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SCIENTIFIC ARTICLE - REVIEW ARTICLE

ASSESSMENT OF PREOPERATIVE FRAILTY IN ADULTS UNDERGOING CARDIAC SURGERY

ESTEVAM BORGES LOPES[1]; ARTUR HENRIQUE DE SOUZA[2]; STANLLEY DE OLIVEIRA LOYOLA[1,2]; MATHEUS SILVA DE OLIVEIRA[1]; GABRIEL PEIXOTO NASCIMENTO[1]; GUSTAVO SIQUEIRA ELMIRO[1]; GIULLIANO GARDENGHI[1,2]

1. Clínica de Anestesia, Goiânia/GO, Brasil.
2. Hospital ENCORE, Aparecida de Goiânia/GO, Brasil

ABSTRACT

INTRODUCTION: The identification of preoperative frailty in patients undergoing cardiac surgery can be important for prognostic and postoperative recovery purposes, assisting in the conduct to be taken, such as pre-qualification, predicting perioperative risks, prudence in risks, prudence in more invasive therapies or procedures, and short- and long-term post-operative care needs. Objective: To estimate the prevalence of preoperative frailty of patients undergoing cardiac surgery, based on the 5 meters walking test. Methods: A retrospective study based on the institutional database of Encore Hospital, in which 91 adult patients who had undergone cardiovascular surgery were evaluated cardiovascular surgery, between the months of March 2019 and June 2023, being weighted the preoperative frailty of the patients by the 5 meters walking test. Results: 77 patients (84.6%) were the classification of non-frail in the pre-anesthetic evaluation, compared to 14 patients (15.4%) were considered frail, 13 of whom were aged 60 or over. were aged 60 or over. Conclusion: The presence of frailty is associated with a higher risk of morbidity, mortality and utilization of health services, demonstrating health services, demonstrating that the assessment of frailty should be explored in preoperative assessments for elective cardiac surgery.

Keywords: Frailty, Thoracic Surgery, Preoperative Period.

INTRODUCTION

The elderly population has a greater tendency to undergo surgeries and interventions of varying complexities, such as cardiovascular surgeries, oncological diseases, and musculoskeletal disorders. Elderly individuals also have a higher risk of falls[1]. Patients undergoing major thoracic surgery are mostly adults over 60 years of age[2]. In cardiac surgery, more than half of the patients are 75 years or older[3].

An aging society carries a range of concerns for patients undergoing surgery, including frailty in older adults, which may be associated with poorer outcomes following a medical procedure[4].

Frailty is defined by the Gerontological Society of America as an individual with diminished reserve and resistance to stressors[4]. Other definitions include frailty as an increased vulnerability to a stressful event, such as trauma or illness, which leads to poor resolution of homeostasis and increases the risk of complications and sequelae. Frailty results from an accelerated loss of functional reserve associated with aging. It is a complex and multidimensional syndrome that involves multiple physiological systems and leads to various phenotypes of frailty[2].

Identifying patients with frailty in the preoperative phase of cardiac surgeries can be important for prognostic purposes and postoperative recovery. It helps guide decisions such as prehabilitation, predicting perioperative risks, exercising caution with more invasive therapies or procedures, and determining short- and long-term postoperative care needs, such as admission to intensive care units[1,5].

However, the consensus on the best way to measure frailty or apply these instruments in clinical practice to predict outcomes remains undefined[6].

Frailty encompasses factors such as malnutrition, emaciation, weakness, slowness, and inactivity. Although frailty tends to increase with age, its assessment is measured through a variety of physical and cognitive tests, nutritional status, and functional decline, which are independent of age or any specific medical condition[3]. There are more than 20 validated tools for screening and measuring frailty, with important similarities, but no standardized assessment tool is defined. Consequently, these extensive scale options allow physicians to find one that suits their needs based on the type of surgery, their local population, and their resources. One of the most well-known tools is the Edmonton Frailty Scale (EFS), which is a multidimensional assessment designed to assist and facilitate the screening of elderly patients in a primary care setting. It includes subscales covering cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence, and functional performance[1], classifying the patient as non-frail, vulnerable (at risk), or frail[2].

