Frailty and Aging

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Introduction:

With the advancement in the health technologies, life expectancy at birth is improving throughout the developed and even, in the developing world. Along with that, aged population is also growing rapidly worldwide. Globally, the number of older persons (aged 60 years or over) is expected to more than double, from 841 million people in 2013 to more than 2 billion in 2050. Currently, near around 65-70% of the world's older adults live in developing countries. Further, UN report expects that, by 2050, nearly 8 in 10 of the world's older population will live in the less developed regions.[1] This has profound implications for the planning and delivery of health and social care.

The most problematic expression of population ageing is the clinical condition of frailty. Frailty results from age-related decline in the efficiency of physiological systems, which makes the person vulnerable to sudden health status changes triggered by minor stressor events.[2] Frailty is a state of increased vulnerability to adverse outcomes, such as falls, functional decline, hospitalization and death. As the clinical importance of the concept of frailty is increasingly recognized, it is of major importance to identify frail older adults.[3] The present research topic represents a timely addition to the burgeoning body of evidence which aims to provide fresh perspectives in our understanding of the frailty phenomena occurring with aging.[4]

What is Frailty?

While policymakers, practitioners and researchers in many countries have acknowledged that frailty is a major public health problem, there is substantial disagreement about definitions of frailty and the extent and scope of public and private responsibility in the prevention and management of frailty. Conceptual models for understanding frailty both implicitly and explicitly suggest that it is a state of reduced physiological reserves associated with ageing that affects an individual's capacity for functional independence. Fried (1994) refers to frailty as a wasting syndrome of advanced old age, while Rockwood et al. (1994) base their model of frailty on a model of breakdown among older people.[5]

Frailty is an indicator of health status in old age.[6] It is a clinical state of increased vulnerability resulting from age-associated decline in reserve and function across multiple physiologic systems such that the ability to cope with every day or acute stressors is compromised.[7] This cumulative decline erodes homeostatic reserve until relatively minor stressor events trigger disproportionate changes in health status, typically a fall or delirium.[8]An overt state of frailty is believed to be preceded by behavioural adaptation made in response to declining physiologic reserve and capacity with which to meet environmental challenges. The causes of this loss of physiologic reserve are likely to be multi-factorial, including both environmental challenges (e.g., area deprivation) and intra-individual challenges (e.g., age-related physiologic changes).[7]

Lacking gold standard, one most widely used operational definition of frailty given by Fried et al viewed frailty as a clinical syndrome in which three or more of the following criteria were present: unintentional weight loss, self-reported exhaustion, weakness, slow walking speed, and low physical activity.[7, 8-10] Older people are most vulnerable to adverse outcome results from frailty. Longitudinal cohort study of 754 community dwelling older persons which lasted for 10 years exhibited that, in last years of life the most common condition leading to death was frailty (27.9%), followed by organ failure (21.4%), cancer (19.3%), other causes

(14.9%), advanced dementia (13.8%), and sudden death (2.6%).[11]

Burden of Frailty

The Operational definitions for frailty and inclusion and exclusion criteria varied between studies, which largely explained considerable variations in reported frailty prevalence rates of 4.0-59.1%. In case of phenotype model, the weighted average prevalence of pre-frailty was 44.2% and frailty was 9.9%. Frailty was statistically more prevalent in females (9.6%) than in males (5.2%). Frailty increases steadily with age.[8, 12]

Systematic review of frailty prevalence worldwide concluded that 10.7% of community-dwelling adults aged ⩾ 65 years were frail and 41.6% pre-frail.[13] In the United Kingdom, with the rising population of older adults (>64 years of age), frailty syndrome has increased from 12% in January 2005 to 14% in March 2013.[14] Data from Survey of Health, Aging and Retirement in Europe (SHARE) in 2004 covering more than 10 European countries, showed prevalence of frailty and pre-frailty in 65+ age group as 17.0% (15.3 – 18.7) were frail and 42.3% (40.5 – 44.1) prefrail.[15] If we look at the low and middle income countries, the prevalence of frailty was much higher than that for developed countries.[16]

