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Original Study

Additional Cost Because of Pneumonia in Nursing Home Residents: Results From the Incidence of Pneumonia and Related Consequences in Nursing Home Resident Study



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A B S T R A C T

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Objectives: Pneumonia is a frequent condition in older people. Our aim was to examine the total healthcare cost related to pneumonia in nursing home (NH) residents over a 1-year follow-up period.
Design: This was a prospective, longitudinal, observational, and multicenter study that was a part of the Incidence of Pneumonia and related Consequences in Nursing Home Resident study.
Setting: Thirteen NHs located in Languedoc Roussillon and Midi-Pyr n es regions in France were included.
Participants: Resident in NH, older than 60 years and had a group iso-resource score ranging from 2 to 5.
Measurements: Pneumonia events were characterized according to the Observatoire du Risque Infectieux en Geriatrie criteria. Direct medical and nonmedical costs were assessed from the French health insurance perspective. Healthcare resources was retrospectively gathered from the French Social Health Insurance database and valued using the tariffs reimbursed by the French health insurance. Socio-demographic variables, clinical factors, vaccinations, cognition, depression, functional status, frailty index, as well as group iso-resource score were also recorded.
Results: Among the 800 patients initially included in the Incidence of Pneumonia and Related Consequences in Nursing Home Resident study, 345 which were listed in the database of the French Social Health Insurance were included in this economic study. Among them, 64 (18%) experienced at least 1 episode of pneumonia during the 1-year follow-up period. Mean annual total additional cost for a patient who experienced at least 1 episode of pneumonia during the 1 year follow-up period is 2813 . On average, total annual costs increased by 60% to 93% when a patient experienced at least 1 episode of pneumonia.
Conclusions: NH-acquired pneumonia has a great impact on total cost of care for NH residents. Our results suggest the potential economic savings that could be achieved if pneumonia could be prevented in NHs.
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The number of people aged 65 years or older is projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050, with most of the increase in developing countries.¹ This will lead to an

increased use of long-term care (LTC) facilities in the next few years. The risk of infectious disease is higher for nursing home (NH) residents than for community-dwelling older people. According to US epidemiologic data, the incidence of NH-acquired pneumonia varies from 0.3 to 2.3 episodes per 1000 resident days,^{2,3} although these estimates are likely underestimating the phenomenon because of the difficulties at applying diagnostic protocols in these settings. Infections in the NH population have been associated with a global deterioration of health

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status and consequently with higher rates of morbidity and mortality, hospitalizations, extended hospital stays, and substantial healthcare expenses.⁴ Upper and lower pulmonary infections is the first cause of infection, the primary reason for a resident's hospitalization^{4,5} and the leading cause of mortality in the NH residents population. According to a study conducted in 2012 in the US, annual healthcare cost sustained by public health for a community-dwelling older person experiencing a pneumonia-related hospitalization was \$15,682 higher than a patient without such an event.⁶

To our knowledge, only 1 previous study assessed cost attributable to pneumonia in NH. This study was conducted in 2003 and estimated that the cost of 1 pneumonia episode was around 458 US\$ per NH patient.⁷ However, this study was focused on the cost of the treatment of the pneumonia inside the NH during a 30-day follow-up period but did not take into account the cost of hospitalization because of pneumonia. Emergency department transfers and hospitalizations are frequent events during pneumonia for a NH resident. Therefore, this underestimates the total healthcare cost. This component is important for policy makers when considering resources dedicated to NH staff to take care, treat, and finally, avoid the transfer to hospital NH resident with pneumonia. In the current study, we apply a more comprehensive approach with a longer follow-up period, which will include all healthcare costs related to pneumonia. The aim of the current study was to examine the total healthcare cost related to pneumonia in NH residents over a 1-year follow-up period.

