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Pain Documentation: Validation of a Reference Model

Emily Gesner [a] Sarah A Collins[a,b,c], Roberto Rocha[a,b,c]

[a] *Clinical Informatics, Partners eCare, Partners Healthcare Systems, Boston, MA*
[b] *Department of General Internal Medicine, Brigham and Women's Hospital, Boston, MA*
[c] *Harvard Medical School, Boston, MA*

Abstract

Over the last decade, interoperability of the Electronic Health Record (EHR) is becoming more of a reality. However, inconsistencies in documentation such as pain are considered a barrier to obtaining this goal. In order to be able to remedy this issue, it is necessary to validate reference models that have been created based upon requirements defined by Health Level 7 (HL7), Logical Names and Codes (LOINC) and the Intermountain Clinical Element Model using external published sources and guidelines. Using pain as an example of complex and inconsistent documentation, it was found that the reference model based upon these standards is valid because the data elements identified are broad and can meet the needs of each sub-domain within the primary domain of pain.

Keywords:
Pain documentation, clinical reference model.

Introduction

Converting a hospital system that has been using various electronic health records (EHR) to a single electronic medical record (EMR) can be a significant challenge. Variation in clinical workflows may serve as rationales to request modifications to the user interface (UI) of an EHR, including data terminology and definitions, for specific settings or specialty care areas. While a goal of these modifications may be to increase productivity by providing tailored screen interactions for end-users, the integrity and consistency of data capture across an organization suffers. The creation of a reference data model and validation based upon external published references is critical to steer consistent data capture in any organization. "Data standards, including terminologies and common data elements (CDE), is a critical first step towards achieving automated data integration."[1]

This study is focused on Partners HealthCare (Partners), a large integrated health care delivery system in the Northeast region of the United States that consists of 12 hospitals that have been affiliated or acquired over the last 20 years. Each hospital has different inpatient and outpatient EHR's, which are either internally developed or vendor provided. The Partners eCare (PeC) Program is an enterprise-wide effort to implement a single vendor-based EHR[9]. The opportunity to convert all the hospitals to one EHR platform has given way to the need to standardize documentation throughout all the specialties. As the United States and other countries increase their infrastructures and capabilities to share electronic healthcare data, consistent data definitions based on clinical reference models will be critical.[2] If clinical data is inconsistently defined and captured, an important goal is to iteratively identify and resolve these data inconsistencies, starting while the new EHR platform is being configured, but continuing throughout the system deployment phases. Ideally, this iterative process should start with high priority clinical documentation topics.

Complexity of Pain Documentation

Pain documentation is an example of an important and complex clinical documentation topic. The complexity of pain documentation is derived from its broad application to a variety of clinical settings, specialty specific requirements, and multiple pain subtopics, such as cancer-related pain or acute post-procedural pain related to a joint replacement. The management of pain requires complex care coordination, clinical decision-making, and trending and evolution of the patient's response to treatment[3]. As complexity of care delivery increased, so does the complexity of documentation to reflect that care. Even educated, experienced medical professionals may rely on past personal experiences, outdated teachings, and be more resistant to incorporating new practice pain management guidelines which can directly affect the degree of documentation completed.[4] Therefore, consistency in application of evidenced-based pain management practice is the primary means to combat under treatment of pain.[5] Standardizing the complexities of structured data capture for pain documentation is hypothesized to increase continuity of care, improve the integrity and efficiency of secondary data use, and ultimately improve patient care. The first step is to review an existing reference model and validate it using external published sources.

At Partners, we have been identifying high priority clinical documentation topics, such as pain, to target for development of reference models. This work is performed as part of the PeC Program and includes ongoing collaborations between clinical experts, EHR analysts, and informaticians. Reference models are defined using a combination of sources, including Health Level 7 (HL7)[6], Intermountain's Clinical Element Model[7] and Logical Observation Identifiers Names and Codes (LOINC)[8]. However, implementing this reference model based on these requirements alone is not valid without the support of published external documentation. It is necessary to validate the model within each type of clinical setting and specialty specific requirements.

We describe in this paper the process we used to validate the reference model for pain, taking into account published evidence from a various sources.