The Frail Scale was developed by the International Society for Nutrition and Aging and assesses 5 components: fatigue, resistance, ambulation, illness, and weight loss. The state of frailty is categorized as robust (0 points), pre-frail (1 to 2 points), and frail (3 to 5 points)[7].

The Society of Thoracic Surgeons (STS) incorporated gait speed measurement to assist physicians in identifying cardiac surgery patients at increased risk of adverse outcomes. This recommendation was based on a study by Afilalo et al.[8], which examined gait speed by measuring the time patients took to walk 5 meters. Patients who take more than 7 seconds to cover the 5 meters are classified as frail, while those who take up to 7 seconds are considered non-frail[9].

Considering the factors presented, the objective of this study was to estimate the prevalence of preoperative frailty in patients undergoing cardiac surgeries, based on the 5-meter walk test.

MATERIALS AND METHODS

This study was a retrospective analysis based on our institutional database at Hospital Encore located in Goiânia, Goiás. We evaluated 91 adult patients who underwent cardiovascular surgery at our institution between March 2019 and June 2023.

Preoperative frailty was assessed based on the measurement of patients' gait speed, specifically the time taken to walk 5 meters. A time greater than 7 seconds classified the patient as frail, whereas a time of 7 seconds or less was considered non-frail[9].

RESULTS

The study population consisted of 91 patients, with a minimum age of 29 years and a maximum age of 89 years, predominantly male (60.4%). The average age was 64.4 years (±12.5), the average weight was 76.1 kg (±13.3), and the average height was 1.7 m (±0.1) (Table 1).

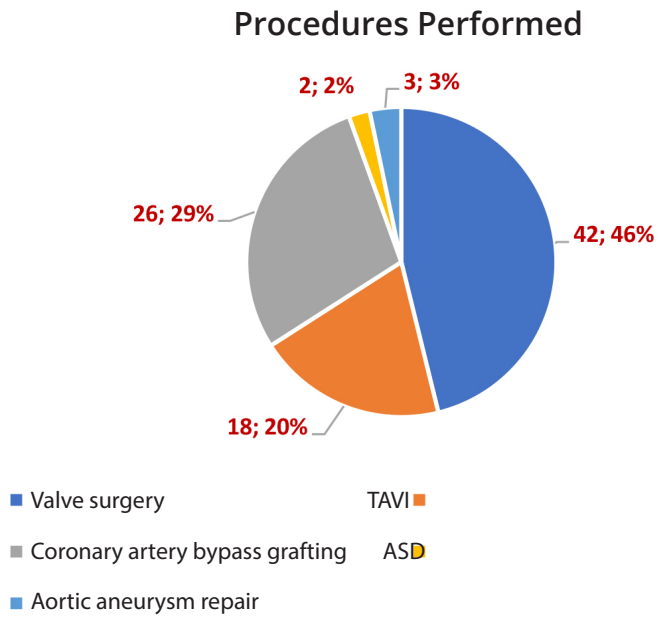
Table 1 - Anthropometric Characteristics of the Sample

Variable Value	(n = 91 patients)
Age (years)	64,4±12,5
Male, n(%)	55 (60.4%)
Female, n (%)	36 (39.6%)
Weight (kg)	76,1±13,3
Height (m)	1,7±0,1

%: percentage; kg: kilograms; m: meters. Data expressed as mean and standard deviation, and absolute frequency and percentage.

The patients underwent various cardiac surgeries, with the largest number undergoing valve surgery (42.46%). Other patients underwent coronary artery bypass grafting (26.29%), transcatheter aortic valve implantation (TAVI) (18.20%), atrial septal defect (ASD) correction (2.2%), and aortic aneurysm repair (3.3%) (Figure 1).

Figure 1. Procedures Performed

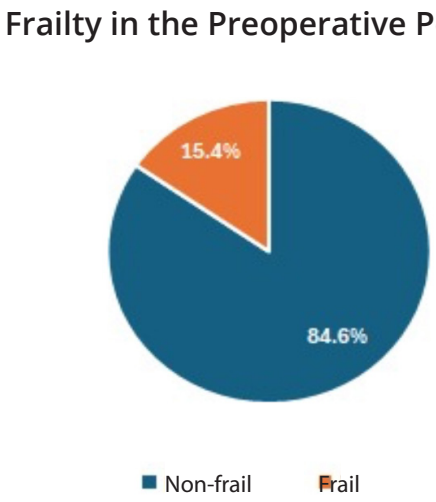


A total of 84.5% of the patients were classified as non-frail during the pre-anesthetic evaluation, compared to 15.4% who were considered frail, as shown in Table 2 and Figure 2.

