

Original Article

The Geriatric 8 (G8) Score as a Predictor of Postoperative Outcomes in Elderly Patients Undergoing Surgical Interventions for Malignancies

Lujain Omar Elghamry¹, Salma M.S. El Said¹, Manar Mostafa Adel¹, Mohamed Mohamed Mortada¹

¹Department of Geriatrics Medicine and Gerontology, Faculty of Medicine, Ain Shams University

ABSTRACT

Background: The fact that a higher incidence of cancer occurs in people aged above 65 years have attracted attention to the importance of offering specific care for elderly patients. Conventional preoperative assessment usually dismiss geriatrics syndromes. Comprehensive Geriatric assessment is a significant prognostic factor for survival and provides tailored interventions for patients. However, it consumes time and is not necessary for each patient. Therefore, screening tools are becoming important which are brief, easily done unlike extensive CGA.

Aim: To assess the ability of the Geriatric 8 (G8) questionnaire to predict postoperative outcomes in elderly patients.

Methodology: A prospective cohort study on 135 elderly patients above 60 years of age, undergoing surgical interventions for malignancies. Preoperatively, G8 score done with assessment of comorbidities and function. Following their surgeries and during their hospital stay, patients were assessed for complications; mortality, length of hospital stay, return to operation room, thromboembolic events, hospital acquired infections and pressure ulcers.

Results: The mean age of the study population is 73 years. 76.3% males and 23.7% females. Upper GIT tumors are the most common malignancy, followed by colorectal and hepatobiliary. The sensitivity of the G8 score for predicting mortality was found to be 64.9% with 71.4% specificity and 84.3% negative predictive value.

Conclusion: In the current study, the G8 has proven to be a specific, accurate and easy assessment tool to predict postoperative complications in elderly patients at cutoff score of 7 as regards mortality, return to OR, hospital acquired infections, length of hospital stay and pressure ulcers.

Keywords: Geriatric 8, G8, preoperative geriatric assessment

INTRODUCTION

Globally, an average of 19.3 million new cancer patients were diagnosed and around 10.0 million cancer deaths happened in 2020.

[1] Increased age of the populations, social and economic factors are from the main reasons causing this rise. [2]

Currently, there are no universally agreed assessment measures and criteria for decision-making regarding treatment for elderly cancer patients as this age group is not sufficiently studied in clinical trials. [3]

Geriatric assessment is recommended to be done for all patients diagnosed with cancer and are above 70 years old according to the

guidelines of the American National Comprehensive Cancer Network (NCCN), the International Society of Geriatric Oncology (SIOG), and the European Organization for Research and Treatment of Cancer (EORTC). [4]

The diversity in the process of aging makes decision making regarding management more complicated. This causes age-related differences in treatment approaches and response, which increases the possibility of inadequate treatment or cause treatment toxicity, further affecting the patients' survival. [5]

This increased age of the world's populations will cause remarkable need for surgical procedures and older patients' perioperative assessment which is usually distinguishable from that required for younger patients, specifically because currently used risk assessment tools are pivoted on a single system affection, while the majority of older patients show decreased physiologic function and stores in various systems. Acute illness or surgical stress, impair patients' quality of life, affects their independence, restrict further therapeutic modalities, and raises mortality. [6] Since the earliest trials to predict postoperative outcome, different scoring tools have been created and validated. [7] The majority of the currently used tools are unable to properly predict outcomes including length of hospital stay (LOS), functional recovery, or requirement for further institutionalization that are important outcomes which will affect the process of decision making, particularly for older patients, their families, and physicians. [8] Comprehensive Geriatric Assessment (CGA) is a multidimensional, interdisciplinary approach that evaluates the patients' general health status as regards their function, cognition, social status, nutrition and psychology. GA can significantly predict overall survival (OS), negative outcomes of chemotherapy [9] identifies specific geriatric issues in greater than 50% of cancer patients [10]. This leads to the development of targeted geriatric interventions that can enhance quality of life, adherence to therapy, and OS. [4]

