The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs

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Abstract

Purpose: Determine the impact and costs of social isolation on delayed hospital discharge. Methods: Prospective study of 278 consecutive patients aged 75 or older with hip fracture admitted to the orthopaedics department of Hospital Universitário de Santa Maria, Portugal, as an emergency. Logistic regression was used to examine the impact of relevant covariates on delayed discharges and a negative binomial regression was used to examine the main drivers of days of delayed discharges. Costs of delayed discharges were estimated using unit costs from national databases. Results: Mean age at admission was 85.5 years and mean length of stay was 13.1 days per patient. 62 (22.3%) patients had delayed discharges, resulting in 419 bed days lost (11.5% of the total length of stay). Being isolated or at a high risk of social isolation, measured with the Lubben social network scale, was significantly associated with delayed discharges (OR: 3.5) as was being referred to a public-funded rehabilitation unit (OR: 7.6). These two variables also increased the number of days of delayed discharges (2.6 and 4.9 extra days, respectively, holding all else constant). Patients who were admitted from an institution were less likely to have delayed discharges (OR: 0.2) with 5.5

fewer days of delay. Total costs of delayed discharges were between 11.2% and 30.7% of total costs (€2,352 and €9,317 per patient with delayed discharge) conditional on whether waiting costs for placement in public-funded rehabilitation unit were included. Conclusion: High risk of social isolation, social isolation and referral to public-funded rehabilitation units increases delays in patients' discharges from acute care hospitals.

Keywords: delayed discharge, social isolation, older, hip fracture, costs

Conflicts of interest: Filipa Landeiro, José Leal, and Alastair Gray declare that they have no conflict of interest.

Mini-abstract

Delayed discharges represent an inefficient use of acute hospital beds. Social isolation and referral to a public-funded rehabilitation unit were significant predictors of delayed discharges while admission from an institution was a protective factor. Preventing delays could save between 11.2% and 30.7% of total hospital costs for this patient group.

Introduction

People aged 60 years or over accounted for 11.7% of the total world population in 2013, a figure which is projected to rise to 21.1% by 2050, with those aged 80 years or over expected to increase from 1.7% to 4.1% of the total [1]. Such demographic changes present a great challenge to healthcare services, with spending expected to increase further as this population expands and the demand for healthcare services rises [1-4]. In developed countries, older people already consume around half to two-thirds of the total acute hospital bed days [5-7].

Acute hospital services constitute the costliest component of healthcare budgets. However, many acute hospital beds are inappropriately occupied by older patients who are medically fit for discharge but are unable to be transferred back to the community [8-10]. This phenomenon, also known as “bed blocking”, consumes resources, leads to cancellation of elective surgical procedures and thus longer waiting lists, and blocks emergency admissions [11]. Furthermore, delaying the discharge of older people from hospitals can have a detrimental effect on their health: these patients experience more iatrogenic complications due to their prolonged hospitalisation [12], as well as having more adverse events such as phlebitis, urinary tract infections and diarrhoea, amongst others [13-16]. Moreover, older people frequently experience an often irreversible functional decline during hospitalisation that can lead to further morbidity and disability [17-20]. Longer hospital stays are even associated with a higher probability of inpatient death or being admitted to a care home on discharge [21], and from a psychosocial perspective prolonged hospital stays can increase the level of social isolation or the development of dependent relationships [22]. Whilst waiting for a transfer to a lower level of care, patients may also suffer setbacks and consequently need further acute treatment [23]. Therefore, reducing delayed discharges could contribute to a decrease in the incidence of adverse outcomes such as functional decline, nursing home admission and in-hospital mortality.

Social isolation in older people is also believed to be a cause of health problems and high medical costs [24-26], though these associations are still disputed [27 28]. Social isolation is, however, associated with an increase in emergency admissions [29] and length of stay in acute care hospitals [30]. However, the impact of social isolation on delayed hospital discharges, measured using a validated instrument, has not yet been evaluated. This study aims to estimate the number of days attributed to delayed discharges in patients with a proximal femoral fracture; determine the impact of social isolation on delayed hospital discharges; and estimate the costs of these delays.

