ORIGINAL ARTICLE

A prospective cohort study of healthcare visits and rehospitalizations after discharge of patients with community-acquired pneumonia

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ABSTRACT

Background and objective: The aim of this study was to identify the frequency of, reasons for, and risk factors associated with additional health-care visits and re-hospitalizations (health-care interactions) among patients with community-acquired pneumonia (CAP), within 30 days of discharge from hospital.

Methods: This was an observational analysis of a prospective cohort of adults hospitalized with CAP at a tertiary hospital in 2007–2009. Additional health-care interactions were defined as visits to a primary care centre or emergency department, and hospital readmissions within 30 days of discharge.

Results: Of the 934 patients hospitalized with CAP, 282 (34.1%) had additional health-care interactions within 30 days of discharge from hospital; 149 (52.8%) required an additional visit to a primary care centre and 177 (62.8%) attended the emergency department. Seventy-two patients (25.5%) were readmitted to hospital. The main reasons for additional health-care interactions were worsening of signs or symptoms of CAP and/or comorbidities that were unrelated to pneumonia, mainly cardiovascular and pulmonary diseases. The only independent factor associated with visits to a primary care centre or the emergency department was alcohol abuse (OR 1.65; 95% CI: 1.03–2.64). Hospitalization in the previous 90 days (OR 2.47; 95% CI: 1.11–5.52) and comorbidities (OR 3.99; 95% CI: 1.12–14.23) were independently associated with re-hospitalization.

Conclusions: Additional health-care visits and re-hospitalizations within 30 days of discharge from hospital were common among patients with CAP. This was mainly due to worsening of signs or symptoms of CAP and/or comorbidities. These findings may have implications for discharge planning and follow-up of patients with CAP.

SUMMARY AT A GLANCE

Additional healthcare visits and rehospitalizations within 30 days of discharge were frequent among patients with CAP, and were documented in 34% of patients. The main reasons were worsening of signs or symptoms of CAP and/or comorbidities. These findings may have implications for discharge planning and follow-up of patients with CAP.

Key words: health service, patient discharge, patient readmission, pneumonia, risk factor.

INTRODUCTION

Community-acquired pneumonia (CAP) continues to be a major health problem worldwide. It is the leading cause of mortality due to infectious diseases. In addition, CAP accounts for more than 1 million hospitalizations annually, at a cost exceeding $9.7 billion.1,2 The high cost of treating CAP has raised interest in the development of strategies to reduce the length of hospital stays and increase the number of patients who receive care at home.3–5

However, one qualitative study6 found that most patients left hospital without clear understanding of pneumonia, its treatment or the follow up required when they returned home, leading to an increase in primary care centre and emergency department visits, cost-ineffective use of inpatient beds and lower levels of patient satisfaction.7,8 Despite this, only a few studies have examined the frequency of and factors associated with hospital readmission following an initial CAP-related hospitalization.9–11

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there have been no studies examining other additional health-care interactions, including visits to a primary care centre because of doubts or complications related to CAP and emergency department visits, within 30 days of discharge of patients with CAP.

In addition, strategies to reduce the length of hospital stays and the trend towards community-based treatment of CAP need to be accompanied by increased emphasis on the information and support required by patients who return home to manage their illness. Identification of the reasons for and risk factors associated with additional health-care visits and re-hospitalizations may therefore be useful in terms of discharge planning. Indeed, discharge planning has been associated with improved referral to and utilization of post-discharge services, and also with fewer readmissions. In addition, such planning appears to prepare patients and caregivers for post-discharge care.

The aim of the present study was to identify the frequency of, reasons for and risk factors associated with additional health-care visits and re-hospitalizations among patients with CAP, within 30 days of discharge from hospital.