However, a CGA consumes time, is not adequately funded in the majority of health care delivering entities and is not usually needed for each patient. [11] Therefore, geriatric screening tools are becoming increasingly necessary. These tools are brief, easily done and can prevent the wasted time and effort of performing unrequired extensive CGA in elderly patients. [12]

The Geriatric 8 (G8) showed to be a markedly sensitive frailty-screening tool for older patients with cancer undergoing systemic treatment. [13]

Detecting elderly cancer patients who need a geriatric assessment for adjusting their management plan was the primary purpose for the development of the G8 score. Clinical trials demonstrate that the G8 is an accurate and sensitive predictor of patients' overall survival, despite the metastatic status or location of the tumor. These results reinforce its clinical value in the setting of geriatric oncology. [14]

SUBJECTS AND METHODS

The current study is a prospective cohort study carried out on 135 elderly patients, between the time of February 2022 and December 2022, in Ain Shams University Hospitals.

- Inclusion criteria:

1. Patients aged 60 years of age or older.
2. Both males and females.
3. Patients undergoing operable surgical intervention for malignancies.
4. Patients diagnosed with malignancies by via imaging or histopathology.

- Exclusion criteria:

1. Patients under 60 years of age.
2. Patients who refused to participate in the study.

Patients were selected from the General Surgery Hospital units prior to the day of their surgeries, after obtaining their oral and written informed consent. Demographic data were collected including their age, gender, occupation, marital status and level of education. Patients' comorbidities were assessed using the modified Frailty Index (mFI) [15] and level of function was assessed as well preoperatively, using Katz Activities of Daily Living (ADL) and Lawton Instrumental activities of Daily Living (IADL). [16]

Preoperative assessment was done using the G8 score, as a structured researcher-administered face-to-face interview in the form of 8 closed-ended questions for which the answers are 3 to 4 choices for the patient to choose from. The G8 score assesses 8 different domains including decline in food intake, weight loss, neuropsychological

problems, mobility, BMI, age and medications. [17]

Following their surgeries and during their entire hospital stay, patients were followed and assessed for postoperative complications including mortality, length of hospital stay, return to operation room, thromboembolic events, hospital acquired infections and pressure ulcers.

Ethical considerations:

1. An informed consent was obtained from each participant upon hospital admission as per the administration protocols.
2. Reviewing and approval of the study methodology was done by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of Medicine, Ain Shams University.
3. Confidentiality and privacy of the patients were ensured.
4. Consent was obtained from the author of the G8 score to apply it in our study after communication via email.

Data management and statistical analysis:

- Data were tabulated and statistically analyzed using SPSS, version 20 (SPSS Inc., Chicago, IL).
- Quantitative data were described as mean and standard deviation / median and interquartile range.
- Test of normality was done for quantitative data and revealed that all quantitative variables are nonparametric (not normally distributed).
- Mann Whitney test and Kruskal Wallis were used for comparing nonparametric quantitative variables between independent groups.
- Qualitative data were expressed as frequencies (n) and percentage (%).
- Chi square test and fisher exact test were used to test association between qualitative variables.
- Pearson correlation coefficient was used to correlate between nonparametric quantitative variables.

A correlation coefficient greater than zero indicates a positive relationship while a value less than zero indicates a negative relationship. A value of zero indicates no relationship between the two variables being compared. P-value ≤ 0.05 was considered significant.

RESULTS

As regards the demographic data, the mean age of the study population was 73 years old. 76.3% were males and 23.7% were females. 40.7% were office workers, 24.4% were housewives and 34.8% were manual workers. The majority of the studied population were literate (63%), mostly of middle education. Regarding the tumor site, 28.1% were upper GIT tumors, 21.5% colorectal, 15.6% hepatobiliary, 14.8% breast, 12.6% genitourinary and 7.4% thyroid.

The majority of the studied population were frail (91%), according to the commonly used cutoff frailty score of the G8 questionnaire, which is less than 14, and 9% were non-frail. The mean total score of our patients was 8.6.

