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EDITORIALS

Sarcopenia, frailty and mortality: the evidence is growing

Sarcopenia is an area of intense research activity [1], and the condition has recently been recognised with an *ICD-10* code. This reflects the considerable progress in operationalising a definition of sarcopenia, now widely viewed as the loss of muscle mass and function with age. The European Working Group recommended first checking for poor muscle function (slow gait speed or weak grip strength) and, if present, testing for low muscle mass [2]. They did not specify a single approach to the measurement of strength and muscle mass, which has allowed the framework to be implemented in numerous studies but has presented a challenge when trying to compare their findings [3].

More recently the Foundation for the Institutes of Health (FNIH) Biomarkers Consortium published cut-points for grip strength and appendicular lean mass divided by body mass index (ALM_{BMI}) [4]. To do this, they pooled data from nine US and European studies of community-dwelling older people and calculated the cut-points that best identified individuals with a gait speed of less than 0.8 m/s. As such their cut-points are intended to help clinicians to decide whether low muscle strength or mass may be playing a major part in a patient's mobility problems.

A key test for the FNIH muscle strength and mass cut-points is whether they identify those at risk of future adverse outcomes. In six of the nine studies, they were able to look at incident mobility disability and all-cause mortality: both low grip and ALM_{BMI} were associated with the former but only low grip with the latter [5]. The FNIH recommended further assessment of their cut-points in relation to ageing outcomes in other populations.

In this issue of *Age and Ageing*, De Buyser and colleagues examine whether the FNIH cut-points predict all-cause mortality over a 15-year period in a cohort of 191 community-dwelling Belgian men [6]. They found that low ALM_{BMI} was associated with an approximately 50% increased risk of mortality, while low grip strength had an increased risk that did not reach statistical significance. The small proportion of the sample with both low ALM_{BMI} and low grip strength at baseline was at two-and-a-half times the risk of death compared to those with normal mass and strength.

De Buyser and colleagues also tested if a simple measure of frailty, the Study of Osteoporotic Fractures (SOF) frailty index, was associated with mortality. Participants were considered to be pre-frail if they had one of the three criteria: inability to rise from a chair five consecutive times without using the arms, weight loss and poor energy; they were considered to be frail if they had two of the three. Pre-frail and frail individuals were at increased risk of death in a graded fashion. Overall, the area under the curve figures suggested a moderate ability of FNIH sarcopenia and SOF frailty to predict an individual's risk of death. Finally, when combined in the same model, sarcopenia and frailty were independently associated with mortality risk.

How can we interpret the findings of the study? For the FNIH grip strength cut-point, the authors did not find a statistically significant relationship with mortality, in contrast with the FNIH's own analyses [5] and findings from previous studies [7, 8]. This difference may be explained by this study's small sample size and in particular the small number (n = 27) of men with weak grip strength at baseline. For the cut-point for ALM_{BMI}, the situation is less clear: here the authors did find a relationship, whereas the FNIH meta-analysis showed heterogeneity between studies and no overall pooled effect. Indeed measures of lean mass have previously shown little relation to ageing outcomes [9], although the recent use of ALM_{BMI} instead of ALM divided by height squared does appear to be more informative [10].

The authors also investigated the SOF frailty index and found that it predicted mortality. There was only partial overlap between those with (pre)frailty and those with relevant sarcopenia measures (weak grip or low ALM_{BMI}). This area of overlap likely reflects the impairment of physical function, which is common to both conditions [11]. Importantly, the current findings would support the use of both sarcopenia and frailty assessments by clinicians aiming to identify older people at increased risk of death, for example when weighing up the risks and potential benefits of an intervention [12].

There are other issues that it may be important to consider if implementing the FNIH cut-points in clinical practice. Dual energy x-ray absorptiometry scans may not be available for the assessment of ALM_{BMI}, for example if seeing patients outside of the hospital setting, and in this regard, the separate analyses undertaken by FNIH and others for grip strength and ALM_{BMI} are helpful. The cut-points have also been developed among mobile, community-dwelling older people. From existing work on grip strength, it is likely that the prevalence of individuals falling below the FNIH cut-points is likely to be much

higher among those in hospital/institutional care settings [13] and the very old [14].

Areas for future work therefore include validating the FNIH cut-points in a range of settings for both men and women, and against a range of other outcomes including mobility and ADL disability, hospitalisation and falls. This will facilitate the identification of sarcopenia in clinical practice, in research and as inclusion criteria for clinical trials.

Key points

- Recent developments in sarcopenia include the publication of cut-points for grip strength and appendicular lean mass by the FNIH Biomarkers Consortium.
- In this issue, De Buyser and colleagues show that these cut-points predicted all-cause mortality in a group of older community-dwelling Belgian men, as did the SOF frailty criteria.
- Their results highlight the overlap between sarcopenia and frailty, with impaired physical function being common to both conditions.
- Areas for future work include validation of the FNIH cut-points in different settings and in relation to other outcomes, including disability.

Conflicts of interest

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