Methods

A prospective cohort study was carried out in the orthopaedics department of Hospital Universitário de Santa Maria, a public hospital in Lisbon, Portugal. This department consisted of 51 orthopaedic beds (45 in the orthopaedics ward and 6 in the intensive care unit) supervised by a team of 27 orthopaedic surgeons. Between 1st July 2012 and 30th June 2013, all the patients aged 75 and above admitted with a proximal femoral fracture via the Accident and Emergency Unit to the orthopaedics department were contacted by the study team. Patients that died before discharge were excluded from the study. Subsequent fractures in patients that were already enrolled in the study were also not included, in order to align the design with protocols used elsewhere. All patients were followed from admission to discharge from hospital, and patients who were discharged but referred to a public-funded rehabilitation unit continued to be followed until availability of a place or admission to such a unit.

Permission to interview patients and carers and to review medical records was obtained from the Ethics Committee of the hospital. Informed consent was obtained from all individual participants included in the study, or next of kin when participants were not able to consent. Data on the characteristics and self-perceived health status of patients were collected via a personal interview

with structured questionnaires. For patients with a cognitive impairment, delirium, significant speaking or hearing impairment, the information was collected through the main carer. Table A.1 in the appendix lists the information collected from each patient.

Delayed discharges were assessed by reviewing daily the medical records of each patient to check if they had been declared medically fit for discharge by the medical team. A patient was considered to be medically fit for discharge when: (1) he/she was able to stand up and be mobile with support; (2) haemoglobin was above 8.5 g/dL; and (3) there was no evidence of active infection. Length of stay was calculated as time from admission to discharge. Intended discharge destination was determined immediately after surgery and before knowing whether a patient was medically fit for discharge. This is therefore a pre-determined characteristic which was not influenced by the length of stay of a patient after being declared medically fit for discharge. Delayed discharges were calculated as the difference between the time a patient was deemed medically fit for discharge and the actual time of discharge. We then calculated the proportion of the total days of hospital stay that could be attributed to delayed discharge. The mean days of delayed discharges was only estimated for patients who had delayed discharges. Social isolation was assessed with the Lubben social network scale – 10 items (1988) [31], previously validated for Portugal, which measures perceived social support in older adults received from family and friends. According to this scale, patients can either have a low/moderate/high risk of social isolation or be socially isolated.

All calculations were carried out in the statistical package STATA version 12 (StataCorp. LP, College Station, United States of America). The costs of delayed discharges were estimated from a societal perspective, which included hospital costs and costs incurred by patients while waiting for a place in a public-funded rehabilitation unit. The hospital costs of delayed discharge were estimated based on the average daily cost of a hospital stay on the orthopaedics ward in Portugal [32], which was €348 in 2013. The daily cost included direct costs (personnel costs, costs of pharmaceutical products, costs of ward/clinical supplies and equipment, depreciation and other expenses) and indirect costs (costs

of administrative sections, such as management and board of directors, technical and administrative services, and costs of auxiliary sections rendering general support, such as facilities and equipment, hotel services, and costs of auxiliary services rendering clinical support, such as: associated diagnostic tests and procedures, anaesthesiology, operating room and other clinical support services). If patients were discharged from hospital while waiting for a placement in a public-funded rehabilitation unit, the costs incurred from hospital discharge until a place became available were considered. These included the costs of: a private care home, a private rehabilitation unit, domiciliary care services, formal carer (e.g. home care assistant), informal care provided by a family member and specific equipment such as articulated bed, chair for the bath and walking frames. The cost of a care home was estimated to be €1,500 per month according to information provided by the social services at Hospital Universitário de Santa Maria. The costs of a private rehabilitation unit were calculated based on the hotel cost for a single room and the average cost of physiotherapy three times a week at the hospital to which patients were discharged for rehabilitation. Domiciliary care service costs were calculated based on the average monthly co-payment made by users of non-statutory organisations (Instituições Privadas de Solidariedade Social) [33]. The costs for equipment, transport and formal paid carers were those reported by patients and families. The costs of informal care were calculated based on the hours that family members dedicated to looking after the patient. When informal carers were retired or unemployed the minimum national wage was used to value their time, while the average annual gross earnings was used to value the time of informal carers who were employed [34]. We also estimated the total hospital costs per patient by multiplying the total length of stay by the daily cost (€348) and adding the total unit cost for an emergency admission in Portugal, which was €119 in 2013, as all of these patients were admitted via the Accident and Emergency Unit. As the time horizon was one year, no discounting was performed.

