International Journal of Gerontology 13 (2019) 106–110
https://doi.org/10.6890/IJGE.201906_13(2).0001

International Journal of Gerontology

journal homepage: http://www.sgecm.org.tw/ijge/

Review Article

Frailty: A Narrative Review with a Focus on Eastern and Southeastern Asia

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ARTICLE INFO

Accepted 16 October 2018

Keywords:
frailty,
Eastern and Southeastern Asia,
narrative review

SUMMARY

Frailty is growing into a major public health problem parallel with the demographic change into an ageing society. Frail people have an increased risk of many adverse outcomes and this can lead to disability and mortality. Frailty is reversible and the purpose of clinical care for frail people is to prevent adverse health outcomes and improve overall health and quality of life. To do this, validated frailty assessment tools should be used early within clinical care and they should be followed by evidence-based interventions. An individualized approach including medication review, physical exercise, nutritional management and social support by a multidisciplinary team seems to be the most effective intervention to prevent and treat frailty.

1. Definition

Frailty is non-controversially defined as a state of increased vulnerability to adverse outcomes among people of the same chronological age. Ageing process, deficit accumulation and reduction of homeostatic capacity from genetic level to multi-organ systems result in frailty. Frail people have a poor recovery and limited reserve capacity after they receive a stress event such as illness or trauma. Falls, immunocompromised status, cognitive impairment, hospitalization, disability and death are important clinical adverse outcomes of frailty. Frailty is also associated with decreased quality of life[1] and increased healthcare costs and economic burden.[2]

According to the frailty phenotype concept,[3] frailty is defined as a syndrome composed of three or more characteristics including weight loss, weakness, exhaustion, low activity level, and slow gait speed. The concept of deficit accumulation[4] defines frailty as a state of vulnerability which has a dynamic process and spectrum. Based on the frailty phenotype approach, disability and comorbidity are outcomes of frailty; whereas based on the deficit accumulation approach, disability and comorbidity are included as deficits within the frailty index.[5]

2. Prevalence of frailty

According to the World Health Organization, the number of people aged 60 years or older has grown worldwide from 607.1 million in 2000 to 962 million in 2017; it is estimated to be more than 2,080 million in 2050.[6] Similarly, the elderly population in Asian countries is rising. In 2050 it is expected that Eastern Asia countries will have the highest percentage (35.7%) of older people, followed by Southeastern Asia (21%), and Southern Asia (18.9%).[6] Prevalence of frailty is higher in elderly people[7] and even higher in elderly hospitalized patients (up to 80%)[8] and older women.[9] Lower socioeconomic status and poor education are also correlated with higher frailty.[7,10] Moreover, frailty prevalence differs between races.[11] The findings of some studies that examined frailty prevalence in Eastern and Southeastern Asian countries are demonstrated in Table 1 (range 2–59.5%).

3. Frailty assessment

Since the frailty level can be reversed, early detection of frailty by validated assessment tools should be performed in clinical settings including complex patients who are younger than the age of 65. There are a variety of tools available to measure frailty.

- The frailty phenotype is composed of the following five criteria: shrinking (weight loss or sarcopenia), weakness, poor endurance (exhaustion), slowness and low activity. Individuals who present three or more of these criteria are defined as frail. Robust state is defined as having none of these criteria, and prefrailty is defined as having one or two.
- The Frailty Index[5] is based on the principle of accumulated health deficits including symptoms, signs, diseases, disabilities or laboratory, radiographic or electrocardiographic abnormalities. The index is expressed as the ratio of deficits present to the total number of deficits considered. The frailty index score ranges between 0 and 1; the higher index score, the frailer an individual is. The deficit variables considered in the index must be associated with health status, increase with age, not saturate too early, and cover a range of systems.
- The Clinical Frailty Scale[12] focuses on mobility, physical activity and

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Table 1
Prevalence of frailty in Eastern and Southeastern Asian countries.

