Impact of socio–economic status on unplanned readmission following injury: A multicenter cohort study

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ABSTRACT

Background: Unplanned readmissions cost the US economy approximately $17 billion in 2009 with a 30-day incidence of 19.6%. Despite the recognised impact of socio–economic status (SES) on readmission in diagnostic populations such as cardiovascular patients, its impact in trauma patients is unclear. We examined the effect of SES on unplanned readmission following injury in a setting with universal health insurance. We also evaluated whether additional adjustment for SES influenced risk-adjusted readmission rates, used as a quality indicator (QI).

Study design: We conducted a multicenter cohort study in an integrated Canadian trauma system involving 56 adult trauma centres using trauma registry and hospital discharge data collected between 2005 and 2010. The main outcome was unplanned 30-day readmission; all cause, due to complications of injury and due to subsequent injury. SES was determined using ecological indices of material and social deprivation. Odds ratios of readmission and 95% confidence intervals adjusted for covariates were generated using multivariable logistic regression with a correction for hospital clusters. We then compared a readmission QI validated previously (original QI) to a QI with additional adjustment for SES (SES-adjusted QI) using the mean absolute difference.

Results: The cohort consisted of 52,122 trauma admissions of which 6.5% were rehospitalised within 30 days of discharge. Compared to patients in the lowest quintile of social deprivation, those in the highest quintile had a 20% increase in the odds of all-cause unplanned readmission (95% CI = 1.06–1.36) and a 27% increase in the odds of readmission due to complications of injury (95% CI = 1.04–1.54). No association was observed for material deprivation or for readmissions due to subsequent injuries. We observed a strong agreement between the original and SES-adjusted readmission (mean absolute difference = 0.04%).

Conclusions: Patients admitted for traumatic injury who suffer from social deprivation have an increased risk of unplanned rehospitalisation due to complications of injury in the 30 days following discharge. Better discharge planning or follow up for such patients may improve patient outcome and resource use for trauma admissions. Despite observed associations, results suggest that the trauma QI based on unplanned readmission does not require additional adjustment for SES.

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Introduction

Injury represents a major burden to society in terms of morbidity and costs [1], and is the leading cause of mortality below 40 years of age [2,3]. Considerable efforts have been invested into reducing mortality following injury [4]. However, stakeholders are now looking to improve non-fatal outcomes including unplanned readmission, defined as unscheduled return to hospital related to a previous admission [1].

Early hospital readmissions are common and costly [5]. In the Medicare population, 19.6% of discharged patients are readmitted within 30 days with an estimated $17 billion in expenditure [6]. The World Health Organization has associated unplanned readmission with poor care or a lack of coordination of care services [7]. One of the keys to reducing unplanned readmission is to identify patients at high risk. Other than the poor quality of care, many factors are now being considered as drivers of unplanned readmission, including socio–economic status (SES).

The impact of SES on unplanned readmissions related to general admissions or specific diagnoses such as cardiovascular disease has been widely discussed in the literature [8–10]. In addition, low SES has been consistently documented as a risk factor for hospitalisations due to injury, injury severity and injury-related mortality [11]. However, information on the impact of SES on readmission following injury is lacking.

Some previous studies have taken into account SES when evaluating the performance of trauma centres [11] and cardiac services [12] in terms of mortality. Thirty-day unplanned readmission has recently been validated as a quality indicator (QI) for trauma centre benchmarking [1]. Calculation of the QI involves adjustment for age, injury severity and comorbidities, but does not account for inter-hospital case-mix variation in SES. Should SES vary across hospital source populations, failure to take account of this factor in performance evaluations may lead to biased hospital comparisons, penalising hospitals in areas with low social and/or material deprivation [11].

The objectives of this study were i) to examine the effect of SES on unplanned readmission following traumatic injury and ii) to determine if accounting for inter-hospital variation in SES influences the results of trauma centre benchmarking based on unplanned readmission.

Methods

Study design

We conducted a retrospective multicenter cohort study based on data from a provincial trauma registry and a provincial medico-administrative discharge database.

Study population

This study was based on the integrated and mature trauma system established in 1993 in the province of Quebec, Canada [13]. The system was designed to cover the whole provincial territory with hospitals designated according to 4 levels of care from large urban centres (level I) to rural community hospitals (level IV). Standardized pre-hospital protocols and standing inter-hospital transfer agreements were developed to ensure timely access to specialised care throughout the province [11].

The study population was identified using the Quebec trauma registry and included all patients>15 years old, hospitalised between April 1, 2005 and February 28, 2010, with a principal diagnosis of trauma, admitted to any of the trauma system's 56 adult trauma centres according to the following trauma registry inclusion criteria: length of stay>two days, intensive care unit admission or transfer between hospitals [13]. Patients aged 65 years or older with isolated hip fractures and no major secondary injuries were excluded. All in-hospital deaths and patients residing outside the province (Quebec) were also excluded [7].

Approval for this study was obtained from the local Research Ethics Committee of Université Laval and the Centre Hospitalier Universitaire de Québec.

Study data sources

The Quebec trauma registry is maintained through an application housed in each trauma centre and connected to a unique central database located at the Ministry of Health with a mandatory assignment to collect information on all patients meeting the inclusion criteria described above [13]. To ensure the reliability and validity of data in the registry, an ongoing audit is conducted at the Ministry of Health to identify and correct aberrant data values in all data fields and to verify date and time chronology [1].

MED-ECHO (Maintenance et exploitation des données pour l'étude de la clientèle hospitalière) is a medico-administrative database managed at the Ministry of Health and maintains data for all hospital-discharged patients. The two databases were linked using the unique health insurance number to determine readmission.

Main outcome

The outcome of interest was unplanned hospital readmission within 30 days of discharge from an acute care hospital following injury. Same-day transfers to another hospital, transition care or rehabilitation, elective surgery and admissions for follow up exams were not considered as readmissions [1]. Causes of readmission were assessed by ICD (international classification of diseases) codes linked to primary readmission diagnoses. Readmissions due to potential complications of injury were identified using Hoyt's classification [14], obtained by correspondence to ICD (International classification of diseases) primary discharge diagnoses. Analyses were performed for all-cause readmissions and then for readmissions due to common specific causes: subsequent injury and complications of injury.

Socio–economic status

SES was quantified using ecological indices of social and material deprivation developed by Pampalon et al. [15]. These indices are based on the smallest geostatistical unit used in the Canadian censuses (400 to 700 persons on average) and defined by the postal code zone [15,16]. Material deprivation encompasses education (proportion without a high school diploma), employment (the employment/population ratio) and income (average income). Social deprivation is based on the proportion of people separated, divorced or widowed; living alone; and single-parent families. The two composite indices are derived using principal components analysis, standardised for age and sex and divided into quintiles [11]. This ecological approach is widely used as a proxy for individual SES data [11,15,17,18].

Statistical analysis

Evaluating the influence of SES on unplanned readmission

We used a hierarchical logistic regression model, with a random intercept to control for clustering by trauma centre, to generate odds ratios (OR) of unplanned 30-day readmission adjusted for the following covariates: age, sex, mechanism of injury, transfer-in, Injury Severity Score (ISS), body region of the most severe injury,