A univariate logistic regression was conducted to assess the impact of each potential explanatory variable, selected based on an a priori clinical decision, on delayed hospital discharges. These results are presented as univariate models. A multivariable logistic regression model was then used to

examine potential predictors of delayed discharges. All levels of social isolation (low, moderate, and high risk of social isolation/socially isolated) were included in the model as this was our main exposure. Furthermore, source of admission was included as we believe that patients that were in a care home or mental health facility prior to admission have a lower probability of having a delay in discharge as they usually have a secured place in the institution they came from. We also included the intended discharge destination as we believe that patients that are referred to public-funded rehabilitation units are more likely to have delays given the reduced number of existing beds in the Lisbon area. Dementia was also included as we think that patients with dementia had some arrangements in place (i.e. either they were institutionalised or had carers) prior to admission and would most likely return to those arrangements after discharge. Finally, we also included age and gender in the model as we believe they could be potential confounders. The results are presented as a multivariate model.

The number of days for which discharge was delayed were estimated for all patients. Five different models were considered: Poisson, negative binomial with a mean dispersion parameter, negative binomial with a constant dispersion parameter, hurdle model (part 1 logistic regression; part 2 Poisson) and the zero inflated Poisson model. The negative binomial with mean dispersion parameter was chosen for this analysis since it provided the best fit according to both the Akaike information criterion and the Bayesian information criterion. This model also reported the lowest mean squared error and mean squared deviation. The negative binomial regression model examined the same covariates as the logistic model. The results for the univariate analysis are presented as univariate models and those for the multivariate negative binomial regression model are presented as a multivariate model.

The goodness of fit for both models was assessed using the Pregibon link test. A covariate was judged to be significant if $p<0.05$.

Results

Study population

In total 288 patients were admitted with a diagnosis of proximal femoral fracture. Two patients (0.7%) declined to take part in the study. Eight patients (2.8%) died before discharge and were therefore excluded from the study. Thus, 278 (96.5%) patients were included in this study. Table 1 reports the characteristics of the population. The mean age of our population was 85.5 years (SD 5.8), mainly women (79.5%) and mostly without a partner (71.9%) but with descendants (78.4%). 20.5% of these patients lived alone prior to admission and another 22.3% were admitted either from a care home or a mental health facility. Approximately one third of these patients were isolated or had a high risk of social isolation according to the Lubben social network scale, and cognitive reduction was present in 19.1% of patients. The vast majority of the patients were completely independent or had a light dependency before admission to hospital with only 5.4% having a severe or total dependency level (measured with the Barthel Index [35]).

The 278 patients spent a total of 3,647 days in hospital, corresponding to a mean length of hospital stay of 13.1 days (SD 10.8, median 10.0 days, interquartile range 7.0 days, range 3 to 100). In total there were 62 (22.3%) patients with a delay in discharge, representing a total of 419 excess bed days or 6.8 excess days per patient with a delay in discharge (SD 11.2 days, median 3.0 days, interquartile range 5.0 days, range 1 to 70). The proportion of all hospital days that were a result of delayed discharge was 11.5% (95% CI: 7.7%-15.2%).

Family members were the main providers of care after hospital discharge, with 48.2% of the patients returning home with family support (either with or without domiciliary care). The number of patients discharged to an institution (either another hospital, care home or mental health facility) was 34.5%, compared to the proportion of admissions from an institution of22.3%. 5.0% of the

patients were discharged to a private rehabilitation unit and 1.1% were discharged directly to a public-funded rehabilitation unit.