Table 1- Acute Pain Reference Model

Reference Model Elements[1]	Elements derived from published sources[1]	Validation Outcome[2]
Pain Onset	Pain History	*V*
Pain Onset (Hours ago)	Pain History	*V*
Speed of Pain Onset	Pain History	*V*
Pain Primary Location	Location	*V*
Pain Quality (Character)	Quality of Pain	*V*
Pain Periodicity		
Pain Temporal Pattern		
Pain Alleviating Factors	Alleviating Factors	*V*
Pain Aggravating Factors	Aggravating Factors	*V*
Pain Duration (Hours, Minutes)	Pain Duration	
Associated Signs and Symptoms	Physiological and behavioral Responses to Pain	*V*
Patient Severity Score	Intensity of Pain	*V*
Pain Course	Pain Treatment	*V*
Relative Temporal Context	*M*	*MN*
Patient Stated Goal	*M*	*MN*

1 M= Missing
2 V= Validated, MN= Missing and Not Required, MR= Missing and Required

Methods

Literature Review of Pain Documentation Guidelines

A literature search was performed in July of 2014 to retrieve publications related to pain documentation that were published before August of 2014. Multiple electronic databases such as Pub Med, Google Scholar, Google, and the Agency for Healthcare Research and Quality (AHRQ) National Guideline Clearinghouse (NCG) website was searched using the keywords "pain" and "documentation" or "chronic pain and documentation" or "acute pain and documentation" or "pain" and "guidelines" or "geriatric pain" or "pediatric pain". Our inclusion criteria were peer-reviewed publications related to acute or chronic pain documentation. We excluded articles that did not discuss discrete data elements related to pain documentation. In addition, articles that discussed pharmacological management of pain or specific interventions to decrease pain were also excluded. The initial search of the keyword "pain management" or "acute pain management" or "chronic pain management" yielded over 75,000 results. When the additional keyword of "documentation" was added, the results decreased to 455 results. After applying the exclusion criteria of pharmacological management or specific interventions, a total of 50 articles were identified. After reviewing the abstracts to determine if they met inclusion and exclusion criteria and removing overlapping articles, a total of 9 articles were selected for full-text review. After reviewing the content of several articles, it became evident that the Agency for Healthcare Research and Quality website needed to be searched. After searching the website using the keywords "pain guidelines", another 3 web pages within the National Guidelines Warehouse (NCG) powered by the AHRQ were identified. A total of 12 articles and web pages were identified to receive full review.

Categorization of literature and findings

Articles were then categorized into two areas of interest: (1) national and international guidelines on general documentation and treatment, and (2) documentation of pain in certain situations. (e.g. treatment of cancer pain.) After reviewing these articles, new categories were derived based upon the type of pain that was being documented. Pain can be divided in to two major sub-topics: "Acute Pain" and "Chronic Pain."

Define a Comprehensive Reference Model for Pain Documentation that includes Acute and Chronic Pain

After reviewing which data elements were required to be documented, a reference model was created. Then each element definition was compared against the existing reference model that had been derived from HL7, Intermountain and LOINC. The outcomes of each data element were placed into three categories (1) Valid (V), (2) Missing Required (MR), (3) Missing Not Required (MN). The criteria for the data elements that were missing and required were elements that were present in the reference model derived from published sources and not present in the existing reference model. Criteria for the elements that were considered missing but not required were elements that appeared in the existing reference model and not in the reference model derived from published sources. Validated elements were considered a 1:1 match or their definitions between each reference model were similar.

Results

Comprehensive Reference Model for Pain Documentation

Sub-categories of acute pain and chronic pain were assigned to specific situations if the guidelines stated that certain documentation was required. The sub-categories for acute pain were (1) self-reported pain perceptions following surgery, (2) geriatric pain management and (3) pediatric pain management. The sub categories for chronic pain were (1) malignant pain and non-malignant pain. Additional sub-types for non-malignant pain needed to be identified to which were (1) neuropathic pain, (2) musculoskeletal pain and (3) inflammatory pain.