Frailty and Co-morbidity

Frailty is linked with many chronic debilitating diseases of old age and its prevalence differs with different diseases. Several studies have marked significant association of frailty with most non-communicable/chronic diseases. Inter-relationship between frailty, co-morbidity and disability was investigated in the Cardiovascular Health Study (CHS) population. Frailty and co-morbidity (defined as two or more of the following nine diseases: myocardial infarction; angina; congestive heart failure; claudication; arthritis; cancer; diabetes; hypertension; chronic obstructive pulmonary disease) was present in 46.2% of the population, frailty and disability (defined as the presence of restriction in at least one activity of daily living) was present in 5.7%, and the combination of frailty, disability and co-morbidity was present in 21.5% of the study group. Importantly, frailty was present without co-morbidity or disability in 26.6% of the study group. This finding provides support for frailty as an independent concept, distinct from co-morbidity and disability.[8]

Frailty Tools

There are numerous tools available to measure each component of frailty in older persons. Most commonly used tool to examine leg strength is repeated chair stand test, timed up and go test to check mobility, balance test to look for static balance, walk test examining gait speed and so on. These tools help the investigator to identify the person having pre-frail or frail criteria. Presence of any two out of five criteria keeps the person in pre-frail category, whereas presence of three or more criteria will categorize the person as frail as per Fried's phenotypical model of frailty.[7] Another frailty measurement tool, Frailty Index (FI), was developed based on cumulative deficit model underpinning the Canadian Study of Health and Aging (CSHA) Frailty Index.[8] The FI was a simple calculation of the presence or absence of each variable as a proportion of the total (e.g. 20 deficits present out of a possible 92 gives a FI of 20/92 = 0.22). Thus frailty is defined as the cumulative effect of individual deficits - 'the more individuals have wrong with them, the more likely they are to be frail.[7, 17] The British Frailty Index has also recently been developed.[18] It was argued that compared to Fried's Frailty phenotype, Frailty Index (FI) is a more sensitive predictor of adverse health outcomes due to its finer graded risk scale and its robustness in clinical inferences with regard to numbers and actual composition of items in FI.[19]

The Frail Elderly Functional Questionnaire (19 items) was identified as a potential outcome measure for frailty intervention studies as it is suitable for use by telephone or proxy, valid and reliable[20], and is sensitive to change[21]. The Groningen Frailty Indicator[22] and the Tilburg Frailty Indicator[23] are simple and similar questionnaire based approaches to detecting people with frailty.

The Edmonton Frail Scale is a multi-dimensional assessment instruments and a test for cognitive

impairment.[24] Comprehensive Geriatric Assessment (CGA) has become the internationally established method to assess older people in clinical practice. It is a multidisciplinary diagnostic process to determine an older person's medical, psychological and functional capability to develop a plan for treatment and follow up.[17, 25]

Role of Pharmacological agents in Frailty

Few pharmacological agents have been investigated in frailty. Angiotensin Converting Enzyme (ACE) inhibitors have been demonstrated to improve the structure and biochemical function of skeletal muscle[26] and there is evidence that ACE inhibitors may halt or slow the decline in muscle strength in older age[27] and improve exercise capacity and quality of life.[28] Testosterone improves muscle strength but also increases adverse cardiovascular and respiratory outcomes.[8] Low vitamin D levels have been associated with frailty and vitamin D has been demonstrated to improve neuromuscular function. Although vitamin D prescription for older people who are deficient may reduce falls and use of calcium/vitamin D supplements for older people in long-term care can reduce fractures, the general use of vitamin D as treatment for frailty remains controversial.[8]

Prevention of frailty

Frailty can be diagnosed at the earliest to avert its consequences. It is frequently observed that after crossing their sixty, most of people want relaxation when their children are ready to take their roles. However, this relaxation for prolonged period makes them sedentary and they may become pre-frail. Cells in our body are continuously regenerated and this process requires proper nutrition, regular physical activity and healthy life-style. As the age advances, individual compromises in his daily physical activity that affects normal body function, metabolism and endocrine activity ultimately leading to frailty. To mitigate frailty, one has to remain active physically, mentally and socially.

