



The Critical Evolution of the Concept of Frailty in Surgery

Georgios Tsoulfas, MD, PhD, FICS, FACS 

Department of Transplantation Surgery, Center for Research and Innovation in Solid Organ Transplantation, Aristotle University School of Medicine, Thessaloniki, Greece

INVITED EDITORIAL

In the paper, “Factors associated with 1-year mortality in elderly patients (80 years and older) with cancer undergoing major abdominal surgery: a retrospective cohort study,” the authors are able to identify perioperative factors associated with long-term mortality in patients older than age 80 years with cancer, who undergo major abdominal surgery.¹ The importance of this lies in the fact that these patients represent a particularly challenging group. Thus, surgeons are generally not eager to offer major surgery, although if the surgery is successful, then the quality of life is excellent. Still, no matter what the challenges, these patients cannot be ignored, because (1) they represent an increasing portion of the population, and (2) we are all heading that way (if we are lucky enough...). According to the World Health Organization (W.H.O.), the number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million, thus making it critical to identify those patients who will have the best overall result from major abdominal surgical procedures.² The authors showed an impressive increase in the mortality from 4% in the first 30 days after the surgery to a 1-year mortality of 24.3%. The factors that were independently associated with this result included Performance Status (PS) > 1, weight loss > 3 kg, intraoperative use of vasopressors, and postoperative transfusion, whereas the perioperative use of an Enhanced Recovery After Surgery (ERAS) protocol and supramesocolic surgery were associated with improved survival.¹

A common denominator in these findings, and perhaps the most critical to identify the patients who will benefit

from surgical management in this age group, is the concept of “frailty.” This is where the problems start! As simple as it sounds, almost self-explanatory some would argue, there is not a universally accepted common definition of frailty for several reasons. First, frailty is usually accompanied by malnutrition and sarcopenia. Malnutrition is a clinical syndrome that represents a spectrum of nutritional disorders ranging from underweight to obese, which are the result of an imbalance of nutrients and eventually lead to the physical results, manifested by sarcopenia and frailty.³ Sarcopenia itself has been defined as a progressive and generalized muscle disorder combining problems in muscle mass, strength, and performance; the last two are the key difference, as in most studies the main measurement is that of muscle mass alone.⁴ The end-result of the combination of malnutrition and sarcopenia is frailty, which has been aptly described as a syndrome of decreased physiologic reserve and ability to recover from various stressors.⁵ Frailty is linked to cancer, as in the case of these patients, through the presence of an inflammatory response, as evidenced by patients with cancer and high modified Glasgow prognostic score.⁶ All of the above present a picture of the potential role of frailty that is not complete, for the reason that frailty is not a static measurement or estimation, but it has the ability to evolve in one direction or the other, in addition to the fact that we can only see the true magnitude of the problem when the patient is faced with one or more health stressors. Stressors, apart from the type of disease, also can include other comorbidities, aging-related conditions, and social determinants of health. Finally, frailty is not necessarily linked to chronological age but rather the biological one.

Seeing the multitude of variables mentioned above regarding the definition of frailty, it is not surprising that not only is it a challenge to find a complete definition but also to agree on the best possible method to assess frailty. Despite concerted efforts, including an important one by the American College of Surgeons National Surgical Quality Improvement Program (NSQIP), there is agreement that

© Society of Surgical Oncology 2023

First Received: 11 October 2023

Accepted: 17 October 2023

Published online: 5 November 2023

G. Tsoulfas, MD, PhD, FICS, FACS
e-mail: tsoulfasg@auth.gr

additional work is needed to identify the best possible tools to assess frailty, although there is the argument that the best metric is the one that can and will be used in the specific practice setting and which also will serve to improve the care that patients will receive.^{7–12}

This brings us to the next problem: because frailty is so important, yet evolving and multifaceted, how can we implement any changes or interventions? The answer is that ideally interventions should be on many different levels, including education, improvement of nutritional status, strengthening motivation and behavioral skills, endocrinological consultation, and, of course, physical activity and pre- and post-rehabilitation.¹³ There are certain crucial points involved in this process: the need to (1) adapt the diagnostic tools and the intervention methods to the center capabilities and the patient's needs, (2) continuously assess the patient's condition and the effect of any interventions, and (3) use a multidisciplinary team, which apart from the medical personnel, would include nutritionists, physical therapists, and psychologists.

