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An Information Model on Pain Management: Cultural Validation and Refinement

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Abstract: This study aimed to validate and refine an information model on pain management in a Brazilian hospital, considering the institutional culture, using an expert consensus approach. The first stage took place through a computerized questionnaire and Content Validity Index calculation. Pain management attributes were considered validated with 75% consensus among 19 experts. The second stage validated and refined the information model by three experts via an online meeting. Results showed that out of 11 evaluated attributes, five were validated. In the second stage, the inclusion of new attributes was suggested to address institutional culture. The final information model resulted from 23 sets of revised attributes: 12 validated, seven suggested and four not validated. The resulting Brazilian model has the potential to support the implementation of interventions and propose improvements to the institution's electronic system, which can be reused in other institutions.

Keywords: electronic health records, big data, informatics, medical records, pain Management

1. Introduction

There is no standardized language capable of covering all health domains available in the Electronic Health Records (EHR) [1]. Information models (IMs) can be used to map semantic similarities, connect reference models and clinical terminology, represent specific concepts within a concept model, and integrate data elements, structures, and relationships [2]. For inpatient care, determining quality indicators for pain management has been an obstacle to effectively directing efforts toward results focused on improving patient-centered care [2]. Patient's response to pain is often linked to a subjective context,

such as social, cultural, and religious norms, along with patients' preferences who should be encouraged and supported in their pain management plan [3].

Using data-driven methodology and big data strategies [4], a Brazilian IM on pain management was developed following the premise of a North American study [5]. It provided an overview of what has been done in clinical practice at a public university hospital, a national reference in the use of HER, and pain management expertise [5]. The attributes that composed the Brazilian model were mined from structured EHR fields that explore attributes of pain and further classified into assessment, reassessment, intervention, goal, and outcome. However, the methodology used does not guarantee the specificities and cultural needs of the Brazilian institution. Thus, validating the Brazilian IM, provides the foundation for improvements in the EHR for better clinical practice.

The objective of this study was to validate and refine the IM on pain management considering the Brazilian institutional culture.

2. Methods

This is an expert consensus validation study [6]. EHR data was extracted from a larger, public, general, and university hospital in southern Brazil with 60 specialties and about 842 beds, a national reference in pain management and palliative care [7]. Data from July 2014 and June 2019 was included, containing approximately 51,643 unique patients, admitted to medical and surgical units. Data was mined for attributes of pain, and classified into assessments, goals, interventions, and outcomes inside an SQL data science environment (Structured Query Language). For the analysis, data was extracted from structured fields available in the EHR.

For the first stage of the IM pain management validation, three pain management and palliative care expert groups were chosen using the “snowball” method. To define the expert sample, a 95% confidence level, 15% sampling error, and 95% proportion of judges were considered; obtaining a minimum of 18 specialists [6]. An adapted criteria was used to include specialists based on a validation study [6], where those who obtained the minimum score of five points were included. The criteria consisted of adding two points to those who had more than 10 years of graduation, or experience in the institution's EHR, PhD, Master or certified in pain management, published articles on pain management, belonging to the Medical Record Commission, Nursing Process Commission, or Pain Treatment and Palliative Medicine Service. Less than that, it scores one.

A questionnaire was created for the 11 attributes of pain management and the developed IM [5]. Two questions were asked for each of the 11 attributes that composed the model: whether the attribute is available in the EHR and whether it is actually used in clinical practice. Three response options were offered: “Yes”, “Partially”, and “No”. Additional open questions about the model developed were included. Suggestions, reflections, and questions about the topic were encouraged. After the experts' evaluation, the Content Validity Index (CVI) was used to evaluate responses, which measures the percentage of agreement in relation to the evaluated content [6]. To assess agreement, the following scores were considered: 1 for “Yes”, 0.5 for “Partially”, and zero for “No”. The sum of the responses’ scores for each set of attributes was divided by the total number of responses. Attribute sets that did not reach 75% of agreement were submitted to a second round of consensus.

The selection of specialists for the second round of evaluation was done by convenience sampling, with three specialists with the best scores from the initial sample being invited. The objective of this second round was to validate and culturally refine the IM on pain management through an online meeting. The project was approved by the Institutional Review Board (#2018.0669).

3. Results

The first stage of the validation was performed by 19 pain management experts, composed of 16 nurses and three physicians, two with a PhD and two Master's degrees. Out of 19, 16 professionals had more than 10 years of training and 11 had worked at the institution for more than 10 years, 12 of them belonging to the Nursing Process Commission, five to the Medical Records Commission and two to the Pain Treatment and Palliative Medicine Service, eight of them have scientific publications in this area.

Derived from the computerized questionnaire and the CVI calculation, the sets of attributes on pain management that reached 75% of consensus were validated, as shown in Table 1 below:

Table 1. Set of attributes about pain validated in the first stage

Attribute set	Is it used in the electronic system?		Does it reflect the institution's clinical practice?		First stage validation
	Score	CVI*	Score	CVI*	
1 Assessment of pain intensity	18,0	**0,95**	16,0	**0,84**	**VALIDATED**
2 Assess the characteristic, location and intensity of pain using pain scales	17,0	**0,89**	14,5	**0,76**	**VALIDATED**
3 Identify with patient factors that relieve / worsen pain	9,5	0,50	10	0,53	NOT VALIDATED
4 Apply cryotherapy / thermotherapy for pain	9,0	0,47	9,0	0,47	NOT VALIDATED
5 Apply mobilization for pain relief	9,5	0,50	12,0	0,63	NOT VALIDATED
6 Deliver drains care if pain	12,0	0,63	13,0	0,68	NOT VALIDATED
7 Perform indwelling catheterization when pain	15,5	**0,82**	16,5	**0,87**	**VALIDATED**
8 Administer medication for pain before procedures and / or after evaluation	16,5	**0,87**	15,0	**0,79**	**VALIDATED**
9 Administer analgesic medications	19,0	**1,00**	18,0	**0,95**	**VALIDATED**
10 Reassess pain from 30 minutes to 1 hour after management	17,0	**0,89**	12,5	0,66	**PARTIALLY VALIDATED**
11 Request pain management consultations	13,5	0,71	12,0	0,63	NOT VALIDATED