Country	Setting	Number of participants	% of females	Age (mean ± SD or min age)	Assessment tools	% of frailty	Source
China	Community	4,000	50.0	72.4 ± 5.2	FP	5.4	Reference #42
China	Community	5,301	49.4	≥ 60	FP	7.0	Reference #43
China	Community	2,162	56.3	73.2 ± 6.1	FP	7.4	Reference #7
China	Community	5,844	56.7	≥ 60	CGA-FI	9.9	Reference #44
China	Community	10,039	61.3	≥ 55	FI	12.3	Reference #45
China	Community	13,175	50.2	62.5 ± 8.9	FI	13.1	Reference #46
China	Community	3257	51.1	≥ 55	FI	17.8	Reference #47
China	Hospital	146	21.9	≥ 60	FP	15.1	Reference #48
China (HK)	Community	816	85.4	≥ 65	FRAIL scale	12.5	Reference #49
China (HK)	Community	4,000	50.0	75.2 ± 6.7	FI	16.6	Reference #50
China (HK)	Hospital	428	41.8	≥ 65	CFS	38.8	Reference #51
Indonesia	Community	527	59.2	74.0 ± 7.0	FRAIL scale	5.0–8.0	Reference #52
Japan	Community	2,217	48.7	≥ 65	Frailty rank (ADL)	6.1	Reference #53
Japan	Community	483–8,864	52.0–100.0	73.3 ± NR–74.3 ± NR	FP	7.9	Reference #10
Japan	Community	16,251	62.4	75.1 ± NR	J-CHS criteria	11.2	Reference #54
Japan	Community	4,745	51.8	≥ 65	FP	11.3	Reference #55
Japan	Community	8,174	53.0	73.6 ± 5.8	KCL	15.0	Reference #56
Japan	Community	1,224	64.5	71.9 ± 7.2	FI-J	16.1	Reference #57
Japan	Community	2,176	100.0	74.7 ± 5.0	Frailty (Woods)	17.9	Reference #58
Japan	Community	2,108	100.0	≥ 65	FP	22.8	Reference #59
Japan	Community	13,294	55.2	74.5 ± 6.8	FP,KCL	9.72, 24.7	Reference #60
Japan	Outpatient	777	54.1	76.5 ± NR	J-CHS criteria	21.6	Reference #61
Japan	Nursing homes	1,373	0.0–76.7	71.9 ± NR–84.1 ± NR	CFS, EFS, FP, GFI, SOF	52.3 (19.0–75.6)	Reference #62
Japan	Hospital	288	56.9	72.6 ± 7.5	FI-CGA	45.5	Reference #61
South Korea	Community	486	68.0	74.6 ± 5.8	FP	7.4	Reference #63
South Korea	Community	11,844	59.6	72.9 ± 6.7	FP	8.2	Reference #64
South Korea	Community	693	50.8	75.9 ± 8.9	SOF, FP, FI	9.2, 13.2, 15.6	Reference #65
South Korea	Community	382	56.0	74.4 ± 6.5	FP, FRAIL scale	17.4, 27.5	Reference #66
South Korea	Community	4,352	57.4	72.6 ± 5.4	FI	44.2	Reference #67
South Korea	Community	3,460	100.0	≥ 60	CSHA	59.5	Reference #12
Singapore	Community	1,575	65.8	66.0 ± 7.6	FP	2.0	Reference #68
Singapore	Community	2,406	63.3	66.1 ± 7.6	FP	3.4	Reference #69
Singapore	Community	2,102	54.9	69.0 ± NR	FP	5.7	Reference #70
Singapore	Community	1,051	57.2	71.2 ± NR	FP	6.2	Reference #71
Singapore	Community	721	56.2	70.6 ± 8.2	CFS	24.5	Reference #72
Taiwan	Community	2,238	48.8	73.3 ± 1.5	FP	4.9	Reference #73
Taiwan	Community	1,839	52.5	63.9 ± 9.3	FP	6.8	Reference #74
Taiwan	Community	715	43.5	66.5 ± 7.3	FP	9.7	Reference #75
Taiwan	Community	2,147	44.9	70.7 ± 5.1	FP	12.7	Reference #76
Taiwan	Community	1,036	48.0	74.2 ± 6.6	FP	13.8	Reference #77
Thailand	Community	8,195	50.6	69.2 ± 6.8	TFI	22.9	Reference #78
Vietnam	Hospital	461	56.8	76.2 ± 8.9	EFS, FP	31.9, 35.4	Reference #79