### METHODS

#### Setting and study design

The study was carried out in a 900-bed university hospital for adults in Barcelona, Spain, which serves a population of 1,100,000 inhabitants and admits approximately 24,000 patients per year. All patients with CAP who were admitted to the hospital from January 2007 to December 2009 were prospectively recruited and followed up. Patients with neutropenia, Ig deficiencies, or HIV infection, and those who had undergone transplantation or splenectomy, as well as those who were receiving immunosuppressant and/or corticosteroid therapy (>20 mg/day of prednisone or equivalent), were excluded.

For the purpose of this study, patients with CAP were classified into two groups: those who had additional health-care interactions (health-care visits and re-hospitalizations) within 30 days of discharge from hospital and those who had not. Patients who died during the hospitalization were excluded from the analysis. Patients who were included in the group that had additional health-care interactions had met any of the following criteria within 30 days of discharge: (i) visits to a primary care centre because of doubts or complications related to CAP (scheduled follow-up visits were excluded); (ii) emergency department visits for any reason; and (iii) hospital readmission for any reason.

Data for the first episode and information regarding the main reasons for additional health-care visits and re-hospitalizations within 30 days of discharge were collected. This prospective, observational study was approved by the institutional review board and informed consent was obtained from patients.

### Clinical evaluation and follow up

Patients were seen daily during their hospital stay by one or more members of the research team, who recorded clinical data using a computer-assisted protocol. Data were collected on demographic characteristics, comorbidities, causative organisms, empirical antibiotic therapy and outcomes, including in-hospital mortality. Data on additional health-care interactions within 30 days of discharge were obtained by reviewing the SAP Healthcare Database of the Catalan Health Service (Institut Català de la Salut).

Severity of illness at presentation was quantified using the Pneumonia Severity Index (PSI). Clinical stability was assessed as described elsewhere.

Patients were categorized as having health care-associated pneumonia if they had received intravenous therapy at home, attended a hospital or haemodialysis clinic in the 30 days before onset of pneumonia, were admitted to an acute care hospital in the 90 days before onset of pneumonia, or resided in a nursing home or long-term care facility.

### Reasons for additional health-care visits and re-hospitalizations

In order to assign the reasons for visits to primary care centres, re-hospitalization or emergency department visits within 30 days of the initial hospitalization, three research nurses (J.A., P.C. and O.C.) and one physician (D.V.) reviewed the primary care visit reports and the emergency department, hospital admission and discharge reports for all patients. In all cases, the reasons for use of health-care resources were assigned by consensus among all investigators, after reviewing the clinical data. Visits to a primary care centre were defined as consultations because of doubts or complications related to CAP, within 30 days of discharge. These were categorized into seven groups: (i) respiratory symptoms; (ii) doubts about prescription drugs or adverse effects of drugs; (iii) general symptoms; (iv) cognitive impairment; (v) fever; (vi) gastrointestinal symptoms; and (vii) underlying disease exacerbation. The reasons for emergency department visits or readmission were categorized as described elsewhere: (i) worsening of signs or symptoms related to pneumonia; (ii) new or worsening comorbidities unrelated to pneumonia; or (iii) any combination of pneumonia-related and comorbidity-related reasons. Patients were categorized as having a pneumonia-related re-hospitalization if a CXR showed an infiltrate and if three or more typical or atypical symptoms of pneumonia were present. If there was insufficient documentation to establish the presence of a radiographic infiltrate at the time of hospital readmission, a SaO2 <92% and the presence of three or more symptoms were also accepted as indicating a pneumonia-related re-hospitalization. Patients were categorized as having a comorbidity-related re-hospitalization if the clinical data suggested an alternative reason for readmission, such as renal failure or heart failure. Finally, patients were assigned to any combination of
pneumonia-related and comorbidity-related reasons, if the primary reason for readmission could not be accurately determined, as in the case of patients with exacerbations of chronic lung disease.

