

Application Status and Reflections on Comprehensive Geriatric Assessment in Frail Older Adults: Postprint

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Date: 2022-08-23T00:00:00+00:00

Abstract

China has currently entered an aging society, with the elderly population increasing dramatically, resulting in continuously escalating costs of elderly care and caregiving burdens. Research indicates that the proportion of frail elderly patients within the elderly population is becoming increasingly severe, while comprehensive geriatric assessment, as a core technology in geriatric medicine, is widely utilized in geriatric practice both domestically and internationally. Therefore, this article reviews existing domestic and international literature to examine the current status of frailty in the elderly and analyze the effectiveness of comprehensive geriatric assessment technology in frail elderly patients. This review finds that interventions for frail patients are gradually receiving increased attention both domestically and internationally, with non-pharmacological therapies being predominant abroad, while domestic research on frailty interventions remains in its nascent stages. Furthermore, research on the application of comprehensive geriatric assessment to frailty is not extensive, prompting considerations on how to more effectively implement comprehensive geriatric assessment-based interventions for frail elderly patients.

Full Text

Application and Considerations of Comprehensive Geriatric Assessment in Elderly Frail Populations

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Abstract: As China enters an aging society, the elderly population is rising sharply, leading to continuously mounting costs and caregiving burdens for elderly care. Research indicates that the proportion of frail elderly patients among the overall elderly population is becoming increasingly severe. Comprehensive Geriatric Assessment (CGA), as a core technology in geriatric medicine, has been widely applied in clinical practice both domestically and internationally. This article reviews existing literature to explore the current status of frailty in older adults and analyze the effectiveness of CGA application in frail elderly patients. The findings reveal that interventions for frail patients are gradually gaining attention worldwide, with non-pharmacological therapies predominating internationally, while domestic research on frailty interventions remains in its infancy. CGA research specifically targeting frailty is not yet extensive, prompting reflection on how to more effectively adapt CGA-based interventions for frail elderly patients.

Keywords: Frailty; Frailty assessment; Comprehensive geriatric assessment; Elderly; Review

According to China's seventh national census in 2021, the total population aged 60 and above in mainland China reached 264 million, accounting for 18.7% of the total population, with 190 million people aged 65 and above (13.50%). Over the 20 years since entering an aging society in 2000, the proportion of elderly individuals increased by 8.4%. Between the 2010 and 2020 censuses, this proportion rose by 5.4% in just one decade—a significantly faster increase than in the previous decade. This rapid growth in the elderly population reflects the continuously escalating economic and caregiving burdens of elderly care in China, highlighting the unprecedented urgency of actively addressing population aging [1]. With advancing age, elderly individuals experience gradual physiological decline, markedly reduced physical strength and endurance, and significantly increased frailty. Frailty has become a crucial factor contributing to adverse events in older adults, including falls, infections, rehospitalization, and even death [2]. Consequently, frailty has emerged as a global research hotspot, with studies demonstrating that timely intervention and prevention can effectively improve or even reverse frailty, delaying mortality by 3%–5% among older adults [3]. Frailty encompasses not only physical but also psychological, socioeconomic, and functional domains that interact in a coordinated yet unstable state or even lead to loss of function. CGA can effectively capture the frailty status of older adults through multidimensional assessment, enabling maximal intervention and support [4] to promote healthy and active aging. Therefore, this systematic review examines the application of CGA in frail elderly populations both domestically and internationally, aiming to provide insights for clinicians and researchers in preventing or mitigating frailty.

Literature Search Strategy: Chinese keywords (“frailty,” “frailty assessment,” “comprehensive geriatric assessment,” “elderly”) were used to search CNKI, VIP, and Wanfang databases. English keywords (“Frailty,” “Frailty as-

assessment,” “Comprehensive geriatric assessment,” “Senile,” “Aged,” “frail,” “frail screening,” “senior,” “old people”) were applied in PubMed, Web of Science, Wiley Online Library, Cochrane Library, and Chinese journal full-text databases using MeSH terms combined with free-text words. The search timeframe spanned from database inception to January 2022, focusing on cohort studies, case-control studies, and cross-sectional studies related to frailty and CGA, particularly those examining CGA in frail patients. Articles without full-text access, duplicate content or viewpoints, and non-English or non-Chinese publications were excluded.

