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Review

Predictors of 30-day hospital readmission after hip fracture: a systematic review

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ABSTRACT

Background: Early readmission to hospital after hip fracture is associated with increased mortality and significant costs to the healthcare system. There is growing interest in the use of 30-day readmission rates as a metric of hospital performance. Identifying patients at increased risk of readmission after hip fracture may enable pre-emptive action to mitigate this risk and the development of effective methods of risk-adjustment to allow readmission to be used as a reliable measure of hospital performance.
Methods: We conducted a systematic review of bibliographic databases and reference lists up to July 2016 to identify primary research papers assessing the effect of patient- and hospital-related risk factors for 30-day readmission to hospital after hip fracture.
Results: 495 papers were found through electronic and reference search. 65 full papers were assessed for eligibility. 22 met inclusion criteria and were included in the final review.
Medical causes of readmission were significantly more common than surgical causes, with pneumonia consistently being cited as the most common readmission diagnosis. Age, pre-existing pulmonary disease and neurological disorders were strong independent predictors of readmission. ASA grade and functional status were more robust predictors of readmission than the Charlson score or individual co-morbidities. Hospital-related risk factors including initial length of stay, hospital size and volume, time to surgery and type of anaesthesia did not have a consistent effect on readmission risk. Discharge location and the strength of hospital-discharge facility linkage were important determinants of risk.
Conclusions: Patient-related risk factors such as age, co-morbidities and functional status are stronger predictors of 30-day readmission risk after hip fracture than hospital-related factors. Rates of 30-day readmission may not be a valid reflection of hospital performance unless a clear distinction can be made between modifiable and non-modifiable risk factors. We identify a number of deficiencies in the existing literature and highlight key areas for future research.

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Introduction

Hip fractures represent a major cause of morbidity and mortality around the world. An estimated 1.6 million hip fractures occur worldwide each year, and by 2050 this number has been projected to reach between 4.5 and 6.3 million [1–3]. Elderly patients, often with multiple co-morbidities, are at significant risk of post-operative complications and loss of independence, with an excess mortality in the first year after injury of up to 36% [4,5]. Hip fracture treatment also places a significant economic burden on healthcare systems, with an estimated annual cost in the UK of £2 billion [6].

Early readmission to hospital may be seen as a preventable failure to ensure safe discharge, and has been increasingly accepted as a metric for the quality of care that a hospital provides [7,8]. Patients readmitted to hospital within 30 days of discharge after hip fracture have been shown to have worse outcomes, with twice the risk of death during the first year [9,10]. It has been reported that up to 16.8% of hip fracture patients are discharged with an active clinical issue, significantly increasing their risk of early re-admission and subsequent morbidity and mortality [11,12]. Readmission is also costly, both directly due to prolonged inpatient stay, and as a result of financial penalties imposed upon hospitals with high readmission rates [13,14]. In the United States, it was estimated that the cost to Medicare of unplanned readmissions in a single year exceeded $17 billion [13]. At the same time, the rate of early readmissions after hip fracture continues to rise, with a 41.2% increase in 28-day readmissions in the UK over the last 12 years, from 72.4 readmissions per 1000 admissions in 2002/3 to 102.4 readmissions per 1000 admissions in 2014/15 [15]. An understanding of the causes and predictors of readmission is therefore of growing importance.

Identifying patients at high risk of early readmission may enable pre-emptive action to mitigate this risk and allow high risk groups to be offered targeted outpatient support [16,17]. Experience from the US also suggests that imposing financial penalties on hospitals with high readmission rates can lead to significant improvements in care [18]. However, for effective strategies of risk mitigation to evolve, and for risk-adjustment in reimbursement schemes to be fair, evaluating the strength of evidence for predictors of readmission is critical. To our knowledge, there are no systematic reviews in this area that relate to hip fracture care.

This review evaluates the literature on patient- and hospital-related risk factors for 30-day readmission after hip fracture. This will enable the development of more informed predictive models and provide direction for future research and policy.

Methods

The methodology of this study is in accordance with the Preferred Reporting Items For Systematic Review and Meta-Analyses (PRISMA) statement for systematic reviews [19]. Studies were identified by searching electronic databases and scanning reference lists of selected papers. The population considered were patients admitted to hospital following a hip fracture and subsequently discharged to either their own home or another facility. There was no restriction by age or geographical location. The primary outcome was readmission to hospital within 30 days of discharge. Papers included were those that made a comparison between patients readmitted and those not readmitted in relation to specific factors such as age, gender, co-morbidities, functional status and hospital case volume.

Search strategy

The Medline (1946- February 2016), Embase (1974- February 2016) and Health Management Information Consortium (1979-February 2016) databases were searched using the following terms: [hip fracture.mp OR exp femur neck/neck of femur.mp OR exp femoral fractures or exp femoral neck fractures] AND [exp patient readmission or readmission.mp OR rehospitalisation.mp OR rehospitalization.mp]. The Cochrane Library was searched using the terms: [hip fracture OR femur OR femoral neck] AND [readmission OR rehospitalisation]. The last full search was run in February 2016, with a limited update literature search run up to July 2016 using Medline (PubMed). We only included full papers or systematic reviews and papers in the English language. Studies that examined the effect of a hip fracture 'pathway' or 'model of care' intervention were excluded due to lack of specificity. Titles and abstracts of papers were reviewed to produce a list of studies for full-paper review.

Eligibility criteria

Papers were required to meet the following eligibility criteria for inclusion:

- Assessment of readmission within a maximum of 30 days of discharge from hospital. Studies that assessed readmission with 28 days of discharge, or those that assessed readmission within 28- or 30-days post-operatively, were therefore included.
- Hip fracture was considered as a separate group (e.g. not 30-day readmissions for all trauma without subgroup analysis for hip fracture)
- Readmission relates to hospital readmission (e.g. not 'readmission' to a nursing home or to the 'healthcare system')
- Assessment of defined, quantifiable (or binary) predictive factors (e.g. the presence or absence of a particular co-morbidity, ASA grade, length of stay, hospital case volume per year, type of anaesthesia used) and not interventions that cannot be clearly defined (e.g. the impact of an orthogeriatric liaison service)
- Statistical analysis that determines the effect of individual risk factors on readmission rate whilst controlling for confounding variables.

Results

A total of 495 papers were identified by applying the search criteria. After removal of duplicates there were 351 papers remaining. 65 of these were considered suitable for full-text review and 22 papers were included in the final review. A flow

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