**Statistical analysis**

The statistical significance of differences between groups was assessed using the chi-square test for categorical variables. For continuous variables Student’s t-test or the Mann–Whitney U-test were used, depending on the results of the Kolmogorov–Smirnov test for normality. The logistic regression model for assessing factors potentially associated with re-hospitalizations and additional visits to a primary care centre or visits to the emergency department within 30 days of hospital discharge, included all variables that were significant in the univariate analysis (if there was a plausible biological relationship with the dependent outcome variable, in order to avoid spurious associations), as well as all clinically important variables, including gender, age, vaccination status, comorbidities, hospitalization within the previous 90 days, clinical stability at hospital discharge and high-risk PSI classes, regardless of whether or not these were significant in the univariate analysis. Independent variables were checked for collinearity. The number of variables included in the multivariate model was restricted according to the rule of at least 5–9 events per variable.20 The goodness-of-fit of the model was evaluated by the Hosmer–Lomeshow test.

**RESULTS**

**Patient characteristics**

During the study period, 934 non-immunosuppressed adults with CAP were hospitalized. Of these, 106 (11.3%) died during the hospitalization. Of the 828 patients discharged from hospital, 282 (34.1%) had additional health-care visits and re-hospitalizations within 30 days of discharge from hospital. Among these patients, 149 (52.8%) visited a primary care centre because of doubts or complications related to CAP, while 177 (62.8%) visited the emergency department, and of these 72 were readmitted to hospital (Fig. 1).

The clinical characteristics during hospitalization, of patients who had or did not have additional health-care interactions are compared in Table 1. Age and gender were similar for the two groups. Patients who had additional health-care interactions were more likely to be heavy drinkers and were more likely to have been hospitalized within the previous 90 days. In addition, they were more likely to have received pneumococcal vaccination. With respect to comorbidities, patients who had additional health-care interactions were more likely to have COPD. Similarly,
Table 1  Main clinical characteristics of patients hospitalized for community-acquired pneumonia according to additional health-care interactions

