Hospital Readmissions in Portugal over the Last Decade

Reinternamentos Hospitalares em Portugal na Última Década

Bernardo SOUSA-PINTO[1], Ana Rita GOMES[1], Andreia OLIVEIRA[1], Carlos IVO[1], Gustavo COSTA[1], João RAMOS[1], Joel SILVA[1], Maria Carolina CARNEIRO[1], Maria João DOMINGUES[1], Maria João CUNHA[1], Altamiro da COSTA-PEREIRA[1,2], Alberto FREITAS[1,2]

Acta Med Port 2013 Nov-Dec;26(6):711-720

ABSTRACT

Introduction: Hospital readmissions are associated with increased healthcare expenses and with higher hospital fatality rates. We aim to characterize unplanned hospital readmissions occurred within 30 days after discharge, according to its Major Diagnosis Category, hospital type and location, and patients' demographic attributes. We also intend to estimate the hospital fatality rates associated to those readmissions, as well as to study the evolution of hospital readmissions rates in the last decade (2000-2008). Moreover, we aim to characterize heart failure readmissions.

Material and Methods: We analysed a database (provided by Autoridade Central do Sistema de Saúde) containing all hospital admissions occurred in Portuguese public hospitals. In order to compare readmissions rates, we performed chi-square tests and linear-by-linear association tests.

Results: Between 2000 and 2008, there were 5 514 331 unplanned admissions, of which 4.1% corresponded to hospital readmissions, classified with the same Major Diagnosis Category of the first admission. Between 2000 and 2008, hospital readmissions rate increased continuously from 3.0% to 4.7%. Hospital fatality rate was significantly higher among readmitted cases (9.5 versus 5.6%, $p < 0.001$). Readmissions rates were also significantly higher among episodes involving older patients (2.6% in children versus 5.3% in the elderly) and males (4.5% versus 3.9% in females, $p < 0.001$), being lower in Lisbon region (2.7%) and in central hospitals (3.0%, $p < 0.001$). For episodes of heart failure, we found a readmissions rate of 6.7%.

Discussion and Conclusion: Most of the differences found are consistent with those described in other Western countries. Readmission episodes, whose rates have been increasing in Portugal, are associated with higher hospital fatality rates.

Keywords: Patient Readmission; Portugal; Quality of Health Care; Hospital Mortality.

RESUMO

Introdução: Os reinternamentos hospitalares estão associados a um incremento das despesas com a saúde e da mortalidade intra-hospitalar. Neste trabalho, pretende-se caracterizar os reinternamentos hospitalares não-planeados, ocorridos num período de 30 dias após alta, de acordo com a sua Grande Categoria Diagnóstica, contexto hospitalar e características demográficas dos utentes, bem como estimar as taxas de mortalidade associadas. Pretende-se também estudar a evolução da taxa de reinternamentos na última década (2000-2008). Procurar-se-á ainda caracterizar os reinternamentos por insuficiência cardíaca.

Material e Métodos: Procedeu-se à análise estatística da base de dados de internamentos hospitalares públicos fornecida pela Autoridade Central do Sistema de Saúde. Recorreu-se aos testes do qui-quadrado e de tendência para comparação de taxas de reinternamentos.

Resultados: Das 5 514 331 hospitalizações não-planeadas no período em estudo, 4,1% corresponderam a reinternamentos hospitalares. Entre 2000 e 2008, a taxa de reinternamentos hospitalares aumentou continuamente de 3,0% para 4,7%. A mortalidade hospitalar foi significativamente maior entre os episódios de reinternamento (9,5%) do que nos restantes episódios (5,6%), $p < 0,001$. A taxa de reinternamentos foi significativamente maior em homens (4,5% versus 3,9% nas mulheres, $p < 0,001$) e doentes mais velhos (2,6% nas crianças e 5,3% nos idosos), sendo menor na região de Lisboa (2,7%) e nos hospitais centrais (3,0%, $p < 0,001$). Para os episódios de insuficiência cardíaca, foi obtida uma taxa de reinternamentos de 6,7%.

Discussão e Conclusão: Em termos gerais, as diferenças encontradas são similares às descritas noutros Países Ocidentais. Os episódios de reinternamento, cujas taxas têm vindo a aumentar em Portugal, estão associados a maior mortalidade intra-hospitalar.

Palavras-chave: Mortalidade Hospitalar; Portugal; Qualidade de Cuidados de Saúde; Readmissão do Doente.

INTRODUCTION

Efficient hospital management s account for patient´s needs, hospital organization and safety, as well as hospital financial sustainability. Due to the present financial crisis in western countries, it is becoming increasingly necessary to improve economic efficiency and reduce waste in the hospital sector. Several studies have shown that high readmission rates are related with an increase in healthcare sector expenditure decrease in healthcare quality and high hospital mortality rates.[1-4]

A hospital readmission can be defined as a new admission occurring within a 1-12 months period after discharge,[5] although this definition is not consensual in the scientific community.[4] In fact, generally speaking, the readmission rates in the US for adult patients is said to vary

1. Departamento de Ciências da Informação e da Decisão em Saúde. Faculdade de Medicina. Universidade do Porto. Porto. Portugal.
2. Centro de Investigação em Tecnologias e Sistemas de Informação em Saúde. Faculdade de Medicina. Universidade do Porto (CINTESIS). Porto. Portugal.