Table 2. Frequency of Frailty Index in Patients Undergoing Cardiac Surgeries

Variable	(n = 91 patients)	< 60 years	≥ 60 years
Preoperative frailty	14 (15.4%)	1	13
Non-frail	77 (84.5%)	29	48

Figure 2. Percentage of Frail Individuals in the Studied Sample



DISCUSSION

Frailty constitutes a risk for complications and mortality following cardiovascular surgery. It is a multidimensional syndrome involving multiple physiological systems, with the typical phenotype being a patient exhibiting weakness, low energy, slowness, and involuntary weight loss [2,10].

As observed in Table 1, the average age of the study participants is 64.4 years (±12.5). According to Pereira[1], age is considered a significant factor in the occurrence of frailty syndrome due to changes in neuroendocrine regulation and immunological dysfunction that accelerate aging and the onset of secondary diseases. According to findings by Fhon et al.[11], in a longitudinal quantitative study involving 262 elderly individuals, frailty syndrome is associated with increased age and low educational level.

Additionally, frailty predisposes patients to a longer surgical recovery time, particularly with complications and reoperations. Furthermore, independent factors associated with postoperative morbidity and mortality include emergency surgeries and poor functional status[2].

The study population consists of 91 patients, with a predominance of males (60.4%) (Table 1). These results differ from data obtained from IBGE (2010), where female patients make up the majority undergoing surgical interventions, justified by the higher demand and utilization of healthcare services by women compared to men[1].

Regarding the walking test used in this study, Afilalo et al.[8] determined that patients with slow pre-

operative walking speed (taking 6 seconds to walk 5 meters) had a 2 to 3 times higher risk of mortality and increased morbidity for any level of mortality risk predicted by the STS-PROM (Society of Thoracic Surgeons Predicted Risk of Mortality or Major Morbidity score) compared to those with normal walking speed. This supports the methodology used in this study for classifying frail patients.

According to a meta-analysis conducted by Bagnall et al.[12], nine studies have shown that preoperative frailty correlates with adverse events following bariatric surgery in elderly patients. Additionally, it highlights that frail patients have a two to four times higher risk of mortality after surgery compared to non-frail patients.

The prevalence of preoperative frailty in cardiac surgeries, when compared to other studies with similar designs, shows variability depending on the scale or method used for evaluation. Even within the same population, this prevalence can vary according to the selected scale. For example, as demonstrated by Miguelena-Hycka[7], it ranged from 10% to 29% within the same patient sample.

Despite this, studies with prospective and longitudinal designs, both preoperative and postoperative, have shown a clear and statistically significant linear trend in the incidence of postoperative morbidity among patients classified as frail, regardless of the scale used for defining frailty preoperatively[7].

In a study conducted by Montgomery et al.[5], which assessed the association between preoperative frailty and outcomes in adults undergoing cardiac surgery, 51 out of 529 patients (9.6%) were identified as frail. This finding supports our study, indicating a small difference in the percentage of frail patients, despite the smaller sample size.

The study by Montgomery et al.[5] further demonstrates that frail patients were older than non-frail patients, and postoperative complications were more common among frail patients. Frail patients received more interventions and required more intensive treatment escalation, including return to the operating room, administration of blood products, reintubation, enteral feeding via tube, and renal replacement therapy, compared to non-frail patients. Additionally, it was found that hospital mortality was 9.8% among frail patients and 1.0% among non-frail patients.

Another similar study conducted by the Virginia Heart Surgery Research Department by Henry et al.[4] evaluated frailty in cardiac surgical patients and found that out of 167 patients assessed, 46 patients (28%) were identified as frail. These frail patients experienced prolonged ventilation, pneumonia, longer ICU stays, and readmission within 30 days, leading to a worse quality of life regarding health. Similarly, the study by Niv AD et al.[6], which assessed frailty in patients undergoing elective cardiac surgery, showed that out of 167 patients who underwent myocardial revascularization and/or valve surgery, 39 patients (23%) were considered frail, leading to prolonged ICU stays.

