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Featured Article

The My Active and Healthy Aging information and communications technology platform to detect and prevent frailty in older adults: Randomized control trial design and protocol

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Abstract

Frailty increases the risk of poor health outcomes, disability, hospitalization, and death in older adults and affects 7%–12% of the aging population. Secondary impacts of frailty on psychological health and socialization are significant negative contributors to poor outcomes for frail older adults. The My Active and Healthy Aging (My-AHA) consortium has developed an information and communications technology–based platform to support active and healthy aging through early detection of prefrailty and provision of individually tailored interventions, targeting multidomain risks for frailty across physical activity, cognitive activity, diet and nutrition, sleep, and psychosocial activities. Six hundred adults aged 60 years and older will be recruited to participate in a multinational, multisite 18-month randomized controlled trial to test the efficacy of the My-AHA platform to detect prefrailty and the efficacy of individually tailored interventions to prevent development of clinical frailty in this cohort. A total of 10 centers from Italy, Germany, Austria, Spain, United Kingdom, Belgium, Sweden, Japan, South Korea, and Australia will participate in the randomized controlled trial. Pilot testing (Alpha Wave) of the My-AHA platform and all ancillary systems has been completed with a small group of older adults in Europe with the full randomized controlled trial scheduled to commence in 2018. The My-AHA study will expand the understanding of antecedent risk factors for clinical frailty so as to deliver targeted interventions to adults with prefrailty. Through the use of an information and communications technology platform that can connect with multiple devices within the older adult's own home, the My-AHA platform is designed to measure an individual's risk factors for frailty across multiple domains and then deliver personalized domain-specific

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interventions to the individual. The My-AHA platform is technology-agnostic, enabling the integration of new devices and sensor platforms as they emerge.

Keywords: Frailty; Randomized control trial; Cognition; Physical activity; Mood; Social activity; Nutrition; Older adults

1. Introduction

Frailty is a precursor of and contributor to age-related diseases [1–5] affecting 7%–12% of the adults aged 65 years and older [5], with the occurrence of frailty increasing with age and potentially reaching a prevalence of 45% in those aged older than 85 years [6,7]. It has been suggested that frailty develops when age-associated degenerative processes overwhelm reserve capacity and plasticity processes that maintain function of the nervous system and other physiologic systems [5,8,9]. Overall, frailty represents the vulnerability of aged population to adverse events as the result of the subtle and progressive metabolic and physical changes. Frailty confers a significantly increased risk for poor health outcomes, incident disability, hospitalization, and mortality [7,10–14]. Older adults experiencing frailty are not acutely medically ill but are in a state of compromised function and capacity arising from a reduction in reserve capacity across multiple systems [15]. This loss of reserve capacity places the individual in a state that is approaching the physiological threshold for symptomatic clinical failure [15]. Therefore, frailty refers to a state of reduced physiological function and capacity rather than to a disease or clinical condition. An older adult in a state of frailty is at increased risk of developing secondary diseases, which then in turn exacerbate the level of frailty experienced [4]. A frail older adult can be conceived of as continually performing at his/her maximum capacity without additional reserves to cope with additional stressors. At the highest level of frailty, the person is increasingly dependent on caregivers, highlighting the social impact of frailty as the person progressively loses autonomy. This loss of autonomy is associated with increased need for assistance with mobility, self-care, and activities of daily living, with an associated progressive loss of self-confidence, leading to social isolation, reduced physical activity, progressive isolation, and decreased social interaction, further exacerbating the level of frailty experienced by the individual. Therefore, early identification and intervention of frailty is essential to prevent this deterioration.

The clinical diagnosis of frailty is based on the presence of symptoms of physical weakness (including weak muscle strength, slow gait speed, unintentional weight loss, malnutrition or comorbidity, exhaustion, and low physical activity). The diagnosis of frailty requires the presence of three or more symptoms of the following: shrinking (weight loss or sarcopenia), muscle weakness; poor energy and endurance, motor slowing, and/or reduced level of physical activity [5]. The presence of three or more of these frailty criteria in an older (>65 years) adult constitutes clinical frailty [5]. Individuals presenting with one or two symptoms are considered to be in a prefrail stage [16]. The prefrail stage (1–2 Fried et al [5] criteria) identifies a subset at high risk of progressing to frailty.

A fundamental weakness of current clinical frailty criteria [5] is that they remain specific to physical frailty and do not encompass the potential for frailty in other domains (e.g., cognitive, psychological, social, and so forth). Hence, the clinical criteria do not fully reflect the theoretical construct of frailty as a weakness in capacity across multiple systems. An additional challenge to conceptualizing prefrailty is in the relationship between frailty and other aging-related diagnostic constructs (e.g., preclinical dementia, preclinical Parkinson's disease, mild cognitive impairment [MCI], and so forth). The construct of frailty refers to a state of compromised function and capacity arising from a reduction in reserve capacity across multiple systems, creating conceptualization challenges in differentiating frailty from other aging-related syndromes involving a loss of function and capacity. For example, MCI [17–19] is a preclinical syndrome of dementia marked by subclinical cognitive impairments. The more recently described phase of preclinical dementia [20] precedes MCI and is marked by biological changes in the brain associated with later development of MCI and dementia. Neither preclinical dementia nor MCI encompasses frailty as a symptom. Similar phases of preclinical decline or deficits are also observed with various psychological and psychiatric conditions, including schizophrenia, bipolar disorders, as well as mood disturbances and various anxiety-related disorders. If frailty is considered to represent a state of vulnerability in an aging individual to adverse events as a result of subtle and progressive metabolic and physical changes, then the construct of frailty represents either: (1) a fully independent diagnostic entity; or, (2) an umbrella term encompassing all aging-related vulnerabilities, from which specific diagnostic constructs emerge (e.g., MCI). The relationship between frailty and other aging-related disorders is an important consideration that ultimately determines the clinical features of frailty and prefrailty. If frailty is considered to be an umbrella term, then the diagnostic features for specific conditions can be incorporated into frailty subtypes. If, however, frailty is considered to be independent of other aging-related disorders, then the presence of clinical features of other aging-related disorders precludes a diagnosis of frailty.