Recebido: 22 de Março de 2013 - Aceite: 09 de Setembro de 2013

between 5 and 29%, this wide gap being partly explained by the lack of uniformity in hospital readmission definition.[4] In Europe, readmission rates appear to be similar – in Spain, Alonso *et al.* found a 26% hospital readmission rate in 2001.[6]

In the US, economic pressure has resulted in a decrease in the length of hospital stay, from which an increase in the number of hospital readmissions may result,[4,7,8] with deleterious consequences.[1-3] In fact, some readmissions may be avoided, as they are related with premature hospital discharges, or with inadequate or ineffective healthcare.[5] According with Benbassat and Taragin, between 9 and 48% of readmissions could be prevented, as they are related with inadequate healthcare during the hospital stay.[5] In addition, according to the same study, between 12 and 75% of readmissions could be avoided with patient's education, a correct assessment before deciding discharge and the extension of healthcare to the household.[5] In fact, long-term home care support appears to play a major role in preventing hospital readmissions.[9,10]

Although readmissions are commonly used as a healthcare quality indicator, several studies have shown that these perform poorly in the assessment of this parameter.[11,12] As an example, Luthi *et al.* (2004) studied hospital readmissions in patients with cardiac failure and found they were not a reliable indicator of hospital healthcare quality.[13] Kossovsky *et al.* (2000) describes that in patients with congestive heart failure, non-planned hospital readmissions were more related to clinical and demographic characteristics than to healthcare quality in the hospital.[14]

In fact, several studies found that certain patient characteristics, such as age, gender, medical history and comorbidities, are related with readmissions rate,[1,3-5,12,15-19] These also vary with certain hospital characteristics.[7,20] As an example, it has been described that readmission rates are higher in central, larger (with more than 200 beds), more complex hospitals, with more sophisticated and specialized technologies, as these receive a higher proportion of gravely ill patients.[20]

As regards patient characteristics, in the US as well as in Europe, readmission rates are higher in older people.[3-5,16] As regards gender, we observe higher readmission rates in male patients.[3-5,16] Finally, with respect to diseases related to hospital readmissions, cardiovascular and respiratory disorders were especially prevalent.[5]

A decrease in hospital readmission rates allows for a decrease in hospital costs and an improvement in treatment quality.[5,21] As such, the characterization of hospital readmissions assumes great importance. Nevertheless, few studies have attempted to analyse hospital readmissions in Portugal as a result of which obtaining a reduction in readmission rate becomes a difficult task, justifying the main objective of our study.

In the present study, we aimed to assess the current dimension of non-planned hospital readmissions occurring in Portugal over a period of 30 days following hospital discharge, and how it has progressed over the last decade. Moreover, this study aimed to assess hospital mortality rates related to hospital readmissions. We also intended to analyse regional national variation in hospital readmission rates, in the framework of the particular hospital context and the patient's characteristics (namely, the assigned Major Diagnostic Category [MDC], gender and age).

In addition to studying hospital readmissions from an overall perspective, this study also aimed to describe readmissions of patients with a heart failure diagnosis according to demographic characteristics and the hospital context. The rationale behind the choice of heart failure lies not only with its major socio-economic impact,[22-24] but is also associated to the fact that previous studies showed that the adoption of strategies oriented to patients with heart failure and a high risk of readmission, are effective in reducing the risk of hospital readmission.[25,26]

Finally in this study, we aimed to compare our results with those found in similar studies carried out in other European countries and in the US.

MATERIAL AND METHODS

Statistical Analysis

We studied a database provided by the *Autoridade Central para os Sistemas de Saúde* (ACSS), including a record of every hospital stay occurring in Portuguese public hospitals (with the exception of the episodes that occurred in the archipelagos of Azores and in Madeira) over nine years (hospital discharges between 2000 and 2008). We only considered admission episodes and excluded from this analysis any ambulatory medical episodes.

This database also includes demographic and clinical information regarding the patients that stayed in the hospital, as well as information regarding the hospital where each hospital stay occurred, which allowed for the study of hospital readmission rates according to several variables. However, since the identification code of the same patient in this database differs from one year to the next and according to the hospital where the admission occurred, it was only possible to study intra-hospital readmissions occurring 30 days upon discharge, between February and December each year. As such, we only considered non-planned hospital readmissions occurring 30 days upon discharge and with the same assigned MDC as in the first hospital stay.

The study of readmission rates was carried out according to the year in which they occurred, aiming to detect changing rates and we highlight, as previously referred, that the database included clinical episodes occurring over a nine year period (2000 to 2008). The hospital mortality rate related to readmission episodes and with non-readmission episodes was calculated.

