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Original Article

Acute and chronic diseases as part of multimorbidity in acutely hospitalized older patients

Bianca M. Buurman [a,*], Wijnanda J. Frenkel [b], Ameen Abu-Hanna [c], Juliette L. Parlevliet [a], Sophia E. de Rooij [a,d]

[a] Academic Medical Center, Department of Internal Medicine, Section of Geriatric Medicine, University of Amsterdam, Amsterdam, The Netherlands
[b] Academic Medical Center, Department of Internal Medicine, Section of Vascular medicine, University of Amsterdam, Amsterdam, The Netherlands
[c] Academic Medical Center, Department of Medical Informatics, University of Amsterdam, Amsterdam, The Netherlands
[d] University Medical Center Groningen, University Center of Geriatric Medicine Groningen, The Netherlands

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ABSTRACT

Background: To describe the prevalence of multimorbidity and to study the association between acute and chronic diseases in acutely hospitalized older patients
Methods: Prospective cohort study conducted between 2006 and 2008 in three teaching hospitals in the Netherlands. 639 patients aged 65 years and older, hospitalized for >48 h were included. Two physicians scored diseases, using ICD-9 codes. Chronic multimorbidity was defined as the presence of ≥2 chronic diseases, and acute multimorbidity as ≥1 acute diseases upon pre-existent chronic diseases. Logistic regression analyses were conducted to analyse cluster associations between a chronic index disease and the concurrent chronic or acute disease, corrected for age and sex.
Results: The mean age of patients was 78 years, over 50% had ADL impairments. Prevalence of chronic multimorbidity was 69%, and acute multimorbidity was present in 88%. Hypertension (OR 1.16; 95% CI 1.08–1.24), diabetes (type I or type 2) (OR 1.12; 95% CI 1.04–1.21), heart failure (OR 1.25; 95% CI 1.14–1.38) and COPD (OR 1.19; 95% CI 1.05–1.34) were associated with acute renal failure. Hypertension (OR 1.10; 95% CI 1.04–1.17) and atrial fibrillation (OR 1.17; 95% CI 1.08–1.27) were associated with an adverse drug event. Gastro-intestinal bleeding was clustered with atrial fibrillation (OR 1.11; 95% CI 1.04–1.19) and gastric ulcer (OR 1.16; 95% CI 1.07–1.25).
Conclusion: Both acute and chronic multimorbidity was frequently present in hospitalized older patients. We identified specific associations between acute and chronic diseases. There is a need for strategies addressing multimorbidity during the exacerbation of chronic diseases.

1. Introduction

The number of chronic diseases rises with age and is associated with increased use of health care facilities, adverse events and hospitalization [1–3]. The presence of multiple chronic diseases can be described with two terms: comorbidity and multimorbidity. Although both terms refer to the presence of two or more diseases in one patient, their emphasis is different. Comorbidity takes one disease as a starting point, and other diseases are specified relative to this index disease, whereas multimorbidity reflects a more integrative approach to diseases [2].

In population-based studies of chronic diseases, multimorbidity prevalence varies from 35–65% in patients aged 60–69 years to 80–99% in octogenarians [4–7]. These variations are mainly due to differences in definitions [7]. Multimorbidity is frequently complicated by an acute event that may lead to acute hospitalization. This acute event can be a new disease related to a chronic disease, an exacerbation of an existing chronic disease, or a new disease not related to co-existing diseases. Information on the prevalence of multimorbidity in acutely hospitalized older patients may be useful for everyday clinical practice to assist patients and their caregivers in decision making as well as inform them about the prognosis of the acute illness experienced in addition to their existing chronic diseases. Studies specifying multimorbidity in acutely hospitalized patients may also show patterns between acute and chronic diseases that might reveal unexpected combinations or potential consequences [8]. Currently, only a limited number of studies describe multimorbidity and its relation to acute and chronic diseases in older hospitalized patients [9,10].

We conducted a multicentre prospective cohort study in acutely hospitalized older patients to investigate 1) the prevalence of acute and chronic diseases, and 2) associations between acute and chronic diseases in this subgroup.

* Corresponding author at: Academic Medical Center, University of Amsterdam, Room F4-108, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands. Tel.: +31 20 5665991; fax: +31 20 5669325.
E-mail address: b.m.vanes@amc.uva.nl (B.M. Buurman).

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2. Methods

2.1. Design and setting

This multicentre prospective cohort study, the DEFENCE study (Developing strategies to Enable Frail Elderly New hospital Complications to Evade), was conducted during a 24-month period, between April 1st 2006 and April 1st 2008, in three hospitals in the Netherlands: the Academic Medical Center (AMC) in Amsterdam, the University Medical Centre Utrecht (UMCU) in Utrecht, and the Spaarne Hospital (SH) in Hoofddorp. The AMC (1024 beds) and UMCU (1042 beds) are tertiary university teaching hospitals. The SH (455 beds) is a regional teaching hospital.

The study was approved by the Institutional Review Board of the Academic Medical Center in Amsterdam. Local approval was given by the Spaarne Hospital and University Medical Centre Utrecht.

