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Perioperative Optimization of Senior Health (POSH): A Descriptive Analysis of Cancelled Surgery

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Abstract

Background—Geriatric collaborative care models improve postoperative outcomes for older adults. However, there are limited data exploring how preoperative geriatric assessment may affect surgical cancellations.

Methods—This is a single-center retrospective cohort analysis. Patients enrolled in the Perioperative Optimization of Senior Health (POSH) program from 2011 to 2016 were included. POSH is a collaborative care model between geriatrics, surgery, and anesthesiology. Baseline demographic and medical data were collected during the POSH pre-op appointment. Patients who attended a POSH pre-op visit but did not have surgery were identified, and a chart review was performed to identify reasons for surgical cancellation. Baseline characteristics of patients who did and did not undergo surgery were compared.

Results—Of 449 eligible POSH referrals within the study period, 33 (7.3%) did not proceed to surgery; cancellation rates within the POSH program were lower than institutional cancellation rates for adults over age 65 who did not participate in POSH. Patients who did not have surgery were significantly older, more likely to have functional limitations, and had higher rates of several comorbidities compared with those who proceeded to surgery ($P < 0.05$). Reasons for surgical cancellations included a similar number of patient- and provider-driven causes.

Conclusions—Many reasons for surgical cancellation were related to potentially modifiable factors, such as changes in goals of care or concerns about rehabilitation, emphasizing the importance of shared decision-making in elective surgery for older adults. These results highlight the important role geriatric collaborative care can offer to older adults with complex needs.

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Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval We have received an institutional IRB exemption for this work (Duke Health Institutional Review Board—#Pro00046310—exempt research).

Introduction

One-third of elective procedures are performed on older adults, and this proportion will increase as the population ages [1, 2]. Surgeries performed on adults over age 65 have higher rates of complications and mortality than those performed on younger patients [3]. Geriatric co-management models have been shown to improve postoperative outcomes of older patients, including fewer complications, reduced length of stay, and improved postoperative functional status [4–6].

The Perioperative Optimization of Senior Health (POSH) program is a unique collaborative model between geriatrics, surgery, and anesthesiology, developed as a quality improvement initiative at Duke University Hospital, Durham, NC [5]. Preoperatively, patients undergo a multidisciplinary assessment for traditional perioperative risk factors, as well as a comprehensive geriatric assessment (CGA) to address and optimize geriatric-specific risk factors. Patients' goals for surgery and expectations of recovery are explored. These goals and expectations are discussed in detail and reconciled with realistic estimates of risks and benefits of the upcoming procedure. Risk of serious complications and mortality, as calculated from the American College of Surgery National Surgical Quality Improvement Program (ACS-NSQIP) risk calculator, are shared with patients during this visit [7].

Patients undergoing surgery may have deficits in understanding risks of and alternatives to surgery [8]. Older adults may be particularly vulnerable to misconceptions, given high rates of sensory and cognitive impairments. The CGA component of the POSH visit is an opportunity to discuss details about the upcoming procedure and attendant risks, provide information about treatment alternatives, and address misconceptions to allow for shared medical-decision making. Despite the emergence and success of geriatric-surgical co-management programs such as POSH, we are not aware of any published literature that describes how these programs affect the decision to proceed with planned surgery. This paper describes patients enrolled in POSH who completed a preoperative POSH assessment but ultimately cancelled their surgery. Our aims are to identify the reasons for surgical cancellation and to observe if patients who completed surgery are different from those who did not.

Methods

Design, setting, and participants

This is a retrospective cohort study at a single academic institution. Patients who were evaluated in the POSH program from its inception in 2011 through 2016 were included in this study. The POSH program has been described in detail elsewhere [5]. Briefly, patients planning elective surgery are referred to POSH at the discretion of their surgeon. Criteria for referral include anyone aged 85 or older, as well as patients age 65–85 who meet at least one qualifying criterion: preexisting diagnosis of cognitive impairment or dementia, poor nutritional status (defined as >10 lb unintentional weight loss and/or body mass index <23), visual impairment, multimorbidity (presence of >2 chronic medical conditions), or polypharmacy (>5 prescription medications). The POSH service description and planned

analyses were reviewed by the Duke Health Internal Review Board and determined to be exempt as a quality improvement project.

