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Review Article

Prevalence of Frailty in Nursing Homes: A Systematic Review and Meta-Analysis

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A B S T R A C T

Background: Nursing home patients are expected to be very frail. However, evidence on frailty in a nursing home setting is scarce in the literature. Especially prevalence of frailty in this population is unknown.
Objective: To systematically search and analyze the prevalence of frailty among nursing home patients in the literature and synthesize pooled estimates of overall prevalence of frailty and prefrailty as well as prevalence of frailty stratified by age, gender, and frailty definitions.
Design: Systematic review using 5 databases: Embase, MEDLINE, CINAHL Plus, PsycINFO, and Cochrane library, and meta-analysis.
Setting: Cross-sectional studies or observational studies with baseline data in a nursing home setting.
Participants: Nursing home patients aged 60 years or older.
Measurements: Prevalence of frailty and prefrailty based on validated criteria or definitions of frailty was collected. In the included studies, meta-analysis was performed using random-effects models to calculate pooled estimates of prevalence of frailty and prefrailty. Methodological quality, heterogeneity, and publication bias were assessed.
Results: Nine studies with a total of 1373 nursing home patients were found to report prevalence of frailty. The included studies were highly heterogeneous and mean prevalence of frailty ranged widely from 19.0 to 75.6%. Pooled estimates of prevalence of frailty and prefrailty were 52.3% (95% confidence interval 37.9%–66.5%) (9 studies, n = 1373) and 40.2% (28.9%–52.1%) (7 studies, n = 1163), respectively.
Conclusions: As high as about one-half of the nursing home patients were frail. Approximately 40% were still prefrail and could be targeted by interventions for frailty prevention or treatment to avoid its negative health outcomes.

Frailty is a syndrome characterized by reduced physiological reserve and increased vulnerability to adverse outcomes, resulting from cumulative deficits of multiple systems.[1–3] Even minor stressor events can trigger disproportionate worsening of health status in frail older people. An increasing number of studies have been conducted on frailty and shown its associations with negative health outcomes including falls, disabilities, hospitalization, dependency, mortality, and institutionalization.[1–3]

Among a number of studies on frailty in the literature, prevalence of frailty reported ranges widely depending on study designs, populations, and settings.[4] As a whole, frailty emerges as people get older and develop diseases and disabilities and is more common in women than men, however, general overall consensus on the prevalence of frailty has not been reached.[1–3] This inconsistency of the prevalence may be attributed to the fact that older people are a highly heterogeneous population. Older people age at different paces with different genetic backgrounds, medical conditions, and biological as well as social and environmental factors through each stage of life periods. Or it may partially be explained by numerous definitions and criteria proposed to operationalize frailty and prevalence of frailty can vary depending on which definition is used even in the same cohort, which makes it challenging to determine the overall frailty prevalence.

Two previous systematic reviews have been conducted specifically on the prevalence of frailty: the former incorporated 21 studies of a total of 61,500 community-dwelling elderly aged 65 years or older and showed prevalence of frailty ranging widely from 4.0% to 59.1% with a pooled average estimate of 10.7% [95% confidence interval (CI) 10.5%–10.9%][4]; whereas the latter identified 20 studies with 2916 cancer patients, among which median prevalence of frailty was 42% (range 6%–86%).[5]

The author declares no conflicts of interest.

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Little is known about frailty among nursing home patients. Given that frailty itself has been shown to be associated with institutionalization,[6] and that multiple components related to frailty such as disabilities, dependency, comorbidities, malnutrition, weight loss, or sarcopenia are highly prevalent in a longterm care setting.[7–12] However, compared with other populations, the evidence is scarce in the literature, and only a limited number of studies have focused on frailty in the nursing home population. Because no systematic reviews have been performed, aggregated overall prevalence of frailty in this probably highly frail elderly population is still unknown. Information on general prevalence of frailty in nursing home patients would be useful for researchers to design frailty studies in this setting and the basics on which policy makers and nursing home administrators could estimate patients' expected course and stratify related risks and outcomes.[13]

Objectives of this systematic review were (1) to identify and compare studies reporting prevalence of frailty in a nursing home setting, (2) to combine the data to calculate pooled overall prevalence of frailty in nursing home patients, and (3) to perform stratified analyses based on age, gender, and definitions of frailty to examine relationships between frailty and these factors.

