

**Original Article**

# Documented Electronic Medical Record-Based Pain Intensity Scores at a Tertiary Pediatric Medical Center: A Cohort Analysis

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**Abstract**

**Context.** Previous surveys have suggested that pain in hospitalized patients remains undertreated. However, little is known about those with persistently high pain scores.

**Objectives.** To document the distribution of scores and analyze the clinical characteristics of outliers with persistently high pain scores.

**Methods.** With institutional review board approval, a retrospective cohort analysis of more than 1.5 million documented scores was completed in a tertiary pediatric medical center during a three-year period. Patients with persistently high pain scores were identified for subgroup analysis.

**Results.** The median score was 0 (all years), and the means were 1.46, 1.34, and 1.3 in 2010, 2011, and 2012, respectively. Approximately 68% of admissions had at least one score of 4 or greater, although this level did not persist. Only 9% had mean scores of 4 or greater, and 1% ( $n = 492$ ) had mean scores of 7 or greater. Scores remained high in patients within identifiable groups, that is, those with chronic pain ( $n = 311$ ), sickle cell vaso-occlusive episodes ( $n = 52$ ), and pain in children with developmental and neuromuscular disorders ( $n = 32$ ). Few had persistently high scores with acute pain but without known comorbidities ( $n = 56$ ).

**Conclusion.** Detailed review of clinical characteristics of patients with persistently high scores led to the strong impression that, in most cases, persistently high pain was not simply because of inadequate administration of opioids. Instead, the first step in improving pain management of hospitalized children may be the identification of outliers with high pain scores to direct efforts on the development of interventions for patient groups with mechanistically similar pain. *J Pain Symptom Manage* 2014;48:924–933. © 2014 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.

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**Key Words**

*Electronic health records, hospitals, pain, pain management, pain measurement, quality improvement*

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**Introduction**

Children frequently endure moderate-to-severe pain while hospitalized<sup>1–4</sup> despite advances in pediatric pain.<sup>5</sup> Pain in hospitalized children has been reported as originating from medical conditions (such as cancer), surgical procedures, and intravenous line placement.<sup>4</sup> In most hospitals, nurses are required to routinely and frequently assess and document pain intensity scores at least every four hours and before and after pain interventions. The primary use of these scores is to guide the care and management of individuals with pain. In addition, these scores are often used for quality improvement efforts.<sup>2,3,6–10</sup> However, many quality improvement efforts are process measures that strive to improve the documentation of pain scores but do not measure patient outcomes. Some institutions have attempted to decrease all pain to a certain level by algorithms guiding care.<sup>11</sup> But pain reduction for all patients to a specific pain intensity level is neither realistic nor safe.<sup>11,12</sup> Vila et al.<sup>11</sup> reported that opioid-related oversedation increased more than twofold after implementation of an algorithm that attempted to reduce pain to less than 4 in all patients. Despite these common uses of pain intensity scores, little is known of the distribution of scores for hospitalized children and how these scores can be used to identify subgroups with persistently high pain.

The purpose of this study was twofold. First, we retrieved and analyzed pain intensity scores documented in the electronic medical record data (Cerner Medical Systems, North Kansas City, MO) to better understand the nature, frequency, and overall distribution of documented pain intensity scores at a tertiary pediatric center. Second, we conducted an analysis to identify subgroups with persistently high pain intensity scores, to better understand the source of pain, and common comorbidities of patients with persistently high pain scores. The reason for identifying subgroups with persistently high pain was to eventually develop interventions for specific patient groups in need.

**Methods***Entire Data Set*

With approval from the institutional review board and waiver of consent, this retrospective study was conducted within a 400-bed tertiary pediatric medical center in the Northeastern United States during 2010–2012. Algorithms were developed to retrieve both the documented inpatient pain scores and demographic data from the institution's data warehouse. Patients admitted for 23-hour admissions, day surgery, patient visits for ambulatory procedures, or clinic appointments were excluded from this analysis. Data from electronic retrieval were judged to be acceptable for analysis in more than 95% of admissions. Data were analyzed using SAS, version 9.3, software (SAS Institute, Inc., Cary, NC). The data retrieval and analysis for each year (2010–2012) were completed independently and compared to ensure data were complete. Descriptive statistics were expressed as means, percentages, or frequency counts as appropriate. Annual institutional means were calculated from the means of each patient. Patient mean scores were calculated from all documented pain scores for all locations during a particular admission without weighting for number of scores per individual patient. Mean scores were classified as “no pain” (mean = 0), “mild” (>0 to <4), “moderate” (≥4 to <7), or “severe” (≥7 to 10). All measures had 0–10 anchors except for the Premature Infant Pain Profile. Patients younger than 37 weeks of postconceptual age who were assessed using the Premature Infant Pain Profile comprised less than 1% of the sample and are not included in these analyses. The FLACC (Face, Legs, Activity, Cry, and Consolability) is a behavioral measure.<sup>13</sup> There were two self-report measures: the Numeric Rating Scale and the Wong-Baker Faces Scale.<sup>14</sup> The Individualized Numeric Rating Scale was used for nonverbal children with intellectual disability.<sup>15</sup> Charts of 50 patients per year (150 patients total) with mean score of less than 7 but at least one score of 7 or greater were randomly selected and examined for time to

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