(Table 1)

Regarding the relation between the G8 score and mortality in the studied elderly patients, it was found that the mean total score of 6.7 was statistically significant. Moreover, the score of 14 was found to be of no significance in relation to mortality. As for the return to the operation room, it was found that the mean total score of 7.3 was statistically significant. For thromboembolic events, the mean total score of 7.2 was significant. Regarding hospital acquired infections, the mean total score of 7.9 was statistically significant. As regards the relation between the G8 score and the length of hospital stay in the studied elderly patients, it was found that the mean total score of 7 was statistically significant as shown in **Table 2**. For the relation between the G8 score and the development of pressure ulcers postoperatively, it was found that the mean total score of 7.1 was statistically significant.

Using ROC curves (**Table 3 & Figure 1**) to evaluate the accuracy of the G8 score for the prediction of postoperative outcomes, it was found that it has 70% accuracy in predicting

mortality, 68.8% accuracy in predicting return to operation room, 65.8% accuracy in predicting thromboembolic events postoperatively, 62.2% accuracy in predicting the occurrence of hospital acquired infections postoperatively and 72.2% accuracy predicting the development of pressure ulcers postoperatively. All of which showing

marked statistical significance which strengthens the value of the G8 score as a preoperative screening tool for frailty. As for the sensitivity of the G8 score for predicting mortality, it was found to be 64.9% with 71.4% specificity, 46.2% positive predictive value and 84.3% negative predictive value.

Table 1. Distribution of Geriatric 8 elements and score in the studied elderly patients

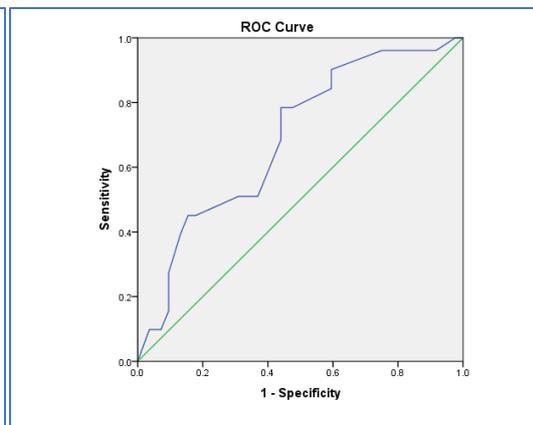
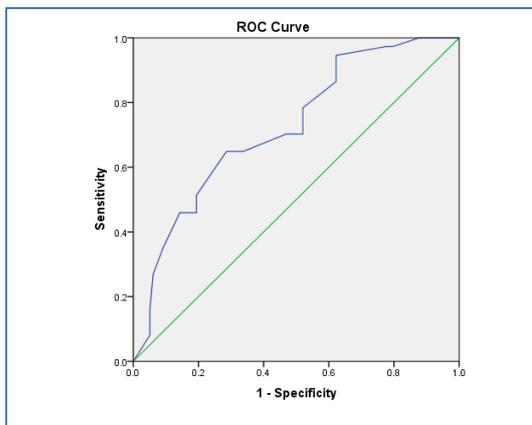
		N	%
Food intake declined over the past 3 months	Severe decrease in food intake	56	41.5%
	Moderate decrease in food intake	54	40.0%
	No decrease in food intake	25	18.5%
Weight loss during the last 3 months	Weight loss > 3 kgs	29	21.5%
	Don't know	45	33.3%
	Weight loss between 1 & 3 kgs	50	37.0%
	No weight loss	11	8.1%
Mobility	Bed or chair bound	48	35.6%
	Able to get out of bed or chair but does not go out	55	40.7%
	Goes out	32	23.7%
Neuropsychological problems	Severe dementia or depression	47	34.8%
	Mild dementia or depression	45	33.3%
	No dementia or depression	43	31.9%
Body Mass Index (BMI)	< 19	31	23.0%
	19 - 21	28	20.7%
	21 - 23	43	31.9%
	> 23	33	24.4%
Takes more than 3 medications/day	No	25	18.5%
	Yes	110	81.5%
In comparison of other people of the same age, the patient considered his/her status	No as good	30	22.2%
	Doesn't know	27	20.0%
	As good	56	41.5%
	Better	22	16.3%
Age	> 85	12	8.9%
	80 - 85	12	8.9%
	< 80	111	82.2%
Geriatric 8 score Mean ± SD (min – max) / Median (IQR)		8.6 ± 3.3 (3-17)	8 (6-11)
Geriatric 8 score Grade	< 14 (frail)	123	91.1%
	>14 (non-Frail)	12	8.9%