Measures

Patient demographic data, social history, functional status, and past medical history were collected. We evaluated functional status via the modified Katz Activities of Daily Living (ADL) and Lawton-Brody Instrumental Activities of Daily Living (IADL) scales and later transitioned to the Older Adults Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire [9–11]. Cognition was assessed with various tools over time, consistent with shifting best practice recommendations. Within the 5-year study period, the methods for determining cognition at POSH visits included the Sweet 16, Mini-Mental Status Exam (MMSE), or St. Louis University Mental Status Exam (SLUMS). Patients were determined to be cognitively intact if they scored within a normal range on any of these examinations, and cognitively impaired if they scored below the cutoff for normal performance [12–14]. In the rare instance that patients did not undergo cognitive testing, the presence of cognitive impairment was assessed by reviewing the past medical history at the time of the POSH visit.

Patients who attended a POSH preoperative assessment but did not have surgery were identified, and a manual chart review was performed to identify the reason for surgical cancellation. Two authors (KZ, SW) performed the chart review, and in instances of disagreement, a third author refereed and made the final determination of cause. Reasons for surgical cancellation were broadly classified into categories chosen a priori based on prior work, including provider-driven, patient-driven, logistical (e.g., patient moving, loss to follow-up), or complications at time of anesthesia induction [15]. Cancellations that were considered provider-driven may have been initiated by geriatric, anesthesiology, or surgical providers. If cancellation occurred after the POSH visit, all subsequent notes from POSH and surgical providers were reviewed to identify the reason for cancellation. Within provider-driven and patient-driven cancellations, reasons for cancellation were reviewed and thematically grouped, using a reflexive approach to cluster similar reasons for cancellation. We also captured the number of surgical cancellations of non-POSH patients aged ≥ 65 years old within our institution from the general and neurosurgical services during the study dates of the interest. This information was tracked by the operating room scheduler at the time of cancellation and entered into an administrative database.

Statistical analysis

We conducted bivariate analyses between patients who did and did not undergo surgery using a χ^2 test or Fischer's exact test as appropriate based on count data or categorical variables, and we used the parametric *t* test (if normally distributed) or the nonparametric Wilcoxon rank-sum test (if not normally distributed) for continuous variables. Interrater agreement for cause of surgical cancellation was determined by Cohen's kappa. All analyses were conducted using R Studio version 3.5.1 (RStudio Inc, Boston, MA).

Results

Participants

There were 449 eligible POSH referrals within the study period of interest. Four patients cancelled surgery but rescheduled within the next 12 months; these patients were excluded from analysis. Table 1 compares the baseline characteristics of patients who did and did not have surgery. Patients who did not have surgery were significantly older, more likely to have functional limitations (defined as dependency in 1 ADL), and had higher rates of several comorbidities, compared with those who proceeded to surgery.

Cancellations

Thirty-three (7.3%) of the 449 POSH referral patients did not proceed to surgery. Twenty-four (72.7%) had surgery scheduled at the time of POSH referral, and the remaining 9 patients had not yet scheduled surgery at the time of their POSH appointment. Of the 24 patients for whom surgery was scheduled, the surgical procedure was cancelled on average 6.3 days prior to scheduled surgical date (median 4.5, range 0–17 days). Four surgeries (0.9%) were cancelled on the day of scheduled surgery. At our institution during the representative study period, general surgery total cancellation rates and same day cancellation rates for patients over 65 were 16.9% and 6.2%, respectively. Total and same day cancellation rates for neurosurgery were 13.6% and 3.2%.

Table 2 summarizes reasons for surgical cancellations. One patient was lost to follow-up, and 2 patients had complications at the time of anesthesia induction. For all other patients, cancellations were evenly split between patient- and provider-driven reasons. Agreement between investigators in assigning a reason for cancellation was excellent ($\kappa = 0.90$).

Review of patient- and provider-driven cancellations revealed several themes. Eleven patients were deemed too high risk due to uncontrolled comorbid disease or unrelated acute illness. Seven patients responded to conservative management of the condition which had prompted surgical consultation. Five patients changed their goals of care, preferring to avoid invasive procedures, and two patients were concerned about their ability to tolerate postoperative rehabilitation. Three patients were found to have metastatic disease on staging workup, one patient elected to pursue “natural remedies” for their disease, and one patient cancelled surgery without providing a reason.

Discussion

The American College of Surgeons Geriatric Surgery Verification Program outlines new surgical standards to systematically improve surgical outcomes for older adults, including an emphasis on “improving communications with patients...to focus on outcomes that matter most to the patient” [16]. However, there is a paucity of literature examining how geriatric co-management programs influence surgical decision-making and surgical cancellation.

