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ORIGINAL PAPER

Respiratory medicine

Differential characteristics of cases of patients diagnosed with pneumonia and delayed discharge for non-clinical reasons in Northern Spain

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Abstract

Background: Delayed discharge for non-clinical reasons is related to a failure to plan for discharge and a lack of availability of intermediate care resources as an alternative to acute hospitalisation. The literature concerning the relationship with pneumonia is scarce. At present, the coronavirus pandemic is a new cause of complicated pneumonias that can further affect the functionality of the most fragile patients.

Objective: The aim of this study was to understand what characteristics are typical of patients affected by pneumonia, compared with other cases of delayed discharge.

Methods: A cross-sectional study was conducted. All cases of delayed discharge were studied at the hospitalisation units of a general university hospital in Northern Spain from 2007 to 2015. In order to compare the differential characteristics of the groups of patients with pneumonia with the total Student's T-test and Pearson's chi-square test (χ^2) were used.

Results: 170 patients were identified with a diagnosis of pneumonia and delayed discharge for non-clinical reasons during the study period. These cases accumulated a total of 4790 days of total stay, of which 1294 days corresponded to the prolonged stay. The mean age of the patients was 80.23 years. The mean DRG weight was 2.28 [SD 0.579], and 14.12% of patients with pneumonia and delayed discharge died. So, patients with pneumonia were older ($P = .001$), less complex ($P = .001$) and suffered greater deaths compared with the remaining patients ($P = .001$).

Conclusions: The sum of these factors has to do with comorbidities and complications associated with ageing and the characteristics of conditions such as aspiration pneumonia.

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1 | BACKGROUND

The phenomenon of delayed discharge for non-clinical reasons, popularly known in the literature as bed-blocking, is defined as *"the period of continued hospital stay after a patient is deemed medically fit to leave hospital but is un-able to do so for non-medical reasons"*.[1] The studies consulted reveal significant variations in prevalence depending on the context, ranging from 1.6% to 91.3%, with an average of 22.8%.[2] The UK is the country that has accumulated the most research on this problem since the 1970s, related to the phenomenon of population ageing and the need to suitably attend to patients with varying care requirements.[3] In the UK, delayed discharge is continuously monitored and is considered an important indicator of quality, where the number of stays affected by delayed discharge in the 2018/2019 period was 8.5%, revealing an increasing trend compared with the previous period.[4] However, in Spain, despite the impact of population ageing and concerns regarding the average length of stay as a hospital efficiency indicator,[5] there is no such monitoring and there are few studies published on delayed discharge for non-clinical reasons. These studies reveal variations according to the study population, from 0.93% of delayed discharges for non-clinical reasons to the total patients discharged from a hospital of high complexity over a period of nine years,[6] or up to 3.5% of cases in the case of internal medicine hospitalisation units.[7]

Certain patient characteristics have been related to a higher probability of suffering a delayed discharge for non-clinical reasons. Although the role of gender is inconclusive,[8-10] numerous studies agree that delayed discharge is more common in older people[8,9,11-19] and is associated with pathologies of greater clinical complexity,[8,9,14] to those involving loss of functional capacity,[8,9,12,15,16,20] or pathologies with added social risk such as those with cognitive impairment.[12,15,16,18,20] From the point of view of the process of care, it seems that a delayed discharge for non-clinical reasons is more likely in the case of urgent admissions[18] and in therapeutic procedures involving surgery.[8,12] Moreover, several studies have reported the negative effect of discontinuity on patient follow-up[12] in hospitals that treat more complex cases,[10] when there is a need for functional recovery and rehabilitation after acute hospitalisation[12,20] and if the patient is transferred directly from the hospital to a nursing home for dependent people.[11,12,14] At the family level, influential factors include the lack of a primary caregiver or the inability of the primary caregiver to assume care after discharge,[20-22] living alone or having a weak social support network.[16,19]

It is well known that, in general terms, delayed discharge for non-clinical reasons is related to a failure to plan for discharge and a lack of availability of intermediate care resources as an alternative to acute hospitalisation.[17] The lengthening of the stay is related to problems that imply a dependency for self-care as a consequence of illness or injury that makes the patient require the support of a third person, making it difficult for the patient to be discharged to their usual environment. In the studies consulted on delayed discharge for non-clinical reasons, the most common categories that appear are those of the nervous system,[20] musculoskeletal, primarily traumatic[6,13] and circulatory.[13] There is a clear relationship with pathologies that lead to an acute loss of functional capacity in elderly patients, such as stroke or hip fracture.[9,13,20-22] However, the literature on this topic is scarce. Therefore, the study of delayed discharge for non-clinical reasons in pneumonia, which has also been related to a functional worsening in our context, especially in older patients, is a novel line of study.[23]

What's already known about this topic?

