

Fragility Fracture Prevention Treatment in a Continued Care Facility: An Opportunity for Intervention

Tratamento de Prevenção de Fraturas de Fragilidade numa Unidade de Cuidados Continuados: Uma Oportunidade para Intervenção

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Abstract

Introduction: Fragility fractures occur spontaneously or after minor trauma. They are common in frail patients and are associated with increased disability, morbidity and mortality. Fragility fractures account for a considerable number of admissions in continued care facilities, representing a major economic burden.

Our aim was to evaluate whether patients admitted to a continued care facility with a fragility fracture diagnosis have received adequate treatment to prevent new fractures.

Methods: This is a retrospective cohort study conducted at Unidade de Cuidados Continuados de Convalescença Rovisco Pais. All patients admitted from July 2021 to August 2022 with a fragility fracture were included.

Results: Eighty eight patients were included (mean age 85 ± 8.71 years; female 76.2%; average length of stay 60 ± 25.8 days; proximal femur fracture 91.3%, vertebral fractures 8.8%). At the time of discharge, 16 (2.6%) had been prescribed antiresorptive drugs; 15 (20.5%) received vitamin D and only 2 (2.7%) had been prescribed calcium. Six (7.5%) had a subsequent fracture. Frail patients were older, had more falls and were more likely to have an adverse event during stay.

Conclusion: Although all patients had indication for treatment with antiresorptive drugs, and despite the availability of effective pharmacologic interventions and well-

established guidelines for fracture prevention, only a minority received such treatment. These findings support that there is clear room for improvement and this study sets the pace for developing an intervention protocol.

Keywords: Frail Elderly; Fractures, Bone/rehabilitation; Long-Term Care; Osteoporosis/rehabilitation; Osteoporotic Fractures.

Resumo

Introdução: As fraturas de fragilidade ocorrem espontaneamente ou após trauma *minor*. São comuns em doentes frágeis, estão associadas a incapacidade e morbimortalidade e são responsáveis por um número considerável de admissões nas Unidades de Cuidados Continuados, representando um elevado peso económico. O nosso objetivo foi avaliar se os doentes internados na Unidade de Cuidados Continuados com o diagnóstico de fratura de fragilidade receberam tratamento adequado para a prevenção de novas fraturas.

Métodos: Estudo retrospectivo realizado na Unidade de Cuidados Continuados de Convalescença Rovisco Pais. Foram incluídos todos os doentes internados com fratura de fragilidade entre julho de 2021 e agosto de 2022.

Resultados: Foram incluídos 80 doentes (média de idades $85\pm 8,71$ anos; género feminino 76,2%; duração média do internamento $60\pm 25,8$ dias; fratura proximal do fémur 91,3%;

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fratura vertebral 8,8%). À data de alta, 16 doentes (21,6%) foram medicados com anti-reabsortivo; 15 doentes (20,5%) receberam suplementação com vitamina D; e apenas 2 doentes (2,7%) receberam cálcio. Seis destes doentes (7,5%) tiveram uma fratura subsequente. Os doentes frágeis eram mais velhos, tiveram mais quedas e maior probabilidade de evento adverso durante a hospitalização.

Conclusão: Todos os doentes tinham indicação formal para iniciar tratamento com anti-reabsortivos. Apesar da existência de *guidelines* bem estabelecidas para a prevenção de fraturas de fragilidade e da existência de tratamento farmacológico eficaz, apenas uma minoria recebeu o tratamento indicado. Estes resultados demonstram que existe margem para melhoria e este estudo pretende ser a força motriz para o estabelecimento de um protocolo de intervenção.

Palavras-chave: Assistência de Longa Duração; Fraturas Ósseas/reabilitação; Fraturas por Osteoporose; Idosos Frágeis; Osteoporose/reabilitação.

Introduction

Fragility fractures (FF) occur spontaneously or after minor trauma and are associated with disability, morbidity and mortality.¹

Yearly, over 10 000 patients are admitted to the Portuguese national health service (Serviço Nacional de Saúde – SNS) with hip fragility fracture, which accounts for around 1.4% of the SNS expenditure (2013 data), therefore, the total amount spent treating all types of FF must be much higher.

During the first year after the fracture, mortality can be as high as 12%.² Many of these patients are admitted to continued care facilities to enroll in rehabilitation programs, especially those who had vertebral and/or lower limb fractures. Despite the existence of several cost-effective interventions and treatment guidelines, most of these patients are not prescribed antiresorptive drugs.