Patients who cancelled surgery were older, had a greater burden of comorbidities, and were more likely to be functionally impaired. Data also suggested a trend toward higher number of medications and higher likelihood of cognitive impairment, although these variables did

not reach statistical significance (Table 1). There is limited literature exploring the association of patient characteristics with surgical cancellation. A 10-year retrospective study of surgical cancellations at a single hospital in Korea found advanced age was associated with increased likelihood of cancellation, although age was not associated with higher rates of same-day cancellations in a Singapore academic medical center [17, 18]. Both studies found an increased likelihood of cancellation for patients with multiple comorbidities.

This study revealed an equal distribution of provider- and patient-driven factors associated with cancellation of surgery. Some cancellations were due to changes in the patient's underlying medical condition for which surgery was being performed or decline in their health status related to comorbid disease. However, many cancellations could be attributed to potentially modifiable risk factors that influenced the patients' or providers' perception of risks, benefits, and appropriateness of surgery. For instance, patients altered their goals of care, responded to conservative management, or expressed concerns about their ability to tolerate rehabilitation.

There are important financial implications for healthcare systems in reducing cancellations, particularly same-day cancellations. Within the first 5 years of the program, only 7.3% of surgeries with POSH consultation were cancelled, and the same-day cancellation rate was 0.9% within the POSH cohort. These cancellation rates are significantly lower than those of non-POSH patients aged 65 and up at our institution during a similar time period. Our institution did not systematically capture data on reasons for cancellation through 2013, so we cannot compare reasons for cancellation within the POSH and non-POSH cohorts. There is limited literature describing reasons for surgical cancellations. A review by Al Talalwah et al. found that the majority of elective surgical cancellations were preventable [19]. Although administrative issues, such as unavailable operating rooms, equipment, hospital beds, or personnel, accounted for a majority of cancellations, a significant portion of surgical cancellations could be attributed to patient or provider-specific factors. Up to a quarter of cancellations were attributed to patient non-compliance with preoperative instruction, absenteeism, lack of appropriate power of attorney, or patient refusal of surgery, while 17.5% of cancellations were due to inadequately controlled comorbidities. This review suggests that programs such as POSH may help limit preventable cancellations by proactively identifying and addressing potential risks.

Studies have shown gaps in patients' understanding of risks of and alternatives to surgery, emphasizing the importance of shared decision-making, particularly for older adults with complex care needs [8, 20]. At the time of the initial surgical appointment, many patients and family members are still trying to understand the ramifications of their new diagnosis and plans for surgery, and they may not ask questions that can help them make an informed decision. The POSH clinic visit is designed to provide time to educate and counsel patients on alternate treatment options, delirium risk, expectations for rehabilitation, and other geriatric-specific issues, while time may be limited in more traditional preoperative assessments [21]. Additionally, the CGA component of the POSH visit creates an opportunity to identify and address medical and psychosocial issues that may be missed during traditional preoperative assessments, such as screening for cognitive impairment,

mood disorders, and malnutrition, management of high-risk psychoactive medications, and in-depth functional assessments [22, 23]. These enhanced discussions in the POSH setting, after the original surgical appointment, allow for patients, family members, and providers to explore the nuances of perioperative care, taking into account the patient's values, preferences, and psychosocial situation, and allow for shared decision-making.

We recognize that geriatric co-evaluation is not feasible in many practice areas. There is momentum toward a more patient-centered approach to deciding to pursue elective surgery in general, and CGA is just one avenue toward this goal [24]. In the absence of such a program, primary care doctors, surgeons with geriatric training, or other multidisciplinary medical team members, such as nurses or social workers, may be able to address these concerns, ideally at a dedicated appointment occurring between the initial surgical referral and surgery itself. Support for shared decision-making via society guidelines and geriatric-focused risk stratification tools like the Question Prompt List (QPL) will be important directions of growth in this area [8]. By finding ways to prioritize, incentivize, and make space for person-centered decision-making, the healthcare system can evolve to support shared decision-making discussions.

This study has important limitations. It is a single-center study at an academic center, and our patient population was highly educated, which may limit generalizability. We did not capture racial or socioeconomic data in this study. Reasons for surgical cancellation were ascertained from chart review without direct communication to either patients or providers. Limitations in institutional data collection, particularly during the first half of the study period, did not allow us to compare characteristics of the POSH cohort to non-POSH older adults who underwent surgery within a similar time period. Additionally, follow-up evaluation about quality of life and satisfaction with the decision to cancel surgery was not determined, and would be useful to help guide future processes in identifying which patients benefit most from programs like POSH. An important area of future research would be qualitative research exploring the experiences of patients who undergo geriatric co-management programs, as well as participating providers, to understand how programs like POSH are received.