Given the reduced number of public-funded rehabilitation beds in the area of Lisbon, Hospital Universitário de Santa Maria is allowed by Administração Regional de Saúde de Lisboa e Vale do Tejo to transfer patients to temporary settings while they are waiting for a bed in one of these units. This is unique to Lisbon: in other regions patients referred to a public-funded rehabilitation unit would have to wait in hospital until a place became available in such unit. Hence, out of the 22 patients discharged and referred to a public-funded rehabilitation unit, 15 had delayed hospital discharges. Three (1.0% of the total) were admitted immediately, and 19 (6.8% of the total) waited for a place to become available at a public-funded rehabilitation unit either at home with family, or at a private care home, or at a private rehabilitation unit. This would have been equivalent to 1,241 days of delayed discharges if the patients had not been discharged from hospital. On average these patients waited 65.3 days (SD 52.4 days, median 48.0 days, interquartile range 30.5 days, range 1 to 172) for a placement, and by the time they were offered one, 5.3% (1/19) had died and 42.1% (8/19) declined the placement.

The readmission rate at one month post-discharge was 10.8%, but only 2 of these 30 patients were readmitted to the orthopaedic ward, with the remainder being readmitted to internal medicine wards.

Predictors of delayed discharges

The univariate analysis suggested that source of admission, intended discharge destination and dementia were significantly associated with delayed discharges. Adjusting for other covariates, patients who were isolated or at a high risk of social isolation before admission to hospital were more likely to have a delay in their discharge than patients with a low risk of social isolation (OR: 3.5, 95% CI: 1.6 – 7.7) (see Table 2 and A.2). Patients who had a moderate risk of social isolation were

also more likely to have a delay in discharge compared to low risk patients, but this was not found to be statistically significant (OR: 1.4, 95% CI: 0.6-3.4). On the other hand, patients who were admitted from an institution had a lower risk of having a delay in their discharge compared to those admitted from home (OR: 0.2, 95% CI: 0.1-0.6). We assessed the interaction between the levels of social isolation and being admitted from an institution but found no statistically significant evidence for such interactions, although this may be partly explained by lack of statistical power. Being referred to a public-funded rehabilitation unit was a statistically significant predictor of delayed discharges (OR: 7.6, 95% CI: 2.8–20.6). Dementia was associated with a significant decrease in the likelihood of a delayed discharge (OR: 0.3, 95% CI: 0.10.9). Age and gender were not found to be significantly associated with delayed discharges.

Number of days of delayed discharges

The univariate analysis suggested that source of admission and intended discharge destination were significantly associated with the number of days of delayed discharge. Adjusting for other covariates, relative to an individual with low risk of social isolation, moderate risk of social isolation and high risk of social isolation/socially isolated were associated with increases in the number of days of delayed discharge. The corresponding incidence rate ratios ("IRR") were 2.4 (95% CI: 2.1-5.4) for moderate risk, and 4.4 (95% CI: 2.1-9.1) for high risk/socially isolated (see Table 3 and A.3). In other words, patients with moderate risk of social isolation spent, on average, an additional 1.5 (95% CI: -0.5 to 3.3) days of delayed discharge in hospital compared to patients with a low risk of social isolation, holding all else constant, while those with high risk/socially isolated spent, on average, an additional 2.6 (95% CI: 0.5 to 4.7) days. The additional costs per patient corresponding to these extra days are €532 for the moderate risk group and €905 for the high risk/socially isolated group, per patient. Patients who were admitted from an institution were estimated to have an incidence rate 0.04 (95% CI: 0.02–0.13) times lower for days of delayed discharge compared to patients who were admitted from their own home. These patients had 5.5 fewer days of delayed discharge (95% CI: -9.1 to -1.9)

relative to the admissions of patients from their own home, with hospitals costs being €1,917 less. Patients referred to a public-funded rehabilitation unit were estimated to have an incidence rate 15.5 (95%: 7.7–31.4) times higher for days of delayed discharge compared to patients discharged to other locations. This corresponds to 4.9 additional days of delayed discharge (95% CI: 1.7-8.0), or an additional €1,691 in hospital costs, adjusting for other covariates. Age, gender and having dementia were not found to be statistically significant predictors of the number of days of delayed discharge.

