



Original Article

Health care utilization of patients with multiple chronic diseases in The Netherlands: Differences and underlying factors

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ABSTRACT

Purpose: To examine health care utilization of people with multiple chronic diseases in The Netherlands compared to people with one chronic disease, and to identify different subgroups of multimorbid patients based on differences in health care utilization.**Methods:** All patients diagnosed with one or more chronic diseases in 2008–2009 ($N = 17,443$) were selected from the nationwide NIVEL Primary Care Database, and data on their GP contacts were included. Data on hospital admissions (from the Dutch Hospital Data database) and household size and income (from the Integral Household Incomes database 2010) were added. Chi-square-tests and multivariate regression analyses were performed to test for differences between multimorbid patients and patients with one chronic disease, and between subgroups of multimorbid patients derived from cluster analysis.**Results:** Multimorbid patients (40% of the total sample) had more GP contacts, prescribed medications, and hospital admissions (all $p < .0001$) than patients with one chronic disease. The largest cluster of multimorbid patients (80%) was characterized by a relatively low level of health care utilization. Two smaller clusters comprised patients with a (very) high level of health care utilization – these people were mainly older, more often female, had a lower income, a smaller household size, and suffered from more chronic diseases.**Conclusions:** Among the vast majority of multimorbid patients health care utilization is only slightly higher compared to patients with one chronic disease. Extensive health care utilization among people with multimorbidity seems to be related to patient characteristics as well as illness characteristics.

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1. Introduction

Due to rapid ageing and greater longevity of the population as well as increasing improvement of medical care, a growing number of people are living with a chronic disease [1]. Thirty percent of the population of the European Union (EU) is living with a chronic disease [2] and this percentage is expected to further increase in the next decades [3]. An increasing proportion of the chronically ill people suffers from multimorbidity [4,5], which refers to the co-occurrence of multiple chronic diseases within a person [6,7]. The total number of people with multimorbidity in the EU is conservatively estimated at about 50 million [8]. Especially among older people the prevalence of multimorbidity is very high: among people over age 65 the proportion of individuals with multiple chronic diseases is estimated at about 65%; among people over age 85 at about 85% [9,10].

Multimorbidity is associated with a poor functional status [11], poor quality of life [12,13], more psychological distress [14], and mortality [15]. Multimorbidity may also be associated with higher levels of health care utilization – not only in comparison to people without a chronic

disease but also to people with a single chronic disease who, in their turn, may have higher levels of health care utilization than people without chronic diseases [12]. For instance, Sinnige and colleagues [16], who studied multimorbidity patterns in an elderly general practice population, argued that multimorbidity is “far more complicated than merely the presence of two co-occurring diseases within a person”, and that knowledge on comprehensive disease patterns should be taken into account when providing care for multimorbid patients.

Since health care systems are under pressure (not least as a result of the growing number of people with [multiple] chronic diseases and the consequential burden on financial and human resources), innovation of chronic illness care in order to provide good quality care (with limited resources) is urgently needed. Integrated care has the potential to meet the complex needs of people with multiple chronic conditions, while making more efficient use of resources [8]. To allocate these resources as efficient as possible, identification is needed of those multimorbid patients who are most urgently in need for care. In other words: it should be made clear which multimorbid patients (i.e. in terms of patient and illness related characteristics) have a particularly high level of health care utilization. The induction of profiles of (groups of) multimorbid patients with high health care utilization will allow the health care system to better meet the comprehensive needs of

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multimorbid patients – for example by implementing integrated care programs [17,18].

The aim of this study was therefore to gain more insight into the (differences in) health care utilization of multimorbid patients. More specifically, the current research addresses the following research questions:

1. How does health care utilization of patients with multimorbidity differ from health care utilization of patients with one chronic disease?
2. Which subgroups of multimorbid patients can be distinguished on the basis of their health care utilization, and how do these differences look like?
3. Which patient and illness characteristics underlie these differences in health care utilization among multimorbid patients?

2. Methods

2.1. Databases

2.1.1. NIVEL Primary Care Database

NIVEL Primary Care Database (formerly known as LINH, see for more information [19]) is a national representative database that holds longitudinal data derived from patients' electronic medical records (EMR) on consultations, morbidity, drug prescriptions, and referrals. In 2010 about 130 Dutch general practices provided data [20]. Primary care physicians code diagnoses using the International Classification of Primary Care (ICPC-1; [21]).