In addition, we aimed to determine if hospital readmission rates were correlated with the level of hospital complexity. Therefore, in order to group public hospitals according to complexity, we used a Classification of the Portuguese National Health System (*Sistema Nacional de Saúde*) that

distinguishes these healthcare institutions in *Hospitais Centrais* (Central Hospitals), *Hospitais Distritais* (District Hospitals) and *Hospitais Distritais Nível 1* (Level 1 District Hospitals), with Central Hospitals as the most complex and Level 1 District Hospitals as the least complex.[27] In order to study variation of readmission rates according to the geographic region, we adopted the NUTS II classification, in which Continental Portugal includes five regions – North, Center, Lisbon, Alentejo and Algarve.[28]

We also calculated the readmission rates related with each MDC, allowing for the identification of which groups of pathologies present higher readmission rates. It should be noted that this classification results from the sub-grouping hospital episodes in 26 exclusive diagnostic areas (generally related with a particular medical specialty).[29]

We also analysed hospital readmission rates according to gender and age group of readmitted patients. Patients were arranged in five age groups (0-14, 15-24, 25-44, 45-64 and +65); this distribution is commonly used by the National Institute of Statistics (*Instituto Nacional de Estatística (INE)*).[30]

Statistical analysis consisted of chi-square tests for nominal discrete variables linear-by-linear association tests for ordinal discrete variables considering as statistically significant *p* values less than 0.05. Data analysis was carried out using SPSS software, version 18.0 (SPSS, Inc., Chicago IL, USA).

Similar procedures were adopted to calculate unplanned hospital readmission rates at 30 days with respect to heart failure episodes. All episodes with a main or secondary diagnosis completed with one of the following ICD-9-CM codes, namely 428.x, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91 and 404.93, were considered to represent heart failure episodes.

Literature Survey

The studies used for comparison with our results were obtained through a search in three online databases – PubMed, ISI Web of Knowledge and Google Scholar. Studies were selected according to inclusion and exclusion criteria, including those aiming to assess non-planned hospital readmission rates occurring within a one-month period and relating to the same diagnostic group. Studies not written in Portuguese, English, Spanish or Italian were excluded.

RESULTS

Taking into account all hospital readmission episodes (*n* = 8,001,277), we found a total readmission rate of 6.8%. When considering only the non-programmed hospital episodes (*n* = 5,514,331), we obtained a hospital readmission rate at 30 days of 6.4%. When considering readmissions in a one month period related to non-planned hospital stays, but within the same MDC, we obtained a 4.1% rate (*n* = 227,459). Of note, all subsequently presented data only reports to non-planned readmissions within the same MDC.

Analysis of the readmission rates per year allows for the conclusion that this rate significantly increased between 2000 and 2008 ($p < 0.001$), with a higher increase between 2000 and 2004.The only year where the readmission rate did not increase in comparison to the previous year was 2008 (Fig. 1).

As regards mortality, the data obtained followed the trend that hospital readmissions were related with higher hospital mortality rates. More specifically, 9.5% of non-planned readmission episodes resulted in the patient´s death, a statistically significant difference from the 5.6% of the remaining non-planned episodes ($p < 0.001$).

Regarding the study of readmission rates per MDC, we

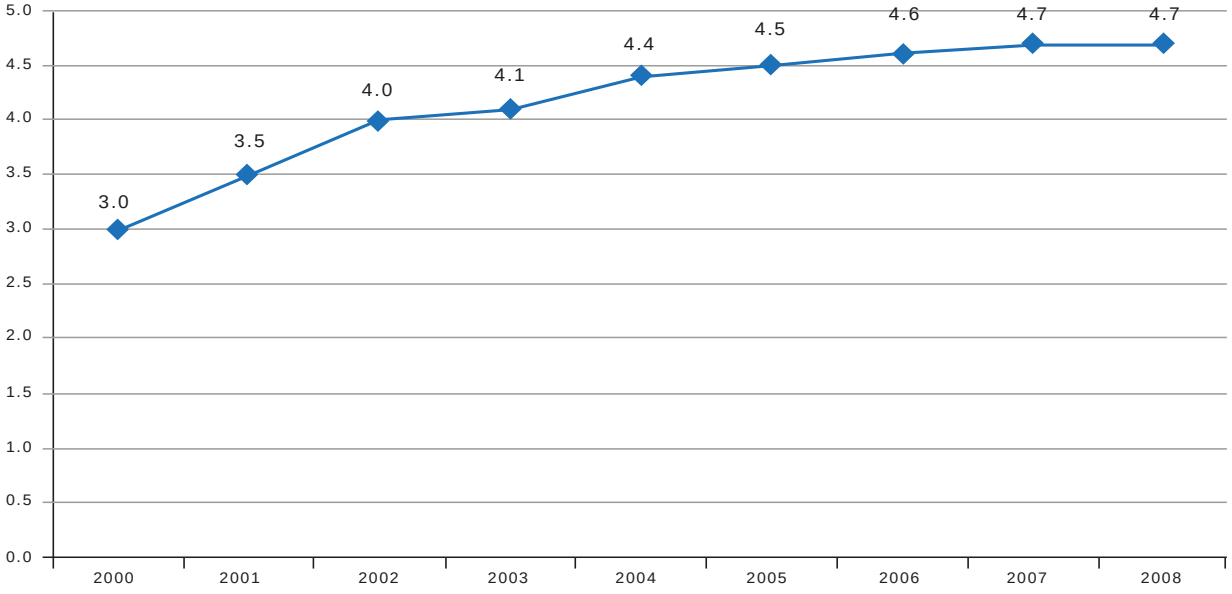

Figure 1 – Readmission rates (non-planned, due to the same MDC), per year.