FF are more common in frail patients. Frailty is a syndrome associated with worse outcomes in patients with fractures, as described in a recently published systematic review which reckons that the presence of such syndrome is a good predictor for complications after fractures and is also associated with higher mortality and longer hospital stays.³

Although there is no consensual definition, the Program of Research on Integration of Services for the Maintenance of Autonomy (PRISMA-7) is a 7-item tool used to identify elder frail patients. A score ≥ 3 is considered an indicator of frailty.⁴

As our population is aging and life expectancy is increasing, timely identification of frail patients who are at risk for fractures is a clinically complex, but rather significant, challenge.

Our study was aimed to characterize a cohort of fragility fractures patients admitted to a Convalescence Continued Care Facility (CCCC). Furthermore, it was assessed whether patients with FF were receiving adequate treatment targeting the prevention of new fractures. As a secondary goal, it was performed a comparative analysis between frail and non-frail patients to assess if frail patients have worse outcomes. Functional capacity at admission and discharge was also compared.

Methods

This study considers the principles of the Declaration of Helsinki and ethics approval was obtained from the ethics commission at Unidade de Cuidados Continuados de Convalescência Rovisco Pais (UCCC-RP). In here, it is described a unicentric observational retrospective cohort study conducted at UCCC-RP. All patients admitted to this facility from July 2021 to August 2022 with a fragility fracture were included. The types of fractures included were proximal femur, vertebral, distal radius and proximal humerus. Patients with fractures resulting from polytrauma were excluded from this study.

Data collected from all patients included socio-demographic information, including age and gender, and clinical information including comorbidities, usual medication, previous falls, length of hospital stay, length of CCCC stay, adverse events during hospital or CCCC stay, functional capacity at admission and at the time of discharge (autonomous, need for walking aids or incapable of walking), death and cause of death during stay, new fracture up to the time of data collection, destination after discharge, treatment with antiresorptive drugs, vitamin D and calcium supplementation at admission and time of discharge. All patients were screened for the presence of frailty syndrome using PRISMA-7 score. As previously stated, PRISMA-7 is a seven-item questionnaire (questions include “Are you older than 85 years?”, “Are you male?”, “Do you have any health problems that require you to stay at home?”, “Do you need someone to help you regularly?”, “Do you have any health problems that limit daily living activities?”, “Should you need help, can you count on someone?”, “Do you regularly need a walking aid or wheelchair?”) used for the recognition of frail geriatric patients. A score ≥ 3 is considered indicative of frailty. A general descriptive analysis of the data was performed. Continuous variables were described at the time of discharge, as means and standard deviation. Categorical variables were presented as absolute numbers or percentages. Associations were tested using the Chi-square test, Fisher exact test, Student’s t-test, or Mann-Whitney U test. Statistical significance was assumed for $p < 0.05$. Statistical analysis was performed using Jamovi®.

Results

Cohort characterization and fragility fracture prevention treatment

Between July 2021 and August 2022, a total of 375 patients were admitted to the UCCC-RP, 80 of which (21.3%) had a fragility fracture diagnosis. Clinical and demographic characteristics (n=80) are described in Table 1. It is an aged cohort, with a mean age of 85 years, the majority being female (76.3%). Patients usually remain at the UCCC-RP for 30 days, however, if clinically justified this period may be extended up to 90 days. In this cohort, the mean length of stay was 60 days, which shows that stay was extended for many patients. As for comorbidities, the majority had more than one illness, with cardiovascular risk factors, such as hypertension and dyslipidemia, being the most common, with a prevalence of 75% and 58.8%, respectively. Psychiatric disturbances were also very prevalent, with approximately one-third of the patients having anxiety and/or depression with frequent use of benzodiazepines (48.8%) and antidepressants (40%).

The most common type of fracture was proximal femur (91.3%), the remaining being vertebral fractures. Most of patients were frail (75%) since they had a PRISMA-7 ≥ 3 . Regarding treatment, 16 (21.3%) patients received antiresorptive drugs, 15 (20.5%) were offered vitamin D and only 2 (2.7%) received calcium supplementation.

During stay in the UCCC-RP, the majority (65.4%) had an adverse event, with urinary tract infection being the most common. At the time of data collection, 6 (7.5%) had had a new fracture, and an equal number had died due to infection or major cardiovascular event.