Table 2. Distribution of postoperative complications in the studied elderly patients

		N	%
Length of hospital stay	1 - 3 day	40	29.6%
	4 - 1 week	41	30.4%
	more than 1 week	54	40.0%
Mortality	No	98	72.6%
	Yes	37	27.4%
Return to OR	No	84	62.2%
	Yes	51	37.8%
Thromboembolic events	No	103	76.9%
	Yes	31	23.1%
Hospital acquired infections	No	58	43.0%
	Yes	77	57.0%
Pressure Ulcers	No	80	59.3%
	Yes	55	40.7%

Table 3. Relation between the mean total G8 scores and grades in the studied population and the postoperative outcomes

Postoperative Outcomes	Mean G8 Score		P value	G8 Grade		P value	
	Yes	No		< 14 (frail)	>14 (non-Frail)		
Mortality	6.7	9.2	0.000	27.6%	25%	1.000	
Return to Operation Room	7.3	9.3	0.000	37.4%	41.7%	0.764	
Thromboembolic Events	7.2	8.9	0.008	24.6%	8.3%	0.294	
Hospital Acquired Infections	7.9	9.4	0.012	56.9%	58.3%	0.924	
Pressure Ulcers	7.1	9.5	0.000	39.8%	50%	0.547	
Length of Hospital Stay	1-3 days	4 days-1week	More than 1 week	0.000	40.7%	33.3%	0.692
	10.1	9.2	7				