- Delayed discharge for non-clinical reasons is related to a failure to plan for discharge and a lack of availability of intermediate care resources as an alternative to acute hospitalisation.
- The literature concerning the relationship with pneumonia is scarce.
- At present, the coronavirus pandemic is a new cause of complicated pneumonias that can further affect the functionality of the most fragile patients.

What does this article add?

- To understand what characteristics are typical of patients affected by pneumonia, compared with other cases of delayed discharge.
- Patients with pneumonia were older, less complex, and suffered greater deaths compared with the remaining patients.

At present, the coronavirus pandemic is a new cause of complicated pneumonias that can further affect the functionality of the most fragile patients. In addition, the risk of exposure because of hospitalisation is more evident, even more so if the stay is extended because of factors that are external to the clinical process.[24] In this context, it is interesting to understand what characteristics are typical of patients affected by pneumonia, compared with other cases of delayed discharge.

Therefore, the aims of this study were to describe the characteristics of patients diagnosed with pneumonia and delayed discharge for non-clinical reasons and to compare the group of patients with pneumonia with the total patient population in terms of differences in length of stay, patient characteristics and factors specific to the care setting.

2 | MATERIALS AND METHODS

A descriptive, observational, cross-sectional study was conducted, based on the period from 1 January 2007 to 31 December 2015. The study setting was the "Marqués de Valdecilla" University Hospital (HUMV), in the north of Spain. This is a publicly owned hospital with teaching accreditation, which had 903 hospitalisation beds at the end of the study period[25] and which directly served a population of

319 751 users, as well as being a national reference for certain highly qualified care and technological services.[26]

The study population was the total number of cases with delayed discharge for non-clinical reasons during the 2007-2015 period. This study included all patients identified as being ready for discharge by the hospital's admissions department, yet whose discharge was delayed by more than 24 hours. Patients discharged to other hospitals or in the care of the hospital's own home hospitalisation service were excluded.

The research protocol was approved by the Cantabria Clinical Research Ethics Committee and the relevant institutional permits were obtained from the hospital management. The data were anonymised and treated confidentially according to the Regulation (EU) 2016/679 and the Organic Law 3/2018 of 5 December on Personal Data Protection and guarantee of digital rights.[27,28]

The study data was collected from information provided by the hospital's Admission Services and Analytical Accounting (AC). The information was based on the Minimum Basic Data Set at Hospital Discharge (MBDSHD) of the cases. Of the total number of cases of delayed discharge for non-clinical reasons, the patients affected by pneumonia were identified and compared with the total. The DRGs included in the group with pneumonia were: DRG 79 (respiratory infections and inflammations except simple pneumonia, >17 years old with complications), DRG 80 (respiratory infections and inflammations except simple pneumonia, >17 years old without complications), DRG 89 (simple pneumonia and pleurisy, >17 years old with complications) DRG 90 (simple pneumonia and pleurisy, >17 years old without complications), DRG 540 (respiratory infections and inflammations except simple pneumonia with major complications) and DRG 541 (simple pneumonia and other respiratory disorders except bronchitis and asthma, with major complications). The coding of the DRGs was version 25.0, in force at the end of the study period.[29]

Among the variables compared, a distinction was made between those related to periods of stay, patient variables and those related to care process. Regarding the hospitalisation period, the duration in days of what was considered an appropriate length of stay (between date of admission and medical discharge), extended stay (between date of medical discharge and effective discharge) and total stay (sum of the above) was counted. The patient-related variables were age, gender and relative weight of the DRG were evaluated to determine the complexity of the process. Regarding the care process, the following were recorded: type of admission (urgent or programmed), place of residence (urban for residents in the region of Santander and rural for the remaining regions of Cantabria), year of medical discharge and destination at discharge. The possible destinations for discharge were classified as: long-term care centre, home, death during a long stay, and a nursing home for dependent persons.

The difference between the total stay of the cases found and what would have corresponded for the same DRG and year of discharge was estimated according to data provided by the hospital.

