



Adverse effects of pneumonia on physical functioning in nursing home residents: Results from the INCUR study



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ABSTRACT

Background: Pneumonia is a very common infection in the nursing home, but little is known about its effects on levels of individual functioning. The aim of this study was to examine adverse effects of pneumonia events on physical functioning in nursing home residents.

Methods: Data were used from the INCUR study, a 1-year prospective cohort study of older residents from 13 nursing homes in France. The sample consisted of 716 residents, who were assessed at baseline, 6 and 12 months. Pneumonia diagnosis was based on clinical conditions documented in medical records. Physical functioning was measured by Activities of Daily Living (ADL). Longitudinal associations between pneumonia and physical functioning were explored using Generalized Estimating Equations (GEE).

Results: Of 716 participants, 145 (20%) had one or more pneumonia events during 12 months follow-up. Mean age of the participants was 86.0 (SD = 7.4) years, and 76% of them were female. Overall, participants had relatively low levels of physical functioning at baseline (Mean ADL = 2.4 out of 6, SD = 1.8). The GEE analyses adjusted for age, gender, baseline physical functioning, and hospitalization during follow-up showed that pneumonia events had adverse effects on ADL functioning ($B = -0.21$, $SE = 0.08$, $p = 0.008$). Pneumonia events were mainly associated with loss of independence in transferring from bed to chair and bathing.

Conclusions: In a population of nursing home residents where levels of physical functioning were already relatively low, pneumonia events were associated with loss of physical functioning. These results highlight the importance of preventive interventions aimed at reducing pneumonia in nursing home residents.

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1. Introduction

In aging societies, the number of people living in nursing homes is expected to increase substantially in the coming years (Richards, 2002; Tolson et al., 2011). Pneumonia is a very common infection in nursing home residents, and the leading cause of morbidity and mortality in this population (Drinka & Crnich, 2005; Liapikou et al., 2014). It is estimated that pneumonia accounts for 13–48% of all infections in the nursing home setting (El Solh, Akinnusi, Alfarah, &

Patel, 2009). So far, studies conducted on pneumonia in the nursing home have been mainly focused on hospitalization and mortality as outcomes (Chan Carusone, Walter, Brazil, & Loeb, 2007; El-Solh, Niederman, & Drinka, 2010; Ewig et al., 2012; Polverino et al., 2010). Therefore, not much is known about potentially detrimental effects of nursing home-acquired pneumonia on levels of physical functioning.

It is important to gain insight into physical functioning after pneumonia, as this may have consequences for quality of life and care planning in older nursing home residents (Chan Carusone et al., 2007). However, epidemiological studies in the nursing home are scarce. The few studies looking at the association between pneumonia events and functional decline in the nursing home were performed in North America, and showed contradicting results. One study showed that nursing home residents with pneumonia were not more likely to decline functionally compared to those who did not experience an infectious event

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(Loeb, McGeer, McArthur, Walter, & Simor, 1999), while two other studies found that pneumonia leads to the development of new functional limitations within 2–3 months (Binder et al., 2003; Fried, Gillick, & Lipsitz, 1997). However, these last two studies were carried out only in subjects experiencing pneumonia and therefore lack the crucial comparison with nursing home residents not experiencing the disease. Other studies investigating the association between pneumonia and functional decline contained merely persons with community-acquired pneumonia (Mody, Sun, & Bradley, 2006; Torres et al., 2004). For example, in a study among hospitalized community-dwelling elderly it was shown that pneumonia resulted in functional loss, irrespective of levels of physical functioning before hospitalization (Mody et al., 2006). However, community-acquired pneumonia has a different clinical presentation compared to nursing home-acquired pneumonia. Nursing home residents often have high rates of comorbidity, including chronic respiratory diseases, and symptoms of pneumonia in this population may therefore be worse or unusual (Drinka & Crnich, 2005; Polverino et al., 2010).

In the current study, we hypothesize that pneumonia is a detrimental event for nursing home residents associated with a significant loss of physical functioning. The main objective of this study was to examine adverse effects of pneumonia events on levels of physical functioning, using data from a longitudinal cohort of nursing home residents in France.