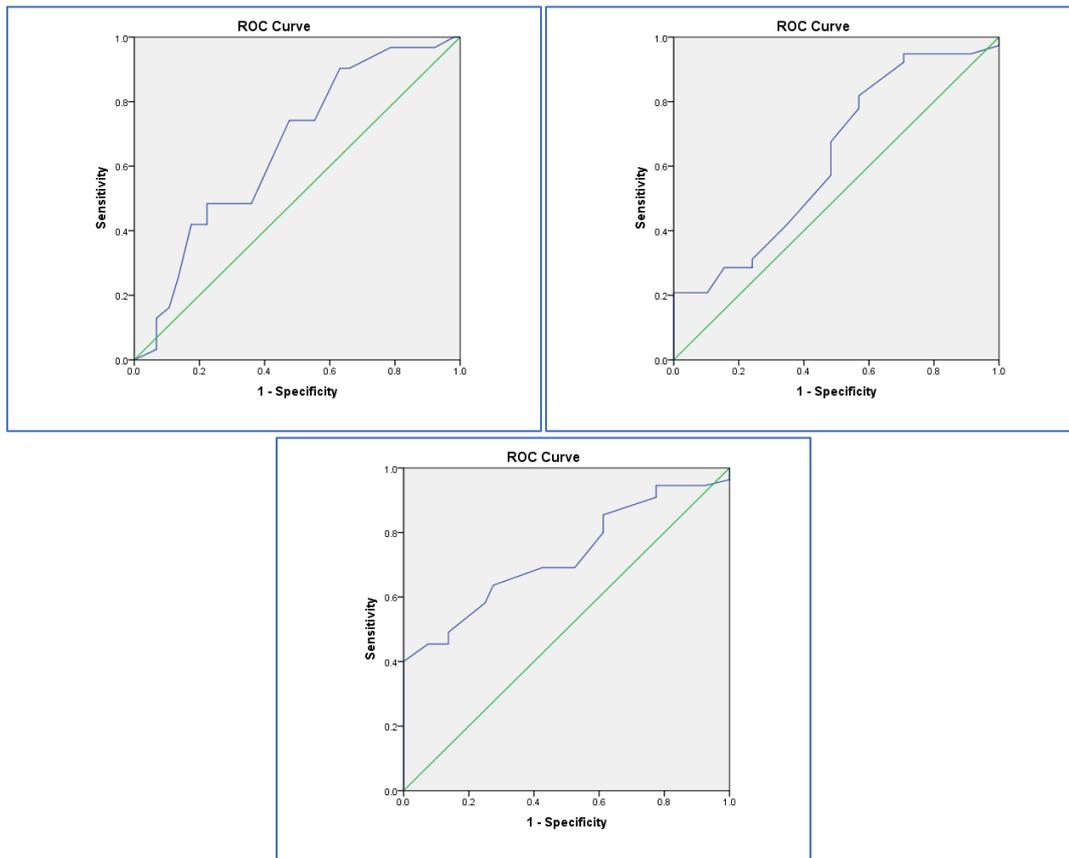


Figure (1). Receiver operating characteristics curve for Geriatric 8 score for prediction of Mortality, return to OR, thromboembolic events, hospital acquired infection and pressure ulcer.

Table 4. Area under the curve of G8 for prediction of mortality, Return to OR, thromboembolic events, hospital acquired infections and pressure ulcers

Area under the curve of G8 for prediction		P	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
Mortality	0.724	.000*	0.630	0.817
Return to OR	0.688	0.000*	0.598	0.779
Thromboembolic Events	0.658	0.008*	0.555	0.761
Hospital Acquired Infections	0.626	0.012*	0.530	0.722
Pressure Ulcers	0.727	0.000*	0.635	0.818

Table 5. Sensitivity and specificity of G8

G8 score (at cut-off point 7) for predicting mortality			
Sensitivity	Specificity	Predictive value of positive	Predictive value of negative
64.9%	71.4%	46.2%	84.3%

DISCUSSION

Most non-frail elderly patients are not regarded as vulnerable and are usually fit for surgery where they might respond to surgical stress as good as younger patients, but frail patients, however, are at an increased risk of unfavorable postoperative complications [18]. The routine measures for identification of frailty is by evaluating older patients' general condition and risk of negative outcomes using the evidence-based approach of comprehensive geriatric assessment (CGA). This occurs through various validated assessment tools for evaluation of nutrition, cognition, comorbidities, functional status and geriatric syndromes to detect vulnerable patients and lead their management and follow-up. [19]

However, performing an extensive CGA is unpractical in busy surgical settings, thus, the International Society of Geriatric Oncology (SIOG) recommends a strategy beginning with the use of a short easy-to-administer screening tool to detect frail elderly patients requiring of additional assessment by CGA. One of these screening tools is the Geriatric 8 (G8), which is seven-item questionnaire developed from the Mini Nutritional Assessment (MNA) and in addition to age (<80, 80–85, or >85 years). Total score ranging from 0 to 17, with a score below 14 indicating designating a geriatric risk profile. [20]

Studying the validity and sensitivity of the G8 questionnaire in elderly patients as a preoperative frailty assessment tool is becoming an important and promising area of research as it may become a good alternative for the long detailed CGA.

Over time, the G8 score has been studied in various declinations and clinical fields, demonstrating how its use has proven useful and statistically significant [21]. Several studies have been conducted in the surgical setting too, demonstrating the versatility and functionality of the G8 screening tool [22]. Moreover, performing the G8 as a geriatric screening tool has shown remarkable outcome prediction in surgical oncogeriatric patients as regards hospital stay length, incidence of

delirium postoperatively and rates of 1-year mortality [23].

We noticed that the percentage of female patients presents quarter of our study population, we assume that this low number is explained by that the most prevalent cancer in females is breast cancer, for which a national campaign is being implemented now with the purpose of early diagnosis and screening, so most patients now are diagnosed early on life before the age of 60 and most of those diagnosed are usually referred to specialized breast cancer centers other than our hospitals for treatment.