ADL, activity of daily living; CFS, clinical frailty scale; CSHA, rules-based definition scale developed in the Canadian Study of Health and Aging; EFS, Edmonton frail scale; FI, frailty index; FI-CGA, frailty index based on a comprehensive geriatric assessment; FI-J, frailty index for Japanese elderly; FP, frailty phenotype; GFI, groningen frailty indicator; HK, Hong Kong; J-CHS criteria, Japanese version of the Cardiovascular Health Study criteria; KCL, Kihon-Checklist; NR, not reported; SOF, study of osteoporotic fractures index; TFI, Thai frailty index.

function using clinical judgement. This tool reports a score ranging from 1 (very fit) to 9 (terminally ill).

- The Edmonton Frail Scale[13] is a combination of 8 frailty domains such as cognition, general health status, functional independence, social support, medical use, nutrition, mood continence, and functional performance.
- The FRAIL Scale[14] contains 5 simple questions assessing fatigue, resistance, ambulation, loss of weight, and illnesses.
- The Groningen Frailty Indicator[15] is a 15-item screening instrument that measures the loss of function and resources in 4 domains: physical, cognitive, social, and psychological. The score ranges between 0 and 15. A score of 4 or more indicates moderate to severe frailty.
- The Study of Osteoporotic Fractures Index[16] consists of 3 components: weight loss, the subject's inability to rise from a chair 5 times without using their arms and reduced energy level. Individuals with 2 or more are considered frail.
- The Kihon-Checklist[17] is a screening tool used within the Japanese Long-Term Care Insurance system[18] to identify community-dwelling older adults who are vulnerable to frailty and at higher risk of becoming dependent. The checklist consists of 25 items composed of 7 categories: physical strength, nutrition, eating, socialization, memory, mood, and lifestyle. The index is scored between 0 (no frailty) and 25 (severe frailty).

4. Frailty and Chronic Conditions

Frailty can increase the risk of many chronic conditions, and vice versa, chronic conditions can increase frailty level. Cardiovascular diseases, as well as hypertension, are common among frail people.

Also, people who are inactive due to their frailty level have higher risk in experiencing complications from treatment. Musculoskeletal disorders are higher in individuals aged 65 years and older.[19] Increased bone fragility, loss of cartilage resilience, reduced ligament elasticity, loss of muscular strength, and fat redistribution due to ageing cause common diseases in this population such as osteoporotic fracture, sarcopenia, and osteoarthritis. Deterioration of the musculoskeletal system with ageing leads to motor performance decline which is a feature of frailty. A meta-analysis[20] revealed that frailty is a significant predictor of fractures among community-dwelling elderly people. The prevalence of frailty is significantly higher in patients with an osteoporotic vertebral compression fracture.[21] Low muscle mass and either low muscle strength or physical performance are diagnostic criteria for syndromic frailty as well as sarcopenia.[22] Both frailty and sarcopenia share common etiology and features such as endocrine dysfunction, persistent low-grade inflammation, malnutrition and low habitual physical activity, and weakness. Prevalence of osteoarthritis increases with age and due to its strong association with pain and disability osteoarthritis has a public health impact.[23] The aged-related mechanisms of osteoarthritis are ageing inflammation (both systemic and local), cell senescence and stress-induced senescence (excessive mechanical loading).

5. Management and interventions

Although frailty decreases the ability of physiological recovery to normal status and increases risk of many adverse outcomes, frailty is a treatable and reversible condition. Therefore the aims of frailty care should be to prevent negative outcomes, decelerate related-conditional deteriorations and improve overall health. Early detection of frailty is very beneficial to avoid and delay its consequences and should be a priority for health care professionals. Frailty can be caused by many accumulated deficits though the type of deficit can differ across individuals. The potential cause of treatable deficits must first be identified and care management should then focus on these treatments.

