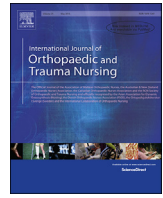




Contents lists available at ScienceDirect

International Journal of Orthopaedic and Trauma Nursing

journal homepage: <http://www.journals.elsevier.com/international-journal-of-orthopaedic-and-trauma-nursing>

The effect of time to surgery on functional ability at six weeks in a hip fracture population in Mid-West Ireland



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A B S T R A C T

Patients with a hip fracture may be appropriately delayed for surgery as they require optimisation or clinical interventions to treat acute medical illnesses (Moja et al., 2012). Other patients are inappropriately delayed due to hospital factors (Brener, 2013; Lee & Elfar, 2014). Timely efficient admission and surgery is well documented as the best course of management for these patients. The aim of this prospective cohort longitudinal follow-up study was to establish if a relationship existed between duration of time spent in the Emergency Department (ED), time to surgery and functional ability in patients with hip fractures and to examine the effect prolonged waits may have on ability to return home. Functional ability for fifty one patients with a hip fracture was evaluated using the Barthel Index Score (BIS) on admission and at six weeks post-surgery. Data were analysed by using SPSS version 20. The findings reveal a change in BIS at 6 weeks for patients whose surgery is delayed. Patients who experienced long delays awaiting admission (>12 h) in the ED functioned less well (Kruskal-Wallis test $p = 0.033$). Correlation existed between time to surgery and returning to pre-fracture place of residence, ($p = 0.000$ Pearson chi-square), which also remained significant while controlling for age. Prolonged waits had an overall negative impact on patients' post-fracture functional ability. This study highlights the deleterious effects on functional ability when surgery is delayed.

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1. Introduction

The prevalence and management of hip fractures among the ageing population is the subject of much debate (Dayama et al., 2016; Walker et al., 2016) due to an increase in life expectancy, the prevalence of osteoporosis and concern regarding the economic cost of managing hip fracture patients. Studies have shown that sustaining a hip fracture increases mortality risk; with reported rates ranging from 14% to 36% at one year post surgery (Zuckerman et al., 1995) and from 8% to 10% at thirty days (Griffiths et al., 2012). Despite a wealth of evidence-based guidelines available nationally and internationally (e.g. BOA, 2007; NICE, 2011), which concur that optimal treatment for hip fracture is early surgical

intervention, it is suggested that there is limited adherence to these recommendations in Ireland, with standards of care varying widely across the country (IHFD, 2015).

Delayed surgical intervention has previously been identified to impact on the length of hospital stay as well as the incidence of post-operative complications and influences the likelihood of returning to an independent level of functioning (Bottle and Aylin, 2006; Weller et al., 2005; Moja et al., 2012). Several authors have recommended that further research is required to determine if functional outcomes are poorer when surgery is delayed, as some studies report no association (Orosz et al., 2002; Grimes et al., 2002; Bergeron et al., 2006). Studies that have examined the correlation between time to surgery and functional outcome are primarily retrospective cohort studies and have examined function by recording post-operative complications, length of hospital stay and mortality, despite the fact that none of these variables are functional issues for patients. Less attention has been applied to examining how patients function and manage their activities of

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daily living following hip fracture surgery and there is a lack of such data available in Ireland.

Clinical guidelines recommend that patients with a hip fracture should be admitted to a designated orthopaedic bed within 4 h of presentation at an ED. This represents one of the standards of care outlined within the “Blue Book Standards: The Care of Patients with Fragility Fractures” (BOA, 2007). Despite the national and international acceptance of this care standard, no literature exists from Ireland that examines the impact that a failure to implement the standard may have patients’ outcomes and function.

2. Background/literature

The estimated number of hip fractures globally is set to peak at 6.3 million by the year 2050 (Cooper et al., 2011). In Ireland, Dodds et al. (2009) concluded that the incidence of hip fractures will increase 100% by the year 2026. In 2014, there were 3428 recorded discharges from acute hospitals in Ireland following surgical treatment of a hip fracture in patients over 60yrs of age (HPO, 2015). It is estimated that 90% of hip fractures occur as a direct result of osteoporosis and in the year 2000 there were approximately 9 million osteoporotic fractures worldwide with 1.6 million occurring at the hip (Cooper et al., 2011). In Ireland it is estimated that 300,000 people over 50yrs of age have osteoporosis, but only 15% are diagnosed (Irish Osteoporosis Society (IOS, 2012). Osteoporosis and fragility fractures of the hip are now becoming a major public health issue, despite being largely preventable (IOS, 2012).

A significant percentage of the cost of hip fractures is attributed to the length of stay in acute hospitals. In 2015 the national median length of stay for hip fracture patients in Ireland was 13 days (*mean*=18) (IHFD, 2015). McGowan et al. (2013) reported that in 2008 the total cost for patients who were treated for hip fracture in Ireland was €55.2 million.