Costs of delayed discharges

The mean length of hospital stay for a patient with a proximal femoral fracture was 13.1 days, corresponding to a hospital cost of €4,684 per patient (SD €3,748) and a total of €1,302,238 for the whole sample. The mean length of hospital stay for a patient without a delay in discharge was 11.1 days corresponding to a hospital cost of €3,994 (SD €2,508) whereas the mean length of hospital stay for a patient with a delay in discharge was 20.0 days, corresponding to a hospital cost of €7,090 (SD €5,834). This means that the average hospital cost of a patient with a delay in discharge was 77.5% higher than that of a patient without a delay. The mean hospital cost of a delayed discharge per patient with a delayed discharge was €2,352 (6.8 days, SD €3,915), equivalent to more than half of the mean hospital cost of a proximal femoral fracture. The total annual hospital cost of delayed discharges for patients with a proximal femoral fracture was €145,812, or 11.2% of total costs.

These costs would have been significantly higher if the 19 patients waiting for a placement in the public-funded rehabilitation unit had not been discharged to a temporary resetting such as home with family, private care home or private rehabilitation unit. This would have increased the annual hospital cost of delayed discharges by €431,868 to a total of €577,680 (€9,317 per patient with a delayed discharge) and the impact of delayed discharges from 11.2% to 30.7% of total hospital costs (€1,879,918). However, these 19 patients still incurred costs while in a temporary setting of €80,824, or €4,254 per patient (see Table 4). Adding these costs, increases the costs of delayed discharges to €226,636, or 16.4% of total costs (€1,383,062).

Discussion

Our results confirm that social isolation is associated with both delayed hospital discharge and the number of days of delay for older patients. Also, we found that being referred to a public-funded rehabilitation unit significantly increases the odds of having a delayed discharge, as well as the number of days of delay. However, being admitted from a care home or a mental health facility was found to be a protective factor for delayed discharge.

This is the first study to examine the impact of social isolation, using a validated tool (Lubben social network scale), on delayed hospital discharges. Other cohort studies have examined the association between delayed discharges and living alone or having formal/informal help prior to hospital admission, which could be construed as a proxy for social isolation. However, the number of studies is small [8 36-39], their results are contradictory and social isolation is better informed by additional dimensions such as friends and family network and patients' contribution to the wider society. A study conducted in Switzerland [38] found a positive association between delayed discharges and patients living alone while studies conducted in England [39] and Italy [8] reported a negative association between having formal/informal help prior to admission and delayed discharges. Conversely, another Italian study [36] reported a negative association between delayed discharges and patients living alone, whereas studies based in Singapore [37] and England [39] reported that living alone did not significantly predict delayed discharges, which is in line with what we found when we analysed the impact of living alone prior to admission (rather than social isolation) on delayed discharges in a multivariate model.

In our study, older patients, both with and without delays, were mostly discharged home with family support (51.1% and 49.5%, respectively). The family structure is still very present in Portuguese society but this is changing with a higher number of women entering the job market [40], increasing

retirement age [41], a reduction in family size and the rapid ageing of the population [42]. These factors, combined with life in the city, have led to an increase in the number of older isolated people. Despite being isolated or at a high risk for isolation, most of these older people are organised and can cope with the normal aspects of their daily life. However, when faced with an adverse event like, a proximal femoral fracture, that significantly reduces their independence, the lack of social support becomes more relevant and alternative ways of providing care after the acute hospital discharge, in the absence of support from social networks, have to be found.

Admission to a care home would be the traditional solution for post-acute care and in fact, being admitted from a care home or mental health facility was found to be a protective factor for delayed discharges, mainly because these patients have secured a place to return to after discharge. We note that 45.2% of the patients admitted from a care home or mental health facility were cognitively impaired. However, despite preventing delayed discharges, discharge to a care home is not necessarily a solution as it fosters further social isolation [43]. The majority of the delayed discharged patients are not cognitively impaired (72%) and, given the right to choose, they preferred not to be discharged to a care home.

