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Outpatient Pain Predicts Subsequent One-Year Acute Health Care Utilization Among Adults With Sickle Cell Disease

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Abstract

Context—Patient demographic and clinical factors have known associations with acute health care utilization (AHCU) among patients with sickle cell disease (SCD), but it is unknown if pain measured predominantly in an outpatient setting is a predictor of future AHCU in patients with SCD.

Objectives—To determine whether multidimensional pain scores obtained predominantly in an outpatient setting predicted subsequent one-year AHCU by 137 adults with SCD and whether the pain measured at a second visit also predicted AHCU.

Methods—Pain data included the Composite Pain Index (CPI), a single score representative of a multidimensional pain experience (number of pain sites, intensity, quality, and pattern). Based on the distribution of AHCU events, we divided patients into three groups: (1) zero events (Zero), (2) 1–3 events (Low), or (3) 4–23 events (High).

Results—The initial CPI scores differed significantly by the three groups ($F(2,134)=7.38$, $P=0.001$). Post hoc comparisons showed that the Zero group had lower CPI scores than both the Low group ($P<0.01$) and the High group ($P<0.001$). In multiviariate, overdispersed Poisson regression analyses, age, and CPI scores (at both measurement times) were statistically significant

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predictors of utilization events. Pain intensity scores at both measurement times were significant predictors of utilization, but other pain scores (number of pain sites, quality, and pattern) were not.

Conclusion—Findings support use of outpatient CPI scores or pain intensity and age to identify at-risk young adults with SCD who are likely to benefit from improved outpatient pain management plans.

Keywords

sickle cell disease; acute health care utilization; Composite Pain Index; outpatient pain; gender; adults

Introduction

Patients with sickle cell disease (SCD) suffer from acute and chronic pain, but it is the severity and frequency of the acute pain episodes that constitute the major reason for their acute health care utilization (AHCU) (1). Risk for mortality increases in SCD for patients with higher rates of painful episodes (2). AHCU (emergency department [ED], acute care center, hospitalization) for SCD presents a significant financial burden to the health care system -- an annual cost of $2.4 billion (3). Although SCD patient demographic and clinical factors are associated with AHCU (1, 3–5), studies in which these factors were systematically examined as predictors of future AHCU for SCD pain are scarce. To identify patients most at risk for AHCU and to develop strategies to improve their care, reduce suffering and mortality risk, and decrease cost associated with AHCU, it is imperative to identify predictors of AHCU in patients with SCD. The purpose of this study of adults with SCD was to determine if a patient-reported pain outcome measure that captures the multidimensional pain experience predominantly from an outpatient setting could predict pain-related AHCU during the subsequent 12 months.

Researchers established that patients with SCD have high utilization of acute health care resources (4, 6). The persistent use of AHCU poses a huge economic challenge to third-party payers, especially the government. In spite of the cost associated with high AHCU by patients with SCD, studies are scant in which investigators examine factors that predict AHCU.

Some research evidence suggests that patient demographics, such as age and gender, are related to AHCU for people with SCD. Younger patients with SCD (18–30 years) have higher AHCU than those who are older (31–45 years) (4), but inconsistent age groupings from study to study (4, 7–9) prevent definitive conclusions about ages most at risk. In one study, female patients with SCD used less ED services and had fewer hospital admissions than male patients with SCD (5). Other researchers reported that ED charges were higher for female patients with SCD than their male counterparts (3). In another epidemiological study (1), unplanned healthcare utilization was similar for males and females. Taken together, these studies suggest, but are inconclusive, that patient demographic factors, such as age and gender, are associated with AHCU.

Pain is the most common clinical factor (6, 10) associated with AHCU in adults with SCD. However, pain measured as a multidimensional experience, such as with the Composite Pain Index (CPI), has been reported for SCD (11, 12), but has not been systematically studied as a predictor of AHCU. The CPI score represents the location, intensity, quality, and pattern dimensions of pain. The specific aim of this study was to determine whether CPI scores obtained predominantly at outpatient clinic visits, age, and gender predicted subsequent AHCU by adults with SCD and if CPI scores obtained about three months later produced similar findings. We hypothesized that utilization would not differ by gender but younger adults (18–30 years) and those who reported lower CPI scores at their clinic visit would have fewer AHCU events than older adults (>31 years) and those with higher pain scores. We also hypothesized that findings would be replicated for the second set of CPI scores and thereby show the robustness and reliability of AHCU prediction.