In conclusion, the paper by Canac et al. very eloquently and methodically shows us that the key to elderly patients undergoing major abdominal surgery is proper selection, with essentially an emphasis on the question of frailty. As simple as the notion of frailty might sound at first, we have seen over the years that it is both multifaceted and continuously evolving. Part of the reason for the latter is the parallel technological progress, which will provide the proper instruments, such as the application of machine learning approaches and artificial intelligence techniques.¹⁴ The overall goal remains to provide our patients with the “whole bundle of care.”

DISCLOSURES There are no conflicts of interest.

REFERENCES

1. Canac J, Faucher M, Depeyre F, et al. Factors associated with 1-year mortality in elderly patients (80 years and older) with cancer undergoing major abdominal surgery: a retrospective

- cohort study. *Ann Surg Oncol*. 2023. <https://doi.org/10.1245/s10434-023-14365-8>.
2. World Health Organization, Ageing and Health. Available at: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>. Accessed 5 Oct 2023.
3. Lochs H, Allison SP, Meier R, et al. Introductory to the ESPEN Guidelines on Enteral Nutrition: terminology, definitions, and general topics. *Clin Nutr*. 2006;25:180–6.
4. Cruz-Jentoft AJ, Bahat G, Bauer J, et al. Sarcopenia: revised European consensus on definition and diagnosis. *Age Ageing*. 2019;48:16–31.
5. McAdams-DeMarco MA, Law A, Salter ML, et al. Frailty as a novel predictor of mortality and hospitalization in individuals of all ages undergoing hemodialysis. *J Am Geriatr Soc*. 2013;61:896–901.
6. Yamada S, Shimada M, Morine Y, et al. Significance of frailty in prognosis after hepatectomy for elderly patients with hepatocellular carcinoma. *Ann Surg Oncol*. 2021;28:439–46.
7. Owodunni OP, Mostales JC, Qin CX, Gabre-Kidan A, Magnuson T, Gearhart SL. Preoperative frailty assessment, operative severity score, and early postoperative loss of independence in surgical patients aged 65 years or older. *J Am Coll Surg*. 2021;232:387–95.
8. Pullen LC. Integrating frailty into clinical care. *Am J Transplant*. 2023;23:453–4.
9. Arya S, Varley P, Youk A, et al. Recalibration and external validation of the risk analysis index: a surgical frailty assessment tool. *Ann Surg*. 2020;272:996–1005.
10. Lai JC, Covinsky KE, Dodge JL, Boscardin WJ, Segev DL, Roberts JP, Feng S. Development of a novel frailty index to predict mortality in patients with end-stage liver disease. *Hepatology*. 2017;66:564–74.
11. Tandon P, Tangri N, Thomas L, et al. A rapid bedside screen to predict unplanned hospitalization and death in outpatients with cirrhosis: a prospective evaluation of the Clinical Frailty Scale. *Am J Gastroenterol*. 2016;111:1759–67.
12. Tapper EB, Derstine B, Baki J, Su GL. Bedside measures of frailty and cognitive function correlate with sarcopenia in patients with cirrhosis. *Dig Dis Sci*. 2019;64:3652–9.
13. Lai JC, Tandon P, Bernal W, Tapper EB, Ekong U, Dasarathy S, Carey EJ. Malnutrition, frailty, and sarcopenia in patients with cirrhosis: 2021 practice guidelines by the American Association for the Study of Liver Diseases. *Hepatology*. 2021;74:1611–44.
14. Oliosi E, Guede-Fernandez F, Londral A. Machine learning approaches for the frailty screening: a narrative review. *Int J Environ Res Public Health*. 2022;19:8825.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.