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Review

Frailty assessment instruments: Systematic characterization of the uses and contexts of highly-cited instruments

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ABSTRACT

The medical syndrome of frailty is widely recognized, yet debate remains over how best to measure it in clinical and research settings. This study reviewed the frailty-related research literature by (a) comprehensively cataloging the wide array of instruments that have been utilized to measure frailty, and (b) systematically categorizing the different purposes and contexts of use for frailty instruments frequently cited in the research literature. We identified 67 frailty instruments total; of these, nine were highly-cited (≥200 citations). We randomly sampled and reviewed 545 English-language articles citing at least one highly-cited instrument. We estimated the total number of uses, and classified use into eight categories: risk assessment for adverse health outcomes (31% of all uses); etiological studies of frailty (22%); methodology studies (14%); biomarker studies (12%); inclusion/exclusion criteria (10%); estimating prevalence as primary goal (5%); clinical decision-making (2%); and interventional targeting (2%). The most common assessment context was observational studies of older community-dwelling adults. Physical Frailty Phenotype was the most used frailty instrument in the research literature, followed by the Deficit Accumulation Index and the Vulnerable Elders Survey. This study provides an empirical evaluation of the current uses of frailty instruments, which may be important to consider when selecting instruments for clinical or research purposes. We recommend careful consideration in the selection of a frailty instrument based on the intended purpose, domains captured, and how the instrument has been used in the past. Continued efforts are needed to study the validity and feasibility of these instruments.

Contents

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1. Introduction

As the population ages, a central focus of health care providers is to understand, and beneficially intervene upon, the factors that place older adults at elevated risk of precipitous declines in health and function. The syndrome of frailty has been hypothesized to represent such risk, in particular the increased vulnerability to stressors (e.g. infection, injury, changes in medication) that characterizes many older adults (Fried et al., 2001; Bandeen-Roche et al., 2006; Varadhan et al., 2008).

While frailty is widely recognized, there continues to be considerable debate over how best to assess it. Many operational definitions have been introduced to attempt to distinguish frail from non-frail older adults (Gobbens et al., 2010; Hogan et al., 2003). These definitions vary in their conceptual underpinnings, clinical practicality, domains, and assessment items (Bouillon et al., 2013; de Vries et al., 2011; Gobbens et al., 2010; Sternberg et al., 2011). There appears to be general agreement that operational definitions of frailty should be: multi-dimensional; exclusive of disability and, possibly, of comorbidity; dynamic; predictively valid for adverse outcomes; and feasible (Gobbens et al., 2010; Hogan et al., 2003). However, instrument variability has led to controversy over which frailty assessment instrument is appropriate in which context, and importantly, what is actually being assessed (for example, frailty versus disability) depending on the chosen instrument. Recent reviews of frailty instruments have highlighted the need for greater reliability and validity testing (Bouillon et al., 2013; de Vries et al., 2011). A systematic review by Sternberg et al. (2011) concluded that the needs and goals of the study or clinic may determine the most suitable frailty instrument, similar to the perspectives of Martin and Brighton (2008) and Cesari et al. (2014a).

A consensus-building effort by Rodríguez-Mañas et al. (2013) led to agreement on a conceptual framework for frailty, the inclusion of specific domains, and its distinction from disability, but no consensus on an overall operational definition of frailty was reached. A separate consensus effort by Morley et al. (2013) to define frailty reached agreement on four key points related to the assessment of physical frailty: (1) it is an important medical syndrome; (2) it can potentially be targeted and treated; (3) there are available screening tests; and (4) all persons 70 years and older should be screened. A published response to the second effort called for careful attention to the choice of instruments for frailty assessment and their validation and refinement (Xue and Varadhan, 2014).

Frailty research is evolving rapidly, with multiple frailty studies published every year despite the relative lack of validation studies and refinement efforts needed to maximize the clinical utility and reproducibility of frailty assessment. Questions such as "what is the best definition of frailty?" and "which instrument should be used to assess frailty?" are often posed, although no answer is readily available. A plausible reason as to why standardization and consensus efforts have been unfruitful is that they have not explicitly considered the purpose and the context of frailty assessment. Though answering the above questions are important, the primary goals of this study were to gain insight into the spectrum of original studies, reviews and other types of articles that comprise the current frailty-related research literature, and to better understand whether high citation counts truly equated with wide use of an instrument, or if, perhaps, citations were more indicative of references in reviews or other types of papers. To accomplish this goal, we aimed to comprehensively catalog the wide array of instruments that have been utilized to measure frailty and provide an empirical foundation of the various purposes and contexts in which highly-cited instruments have been used. Trends of instrument uses, along with further considerations of theory, validity, and feasibility, can help to guide the development, selection and implementation of appropriate frailty instruments in the future, where "appropriate" means matching the assessment instrument to the purpose and context.

2. Methods

2.1. Literature search and inclusion to identify frailty instruments

A search strategy was developed to identify frailty instruments using the following steps (see Appendix 1 for flow chart of the search strategy):

1. We first performed a PubMed database search using the "frail elderly" MESH term in combination with the term "instrument." Relevant articles that included frailty assessment instruments were identified by reading the abstract and, when necessary, the full article. This search was performed from the start of the database through December 2013.
2. In our PubMed search, we identified three recent review papers that have examined the components and domains of frailty instruments (Bouillon et al., 2013; de Vries et al., 2011; Sternberg et al., 2011); two were found directly in the search results (Bouillon et al., 2013; de Vries et al., 2011) and the third article (Sternberg et al., 2011) was found by pearling the references of the review by Bouillon and colleagues.
3. We then screened the three identified review papers and found additional instruments not found in our PubMed search that met our inclusion criteria (described below).
4. Lastly, as we conducted the citation review described below, additional frailty assessment instruments were found in the literature that met our inclusion criteria.

For inclusion, we defined a frailty instrument as a specific and reproducible set of criteria for assessing frailty status. For each frailty instrument identified, we determined the instrument's seed article(s) where the definition of the instrument for measuring frailty was first published. Generally, one article served as the seed article but in two cases (Deficit Accumulation Index and FRAIL