Methods

Design

This study was a longitudinal comparative investigation. The Institutional Review Board at the University of Illinois at Chicago (UIC) approved this study.

Sample

We recruited consecutive adults with SCD who received their care from the University of Illinois Hospital and Health Sciences System (UI) and its Sickle Cell Clinic. Eligibility criteria were: 1) had a diagnosis of SCD, 2) attended the UI Sickle Cell Clinic, 3) reported a moderate to severe level of pain (≥3 on 0–10 scale) related to the sickle cell disease within the 12 months before study enrollment, 4) had at least one ED visit or hospitalization within the two years prior to study enrollment, 5) spoke and read English; and 6) was aged 18 years or older. Exclusion criteria were: 1) legally blind or 2) physically unable to complete study questionnaires.

We approached 339 patients, 279 consented and 60 declined, which represents an enrollment rate of 82%. The main reasons for declining participation were lack of time, unwillingness to commit to a longitudinal study, and lack of interest. Of the consenting patients, 240 patients completed baseline measures and 187 (78%) of them participated in the acute care phase of the study. For this study, we included the first 137 participants who completed their initial data collection at a routine clinic visit, in their home, or just before discharge from the hospital and, at the time of this analysis, had been followed for 12 months to capture all acute care visits (ED and Acute Care Center [ACC, also known as day hospital care in some settings (13)] visits).

The participants' mean age was 34.1 ± 11.7 years. The majority were African Americans (98%), female (65%), and had an education level greater than a high school diploma (50%). Approximately 42% of participants used computers daily. Other demographic information appears in Table 1.

Procedures

The investigators introduced the study to the UI Sickle Cell Clinic, ED, and ACC staff. The UI registered nurses or physicians referred the patients to the Research Specialist (RS) during a routine clinic visit. The RS screened patients for eligibility, explained the study to the patients, and obtained signed informed consent. The RS obtained measures either in research space located in the UI Sickle Cell Clinic area, at home, or just prior to hospital discharge. Data were collected with a computerized software program at two visits roughly three months apart. For the first visit, data were collected in the UI clinic for 119 patients (87%), at home for three patients (2%), and in the hospital for 15 patients (11%). For the second visit, data were collected in the UI clinic for 115 patients (84%), at home for two patients (1%), and in the hospital for 20 patients (15%). The RS captured acute health care visits by daily monitoring of the UI electronic admission records for the UI ACC and ED. A trained RS also contacted patients every two weeks by telephone to document AHCU that may have occurred at a facility other than UI.

Instruments

All pain and demographic data were collected using the PAIN*Report*It (14–16) software program (Nursing Consult LLC, Seattle WA). PAIN*Report*It contains a computerized version of the McGill Pain Questionnaire (MPQ), a multidimensional tool that measures pain location, intensity, quality, and pattern that has been well validated (17). We recently validated PAIN*Report*It in a different SCD sample (11). Using pen-tablet computers, we provided patients uniform directions and practice before they completed questionnaire items by touching the screen either with a stylus or with a keyboard and mouse. The software automatically saved each of the patients' selections into an Access database (Microsoft Corp, Redmond, Washington). Specifically, the data collection steps were as follows:

1. Patients drew their pain sites on anterior and posterior views of a body outline drawing. The program counts the number of different pain sites selected by the patient.

2. Patients touched a number key to report their current pain intensity and the least and worst pain intensity during the previous 24-hours, on a scale of 0 to 10, where 0 is "no pain" and 10 is "pain as bad as it could be." Each scale is scored separately. The internal consistency alpha of these three scores was 0.85. We also computed the average pain intensity score by summing and averaging the current, least, and worst pain scale scores. The average score also ranges from 0 to 10. The average pain intensity score has been validated in the SCD population (11).