| Characteristic | Additional health-care interactions (n = 282) | No additional health-care interactions (n = 546) | P-value |
|---------------|-------------------------------------------|---------------------------------------------|---------|
|               | n  | %          | n  | %          |         |
| Age (years), median (IQR) | 72 | 58-80 | 71 | 55-79 | 0.33 |
| Demographic characteristics | | | | | |
| Male gender | 193 | 68.4 | 352 | 64.5 | 0.25 |
| Current smoker | 78 | 27.8 | 135 | 24.8 | 0.35 |
| Heavy drinker | 55 | 19.6 | 68 | 12.5 | 0.007 |
| Influenza vaccination (<1 year) | 154 | 61.4 | 265 | 54.1 | 0.06 |
| Pneumococcal vaccination (<5 years) | 71 | 31.7 | 97 | 21.3 | 0.003 |
| Previous CAP (<1 year) | 31 | 11.2 | 56 | 10.3 | 0.69 |
| Nursing home resident | 90 | 31.9 | 141 | 25.8 | 0.06 |
| Hospitalization within previous 90 days | 35 | 12.4 | 36 | 6.6 | 0.005 |
| Underlying disease | | | | | |
| COPD | 221 | 78.4 | 400 | 73.4 | 0.12 |
| Diabetes mellitus | 92 | 32.6 | 131 | 24 | 0.008 |
| Chronic heart disease | 60 | 21.3 | 94 | 17.2 | 0.15 |
| Cancer | 28 | 9.9 | 49 | 9 | 0.65 |
| Cerebrovascular disease | 41 | 14.5 | 67 | 12.3 | 0.36 |
| Dementia | 17 | 6 | 24 | 4.4 | 0.30 |
| Chronic liver disease | 18 | 6.4 | 28 | 5.1 | 0.45 |
| Chronic renal disease | 33 | 11.7 | 43 | 7.9 | 0.07 |
| High-risk PSI classes† | 185 | 65.6 | 330 | 60.4 | 0.15 |
| Clinical findings at admission | | | | | |
| Shock | 27 | 9.6 | 53 | 9.7 | 0.95 |
| Altered mental status | 47 | 16.7 | 89 | 16.3 | 0.89 |
| Purulent sputum | 146 | 51.8 | 216 | 39.8 | 0.001 |
| Pleuritic chest pain | 101 | 35.8 | 220 | 40.4 | 0.19 |
| Physical examination findings | | | | | |
| Axillary temperature on admission (°C), median (IQR) | 37.5 | 36.9–38 | 37.7 | 37–38.2 | 0.14 |
| Fever (>37.2°C) | 184 | 65.5 | 372 | 68.8 | 0.34 |
| Rales | 242 | 86.1 | 454 | 83.8 | 0.37 |
| Laboratory and radiographic findings | | | | | |
| SaO₂ <90% or PaO₂/FIO₂ <300 | 169 | 64 | 324 | 63.5 | 0.89 |
| Bacteraemia | 30 | 12.6 | 49 | 10.3 | 0.36 |
| Multilobar pneumonia | 83 | 29.5 | 181 | 33.3 | 0.27 |
| Pleural effusion | 45 | 16 | 89 | 16.3 | 0.89 |
| Complications during hospitalization‡ | 69 | 24.5 | 152 | 27.8 | 0.32 |
| Adverse event during hospitalization‡ | 38 | 13.5 | 78 | 14.3 | 0.75 |
| ICU admission | 17 | 6 | 55 | 10.1 | 0.05 |
| Mechanical ventilation | 7 | 2.5 | 31 | 5.7 | 0.04 |
| Clinical stability at hospital discharge¶ | 230 | 92.3 | 484 | 92.7 | 0.81 |
| Tachypnoea | 14 | 5.2 | 14 | 2.7 | 0.08 |
| SaO₂ <90% | 7 | 2.6 | 19 | 3.7 | 0.42 |
| Aetiology | | | | | |
| Streptococcus pneumoniae | 127 | 45 | 246 | 45.1 | 0.99 |
| Legionella pneumophila | 5 | 1.8 | 20 | 3.7 | 0.13 |
| Haemophilus influenzae | 23 | 8.2 | 14 | 2.6 | <0.001 |
| Anaerobic organism | 12 | 4.3 | 35 | 6.4 | 0.20 |
| Duration of first hospitalization (days), median (IQR) | 7 | 5–11 | 7 | 5–11 | 0.73 |

† Patients were stratified into high-risk classes according to the PSI score (>90 points, classes IV and V).
‡ Related to the disease.
§ Related to pharmacological treatment.
¶ Clinical stability as described by Halm et al.5
CAP, community-acquired pneumonia; FiO₂, fraction of inspired oxygen; HCAP, health care-associated pneumonia; ICU, intensive care unit; IQR, interquartile range; PSI, Pneumonia Severity Index.
patients who had additional health-care interactions were less likely to require admission to the intensive care unit during hospitalization. There was no significant difference between the groups with respect to clinical stability at discharge from hospital. However, the presence of tachypnoea at discharge from hospital tended to be associated with additional health-care interactions.

Among the causative pathogens for pneumonia, *Haemophilus influenzae* was most frequently identified in patients who had additional health-care interactions. There were no differences between the groups, with respect to other causative organisms.

### Reasons for visits to a primary care centre or the emergency department and for readmission

As shown in Table 2 the main reasons for visits to a primary care centre were respiratory and general symptoms. Less frequent reasons were gastrointestinal symptoms, cognitive impairment and exacerbations of underlying disease. The main reasons for emergency department visits were pneumonia-related worsening of signs or symptoms and comorbidities that were unrelated to pneumonia. The comorbidity most frequently identified as leading to an emergency department visit was cardiovascular disease, followed by pulmonary and genitourinary diseases (Table 3). Similarly, the main reason for readmissions was new or worsening comorbidities that were unrelated to pneumonia. The main comorbidities related to readmission were cardiovascular and pulmonary diseases and cancer (Table 4).