1. Current Status of Frailty

1.1 Concept of Frailty

Frailty was first mentioned in a cross-sectional study of community-dwelling older adults in the late 1960s [5] and formally defined at the 1978 U.S. Federal Conference on Aging. In 2001, Fried et al. provided a potential standardized definition, describing frailty as a complex syndrome characterized by compromised resistance to stressors due to functional decline across multiple organ systems—in other words, increased vulnerability and reduced stress response capacity [6–7]. Consequently, frailty predisposes individuals to cognitive impairment, falls, urinary incontinence, and other issues [8]. Currently, frailty is recognized as the most critical geriatric syndrome affecting quality of life in older adults.

1.2 Epidemiology of Frailty

Due to the wide variety of frailty assessment scales, significant differences in sensitivity, and lack of standardized assessment methods and populations, frailty prevalence varies across regions [9]. Fried’s Frailty Phenotype (FP) is relatively widely used and thus forms the basis for this discussion. In China, Yu Jingya et al. [10] investigated 526 community-dwelling older adults in Chengdu, finding frailty and pre-frailty prevalence rates of 9.3% and 45.4%, respectively. A survey in Haikou using convenience sampling of 600 older adults across 10 communities reported a frailty prevalence of 35.8% [11]. Ren Jingjing [12] examined 459 older adults in two urban districts of Lanzhou, revealing frailty and pre-frailty rates of 10.1% and 61.4%, respectively. A multi-stage random cluster sampling survey of 778 older adults in Tianjin showed 10.5% were frail and 42.9% were pre-frail [13]. Tian Peng et al. [14] conducted a systematic review of frailty prevalence among Chinese older adults over nearly 20 years, finding prevalence rates of 12.2% for ages 65–74, 33.2% for ages 75–84, and 46.8% for those 85 and older. Another cross-sectional study analyzing frailty causes among 5,844 randomly selected community-dwelling older adults nationwide reported an overall frailty rate of 9.9%, with regional variations: Southwest China (12.7%), Northern China (11.1%), Northwest China (5.9%), Southern China (5.0%), Eastern China (2.5%), and Northeast China (2.3%). Frailty was more prevalent among women than men and in rural areas than urban settings [15].

Internationally, Collard et al. [16] conducted a cross-sectional study across 21 studies involving 61,500 community-dwelling older adults aged 65+ in the United States, finding frailty prevalence ranging from 4.0% to 59.1%. A Spanish study of 408 community-dwelling adults over 70 reported frailty and pre-frailty rates of 27.7% and 44.9%, respectively [17]. A Saudi Arabian study of 486 community-dwelling adults aged 60+ found frailty and pre-frailty prevalence of 21.4% and 47.3% [18]. Choi et al. [19] reported a frailty prevalence of 23% in Italy. The Survey of Health, Ageing and Retirement in Europe (SHARE) using a unified frailty instrument measured frailty rates of 5.8% in Switzerland and 8.6% in Sweden [20]. Numerous studies have also demonstrated that frailty prevalence is closely linked to geographic location, with lower-income countries typically exhibiting higher rates than developed nations [21-22].

2. Comprehensive Geriatric Assessment

2.1 Concept and Characteristics

Comprehensive Geriatric Assessment (CGA) employs a multidimensional, interdisciplinary approach to evaluate older adults' physical condition, functional status, mental health, and social environment, thereby formulating treatment plans aimed at maintaining and improving health and functional status while maximizing quality of life. As the core technology of geriatric medicine [23], CGA not only addresses existing problems but also screens for potential clinical issues. It facilitates early identification of disease risks, enables preventive measures, enhances quality of life, improves self-management efficacy, and strengthens adherence to chronic disease and multimorbidity management among older patients.

2.2 Assessment Content

While specific CGA components vary slightly between domestic and international applications, the overall framework remains consistent, primarily encompassing five domains: physical condition, functional status, psychological state, social support, and living environment [24]. Specific assessment items typically include activities of daily living, vision and hearing, oral health, sarcopenia, balance and gait, fall risk, urinary incontinence, pain, nutritional status, frailty, mental and psychological state, sleep disorders, multimorbidity, polypharmacy, pressure injury risk, social support, and home environment [23]. Although different assessment tools can be selected based on the target population and setting, the complete CGA package provides a comprehensive, objective analysis of older adults' overall status, offering robust direction and support for future treatment and recovery.