3. Patients selected, from a 78-word list, those that described their usual SCD pain quality (e.g., throbbing, shooting, burning, cramping). We used Melzack's scoring system (17) to create the typical pain-rating index (PRI) scores: PRI-sensory (ranges 0–42), PRI-affective (PRI-T) (ranges 0–14), PRI-evaluative (ranges 0–5), PRI-miscellaneous (ranges 0–17), and PRI-total (ranges 0–78). We also calculated the number of words selected (NWC), which ranges from 0–20 (17). We also counted the number of nociceptive descriptors selected (ranges from 0–26) and the number of neuropathic descriptors selected (ranges from 0–28) (12, 18). We coded

each of the 78 words as selected or not to permit calculation of all these eight indicators of pain quality. We also have reported the normative scores for these indicators for a variety of pain populations (19) and for adults with SCD (12).

4. Patients selected from nine MPQ pain pattern descriptors, which represent constant, intermittent, and transient types of pain pattern. We scored each pattern descriptor as selected or not selected. We created a total pattern score by assigning values to groups of descriptors and then summing the values of selected descriptors (constant=3, transient=2, intermittent=1). The range of the total pattern score is from 0 to 6 (18).

We calculated the CPI score by converting the number of pain sites, pain intensity (current, least, and worst), PRI-T, and pain pattern into proportional scores on a 0 to 100 scale, which were then summed and averaged. The CPI score ranges from 0 to 100 and is a single score that accounts for the multidimensional attributes of the SCD pain experience. We derived the CPI from the MPQ with scores that have well-established validity and reliability (17). We found in a cancer sample that the reliability alpha for CPI was 0.71 (20). In this sample, the correlation between CPI T1 and CPI T2 is r=0.45, $P<0.001$, 95% confidence interval 0.31, 0.57. The CPI demonstrated sensitivity to detect the effect of an educational intervention in a cancer population (20).

Included in the PAIN*Report*It are questions regarding demographic characteristics, which we collected for the purpose of describing sample characteristics. Patients provided information about their age, gender, ethnicity, marital status, level of education completed, annual family income, prior use of computers, and current access to computers.

Two independent raters conducted chart reviews of patients' UI electronic medical records to validate the AHCU events. The inter-rater reliability was 92%. We captured the AHCU events at other facilities during the every two-week telephone calls with patients.

Statistical Analysis

We exported data from the Access tables for data analysis using statistical software R (21). Analytic techniques included descriptive statistics (means, SD, frequencies, percentages) and inferential statistics (Chi-square, analysis of variance [ANOVA], Tukey HSD [honest significant difference] tests, and generalized linear regression) to compare groups on dependent variables. We a priori accepted a significance level of less than 0.05 as statistically significant.

Results

The types of AHCU events (referred to hereafter as utilization) that had occurred during the 12-month study included: no utilization (*n*=25, 18%), UI ED visit only (*n*=48, 35%), ACC only (*n*=3, 2%), other ED only (*n*=9, 7%), and visits to multiple EDs (*n*=52, 38%).

Utilization Group Classification

The mean (SD) number of utilization events for the 137 patients was 4.3 (SD=4.6), with a minimum of 0 and a maximum of 23 utilization events within 12 months. Patients were

categorized into three groups based on the frequency distribution of the number of utilization events during the 12-month study: zero utilization group (Zero Utilization), 1–3 utilization group (Low Utilization), and 4–23 utilization group (High Utilization). There were 25 (18%) patients in the Zero Utilization group, 54 (39%) patients in the Low Utilization group, and 58 (42%) patients in the High Utilization group. The groups differed significantly on age ($F(2,134)=4.85$, $P=0.01$), with the High Utilization group being significantly younger than the Low Utilization group ($P=0.006$), but not on any of the other demographic variables including gender, education, sickle cell type, and computer use.

Analysis of Variance for Pain Outcomes

Descriptive statistics for the pain outcomes and comparisons by utilization groups appear in Table 2 (first visit) and Table 3 (second visit). For both visits, the High Utilization group reported a higher number of pain sites than the other two groups, but the difference was not statistically significant.

