects, who contract among themselves the shared responsibilities in the management processes.
Co-management		Inclusion of new subjects in planning and decision-making processes	Valuing and encouraging the inclusion of workers and users in the entire health production process.

Source: Adapted from the documents that constitute the National Humanization Policy[13,14].

The inclusion criteria addressed the NHP principles and guidelines, namely: transversality, inseparability between care and management; protagonism, co-responsibility and autonomy of the subjects and collectives; and co-management. The following studies were included: a) those that discussed the implementation of the EPR in relation to: changes in practices and interaction modes; the extended and open dialogue between subjects and collectives; intra- and intergroup communication capacity; the exchange of knowledge and experiences; and the horizontalization of labor relations; b) addressed the EPR as an instrument that favors or harms the inseparability

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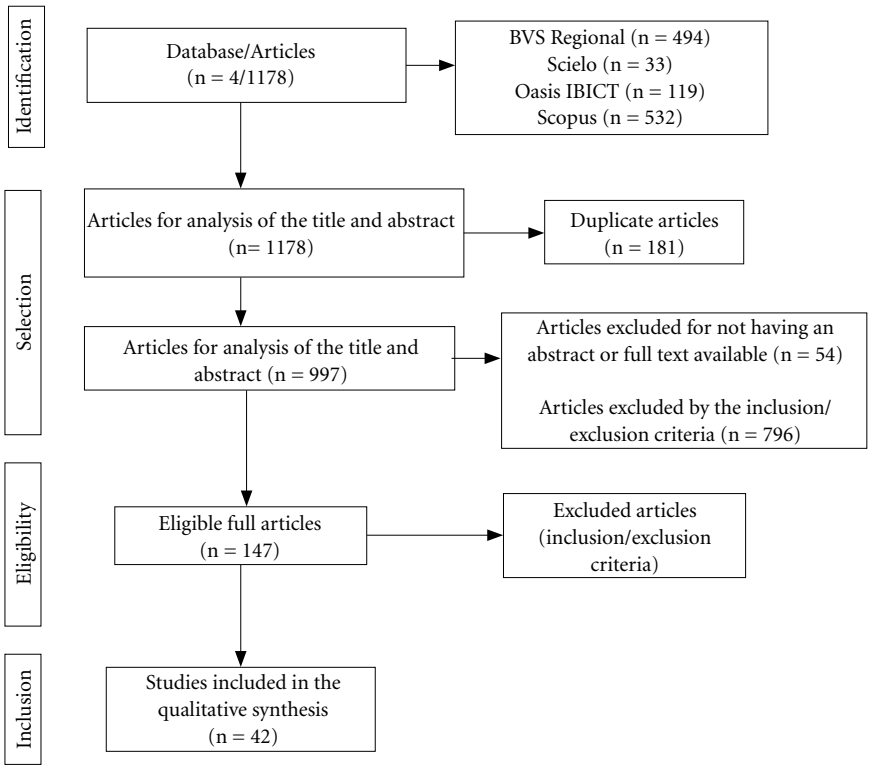

Figure 1. PRISMA flowchart.

Source: Adapted from PRISMA Statement[15,16] by the authors.

between management and care; c) considered the discussion of the EPR as an instrument to promote the empowerment and autonomy of the subjects; the establishment of co-responsibility networks through care; and the responsibility of workers, managers and users as active subjects in the managing and caring processes; d) discussed the EPR as a promoter of collective spaces for discussion with the inclusion of new subjects in the planning and decision-making processes; as a promoter of the democratization of health actions and services while creating co-responsibility in the health system management.

The exclusion criteria were: a) studies that addressed analysis on software engineering; b) contemplated analyses related only to the complementary modules to EPR, such as the patient portal, module for the disclosure of exam results, the clinical decision support module, the phenotype search module for scientific research; c) addressed the EPR only as a source of data for the study and, therefore, did not consider an expanded analysis of the electronic medical record. At this stage, studies that addressed issues related to software engineering and data mining were excluded.

In case of disagreement, the application of the consensus technique was predicted, which was not necessary, due to the lack of disagreements between the evaluators.

A total of 42 articles were included in the synthesis, 11 published in Portuguese and 31 in the English language. The publications took place between 2006 and 2019 and were concentrated in 2017, with nine articles published in that year. The search found no articles published in the years 2008 and 2009.

