

REVIEW ARTICLES

Multimorbidity patterns: a systematic review

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Abstract

Objectives: The aim of this review was to identify studies on patterns of associative multimorbidity, defined as the nonrandom association between diseases, focusing on the main methodological features of the studies and the similarities among the detected patterns.

Study Design and Setting: Studies were identified through MEDLINE and EMBASE electronic database searches from their inception to June 2012 and bibliographies.

Results: The final 14 articles exhibited methodological heterogeneity in terms of the sample size, age and recruitment of study participants, the data source, the number of baseline diseases considered, and the statistical procedure used. A total of 97 patterns composed of two or more diseases were identified. Among these, 63 patterns were composed of three or more diseases. Despite the methodological variability among studies, this review demonstrated relevant similarities for three groups of patterns. The first one comprised a combination of cardiovascular and metabolic diseases, the second one was related with mental health problems, and the third one with musculoskeletal disorders.

Conclusion: The existence of associations beyond chance among the different diseases that comprise these patterns should be considered with the aim of directing future lines of research that measure their intensity, clarify their nature, and highlight the possible causal underlying mechanisms. © 2014 Elsevier Inc. All rights reserved.

Keywords: Associative multimorbidity; Chronic disease; Patient-centered care; Electronic medical records; Practice guidelines; Primary health care

1. Introduction

Although newborns in industrialized countries are currently likely to reach 80 years of age, during their last 15 years of life, half of them will suffer multimorbidity, that is, they will live with at least two coexisting chronic diseases such as hypertension, diabetes, cancer, or coronary heart disease. As shown in the Scottish study by Barnett et al. [1], the onset of multimorbidity may occur 10–15 years earlier in individuals living in deprived areas, and one

mental health disorder such as depression or anxiety is bound to be one of their chronic diseases. As a consequence of multimorbidity, individuals will have poor quality of life, psychological distress, worsening functional capacity, longer hospital stays, and more postoperative complications, leading to higher costs of care [2–4].

The negative outcomes associated with multimorbidity are partly attributable to the fact that health-care delivery and quality measurement are organized and designed based on patients with single diseases [5,6]. Moreover, the evidence for treating patients affected with multiple concurrent chronic conditions is worryingly weak [7]. Despite being effective for their targeted single illnesses, it is worth highlighting that clinical guidelines are often unable to address the complex needs of patients with multimorbidity because of the inadequate attention to co-occurring diseases [8]. General practitioners often cite this limitation as a

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What is new?**What is known?**

- Individuals with multimorbidity have poor quality of life, psychological distress, worsening functional capacity, longer hospital stays, and more postoperative complications, leading to higher costs of care.
- Disorders that are not designated as the “primary” condition are often undertreated.

What is new?

- This systematic review reveals a recent interest in the study of nonrandom associations among diseases (ie, 12 of the 14 articles identified were published in the last 5 years).
- Nonrandom associations were identified for three groups of patterns: cardiovascular and metabolic diseases, mental health problems, and musculoskeletal disorders.

What this means?

- This provides essential information for developing guidelines that offer clinical management and treatment decision support for patients with multiple chronic diseases.

barrier to guideline implementation, arguing that the guidelines are simply not relevant or applicable to their typical patients, who have multiple chronic diseases [9]. If each of the guidelines was used for each of the health problems present in a patient with multimorbidity, the patient would be unable to comply with the treatment recommendations, and interactions among medications for multiple diseases might occur [10]. Therefore, the disorders that are not designated as the “primary” condition are often undertreated [11].

According to the European Forum for Primary Care, one important first step to generate an evidence base for actual clinical practice is the focus on the associations beyond chance or patterns of diseases [12]. However, there is considerable variability both in the vast number of co-occurring disease combinations and in the ways that associations among diseases are analyzed. Several studies have focused on those disease combinations with the highest absolute frequencies [13]. These frequencies are determined by the prevalence rates of each disease in the combinations and therefore have limited value. For example, given its high prevalence in the population, hypertension is a member among the most frequent disease combinations. Thus, it is more informative to view disease patterns from the perspective of the nonrandom association of health problems, as

defined by the term associative multimorbidity [14]. One type of associative multimorbidity, causal multimorbidity, for which common pathophysiological mechanisms underlying disease aggregation can be ascertained, is of special interest because of its potential for secondary disease prevention [15]. Recently, the increasing availability of medical data has facilitated the exploration of novel and potentially (clinically and statistically) relevant patterns or associations of diseases without stating a priori hypotheses [16].

Knowledge about the patterns of multimorbidity in a given population has important implications for patient-oriented (rather than disease) prevention, diagnosis, treatment, and prognosis strategies. According to the National Institute for Health and Clinical Excellence, this knowledge also provides essential information for developing guidelines that offer clinical management and treatment decision support for patients with multiple chronic diseases [17].

The general objective of this systematic review was to identify, describe, and evaluate the studies on patterns of associative (including causal) multimorbidity. The specific aims were to (1) describe the main methodological features of the studies, (2) gain knowledge about the identified patterns of multimorbidity, and (3) identify similarities regarding the diseases conforming the patterns detected in the different studies.

2. Methods*2.1. Inclusion criteria*

All the included articles were original publications that focus on the identification of patterns of associative multimorbidity, which is defined as the nonrandom association between diseases.

2.2. Exclusion criteria

Articles were excluded based on the following criteria:

1. Analyzed the frequency of disease combinations without applying any statistical technique to proof the nonrandomness of disease associations.
2. Began with a preliminary selection of index diseases (ie, studies of comorbidity).
3. Initially selected less than 10 diseases (criterion adapted based on the previous recommendations available [18,19]).
4. Applied a criterion related to one specific outcome variable.
5. Included selected populations based on the presence of diseases or specific health problems.

2.3. Search strategy for article identification

Studies were identified through MEDLINE and EMBASE electronic database searches from their inception to June 2012. The search strategy was based on two criteria,

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