2.1.2. Dutch Hospital Data

Data on hospital admissions were derived from the Dutch Hospital Data (DHD) database containing information on all day care and inpatient admissions to approximately 88% of all hospitals in the Netherlands [22].

2.1.3. Integral Household Incomes database

Data on household size and income were derived from the Integral Household Incomes database (CBS) containing information on income per household (several measures) as well as the number of household members (with a personal income).

2.1.4. Linkage

Data from the three databases were linked using postal code and date of birth. Linkage was performed by a TTP and researchers only had access to anonymized data. To perform this linkage, patients had to be uniquely identifiable during 2010, i.e. no other persons with the same date of birth and postal code should be present.

2.2. Study population

From the NIVEL Primary Care Database, we selected patients aged 18 years and older who had at least one chronic disease. For this study, we used a list of 29 chronic diseases which had been selected for previous studies based on a high prevalence and a chronic and severe character [23,16] (see Appendix A). In the Netherlands, all individuals are listed obligatory in a general practice, and all consultations with the general practitioner are fully reimbursed by the mandatory health insurance. The general practitioner is usually the first professional to be consulted for health problems, and acts as a gatekeeper to secondary care. As medical records in primary care practice are likely to be most complete and reflect the total population, these are especially suitable for estimating prevalence of chronic diseases.

Patients were required to be registered at the same general practice for the full period 2008–2010. By using a minimal period of two years, diagnoses were determined more accurately, as for some chronic diseases patients do not necessarily visit their family physician annually. We selected practices that registered morbidity data for at least two

complete consecutive years in the period 2008–2009 and registered health care utilization (i.e. general practitioner [GP] contacts and prescriptions) in the full year 2010.

This study was executed according to the precepts of the Dutch legislation on privacy and the regulations of the Dutch Data Protection Authority. According to Dutch legislation, studies using this kind of observational data do not require medical ethical approval, nor informed consent.

2.3. Health care utilization

2.3.1. GP care utilization

Number of GP contacts in the year 2010 was derived from the NIVEL Primary Care Database. Based on this number, we calculated an additional variable 'having had at least one GP contact in 2010' (yes = 1, no = 0).

2.3.2. Medication use

Number of prescribed medications (different types, on ATC3-level) in the year 2010 was derived from the NIVEL Primary Care Database. Based on this number, we calculated an additional variable 'polypharmacy (≥ 10 prescriptions) in 2010' (yes = 1, no = 0), which shows the number (and percentage) of patients who were prescribed ten or more different types of medications in 2010.

2.3.3. Hospital admission

The number (and percentage) of patients with at least one day admission (yes = 1, no = 0) and the number of patients with at least one clinical admission (yes = 1, no = 0) to the hospital in 2010 were derived from the Dutch Hospital Data (DHD) database.

2.4. Patient and illness related characteristics

Age, gender, number and type(s) of chronic diseases were derived from the NIVEL Primary Care Database. Disposable income (in Euro's, over the year 2010) and household size (in the year 2010) were derived from the Integral Household Incomes database (Statistics Netherlands). Disposable income equals gross income minus: inter-household transfers paid, income insurance premiums, health insurance premiums, and capital income and gain taxes.

2.5. Data analysis

First, we compared the patients diagnosed with a single chronic disease with those diagnosed with more than one chronic disease (multimorbidity) on baseline and disease characteristics (i.e. prevalence of each of the listed chronic diseases, gender, age, household size and income). We also examined differences in health care utilization (GP care utilization, medication use and hospital admissions; research question 1). Differences between the two groups were tested with logistic regression analysis and Chi-square-tests, except for the number of GP contacts, which were tested using multivariate negative binomial regression analyses [24]. We chose this type of regression analysis since the number of GP consultations is a rate and this type of regression analysis predicts the rate of an event.

Next, in order to investigate differences in health care utilization among multimorbid patients (research question 2), a hierarchical cluster analysis (complete linkage) was conducted [25]. This procedure divides patients into clusters based on Euclidean distances. This analysis was performed with the following clustering variables: number of GP contacts in 2010, number of prescribed medications (different types, on ATC3-level) in 2010, having had at least one day admission to a hospital in 2010, and having had at least one clinical admission to a hospital in 2010.

Finally, we performed a series of regression analyses (multiple, logistic) and Chi-square-tests in which we tested for differences in patient

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