Of the studies included in this review, 10 included analysis or results related to the proposed domains or categories, although some articles had more than one analytical category. In total, there were 18 references to the categories. Chart 3 shows the distribution of categories in the analyzed studies.

In this analysis, 32 studies did not address the analytical categories proposed in this SR.

Discussion

The category changes in practices was addressed by two studies. O'Malley et al.[18] found in their research that the adoption of the EPR resulted in changes in care practices and assistance improvements. They report an increase in the "efficiency" perceived by professionals and in the doctors' satisfaction in relation to their work processes. The informants attributed the improvement in "efficiency" to the fact that the electronic medical record favored the concentration on the patients' needs during care and directed the physician's actions during the consultation. Schenk et al.[20] also observed a change in practices with the adoption of EPR in their findings. They observed a significant change related to the time that nurses dedicated to individual patient care in relation to

Chart 3. Distribution of analytical categories by articles included in the review.

Analytical Categories for the Systematic Review	Articles that addressed the analytical categories (as analysis categories or in their findings)		Total
Changes in practices	O'Malley et al. 2015[18] Schenk et al. 2018[20]		2
Intra- and intergroup communication capacity	Gomes et al. 2019[21] Alanazi et al. 2019[22] Rathert et al. 2017[17] O'Malley et al. 2015[18] Sockolow et al. 2011[23]		5
Exchange of knowledge and experiences	Rathert et al. 2017[17]		1
Horizontalization of labor relations	O'Malley et al. 2015[18]		1
Inseparability between management and care	Martins et al. 2017[19] Godoy et al. 2012[25] Holmes 2016[26] Schenk et al. 2018[20]		4
Democratization of health actions and services	-		0
Co-responsibility of care	Martins et al. 2017[19] Rathert et al. 2017[17] O'Malley et al. 2015[18] Morrison et al. 2013[27]		4
Responsibility of professionals, managers and users	-		0
Inclusion of new subjects in planning and decision-making processes	Rathert et al. 2017[17]		1
Did not address the analytical categories proposed for this study	Mcbride et al. 2017 Yanamadala et al. 2016 Mundim et al. 2016 Gonçalves et al. 2013 Welch et al. 2007 Paek et al. 2006 Fumis et al. 2014 Lin et al. 2019 Kuo et al. 2018 Hagglund et al. 2017a Hagglund et al. 2017b Tharmalingam et al. 2016 Pandit et al. 2013 Hiligoss et al. 2013 Greenhalgh et al. 2010 Graetz et al. 2015	Kami et al. 2015 Joynt et al. 2015 Bhuyan et al. 2014 Lima et al. 2018 Colleti Junior et al. 2018 Souza et al. 2017 Farias et al. 2014 Graham et al. 2018 Ericson et al. 2017 Duarte et al. 2017 Plantier et al. 2017 Mysen et al. 2016 Ser et al. 2014 Takian et al. 2014 Silverman et al. 2014 Stewart et al. 2010	32

Source: Developed by the authors.

other activities. Moreover, the study found that, although nurses spent more time in overall nursing interventions, such as medication administration, they had less interaction with patients and their families, especially in educational and counseling activities. The authors also observed that nurses showed a slight reduction in the effectiveness of care, perceived after the adoption of EPR[20]. These changes should be better assessed in subsequent studies, aiming to better understand their influence on health education actions.

Five studies addressed the category of intra- and intergroup communication capacity. A study carried out in Primary Care in a municipality in the state of Minas Gerais, Brazil, described the EPR as a tool for team integration and care[21]. Another study pointed it out as a useful tool to improve communication between health professionals[22]. The third study, a systematic review, indicated that the use of EPR facilitates communication and the exchange of information in the team, although it pointed out the need for more robust studies that explain how this transformation influences the communication functions[17]. In another study, the interviewees stated that the communication improved by the EPR in a team occurs through the access to and sharing of patient information, mobilizing several resources, such as instant messaging within the system itself, notes in the medical records, reminders and task assignments[18]. The last study that addressed the topic identified in the interviews that the team's primary means of communication was face-to-face communication, and not the EPR[23]. This finding corroborates the discussion presented by Alanazi et al.[22], which emphasizes the common sense about communication improvement attributed to the EPR based on the preconception that the system, by interconnecting different services and departments of a health unit, could improve the organizational communication.