Intensity—For both visits, the High Utilization group had the highest mean score for current pain, least pain, worst pain, and average pain intensity. In addition, the Low Utilization group generally fared worse than the Zero Utilization group. For the first visit, the three utilization groups differed significantly on current pain ($F(2,134)=5.72$, $P=0.004$), least pain ($F(2,134)=4.65$, $P=0.011$), worst pain ($F(2,134)=10.04$, $P<0.001$, and average pain intensity ($F(2,134)=8.61$, $P<0.001$). The *P*-values for the ANOVA were not statistically significant for the second visit.

Quality—In general, the Zero Utilization group had the lowest PRI scores, whereas the scores of the Low Utilization and High Utilization groups were comparable. For the first visit, the group differences on PRI-sensory, PRI-affective, and PRI-total were statistically significant. For the second visit, none of the group differences was statistically significant. We saw a similar pattern in the number of word groups chosen, number of nociceptive descriptors chosen, and the number of neuropathic descriptors chosen, with the Zero Utilization group reporting the lowest value and the other two groups reporting comparable values. The group differences on all three were statistically significant for the first visit. For the second visit, the difference on the number of word groups chosen was statistically significant, and the differences on the other two were close to statistically significant.

Pattern—We examined the three utilization groups for differences by the total pain pattern score. The utilization groups did not differ statistically on total pain pattern score.

CPI—For both visits, we observed the trend of the Zero Utilization group having the lowest CPI, followed by the Low Utilization group, and then the High Utilization group, which had the highest CPI. The group difference was statistically significant for the first visit, $F(2, 134)=7.38$, $P<0.001$, but not for the second visit.

Regression Analysis

The objective of the regression analysis was to investigate whether the CPI, as we hypothesized, predicts utilization, after controlling for patient age, which ANOVA showed

to have an effect on the outcomes, and for patient sex, which was reported to be inconsistently associated with utilization in the literature (5). We also investigated a model using individual components of the CPI as predictors to determine their individual contributions to the outcome.

CPI as Predictor—We modeled the patients' number of utilization events as over-dispersed Poisson. The coefficient estimates and related standard errors appear in Table 4. As we hypothesized, the effect of CPI was significant in predicting utilization, with higher CPI scores leading to more utilization. On average, a 10-point increase in CPI for visit 1 was associated with a 28% increase in the number of utilizations. The effect of gender was not significant. The age effect was significant, with younger patients having more utilization. On average, a 10-year increase in age was associated with a 17% decrease in the number of utilizations. On average, a 10-point increase in CPI for visit 2 was associated with a 15% increase in the number of utilization events. Findings were essentially the same for the sample of 122 patients whose initial pain measurements were obtained in outpatient or home settings, which indicates the findings were not influenced by the sample heterogeneity in the setting where the data were collected.

CPI Components as Predictors—The previous CPI model was a reduced version of a more complete model using all four CPI components as predictors. The output of the regression analysis of this model appears in Table 5. Consistent with the analysis of the previous reduced model, gender had no significant effect, whereas younger age was associated with higher utilization. Among the four components of the CPI, only average pain intensity was significant, with a higher average pain intensity associated with a higher number of utilizations.

Discussion

In this study, we are the first to find that a multidimensional patient-reported outcome measure, the CPI, is an independent predictor of AHCU in patients with SCD along with age but not gender. It is a striking finding that two CPI scores reported at an interval of approximately three months in outpatient or inpatient settings are predictive of the AHCU over the year subsequent. Interestingly, in separate analyses, average pain intensity is the only CPI component that predicted AHCU, and it did so for both measurement times. Either the CPI or average pain intensity scores provide insight for at-risk patients who might benefit from programs focused on improving pain management.

Our finding that both the CPI and pain intensity scores predict AHCU is important. It shows that both measures are robust outcome measures of SCD pain. Either measure could be used to predict AHCU in patients with SCD contingent upon the purpose of the study. If sensory pain is the desired predictor and there are time and budget constraints, then pain intensity could be used. In situations where researchers are interested in understanding the dimensions of pain other than sensory pain, the CPI becomes a measure of choice. Future construct validity studies are needed to ascertain if both pain intensity and CPI can independently predict other important outcomes in patients with SCD such as length of stay, readmission rates, and cost of hospitalization. Further, the CPI as a multidimensional measure that

captures the multidimensional pain experience has demonstrated test-retest reliability in patients with SCD. This findings supports our continual use of the CPI in patients with SCD who had reported multiple pain locations, patterns, and especially neuropathic pain descriptors akin to patients with neuropathic pain, a finding that could shift the pain treatment paradigm in this population. The finding related to the CPI as a predictor of AHCU is novel and relevant.