2.3 Current Status of CGA

In China, CGA has been widely applied in elderly populations with chronic diseases. Mao Qian found that CGA-based nursing protocols were superior

to conventional care in pulmonary rehabilitation for COPD patients [25]. He Chengguo et al. [26] demonstrated in an interventional study of hypertensive patients that CGA-guided combined therapy improved blood pressure control rates, patient satisfaction, and reduced treatment costs compared to hypertension treatment alone. Ge Xiurong et al. [27] showed that CGA intervention in elderly diabetic patients more effectively controlled blood glucose, reduced hypoglycemia incidence, shortened hospital stays, decreased adverse events, and improved safety management compared to routine diabetes care. In China, CGA is primarily applied to inpatients, with limited implementation in outpatient settings. Internationally, CGA is used not only for chronic diseases and community populations but also increasingly in oncology and perioperative patients. Extermann M [28] applied CGA to elderly cancer patients, finding it could identify morbidity and mortality risks while significantly improving care quality—a finding consistent with Koneru R [29]. Graham Ellis et al. [30] conducted a systematic review of inpatient CGA, analyzing 22 trials across six countries with 10,315 participants, concluding that CGA groups had lower risks of death or deterioration and higher likelihood of cognitive improvement compared to usual care. Harding S. [31] summarized two randomized controlled trials, one case-matched cohort study, and two quasi-experimental studies, finding that CGA in emergency departments reduced 30-day readmission rates.

3. Application of CGA in Elderly Frailty

3.1 Frailty Assessment

Numerous frailty assessment scales exist. Buta et al. identified 67 frailty assessment instruments in scientific publications, with approximately nine being highly cited [32]. Fried and Tangen's Frailty Phenotype (FP), based on the frailty cycle theory, is currently the most widely used and rapid assessment tool, though it focuses primarily on physical condition [6]. It is also recommended as a frailty screening tool within CGA. Since frailty in older adults involves overall functional decline beyond just physical aspects to include psychological dimensions, Mitnitski et al. [33] developed the Frailty Index (FI) based on the cumulative deficit theory, comprising 70 health deficit items covering physical, psychological, and cognitive domains. While comprehensive, FI is time-consuming and clinically applied less frequently than FP. The Tilburg Frailty Indicator (TFI) [34], Comprehensive Frailty Assessment Instrument (CFAI) [35], Groningen Frailty Index (GFI) [36], and CGA-based Frailty Index (CGA-FI) [37] are all based on integrated frailty models, have Chinese versions with good reliability and validity, but remain underutilized in clinical practice.

Although multiple frailty screening tools exist, their diagnostic test accuracy has not been explicitly established. Particularly for older adults with complex conditions, multidimensional assessment is essential for frailty screening. Therefore, CGA serves as an appropriate tool for screening and measuring frailty in older adults.

3.2 CGA Application in Elderly Frailty

CGA is a multidimensional, comprehensive assessment tool that effectively evaluates various geriatric syndromes. As frailty has become the syndrome most affecting quality of life in older adults, increasing numbers of researchers are using CGA to provide personalized interventions for elderly patients, thereby delaying or even improving their frailty status.

Internationally, CGA is commonly applied to frail oncology patients, frail chronic disease patients, and community-dwelling frail older adults, often using cross-sectional and cohort study designs. For example, several Korean interventional trials in frail populations found that CGA-based interventions could potentially promote healthy aging in community-dwelling older adults [38], with interventions including group exercise, nutritional supplementation, depression management, over-the-counter medication management, and home hazard reduction, demonstrating benefits lasting up to one year. Jang et al. [39] noted that the goal of frailty assessment is to implement personalized interventions, with CGA-based continuous care improving clinical outcomes. Amelie Lindh Mazya et al. [40] conducted the Dynamic Geriatric Assessment-Frailty Intervention Trial, examining CGA-based outpatient interventions for community-dwelling older adults with multimorbidity. The control group received usual care and humanistic support, while the intervention group received dynamic CGA-based assessment and multidisciplinary team interventions including medication adjustment, exercise, and dietary advice. After 24 months, the intervention group showed significantly higher proportions of pre-frail individuals and more transitions from frailty to pre-frailty or robust status compared to controls, though results lacked statistical significance due to missing data and short follow-up. Future studies should consider longer follow-up periods or more effective measures.

