



Considering self-reported baseline function and cognition in predicting post-operative complications among older adults

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Background: Older adults experience high rates of postoperative complications and poorer outcomes. Current perioperative risk assessments lack specific measures and are too time-consuming for busy surgeons.

Methods: Using data from the Health and Retirement Study Survey linked with Medicare data, we performed a cross-sectional study, evaluating all adults ≥ 65 years old who underwent high-risk elective surgery between 1992–2012. Primary exposure variables included self-reported preoperative functional and cognitive abilities using activities of daily living (ADLs), instrumental activities of daily living (IADLs), and a 27-point self-administered test of memory and mental processing. Primary outcome was the development of a serious postoperative complication within 30-days following index operation.

Results: Overall, 42% (n=501) developed at least one serious postoperative complication. Patients with moderate (aOR 1.52, 95% CI: 1.14–2.04) and severe (aOR 1.55, 95% CI: 1.00–2.46) baseline functional limitations were at higher risk of serious postoperative complications compared to those with no functional limitation. Cognitive impairment was not associated with serious postoperative complications.

Conclusions: Self-reported functional measures may help to quickly identify patients at high-risk for surgical complications and better inform pre-operative discussions including earlier initiation of palliative care services.

Keywords: Geriatric surgery; pre-surgical assessment; complications; palliative care

Submitted Mar 25, 2020. Accepted for publication Apr 22, 2020.

doi: 10.21037/apm-20-816

View this article at: <http://dx.doi.org/10.21037/apm-20-816>

Introduction

Older adults experience disproportionately higher rates of postoperative complications and poorer outcomes than their younger counterparts (1,2). Despite efforts to promote optimal care for older patients, current perioperative risk assessments lack meaningful and specific measures, and have been cited as too time-consuming for busy surgeons (3). As such, our objective was to evaluate the association of self-reported preoperative functional and cognitive abilities with complications among older adults undergoing high-

risk surgery. Such knowledge may better inform surgical decision-making and allow for earlier introductions to palliative care among this vulnerable patient population.

Methods

Using data from the Health and Retirement Study Survey linked to Centers for Medicare and Medicaid Services Part-A and B claims, we evaluated all adults ≥ 65 years old who underwent high-risk elective surgery ($\geq 1\%$ inpatient mortality) between 1992–2012 (4). Primary exposure

Table 1 Demographic data for patient's ages 65 and older who underwent high-risk surgery

Characteristics	Total cohort, N=1,197	No complication, N=696	Complication [¶] , N=501	P value
Age, mean [SD]	74.97 [6.3]	74.6 [6.3]	75 [6.4]	0.26
Male, N [%]	545 [46]	333 [48]	212 [42]	0.06
Race, N [%]				0.86
White	1,061 [89]	614 [88]	447 [89]	
Black	109 [9]	66 [9]	43 [9]	
Other	27 [2]	16 [2]	11 [2]	
Elixhauser comorbidity score, mean [SD]	0.48 [1.1]	0.46 [1.1]	0.52 [1.2]	0.36
Surgery type, N [%] [†]				<0.001
Cardiothoracic	543 [45]	269 [37]	274 [55]	
Intra-abdominal	421 [35]	280 [38]	141 [28]	
Peripheral vascular	168 [14]	105 [15]	63 [13]	
Neurological, ENT, other	65 [6]	42 [6]	23 [5]	
Functional limitation [‡]				0.006
None	825 [69]	505 [72]	320 [64]	
Mild-moderate	271 [23]	139 [20]	132 [26]	
Severe	101 [8]	52 [7]	49 [10]	
Cognitive impairment [§]				0.264
None	867 [72]	516 [74]	351 [70]	
Mild	257 [21]	142 [20]	115 [23]	
Moderate-severe	73 [6]	39 [5]	35 [7]	

[†], high risk-surgery was defined as any operation with inpatient mortality greater than 1% (4). [‡], functional limitation determined by total number of ADL/IADL deficits (walking, dressing, bathing, eating, getting out of bed, and toileting) and IADLs (preparing a hot meal, shopping for groceries, making telephone calls, taking medicines, and managing money); 0= no limitations; 1–3= mild to moderate; ≥ 4 = severe. [§], cognitive impairment determined by a 35-point self-administered test; ≥ 11 = normal; 7–11= mild cognitive impairment; 0–6= severe; for patients who were unable to be interviewed, proxies were interviewed using a validated survey instrument (5). [¶], serious-postoperative complications and percent [%] of patients with each complication; deep vein thrombosis (n=41; 3.4%), gastrointestinal bleed (n=60; 5.0%), hemorrhage (n=41; 3.4%), myocardial infarction (n=148; 12.4%), pneumonia (n=77; 6.4%), pulmonary failure (n=188; 15.7%), renal failure (n=65; 5.4%), and surgical site infection (n=53; 4.4%). Percent of patients with complication adds up to more than 41% because some patients had multiple complications (8). SD, standard deviation; ENT, otolaryngology.

variables included self-reported preoperative functional and cognitive abilities. Baseline functional status was determined by the number of activities of daily living (ADLs) and instrumental activities of daily living (IADLs) requiring assistance (0= none, 1–3= mild-moderate, ≥ 4 = severe functional limitations) (5). Baseline cognitive status was determined by a 27-point scale encompassing memory, serial-7 subtractions, naming and orientation (≥ 11 = normal, 7–10= mild, 0–6= moderate-severe cognitive impairment) (5). Secondary exposure variables included

specific ADL and IADL deficiencies. The primary outcome was development of a serious postoperative complication within 30-days following index operation identified by ICD-9 codes (*Table 1*, footnote).