Reducing the prevalence or severity of frailty is likely to have large benefits for the individual, their families and for society. Several approaches have been investigated in clinical trials. Nutritional interventions may have potential to address the impaired nutrition and weight loss of frailty. However, there is a paucity of evidence. Exercise has physiological effects on the brain, endocrine system, immune system and skeletal muscle.[8] Three systematic reviews of home-based and group-based exercise interventions for frail older people concluded that exercise can improve outcomes of mobility and functional ability.[29-31]

Scope and Research

Researchers are expected to explore various aspects of frailty and mechanism of its development. Frailty is an emerging geriatric syndrome and new collaborative and interdisciplinary research projects are needed to detect and severity grade the frailty, so that it forms the part of routine clinical practice. The use of pharmacological agents for the prevention and treatment of frailty is one of the important areas for future research.

Conclusion

Frailty is a vital issue in geriatric health care and is also a crucial factor in the hospitalization of geriatric population. Identifying and assessing frailty at the earliest can reduce risk of frequent hospitalization among aged people and help them to live happy and independent healthy life.

References :

1. United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Ageing 2013. ST/ESA/SER.A/348.
2. Andrew Clegg, John Young, Steve Iliff e, Marcel OldeRikkert, Kenneth Rockwood. Frailty in elderly people. Lancet 2013; 381: 752–62.
3. Emiel O. Hoogendijk, Olga Theou, Kenneth Rockwood,Bregje D. Onwuteaka-Philipsen, Dorly J. H. DeegMartijn Huisman. Development and validation of a frailty index in the Longitudinal Aging Study Amsterdam. Aging ClinExp Res (2017) 29:927–933.
4. Lim W-S, Canevelli M and Cesari M (2018) Editorial: Dementia, Frailty and Aging. Front. Med. 5:168.
5. Maureen Markle-Reid and Gina Browne. Conceptualizations of frailty in relation to older adults. Blackwell Publishing Ltd, Journal of Advanced Nursing, 44(1), 58–68.
6. Brigitte Santos-Eggimann, Patrick Cuénoud, Jacques Spagnoli, and Julien Junod. Prevalence of Frailty in Middle-Aged and OlderCommunity-Dwelling Europeans Living in 10 Countries. J Gerontol A BiolSci Med Sci.2009. Vol. 64A, No. 6, 675–681.