In cross-sectional studies, Meltem Koca [41] used CGA to find higher frailty status in atrial fibrillation patients compared to those with normal rhythm, suggesting atrial fibrillation as a frailty marker, though results were not statistically significant likely due to small sample size. Delphine Bréchemier et al. [42] applied CGA to 418 elderly oncology patients in a French geriatric frailty clinic, finding that frail patients showed greater dependency in self-care, poorer nutritional status with malnutrition risk, higher cognitive impairment risk, and significantly lower Short Physical Performance Battery (SPPB) scores compared to pre-frail and robust individuals, along with prominent polypharmacy issues. While most geriatric oncology studies have arbitrarily defined frailty within specific domains without considering comprehensive factors, this study was the first to characterize various geriatric features in frail patients, though its validity requires further verification.

In China, interventional studies using CGA for frail elderly patients are fewer compared to international research, predominantly consisting of randomized controlled trials focused on hospitalized chronic disease patients. Except for

limited applications in frail oncology patients, some scholars have applied CGA to perioperative frailty, though small sample sizes and short intervention periods limit conclusion validity [48]. Yao Simin et al. [43] conducted a multicenter, randomized, parallel-controlled trial in China to explore outcomes of frail elderly patients receiving CGA and multidisciplinary management. The trial aimed to develop a diagnosis and treatment management model for frail elderly patients incorporating various intervention strategies, including rehabilitation exercise, dietary adjustment, polypharmacy management, traditional Chinese medicine acupuncture, and patient education, but remains ongoing without definitive conclusions.

Beyond traditional CGA models, Chinese researchers have applied this technology via internet platforms. Wang Shuai et al. [44] developed a novel CGA intervention platform using WeChat public accounts and hospital websites, integrating geriatricians, rehabilitation therapists, nutritionists, and geriatric nurse specialists. The platform assesses seven domains: general condition, frailty assessment, quality of life, nutritional status, geriatric syndromes, disease and medication status, and social/environmental factors, providing personalized and comprehensive intervention guidance. Three-month follow-up assessments showed effective improvements in frailty index and SF-36 quality of life scores, though the system's practicality and effectiveness require further validation due to short application and follow-up periods.

4. Summary

Frailty significantly reduces quality of life and markedly increases adverse event rates [2], posing substantial challenges to healthcare workers and creating heavy societal burdens. Currently, worldwide attention to frailty is growing, with randomized controlled studies demonstrating that multidisciplinary interventions can effectively treat and improve frailty [31,45-46], with exercise and nutrition considered the most effective methods [41,47].

However, frailty intervention research remains in its early stages, requiring multiple validation approaches. While various frailty assessment scales exist, each has limitations. Mature CGA technology enables scientific, comprehensive assessment and intervention to appropriately delay frailty onset. Domestic researchers have found that CGA application in certain hospitalized frail populations can effectively shorten hospital stays, reduce costs, improve emotional and cognitive status [48-49], enhance self-management awareness, and decrease adverse events through personalized treatment plans [50-51], while improving perioperative frailty status and postoperative recovery quality [48]. Chinese researchers have begun exploring internet-based CGA to shorten assessment time and improve efficiency, though the technology remains immature and not widely implemented, with regional explorations ongoing [43-44]. International researchers primarily apply CGA to oncology and community frail populations, effectively improving frailty status, though large participant numbers and extended timeframes create management difficulties and high attrition rates, necessitating

further validity confirmation [39-40]. Overall, CGA is time-consuming and not widely used for frail elderly patients in China, with common issues of small sample sizes and short intervention periods requiring further validation. Since frailty predominantly exists in hospitalized patients, domestic CGA research primarily focuses on inpatients, with limited studies in outpatient and community populations. However, survey research indicates large numbers of at-risk individuals in community settings [10-15]. As society develops and research advances, we hope to develop faster, more comprehensive, and authoritative frailty assessment tools, establish industry standards for frailty, and provide comprehensive yet personalized medical services and health guidance not limited to inpatients but extending to community-based care to promote healthy, successful, and enjoyable aging. Standardized evaluation criteria would enable effective data aggregation and comparative analysis for deeper insights and future treatment directions, further improving quality of life and well-being. With rapid information technology development, traditional medical technologies for frail elderly patients should be integrated with internet technology, utilizing modern information systems to streamline complex assessments, share information platforms, and establish comprehensive, modern, and scientific frailty healthcare systems. Simultaneously, we hope national-level support will provide more opportunities for geriatric medicine and nursing development to ultimately deliver higher-quality services for older adults.