### Risk factors associated with additional health-care visits and re-hospitalizations

Tables 5 and 6 summarize the results of the multivariate analyses for risk factors that were potentially associated with additional visits to a primary care centre or emergency department and re-hospitalizations, respectively, within 30 days of discharge from hospital. After adjustment for confounding, alcohol abuse (OR 1.65; 95% CI: 1.03–2.64) was shown to be an independent factor associated with additional health-care visits.

#### Table 2 Reasons for visits to a primary care centre within 30 days of discharge from hospital for 149 patients

| Reason                               | n  | %   |
|--------------------------------------|----|-----|
| Respiratory symptoms                 | 112| 75.2|
| General symptoms                     | 34 | 22.8|
| Fever                                | 13 | 8.7 |
| Doubts about prescription drugs or adverse effects of drugs | 7  | 4.7 |
| Gastrointestinal symptoms            | 6  | 4   |
| Cognitive impairment                 | 3  | 2   |
| Exacerbation of underlying disease   | 3  | 2   |

1 Twenty-nine patients reported more than one reason for visiting a primary care centre

#### Table 3 Reasons for emergency department visits within 30 days of discharge from hospital for 177 patients

| Reason                               | n  | %   |
|--------------------------------------|----|-----|
| Pneumonia-related worsening of signs or symptoms | 84 | 47.5|
| New or worsening comorbidities that were independent of pneumonia | 77 | 43.5|
| Cardiovascular                       | 20 | 11.3|
| Pulmonary (unrelated to pneumonia)   | 11 | 6.2 |
| Genitourinary                        | 8  | 4.5 |
| Other†                               | 8  | 4.5 |
| Gastrointestinal                     | 6  | 3.4 |
| Neurological                         | 5  | 2.8 |
| Orthopaedic                          | 5  | 2.8 |
| Neoplastic                           | 5  | 2.8 |
| Infection                            | 5  | 2.8 |
| Adverse effects of drugs             | 4  | 2.3 |
| Any combination of pneumonia-related and comorbidity-related reasons‡ | 16 | 9 |

† For patients who visited the emergency department for new or worsening comorbidities that were independent of pneumonia, other comorbidities were as follows: hyperglycaemia (*n* = 1), retinal detachment (*n* = 1), cataract of the eye (*n* = 1), insect bite (*n* = 1), vasovagal syncope (*n* = 1), hepatic encephalopathy (*n* = 1), epistaxis (*n* = 1) and tracheal granuloma (*n* = 1).

‡ For patients who visited the emergency department for both pneumonia and comorbidity-related reasons, the comorbidities were exacerbation of chronic pulmonary disease or aspiration.

#### Table 4 Reasons for readmission within 30 days of discharge from hospital for 72 patients

| Reason                               | n  | %   |
|--------------------------------------|----|-----|
| New or worsening comorbidities that were independent of pneumonia | 31 | 43.1|
| Cardiovascular                       | 12 | 16.7|
| Pulmonary (unrelated to pneumonia)   | 8  | 11.1|
| Neoplastic                           | 5  | 6.9 |
| Infection                            | 2  | 2.8 |
| Neurological                         | 1  | 1.4 |
| Gastrointestinal                     | 1  | 1.4 |
| Adverse effects of drugs             | 1  | 1.4 |
| Retinal detachment                   | 1  | 1.4 |
| Pneumonia-related worsening of signs or symptoms | 28 | 38.9|
| Any combination of pneumonia-related and comorbidity-related reasons† | 13 | 18.1|

† For patients who visited the emergency department for both pneumonia and comorbidity-related reasons, the comorbidities were exacerbation of chronic pulmonary disease or aspiration.
visits. Furthermore, hospitalization within the previous 90 days (OR 2.47; 95% CI: 1.11–5.52) and comorbidities (OR 3.99; 95% CI: 1.12–14.23) were associated with hospital readmissions. The \( P \)-values for the Hosmer–Lemeshow goodness-of-fit statistics for the two models were 0.59 and 0.36.