Source: Research data.
Note: * CVI - Content Validity Index

Sets of attributes that did not reach 75% agreement were submitted to a second round of consensus among three experts selected from the highest scores in the initial sample, with scores of 8, 10, and 12, respectively. During a virtual meeting, all attributes were evaluated and those attributes that would integrate the final model were revised, also considering those related to post-anesthetic care (CPA). Based on the results from this meeting, the final Brazilian IM on pain management was validated.

The experts suggested that interventions related to the Nursing Diagnoses (NDs) Chronic Pain and Acute Pain available in the EHR should be considered since the institution consistently employs NDs in its work process. Thus, a broader mining of the database and a refinement of the attributes were conducted. The final information model resulted from 23 sets of revised attributes: 12 validated, seven suggested and four not validated. The attribute set “Request pain management consultations" was revised and validated in the second round.

The Brazilian IM on pain management was validated in two stages. After the first round of validation, considering the experts' suggestions, a second set of recommendations was added, with the IM being refined representing cultural variations found in the Brazilian institution, as shown in Figure 1.

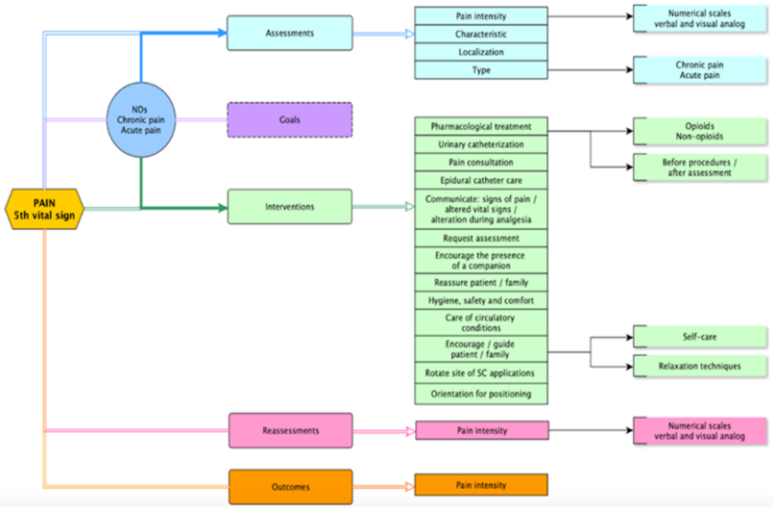

Figure 1. Brazilian Information model on pain management culturally validated and refined by specialists.

4. Discussion

Although all attributes were extracted from the EHR most experts considered that the non-validated attributes were evaluated in a broad way instead of a more precise analysis. Thus, two stages of validation by specialists were essential in order to support clinical practice on pain management, considering the institutional culture. The institution recommends pain assessment at least every 6 hours, considered as the fifth vital sign, as well as the reassessment in 30 minutes to 1 hour when pain is present and after medication administration [3]. The verbal numerical scale is most used in the institution. Other scales mapped for pain assessment were excluded due to the understanding that these scales belong exclusively to the population that was not included in this study.

It was identified that despite the importance of assessing factors that relieve and worsen pain for pain management [8], the documentation is little explored and tends to be underestimated when prioritizing medications as the first choice of treatment. Attributes classified as non-pharmacological intervention measures found in the institution's EHR represent mainly the application of cold and heat, patient mobilization, drains management, and indwelling catheterization. However, these practices are little

prescribed and implemented. Goals and outcomes on pain management were not identified through structured records, although the Brazilian institution develops clinical research aiming at implementing the Nursing Outcomes Classification – NOC [9].

According to experts, there is no systematization for disclosure and monitoring of compliance with the recommendations about analgesics. The use of opioids in Brazilian clinical practice has been progressively increasing, which highlights the urgent need to introduce policies and precautions in order to prevent the development of an opioid epidemic in the country [10]. At the Brazilian institution, pain consultations can be requested for patients, directing specific situations that aim to promote quality of life and safety for patients considered at risk for increased pain and/or abuse [7].

The second phase of validation was essential to validate and refine the model. The attributes were critically reviewed and refined, nine of them being ratified as to their status of validation, with the attributes on pain consultations and pain reassessments considered validated after the second phase. In this phase, attributes related to CPA were included and care related to NDs was suggested, considering the institutional culture that uses standardized nursing languages in the Nursing Process [9] since 2000.

The study's limitations refer to the data mining being restricted to structured records, excluding documents considered important such as nursing daily evaluation notes and history assessments. Furthermore, the study result refers to a specific Brazilian hospital and its institutional culture may limit the generalization of the results to other settings or cultures.

5. Conclusions

The Brazilian IM on pain management has been validated and refined through expert evaluations and consensus. Contributes to the standardization and comparison of data across settings. The validated model became more forceful in supporting the implementation of potential interventions and improvements in the institution's EHR. The result of these actions would optimize patient safety through institutional policies, well-defined protocols, and, consequently, better evidence-care practices.

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