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Review Article

The management of community-acquired pneumonia in the elderly

Paola Faverio [a,b], Stefano Aliberti [a,*], Giuseppe Bellelli [c], Giulia Suigo [a], Sara Lonni [a], Alberto Pesci [a], Marcos I. Restrepo [b,d,e]

[a] Department of Health Science, University of Milan Bicocca, Clinica Pneumologica, AO San Gerardo, Via Pergolesi 33, Monza, Italy
[b] University of Texas Health Science Center at San Antonio, TX, USA
[c] Department of Health Science, University of Milan Bicocca, Geriatric Clinic, AO San Gerardo, Via Pergolesi 33, Monza, Italy
[d] South Texas Veterans Healthcare System Audie L. Murphy Division, San Antonio, TX, USA
[e] Veterans Evidence Based Research Dissemination and Implementation Center (VERDICT), San Antonio, TX, USA

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ABSTRACT

Pneumonia is one of the main causes of morbidity and mortality in the elderly. The elderly population has exponentially increased in the last decades and the current epidemiological trends indicate that it is expected to further increase. Therefore, recognizing the special needs of older people is of paramount importance. In this review we address the main differences between elderly and adult patients with pneumonia. We focus on several aspects, including the atypical clinical presentation of pneumonia in the elderly, the methods to assess severity of illness, the appropriate setting of care, and the management of comorbidities. We also discuss how to approach the common complications of severe pneumonia, including acute respiratory failure and severe sepsis. Moreover, we debate whether or not elderly patients are at higher risk of infection due to multi-drug resistant pathogens and which risk factors should be considered when choosing the antibiotic therapy. We highlight the differences in the definition of clinical stability and treatment failure between adults and elderly patients. Finally, we review the main outcomes, preventive and supportive measures to be considered in elderly patients with pneumonia.

1. Introduction

A 79-year-old male with past medical history of hypertension, chronic stable angina, diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD) class C GOLD, and prostate cancer was presented to the Emergency Department (ED) with acute respiratory symptoms. He complained of poor appetite and dyspnea for three days prior to presentation. The patient was able to walk with aids during the previous months and he had moderate cognitive impairment (Mini-Mental State Examination, MMSE: 18/30) [1]. His wife reported that he was more confused and drowsy than usual, and that he had gait and balance impairment in the previous 4–5 days. The patient denied any recent hospitalization or changes in his chronic sputum production, but reported two COPD exacerbations in the past year and recent contact with his niece who had flu-like symptoms. He was up-to-date with his annual flu-vaccine, but he had never been vaccinated against *Streptococcus pneumoniae*. Vital signs on arrival to the ED were: blood pressure 100/65 mm Hg, heart rate 110 bpm and respiratory rate 26 bpm, oxygen saturation 89% on room air and temperature of 36.8 °C. The patient was dehydrated and delirious (according to DSM IV-TR criteria) [2]. Chest auscultation revealed fine crackles in the right lung base and diffuse mild wheezing. Chest X-ray (CXR) on admission showed a right lower lobe consolidation. Laboratory analyses demonstrated normal white blood cell (WBC) count, blood glucose of 250 mg/dL, C-reactive protein (CRP) of 14 mg/dL (normal value: <0.5 mg/dL), procalcitonin (PCT) of 2.5 ng/mL (normal value: <0.5 ng/mL), serum lactate of 3 mmol/L, serum creatinine 1.5 mg/dL and urea nitrogen (BUN) 40 mg/dL. Arterial blood gas showed a mild hypoxemic respiratory failure (pH 7.38, $PaCO_2$ 43 mm Hg, PaO_2 57 mm Hg on room air). The patient was subsequently admitted to the ward and was started on ceftriaxone and azithromycin for a presumptive diagnosis of community-acquired pneumonia (CAP). Supportive therapy consisted of supplemental oxygen, intravenous fluid replacement, prophylactic unfractionated heparin and a personalized diet. On day 4 of hospitalization, CRP and PCT began to trend down and the patient returned to his baseline mental status. However, he was still dyspneic and began to complain of palpitations. An electrocardiogram was performed and demonstrated new atrial fibrillation. The patient was started on an amiodarone drip while continuing prophylactic heparin. Sinus rhythm was achieved within a few hours after initiation of treatment. Finally, on day 7 of hospitalization, PCT was negative and the patient reached clinical stability, therefore antibiotic therapy was discontinued and the patient was discharged home. CXR at

* Corresponding author. Tel.: +39 0392339284; fax: +39 0392339437.
E-mail address: stefano.aliberti@unimib.it (S. Aliberti).

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1 month showed complete resolution of the consolidation, but the patient died two months following hospital discharge due to a presumptive cardiovascular event.

This case report includes some of the most common features presented by elderly patients with CAP.

The incidence of CAP in elderly patients is estimated to be 25–44 cases per 1000 persons [3], but it can be as high as 52 cases per 1000 persons in those aged 85 years or more [4].

In this review we address the main differences to consider when approaching elderly patients with pneumonia compared to adults.