We did not identify studies in which investigators examined a multidimensional pain experience as a predictor of AHCU. A research paradigm shift is needed to close this gap and provide greater understanding of the contributions of pain dimensions other than intensity to the SCD pain experience and AHCU. Three groups of investigators found that pain is the chief complaint of patients with SCD who present to ED or acute care centers (6, 10, 22). Given our findings, we encourage investigators to consider examining pain as a predictor of AHCU using either pain intensity or a multidimensional measure such as the CPI. Although the clinically significant cut-off for the CPI has not been established, the mean CPI scores for the three utilization groups differed by at least two points on a scale of 0–100 and differentiated the groups.

Age was the single demographic characteristic that, along with either the CPI scores or some of the CPI component pain scores, predicted the three utilization groups. Although gender did not predict utilization, young adults with SCD who were 30 years of age or younger had higher utilization than those 31 years and older. This finding that younger patients with SCD have higher utilization is similar to previous research (4, 8). The reason for the increased pain and AHCU among young adults is unknown, but is consistent with the high mortality among people with SCD. The median survival for men with SCD is 42 years and for women is 48 years (23). It is not clear if the high rates of AHCU among young adults is related to issues of the transition from pediatric care to adult care, an increase in SCD severity as the young adult ages, other causes, or a combination of one or more of these causes. Additional research is needed to better understand the phenomenon of pain and AHCU among young people with SCD.

Some limitations detract from our study findings. This study was conducted in a comprehensive sickle cell clinic affiliated within a single academic institution in one state. Findings may not generalize to SCD patients from other sickle cell clinics or from centers in other states. The sample was imbalanced by gender, which may have influenced our findings that utilization did not differ by gender. Also, the sample was not represented by people with SCD from ethnic groups other than African Americans, which means that is unknown if the findings apply to other ethnic groups.

In conclusion, our study is innovative because it is the first study to report that predominantly outpatient pain, especially as measured by the CPI or by average pain intensity is a predictor of AHCU. Other investigators have reported that pain is the most frequent reason for presentation to the ED or acute care centers by patients with SCD, but ours is the only study in which predominantly outpatient pain was systematically identified as an independent predictor of AHCU. Patients with SCD who had 4–23 AHCUs in the 12 months subsequent to reporting their pain had larger CPI scores than patients who had 0 or

1–3 AHCU events. Additional studies are needed to fully explore the relationship between AHCU, including the total number of days hospitalized, and pain measured as a multidimensional experience.

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Table 1

Demographic Characteristics of All Patients and by Acute Healthcare Utilization Event Group Membership (*N*=137)

Demographic Variable	All Patients (*N*=137)	Group			Test Statistic	*P*-value
		0 Events (*n*=25)	1–3 Events (*n*=54)	4–23 Events (*n*=58)		
Age					$F(2,134) = 4.85$	0.01
Mean (SD)	34.1 (11.7)	33.9 (10.3)	37.6 (12.1)	30.9 (11.2)		
Min-Max	18–74	20–57	20–68	18–74		
Age group, *n* (%)					$X^2(2) = 8.31$	0.02
18–30	66 (48)	11 (44)	19 (35)	36 (62)		
31+	71 (52)	14 (56)	35 (65)	22 (38)		
Gender, *n* (%)					$X^2(2) = 0.40$	0.82
Female	89 (65)	15 (60)	35 (65)	39 (67)		
Male	48 (35)	10 (40)	19 (35)	19 (33)		
Race, *n* (%)						1[a]
Other	3 (2)	0 (0)	1 (2)	2 (3)		
African American	134 (98)	25 (100)	53 (98)	56 (97)		
Education, *n* (%)						0.49 [a]
≤High school	61 (45)	10 (40)	21 (39)	30 (52)		
≥High school	69 (50)	14 (56)	31 (57)	24 (41)		
Unknown	7 (5)	1 (4)	2 (4)	4 (7)		
Sickle cell type, *n* (%)						0.85 [a]
SS	106 (77)	21 (84)	39 (72)	46 (79)		
SC	17 (12)	2 (8)	8 (15)	7 (12)		
Other	14 (10)	2 (8)	7 (13)	5 (9)		
Computer Use, *n* (%)						0.83 [a]
Daily	57 (42)	13 (52)	22 (41)	22 (38)		
Weekly	23 (17)	2 (8)	11 (20)	10 (17)		