Author Contributions: Wu Minjie conceptualized the research topic and writing framework, collected literature, translated materials, and drafted the manuscript; Wu Shenhui participated in literature collection and initial manuscript review; Yan Yuru finalized manuscript review, provided supervision and management, and assumed overall responsibility for the article.

Conflict of Interest: The authors declare no conflict of interest.

References: [1] Tong YF. Latest trends and dynamics of China' s population –An analysis based on the seventh national census data[J]. *Journal of China University of Labor Relations*, 2021,35(4):15-25. [2] Bartley MM, Geda YE, Christianson TJ, Pankratz VS, Roberts RO, Petersen RC. Frailty and Mortality Outcomes in Cognitively Normal Older People: Sex Differences in a Population-Based Study. *J Am Geriatr Soc*. 2016 Jan;64(1):132-7. doi: 10.1111/jgs.13821. PMID: 26782862; PMCID: PMC4721254. [3] Shamliyan T, Talley KM, Ramakrishnan R, Kane RL. Association of frailty with survival: a systematic literature review. *Ageing Res Rev*. 2013 Mar;12(2):719-36. doi: 10.1016/j.arr.2012.03.001. Epub 2012 Mar 12. PMID: 22426304. [4] Pilotto A, Custodero C, Maggi S, Polidori MC, Veronese N, Ferrucci L. A multidimensional approach to frailty in older people. *Ageing Res Rev*. 2020;60:101047. doi:10.1016/j.arr.2020.101 [5] O' Brien TD, Roberts J, BrackenridgeGR, et al. Some aspects of community care of the frail and elderly: the need for assessment [J]. *Gerontol Clin (Basel)*, 1968,10(4):215-227. [6] Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001;56(3):M146-M156. doi:10.1093/gerona/56.3.m146

- [7] Rohrmann S. Epidemiology of Frailty in Older People. *Adv Exp Med Biol.* 2020;1216:21-27. doi: 10.1007/978-3-030-33330-0_3 [8] Lang PO, Michel JP, Zekry D. Frailty syndrome: a transitional state in a dynamic process. *Gerontology.* 2009;55(5):539-549. doi:10.1159/000211949 [9] Buta BJ, Walston JD, Godino JG, Park M, Kalyani RR, Xue QL et al (2016) Frailty assessment instruments: systematic characterization of the uses and contexts of highly-cited instruments. *Ageing Res Rev.* 26:53-61. [10] Yu JY, Gao J, Bai DX, et al. Current status and influencing factors of frailty among community-dwelling older adults in Chengdu[J]. *Chinese Journal of Gerontology*,2021,41(9):1972-1977. DOI:10.3969/j.issn.1005-9202.2021.09.052. [11] Li XC, Mao YF, Pan AX, Zhou L, Fu CM, Zhou WJ, Yang XL. Current status and influencing factors of frailty among community-dwelling older adults in Haikou[J]. *Chinese Journal of Multiple Organ Diseases in the Elderly*,2021,20(11):829-833. [12] Ren JJ. Study on current status and influencing factors of frailty among community-dwelling older adults[D]. Lanzhou University,2020. DOI:10.27204/d.cnki.glzhu.2020.00 [13] Lei PQ, Liu CN, Gao Y, Xue M. Study on correlation between psychosocial factors and frailty among community-dwelling older adults[J]. *Chinese General Practice*,2018,21(02): [14] Tian P, Yang N, Hao QK, Peng CM. Systematic review of frailty prevalence among older adults in China[J]. *Chinese Journal of Evidence-Based Medicine*,2019,19(06):656-66 [15] Ma L, Tang Z, Zhang L, Sun F, Li Y, Chan P. Prevalence of Frailty and Associated Factors in the Community-Dwelling Population of China. *J Am Geriatr Soc.* 2018;66(3):559-564. doi:10.1111/jgs.15214 [16] Collard RM, Boter H, Schoevers RA, Oude Voshaar RC (2012) Prevalence of frailty in community-dwelling older persons: a systematic review. *J Am Geriatr Soc* 60(8):1487-1492 [17] Menéndez-González L, Izaguirre-Riesgo A, Tranche-Iparraguirre S, Montero-Rodríguez Á, Orts-Cortés MI. Prevalencia y factores asociados de fragilidad en adultos mayores de 70 años en la comunidad [Prevalence and associated factors of frailty in adults over 70 years in the community]. *Aten Primaria.* 2021;53(10):102128. doi:10.1016/j.aprim.2021.102128 [18] Alqahtani BA, Alenazi AM, Alshehri MM, Osailan AM, Alsubaie SF, Alqahtani MA. Prevalence of frailty and associated factors among Saudi community-dwelling older adults: a cross-sectional study. *BMC Geriatr.* 2021;21(1):185. Published 2021 Mar 17. doi:10.1186/s12877-021-02142-9 [19] Choi J, Ahn A, Kim S, Won CW (2015) Global prevalence of physical frailty by Fried' s criteria in community-dwelling elderly with national population-based surveys. *J Am Med Dir Assoc* 16(7):548-550 [20] Santos-Eggimann B, Cuenoud P, Spagnoli J, Junod J(2009) Prevalence of frailty in middle-aged and older community-dwelling Europeans living in 10 countries. *J Gerontol A Biol Sci Med Sci* 64(6):675-681. [21] Siriwardhana DD, Hardoon S, Rait G, Weerasinghe MC, Walters KR (2018) Prevalence of frailty and prefrailty among community-dwelling older adults in low-income and middle-income countries: a systematic review and meta-analysis. *BMJ Open* 8(3): e018195 [22] Rohrmann S. Epidemiology of Frailty in Older People. *Adv Exp Med Biol.* 2020;1216:21-27. doi: 10.1007/978-3-030-33330-0_3 [23] Chen XJ, Yan J, Wang JY, Yu PL. Expert consensus on the application of comprehensive geriatric assessment technology in China[J]. *Chinese Journal of*