The main finding in our study was that the G8 score can predict postoperative complications which is the practical point of new preoperative assessment for elderly patients. These findings showed that the G8 is an acceptable screening tool due to the high sensitivity and negative predictive value (NPV) while maintaining sufficient specificity. [Table 4]

We considered sensitivity and NPV to be the most important characteristics of this screening tool because we wish to ensure that almost every frail patient is identified with our screening. This agreed with the results of *Lertseree et al., (2022)* which had the objective of identifying the sensitivity of preoperative Geriatric 8 (G8) score for postoperative outcomes prediction in head and neck older cancer patients. They found that the G8 score is a strong predictor of postoperative outcomes. [24]

In the current study, 91% of the patients had impaired G8 score of less than 14 (*Table 1*). *Penning et al. (2022)* who evaluated the association between G8 and CGA, and the risk of 90-day postoperative complications risk in oncogeriatric patients, reported that 67.9% of the patients were identified by an impaired G8 as being at risk for frailty. We also found that the frailty cutoff score of 14 did not have any statistically significant relation with the postoperative outcomes in our studied elderly patients, (*Table 3*) while *Penning et al.* Found a significant difference

in postoperative outcomes between patients with a $G8 \leq 14$ and patients with a $G8 > 14$. However, they identified an association between impaired G8 screening and the development of at least one complication, which is consistent with our results as we found a statistically significant association between an impaired G8 score (varying from 6.7 to 7.3) and all postoperative outcomes. [Tables 2]

A prospective trial by *Bruijnen et al. (2020)* was performed with the objective of validating G8 as a tool for screening elderly patients diagnosed with solid neoplasia who are candidates for surgical treatment, in order to detect those who require additional CGA. The CGA and G8 were performed before the surgery. The data collected included thirty-days postoperative complications, length of hospital stay postoperatively, unplanned readmission rates, incidence of discharges to a rehabilitation centre, as well as the 1-year mortality. They concluded that G8 is a useful screening tool as elderly patients with impairments in their G8 had a higher chance of developing adverse postoperative complications.^[13] These results were similar to the current study as regards mortality and length of hospital stay. [Table 2] However, we did not evaluate patients' future need for unplanned readmissions or further institutionalization which are important postoperative outcomes to be considered as well. Whereas significant immediate postoperative complications that could possibly occur to the patients during their hospital stay such as hospital acquired infections, thromboembolic events, return to OR and development of pressure ulcers were not investigated in their study unlike ours which identified impaired G8 score is a strong predictor of all of them postoperatively.

[Table 3]

Bruijnen et al. (2020) identified that 54.5% had an impaired G8 score and were classified

as being at risk for frailty. Their results show that a threshold of \geq two abnormal instruments in the CGA. For the G8, a sensitivity, specificity, and NPV of 82%, 63%, and 85%, respectively. In the current study, sensitivity of the G8 score was 64.9% with 71.4% specificity and 84.3% negative predictive value. [Table 4] The additional objective of *Bruijnen et al.* study was to identify if the patients with a $G8 \geq 14$ and the patients with a $G8 < 14$ experienced different postoperative outcomes. The occurrence of major 30- days complications (defined as Clavien-Dindo grade \geq III) was bot different between both groups which is similar to our results as well, that the score of more than 14 did not accurately predict that the patient is not at risk of developing adverse postoperative outcomes, but a score of around 7 will do. [13]

CONCLUSION

In the current study, the G8 questionnaire has proven to be a specific, accurate and easily used assessment tool to predict postoperative complications and prognosis in elderly patients at cutoff score of 7 as regards mortality, return to operation room, hospital acquired infections, length of hospital stay and pressure ulcers.

RECOMMENDATIONS

We recommend the use of the G8 questionnaire by surgeons as a preoperative assessment tool and for those patients who score 7 or less, to consider alternative management plan to avoid the occurrence of adverse postoperative outcomes.

STATEMENTS AND DECLARATIONS

Consent for Publication: I confirm that all authors accept the manuscript for submission

Availability of data and material: Available

Competing interests: None Funding: No fund

Conflicts of Interest: The authors declare no conflicts of interest regarding the publication of this paper.