Comprehensive geriatric assessment (CGA) is defined as a multidimensional interdisciplinary diagnostic process focused on determining a frail elderly person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and long-term follow up.[24] The Cochrane database of systematic reviews revealed that administering the CGA at hospital admission could delay admission to a nursing home up to a year after hospital stay in older adults.[25] However, it was not found to reduce risk of death during follow-up up to a year.[25] Assessing an older patient who is undergoing surgery for a hip fracture with a CGA could improve adverse outcomes such as lower mortality risk, shorter length of hospital stay and total health care cost, but does not affect re-admission rate.[26] CGA could also ameliorate function and decrease mortality while reducing cost in emergency surgical patients.[27]

Physical exercise is one of the most effective interventions for people living with frailty. Not only can exercise improve physical function, reduce frailty and prevent disability in frail people, but also it increases quality of life of frail older adults. Physical activity is advantageous in sarcopenia, functional impairment, cognitive performance and depression. A structured, moderate-intensity physical activity program for 2.6 years can decrease major mobility disability;[30] physical exercise when conducted in a group was found more effective.[28] Regarding duration, longer-term training ($\geq$ 5 months) performed three times per week with shorter-duration sessions (30–45 min) may have superior outcomes for this population.[29] In terms of exercise type, multi-component programs containing resistance exercise would ameliorate functional capacity in frail older adults.[31]

Nutritional management is also important since malnutrition is a major factor of frailty. A higher prevalence of nutrient insufficiency is found in elderly people living with frailty. Nutritional status screening should be performed early in older adults, especially in hospitalized patients, to identify malnourished individuals and initiate a nutritional intervention. Additionally, causes of malnutrition should be evaluated and treated. Body weight should be monitored to screen malnutrition as well as frailty. Validated nutritional screening tools which were designed and recommended for elderly people are: Mini Nutritional Assessment (Short-Form),[32] Malnutrition Universal Screening Tool[33] and Geriatric Nutritional Risk Index.[34] In general, for healthy older people, the recommendation of daily energy intake is 25–30 kcal/kg and protein intake is 1.0–1.2 g/kg. For elderly people who are malnourished or at risk of malnutrition due to acute or chronic illness, the protein intake is recommended to be 1.2–1.5 g/kg and higher for individuals with severe illness or injury. Oral nutritional supplements are recommended for improvement or maintenance of nutritional status in frail older individuals. An RCT[35] showed that high-protein nutrition supplement containing beta-hydroxy-beta-methylbutyrate reduced mortality and improved nutritional status in malnourished elderly people. Tube feeding can also maintain and improve nutritional parameters in frail older adults; nevertheless, it is not recommended in terminally ill patients. A recent meta-analysis[36] revealed that the Mediterranean diet was significantly associated with a decreased risk of frailty in community-dwelling older people. An adequate nutrient intake can prevent frailty.

Pharmacotherapy for frailty treatment has limited data. Although treatment of underlying diseases can improve deficits, understanding pharmacokinetics, pharmacodynamics and adverse effects of prescribing agents in elderly people which differ from the younger adult is very important. Appropriate medication use and unnecessary polypharmacy are of concern and should be avoided. Regular review of medications and deprescribing can reduce inappropriate prescriptions, improve adherence with other medications, and prevent adverse drug reactions and unnecessary health-care costs.[37] Some studies suggested using medications such as vitamin D, angiotensin-converting enzyme inhibitors (ACEi), testosterone and IGF-1 to improve frailty levels. Nevertheless, there is not enough strong evidence to recommend using ACEi, testosterone and IGF-1 for treatment of frailty.

Social determinants include education, working conditions, income, marital status, social relationships and environment. Social vulnerability is found to increase with age and results in adverse health outcomes including cognitive decline and frailty.[39] Following the deficit accumulation model, social variables can be combined into a social vulnerability index in order to quantify the overall social well-being of an individual.[40] Social support is an unavoidable and important intervention for frail people. Attention should be focused on every level, including individual, family, and community. It is also important to understand the linkage between each level to holistically and effectively manage frailty. The social environments that are related to frailty are composed of 5 dimensions: social networks, social support, social participation, subjective neighborhood experience, and socioeconomic neighborhood characteristics. Home visits and social support programs have shown positive effects in regards to frailty status and may also prevent health risks in the future.[41]

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