Demographic Variable	All Patients (*N*=137)	Group			Test Statistic	*P*-value
		0 Events (*n*=25)	1–3 Events (*n*=54)	4–23 Events (*n*=58)		
Monthly	24 (18)	5 (20)	9 (17)	10 (17)		
Never	16 (12)	3 (12)	7 (13)	6 (10)		
Missing	17 (12)	2 (8)	5 (9)	10 (17)		

[a]Produced by Fisher's exact test.

Table 2

Pain Outcomes by Acute Healthcare Utilization Event Groups (First Visit, *N*=137)

Variable (min-max possible score)	Group			F Sstatistic	*P*-value
	0 Events (*n*=25) Mean (SD)	1–3 Events (*n*=54) Mean (SD)	4–23 Events (*n*=58) Mean (SD)		
Composite Pain Index (0–100)	31.9 (13.1)	41.0 (13.4)	43.3 (11.5)	7.38	0.001
Number of pain sites (0–22)	3.4 (2.4)	3.3 (2.1)	4.0 (2.2)	1.41	0.249
Pain Intensity score (0–10)					
Current pain	3.1 (3.3)	3.0 (3.0)	4.8 (3.1)	5.72	0.004
Least pain in the last 24 hours	2.0 (2.7)	3.2 (2.9)	4.0 (2.7)	4.65	0.011
Worst pain in the last 24 hours	3.4 (4.0)	4.6 (3.3)	6.7 (3.1)	10.04	<0.001
Average pain intensity (0–10)	2.8 (2.9)	3.6 (2.6)	5.2 (2.5)	8.61	<0.001
Pain Rating Index (PRI)					
PRI-S: Sensory (0–42)	13.9 (6.9)	19.8 (7.6)	19.3 (7.2)	6.10	0.003
PRI-A: Affective (0–14)	2.8 (2.6)	5.4 (4.0)	5.0 (4.0)	3.98	0.021
PRI-E: Evaluative (0–5)	3.2 (1.9)	3.8 (1.7)	3.6 (2.0)	0.85	0.430
PRI-M: Miscellaneous (0–17)	4.1 (4.0)	6.5 (4.9)	6.0 (4.5)	2.34	0.101
PRI-T: Total (0–78)	24.0 (13.3)	35.4 (15.4)	33.8 (14.6)	5.43	0.005
Pain Descriptive Words					
Number of word groups chosen (0–20)	8.6 (4.3)	11.5 (4.2)	10.7 (4.2)	3.96	0.021
Number of nociceptive words (0–28)	4.8 (2.5)	7.4 (4.4)	7.0 (3.5)	4.34	0.015
Number of neuropathic words (0–26)	2.8 (2.7)	4.6 (2.9)	4.8 (3.3)	3.83	0.024
	N (%)	*N* (%)	*N* (%)		
Pain pattern (3 descriptors per group)					
Constant group	16 (64%)	46 (85%)	51 (88%)		0.037
Intermittent group	9 (36%)	29 (54%)	26 (45%)		0.322
Transient group	11 (44%)	26 (48%)	15 (26%)		0.039
Total pain pattern score (0–6)	3.2 (1.6)	4.1 (1.6)	3.6 (1.6)	2.82	0.063

Note. The CPI is now computed as a proportional score that ranges from 0 to 100. In our previous publication, the CPI score was calculated differently (12).