2. Methods

2.1. Design and study sample

Data were used from the Incidence of pneumonia and related Consequences in nursing home Residents (INCUR) study. This is a one-year observational cohort study among residents from 13 randomly selected nursing homes in the Midi-Pyrénées region in France. The baseline data collection took place between February and July 2012, with follow-up assessments of the study population at 6 and 12 months. Details on the design and data collection of INCUR have been published elsewhere (Demougeot et al., 2013). The INCUR study was conducted in accordance with the amended Declaration of Helsinki. The Ethics Committee of the Toulouse University Hospital and the Consultative Committee for the Treatment of Research Information on Health (CNIL) approved the entire study protocol (approval number: 34-0911). The Ethics Committee waived the need for written informed consent given the epidemiological nature of the research conducted within the domain of usual clinical care practice. However, all patients (or their representatives) received written information about the study prior to their inclusion, and were allowed to decline participation.

A total of 800 nursing home residents were recruited. Participants were included if they were 60 years or older, living in a nursing home for at least 30 days, and had a Groupes Iso-Ressources (GIR) scale score between 2 and 5 inclusive. The GIR scale is the French administrative tool to rate the ability of the person to be independent, ranging from 1 (fully dependent, bedridden) to 6 (fully independent) (Demougeot et al., 2013). At the baseline, 6-month and 12-month clinical visits, a standardized comprehensive geriatric assessment was conducted by a trained technician (Abellan Van Kan et al., 2008). Data was directly retrieved from the medical chart and clinical documentation of the resident. Moreover, the technician administered a wide range of additional questionnaires and tests for completing an objective and multidimensional description of the residents' health status. For the present analyses, only residents with data on physical functioning at baseline and at least one of the follow-up measurements were considered. This resulted in a sample of

716 individuals, with a total of 1322 observations. There were no age differences between excluded participants ($n=84$) and included participants ($n=716$), but a gender difference (38% vs. 24% male participants, respectively) was reported. The main reason for the exclusion of participants due to missing data was their death occurred during the first six months of follow-up (62%, $n=52$ of 84).

2.2. Pneumonia

In this study, pneumonia events were identified using the Observatoire du Risque Infectieux en Gériatrie (ORIG) criteria (Rothan-Tondeur, Piette, Lejeune, de Wazieres, & Gavazzi, 2010). These criteria refine the McGeer criteria (McGeer et al., 1991) and adapt them for use in the nursing home setting. In fact, the ORIG definition replaces the most complex imaging and microbiological criteria, which are very difficult to establish in a real life nursing home setting, with the physician's clinical judgment. Therefore, in agreement with the ORIG definition, pneumonia events were identified on the basis of the following two criteria:

1. Presence of at least two of the following signs/symptoms:
 - (a) worsening or onset of cough, purulent sputum, or specific signs at the auscultation;
 - (b) fever ($\geq 38^\circ\text{C}$);
 - (c) thoracic pain;
 - (d) high respiratory rate (≥ 25 breaths per minute);
 - (e) mental confusion or worsening of physical disability, and
2. Clinical evidence documented by a physician of crackles at the thoracic auscultation (Demougeot et al., 2013).

2.3. Physical functioning

Physical functioning was measured using scales of Activities of Daily Living (ADL) and Instrumental ADL (IADL). The ADL scale includes the evaluation (dependent/independent) of six tasks of daily living: transferring from bed to chair, eating, bathing, dressing, using the toilet and personal hygiene (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). Given the setting of the INCUR study (i.e., the nursing home), the IADL scale was reduced to the evaluation of only four items relevant to this population: use of the telephone, use of transportation, managing medication and managing finances (Lawton & Brody, 1969).

2.4. Other variables

Demographic and health-related variables used for the present analyses included age, gender, level of education, marital status, Body Mass Index (BMI), smoking, chronic conditions (i.e., hypertension, cardiac disease, diabetes, respiratory disease, osteoarthritis, dementia, stroke and cancer), vaccinations (flu and pneumococcal), the Mini Nutritional Assessment (MNA) (Guigoz, Lauque, & Vellas, 2002), the 10-item Geriatric Depression Scale (GDS) (Yesavage et al., 1982; van Marwijk et al., 1995), and hospitalizations during follow-up (obtained from medical records).

2.5. Statistical analysis

First we described the study sample. Chi-square tests and t -tests were performed to compare baseline characteristics of participants experiencing pneumonia during follow-up with those who did not experience pneumonia during follow-up. Next, longitudinal associations between pneumonia events and physical functioning were tested using Generalized Estimating Equations

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