Specifically speaking about transcatheter aortic valve implantation (TAVI), despite the good results of the procedure in follow-up, the one-year survival after TAVI for symptomatic severe aortic stenosis depended on the performance of the pre-TAVI 5-minute walk test. Patients who were unable to walk or took more than 7 seconds had worse survival compared to patients who took less than 7 seconds. This finding may assist in the selection and management of patients[9].

In the present study, 92.85% of frail patients were 60 years or older, while 7.15% were younger than 60 years, similar to the study by Sepehri et al.[3], which conducted a systematic review on the impact of frailty on postoperative outcomes in cardiac surgery. This study described that the associations were stronger in elderly patients undergoing cardiac surgery, highlighting the need for special attention to this age group.

CONCLUSION

Frailty was observed in 15.4% of the patients evaluated, with 92.85% of frail patients being 60 years or older. The walking test used in the study to estimate frailty in adults is simpler and easier to administer compared to many other frailty assessments that involve multidimensional evaluations with multiple parameters, which is a limitation of our study. Nevertheless, it can be inferred that the presence of preoperative frailty is associated with a higher risk of morbidity, mortality, and use of healthcare services, indicating that this tool can be useful and should be more routinely explored in preoperative evaluations for elective cardiac surgeries.

REFERENCES

1. Pereira EMP, Melo MPLB, De Armond LS, Souza AAB, Silva CR. Relação entre índice de fragilidade em idosos submetidos a cirurgia eletiva e complicações pós-operatórias. Rev HUGV [Internet]. 2023 Sep 20 [Cited 2024 Aug 20];22(1):10937. Available from: https://periodicos.ufam.edu.br/index.php/revistahugv/article/view/10937/version/17217doi: 10.60104/revhugv10937.

2. Cappe M, Laterre PF, Dechamps M. Preoperative frailty screening, assessment and management. Curr Opin Anaesthesiol [Internet]. 2023 Feb [Cited 2024 Aug 20];36(1):83-8. Available from: https://journals.lww.com/co-anesthesiology/fulltext/2023/02000/preoperative_frailty_screening,_assessment_and.16.aspx. doi: 10.1097/ACO.0000000000001221.

3. Sepehri A, Beggs T, Hassan A, Rigatto C, Shaw-Daigle C, Tangri N, Arora RC. The impact of frailty on outcomes after cardiac surgery: a systematic review. J Thorac Cardiovasc Surg [Internet]. 2014 Aug 7 [Cited 2024 Aug 20];148(6):3110-7. Available from: https://www.jtcvs.org/article/S0022-5223(14)01067-8/fulltext. doi: 10.1016/j.jtcvs.2014.07.087.

4. Henry L, Halpin L, Barnett SD, Pritchard G, Sarin E, Speir AM. Frailty in the cardiac surgical patient: comparison of frailty tools and associated outcomes. Ann Thorac Surg [Internet]. 2019 Apr 3 [Cited 2024 Aug 20];108(1):16-22. Available from: https://www.annalsthoracicsurgery.org/article/S0003-4975(19)30438-2/fulltext. doi: 10.1016/j.athoracsur.2019.03.009.

5. Montgomery C, Stelfox H, Norris C, Rolfson D, Meyer S, Zibdawi M, Bagshaw S. Association between preoperative frailty and outcomes among adults undergoing cardiac surgery: a prospective cohort study. CMAJ Open [Internet]. 2021 Jul 20 [Cited 2024 Aug 20];9(3):E777-87. Available from: https://www.cmajopen.ca/content/9/3/E777. doi: 10.9778/cmajo.20200034.

6. Ad N, Holmes SD, Halpin L, Shuman DJ, Miller CE, Lamont D. The effects of frailty in patients undergoing elective cardiac surgery. J Card Surg [Internet]. 2016 Apr [Cited 2024 Aug 20];31(4):187-94. Available from: https://onlinelibrary.wiley.com/doi/10.1111/jocs.12699. doi: 10.1111/jocs.12699.