REFERENCES

1. **Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F.** Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2021 May;71(3):209-49.
2. **Latest global cancer data: Cancer burden rises to 19.3 million new cases and 10.0 million cancer deaths in 2020 – IARC (no date).** Available at: <https://www.iarc.who.int/news-events/latest-global-cancer-data-cancer-burden-rises-to-19-3-million-new-cases-and-10-0-million-cancer-deaths-in-2020/?fbclid=IwAR0Zt9gfoxO6AZ0UEe5-Gt1GmF4YubXQvDJptxN8UtEiBQpDTQ9O6Dbeck> (Accessed: 22 November 2021).
3. **Crome P, Lally F, Cherubini A, et al.** Exclusion of older people from clinical trials: Professional views from nine European countries participating in the PREDICT study. *Drugs Aging*. 2011;28:667–677.
4. **Wildiers H, Heeren P, Puts M, Topinkova E, Janssen-Heijnen ML, Extermann M, Falandry C, Artz A, Brain E, Colloca G, Flamaing J, Karnakis T, Kenis C, Audisio RA, Mohile S, Repetto L, Van Leeuwen B, Milisen K, Hurria A.** International Society of Geriatric Oncology consensus on geriatric assessment in older patients with cancer. *J Clin Oncol*. 2014 Aug 20;32(24):2595-603. doi: 10.1200/JCO.2013.54.8347
5. **Giordano SH, Hortobagyi GN, Kau SW, et al.** Breast cancer treatment guidelines in older women. *J Clin Oncol*. 2005;23:783–791.
6. **Kim S, Brooks AK, Groban L.** Preoperative assessment of the older surgical patient: honing in on geriatric syndromes. *Clin Interv Aging*. 2014 Dec 16;10:13-27. doi: 10.2147/CIA.S75285.
7. **Kinoshita M, Morioka N, Yabuuchi M, et al.** New surgical scoring system to predict postoperative mortality. *J Anesth*. 2017; 31, 198–205. <https://doi.org/10.1007/s00540-016-2290-2>
8. **Dworsky JQ, Russell MM.** Surgical Decision Making for Older Adults. *JAMA*. 2019 Feb 19;321(7):716. doi: 10.1001/jama.2019.0283.
9. **PACE participants, Audisio RA, Pope D, Ramesh HS, Gennari R, van Leeuwen BL, West C, Corsini G, Maffezzini M, Hoekstra HJ, Mobarak D, Bozzetti F, Colledan M, Wildiers H, Stotter A, Capewell A, Marshall E.** Shall we operate? Preoperative assessment in elderly cancer patients (PACE) can help. A SIOG surgical task force prospective study. *Crit Rev Oncol Hematol*. 2008 Feb;65(2):156-63. doi: 10.1016/j.critrevonc.2007.11.001.
10. **Kenis C, Bron D, Libert Y, Decoster L, Van Puyvelde K, Scalliet P, Cornette P, Pepersack T, Luce S, Langenaeken C, Rasschaert M, Allepaerts S, Van Rijswijk R, Milisen K, Flamaing J, Lobelle JP, Wildiers H.** Relevance of a systematic geriatric screening and assessment in older patients with cancer: results of a prospective multicentric study. *Ann Oncol*. 2013 May;24(5):1306-12. doi: 10.1093/annonc/mds619.
11. **Extermann M, Meyer J, McGinnis M, Crocker TT, Corcoran MB, Yoder J, Haley WE, Chen H, Boulware D, Balducci L.** A comprehensive geriatric intervention detects multiple problems in older breast cancer patients. *Crit Rev Oncol Hematol*. 2004 Jan;49(1):69-75. doi: 10.1016/s1040-8428(03)00099-4.
12. **Deschodt M, Wellens NIH, Braes T, et al.** Prediction of functional decline in older hospitalized patients: a comparative multicenter study of three screening tools. *Aging Clin Exp Res* 23, 421–426 (2011). <https://doi.org/10.1007/BF03325237>
13. **Bruijnen CP, Heijmer A, van Harten-Krouwel DG, van den Bos F, de Bree R, Witteveen PO, Emmelot-Vonk MH.** Validation of the G8 screening tool in older patients with cancer considered for surgical treatment. *Journal of Geriatric Oncology*. 2021; 12(5):793-8. doi: 10.1016/J.JGO.2020.10.017.
14. **Martinez-Tapia C, Paillaud E, Liuu E, Tournigand C, Ibrahim R, Fossey-Diaz V, Culine S, Canoui-Poitrine F, Audureau E, Caillet P, Laurent M.** Prognostic value of the G8 and modified-G8 screening tools for multidimensional health problems in older patients with cancer. *European journal of cancer*. 2017; 83:211-9.. doi: 10.1016/J.EJCA.2017.06.027.
15. **Subramaniam, S., Aalberg, J. J., Soriano, R. P., & Divino, C. M. (2018).** New 5-Factor Modified Frailty Index Using American