Student's *t*-test was used to compare means and chi-square test was performed for categorical variables. Multivariable logistic regression was used to analyze outcomes with the following covariates: age, gender, comorbidity score, surgery type, functional status, cognitive status, and year of surgery (*Table 1*). Statistical significance

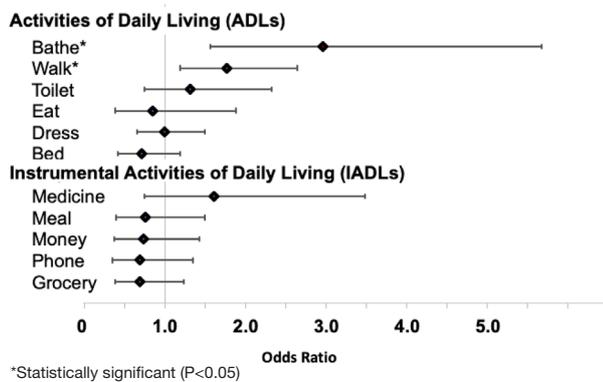


Figure 1 Adjusted[†] odds of serious postoperative complications based on activities of daily living (ADLs) and instrumental activities of daily living (IADLs). [†], adjusting for demographics and clinical variables including age, race, gender, Elixhauser comorbidity index, surgery type, and year of surgery.

was set at $P < 0.05$ with two-sided tests. All analyses were performed with SAS version 9.4. This study was deemed exempt by the Michigan Medicine Institutional Review Board.

Results

Of 1,197 older adults who underwent high-risk surgery, 46% ($n=545$) were male with a mean age of 74.7 years (SD 6.3) (Table 1). Overall, 42% ($n=501$) developed ≥ 1 serious postoperative complication. Among primary exposure variables, moderate (aOR 1.52, 95% CI: 1.14–2.04) and severe (aOR 1.55, 95% CI: 1.00–2.46) functional limitations were independently associated with serious postoperative complications compared to no functional limitation (Table 1). Cognitive impairment was not associated with serious postoperative complications. Among secondary exposure variables, the inability to bathe (aOR 3.01, 95% CI: 1.59–5.71) or walk (aOR 1.79, 95% CI: 1.21–2.63) were independently associated with increased odds of developing serious postoperative complications (Figure 1).

Discussion

Greater baseline functional deficits are an independent predictor of serious postoperative complications among older adults undergoing high-risk elective operations. Specifically, those who demonstrate the inability to bathe or walk are at higher risk of developing complications even

when adjusting for demographic and clinical factors. These simple metrics are easy to assess in busy clinical settings and may help to improve surgical decision-making and manage expectations with patients and families. Self-reported measures may also be used to rapidly identify patients who might benefit most from preoperative optimization including nutritional counseling and prehabilitation measures. Finally, as surgical patients often underutilize palliative care services, this may represent an important opportunity to introduce palliative care approaches to surgical patients whose illness trajectories may not be predictable in the immediate postoperative setting but likely demonstrate decline over the long-term (6,7).

This study was limited by reliance on self-reported measures, which may lead to subjectivity, recall bias, and selection bias. Furthermore, given the data is from 1992 to 2012, it is unknown if complication rates would differ given recent advances in technology and improved surgical technique. However, our findings are drawn from a nationally representative cohort, which allows for generalizability of our results, as well as outcomes that are meaningful to patients. Importantly, our findings suggest that a brief, patient-centered approach is feasible to determine preoperative risk where quick decisions frequently have lasting consequences.

Acknowledgments

The authors wish to thank the American College of Surgeons for funding of this project.

Funding: This work is supported by the American College of Surgeons Thomas R. Russell Faculty Research Fellowship.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at <http://dx.doi.org/10.21037/apm-20-816>

Data Sharing Statement: Available at <http://dx.doi.org/10.21037/apm-20-816>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/apm-20-816>). PAS serves as an unpaid editorial board member of *Annals of Palliative Medicine* from May 2019 to Apr 2021. PAS reports grants from American College of Surgeons Thomas R. Russell Faculty Research

Fellowship, from null, outside the submitted work. The other authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This study was deemed exempt by the Michigan Medicine Institutional Review Board.

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References

1. Min L, Hall K, Finlayson E, et al. Estimating risk of postsurgical general and geriatric complications using the VESPA preoperative tool. *JAMA Surg* 2017;152:1126-33.
2. Oresanya LB, Lyons WL, Finlayson E. Preoperative assessment of the older patient: a narrative review. *JAMA* 2014;311:2110-20.
3. Kim SW, Han HS, Jung HW, et al. Multidimensional frailty score for the prediction of postoperative mortality risk. *JAMA Surg* 2014;149:633-40.
4. Schwarze ML, Barnato AE, Rathouz PJ, et al. Development of a list of high-risk operations for patients 65 years and older. *JAMA Surg* 2015;150:325-31.
5. Langa KM, Larson EB, Karlawish JH, et al. Trends in the prevalence and mortality of cognitive impairment in the United States: is there evidence of a compression of cognitive morbidity? *Alzheimers Dement* 2008;4:134-44.
6. Olmsted CL, Johnson AM, Kaboli P, et al. Use of palliative care and hospice among surgical and medical specialties in the Veterans Health Administration. *JAMA Surg* 2014;149:1169-75.
7. Rodriguez R, Marr L, Rajput A, et al. Utilization of palliative care consultation service by surgical services. *Ann Palliat Med* 2015;4:194-9.
8. Weingart SN, Iezzoni LI, Davis RB, et al. Use of administrative data to find substandard care: validation of the complications screening program. *Med Care* 2000;38:796-806.

Cite this article as: Shnayder MM, Montgomery JR, Abrahamse P, Suwanabol PA. Considering self-reported baseline function and cognition in predicting post-operative complications among older adults. *Ann Palliat Med* 2020;9(4):1847-1850. doi: 10.21037/apm-20-816