Table 1 - Demographic and clinical characteristics

Demographic characteristics	
Age, mean (sd)	85 (8.71)
Female, n(%)	61 (76.3)
Length of stay in UCCC-RP (days), mean (sd)	60 (25.8)
Length of stay in Orthopaedics (days), mean (sd)	20 (9.57)
Clinical characteristics	
Comorbidities	
High blood pressure, n(%)	60 (75)
Dyslipidaemia, n(%)	47 (58.8)
Depression/anxiety, n(%)	28 (35)
Heart failure, n(%)	19 (23.8)
Diabetes mellitus, n(%)	19 (23.8)

Atrial fibrillation, n(%)	17 (21.3)
Cancer, n(%)	12 (15)
Previous fragility fracture, n(%)	11 (13.8)
Obesity, n(%)	11 (13.8)
Medication	
Antihypertensive, n(%)	55 (68.8)
Benzodiazepines, n(%)	39 (48.8)
Antidepressive, n(%)	32 (40)
Antiepileptics, n(%)	13 (16.3)
Type of fragility fracture	
Proximal femur fractures, n (%)	73 (91.3)
Vertebral fractures, n(%)	7 (8.8)
Frailty	
Prisma 7 ≥ 3 , n (%)	60 (75)
Fragility fracture prevention treatment	
Antiestrogenic, n (%)	16 (21.6)
Vitamin D, n (%)	15 (20.5)
Calcium, n (%)	2 (2.7)
Subsequent fracture, n (%)	6 (7.5)
Adverse events during stay, n (%)	52 (65.4)
Deaths, n (%)	6 (7.5)
Home discharge, n(%)	62 (77)
Frail versus non-frail	

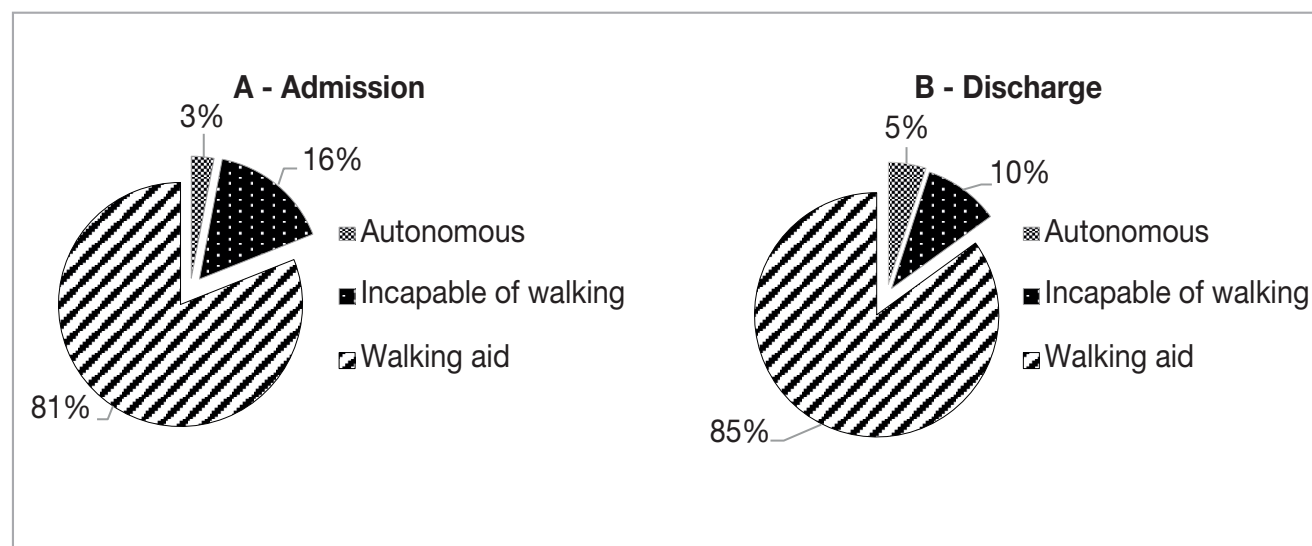
As described in Table 2, a comparative analysis between frail and non-frail patients showed that frail patients (PRISMA 7 ≥ 3) were older (86.0 vs 78.5 years, $p < 0.001$), had more previous falls (48.1% vs 15.8%, $p < 0.013$) and more complications (88.3% vs 60.0%, $p < 0.005$). Although there was a clinical tendency for higher mortality in frail patients, this result was not statistically significant (6 vs 0 deaths, $p < 0.141$). Statistical differences regarding sex, length of stay or subsequent fracture were also not found.

Functional capacity and discharge

At admission (Fig. 1-A), most patients (81.3%) required walking aids, 13 (16.3%) were incapable of walking and only 2 (2.5%) were able to walk unassisted. In turn, at the time of discharge, there was an improvement in these indicators, given that twice the patients were capable of walking autonomously (5%) and only 8 were incapable of walking. However, these results were not statistically significant. Most patients (77%) were discharged home (Table 1); the remainder were discharged to another continued care facility, retirement home or died.

