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Musculoskeletal health, frailty and functional decline

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A B S T R A C T

Frailty in older people is associated with a vulnerability to adverse events. While ageing is associated with a loss of physiological reserves, identifying those with the syndrome of frailty has the potential to assist clinicians to tailor treatments to those at the risk of future decline into disability with an increased risk of complications, morbidity and mortality. Sarcopenia is a key component of the frailty syndrome and on its own puts older people at risk of fragility fractures; however, the clinical syndrome of frailty affects the musculoskeletal and non-musculoskeletal systems. Hip fractures are becoming a prototype condition in the study of frailty. Following a hip fracture, many of the interventions are focused on limiting mobility disability and restoring independence with activities of daily living, but there are multiple factors to be addressed including osteoporosis, sarcopenia, delirium and weight loss. Established techniques of geriatric evaluation and management allow systematic assessment and intervention on multiple components by multidisciplinary teams and deliver the best outcomes. Using the concept of frailty to identify older people with musculoskeletal problems as being at the risk of a poor outcome assists in treatment planning and is likely to become more important as effective pharmacological treatments for sarcopenia emerge.

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This review will focus on the concept of frailty and its relationship with functional decline, as well as describing its causes, prevalence, risk factors, potential clinical applications and treatment strategies.

Many of the common musculoskeletal problems of old age including osteoporosis, osteoarthritis and fragility fractures are associated with mobility disability [1] and can spiral into functional decline and disability. As the population ages and patients present with more and more co-morbidities, it is important for clinicians to be able to identify quickly those who require resource-intensive multicomponent interventions delivered by teams from those who require a short physiotherapy program or a self-management program. The presence of frailty is starting to guide treatment for health conditions in older people because it has been shown that frailty can predict the response to treatment and the likelihood of adverse complications [2].

Frailty is a term first used in the medical literature in the 1970s, which is receiving increasing focus in research and clinical practice due to its ability to predict poor outcomes in older people of relevance to society such as falls, disability, functional decline, hospitalisation, institutionalisation and mortality [3–11]. While linked to theories of ageing, it has come to be thought of as a separate condition indicating abnormal ageing and poor health and therefore a potential target for interventions and therapies to slow or reverse its progression [12]. In addition, it is known to occur in tandem with other clinical conditions of ageing including sarcopenia, functional decline, neuroendocrine disorders and immune dysfunction [13].

Frailty has been associated with an increased risk of having a fall (odds ratio (OR) 2.02, 95% confidence interval (CI) 11.44–2.83) and experiencing a greater number of fractures in community-dwelling older adults (OR 3.67, 95% CI 1.47–9.15) [14]. The costs to the US of fragility fractures seen in frail older adults such as hip fracture has been estimated to be >$US 12 billion per year [15]. The costs of providing hospital, medical and community services for frail older adults compared to non-frail older adults have been estimated to be up to an additional £109 per week in the UK [16]. Therefore, while the debate continues regarding the identification and aetiology of frailty, the importance of developing adequate means of addressing this increasing burden on the health-care system cannot be overestimated.

Definitions of frailty

The recent push to standardise definitions of frailty has resulted in a number of reviews of this topic published recently [3,12,13,17–19]. Two models of frailty dominate the literature. Fried et al. [10] have proposed a phenotype model of frailty that evolved from factors such as chronic disease, and musculoskeletal changes, leading to reduced physical activity and energy expenditure, abnormalities in neuroendocrine regulation and chronic under-nutrition. The consequences of the above conditions include loss of weight and muscle mass which further impact upon musculoskeletal changes producing the cyclical nature of the model. Based upon this model, Fried proposed five criteria for use in research and clinical settings including unintentional weight loss or loss of muscle mass (i.e., sarcopenia), weakness, poor endurance or exhaustion, slowness and low activity levels. From this phenotype, a practical instrument for assessing performance in these areas based on five measures included in the Cardiovascular Health Study has been created [10]. This phenotype was validated with 5317 participants aged $\geq$65 years and was associated with an increased risk of mortality (hazard ratio (HR) = 6.47, 95% CI 4.63–9.03, $p < 0.0001$), first hospitalisation (HR 2.25, 95% CI 1.94–2.62, $p < 0.0001$), first fall (HR 2.06, 95% CI 1.64–2.59, $p < 0.0001$), increasing activities of daily living (ADL) disability (HR 5.61, 95% CI 4.50–7.00, $p < 0.0001$) and worsening mobility (HR 2.68, 95% CI 2.26–3.18, $p < 0.0001$) over 3 years of follow-up [10]. Since that study, these criteria or similar have been shown to be associated with an increased risk of mortality, admission to residential aged care, hospitalisation, declining ability to