Table 1 - Non-planned readmissions according with gender, age group, geographical location, hospital type and MDC

	(%)	Mortality (%)	
	Readmissions	Readmited patients	Non-readmited patients
Gender*			
Male	4.5	12.1	6.9
Female	3.9	7.1	4.6
Age group**			
0-14 years	2.6	0.4	0.3
15-24 years	3.8	0.6	0.5
25-44 years	3.5	2.5	1.1
45-64 years	5.1	10.6	5.9
≥ 65 years	5.3	16.4	13.3
Region*			
North	4.9	7.9	4.7
Center	4.4	9.9	5.8
Lisbon	2.7	11.4	6.2
Alentejo	5.1	11.7	7.2
Algarve	4.9	10.9	5.7
Hospital type**			
Central hospital	3.0	9.7	5.8
District hospital	4.7	9.3	5.4
Level 1 district hospital	5.9	11.2	7.0
Major Diagnostic Category (Diseases and Disorders) *			
0 – Ungroupable	0.4	18.6	19.9
1 – Nervous system	2.2	12.5	10.9
2 – Eye	3.1	0.3	0.4
3 – Ear, nose, mouth and throat	2.4	9.5	2.6
4 – Respiratory system	6.5	19.4	13.7
5 – Circulatory system	5.3	9.9	8.6
6 – Digestive system	3.8	15.1	6.0
7 – Hepatobiliary system and pancreas	9.1	13.9	9.3
8 – Musculoskeletal system and connective tissue	2.1	3.2	2.1
9 – Skin, subcutaneous tissue and breast	2.3	15.2	5.5
10 – Endocrine, nutritional and metabolic	4.4	5.6	6.5
11 – Kidney and urinary tract	6.4	7.3	6.2
12 – Male reproductive system	5.1	19	11.7
13 – Female reproductive system	4.6	10	3.8
14 – Pregnancy, childbirth and the puerperium	3.7	< 0.1	< 0.1
15 – Newborn and neonatal conditions began in perinatal period	2.2	0.2	0.3
16 – Blood, blood forming organs, immunological	7.0	2.4	3.8
17 – Myeloproliferative and poorly differentiated neoplasms	19.5	10.3	22.3
18 – Infectious and parasitic	1.7	7.5	14.7
19 – Mental	4.8	0.3	0.8
20 – Alcohol/drug use and alcohol/drug induced organic mental	2.0	0.4	1.1
21 – Injuries, poisoning and toxic effects of drugs	1.4	1.5	2.8
22 - Burns	0.5	< 0.1	3.9
23 – Factors on health status and other contacts with health services	2.9	5.8	6.3
24 – Multiple significant trauma	7.8	17.9	16.2
25 – Human immunodeficiency virus infections	0.5	2.7	12.3

* Statistically significant differences, according to the chi-square test ($p < 0.001$)

** Statistically significant differences, according to linear association testing (linear-by-linear association) ($p < 0.001$)

also found statistically significant differences, with MDC 17 (which included myeloproliferative and poorly differentiated neoplasms) as the one that presented the highest readmission rate. Nevertheless, between readmission episodes, intra-hospital mortality rate is higher for MDC 4, which is related with respiratory disorders (Table 1).

In terms of demographic trends, the readmission rate obtained in males is higher than in females (4.5 *vs*. 3.9%) with a statistically significant difference ($p < 0.001$). In addition, intra-hospital mortality rate concerning the readmissions of male is much higher than in female patients (12.1 *vs*. 7.1, Table 1).

We also found statistically significant differences ($p < 0.001$) regarding the variation of readmission rates per age group and we found that these rates (such as related intra-hospital mortality rates) increase hand-in-hand with the age group (from 2.6% in 0-14 age group to 5.3% in the above 65 group).

In what concerns the location of the hospital, we also found statistically significant differences ($p < 0.001$), Lisbon being the region with the lowest readmission rate (2.7%), highest in Alentejo (5.1%). Nevertheless, intra-hospital mortality related with readmissions was lower in the North (7.9%) and higher in Alentejo (11.7%) and Lisbon (11.4%) (Table 1).

In addition, readmission percentage seems inversely correlated with the hospital's complexity (Table 1) in that Central Hospitals present a lower percentage of readmissions (3.0% *vs*. 4.7% and 5.9% in the remaining two groups, $p < 0.001$). This correlation may be partially explained by the fact that hospital stay percentage of patients aged 65 and above also seems inversely correlated

Table 2 – Non-planned hospital stay and hospital readmission rate according to the age group of each level of hospital complexity

		0-14 years		15-24 years		25-44 years		45-64 years		≥ 65 years	
		H*	R**	H*	R**	H*	R**	H*	R**	H*	R**
Hospital complexity	Central hospital	21.8	2.2	7.1	2.8	23.4	2.6	15.6	3.6	32.1	3.5
	District hospital	23.8	2.7	7.3	4.3	21.7	4.0	13.4	6.0	33.7	6.1
	Level 1 District hospital	16.5	4.6	5.6	4.4	15.1	4.8	14.3	6.4	48.6	6.7

* Hospital stays (%)

** Readmission rate (%)

Table 3 – Hospital stay and hospital readmission rate according to hospital type in mainland Portugal regions

		Central Hospital		District Hospital		Level 1 District Hospital	
		H*	R**	H*	R**	H*	R**
Region	North	35.7	3.5	55.4	5.7	9.0	5.6
	Center	25.6	2.2	68.3	5.0	6.2	6.4
	Lisbon	58.6	2.9	40.7	2.3	0.7	5.2
	Alentejo	0.0	-	95.9	5.0	4.1	5.0
	Algarve	0.0	-	100.0	4.9	0.0	-

* Hospital stays (%)

** Readmission rate (%)

with the hospital's complexity level (Table 2). However, even according with the age group, this readmission percentage is always considerably lower in central hospitals when comparing with the other groups.