Geriatric Research (Electronic Edition),2017,4(02):1-6. [24] Yao Y, He Y, Zhao YL, Liu M, Yang SS, Wang JH. Definition, application, and development trends of comprehensive geriatric assessment in China[J]. Chinese Journal of Health Care and Medicine,2017,19(05):452-454. [25] Mao Q. Clinical application analysis of comprehensive geriatric assessment in COPD nursing[J]. Contemporary Clinical Journal,2021,34(04):94+56. [26] He CG, Fang XK, Wang DD. Application value of comprehensive geriatric assessment in comprehensive treatment of elderly hypertensive patients[J]. Prevention and Treatment of Cardio-Cerebral-Vascular Diseases,2021,21(03):288-290. [27] Ge XR, Wang CX, Bian YX, Wei WJ. Evaluation of comprehensive geriatric assessment intervention on blood glucose control and safety management in elderly diabetic patients[J]. Journal of Qilu Nursing,2021,27(13):8-11. [28] Extermann M, Hurria A. Comprehensive geriatric assessment for older patients with cancer. J Clin Oncol. 2007;25(14):1824-1831. doi:10.1200/JCO.2007.10.6559 [29] Koneru R, Freedman O, Lemonde M, Froese J. Evaluation of a comprehensive geriatric assessment tool in geriatric cancer patients undergoing adjuvant chemotherapy: a pilot study. Support Care Cancer. 2019;27(5):1871-1877. doi:10.1007/s00520-018-4448-y [30] Ellis G, Whitehead MA, O' Neill D, Langhorne P, Robinson D. Comprehensive geriatric assessment for older adults admitted to hospital. Cochrane Database Syst Rev. 2011;(7):CD006211. Published 2011 Jul 6. doi:10.1002/14651858.CD006211.pub2. [31] Harding S. Comprehensive geriatric assessment in the emergency department. Age Ageing. 2020;49(6):936-938. doi:10.1093/ageing/afaa059 [32] Buta BJ, Walston JD, Godino JG, Park M, Kalyani RR, Xue QL et al (2016) Frailty assessment instruments: systematic characterization of the uses and contexts of highly-cited instruments. Ageing Res Rev. 26:53-61 [33] Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging[J]. Scientific World J.2001,1:323-336. DOI:10.1100/tsw.2001.58. [34] Turner G, Clegg A, British Geriatrics Society, et al. Best practice guidelines for the management of frailty: a British Geriatrics Society, Age UK and Royal College of General Practitioners report[J]. Age Ageing,2014,43(6):744-747. DOI:10.1093/Ageing/afu138. [35] De Witte N, Gobbens R, De Donder L, et al. The comprehensive frailty assessment instrument: development, validity and reliability[J]. Geriatr Nurs,2013,34(4):274-281. DOI:10.1016/j.gerinurse.2013.03.002. [36] Steverink N, Slaets JPJ, Schuurmans H, et al. Measuring frailty: developing and testing the GFI (Groningen frailty indicator)[J]. Gerontologist,2001,41 Special Issue 1:236-237. [37] Jones DM, Song X, Rockwood K. Operating a frailty index from a standardized comprehensive geriatric assessment[J]. J Am Geriatr Soc,2004,52:1928-1933. [38] Lee H, Lee E, Jang IY. Frailty and comprehensive geriatric assessment. J Korean Med Sci 2020;35(3):e16. [39] Jang IY, Jung HW, Park H, Lee CK, Yu SS, Lee YS, et al. A multicomponent frailty intervention for socioeconomically vulnerable older adults: a designed-delay study. Clin Interv Aging 2018;13:1799-814. [40] Mazya AL, Garvin P, Ekdahl AW. Outpatient comprehensive geriatric assessment: effects on frailty and mortality in old people with multimorbidity and high health care utilization. Aging Clin Exp Res. 2019;31(4):519-525. doi:10.1007/s40520-018-1004-z [41] Koca M, Yavuz BB, Tuna Doğrul R, et