In summary, this study demonstrated a 7.3% cancellation rate for patients referred for a preoperative CGA via the POSH program, which was lower than institutional cancellation rates for non-POSH patients. Patients who cancelled surgery were older, had a higher burden of comorbidities, and more likely to be functionally impaired than those who did not. Reasons for surgical cancellations were evenly split between patient- and provider-driven reasons. Many reasons for surgical cancellation were related to modifiable factors, such as changes in goals of care, response to conservative management, or concerns about rehabilitation, emphasizing the important role shared decision-making plays in elective surgery for older adults. Although this is a small study, we believe these results highlight the important role geriatric co-management can offer to the most complex older adults, to ensure medical decision making aligns with both patient and provider values.

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Table 1

Comparing baseline characteristics of patients who did and did not proceed to surgery. All data collected at time of initial POSH consult appointment. Student's *t* test used to compare continuous variables (age, number of medications, and ACB score). Chi-squared test or Fischer's exact test used to compare dichotomous variables.

	Surgery N = 416	No surgery N = 33	P
Age (Mean, SD)	76.2 (7.1)	79.1 (7.7)	0.02*
Males	195 (46.9)	18 (54.5)	0.40
Some college (or higher) level of education	240 (57.7)	20 (60.6)	0.74
Smoker: current or prior	219 (52.6)	21 (63.6)	0.22
Alcohol use (any amount)	154 (37.0)	13 (39.4)	0.79
BMI			0.57
<18.5	10 (2.4)	2 (6.1)	
18.5–24.9	139 (33.4)	13 (39.4)	
25.0–29.9	140 (33.7)	11 (33.3)	
>30	126 (30.3)	7 (21.2)	
Total # medications (Mean, SD)	11.4 (6.2)	13.5 (6.7)	0.05
Anticholinergic Burden Score (Mean, SD)	1.3 (2.1)	1.8 (2.1)	0.20
Benzodiazepine use	72 (17.3)	5 (15.2)	0.75
Deficiency in 1 + ADL	66 (15.9)	10 (30.3)	0.03*
Deficiency in 1 + IADL	198 (47.6)	21 (63.6)	0.08
Cognitive impairment present	231 (55.5)	24 (72.7)	0.06
Referring surgical service			0.01*
Neurosurgery	100 (24.0)	5 (15.2)	
Orthopedics	1 (0)	0 (0)	
Colorectal	139 (33.4)	9 (27.3)	
Hepatopancreaticobiliary	18 (4.3)	2 (6.1)	
General	124 (29.8)	8 (24.2)	
Vascular	5 (1.2)	1 (3.0)	
Cardiac	3 (0.7)	2 (6.1)	
Urology	20 (4.8)	5 (12.2)	
Oncology	3 (0.7)	0 (0)	

	Surgery N = 416	No surgery N = 33	P
Endocrine	3 (0.7)	0 (0)	
Combined	0 (0)	1 (3.0)	
Sensory impairment			0.64
Hearing impairment	12 (36.4)	150 (36.1)	
Vision impairment	19 (57.6)	285 (68.5)	
Comorbidities			0.02*
Depression	12 (36.4)	121 (29.1)	
Anxiety	9 (27.3)	102 (24.5)	
Diabetes	9 (27.3)	111 (26.7)	
Hypertension	26 (78.8)	294 (70.7)	
CAD	12 (36.4)	108 (26.0)	
CHF	10 (30.3)	50 (12.0)	
Afib	8 (24.2)	61 (14.7)	
H/o VTE	2 (6.1)	44 (10.6)	
COPD	6 (18.2)	49 (11.8)	
Asthma	2 (6.1)	35 (8.4)	
OSA	1 (3.0)	56 (13.5)	
Parkinson's disease	3 (9.1)	6 (1.4)	
History of CVA	5 (15.2)	61 (14.7)	

* P value 0.05 considered significant and is denoted

A summary of reasons why elective surgeries were cancelled after POSH preoperative evaluation. Reasons for cancellation were broadly characterized into categories chosen a priori. Reasons for patient- and provider-driven cancellations were further thematically analyzed and grouped

Table 2

Reasons for cancellation	N (%)	Thematic reasons for patient- and provider-driven cancellations		
		Provider-driven (N)	Patient-driven (N)	Patient-driven (N)
Patient-driven	15 (45.5%)	2	3	3
Provider-driven	15 (45.5%)	0	2	2
Lost to follow-up	1 (3.0%)	2	5	5
Complications of anesthesia induction	2 (6.1%)	8	3	3
		3	0	0
		0	1	1
		0	1	1