Methods

Data Sources and Search Strategy

The author systematically searched the literature in January 2015 in Embase, MEDLINE, CINAHL Plus, PsycINFO, and Cochrane library for studies published from 1990 to 2014 with the following search terms: (nursing home*) OR (nursing home patients) OR (long term care*) OR (long-term care*) OR (home* for the aged) OR (home* for the elderly) OR (institutionalized) OR (institutionalised) AND (frailty) OR (frailty syndrome), using Medical Subject Heading (MeSH) Terms when applicable. The reference lists of the included and other relevant studies were manually reviewed to identify additional studies. The author attempted to obtain additional data needed for the main and stratified analyses by contacting authors of included studies and studies that could be potentially included in this review.

Study Selection

The criteria used to include in this systematic review were studies (1) written in English, (2) among or including nursing home participants aged 60 years or older, (3) including at least 50 eligible participants, (4) using a cross-sectional design or observational study design reporting baseline data, (5) using validated criteria or definitions to define frailty, and (6) reporting prevalence of frailty or sufficient data to calculate prevalence of frailty. Studies were excluded if they were (1) review articles, randomized controlled trials, comments, or personal opinions; (2) substituting other measures such as only handgrip strength or disability to define frailty than validated definitions such as Fried frailty index (FFI)[3]; or (3) using non-nursing home populations (ie, assisted living facilities, care homes, or senior housing) or selected samples with certain diseases or conditions (ie, fractures, cancers, or while hospitalized). If multiple studies reported data from the same cohort, those reporting sufficient information with the largest number of participants or the most detailed information were included. If a study contained compound cohorts, only data relating to nursing home patients were included.

A geriatric medicine fellowship-trained clinician-researcher with clinical and research experience in a nursing home setting screened the titles and abstracts of the studies identified by the literature search and selected relevant studies based on the inclusion and exclusion criteria for further full-text review. Full texts of the studies selected by the title and abstract screening were carefully read and assessed if they were eligible for systematic review.

Data Extraction

A standard data collection tool was used to extract data from the eligible studies including first author, year of publication, region, study design, sample size, age (mean and range), proportion of female participants, frailty definition, prevalence of frailty, and robust/non-frailty. Some of the studies reported an intermediate status between frail and nonfrail, such as "prefrail." Data of these in-between statuses were also collected if available.

Quality Assessment

Eligible studies were further examined for methodological quality using a 6-item tool for critically appraising studies of prevalence or incidence of a health problem.[14] (1) Are the study design and sampling method appropriate for the research question? (2) Is the sampling frame appropriate? (3) Is the sample size adequate? (4) Are objective, suitable and standard criteria used for measurement of the health outcome? (5) Is the health outcome measured in an unbiased fashion? (6) Is the response rate adequate? Are the refusers described? Each item was scored as 1 if a study met the criterion, and all the scores were summed up to provide a total score, ranging from 0 (lowest quality possible) to 6 (highest quality possible). Studies scoring less than 50% were considered as low quality and were not included.

Statistical Analysis

Prevalence of frailty and prefrailty, numbers of entire cohorts, and those who were classified as frail and prefrail were collected directly from the included studies or from authors on request. Cochran's Q statistic was used to assess heterogeneity between studies, and the heterogeneity was considered present at $P < .05$. I^2 statistic was used to quantify the magnitude of the heterogeneity, and I^2 values of 25%, 50%, and 75% were considered as low, moderate, and high heterogeneity, respectively.[15] The pooled estimate of prevalence of frailty and prefrailty with 95% CIs were calculated using a random-effects model if the Cochran's Q statistic detected statistically significant heterogeneity and using a fixed-effects model otherwise. Publication bias was assessed using Egger and Begg tests.

In stratified meta-analyses, the data were divided into subgroups according to age groups (60–69, 70–79, and 80+), gender (male, female), and frailty definitions (FFI, non-FFI), and pooled estimates of prevalence of frailty with 95% CIs were calculated. All data analyses were performed using Stata IC 13 (College Station, TX), StatsDirect (Cheshire, UK), and Microsoft Excel 2010 (Redmond, WA).[16]

Results

Of a total of 1792 studies identified by the extensive and comprehensive systematic literature search, 9 studies[17–25] reporting prevalence of frailty among nursing home patients aged 60 years or older were included for this systematic review and meta-analysis.

Selection Processes

Figure 1 is a flow diagram of the systematic literature review to identify relevant studies showing details of the flow of the review processes and reasons for exclusion. Electronic search using the databases identified a total of 1791 studies (1181 from Embase, 273 from MEDLINE, 184 from CINAHL Plus, 107 from PsycINFO, and 46