7. Qian-Li Xue. The Frailty Syndrome: Definition and Natural History.ClinGeriatr Med. 2011 February; 27(1): 1–15.
8. Frailty in older people. Lancet. 2013 March 2; 381(9868): 752–762.
9. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in Older Adults: Evidence for a Phenotype. Journal of Gerontology: Medical Sciences 2001, 56A:3, M146–M156.
10. Marc D. Rothman, Linda Leo-Summers, Thomas M. Gill. Prognostic Significance of Potential Frailty Criteria. Journal of American Geriatric Society. 56:2211–2216, 2008.
11. Gill TM, Gahbauer EA, Han L, Allore HG. Trajectories of disability in the last year of life. N Engl J Med 2010; 362(13): 1173–80.doi: 10.1056/NEJMoa0909087.
12. Siriwardhana DD,Hardoon S, Rait G, et al. Prevalence of frailty and prefrailty among community-dwelling older adults in low-income and middleincome countries: a systematic review and meta-analysis. BMJ Open 2018;8:e018195. doi:10.1136/bmjopen-2017-018195.
13. Collard RM, Boter H, Schoevers RA, etal.Prevalence of frailty in community-dwelling older persons: a systematic review. J Am GeriatrSoc 2012;60(8): 1487-92.
14. Soong J, Poots AJ, Scott S, et al. Quantifying the prevalence of frailty in English hospitals. BMJ Open 2015; 5:e008456. doi:10.1136/bmjopen-2015-008456.
15. Santos-Eggimann b, Cuénoud P, Spagnoli J, Junod J. Prevalence of Frailty in Middle-Aged and OlderCommunity-Dwelling Europeans Living in 10 Countries. J Gerontol A BiolSci Med Sci2009;64A(6):675–681doi:10.1093/gerona/glp012.
16. Nguyen TN, Cumming RG, Hilmer SN. A Review of Frailty in Developing Countries. J Nutr Health Aging 2015;19(9):941-6.
17. Gray WK, Richardson J, McGuire J, Dewhurst F, Elder V, Weeks J, Walker RW, Dotchin CL.Frailty Screening in Low- and Middle-Income Countries: A Systematic Review. Journal of American Geriatric Society. 64:806–823, 2016.
18. .Kamaruzzaman S, Ploubidis GB, Fletcher A et al. A reliable measure of frailty for a community dwelling older population. Health Qual Life Outcomes 2010;8:123.
19. Rockwood K, Andrew M, Mitnitski A. A comparison of two approaches to measuring frailty inelderly people. Journals of Gerontology Series A-Biological Sciences and Medical Sciences. 2007; 62:738–743.
20. Gloth FM 3rd, Walston J, Meyer J, Pearson J. Reliability and validity of the Frail ElderlyFunctional Assessment questionnaire. Am J Phys Med Rehabil. 1995; 74(1):45–53. [PubMed:7873113].
21. Gloth FM 3rd, Scheve AA, Shah S, Ashton R, McKinney R. The Frail Elderly FunctionalAssessment questionnaire: its responsiveness and validity in alternative settings. Arch Phys MedRehabil. 1999; 80(12):1572–6. [PubMed: 10597808].
22. Schuurmans H, Steverink N, Lindenberg S, Frieswijk N, Slaets JP. Old or frail: what tells usmore? J Gerontol A BiolSci Med Sci. 2004; 59(9):M962–5. [PubMed: 15472162].
23. Gobbens RJ, van Assen MA, Luijkx KG, Schols JM. The Predictive Validity of the Tilburg. Frailty Indicator: Disability, Health Care Utilization, and Quality of Life in a Population at Risk.Gerontologist. 2012.
24. Rolfson DB, Majumdar SR, Tsuyuki RT, Tahir A, Rockwood K. Validity and reliability of theEdmonton Frail Scale. Age Ageing. 2006; 35(5):526–9. [PubMed: 16757522].
25. .Rubenstein LZ, Stuck AE, Siu AL, Wieland D. Impacts of geriatric evaluation and managementprograms on defined outcomes: overview of the evidence. J Am Geriatr Soc. 1991; 39(9 Pt 2):
26. Schaufelberger M, Andersson G, Eriksson BO, Grimby G, Held P, Swedberg K. Skeletal musclechanges in patients with chronic heart failure before and after treatment withenalapril. Eur Heart J. 1996; 17(11):1678–85. [PubMed: 8922916].
27. Onder G, Penninx BW, Balkrishnan R, Fried LP, Chaves PH, Williamson J, Carter C, Di Bari M,Guralnik JM, Pahor M. Relation between use of angiotensin-converting enzyme inhibitors andmuscle strength and physical function in older women: an observational study. Lancet. 2002;359(9310):926–30. [PubMed: 11918911].
28. Sumukadas D, Witham MD, Struthers AD, McMurdo ME. Effect of perindopril on physicalfunction in elderly people with functional impairment: a randomized controlled trial. CMAJ.2007; 177(8):867–74. [PubMed: 17923654].
29. De Vries NM, van Ravensberg CD, Hobbelen JS, OldeRikkert MG, Staal JB, Nijhuis-van derSanden MW. Effects of physical exercise therapy on mobility, physical functioning, physicalactivity and quality of life in community-dwelling older adults with impaired mobility, physicaldisability and/or multi-morbidity: a meta-analysis. Ageing Res Rev. 2012; 11(1):136–49.[PubMed: 22101330].
30. Theou O, Stathokostas L, Roland KP, Jakobi JM, Patterson C, Vandervoort AA, Jones GR. Theeffectiveness of exercise interventions for the management of frailty: a systematic review. JAging Res. 2011; 2011:569194. [PubMed: 21584244].
31. Clegg A, Barber S, Young J, Forster A, Iliffe S. Do home-based exercise interventions improveoutcomes for frail older people? Findings from a systematic review. Reviews in clinicalgerontology. 2012; 22(1):68–78.