Table 2 - Frail versus non-Frail

Characteristics	Non-Frail	Frail	<i>p</i> value
Age (Years)	78.5 ± 8.78	86.0 ± 7.95	<i>p</i><0.001
Female	70.0	78.3	<i>p</i> =0.448
Mean length of stay (days)	60 ± 25.64	60 ± 27.0	<i>p</i> =0.797
Previous Falls (%)	15.8	48.1	<i>p</i><0.013
Adverse events during stay (%)	60.0	88.3	<i>p</i><0.005
Urinary tract infection (n)	1	15	
Respiratory infection (n)	2	5	
Falls (n)	1	6	
others (n)	8	26	
Mortality (n)	0	6	<i>p</i> =0.141
Subsequent fracture (%)	11.1	7.5	<i>p</i> =0.639

**Figure 1** - Funcional capacity; A – admission; B - discharge

Discussion

As per our knowledge, this is the first description of a patient cohort with fragility fractures from a continued care facility in Portugal. As expected, most of the cohort patients were female, likely due to their higher life expectancy and osteoporosis prevalence.⁵ According to the Portuguese Multidisciplinary Recommendations and the Portuguese recommendations for the prevention, diagnosis and management of primary osteoporosis,^{5,6} all patients older than 50 years with a fragility fracture of the hip, a symptomatic vertebral fracture or more than two fragility fractures, regardless of their location or the absence of symptoms, should receive antiresorptive treatment. Despite

these recommendations and the fact that all patients in this cohort study fulfil the criteria for starting this therapy, only a minority were treated as recommended. Furthermore, an even lower proportion of patients were adequately prescribed calcium supplementation (2.7%). The prescription of this supplement, essential in enhancing the efficacy of antiresorptive therapies, appears to stem from clinicians' fear of worsening the risk of atherosclerotic disease in patients with multiple cardiovascular risk factors. However, one should instead consider the results from a prospective study with over 400 000 patients performed in the United Kingdom by Harvey *et al* (2018),⁷ which shows that the use of calcium and vitamin D supplements was not associated with increased risk of death or hospital

admission due to ischemic cardiovascular events. Furthermore, it is widely recognized the use of benzodiazepines potentiates the risk of falls in the geriatric population,⁸ yet almost half of the patients included in this cohort study were undergoing benzodiazepine treatment. To add injury to insult, some antidepressants and anticonvulsants increase bone resorption,⁶ henceforth leading to higher bone fragility when used for long periods. From these results, it is clear that patients' medication should be regularly revised, not only to reduce the risk of falls but also to avoid the use of drugs that may increase bone fragility.

Frail patients presented worse outcomes, with a higher number of inpatient complications. While the power of the analysis herein was insufficient to establish statistical differences, patients with frailty syndrome appeared to have higher mortality rates. This goes according to current literature. Ha Mai *et al* (2022)⁹ concluded that the establishment of frailty increases the risk of subsequent fractures. Other authors (Feng *et al*, 2022)¹⁰ showed that frailty syndrome is associated with prolonged hospital inpatient periods, a higher need for continuous care in specialized facilities or retirement homes, increased treatment costs, namely of hip fractures and higher complication rates (Wong *et al*, 2022).¹¹ Therefore, it is mandatory to screen for the presence of frailty syndrome in patients at higher risk of bone fractures, so that personalized care can be established to reduce the risk of fragility bone fractures or other medical complications.

This study has, however, some limitations, since it is a retrospective transversal study that relies upon the quality

of clinical records of the patients included in this cohort study. Furthermore, the sample size of this study is relatively small, conditioning a lower power of statistical analysis and therefore capability to detect smaller magnitude differences in some of the outcomes of these analysis.

Conclusion

Although patients with FF account for a large portion of all admissions in UCCC-RP, new fracture prevention treatment was inadequate in almost all of them. These findings elicit that there is clear room for improvement in treating these patients. This sets the pace for the development of an intervention protocol and its impact shall be assessed in short term.

We also concluded that frail patients were older, had more previous falls and were most likely to have an adverse event during stay.

CCCF are prime institutions for the treatment of patients with fragility fractures providing high-quality multidisciplinary care, with the intervention of internal medicine and physiatrists. It is of the utmost importance to develop similar studies in other CCCF to assess if these results are representative of a national reality. Further research with longer follow-up is needed to evaluate long-term outcomes such as mortality, subsequent fracture, and new hospital admissions.

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