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Multimorbidity measures were poor predictors of adverse events in patients aged ≥80 years: a prospective cohort study

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Abstract

Objectives: To assess and compare the ability of two measures of multimorbidity and a simple disease count (DC) to predict health outcomes in a population of patients aged ≥80 years.

Study Design and Setting: A prospective, observational, and population-based cohort study including 567 individuals [3.0 years (standard deviation ± 0.25) follow-up].

Results: Of the patients, 37.6% were reported with five or more diseases. Multimorbidity was measured by means of a modified Charlson comorbidity index [mCCI; median score, 5 (range, 4−15)], Cumulative Illness Rating Scale [CIRS; median score, 4 (range, 1−11)], and a simple DC of 22 selected chronic conditions [median score, 4 (range, 0−13)]. All measures were independently related to mortality [adjusted hazard ratio (HR) mCCI, 2.5 (confidence interval {CI}: 1.5, 4.1); CIRS, 2.1 (CI: 1.4, 3.2); DC, 2.1 (CI: 1.4, 3.2)] and hospitalization [adjusted HR DC, 2.3 (CI: 1.7, 3.1); mCCI, 2.1 (CI: 1.5, 3.0), CIRS, 1.9 (CI: 1.5, 2.6)] but not to functional decline. Areas under the curve for mortality and hospitalization were all below 0.70. Net reclassification improvements did not indicate that any one measure provided a significant benefit over the others.

Conclusion: In this population, the mCCI, CIRS, and unweighted DC predicted mortality and hospitalization but not functional decline. There is no clear advantage of using one measure over another.

Keywords: Multimorbidity; Measurement; Mortality; Hospitalization; Functional decline; Older persons

1. Introduction

Aging populations are associated with increases in the prevalence of chronic disease and dependence. In clinical care, patients with multiple conditions (multimorbidity) are the rule rather than the exception [1,2], and studies have primarily focused on patients with a single disease [3,4]. Thus, the results of these studies may not apply to patients with multiple conditions [5,6]. To tailor the care to this growing group of patients, interest in multimorbidity research is rapidly growing. However, this research is challenging, as the concept of multimorbidity is difficult to define and measure [7]. Various measures have been developed, but researchers are unsure on which instrument to choose [8,9].

Most studies have used simple disease counts (DCs), but weighted scores that allocate different weights to different diseases, such as the Charlson comorbidity index (CCI) [10] and the Cumulative Illness Rating Scale (CIRS) [11−13], have also been developed and validated. Experts in the field have suggested that researchers use an index that is valid for predicting the specific outcome of interest, but few studies have directly compared the performance of different measures [9]. Moreover, although most measures were originally developed and validated for a single outcome, multimorbidity impacts several health-related outcomes and measures of multimorbidity may not be equally valid across different outcomes [14,15].

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What is new?

- Weighted multimorbidity measures are not superior to a simple disease count to predict mortality, hospitalisation and functional decline in the oldest age group.
- In general, measures of multimorbidity have a limited ability to predict adverse outcomes in this population.

It is unclear whether more complicated measures of multimorbidity are really of added value in multimorbidity research or whether simple counts can also be used with acceptable validity across health outcomes. The present study compares the ability of two multimorbidity measures [a modified CCI (mCCI) and the CIRS] and a simple DC to predict mortality, hospitalization, and functional decline in persons aged 80 years and older. These measures were appropriate to compare because DCs are the easiest measure to use in clinical research, the CCI is the most established measure in multimorbidity research, and the CIRS is the most comprehensive measure.

2. Methods

2.1. Study population

The BELFRAIL study (BF_{C80+}) was designed as a prospective, observational, and population-based cohort study to evaluate subjects aged 80 years and older living in Belgium. All the participants in the study provided informed consent, and the Biomedical Ethics Committee of the Medical School of the Université Catholique de Louvain of Brussels approved the study. The study protocol and the sampling methods have previously been described in detail [16]. In short, between November 2008 and September 2009, 567 individuals were included in the study. Only three exclusion criteria were used: known severe dementia, palliative situations, and medical urgency. At baseline (T0), the patient's general practitioner (GP) recorded sociodemographic data and medical history information. A clinical research assistant (CRA) performed an extensive examination that included performance testing and questionnaires. A second CRA visit was performed 19.6 ± 2.5 months after patient enrollment (T1). Detailed follow-up on mortality and hospitalizations was collected from the participants' GPs until 3.0 ± 0.25 years after baseline (T2) (Fig. 1).

2.2. Baseline multimorbidity

The GPs reported the medical histories of their patients as free text. These histories included both active medical problems and important antecedents, such as myocardial infarction and pulmonary embolism. The GPs also completed a structured questionnaire that asked about the presence or absence of 22 chronic conditions (vide infra). Multimorbidity was measured by means of a simple DC, an mCCI, and the CIRS. The simple DC was the sum of the diseases that were included in the structured questionnaire. To calculate the mCCI and the CIRS, two researchers (P.B. and O.D.) assessed and coded the medical history of each patient. In cases of discrepancy between the first and the second researcher's codes, the patient's case was discussed with a third researcher (B.V.) until consensus was reached.

2.2.1. Disease count

The unweighted DC included hypertension, lipid disorder, angina pectoris, cardiomyopathy, myocardial infarct, transient ischemic attack, cerebrovascular accident (CVA), peripheral arterial disease, an episode of decompensated heart failure, an episode of atrial fibrillation, known valvular disease, thyroid disease, respiratory impairment [either asthma or chronic obstructive pulmonary disease (COPD)], Parkinson's disease, arthritis, osteoarthritis, documented osteoporosis, cancer, depression, renal insufficiency, locomotor sequelae of CVA, and diabetes.

2.2.2. The modified Charlson comorbidity index

The CCI includes 19 chronic diseases that are weighted based on their association with mortality [10]. For the present study, the CCI was slightly modified because connective tissue disease could not be reliably assessed and various stages of liver disease, cancer, and diabetes could not always be differentiated. Consequently, the mCCI assigned the following weights: 1 point: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, chronic pulmonary disease (COPD or asthma), all liver diseases, and all cases of diabetes; 2 points: hemiplegia, renal disease, and all cancers with no metastases mentioned in the medical history; 6 points: human immunodeficiency virus and metastatic cancer.

2.2.3. The Cumulative Illness Rating Scale

The CIRS uses a scoring system that includes 14 body systems, and the scale can be validly reproduced based on a chart review [11]. Based on the medical history of the patient, each body system is assigned a severity score (1, no problem; 2, current mild problem or past significant problem; 3, moderate disability or morbidity; or 4, severe problem). The CIRS comorbidity index (CIRS-CI) [12] is based on the number of body systems that present a severity score of at least 3, so the score can range from 0 to 14. Within this study sample, 58 chronic conditions were observed in the patients' medical histories. The conditions were categorized into the appropriate body systems according to the CIRS scoring manual that was published by Hudon [12].