All data were analysed using R 3.6.0 for Windows. In the descriptive analysis, proportions with their corresponding 95% confidence intervals (95% CI) were estimated for the discrete variables. For continuous variables, means were estimated with their standard deviation (SD). In order to compare the differential characteristics of the groups of patients with pneumonia with the total number of cases of delayed discharge for non-clinical reasons, in the case of continuous quantitative variables, we compared these by means of the Student's T-test and Pearson's chi-square test (χ^2) for categorical variables. An adjustment was made for multiple comparisons applying Bonferroni's correction, considering a p value less than or equal to 0.0015 to be significant.

3 | RESULTS

In total, 170 patients were identified with a diagnosis of pneumonia and delayed discharge for non-clinical reasons (bed-blocking) during the study period. The characteristics of these cases are shown in Table 1.

The appropriate length of stay (between the date of admission and medical discharge), extended stay (between the date of medical discharge and effective discharge) and total stay (sum of the above) was counted.

These cases accumulated a total of 4790 days of total stay (number of days between the date of admission and effective discharge), of which 1294 days corresponded to the prolonged stay (number of days between the date of medical discharge and effective discharge). The mean length of the total stay was 28.17 days [SD 21.08]. The mean length of appropriate stay (number of days between the date of admission and medical discharge) was 20.56 days [SD 13.88] and the mean length of prolonged stay was 7.61 days [SD 13.04].

The mean length of stay that would have corresponded to the same DRG and year of discharge for each case if there had been no delay was 11.58 days [SD 2.27]. Comparing the total length of stay in these cases with the length of stay that would have corresponded, the mean difference was 16.58 [SD 20.80] additional days of stay.

The proportion of women was 44.12% (95%CI 36.52; 51.92). The mean age of the patients was 80.23 years [SD 9905], ranging from 44 to 98 years. The mean DRG weight was 2.28 [SD 0.579], ranging from 0.80 to 3.62. Up to 80.59% (95%CI 73.83; 86.25) lived in an urban area coinciding with the region where the hospital is located. 98.23% (95%CI 94.93; 99.63) were admitted as emergencies. 72.94% (95%CI 65.60; 79.46) were discharged to a long-term care centre for functional recovery. The year 2008 had the highest number of cases (20.59%, IC95% 14.78; 27.45) after which a decreasing trend was observed.

Table 1 also displays the differential characteristics of those classified with DRG codes related to pneumonia compared with the other cases of delayed discharge. Patients with pneumonia were older ($P = .001$), less complex ($P = .001$) and suffered greater deaths compared with the remaining patients ($P = .001$). There were no differences in terms of length of stay, gender, mode of admission, place of residence or years ($P > .0015$ by Bonferroni correction for adjustment with multiple comparisons).

TABLE 1 Comparison of cases with pneumonia vs other cases of delayed discharge for non-clinical reasons. Marqués de Valdecilla University Hospital (Cantabria), 2007-2015

		Pneumonia (n = 170)	Range	SD, 95%CI[a]	No Pneumonia (n = 2845)	Range	SD, 95%CI[a]	*P*-value
Total stay[b]		28.17	3-162	[21.083]	28.54	2-589	[30.556]	0.878
Appropriate stay[c]		20.56	1-70	[13.887]	21.22	1-560	[23.616]	0.720
Prolonged stay[d]		7.61	1-119	[13.042]	7.32	1-500	[16.041]	0.816
Gender	Male	95 (55.88%)		(48.07-63.48)	1349 (47.42%)		(45.57-49.27)	0.039
	Female	75 (44.12%)		(36.52-51.92)	1496 (52.58%)		(50.73-54.43)	
Age (years)		80,23	44-98	[9905]	77,21	17-104	[12 047]	0.001
DRG[e] weight[f]		2.28	0.80-3.62	[0.579]	3.86	0.08-51.35	[6.628]	0.001
Place of residence	Rural[g]	33 (19.41%)		(13.75-26.17)	645 (22.67%)		(21.14-24.25)	0.371
	Urban[h]	137 (80.59%)		(73.83-86.25)	2200 (77.33%)		(75.74-78.86)	
Type of hospitalisation	Programmed	3 (1.76%)		(0.36-5.07)	208 (7.31%)		(6.38-8.33)	0.009
	Urgent	167 (98.23%)		(94.93-99.63)	2637 (92.69%)		(91.67-93.62)	
Destination at discharge	Long-Term Care Centre	124 (72.94%)		(65.60-79.46)	2253 (79.19%)		(77.65-80.67)	0.001
	Home	20 (11.76%)		(7.37-17.58)	392 (13.78%)		(12.53-15.10)	
	Deceased	24 (14.12%)		(9.26-20.27)	174 (6.12%)		(5.26-7.06)	
	Other[i]	2 (1.18%)		(0.14-4.18)	26 (0.91%)		(0.59-1.34)	
Year of medical discharge	2007	26 (15.29%)		(10.24-21.60)	348 (12.23%)		(11.05-13.49)	0.078
	2008	35 (20.59%)		(14.78-27.45)	412 (14.48%)		(13.21-15.83)	
	2009	22 (12.94%)		(8.29-18.93)	351 (12.38%)		(11.15-13.60)	
	2010	16 (9.41%)		(5.48-14.83)	350 (12.30%)		(11.12-13.57)	
	2011	21 (12.35%)		(7.81-18.26)	375 (13.18%)		(11.96-14.48)	
	2012	19 (11.17%)		(6.86-16.90)	273 (9.59%)		(8.54-10.74)	
	2013	17 (10.00%)		(5.93-15.53)	261 (9.17%)		(8.14-10.29)	
	2014	7 (4.12%)		(1.67-8.30)	217 (7.63%)		(6.68-8.66)	
	2015	7 (4.12%)		(1.67-8.30)	258 (9.07%)		(8.04-10.18)	