**DISCUSSION**

This prospective cohort study showed that additional health-care visits and re-hospitalizations within 30 days of discharge from hospital were frequent among patients with CAP (34.1% of patients). The main reasons for additional health-care interactions were worsening of signs or symptoms of CAP and new or worsening comorbidities that were independent of pneumonia. The only independent factor associated with additional health-care visits was alcohol abuse. Hospitalization in the previous 90 days and comorbidities were independently associated with hospital readmissions.

Taking into account that scheduled follow-up visits were excluded, these results indicate that more than one-third of patients with CAP had additional healthcare interactions following discharge from hospital. Nearly half these patients required an additional visit to a primary care centre or attended the emergency department. To date there have been no studies analysing the frequency of visits to primary care centres and emergency departments within 30 days of discharge of CAP patients from hospital. However, some studies have examined the frequency of, and risk factors associated with, short-term readmission following discharge after a CAP-related hospitalization. In those studies, about 7–12% of patients were re-hospitalized within 30 days of discharge.\(^1,9,11\) A similar result was obtained in the present study, with 8.7% of patients being readmitted within 30 days of discharge.

Below are the tables mentioned in the text:

**Table 5** Multivariate analysis of factors associated with additional visits to a primary care centre or visits to the emergency department within 30 days of discharge

| Factor                                      | Odds ratio | 95% confidence interval | \( P \)-value |
|---------------------------------------------|------------|-------------------------|--------------|
| Age \( \geq 65 \) years                     | 0.82       | 0.52–1.29               | 0.40         |
| Male gender                                 | 0.76       | 0.52–1.11               | 0.16         |
| Alcohol abuse                               | 1.65       | 1.03–2.64               | 0.04         |
| Pneumococcal vaccination (<5 years)         | 1.18       | 0.76–1.84               | 0.46         |
| Influenza vaccination (<1 year)             | 1.06       | 0.68–1.64               | 0.80         |
| Hospitalization in the previous 90 days     | 1.39       | 0.76–2.54               | 0.29         |
| Comorbidities\(^1\)                         | 0.99       | 0.62–1.59               | 0.97         |
| High-risk PSI classes\(^1\)                 | 1.19       | 0.78–1.83               | 0.42         |
| Clinical stability on discharge             | 0.85       | 0.45–1.62               | 0.62         |

\(^1\) Comorbidities included COPD, diabetes mellitus, chronic heart disease, cancer, cerebrovascular disease, dementia, chronic liver disease and chronic renal disease.

**Table 6** Multivariate analysis of factors associated with hospital readmission within 30 days of discharge

| Factor                                      | Odds ratio | 95% confidence interval | \( P \)-value |
|---------------------------------------------|------------|-------------------------|--------------|
| Age \( \geq 65 \) years                     | 1.43       | 0.66–3.01               | 0.37         |
| Male gender                                 | 1.58       | 0.77–3.21               | 0.21         |
| Pneumococcal vaccination (<5 years)         | 1.83       | 0.92–3.63               | 0.08         |
| Influenza vaccination (<1 year)             | 1.16       | 0.53–2.55               | 0.71         |
| Hospitalization in the previous 90 days     | 2.47       | 1.11–5.52               | 0.03         |
| Comorbidities\(^1\)                         | 3.99       | 1.12–14.23              | 0.03         |
| High-risk PSI classes\(^1\)                 | 0.65       | 0.32–1.31               | 0.22         |
| Clinical stability on discharge             | 1.80       | 0.41–7.93               | 0.44         |
| *Haemophilus influenzae* pneumonia          | 1.70       | 0.59–4.88               | 0.32         |

\(^1\) Patients were stratified into high-risk classes according to Pneumonia Severity Index (PSI) score (>90 points, classes IV and V).