In turn, the correlation between hospital complexity and readmission rate may partially explain the fact that readmission rates vary according to the country's region. In fact, Lisbon is both the region with the lowest readmission rate and the highest rate of patients visiting Central Hospitals (Table 3). In contrast, Alentejo and Algarve, characterized by the highest readmission rates, are regions without any Central Hospital (Table 3).

Hospital Readmissions in Patients with Heart Failure

When considering all non-planned hospital stays due to heart failure (n = 315,321), we found a hospital readmission rate at 30 days of 6.7% (n = 21,165). Readmission rate of patients with heart failure has increased significantly, between 2000 and 2008 ($p < 0.001$). Although presenting higher fluctuations, generally speaking, hospital mortality increased over the period considered in the study, in readmitted patients as well as in non-readmitted patients, and this rise was higher in readmitted patients (Table 4).

In any case, we did not find any significant difference in the hospital mortality between readmitted (17.2%) and non-readmitted patients with heart failure (16.9%) (p = 0.367). In fact, contrary to what would be expected, in Alentejo, hospital mortality is significantly higher in non-readmitted patients (20.6% *vs.* 18.7%, p = 0.047), with a similar situation between patients aged 0-14 (15.1% *vs.* 6.0%, p = 0.03) (Table 4).

As what would be expected, readmission rate observed in male patients is significantly higher than in female patients (7.1 *vs*. 6.4%, $p < 0.001$). In addition, we found statistically significant differences ($p < 0.001$) regarding the variation of readmission rate by age group, with higher rates in the 0-14 age group (11.3%) and with similar rates in the remaining age groups. In contrast, intra-hospital mortality is higher in older patients (Table 4).

Regarding regions, we also found statistically significant differences (Table 4). In fact, we found that readmission rate of patients with heart failure is lower in the Lisbon region (4.7%) and higher in the Algarve (8.6%) and in Alentejo (8.1%). These latter two regions also present the highest intra-hospital mortality in readmitted patients (20.2% and 18.7%, respectively). In contrast, in the Northern region intra-hospital mortality in readmitted patients is the lowest (16.4%).

In what concerns hospital complexity, Central Hospitals present a lower readmission percentage (4.5%), when comparing with District and Level 1 District Hospitals (7.7% and 8.3%, respectively). Additionally, District Hospitals present higher hospital mortality in patients with heart failure (Table 4).

Comparison with Other Studies

We could not find any national study for comparison with our results. However, we found several studies analysing non-planned readmission rates at 30 days with the same diagnosis group in a particular hospital or city (Table 5).

DISCUSSION

The results found in our study showed that hospital readmission rate increased over the studied period, in agreement with published data.[4,7,8]

Hospital mortality rates are also higher in readmitted patients, compared to non-readmitted patients as previously described,[3,4] probably explained by the fact that hospital readmissions are more frequent in more serious situations, inefficient healthcare during the first hospital stay being a possible contributing factor. In line with previous studies, we found higher readmission rates in male patients. This may be explained by the fact that these patients present higher mortality and severity, when compared with female patients in the same age group.[16]

As would be expected, readmission rate is significantly higher in older patients, probably explained by the fact that their health is more fragile and due to the presence of more comorbidities. As such, in older patients, morbidity and functional disability are considered as risk factors for hospital readmissions.[31]

In contrary to what would be expected, hospital complexity is inversely correlated with readmission rate. This may be explained by the fact that more complex hospitals present better performance and efficiency indices. In addition, it should be stated that according to the data used in our study, Level 1 District Hospitals present higher percentage of patients aged 65 or above (Table 2), corresponding to the age group with higher readmission rate.

Regarding analysis by national regions, results show that readmission rates are lower in Lisbon region, which may be explained by the fact that patients living in that region are mostly treated in Central Hospitals (where readmission rate is lower). In fact, according to data presented in Table 3, 58.6% of hospital stays that occurred in Lisbon region took place in Central Hospitals (Lisbon is the region with the highest percentage of hospital stays occurring in these type of hospitals). In contrast, Alentejo and Algarve are the only Continental Portuguese regions without Central Hospitals,[27] what may partially explain the fact of having a higher readmission rate.