The category exchange of knowledge and experiences was addressed by Rathert et al.[17] in their systematic review. Their findings indicated the relevance of the EPR for the exchange of biomedical and psychosocial information, being essential for both the adequate diagnosis and the development of treatment plans. It should be noted that this information can also be used to guide clinical practices. The studies that comprised the review reported evidence-based medical practice, based on information collected from electronic medical records.

The category horizontalization of work relations was briefly discussed in the findings by O'Malley et al.[18]. The study participants reported the redefinition of the health team roles with the implementation of the EPR, based on the delegation of tasks that, combined with revised clinical workflows, allowed non-medical professionals to have their roles improved. There is no record of the effect on medical professionals of the care team.

The categories changes in practices; intra- and intergroup communication capacity; exchange of knowledge and experiences; and horizontalization of work relationships, constitute the principle of the NHP transversality, which predicts the expansion of types of connection and the improvement in work relations, promoting networked health practices[24].

The category inseparability between management and care was observed in four studies. Martins et al.[19] emphasized in their findings the use of electronic medical records as a management tool for health units, allowing a comprehensive administrative and sanitary view of the unit health status. Another study[20] showed that nurses spent significantly more time performing actions related to management, such as coordination, action planning and decision making. During the interviews, the participants emphasized the significant role of the EPR as a management tool for planning and decision-making, as it encompasses most of the health actions carried out within the scope of health equipment. From the records of consultations and activities, the system collects all the necessary information for the creation of the users' medical records, as well as all the necessary information for Public Health managers[25]. However, in a study carried out in the Family Health Strategy (FHS) units in the city of João Pessoa, state of Paraíba (PB), Brazil, it was observed that the use of the e-SUS forms was precarious, that is, the professionals scarcely use data from this system to make decisions in their practices. The study participants also stated that the management scarcely uses the information collected through e-SUS for health action planning and performance. The informants attribute the scant use of these data to the difficulties inherent to the system usability, lack of training for the operationalization of the electronic medical record and the inadequacy of the EPR to the local reality[26].

The category co-responsibility of care was addressed in four studies. Martins et al.[19] observed in a city in southern Brazil that professionals working in Basic Health Units (BHUs) used the EPR during the work process. The professionals

reported that they used the electronic medical record system in all their activities as a consultation tool for the daily activities of their responsibility and for planning actions for the health team activities. Rathert et al.[17] verified that the EPR helps in the preparation of the diagnosis, the creation of the therapeutic plan and the development of treatment plans for complex patients, facilitating the discussion for decision making with the patients themselves. O'Malley et al.[18] show, as an example, the monitoring of some patients with complex therapeutic needs. Pharmacists collect the information entered in the EPR by other professionals, subsidizing the health education activities that these professionals carry out when dispensing medications. The interviewees explained that the EPR offers support to permanent recommendations and integrated protocols. They consider that it contributes to the increase in autonomy of the team members, especially the monitoring of actions by the nursing team, such as vaccinations or health exams that precede the medical care[18]. In another study[27], they observed that the technology available in electronic medical record systems was increasing patients' desire for information, increasing their proactivity in relation to their health care and improving treatment adherence. This is especially true in cases of chronic diseases, such as diabetes. Participants stated that drug management was an area that could greatly benefit from the supply of structured information to and from users, allowing a better understanding of the necessary care and greater adherence to medications.

The category insertion of new subjects in planning and decision-making processes was only identified in one of the analyzed studies. It is a systematic review carried out by Rathert et al.[17], in which one of the studies postulated that the EPR helps in the preparation of the diagnosis, in the decision-making process and in the development of treatment plans for complex patients, facilitating the discussion for the decision making with the patients themselves. Therefore, the authors state that the use of EPR offers opportunities for the patient and the doctor to share power. This study also demonstrated the relevance of the EPR for the exchange of biomedical and psychosocial information between professionals and patients, being essential both for the adequate diagnosis and the development of shared treatment plans.

