Epidemiology of sarcopenia
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Epidemiological studies have assessed the relationship between sarcopenia and 4 other conditions: (1) osteoporosis, (2) falls, (3) mortality, and (4) sarcopenic obesity. The aim of this presentation is to review how findings from such studies can be used to identify individuals at risk for the adverse outcomes of sarcopenia and associated conditions.

**Osteoporosis.** The prevalence of sarcopenia, osteopenia, and osteoporosis all increase with age; based on a UK study using dual energy X-ray absorptiometry measurements, 1 of every 3 women over 70 years has sarcopenia, while 1 of 2 has osteopenia, and 1 of 10 has osteoporosis. Early study results showed an association between quadriceps muscle strength and bone mineral density (BMD) of the hip (femoral neck). Further, Health ABC study results demonstrated that lower lean body mass and higher fat mass independently contributed to low BMD levels, but the association depended on the bone site and bone index used. Where differences did occur, they were primarily by gender not race. Thus, maintaining or increasing lean mass in older people may help to preserve BMD in old age, regardless of race or gender.

**Falls.** Low levels of muscle mass and poor muscle strength are associated with risk for falling. In elderly men, low relative appendicular skeletal muscle mass index was associated with impaired balance and with increased risk of falls. A regression analysis identified weak hand grip strength as an independent predictor of future falling in older adults. And in a study of older people who underwent surgical repair of minimal trauma hip fractures, low muscle strength (hand grip, knee extension, and hip abduction) was a risk factor for recurrent and injurious falls.

**Mortality.** Poor muscle strength, but not low muscle mass, is associated with mortality risk. From the InChianti study of community-dwelling older adults (≥ 65 years; n = 934), neither calf skeletal muscle mass nor fat mass could predict mortality. In older adults (ages 70-79 years), muscle quality (strength) was a much better predictor of mortality than was muscle quantity (mass); mortality risk was evaluated according to muscle strength (measured by isometric handgrip strength and isokinetic knee extension strength) and muscle mass (measured as muscle mass by CT and DEXA methods). In yet another study of older disabled adults (women 65-101 years; n = 919), handgrip strength was a powerful predictor of both cause-specific and total mortality. An inverse association between muscular strength and death from all causes and cancer was already observed in young men, even after adjusting for cardiorespiratory fitness and other potential confounders.

**Sarcopenic obesity.** Sarcopenic obesity is a condition characterized by both sarcopenia and obesity. This condition appears to be caused by a combination of factors—including excess energy intake, physical inactivity, low-grade inflammation, insulin resistance and changes in hormonal milieu. It was originally believed that the culprit of age-related muscle weakness was a reduction in muscle mass, but it is now clear that changes in muscle composition and quality are predominant. Data analysis of 4 different cohort studies showed that older persons with low strength were about 2 times more likely to be obese than those with greater muscle strength.

**Conclusion.** The ultimate goal of epidemiological studies is to determine what muscle characteristics and what assessment techniques can optimally identify older people who are at increased risk for adverse outcomes.

**Take-home messages**
- Muscle mass, muscle strength and fat mass seem to be associated with bone mineral density, with some differences due to bone site and gender.
- Low levels of muscle mass and poor muscle strength are associated with risk for falling.
- Poor muscle strength, but not low muscle mass, increases mortality risk based on several large, aging cohort studies.
- Sarcopenic obesity may emerge as an important geriatric syndrome in the near future.
References


