

Predictors of maximal inpatient pain severity score and relationship with post-discharge satisfaction survey results

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INTRODUCTION

Patient satisfaction with hospital-based care is an important publicly reported quality metric. The HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) survey, developed by the Centers for Medicare and Medicaid Services (CMS), may be accessed via www.hospitalcompare.hhs.gov, and reports recently acquired data for US hospitals. Satisfaction with pain management is the subject of two of the HCAHPS survey questions, and is an important driver of overall patient satisfaction with hospital care⁽¹⁾.

Few investigations have addressed the data available to guide clinicians in the identification of patients who are likely to experience moderate or severe pain during hospitalization. It has been reported previously that younger age, female gender, anxiety, pre-admission pain, pre-admission opioid use are predictive of pain in the early period following surgery⁽²⁾. Additionally, various diagnoses and surgical procedures are well known to be associated with more severe inpatient pain.

As a hospital-wide trans-disciplinary pain management committee, we began a performance improvement project to identify demographic and administrative data elements that would facilitate allocation of limited pain management resources. We hypothesized that we could identify demographic, clinical, and administrative predictors of inpatient visual analogue scale (VAS) pain scores that were secondarily predictive of HCAHPS pain satisfaction survey results.

MATERIAL AND METHODS

The study was approved as a retrospective investigation by the Institutional Review Board. The medical center's Elec-

tronic Data Warehouse was queried to obtain the following data from adult inpatients admitted from January 2008 through April 2009: age, gender, race, discharging physician, department of discharging physician, principal ICD-9 diagnosis, names of medications administered, and VAS pain scores. Data were obtained on 38,544 patients that met the following criteria: admission to an adult medical-surgical nursing floor, age >18 yo, age < 90 yo, hospitalization of 1-30 days duration, and at least one VAS pain score recorded. Obstetrical patients were excluded.

All patients had VAS pain scores recorded at least once every 12 hours during hospitalization, unless the nurses were unable to assess the patient (e.g., off nursing floor or obtunded mental status). VAS pain scores were grouped into none (VAS = 0), mild (VAS = 1-3), moderate (VAS 4-6), or severe (VAS 7-10) categories. Post-discharge telephone survey data were available on 4,062 and 4,067 patients for the two respective pain satisfaction HCAHPS questions: «How often was your pain well controlled?» and «How often did we do everything to help your pain?»

An initial exploratory analysis using chi-square tables (see Results section) demonstrated that the intensity of the VAS pain scores had strong inverse associations with the likelihood of answering «always» to the two HCAHPS pain management questions. This was highly statistically significant for first, last, and median, 75th and 90th percentile VAS score category, however, maximum inpatient VAS score had the strongest association with both HCAHPS questions' results. All further analyses used the maximum (worst) inpatient VAS pain score category.

Principal ICD-9 diagnosis codes (with at least 20 instances) were stratified according to the incidence of mod-

Table I. Predictors of moderate or severe pain as maximum inpatient VAS assessment.

	Odds Ratio	Lower confidence limit	Upper confidence limit
Age (per 10 yrs increase) for male	0.7693	0.7460	0.7933
Age (per 10 yrs increase) for female	0.8250	0.8024	0.8483
Length of stay 1-3 days (vs LOS = 1)	2.476	2.254	2.721
Length of stay 3-7 days (vs LOS = 1)	4.336	3.934	4.779
Length of stay > 7 days (vs LOS = 1)	7.259	6.495	8.113
Race: Hispanic vs Caucasian	1.104	1.013	1.204
Race: African American vs Caucasian	1.113	1.016	1.219
Race: Asian vs Caucasian	0.797	0.674	0.942
Antidepressant vs no CNS drug	1.2258	1.1097	1.3540
Anxiolytic vs no CNS drug	1.2161	1.1296	1.3092
Other CNS drug vs no CNS drug	1.2473	1.1418	1.3626
Dept. of Surgery vs Medicine	3.711	3.364	4.093
Dept. of Cardiothoracic Surgery vs. Medicine	1.164	1.011	1.340
Dept. of Obstetrics/Gynecology vs Medicine	0.841	0.720	0.982
Dept. of Orthopedics vs Medicine	7.676	6.345	9.285
Dept. of Rehabilitation Medicine vs Medicine	2.801	2.378	3.298
Dept. of Psychiatry vs Medicine	0.273	0.230	0.325
Dept. of Neurosurgery vs Medicine	2.805	2.343	3.357
Dept. of Urology vs Medicine	2.062	1.705	2.493
Dept. of Neurology vs Medicine	0.727	0.584	0.905

Abbreviations: CNS = central nervous system; LOS = length of hospital stay.

erate or severe pain as the maximal VAS score category. The ICD-9 codes that fell within the highest quartile were retained for further analysis. Patients were categorized according to their having received medications classified as anti-anxiety, anti-depressant, anti-psychotic, or mixed CNS effects (e.g., mood stabilizers). Multivariate logistic regression was used to predict the likelihood of experiencing moderate (VAS 4-6) or severe (VAS 7-10) pain as the maximum inpatient VAS rating. The model was created using 50% of the patients and validated using the remaining data.

RESULTS

Greater likelihood of moderate/severe pain was associated with younger age, female gender, longer length of stay, department of the primary physician, 24 of the principal ICD-

9 diagnoses, and «CNS» medication use (Table I). The C-statistic of the validation dataset was 0.78.

DISCUSSION

We are able to predict with reasonable certainty which inpatients will experience moderate/severe pain as the maximum VAS score using data that are known at the time of admission. Strategies that have emerged from this project to improve pain severity/pain satisfaction include: disseminating reports of pain by principal physician by diagnosis and by nursing unit; extension of postoperative neuraxial opiates to surgical patient floors; introduction of multi-modal protocols for total joint replacement; PCA ordering protocols; and a pilot project for nurses to stratify patients upon admission for education and advocacy. Progress will be measured using continual assessment of inpatient VAS scores and HCAHPS pain satisfaction trends.

REFERENCES

1. DuPree E, Martin L, Anderson R, Kathuria N, Reich D, Porter C, Chassin MR. Improving patient satisfaction with pain management using six sigma tools. *Jt Comm J Qual Patient Saf* 2009;35:343-50.
2. Janssen KJ, Kalkman CJ, Grobbee DE, Bonsel GJ, Moons KG, Vergouwe Y. The risk of severe postoperative pain: modification and validation of a clinical prediction rule. *Anesth Analg* 2008;107:1330-9.