2. Is the older patient a frail patient?

Our patient not only had multiple comorbidities, but he also presented with hypokinetic delirium superimposed on dementia and a sudden change in functional status (gait and balance impairment). Furthermore, he developed a series of adverse clinical events both during and after hospitalization. These characteristics are typical of frail subjects, who require a specific assessment and accurate identification in order to meet their complex healthcare needs. However, the recognition of a "frail" or "vulnerable" patient (e.g. a patient who is at increased risk of adverse events) is often suboptimal, since many physicians interchangeably use the terms multiple comorbidities, disability (or functional dependence) and frailty [5]. Recent studies suggest that comorbidities, disability and frailty, although interrelated, are distinct clinical entities, which may have different management and outcomes [5,6].

Several methods have been proposed to assess frail patients, but, since they may be challenging to use, frailty continues to be undetected in clinical practice [6–10]. However, gait speed and walking abilities may be used as clinical indicators of frailty in older subjects [11,12].

Acute mobility impairment and delirium are two typical geriatric syndromes [13,14]. Both these conditions are associated with negative clinical outcomes and can be triggered by an acute illness, such as pneumonia [15–18]. Functional status is the ability to manage daily routines; its deterioration may represent both a marker of frailty and a risk factor for infectious diseases [3,19].

Functional status can also predict clinical outcomes (e.g. clinical recovery, re-hospitalization and mortality), and is considered a clinical outcome itself. Bo and coworkers conducted a study on 659 older patients admitted to the intensive care unit (ICU) for any acute condition including pneumonia [20]. They found that in-hospital mortality depended not only on the severity of the acute illness and age, but also on preexisting conditions, such as loss of functional independence, severe and moderate cognitive impairment and low body mass index (BMI). Therefore, we suggest screening all elderly patients for the presence of delirium and acute mobility impairment both on admission and systematically during the hospitalization.

3. Is pneumonia presentation different in the elderly in comparison to adults?

Our patient presented to the ED with both typical (shortness of breath) and atypical (confusion and unsteadiness) symptoms of pneumonia. He was afebrile and his WBC count was normal, but both CRP and PCT were elevated. The diagnosis of pneumonia in elderly patients can be challenging because its clinical presentation may be different from younger adults. Klapdor and colleagues suggested that CAP could be a different entity in the elderly because of an atypical clinical presentation, more severe symptoms and higher long-term mortality in comparison to younger patients [21]. Several studies have further confirmed the atypical presentation of pneumonia in the elderly (Table 1) [15,22–27]. Therefore, we recommend clinicians to suspect pneumonia in older patients who have an atypical presentation (e.g. absence of radiological and laboratory abnormalities), to reduce the complications associated with delayed treatment.

Table 1
Signs and symptoms associated with pneumonia in elderly patients.

More common	Less common
Falls	Pleuritic chest pain
Acute change in functional status	Cough
Decreased appetite	Shortness of breath
Urinary incontinence	Fever
Delirium/acute confusional status	Leukocytosis

4. How to evaluate the severity of the disease in elderly patients and how to choose the appropriate site of care?

Our patient presented with several clinical problems that must be considered when deciding the optimal setting of care: delirium, hypoxic respiratory failure and severe sepsis. Severity assessment tools can help in determining the optimal setting in which care should be provided. The Pneumonia Severity of Illness (PSI) score and the CURB-65 (stands for Confusion, blood Urea nitrogen, Respiratory rate, systolic or diastolic Blood pressure, and Age >65) are the most extensively studied scores assessing patients with CAP [28]. However, these scores present biases in the elderly population, particularly in assessing very elderly patients. Furthermore, studies from different countries showed that they are infrequently used by physicians in clinical practice, mainly because of the high number of variables needed to calculate each score [29,30].

Therefore, an accurate evaluation of the appropriate site of care for elderly patients cannot rely only on severity assessment scores and other factors should also be considered [31]. The Infectious Diseases Society of America (IDSA)/American Thoracic Society (ATS) 2007 guidelines [32] recommend evaluating subjective factors when deciding the setting of care: patients' ability to take oral medications, availability of outpatient support resources and caregivers in case of dependent patients, other medical or psycho-social needs (such as homelessness and poor functional status), and lack of response to previous adequate empiric antibiotic therapy [33]. However, clinicians' experience and judgment in assessing patient's severity is still the cornerstone of clinical management. Three possible scenarios must be taken into account when evaluating the severity of a patient with pneumonia: 1) onset of severe sepsis; 2) onset of acute respiratory failure; and 3) presence of decompensated comorbidities [34].

5. How to manage severe sepsis and acute respiratory failure in elderly patients?

Early recognition of sepsis in older compromised patients can be challenging. The classical criteria to define the systemic inflammatory response syndrome (SIRS: fever or hypothermia, tachycardia, tachypnea, or abnormal WBC count) can be absent in anergic patients. Therefore, the clinical diagnosis of sepsis can be delayed until the moment when multi-organ failure (MOF) and septic shock develop. In this scenario use of biomarkers can be helpful in early recognition. Serum lactate level is the most used biomarker to identify sepsis [19]. However, since lactate elevation corresponds to inadequate oxygen delivery/utilization, other comorbidities, such as anemia and severe dehydration, can cause its increase. Therefore, evaluation of serum lactate level could be considered in elderly patients with pneumonia at presentation and in cases where there is a prolonged time to reach clinical stability.

Acute respiratory failure can be treated with different levels of intensity of care, mainly depending on the etiology, type and severity of respiratory failure, including non-invasive ventilation (NIV) and mechanical ventilation (MV). However, despite the lack of evidence that these mechanisms of support are less effective in elderly patients, the elderly are