Rehabilitation in a specialised unit can significantly reduce the level of dependency of these patients and allow them to return home. Taking into account that the income level of these patients is very low, not many are able to afford private rehabilitation. Furthermore, there is currently a shortage of beds in public-funded rehabilitation units in the Lisbon area. This, combined with the fact that sometimes patients are not referred to the correct units, causes delays in the admission process of those patients whilst blocking the entrance of others, resulting in long waiting times for older people that are referred to public-funded rehabilitation units. Therefore, being referred to a public-funded rehabilitation unit significantly increases the odds of having a delayed discharge and the number of days of delay. Sometimes, patients are not referred to these units because it is known that they will be waiting in hospital for a long time before a place becomes available at one of these units and,

therefore, other alternative forms of care are sought. The percentage of patients referred to this type of unit in this study (7.9%) contrasts with that seen, for instance, in the United Kingdom where, in 2013, 18.9% of proximal femoral fracture patients were discharged to a rehabilitation unit (National hip fractures database) [44].

In terms of costs, the average hospital stay of a patient with a delayed discharge was 77.5% (€3,096) higher than that of a patient with no delay. Delayed discharges represent both an inappropriate and inefficient use of acute hospital beds that, if prevented, could have led to potential hospital cost savings of €145,812. We found that these costs of delayed discharges are underestimated due to the fact that 86.4% of the patients referred to a public-funded rehabilitation unit waited for a placement in a temporary setting. If we consider the costs incurred by these patients while waiting for a placement, then the costs of delayed discharges amount to €226,636, increasing to €577,680 if they had not been discharged from the acute hospital in the first place. Furthermore, patients with delayed discharges could benefit from another level of care that is much less expensive than an acute hospital bed and more appropriate to their needs. Public-funded rehabilitation units received €88 per patient per day in 2013 to cover healthcare services rendered, medicines, auxiliary diagnostic tests, wound dressing packs for pressure sores and social care services [45], which is significantly lower than the cost of a bed-day in acute care (€348). While waiting for a placement in a rehabilitation unit, delayed discharge patients also spend a significant amount of time in acute wards that are not prepared to provide the level or expertise of care that they need and this will have a detrimental impact on their rehabilitation.

There are some limitations to this study. First, the criteria used to determine whether a patient was medically fit for discharge are based on clinical judgement made on three clinical indicators, all objective but not recognised as an evaluation tool. However, it is unclear whether internationally used tools, such as the Appropriateness Evaluation Protocol [46], would have had a statistically significant impact on the estimated proportion of delayed discharges. Secondly, no national hospital

costs were available for proximal femoral fracture patients. Microcosting would have provided more accurate results for bed day costs but this was not possible. Instead, we used the national daily cost of a hospital stay in an orthopaedics ward. Thirdly, it was not possible to calculate the opportunity cost of the beds used by the delayed discharge patients, i.e., how many patients were not admitted for elective surgery due to beds being occupied by patients with delayed discharges. However, the foregone opportunities this represents are expected to be high, as there is a long waiting list for elective procedures in this orthopaedics department and the bed occupancy rate in 2012 was above 80%. Finally, we are aware that there may be some omitted variables regarding intended discharge destination that could have improved model fit if available. However, we did run two models, one with being discharged to a public-funded rehabilitation unit as an explanatory variable and the other one without this variable. The coefficients for social isolation were not affected by the inclusion of intended discharge destination in the model.

Having a high risk of social isolation, being socially isolated and being referred to a public-funded rehabilitation unit increases delays in patients' discharges from acute care hospitals. Social isolation among older adults is increasing in Portugal. Moreover, after receiving rehabilitation in an adequate setting, even patients who are isolated or with a high risk of social isolation could return home to live independently. Taking these factors into account, an increase in the number of beds in public-funded rehabilitation units would certainly reduce the number of days of delayed discharge of these patients. It is important to a patient's recovery to have quick access to rehabilitation, but it is also important that they return quickly to the community, where they should have adequate services available and strategies in place to promote social inclusion. These results may be applicable to countries where the family structure is still very present, like in most southern European countries, Latin American countries and some Asian countries, or where there is a limited supply of post-acute care rehabilitation units.

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments on comparable ethical standards.

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