Moreover, regional variations in readmission rates may also be partially explained by age differences. In fact, the average age in mainland Portugal (corresponding to 39.2) is lower than the recorded averages in Alentejo and Algarve (42.6 and 40.8, respectively).[30] In addition, the percentage of patients aged 65 or above is higher in Alentejo and in the Algarve, when comparing with the national average. In fact, 16.5% of patients in mainland Portugal are aged 65 or above. In the Alentejo and in the Algarve, 22.3% and 18.6% of patients are in that age group, respectively.[30] However, we should note that, despite Center region presenting a more aged population than the Algarve (the average age

Table 4 - Non-planned hospital readmission rate in patients with heart failure, according to the year when it occurred, gender, age group, geographical region and hospital type

	(%)	Mortality (%)	
	Readmissions	**Readmitted patients**	**Non-readmitted patients**
Year**			
2000	4.7	15.6	16.4
2001	5.4	16.4	16.4
2002	6.5	17.2	17.2
2003	6.5	18.4	17.3
2004	6.7	18.0	16.2†
2005	6.8	16.8	17.3
2006	7.2	17.2	16.9
2007	7.9	16.9	17.1
2008	7.8	17.3	17.3
Gender*			
Male	7.1	18.2	17.1
Female	6.4	16.2	16.7
Age group**			
0-14 years	11.3	6.0	15.1†
15-24 years	6.5	3.3	12.6
25-44 years	6.8	9.5	9.8
45-64 years	6.9	10.6	9.3†
≥ 65 years	6.7	18.2	18.0
Geographical region*			
North	7.4	16.4	15.3
Center	7.0	17.1	17.1
Lisbon	4.7	17.4	17.4
Alentejo	8.1	18.7	20.6†
Algarve	8.6	20.2	20.1
Hospital type**			
Central hospital	4.5	16.1	16.2
District hospital	7.7	17.7	17.6
Level 1 District hospital	8.3	16.2	14.8

* Statistically significant differences found for the values presented in the column "Readmissions (%)", according to square-test ($p < 0.001$)

** Statistically significant differences found for the values presented in the column "Readmissions (%)", according to the linear association test (linear-by-linear association) ($p < 0.001$)

† Statistically significant differences between mortality in readmitted and non-readmitted patients. The obtained p values were 0.024; 0.03; 0.039 and 0.047; respectively for mortality differences in 2004 in 0-14, 45-64 age groups and in Alentejo.

in Center region is approximately 40.79 and there are approximately 19.4% of patients aged 65 or above),[30] there are several Central Hospitals in the Center region, absent in the Algarve.[27]

As we could not find any nation-wide study presenting non-planned hospital readmission rate in a one-month period, with the same MDC, it is not possible to establish any comparison between readmission rates in different

Table 5 - Non-planned readmission rates at one month period, due to the same diagnostic category, found in studies carried out by foreign authors

Study	Population	Readmissions (%)
Abenhaim et al, 2000[42]	Patients in a Montreal hospital (Canada) 1995-1996	**9.6**
Allaudeen et al, 2011[43]	Patients in a San Francisco university hospital (California, USA) 2006-2008	**4.4**
García Ortega et al, 1998[44]	Patients in a Algeciras hospital (Spain) 1995-1996	**3.5**
Maurer et al, 2004[45]	All patients admitted to the Internal Medicine Department at a Winterthur hospital (Switzerland), in May 1998	**4.1**
Seoane González et al, 2010[46]	Patients in a La Coruña university hospital (Spain)	**8.4** *
van Walraven et al, 2010[47]	Patients in eleven hospitals in Ontario (Canada) 2002-2006	**7.3**

* This result refers to readmission rate at 28 days and not 30 days

countries. However, in general, there does not seem to be any geographical tendency for readmission rates, as the results found in the US are similar to those found for European hospitals.

In the present study, we obtained lower results in patients with heart failure when comparing with the results obtained in most foreign studies – in the US, several studies suggest that, in patients with heart failure, readmission rate is usually above 10%,[32] while readmission rate due to all causes is usually above 20%.[23,32,33] The results found in European studies seem in line with those found in American studies.[34,35] Interestingly, Allen *et al.* found similar results as those obtained in our study.[36] The association between male patients and a higher risk of readmission in patients with heart failure is also in agreement with other studies.[37,38] However, in contrast with what was described in the present study, most studies found a direct correlation between hospital complexity and the readmission rate.[37,38]

The main limitation of our study regards the fact that only episodes that occurred in public hospitals and in mainland Portugal were included (therefore excluding hospital stays that occurred in private hospitals and in the archipelagos of Azores and Madeira). However, these episodes refer to approximately 85% of hospital stays in Portugal. In addition, as the identification code changes from year to year and according to the hospital, the hospital readmission rate that we obtained may be slightly lower than the real value.

The fact that we analysed administrative data may also represent a limitation for a generalization of the results, due to possible inaccuracy or insufficiency.[39-41] However, administrative data are commonly used in health studies, due to the fact that it is easily accessible and allowing for reducing costs.[34]

In addition, we should note that, to the best of our knowledge, there are no published studies regarding non-planned hospital readmissions at 30 days in Portugal, preventing a direct comparison to the results that we found. We envisage the present study may be helpful as it is the first study of its kind in Portugal. It may be useful for hospital management, as it identifies factors which are correlated with higher hospital readmission rates. We hope these results may have positive effects on the *Sistema Nacional de Saúde*, as the identification of hospital readmissions is a starting point for their reduction. In addition, we analysed every recorded acute episode in mainland Portugal public hospitals occurring between 2000 and 2008, allowing for more precise conclusions and for a measure of hospital readmission rates over almost one decade.

CONCLUSIONS

From all factors correlated with higher readmission rates, we emphasize those episodes that occurred in older male patients, living out of Lisbon region and that were attended in less-complex hospitals. Hospital readmission rate has increased over the last decade and considering that hospital mortality rates are higher in readmission episodes, it is crucial to adopt measures to reduce readmission rates.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the *Administração Central do Sistema de Saúde, IP (ACSS)* for the availability of data used in this research study.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interests in the writing of this manuscript.