\(^2\) Comorbidities included COPD, diabetes mellitus, chronic heart disease, cancer, cerebrovascular disease, dementia, chronic liver disease and chronic renal disease.

\(^3\) Patients were stratified into high-risk classes according to the Pneumonia Severity Index (PSI) score (>90 points, classes IV and V).
evaluated the reasons for re-hospitalization among patients with CAP and which also showed that new or worsening cardiac or pulmonary disease was the most frequent cause of readmissions.1

The present results also showed that alcohol abuse was the only independent factor associated with additional health-care visits to a primary care centre or emergency department after discharge. In this regard, it is well known that the incidence of CAP is greater in individuals with a history of alcohol abuse.23,24 Similarly, alcohol abuse is associated with increased morbidity in patients with CAP with a greater incidence of bacteremia, delayed time to recovery, and a higher frequency of persistent pulmonary infiltrates on CXR.22–24 Furthermore, comorbidities were associated with hospital readmissions. A previous study also reported that the majority of re-hospitalizations following pneumonia are comorbidity-related and are the result of underlying cardiopulmonary diseases.1 In addition, this study showed that hospitalization within 90 days before the pneumonia-related episode was independently associated with hospital readmissions. This finding concurs with those from other studies, which showed that patients with previous hospitalizations were at increased risk of re-hospitalization.25

This study also showed that prior pneumococcal vaccination was not independently associated with a reduced risk of hospital readmission. Similarly, in a previous population-based cohort study, prior pneumococcal vaccination did not significantly reduce the risk of subsequent hospitalization or death.26 On the other hand, clinical instability at discharge from hospital was not associated with additional health-care interactions. However, in the univariate analysis, tachypnoea tended to be associated with additional health-care interactions. In addition, it should be noted that it is likely that some patients who were clinically unstable at discharge may have continued to receive hospital-based home care. Unfortunately, this information was not collected in the present study.

In light of these findings it should be noted that previous research has shown that effective discharge planning can reduce additional health-care visits and re-hospitalizations and increase the cost-effective use of inpatient beds, as well as patient satisfaction.7,15,27 Discharge planning begins with an early assessment of the anticipated patient care requirements. In addition, discharge planning requires concern for the well-being of the patient and involves the patient, his or her family and caregivers in dynamic and interactive communication. The aim is to reach mutual agreement regarding continuation of care.28,29 Therefore, the ability of physicians and nurses to facilitate an effective discharge process has never been more urgent and complex than in the current care context.7,29 The present study highlights a number of points that should be acknowledged before planning the discharge of CAP patients. Based on these results, patients with CAP should have, upon discharge, specific information relating to the management of signs or symptoms of pneumonia, as well as to underlying comorbidities and appropriate outpatient follow up.

The strengths of this study were its prospective design and the large number of patients included. Similarly, comprehensive clinical data were collected and the research was conducted using a standardized protocol. The study was limited by the fact that it was performed at a single centre, and that information about additional health-care interactions was obtained by reviewing the hospital database rather than through patient interviews. Nevertheless, there were no missing data on additional health-care interactions and the investigators assessed all consultations and hospital records. Moreover, confounding by indication may explain why prior pneumococcal vaccination appeared to increase the risk of the outcomes. In this regard, if the multivariate logistic regression analysis was restricted to patients aged ≥65 years, prior pneumococcal vaccination was not associated with additional health-care interactions.

In conclusion, this study showed that additional health-care visits and re-hospitalizations within 30 days of discharge were frequent among patients with CAP. These additional health-care interactions were mainly due to worsening of signs or symptoms of CAP; and to new or worsening comorbidities that were independent of pneumonia. After adjustment, the only risk factor associated with additional health-care visits was alcohol abuse. Hospitalization within the previous 90 days and comorbidities were independently associated with hospital readmissions. These findings may have implications for discharge planning and follow up of patients with CAP.

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