Methods

Setting, Design, and Population

This study is a part of the Incidence of Pneumonia and Related Consequences in Nursing Home Resident (INCUR) study.⁸ The INCUR study initially aimed to assess the incidence of pneumonia and mortality because of pneumonia in NHs. This was a prospective, longitudinal, observational, and multicenter study. Thirteen NHs located in Languedoc Roussillon and Midi-Pyrénées regions in France were randomly selected. Participants were included in the INCUR study if they were a resident in a NH, older than 60 years, and had a group iso-resource (GIR) score ranging from 2 to 5. The GIR tool is a scale that allows homogeneously classifying persons according to different independence stages. The French AGGIR (Autonomy, Gerontology, Iso-Resources Groups) grid rates individuals' ability to execute activities of daily living (ADL): independently, without any difficulty (1 point); independently, with some difficulty (0.5 points); or unable or needing help to execute (0 point). The GIR scale ranges from 6 (ie, fully independent) to 1 (ie, fully dependent, bedridden). The GIR score expressed the global functional capacity of the person and drives decisions about the allocation of financial and social support from the public social system.

Patients were recruited for the study between February and July 2012, and followed during 1 year. After the baseline visit, 2 follow-up visits were scheduled at 6 and 12 months. From the 800 patients initially included in the INCUR study, 345 patients from 9 NHs were registered in the health insurance database of the Midi-Pyrénées region, south-west of France. The remaining 455 patients, which were registered elsewhere or were not enrolled in the general assurance scheme, were excluded from the present analyses.

Assessment of Pneumonia

Pneumonia events were characterized according to the Observatory of infectious risk in geriatrics criteria.⁹ These criteria were adapted from those of McGeer et al¹⁰ and are specifically designed for use in the context of the NH. These adapted criteria took into

account the difficulties to diagnose pneumonia in NHs, particularly because of comorbidities and the limited availability/access to traditional diagnostic tools (eg, radiology, microbiology). Thus, the Observatory of infectious risk in geriatrics definition of a pneumonia event mirrors the one based on the algorithm by McGeer et al¹⁰ but replaces the most invasive and complex endoscopic and microbiological criteria based on the physician's clinical judgment.⁸

Pneumonia events were identified on the basis of the following 2 criteria⁸: (1) presence of at least 2 of the following 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.

Pneumonia events were recorded throughout the INCUR study over a period of 12 months.

Cost Estimates

Healthcare costs were assessed from the French health insurance perspective. Direct medical and nonmedical costs were included in this study. Direct costs were hospitalization costs, outpatient costs (ie, visits and medical acts [imaging, and other preventive exams, diagnostic exams and curative acts], paramedical acts [nurse, physiotherapist, speech therapist]), medications, and medical equipment costs. Nonmedical costs included transportation costs. Costs were estimated by multiplying the number of units used for each resource with the corresponding unit cost.

The consumption of healthcare resources was retrospectively gathered from the database of the French Social Health Insurance (FSHI). Administrative data corresponding to the name, surname, birthdate, place of residence, and sex were recorded for patients who live in a NH located in the Midi-Pyrénées Region.

Inpatient stays were valued using the French disease-related groups. Outpatient care that includes visits, medical and paramedical acts was valued using the tariffs reimbursed by the French health insurance. Visits and paramedical acts were valued using the French General Nomenclature of Professional Acts. Medical acts were valued using the French Common Classification of Medical Acts, except for laboratory tests for which valuation was based on the Nomenclature of Biological Acts.

For all these fees, we applied the corresponding reimbursement rate and we subtracted, if necessary, the medical deductible which is due by the patient and not reimbursed by the French Social Health Insurance. Reimbursement rates can be different according to the enrollment or not to the long-term disease scheme, which allows the reimbursement at 100% of all healthcare costs related to a specific disease for which patient was included in the long-term disease scheme. Costs are expressed in Euros, according to 2013 values.

Other Variables

Sociodemographic (ie, age, sex, marital status, and education), clinical factors (ie, medical history, smoking history), vaccinations, cognition (ie, abbreviated mental test), depression (ie, 10-item Geriatric Depression Scale), functional status (ie, ADL), a 30-item frailty index, as well as GIR score were recorded at baseline, 6 months, and 12 months. The score to the 30-item frailty index used in a previous INCUR study was recorded.¹¹ It included the presence and/or severity of current diseases and ability in ADL; physical signs from the clinical and neurologic examinations were recorded. Each deficit was dichotomized to the interval 0–1, representing the occurrence and severity of the problem. For each person, a 30-dimensional vector was constructed. For example, a person with 3 deficits would have an index score of $3/30 = 0.10$.¹¹

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