[a]95%CI, 95% confidence interval.

[b]Total stay, number of days between date of admission and effective discharge.

[c]Appropriate stay, number of days between date of admission and medical discharge.

[d]Prolonged stay, number of days between date of medical discharge and effective discharge.

[e]DRG, diagnosis-related group.

[f]DRG weight, complexity in terms of consumption of hospital resources for care provision, based on the average annual cost of hospitalisation in acute care units (weight = 1).

[g]Rural: patient living outside the region of Santander.

[h]Urban: patient living in the region of Santander.

[i]Nursing homes for people with dependency.

4 | DISCUSSION

In our study, the days of extended stay in cases of pneumonia because of delayed discharge for non-clinical reasons represented a quarter of the total stay, however, this figure is doubled if we consider the days that would have corresponded for the same DRG and year of discharge. The relationship between aspiration pneumonia at advanced age and increased length of hospital stay have been demonstrated.[30] Our results suggest the presence of a covert delayed discharge, given that an extended stay could be implicit in the appropriate stay, because of the lack of a solely clinical criterion at the time of discharge. In Spain, the mean stay is an important data to compare the efficiency between hospitals, representing one of the main important outcome variables in the Data Envelopment Analysis, a method used to measure the technical efficiency in hospitals (output), according to its data consumption (input).[31] However, improper recording of the discharge date distorts these stay data, causing biases that make comparisons inaccurate. In contrast to what happens in Spain, in the United Kingdom, the NHS determines clear criteria of when the patient is considered ready to return home from an acute or chronic hospitalisation resource dependent on this organism. These criteria or conditions are a decision made by the clinician that the patient is ready to return home (in acute hospitalisation), or a decision made by the multidisciplinary care team (in the case of chronic hospitalisation) and that such discharge is considered safe for the patient. These criteria for clinical suitability for discharge depend on whether the patient has care needs that require him or her to remain in the same care setting, however, they do not depend on whether the patients have any pending tests or whether they have still not recovered their previous level of function.[32] For an accurate measurement of length of stay in cases of delayed discharge, a record of the discharge date with details of the clinical criteria is important.[33]

In 72.94% of our cases, the discharge destination was a long-term care centre, a resource for functional recovery or convalescence stays. According to other authors, the mean total stay in cases of delayed discharge is conditioned by the subsequent destination.[18] In this context, it is likely that clinicians may wait for an available place in the convalescent or recovery facility before declaring the patient fit for discharge, thus lengthening the supposedly adequate stay and skewing the duration of the prolonged stay. The lack of objective criteria for medical discharge has been shown to condition the hospital stay, as it is dependent on factors beyond the control of the hospital itself, such as the availability of long-term stay or recovery beds.[9]

In our study, pneumonia affected older patients, with less complex processes and who suffered from a higher proportion of deaths. In terms of age, we found evidence that relates older age with a higher risk of pneumonia and admission for pneumonia.[34] Also other age-related conditions are cited in the literature, such as malnutrition, uremia or chronic obstructive pulmonary disease (COPD)[34] and greater physical decline in terms of loss of strength with older patients, among those admitted for pneumonia.[23]

