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Comorbidity-polypharmacy score predicts readmission in older trauma patients



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ABSTRACT

Background: Hospital readmissions are considered to be a measure of quality of care, correlate with worse outcomes, and may soon lead to decreased reimbursement. The comorbidity-polypharmacy score (CPS) is the sum of the number of preinjury medications and comorbidities, and may estimate patient frailty more effectively than patient age. This study evaluates the association between CPS and readmission.

Methods: Medical records for trauma patients ≥ 45 y evaluated between January 1 and December 31, 2008, at our American College of Surgeons-verified level 1 trauma center were reviewed to obtain information on demographics, injuries, preinjury comorbidities, and medications, and occurrences of readmission to our facility within 30 d of discharge. Chi-square and Kruskal–Wallis testing was used to evaluate differences between readmitted and nonreadmitted patients, with multiple logistic regression used to evaluate the contribution of independent risk factors for readmission.

Results: A total of 879 patients were included; their ages ranged from 45–103 y (median 58), injury severity scores from 0–50 y (median 5), and CPS from 0–39 y (median 7). A total of 76 patients (8.6%) were readmitted to our facility within 30 d of discharge. The readmitted cohort had higher CPS (median, 9.5, range 0–32, $P = 0.031$) and injury severity score (median, 9, range 1–38, $P = 0.045$), but no difference in age (median, 59.5, range 47–99, $P = 0.646$). Logistic regression demonstrated independent association of higher CPS with increased risk of readmission, with each CPS point increasing readmission likelihood by 3.5% ($P = 0.03$).

Conclusions: CPS appears to correlate well with readmissions within 30 d. Frailty defined by CPS was a significantly stronger predictor of readmission than was patient age. Early recognition of elevated CPS may improve discharge planning and help guide interventions to decrease readmission rates in older trauma patients.

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1. Introduction

Unplanned hospital readmission is considered an indicator of poor quality of care, has been found to correlate with worse outcomes, and may soon lead to decreased reimbursement from third party payors [1,2]. Despite the importance of this quality marker, known risk factors for readmission are still poorly defined [3]. One important suggested risk factor for readmission is patient age [3]. As the current population ages, a larger number of older individuals will be injured and require hospital care for trauma [4]. All “older” individuals are not identical, however, and “physiologic age” or “frailty” may be more important to outcomes than chronologic age. This “physiologic old age” brings with it an increased number of comorbidities, and long-term control of these chronic diseases necessitates the use of an increasing number of medications [5,6].

The comorbidity-polypharmacy score (CPS) is simply the number of drugs a patient takes. As the CPS in older individuals rises, an increased rate of complications after injury is seen [5,7]. The CPS alone is a predictor for unfavorable outcomes in older trauma patients, but our group’s previous work has shown that the addition of comorbidities to the score may result in a more powerful tool for estimating morbidity and mortality in this population [8,9].

The CPS is the sum of the number of preinjury medications and the number of preinjury comorbidities and may estimate patient frailty more effectively than patient age does [5,8,9]. Although CPS has previously been correlated with accuracy of triage from the emergency department and with clinical outcomes in older trauma patients [8,9], no information is currently available regarding the association between CPS and hospital readmission. This study was designed to evaluate the association between hospital readmission and CPS in older trauma patients, with the secondary goal to compare CPS with other potential predictors for readmission. We hypothesized that there would be a positive correlation between CPS and hospital readmission in trauma patients aged ≥ 45 y.

2. Materials and methods

2.1. General information

Institutional review board approval was granted. We used our institutional trauma registry to identify all injured patients aged ≥ 45 y seen at our American College of Surgeons (ACS)-verified level 1 trauma center over the 2008 calendar year. Per ACS standards, this registry includes patients with identified injuries at the time of admission or at time of evaluation in the institution’s emergency department, and therefore includes patients who are admitted to the hospital and those discharged directly from the emergency department. Patients excluded from evaluation included inmates, those who died before discharge, and those discharged to hospice care. We retrospectively gathered data on each patient from the institutional trauma registry and from the institution’s electronic medical record.

2.2. Data collection

An allergy and medication history is taken on each patient seen at our facility and that information is entered into the institution’s electronic medical record; this process has been previously described [5]. All patients similarly have chronic medical problems delineated and recorded. Exceptions to the gathering of these data occur in patients who present in conditions that do not allow them to communicate their history and when no alternative source of history is available. Institutional trauma registry data and electronic medical records were reviewed to obtain patient demographics, trauma activation level (1, 2, or not activated), mechanism of injury (blunt, penetrating, or burn), injury severity score (ISS), Glasgow coma score (GCS), the prospectively gathered pre-injury comorbidities and medications, lengths of stay (LOS), intensive care unit (ICU) LOS, and occurrences of readmission to our facility within 30 d of discharge.

2.3. Comorbidity-polypharmacy score

Each patient’s CPS was calculated retrospectively based on the prospectively gathered data by totaling the patient’s outpatient medications and preinjury comorbidities. For example, a patient presenting with history of hypertension and gout and currently taking metoprolol and allopurinol is given a comorbidity score of 2, a CPS of 2, and a CPS of 4. Prior studies [9] have arbitrarily defined “CPS groups” of level 1 “minor” (CPS, 0–7); 2, “moderate” (8–14); 3, “severe” (15–21); and 4, “morbid” (≥ 22), and we additionally classified each patient into the appropriate CPS group.

2.4. Readmission criteria

Readmission was defined as being admitted to our institution within 30 d of the most recent discharge from our institution. We did not consider the participation of a patient in our medical center’s inpatient rehabilitation center as being “hospitalized”; readmissions were included if within 30 d of discharge from our institution’s nonrehabilitation units. Evaluations at or admissions to other medical centers were not obtained and were not included in tabulated readmissions.

2.5. Statistical analysis

Data analysis was performed to evaluate differences between readmitted patients and those who were not, including evaluation of patient age, gender, mechanism of injury, LOS, ICU LOS, trauma activation level, ISS, GCS, CPS, and CPS group. Appropriate descriptive statistics were evaluated for each variable. Chi-square testing was used to evaluate differences in categorical variables (gender, mechanism of injury, trauma activation level, and CPS group), and Kruskal–Wallis testing was used to evaluate differences in ordinal variables (age, LOS, ICU LOS, ISS, GCS, and CPS) between admitted and non-readmitted groups. Variables which approached statistically significant difference ($P < 0.2$) between admitted and non-readmitted groups were included in multiple logistic regression analysis to evaluate the independence of the variables

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