7. Miguelena-Hycka J, Lopez-Menendez J, Prada PC, Rodriguez-Roda J, Martin M, Vigil-Escalera C, Hernandez-Vaquero D, Miguelena JM, Silva J, Gonzalez-Colaço M. Influence of preoperative frailty on health-related quality of life after cardiac surgery. Ann Thorac Surg [Internet]. 2019 [Cited 2024 Aug 20];108(1):23-29. Available from: https://www.annalsthoracicsurgery.org/article/S0003-4975(19)30098-0/fulltext#%20. doi: 10.1016/j.athoracsur.2018.12.028.

8. Afilalo J, Alexander KP, Mack MJ, Maurer MS, Green P, Allen LA, Popma JJ, Ferrucci L, Forman DE. Frailty assessment in the cardiovascular care of older adults. J Am Coll Cardiol [Internet]. 2014 Mar 4 [Cited 2024 Aug 20];63(8):747-62. Available from: https://www.sciencedirect.com/science/article/pii/S073510971306155X?via%3Dihub. doi: 10.1016/j.jacc.2013.09.070.

9. Kazui T, Hsu CH, Hamidi M, Acharya D, Shanmugasundaram M, Lee K, Chatterjee A, Bull D. Five-meter walk test before transcatheter aortic valve replacement and 1-year noncardiac mortality. JTCVS Open [Internet]. 2022 Aug 18 [Cited 2024 Aug 20];12:103-17. Available from: https://www.jtcvsopen.org/article/S2666-2736(22)00313-8/fulltext. doi: 10.1016/j.xjon.2022.08.003.

10. Arai Y, Kimura T, Takahashi Y, Hashimoto T, Arakawa M, Okamura H. Preoperative frailty is associated with progression of postoperative cardiac rehabilitation in patients undergoing cardiovascular surgery. Gen Thorac Cardiovasc Surg [Internet]. 2019 Apr 9 [Cited 2024 Aug 20];67(11):917-924. Available from: https://link.springer.com/article/10.1007/s11748-019-01121-7. doi: 10.1007/s11748-019-01121-7.

11. Fhon JRS, Rodrigues APR, Santos JLF, Diniz MA, Dos Santos EB, Almeida VC, Giacomini SBL. Factors associated with frailty in older adults: a longitudinal study. Rev Saúde Pública [Internet]. 2018 Aug 3 [Cited 2024 Aug 20];52:1518-8787. Available from: https://www.revistas.usp.br/rsp/article/view/148599. doi: 10.11606/S1518-8787.2018052000497.

12. Bagnall NM, Faiz O, Darzi A, Athanasiou T. What is the utility of preoperative frailty assessment for risk stratification in cardiac surgery? Interact Cardiovasc Thorac Surg [Internet]. 2013 Aug [Cited 2024 Aug 20];17(2):398-402. Available from: https://academic.oup.com/icvts/article/17/2/398/789880. doi: 10.1093/icvts/ivt197.

ESTEVAM BORGES LOPES - http://lattes.cnpq.br/5104171664385663 - https://orcid.org/0009-0009-5137-5922

ARTUR HENRIQUE DE SOUZA - http://lattes.cnpq.br/0355122314956228 - https://orcid.org/0000-0002-5835-1052

STANLLEY DE OLIVEIRA LOYOLA - http://lattes.cnpq.br/4304216131077946 - https://orcid.org/0000-0002-1832-7103

MATHEUS SILVA DE OLIVEIRA - http://lattes.cnpq.br/9334250949525813 - https://orcid.org/0000-0002-9936-1556

GABRIEL PEIXOTO NASCIMENTO - http://lattes.cnpq.br/1553201526937403 - https://orcid.org/0000-0002-6607-7110

GUSTAVO SIQUEIRA ELMIRO - http://lattes.cnpq.br/4765163399934337 - https://orcid.org/0000-0003-2113-8757

GIULLIANO GARDENGHI - http://lattes.cnpq.br/1292197954351954 - https://orcid.org/0000-0002-8763-561X

ENDEREÇO

GIULLIANO GARDENGHI
CET – CLIANEST, R. T-32, 279 - St. Bueno, Goiânia - GO, Brasil, CEP: 74210-210
E-mail: coordenacao.cientifica@ceafi.edu.br

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