al. Impact of atrial fibrillation on frailty and functionality in older adults. *Ir J Med Sci.* 2020;189(3):917-924. doi:10.1007/s11845-020-02190-x [42] Bréchemier D, Sourdet S, Girard P, et al. Use of comprehensive geriatric assessment (CGA) to define frailty in geriatric oncology: Searching for the best threshold. Cross-sectional study of 418 old patients with cancer evaluated in the Geriatric Frailty Clinic (G.F.C.) of Toulouse (France). *J Geriatr Oncol.* 2019;10(6):944-950. doi:10.1016/j.jgo.2019.03.011 [43] Yao S, Zheng P, Ji L, et al. The effect of comprehensive assessment and multi-disciplinary management for the geriatric and frail patient: A multi-center, randomized, parallel controlled trial. *Medicine (Baltimore).* 2020;99(46):e22873. doi:10.1097/MD.00000000000022873 [44] Wang S, Huo XP, Wang XJ, Wang YJ. Construction of a novel comprehensive geriatric assessment platform and its impact on frailty degree and quality of life in elderly frail patients[J]. *Modern Clinical Nursing*,2020,19(08):20-26. [45] Cameron ID, Fairhall N, Langron C, et al. A multifactorial interdisciplinary intervention reduces frailty in older people: randomized trial. *BMC Med.* 2013;11:65. Published 2013 Mar 11. doi:10.1186/1741-7015-11-65 [46] Losa-Reyna J, Baltasar-Fernandez I, Alcazar J, et al. Effect of a short multicomponent exercise intervention focused on muscle power in frail and pre frail elderly: A pilot trial. *Exp Gerontol.* 2019;115:114-121. doi:10.1016/j.exger.2018.11.022 [47] Kelaiditi E, van Kan GA, Cesari M. Frailty: role of nutrition and exercise. *Curr Opin Clin Nutr Metab Care.* 2014;17(1):32-39. doi:10.1097/MCO.0000000000000008 [48] Gao D, Chen Y. Application effect of comprehensive assessment management model in perioperative period of elderly frail patients undergoing colorectal surgery[J]. *Nursing Practice and Research*,2022,19(07):1035-1039. [49] Yang NN, Wang GQ, Zhao MY, Ma QQ, Zhang XY, Shi WQ. Effect analysis of acute care for elders (ACE) model based on comprehensive geriatric assessment on recovery of elderly frail patients[J]. *International Journal of Geriatrics*,2020,41(04):256-258. [50] Zhang XF, Tang HX, Qiao CD. Application of comprehensive geriatric assessment in individualized management of elderly diabetic patients[J]. *Chinese Journal of Clinical Health Care*,2021,24(06):861-864. [51] Yang NN, Wang GQ, Zhao MY, Ma QQ, Zhang XY, Shi WQ. Effect analysis of acute care for elders (ACE) model based on comprehensive geriatric assessment on recovery of elderly frail patients[J]. *International Journal of Geriatrics*,2020,41(04):256-258.

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