The category distribution chart (Chart 3) describes the studies that, even though included the use of electronic medical records, did not address the NHP categories. The details of these studies are important to characterize the type of the most covered categories.

In addition to the 42 identified studies, two studies that were not included in this review because they did not meet the defined search criteria were also analyzed. These reinforce the importance of EPR in Primary Health Care (PHC) regarding its essential characteristics[28,29]. The longitudinality of care, care comprehensiveness and coordination of care are attributes that can be favored with the implementation of medical records that allow intra- and intergroup communication, favoring the co-management and changes in practices.

Final considerations

Studies that consider the analysis of the EPR implementation are published annually. Most of them address the criteria of usability, user satisfaction, cost-benefit ratio and changes in health results related to the implementation of this technology. These studies contribute to the identification of the benefits and challenges of its implementation.

The articles indicate a certain resistance regarding the use of the EPR by the professionals, attributed to the lack of training for its use. An investment in training was observed, focused on usability, as well as an emphasis on the handling of the system. In health systems where the use of EPR is mandatory and whose professionals have already participated in usability training, the underuse of medical records was observed, as well as the fact that they were used only as a repository of patient information for clinical case management and epidemiological follow-up. This resistance must be assessed in details in studies that analyze the changes in practices involved in health production processes and their relationship with the implementation of electronic medical records. Understanding this process can improve the adoption of EPR by health professionals in their daily lives.

Another observed point was the focus on interprofessional communication. The intra- and intergroup communication capacity is still limited to the exchange of information between health professionals. Regarding the exchange of knowledge, the studies also pointed out the need to encourage the adoption of the EPR for the sharing of experiences between the local health team participants, between them and the scientific community, and with the health service us-

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ers. The adoption of applications for patients to have access to their clinical data can be a good way to stimulate this exchange of knowledge.

The implementation of the EPR, according to the analyzed studies, favored the organization of a network of services with horizontal integration between the professional team members, promoting more democratic and participatory management in health services. In this sense, the EPR was considered a promoter of changes in the ways of caring and managing, without the dissociation between the integrality of care and the integration of work processes, guaranteeing the inseparability between management and care, which is one of the NHP principles.

The studies also pointed out the influence of the EPR in the co-responsibility of care and in the health professionals' autonomy production. However, in relation to patients, this relationship is still a fragile one. This fact is symptomatic, as it may indicate the absence of mechanisms in the electronic medical records that promote the subjects' autonomy, especially regarding the patients. The inclusion of new subjects in the planning and decision-making processes reflects the NHP co-management principle. From this perspective, the understanding of the EPR role for the adoption of co-management practices remains unclear and the literature is still scarce in this regard.

In fact, the discussion about the EPR as a tool that can favor active and extended communication, the transversality, the integrality and the protagonism of the subjects in the care production processes is still incipient. Few studies have analyzed the relationship between the EPR implementation and the process of humanizing care, work and health management. It is important to highlight that the NHP principles and guidelines are intrinsically related to the essential characteristics of Primary Health Care (PHC). Brazilian studies have already demonstrated the relevance of the EPR for PHC by favoring care coordination, integrality of assistance and the longitudinality of care. This discussion is an essential one, so that proposals for continuing education, addressing the relationship of the EPR with the NHP principles and guidelines and with the PHC attributes, can be implemented, promoting the professionals' qualification and allowing a more humanized care.

Among the study limitations, it is pointed out that overall, the concept of humanization in health is not guided by public policies, if the global scenario is considered. Therefore, the principles and guidelines considered here do not always appear related to each other in different studies. Further studies should be carried out to allow for a broader understanding of the challenges of implementing the EPR, from the perspective of humanization in health.

This SR aimed to analyze the EPR implementation from the perspective of the NHP principles and guidelines. Each category provided subsidies for the construction of dimensions aiming at the EPR implementation assessment. This assessment will provide relevant information for the management decision-making in the implementation of SUS electronic medical records.

Collaborations

PPS Toledo contributed with the study design, methodology, analysis, discussion and final writing of the manuscript. EM Santos contributed with the design, methodology, discussion and final writing of the manuscript. GCP Cardoso contributed with reading and critical review of the manuscript. AB Oliveira contributed with the reading, critical review of the manuscript and methodology. DMF Abreu participated as an independent reviewer of the articles.

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