

Frailty Was Related With Fracture: A Systematic Review

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Abstract

A. Background: The World Health Organization suggested that frailty is a critical indicator influencing successful aging. Previous studies have indicated a high correlation between frailty and bone fracture in older adults. However, few studies have investigated the correlation between the various stages of frailty with bone fracture risk.

B. Purpose: This study investigated the correlation between frailty and bone fracture in older adults. In addition, the correlation between various frailty criteria and the bone fracture was examined.

C. Method: A systematic review and meta-analysis were conducted. According to the research purpose, publications were retrieved from the databases of PubMed, Ovid, MEDLINE, CINAHL, and the Cochrane Library by using the following keywords: frailty or frail, and bone fracture. The start date of the publication timespan was not limited; the end date was set as October 10, 2016. The title and abstract content of the publications were screened. The inclusion criteria were: (a) prospective study, and (b) relative risk and 95% confidence level. Publication quality was evaluated according to the risk of bias, consistency, and the precision of survival estimates in order to examine the strength of evidence of the correlation suggested between frailty and bone fracture in the various publications.

D. Results: This study collected 6 papers that analyze the correlation of stages of frailty (non-frail, pre-frail, and frail) with a bone fracture. Literature analysis revealed that compared with non-frail older adults, frail older adults had the highest bone fracture risk, followed by pre-frail older adults. Notably, an analysis of secondary groups determined that for females, adults with hip bone fractures, and adults aged 65 years and above, frail adults attained the highest fracture risk, followed by pre-frail adults. In addition, the literature

analysis also revealed that regardless of how frailty was categorized using different criteria, frail adults still showed the highest risk for fracture, followed by pre-frail adults.

E. Conclusion: Frailty is a critical topic in geriatric assessment. The research findings can serve as a reference for case evaluations examining the correlation between frailty and bone fracture, formulating care strategies, and for evaluating care cases related to frailty.

Keywords: frailty, fracture, geriatric assessment, systematic review

I. INTRODUCTION

The global population is aging rapidly and has become a critical concern worldwide. According to the United Nations (UN), the world's older population is expected to increase from 600 million (10% of the total population) in 2000 to 2 billion (21%) by 2050 (The UN, 2002). Therefore, the UN has appealed to governments worldwide to prioritize policies related to older adults as action strategies. Accordingly, the issue of active aging proposed by the World Health Organization (WHO) has become the core concept in the geriatric health care policies drafted by governments worldwide (WHO, 2002).

The health and physical functions of older adults of the same age differ markedly in both course and speed (Chang & Lin, 2015). This heterogeneity poses a considerable challenge to evaluating their health. Frailty is considered to be the first sign of functional decline in older adults and the middle stage between independent living and mortality (Chang & Lin, 2015). In addition, it is a considerable threat to the living functions and quality of life of older adults. Previous studies have suggested that frailty, besides negatively impacting activity and quality of life (Avila-Funes et al., 2009; Shamlivan et al., 2013) and causing cognitive impairment, also impedes daily living function, may result in bone fractures and increases the probability of requiring institutional care or hospitalization; extreme cases could also lead to death (Fried et al., 2001;



Kulmala et al., 2014a,b; Shamliyan et al., 2013). Among these factors, bone fracture is a critical factor contributing to the death of older adults. Yang (2008) suggested that hip fractures were the most common among bone fractures in older adults and that the patients have a 50% probability of dying one year from incurring a hip fracture.

II. PURPOSE

This study systematically reviewed past literature to investigate the correlation between different stages of frailty and bone fractures of older adults.

III. METHODOLOGY

A. Data Sources and Search Strategy

Using the databases of PubMed, Ovid, MEDLINE, CINAHL, and the Cochrane Library, this study systematically reviewed past literature. The search keywords included 'frailty' or 'frail', 'bone fracture', and 'older adult'. The start date of the data search time span was not specified; the end date was set to October 10, 2016.

B. Inclusion and Exclusion Criteria

This study included prospective studies that involved participants aged 65 years and above. Publications that were intervention studies, books, master or doctoral theses, letters, or conference papers were excluded.

C. Data Retrieval

Two researchers independently conducted systematic reviews. The retrieved data content included sample size, prevalence rate, and odds ratio or relative risk. The retrieved data were then integrated. Discrepancies were examined by a third researcher.

D. Quality Assessment

The retrieved publications were evaluated according to the Agency for Healthcare Research and Quality for the risk of bias, consistency, and the precision of survival estimates. The strength of evidence regarding the individual publications on the correlation between frailty and bone fracture was thus examined.