Acute Pain

Acute pain has a set of data elements that make up its reference model. (Table 1). Acute pain consists of three sub-domains, (1)self-reported pain perceptions following surgery,

Table 2 – Self- Reported Pain Reference Model

Reference Model Elements[1]	Elements derived from published sources[1]	Validation Outcome[2]
Pain Onset	Pain History	*V*
Pain Onset (Hours ago)	Pain History	*V*
Speed of Pain Onset	Pain History	*V*
Pain Primary Location	Location	*V*
Pain Quality (Character)	Quality of Pain	*V*
Pain Periodicity	Frequency	*V*
Pain Temporal Pattern	M	*MN*
Pain Alleviating Factors	Alleviating Factors	*V*
Pain Aggravating Factors	Aggravating Factors	*V*
	Pain Duration	
Pain Duration (Hours, Minutes)		*MN*
Associated Signs and Symptoms	Physiological and behavioral Responses to Pain	*V*
Patient Severity Score	Intensity of Pain	*V*
Pain Course	Pain Treatment	*V*
Relative Temporal Context	Quality of Life	*V*
M	Patient Education regarding pain management	*MR*

1 M= Missing
2 V= Validated, MN= Missing and Not Required, MR= Missing and Required

(2) geriatric pain management and (3) pediatric pain management.

These three sub-domains were chosen because of the specificity of how pain needs to be reported. The geriatric and pediatric pain populations were singled out due to the way the patients report and respond to pain stimuli. For example, cognitive status in geriatric pain management is significant because the self-reported pain may not be entirely accurate if the patient is confused. (Table 3). Self-reported pain (Table 2) also has its' specific requirements such as patient education regarding pain management while geriatric pain management required a cognitive status assessment as part of its documentation. Pediatric pain requires only Pain History, Pain Quality, Pain Pattern, Alleviating Factors, Aggravating Factors and Pain Intensity to be documented . In Self-reported perception of pain, it was found that the patient education regarding pain management is a required criteria to be documented. All other elements were considered to either be valid or missing but not required.

Table 3- Acute Pain: Geriatric Pain Management

Reference Model Elements[1]	Elements derived from published sources[1]	Validation Outcome[2]
Pain Onset	Present Pain	*V*
Pain Onset (Hours ago)	Pain History	*V*
Speed of Pain Onset	Pain History	*V*
Pain Primary Location	Pain Location	*V*
Pain Quality (Character)	Pain Character	*V*
Pain Periodicity	Frequency	*V*
Pain Temporal Pattern	Pattern	*V*
Pain Alleviating Factors	Alleviating Factors	*V*
Pain Aggravating Factors	Precipitating Factors	*V*
	Pain Duration	
Pain Duration (Hours, Minutes)		*V*
Associated Signs and Symptoms	Cognitive Status, mental state and functional status	*V*
Patient Severity Score	Pain Intensity	*V*
Pain Course	Pain History	*V*
Relative Temporal Context	Quality of Life	*V*

1 M= Missing
2 V= Validated, MN= Missing and Not Required, MR= Missing and Required

Chronic Pain

Chronic pain consists of two major sub-types: cancer-related pain and non-malignant pain (Table 4). Unlike acute pain, chronic pain sub-domains within the sub-types. Non-malignant pain is broken down in to 3 sub-types: Musculoskeletal and inflammatory pain, and neuropathic pain (Table 5). The minor differences between Data elements can be applied to chronic pain documentation using the Institute for Clinical Systems Improvement (ICSI) Assessment and Management of Chronic Pain Algorithm. [10] The reference models were found to be valid with no elements that were missing and required to be documented upon.

Discussion

Despite the fact that many of the data elements that are necessary for pain documentation are similar, the context of which they are being used can be different. A patient with acute pain is focused on how the pain began and how to resolve it. Using the definitions of the data elements within the sub-domains as a guideline that assist in resolving the problem because the documentation is very specific to each specialty and the sub-domains address the specifics in very broad terms with the understanding that they align to a specific data element within the current reference model. (e.g., Acute abdominal pain for GI specialty versus chronic back pain found in Orthopedics.) Validating each element in the reference model allows a one-to- many ratio to meet the needs in each situation.