FINANCIAL SOURCES

The authors declare there were no external financial sources in the writing of this manuscript.

REFERENCES

1. Jweinat JJ. Hospital readmissions under the spotlight. J Healthc Manag. 2010;55:252-64.
2. Chrusch CA, Olafson KP, McMillan PM, Roberts DE, Gray PR. High occupancy increases the risk of early death or readmission after transfer from intensive care. Crit Care Med. 2009;37:2753-8.
3. Sicras MA, Navarro AR. Valoracion del reingreso hospitalario en el servicio de medicina interna. Med Clin. 1993;101:732-5.
4. Hasan M. Readmission of patients to hospital: still ill defined and poorly understood. Int J Qual Health Care. 2001;13:177-9.
5. Benbassat J, Taragin M. Hospital readmissions as a measure of quality of health care: advantages and limitations. Arch Intern Med. 2000;160:1074-81.
6. Alonso MJL, Llorente DB, Echegaray AM, Urbieta EMA, Gonzalez AC. Reingreso hospitalario en Medicina Interna. An Med Interna. 2001;18:248-54.
7. Heggestad T. Do hospital length of stay and staffing ratio affect elderly patients' risk of readmission? A nation-wide study of Norwegian hospitals. Health Serv Res. 2002;37:647-65.
8. Bueno H, Ross JS, Wang Y, Chen J, Vidan MT, Normand SL, et al. Trends in length of stay and short-term outcomes among Medicare patients hospitalized for heart failure, 1993-2006. JAMA. 2010;303:2141-7.
9. Damiani G, Federico B, Venditti A, Sicuro L, Rinaldi S, Cirio F, et al. Hospital discharge planning and continuity of care for aged people in an Italian local health unit: does the care-home model reduce hospital readmission and mortality rates? BMC Health Serv Res. 2009;9:22.
10. Vavouranakis I, Lambrogiannakis E, Markakis G, Dermitzakis A, Haroniti Z, Ninidaki C, et al. Effect of home-based intervention on hospital readmission and quality of life in middle-aged patients with severe congestive heart failure: a 12-month follow up study. Eur J Cardiovasc Nurs. 2003;2:105-11.
11. Rosenberg AL, Watts C. Patients readmitted to ICUs*: a systematic review of risk factors and outcomes. Chest. 2000;118:492-502.
12. Fernandez GJ, Martinez GM, Garcia RJ, Bueno CA, Lardelli CP, Garcia MM. Factores asociados a la incidencia de reingresos hospitalarios. Med Clin. 1997;108:4-8.
13. Luthi JC, Burnand B, McClellan WM, Pitts SR, Flanders WD. Is readmission to hospital an indicator of poor process of care for patients with heart failure? Qual Saf Health Care. 2004;13:46-51.
14. Kossovsky MP, Sarasin FP, Perneger TV, Chopard P, Sigaud P, Gaspoz J. Unplanned readmissions of patients with congestive heart failure: do they reflect in-hospital quality of care or patient characteristics? Am J Med. 2000;109:386-90.
15. Billings J, Dixon J, Mijanovich T, Wennberg D. Case finding for patients at risk of readmission to hospital: development of algorithm to identify high risk patients. BMJ. 2006;333:327.
16. Moloney ED, Bennett K, Silke B. Patient and disease profile of emergency medical readmissions to an Irish teaching hospital. Postgrad Med J. 2004;80:470-4.
17. Chin MH, Goldman L. Correlates of early hospital readmission or death in patients with congestive heart failure. Am J Cardiol. 1997;79:1640-4.
18. Anderson GF, Steinberg EP. Predicting hospital readmissions in the Medicare population. Inquiry. 1985;22:251-8.
19. Romansky JB, Lyons JS, Lehner RK, West CM. Factors related to psychiatric hospital readmission among children and adolescents in state custody. Psychiatr Serv. 2003;54:356-62.
20. Ansari MZ, Collopy BT, Booth JL. Hospital characteristics associated with unplanned readmissions. Aust Health Rev. 1995;18:63-75.
21. Jha AK, Orav EJ, Epstein AM. Public reporting of discharge planning and rates of readmissions. N Engl J Med. 2009;361:2637-45.
22. Shah KB, Rahim S, Boxer RS. Heart failure readmissions. Curr Treat Options Cardiovasc Med. 2013;15:437-49.
23. Zaya M, Phan A, Schwarz ER. Predictors of re-hospitalization in patients with chronic heart failure. World J Cardiol. 2012;4:23-30.
24. Fida N, Pina IL. Trends in heart failure hospitalizations. Curr Heart Fail Rep. 2012;9:346-53.
25. Basoor A, Doshi NC, Cotant JF, Saleh T, Todorov M, Choksi N, et al. Decreased readmissions and improved quality of care with the use of an inexpensive checklist in heart failure. Congest Heart Fail. 2013;19:200-6.
26. Amarasingham R, Patel PC, Toto K, Nelson LL, Swanson TS, Moore BJ, et al. Allocating scarce resources in real-time to reduce heart failure readmissions: a prospective, controlled study. BMJ Qual Saf. 2013.
27. Ministério da Saúde. Diário da República, Portaria n.º 281/2005 de 17 de Março. [consultado em 2012 Jun 27]. Disponível em: http://www.dre.pt/pdf1s/2005/03/054B00/24302431.pdf.
28. Ministério da Saúde. Diário da República, Portaria n.º 255/2002 de 5 de Novembro. [consultado em 2012 Jun 27]. Disponível em http://dre.pt/pdf1sdip/2002/11/255A00/71017103.pdf.
29. Ministério da Saúde. Diário da República, Portaria n.º 113/2006 de 12 de Junho. [consultado em 2012 Jun 27]. Disponível em http://www.acss.min-saude.pt/Portals/0/Port_567_2006_12%20de%20Junho.pdf.
30. Instituto Nacional de Estatística. Resultados Definitivos dos Censos 2001 [consultado em 2012 Jun 27]. Disponível em: http://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=ine_censos_publicacoes&pcensospagenumber=2.
31. Garcia-Perez L, Linertova R, Lorenzo-Riera A, Vazquez-Diaz JR, Duque-Gonzalez B, Sarria-Santamera A. Risk factors for hospital readmissions in elderly patients: a systematic review. QJM. 2011;104:639-51.
32. Robertson J, McElduff P, Pearson SA, Henry DA, Inder KJ, Attia JR. The health services burden of heart failure: an analysis using linked population health data-sets. BMC Health Serv Res. 2012;12:103.
33. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. N Engl J Med. 2009;360:1418-28.
34. Zapatero A, Barba R, Gonzalez N, Losa JE, Plaza S, Canora J, et al. Influence of obesity and malnutrition on acute heart failure. Rev Esp Cardiol. 2012;65:421-6.
35. Schiotz M, Price M, Frolich A, Sogaard J, Kristensen JK, Krasnik A, et al. Something is amiss in Denmark: a comparison of preventable hospitalisations and readmissions for chronic medical conditions in the Danish Healthcare system and Kaiser Permanente. BMC Health Serv Res. 2011;11:347.
36. Allen LA, Smoyer Tomic KE, Smith DM, Wilson KL, Agodoa I. Rates and predictors of 30-day readmission among commercially insured and Medicaid-enrolled patients hospitalized with systolic heart failure. Circ Heart Fail. 2012;5:672-9.
37. Coffey RM, Misra A, Barrett M, Andrews RM, Mutter R, Moy E. Congestive heart failure: who is likely to be readmitted? Med Care Res Rev. 2012;69:602-16.
38. Caminal J, Hermosilla E, Sanchez E, Urrea M, Puig P, Tomas L. Estudio longitudinal de los reingresos en pacientes con insuficiencia cardiaca en Cataluna, 1996-1999. Rev Esp Salud Publica. 2004;78:267-76.
39. Freitas A, Silva-Costa T, Lopes F, Garcia-Lema I, Teixeira-Pinto A, Brazdil P, et al. Factors influencing hospital high length of stay outliers. BMC Health Serv Res. 2012;12:265.
40. Freitas JA, Silva-Costa T, Marques B, Costa-Pereira A. Implications of Data Quality Problems within Hospital Administrative Databases. IFMBE Proceedings. 2010;29:3.
41. Torchiana DF, Meyer GS. Use of administrative data for clinical quality measurement. J Thorac Cardiovasc Surg. 2005;129:1223-5.
42. Abenhaim HA, Kahn SR, Raffoul J, Becker MR. Program description: a hospitalist-run, medical short-stay unit in a teaching hospital. CMAJ. 2000;163:1477-80.