The complexity of the process was measured by the weight of the DRG, which reflects the complexity in terms of consumption of hospital resources for care provision, based on the average annual cost of hospitalisation in acute care units (weight = 1).[35] In the sample of patients with pneumonia, the mean weight of the DRG was 2.28 [SD 0.579], ranging from 0.80 to 3.62. According to HUMV AC data, the mean annual complexity during the study period ranged from 1863 to 1949. Therefore, the complexity of the cases attended by the hospital was high, as it corresponds to a university hospital, and according to similar studies, this complexity, reflected in the DRG weight is related to longer periods of stay.[10] In addition, the mean weight in our cases of delayed discharge for non-clinical reasons is much higher than that found by other studies measuring DRG weight (1.97 in the study by Holmas et al, 2013)[10] and also compared with the mean of the HUMV. This weight may correspond to additional procedures and secondary diagnoses quantified in the DRG that increase the complexity and prolong the stay.[9] Nonetheless, these patients with pneumonia are less complex compared with the total number of patients with delayed discharge, probably because they are not surgical patients. It is worth noting, however, that at the lower end of the range, we found cases of patients with pneumonia with a DRG weight of less than 1. These may be apparently simple cases, although with delayed discharge, which were most likely admitted because of the lack of a caregiver or burden on the primary caregiver, using the hospital bed resource as a transition while waiting for a definitive care support resource. Similar results regarding low complexity in terms of cost and extended stays have been found in recent studies on cases of hospitalisation among homeless people.[36]

Lastly, it is important to note that in our study, 14.12% of patients with pneumonia and delayed discharge died (95% CI 9.26; 20.27). This proportion is significantly higher than the total number of cases of delayed discharge for non-clinical reasons. Also, related to greater ageing and complexity, certain conditions are associated with higher mortality such as dementia, liver disease or cancer,[37] increased comorbidity, malnutrition, indicators of the severity of pneumonia[38] and delayed recovery of clinical stability.[39] The triad of advanced age, variable complexity and mortality is observed in cases of aspiration pneumonia where an association with longer hospital stay and comorbidity has also been demonstrated.[40]

No differences were observed in the proportions of the number of cases throughout the years of the period, although in both groups 2008 was the year with the highest number of cases and the last years of the period were those with the lowest number of cases. This result is consistent with the progression found by the authors for the total sample,[6] and with studies demonstrating the effect of the implementation of the system of care for dependent persons in Spain on hospital stays.[24]

Regarding the limitations of this study, the variables studied are based on the data collected through the MBDSHD. This study collected variables at hospital discharge in a systematic, homogeneous and objective way. Demographic and clinical data (DRG) were collected, as well as data on the type of care or social context that could be related to delayed discharge for non-clinical reasons. These records, provided by the MBDSHD, ensured that data collection took

place in a systematic way, as well as enabling the management of a large amount of data from an extended period. However, in the process of patient care, other variables that have been shown to be related to the problem, such as lack of social or family support, living alone, or an increased level of dependency for self-care, are collected in their clinical history. These qualitative information were not objectively reflected in the MBDSHD, and therefore certain data may have been lost, which requires a review of the clinical history by the professionals in order to be collected.

In terms of the knowledge of usual clinical practice, another possible source of bias was found. The professionals responsible for the hospital stay can process the discharge once the patient already has a social support resource but not when the patient is clinically stable once the acute problem underlying the need for hospitalisation has been resolved. This can distort the periods of stay, prolonging the so-called adequate stay at the expense of extended stay. To assess the possible impact of this bias found in the usual practice in hospitalisation units, we also considered the difference between the total stay of the cases found what would have corresponded for the same DRG and year of discharge according to data from the hospital itself. In addition, pneumonias that were not registered in the DRG as a primary diagnosis, but only as a secondary complication of the primary diagnosis, such as nosocomial pneumonias, may be lost. Finally, this study may also have lost the deaths during the appropriate stay of cases where discharge may have been delayed if they had not died or who die later, for example, in a long-term stay centre.

5 | CONCLUSIONS

The length of stay of patients with pneumonia experiencing delayed discharge for non-clinical reasons is longer than what would correspond to the same DRG and year of discharge. However, the record of this stay is most likely inaccurate because the clinical discharge is not recorded once the patient is clinically fit, but rather when a subsequent resource is available.

Compared with the other patients with delayed discharge for non-clinical reasons, those affected by pneumonia are older, less complex, and more likely to die. The sum of these factors has to do with comorbidities and complications associated with ageing and the characteristics of conditions such as aspiration pneumonia.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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