Acute pain patients can convert to chronic pain after the initial injury has resolved. In this case, the patient would also convert over to the chronic pain sub-domain. The documentation would then qualify for a specific sub type and secondary sub-domain based upon the signs and symptoms. The implication for the reference model is that it can be used in different scenerios without having to be significantly changed. However, when considering the context of self-reported acute pain, it is necessary to understand the level of education the patient has regarding his or her pain management. In this case, it would be necessary to add the data element "Patient education regarding patient management" to this context in order to gain an accurate picture of the patient's pain and how it is being managed.

Chronic pain is focused on management of the pain overtime, as it may never resolve. By definition, chronic pain is pain persisting longer than three to six months, beyond the time that healing normally occurs.[11] Changes in the chronic pain pathways are usually permanent, may be present in the absence of an identifiable source, and have varying response to conventional analgesic medications.[5]

Table 4- Chronic Pain: Malignant and Non-Malignant

Reference Model Elements[1]	Elements derived from published sources[1]	Validation Outcome[2]
Pain Onset	M	*MN*
Pain Onset (Hours ago)	M	*MN*
Speed of Pain Onset	M	*MN*
Pain Primary Location	Pain Location	*V*
Pain Quality (Character)	Pain Quality	*V*
Pain Periodicity	M	*MN*
Pain Temporal Pattern	Pain Pattern	*V*
Pain Alleviating Factors	Pain Relief	*V*
Pain Aggravating Factors	Mechanism of Pain	*V*
Pain Duration (Hours, Minutes)	Pain Duration	*V*
Associated Signs and Symptoms	M	
Patient Severity Score	Pain Intensity	*V*
Pain Course	M	*MN*
Relative Temporal Context	Functional Ability	*V*
Patient Stated Goal	Follow-Up Plan	*V*

1 M= Missing
2 V= Validated, MN= Missing and Not Required, MR= Missing and Required

The definition of these data elements is one step in the process of configuring clinical documentation content in an EHR. The configuring of how the data elements are represented on a form is a separate and significant and complex process requiring information about the technical capabilites of the system and end-user requirements.

Limitations

The definitions were derived from national guidelines which could be in the process of being updated and thus making these definitions out of date at some point in the future. However, timely integration of the most up to date literature is a continuous struggle for all evidence-based practice and documentation. The search parameters were using keyword searches which, if not using the correct keyword, could have left a result out that may have made a significant contribution to the meaning of the definitions.

Conclusion

Validating a reference model using documentation derived from published sources is only a first step in creating standardized documentation across the entire healthcare system. The method of using evidence to validate reference models for specific clinical topics will be applied to other areas such as wound care, line placement, and living situation. Optimization of clinical data definitions within an EHR necessitates the assessment of broad clinical topics and validation of reference models for each topic that can be applied across settings and specialties in order to create consistent data output.

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Table 5- Non-Maglinant Chronic Pain: Neuropathic Pain

Reference Model Elements[1]	Elements derived from published sources[1]	Validation Outcome[2]
Pain Onset	*M*	*MN*
Pain Onset (Hours ago)	*M*	*MN*
Speed of Pain Onset	*M*	*MN*
Pain Primary Location	Pain Location	*V*
Pain Quality (Character)	Pain Quality	*V*
Pain Periodicity	*M*	*MN*
Pain Temporal Pattern	*M*	*MN*
Pain Alleviating Factors	Pain Relief	*V*
P ain Aggravating Factors	*M*	*MN*
Pain Duration (Hours, Minutes)	Pain Duration	*V*
Associated Signs and Symptoms	Mental Status, Psychological/Social Factors	*V*
Patient Severity Score	Pain Intensity	*V*
Pain Course	*M*	*MN*
Relative Temporal Context	Functional Ability	*V*
Patient Stated Goal	Goals	*V*

1 M= Missing
2 V= Validated, MN= Missing and Not Required,
MR= Missing and Required

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Address for Correspondence

Partners eCare
2 Ave de Lafayette Ste. 1
Boston, MA 02111
Emily Gesner DNP, RN-BC
(617) 857-5307
egesner@partners.org