43. Allaudeen N, Vidyarthi A, Maselli J, Auerbach A. Redefining readmission risk factors for general medicine patients. J Hosp Med. 2011;6:54-60.
44. Garcia Ortega C, Almenara Barrios J, Garcia Ortega JJ. Tasa de reingresos de un hospital comarcal. Rev Esp Salud Publica. 1998;72:103-10.
45. Maurer PP, Ballmer PE. Hospital readmissions--are they predictable and avoidable? Swiss Med Wkly. 2004;134:606-11.
46. Seoane Gonzalez B, Nicolas Miguel R, Ramos Polledo V, Pellicer Vazquez C, de la Iglesia Martinez F. Unidad de corta estancia medica. Causas de reingreso. Rev Clin Esp. 2010;210:118-23.
47. van Walraven C, Dhalla IA, Bell C, Etchells E, Stiell IG, Zarnke K, et al. Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community. CMAJ. 2010;182:551-7.

Bernardo SOUSA-PINTO, Ana Rita GOMES, Andreia OLIVEIRA, Carlos IVO, Gustavo COSTA, João RAMOS, Joel SILVA, Maria Carolina CARNEIRO, Maria João DOMINGUES, Maria João CUNHA, Altamiro da COSTA-PEREIRA, Alberto FREITAS

Hospital Readmissions in Portugal over the Last Decade

Acta Med Port 2013:26:711-720

Publicado pela **Acta Médica Portuguesa**, a Revista Científica da Ordem dos Médicos

Av. Almirante Gago Coutinho, 151
1749-084 Lisboa, Portugal.
Tel: +351 218 428 215
E-mail: submissao@actamedicaportuguesa.com
www.actamedicaportuguesa.com
ISSN:0870-399X | e-ISSN: 1646-0758