Table 3

Pain Outcomes by Acute Healthcare Utilization Event Groups (Second Visit, *N*=137)

Variable (min-max possible score)	Group			F statistic	*P*- value
	0 Events (*n*=25) Mean (SD)	1–3 Events (*n*=54) Mean (SD)	4–23 Events (*n*=58) Mean (SD)		
Composite Pain Index (0–100)	37.1 (10.9)	41.4 (15.2)	43.0 (13.7)	1.58	0.209
Number of pain sites (0–22)	3.0 (2.7)	3.7 (2.3)	4.4 (2.9)	2.67	0.073
Pain Intensity score (0–10)					
Current pain	3.8 (4.1)	4.4 (3.1)	5.0 (3.0)	1.12	0.330
Least pain in the last 24 hours	2.8 (3.4)	3.2 (3.1)	4.0 (2.6)	1.81	0.167
Worst pain in the last 24 hours	4.3 (3.8)	5.5 (3.6)	6.0 (3.0)	2.20	0.115
Average pain intensity (0–10)	3.7 (3.0)	4.4 (2.7)	5.0 (2.4)	2.37	0.097
Pain Rating Index (PRI)					
PRI-S: Sensory (0–42)	15.4 (6.9)	19.0 (7.8)	18.3 (8.0)	1.93	0.150
PRI-A: Affective (0–14)	3.8 (3.2)	5.0 (3.6)	3.9 (3.5)	1.94	0.147
PRI-E: Evaluative (0–5)	3.5 (1.8)	3.4 (1.7)	3.4 (2.2)	0.05	0.954
PRI-M: Miscellaneous (0–17)	4.8 (4.2)	6.4 (3.8)	5.8 (5.0)	1.06	0.349
PRI-T: Total (0–78)	27.5 (13.3)	33.8 (14.2)	31.4 (16.2)	1.56	0.215
Pain Descriptive Words					
Number of word groups chosen (0–20)	9.2 (4.2)	11.6 (4.5)	10.0 (4.6)	3.07	0.050
Number of nociceptive words (0–28)	5.1 (2.9)	6.8 (3.2)	6.9 (4.2)	2.47	0.088
Number of neuropathic words (0–26)	3.3 (2.6)	4.3 (2.7)	4.6 (3.5)	1.59	0.208
	N (%)	N (%)	N (%)		
Pain pattern (3 descriptors per group)					
Constant group	19 (76%)	43 (80%)	50 (86%)		0.472
Intermittent group	15 (60%)	27 (50%)	26 (45%)		0.466
Transient group	11 (44%)	22 (41%)	19 (33%)		0.543
Total pain pattern score (0–6)	3.8 (1.6)	3.7 (1.9)	3.7 (1.7)	0.014	0.986

Note. The CPI is now computed as a proportional score that ranges from 0 to 100. In our previous publication, the CPI score was calculated differently (12).

Table 4

Regression Analysis of Age, Gender, and CPI as Predictors of Acute Care Utilization Events

Time	Variable	Estimate	Std Error	*z* value	*P*-value
Visit 1	Age	−0.019	0.008	−2.285	0.024
	Gender	−0.027	0.187	−0.144	0.886
	CPI	0.025	0.006	3.841	<0.001
Visit 2	Age	−0.019	0.009	−2.168	0.032
	Gender	−0.114	0.195	−0.582	0.562
	CPI	0.014	0.006	2.185	0.031

Table 5

Regression Analysis of Age, Gender, and Composite Pain Index (CPI) Components as Predictors of Acute Care Utilization Events

Time	Variable	Estimate	Std Error	*z* value	*P*-value
Visit 1	Age	−0.019	0.008	−2.208	0.029
	Gender	0.011	0.189	0.056	0.955
	Pain Intensity	0.134	0.034	3.981	<0.001
	Number of Sites	0.008	0.037	0.227	0.821
	Pattern	0.088	0.065	1.350	0.179
	PRI-T	0.003	0.007	0.457	0.648
Visit 2	Age	−0.017	0.008	−2.026	0.045
	Gender	−0.043	0.189	−0.227	0.824
	Pain Intensity	0.108	0.035	3.802	0.003
	Number of Sites	0.034	0.031	1.103	0.272
	Pattern	0.040	0.059	0.679	0.499
	PRI-T	−0.004	0.007	−0.501	0.618

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