It is suggested that decreasing the pre-operative waiting time for surgery will decrease the total length of stay (Leung et al., 2010). This would require efficient, safe systems that ensure timely admission and surgery. McNamara et al. (2014) reported on the impact of implementing a fast track admission pathway for hip fracture patients at an Irish University Hospital. Results showed that there was a 12% increase in patients (*n* = 52) receiving surgery within 24 h of admission, resulting in a one-night stay per patient. The same study estimated that a nightly cost of €1366 is incurred per patient. Projecting this cost over the annual hip fracture rate (approx. 254) at the same hospital would yield a possible saving of €97,149 (McNamara et al., 2014). Rademakers et al. (2007) demonstrated that the median length of Hospital stay for patients in their study (*n* = 234) who underwent surgery < 12 h was 11.3 days. The median length of stay was 13.3 days for patients (*n* = 488) when surgery was ≥12 h and longer and longer length of stay was also associated with the development of pressure ulcers. Both of these studies demonstrated that reducing waiting times not only has financial benefits for hospitals but also reduces the risk of comorbidities.

Patients experience delays to surgery for a variety of reasons. The first delay is usually encountered while awaiting admission to a designated orthopaedic bed or due to lack of operating room availability (Lee and Elfar, 2014). Some may be delayed for surgery because they require optimisation or clinical interventions to treat acute medical illnesses such as pneumonia, myocardial infarction or underlying renal co-morbidities (Andrews and Vielhauer, 2011; Moja et al., 2012). Some patients who require surgery are taking an irreversible inhibitor of platelet aggregation medication e.g. Clopidogrel, that may warrant a waiting period pre-operatively to reduce the risk of intra-operative bleeding or spinal haematoma (Leonidou et al., 2011). Other patients are inappropriately delayed

due to hospital factors that include the non-availability of diagnostic procedures or a lack of access to a dedicated trauma operating theatre or theatre personnel (Brenner, 2013). Fantini et al. (2011) examined the determinants of surgical delay in hip fracture patients (*n* = 1768) and demonstrated that patients admitted on a Thursday or Friday were three times more likely to be inappropriately delayed and had a two-fold risk of delay if they were admitted on a Saturday or Sunday. This may be due to the changes in access to a trauma operating theatre at weekends.

In response to the debate over timing of surgery, in 2007 the British Orthopaedic Association (BOA) and British Geriatric Society (BGS) jointly published “The Blue Book”, “The care of Patients with Fragility Fracture”. Six recommendations regarding hip fracture care were outlined; including that this cohort of patients should not endure waits beyond 4 h in the ED and that surgery should be undertaken within 48 h of presentation (BOA, 2007). More recently, the National Institute for Health and Care Excellence (NICE, 2011) published its guideline; “The Management of Hip Fracture in Adults” and, in 2012, released twelve quality standards which included recommending that surgery should be undertaken on the day of admission or the day after (NICE, 2012). Understanding the impact a delay to surgery can have on morbidity and mortality rates of hip fracture patients would be best addressed with a randomised controlled trial, but ethical concerns prevent such a study being proposed (Leung et al., 2010; Khan et al., 2009).

In Ireland, the “Emergency Department Task Force Report” (HSE, 2007) outlined recommendations to improve the patient experience and outcomes following attendance at EDs. This report highlighted that seven of the national EDs in Ireland were “unfit for purpose” and that the majority of them were operating at 95% capacity. The main reasons cited as to why patients encounter unnecessary delays were; patients presenting with chronic conditions requiring complex management inadvertently placing stress on the service, lack of access to diagnostics and lack of in-patient beds to accommodate the demand for admission (HSE, 2007). These findings have assisted with the development of some alternative routes to urgent care services for patients such as acute medical assessment units and community based outreach services for the management of chronic diseases. However, these changes have not impacted significantly on overcrowding or assisting with the admission target time of 4 h for hip fracture patients (BOA, 2007). The Irish Hip fracture Database National Report for 2014 highlighted that only 14% of hip fracture patients nationally achieved this 4 h admission target time (*n* = 2664) (IHFD, 2015). This justifies examining how prolonged waits in EDs may impact on patient outcomes.

There are currently no Irish studies published where this cohort of patients’ functional ability was examined using the, pre-validated, Barthel Index Score (BIS). Torre-Garcia et al. (2011) examined a wide variety of hip fracture patients’ (including those who were treated without surgery) functional ability at six and twelve months post-surgery using the BIS. The study did not examine time to surgery as a variable that may have influenced the differences in BIS; the only variable studied from this perspective was fracture.

The literature suggests that a delay to surgery for this patient cohort can be attributed to varying factors in the care trajectory. These range from patient health status on admission (underlying co-morbidities) or timing of admission (weekends) and lack of access to necessary resources (hospital bed/operating theatre space). It is suggested that these factors do result in negative fiscal implications in orthopaedic care and moreover result in poor patient outcomes. Primarily, the literature identifies a lack of consensus with regards to mortality rates but evidence concurs that the earlier the surgery, the incidence of pressure sores and

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