2.2. Patients

Consecutive patients aged 65 years and older acutely admitted to one of the medical wards of the three hospitals were enrolled. Patients were excluded if they 1) were too ill to participate according to their attending physician, 2) came from another ward within or were transferred from another hospital, 3) were transferred to Intensive Care Unit, Coronary Care Unit or another ward within 48 h after admission, or 4) were unable to speak or understand Dutch. Inclusion had to take place within 48 h after admission.

2.3. Data collection

The research team in each of the participating hospitals consisted of a research nurse experienced in older patients, a nurse practitioner in geriatrics and a geriatrician. The research nurse visited the participating wards on a daily basis (except during weekends) to determine if there were patients eligible for the study. After obtaining written informed consent from the patient or primary caregiver if the patient was cognitively impaired, the research nurse performed a standardized comprehensive geriatric assessment (CGA) covering the four domains of functioning (somatic, psychological, functional and social). The primary care giver was interviewed as well. The assessment of the patient had to be completed within 48 h after admission. More detailed information on the data collection procedure and related measurement instruments can be found elsewhere [11].

After inclusion of the patient and collecting data during CGA, the research nurse discussed her findings with a geriatrician of the research team. The geriatrician also visited the patient within 48 h after admission and had special attention for the presence of potential psychiatric problems, such as cognitive impairment, depression and delirium. The patient was screened for delirium with the Confusion Assessment Method (CAM), based on the DSM-IV criteria [12]. Laboratory results at admission were collected of all patients from the Hospital Information System. Length of hospital stay was registered for all patients.

2.4. Scoring of chronic and acute disease

After discharge, two physicians (WF, JP) studied the discharge summaries of each patient to determine the presence of acute and chronic diseases and adverse drug events before and during hospitalization. The ICD-9 diagnostic criteria were applied to score the acute and chronic diseases [13]. The scoring was conducted using the main categories of the ICD-9. For example, we did not specify the exact agent causing an infection, but we noted the source of the infection (e.g., pneumonia or urinary tract infection). An overview of all definitions used is found in Appendix 1. In total, 35 chronic conditions and 14 acute conditions were scored. In some cases (e.g., hypertension or acute or chronic renal failure), more specific criteria such as blood pressure and creatinin serum levels were used to determine the presence or severity of the medical condition. For other diagnoses, such as solid tumours, a time frame was used (e.g., a period of five years after a patient was successfully treated for a tumour was the cut-off to score the condition as present). For each of the diseases was recorded whether a disease required active intervention during the hospital stay. The patients' medications at admission and the Charlson comorbidity index at discharge [14] were derived from the hospital information system and the discharge summaries.

To obtain uniformity in all screening processes, the first 30 discharge letters were investigated by both independent reviewers. If there were any discrepancies concerning the presence of a disease, the complete medical record was retrieved to ascertain the diagnosis and any remaining issues were discussed between both reviewers and solved.

2.5. Definitions of multimorbidity, chronic disease and acute illness

Two definitions of multimorbidity are used in this article. Chronic multimorbidity is defined as the presence of two or more chronic diseases [7]. This definition is only based on counting the number of chronic diseases present and does not specify any potential relationship between diseases. We also calculated the percentage of patients with acute diseases that occurred in combination with one or more chronic diseases and defined this as acute multimorbidity.

We defined chronic diseases as diseases that were already pre-existent before hospital admission. Acute illnesses were those (new) diagnoses that required active treatment during hospital stay. Although anaemia or renal failure could be a chronic disease, this distinction was sometimes difficult to determine from the discharge summaries. Therefore, anaemia and renal failure were classified based on laboratory results at admission and both treated as acute diseases (see Appendix 1 for the definitions applied to define anaemia and renal failure). Adverse drug events were classified based on the method described by Bates [15]. We did not score the preventability, causality or severity of adverse drug events.

2.6. Statistical analysis

Baseline characteristics were calculated using descriptive statistics. For all continuous variables, mean scores and standard deviations (SD) are given. Prevalence rates of acute and chronic diseases were also calculated using descriptive statistics. Acute and chronic multimorbidity percentages were calculated using the given definition. Differences in multimorbidity between three age groups (65–74 years, 75–84 years and 85 years and older) were computed, as the general prevalence of multimorbidity tends to increase with age [2,6,7]. This part of the data analysis was performed with the Statistical Package of Social Sciences, version 18.0.

Next, potential associations between diseases were explored. In these analyses, only diseases with prevalence rates of 5% or higher were included. Logistic regression analyses were performed using clusters of two diseases. For each of the analysis, the independent association between the index chronic disease and the concurrent disease (chronic or acute) was calculated. The index disease was the independent variable, and the concurrent disease the dependent variable, and age and sex were entered as covariates. Outcomes are expressed in odds ratios (OR), and their corresponding 95% confidence intervals (95% CI) are given. In the tables, for example the odds for a patient with hypertension (index disease) to have dyslipidaemia (concurrent disease) is given, controlled for age and sex. All logistic regression analysis were performed in R.