- College of Surgeons NSQIP Data. *Journal of the American College of Surgeons*, 226(2), 173–181.e8.
<https://doi.org/10.1016/j.jamcollsurg.2017.11.005>
16. **Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW.** *Studies of Illness in the Aged: The Index of ADL: A Standardized Measure of Biological and Psychosocial Function.* *JAMA*. 1963;185(12):914–919.
[doi:10.1001/jama.1963.03060120024016](https://doi.org/10.1001/jama.1963.03060120024016)
 17. **Bellera CA, Rainfray M, Mathoulin-Pélissier S, Mertens C, Delva F, Fonck M, Soubeyran PL.** Screening older cancer patients: first evaluation of the G-8 geriatric screening tool. *Annals of Oncology*. 2012; 23(8):2166-72.
 18. **Huisman MG, Kok M, de Bock GH, van Leeuwen BL.** Delivering tailored surgery to older cancer patients: Preoperative geriatric assessment domains and screening tools—A systematic review of systematic reviews. *Eur J Surg Oncol*. 2017; 43:1–14.
 19. **Fagard K, Casaer J, Wolthuis A, Flamaing J, Milisen K, Lobelle JP, et al.** Value of geriatric screening and assessment in predicting postoperative complications in patients older than 70 years undergoing surgery for colorectal cancer. *J Geriatr Oncol*. 2017; 8:320–327.
 20. **Kaibori M, Ishizaki M, Matsui K, Iida H, Inoue K, Nagashima F, et al.** Geriatric assessment as a predictor of postoperative complications in elderly patients with hepatocellular carcinoma. *Langenbecks Arch Surg*. 2016; 401:205–214.
 21. **Agemi Y, Shimokawa T, Sasaki J, Miyazaki K, Misumi Y, Sato A, Aida S, Ishii M, Nakamura Y, Naoki K, Okamoto H.** Prospective evaluation of the G8 screening tool for prognostication of survival in elderly patients with lung cancer: a single-institution study. *PLoS One*. 2019; 14(1):e0210499.
 22. **Scheepers ER, van der Molen LF, van den Bos F, Burgmans JP, van Huis-Tanja LH, Hamaker ME.** The G8 frailty screening tool and the decision-making process in older breast cancer patients. *European Journal of Cancer Care*. 2021; 30(1):e13357.
 23. **Bruijnen CP, Heijmer A, van Harten-Krouwel DG, van den Bos F, de Bree R, Witteveen PO, Emmelot-Vonk MH.** Validation of the G8 screening tool in older patients with cancer considered for surgical treatment. *Journal of Geriatric Oncology*. 2021; 12(5):793-8.
 24. **Lertseree S.** Geriatrics 8 scores as a predictor of postoperative outcome in elderly patients with Head and Neck cancer in Rajavithi Supertertiary Care Hospital. *medRxiv*. 2022 Jan 1.
 25. **Penning Y, El Asmar A, Moreau M, Raspé J, Dal Lago L, Pepersack T, Donckier V, Liberale G.** Evaluation of the Comprehensive Geriatric Assessment (CGA) tool as a predictor of postoperative complications following major oncological abdominal surgery in geriatric patients. *PLoS One*. 2022 Mar 3;17(3):e0264790.