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Editorial/Introduction to Virtual Issue: Frailty

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Launching a new initiative

It is with great pleasure that APNM announces that we are launching an exciting, new initiative, virtual thematic issues. Our editorial board will be selecting topics that are of timely interest and which APNM publications have made significant contributions. The board will invite authors of a key paper to lead in selecting published papers on a theme and their selection will then be placed together in a virtual issue and posted on the Journal's website. The first of these has been led by Drs Gareth Jones and Jennifer Jakobi on the important topic of frailty. I am sure that readers will find the issue to be educational and an excellent resource for both teaching and for future research.

Drs Jakobi and Jones have done an outstanding job identifying key papers that complement their recent article in APNM and also in briefly pointing out the importance of the articles. (Their introduction follows my editorial.) The virtual issue can be accessed at <http://www.nrcresearchpress.com/toc/apnm-f/01/01> or by following the links from the journal's home page [www.nrcresearchpress.com/apnm/].

On behalf of APNM and our readers, I want to thank Drs. Jones and Jakobi for their excellent work in organizing our first virtual issue.

T Graham
Editor

Why exercise and nutrition research is important in addressing frailty?

Gareth R Jones & Jennifer M Jakobi

Adult aging is a natural process of gradual decline across all systems of the human body. In older adults this decline commonly results in functional deficits, (i.e. slowed gait speed, difficulty rising from a chair, challenged to climb stairs) that are consequential to reduced physiological reserve capacity (poor fitness) and the inability to cope with pathological stressors (disease) rendering them frail. Conceptualized as an age-associated medical syndrome, independent of disease and disability, frailty places older adults at higher risk for poor health outcomes including, disability, falls, hospitalization and death. The incidence of frailty increases with age and is more prevalent in females. Frailty already affects 1.3 million older Canadians; unfortunately, contemporary health care is not designed to treat this emergent geriatric syndrome. Although easily recognized, frailty is difficult to diagnose and often challenging to treat. Frail older adults are characterized as; slow moving, unsteady, easily exhausted or overwhelmed by daily activities resulting in a failure to thrive. However, frailty is responsive to therapeutic interventions; exercise and nutrition are likely the two most promising treatment options.

Frailty is synonymous with age-related physiological decline. Designing exercise and nutrition interventions to mitigate and/or reverse physiological decline is well described within the exercise literature. A scan of published papers, within Applied Physiology Nutrition and

Metabolism (APNM) as well as earlier issues (Canadian Journal of Applied Physiology) revealed 1902 publications, including conference abstracts and published graduate theses that used the key word '*aging*' anywhere within these documents. An additional search using the key words '*older adults*' and '*elderly*' resulted in 27 and 15 manuscripts, respectively in APNM/CJAP. Most, if not all papers identified either exercise or nutrition as malleable and feasible approaches to address age-associated decline in physical function. Interestingly, a specific search on '*frailty*' across all issues revealed only four manuscripts and one published thesis. When one considers that a search in general web engines pinpointed an increase in frailty citations from ~28 in 1993 to ~1366 in 2016, it is surprising that given the potential for exercise and nutrition to alter this syndrome that publications in APNM are lacking in quantity. Although not traditionally considered a repository for gerontological and geriatric research, APNM has contributed extensively to the field of aging and notably through its excellence in exercise and nutrition research.

Within APNM/CJAP publications there are significant contributions toward understanding the consequence of age-associated physiological decline across the cardiorespiratory (Cunningham et al., 1993; Paterson & Cunningham, 1999) and neuromuscular (Overend et al., 1993; Porter, 2001) systems. Although these early investigations did not measure frailty, they did equate physiological decline to a loss of functional independence in old age. Paterson and colleagues (2007) summarized the research evidence recommending exercise to mitigate and/or reverse the affects of aging and preserve functional independence. These authors acknowledged that frail older adults respond remarkably well to exercise but emphasized that more research was required to support exercise as a means to reverse frailty. Because a number of factors inclusive of but not limited to age, disease, inactivity, malnutrition, neuromuscular remodeling and hormonal deficiency are synonymous with both frailty and muscle fatigue leading to lower tolerance for muscular work (Theou et al., 2008). Theou et al., (2011) proposed that performance-based measures be considered effective screening tools for frailty. Gait speed, grip strength and sit-to-stand performance are all crucial indicators in determining frailty severity.

Older adults who are frail or transitioning toward frailty (pre-frail or vulnerable) must receive appropriate and targeted therapeutic interventions. There is good evidence supporting the efficacy of several interventions including; exercise (increased physical activity) and nutrition (caloric and protein and vitamin D supplementation). Frailty is unique to each individual because those factors that affect frailty impose their influence differently upon each individual. The most effective interventions are often multicomponent and interdisciplinary programs that capitalize on the older adult's remaining assets. Recommendations for exercise (Bray et al., 2016) and nutrition (Laur et al., 2017) interventions are already reported within APNM.

The recommendations for exercise to reverse frailty (Bray et al. 2016) provide evidence to support a targeted, multi-component exercise strategy based-upon the individual's level of frailty or frailty phenotype. For example, older adults transitioning toward frailty often do not recognize the subtle changes (sarcopenia, dynapenia, osteopenia) that reduce lower leg strength and increase fall risk. This group, in some areas of literature identified as pre-frail or vulnerable are generally still physically active but are living in a precarious situation where their daily activity

will place them at higher risk of falling and/or injury. This cohort of older adults is likely to experience great functional gains from exercises that strengthen the lower legs and improves static and dynamic balance. Alternatively, for those older adults who are frail, exercise should focus on aerobic conditioning to improve endurance tolerance to counteract perceived exhaustion. Tailoring the exercise prescription to specifically address deficits and utilize remaining physical assets is the best practice to reverse frailty.

Malnutrition is either a cause or consequence of frailty. Laur and colleagues (2017) suggest there is much overlap between the malnutrition and frailty research. Most intervention research targets exercise, with less attention given to the potential influence nutrition can have on reversing many of the physical factors (mobility, strength, exhaustion, weight-loss, inactivity) that contribute to the frailty phenotype. Nutrition intervention programs considered most effective at reversing frailty when the older adult is already determined to be malnourished. In addition, malnutrition must be specified as a physiological deficit for the older frail adult. Nutritional supplementation given independently or combined with exercise is likely an efficacious approach to reverse frailty.

Frailty is often an unfortunate reality for an aging population. It is often difficult to diagnose and challenging to treat within current medical practice. Yet, exercise physiologists and nutritionist/dietitians are two professions well suited to address frailty through their knowledge and practice of interventions to reverse this geriatric syndrome. To be most effective both professions need to combine their skills to develop long-term strategies that will keep older adults independent and strong throughout their remaining lifespan.

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