IV. RESULTS

A. Study sample

A total of 23 studies were first identified. After excluding those articles that did not provide relative risk data, included participants who were inpatients or non-older adults or had a follow-up time of less than 1 year, 6 prospective studies were formally included for analysis.

In the six studies, two of them used the

Cardiovascular Health Study (CHS) and Study of Osteoporotic Fractures (SOF) criteria (Ensrud, 2008; Ensrud, 2009; Oleg Zaslavsky et al., 2016), one examined bone fracture risk (hereafter referred to as fracture risk) according to sex (Ensrud, 2009), and one investigated the correlation between various types of bone fracture with frailty (Ensrud, 2009).

B. Correlation between Stages of Frailty and Bone Fracture

Five studies indicated that fracture risk of frail older adults was greater than that of pre-frail and non-frail older adults, and that of pre-frail older adults was greater than that of non-frail older adults. In other words, frail older adults had the highest risk for bone fracture, followed by pre-frail older adults.

C. Correlation between Various Frailty Criteria and Bone Fracture

Among the six included studies, four studies provided data using CHS criteria (Ensrud, 2008; Ensrud, 2009; Oleg Zaslavsky et al., 2016; Sarah, 2013), and three studies provided data using SOF criteria (Ensrud, 2008; Ensrud, 2009; Oleg Zaslavsky et al., 2016). A review of the literature using various frailty criteria indicated that the fracture risk of frail older adults was greater than that of pre-frail and non-frail older adults, and that of pre-frail older adults was greater than that of non-frail older adults. In other words, despite the different criteria used, the studies all showed that frail older adults had the highest risk for bone fracture, followed by pre-frail older adults.

V. DISCUSSION

The WHO (2014) suggested that frailty is a critical indicator influencing successful aging. This study conducted a systemic review of previous prospective studies on the correlation of frailty and bone fracture and found that frailty was a vital factor predicting bone fractures in older adults. The primary reason was inferred to be that of the various dimensions that are encompassed by frailty criteria, and the primary physiological dimension includes various evaluations such as physical activity, muscular, balance, self-perceived activity, and gait speed levels, which are correlated with fracture risk. Armstrong et al. (2011) indicated that physical activity was related to hip bone fracture incidence rate. Muir et al. (2013) suggested that the dynamic parameters of balance were related to falls and bone fracture history among older adults. In addition, Chang and Lin (2015) surmised that muscle strength and gait speed were crucial predictors of hip bone fracture in older adults. Thus, physiological evaluations of frailty can effectively predict fracture risk in older adults.

The present systematic review revealed that frail older adults demonstrated a greater fracture risk than did non-frail older adults. This was consistent with previous studies, which found that frailty was the main risk factor in predicting bone fracture in older adults (Correa-de-Araujo, 2006; Ensrud et al., 2007; Ensrud et al., 2008; Ensrud et al., 2009; Tom et al., 2013; Woods et al., 2005). The present study found that upon entering the frail stage, older adults' fracture risk markedly increases. Thus, by providing relevant intervention programs upon early detection of frailty symptoms, medical institutions can alleviate fracture risk in older adults. However, no consensus has been reached on the fracture risk of pre-frail and non-frail older adults. Whereas some studies have suggested that pre-frailty is related to bone fracture (Tom et al., 2013; Ensrud et al., 2007; Ensrud et al., 2008), other studies have reported opposite inferences (Correa-de-Araujo, 2006; Ensrud et al., 2009; Woods et al., 2005). Therefore, correlation analyses should be conducted in future studies to compare the fracture risk in different stages of frailty. Additionally, the present study analyzed the two most commonly used frailty criteria, namely, CHS and SOF criteria, and found that the frail group had the highest fracture risk, followed by the pre-frail group.

This study had several strengths. First, this study comprehensively analyzed the relation between fracture risk and each stage of frailty. Second, the screening instruments were mainly used to conduct physiological evaluations of frailty; therefore, they possessed favorable homogeneity and can be a valuable reference for promoting awareness of the fracture risk of frail older adults. Last of all, this study investigated adults aged 65 years and above; therefore, the findings of this study can be used as a reference for prevention programs concerning frailty-related fracture. However, this study had some limitations. Some of the reviewed studies employed modified criteria; therefore, when classifying the type of frailty, errors might have occurred. In addition, the follow-up times for fracture were short; hence, the long-term effects could not be ascertained. Nevertheless, the present study's findings can serve as a reference for medical practitioners in assessing frailty-related fracture risk as well as a basis for future geriatric care policies and care evaluations.

VI. CONCLUSION

Frailty is a critical topic in geriatric assessment. Nursing professionals should identify early signs of frailty and provide relevant nursing guidelines to prevent fractures. Doing so would

decrease the likelihood of incurring disabilities or death.

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