# From Prehab to Rehab:
## Opportunities in Geriatric Perioperative Medicine

Internal Medicine Grand Rounds

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**This is to acknowledge that Tom Dalton, M.D. has disclosed that he does not have any financial interests or other relationships with commercial concerns related directly or indirectly to this program. Dr. Dalton will not be discussing off-label uses in his presentation.**

**Purpose & Overview:**

The population is aging. Advances in perioperative care and technology have made surgery a viable therapeutic option even in the extremes of age and health status, but surgery still carries significant short and long-term risks, especially for patients with poor functional status and multiple comorbidities. Internists play a big role in the care of the surgical patient, from the primary care physician who traditionally assesses risk and helps patients and surgeons decide whether surgery is appropriate to the hospitalist who co-manages patients in the postoperative period to the "SNFist" who manages their care in the skilled nursing facility following discharge. This talk will outline issues that are particularly important to the geriatric surgery patient and highlight opportunities for internists to be involved in improving the care this vulnerable population receives.

**Educational Objectives:**

*At the conclusion of this lecture, listeners should be able to:*

1. Articulate the challenges that an aging population poses to perioperative providers and the health system
2. Advocate for more meaningful quality metrics for older adults undergoing surgery
3. Recognize frailty as an important factor in quantifying perioperative risks and a potential opportunity for risk mitigation
4. Incorporate best practices for delirium prevention in the inpatient period
5. Appreciate emerging multidisciplinary interprofessional models of care seeking to improve the quality of care delivered to older surgical patients

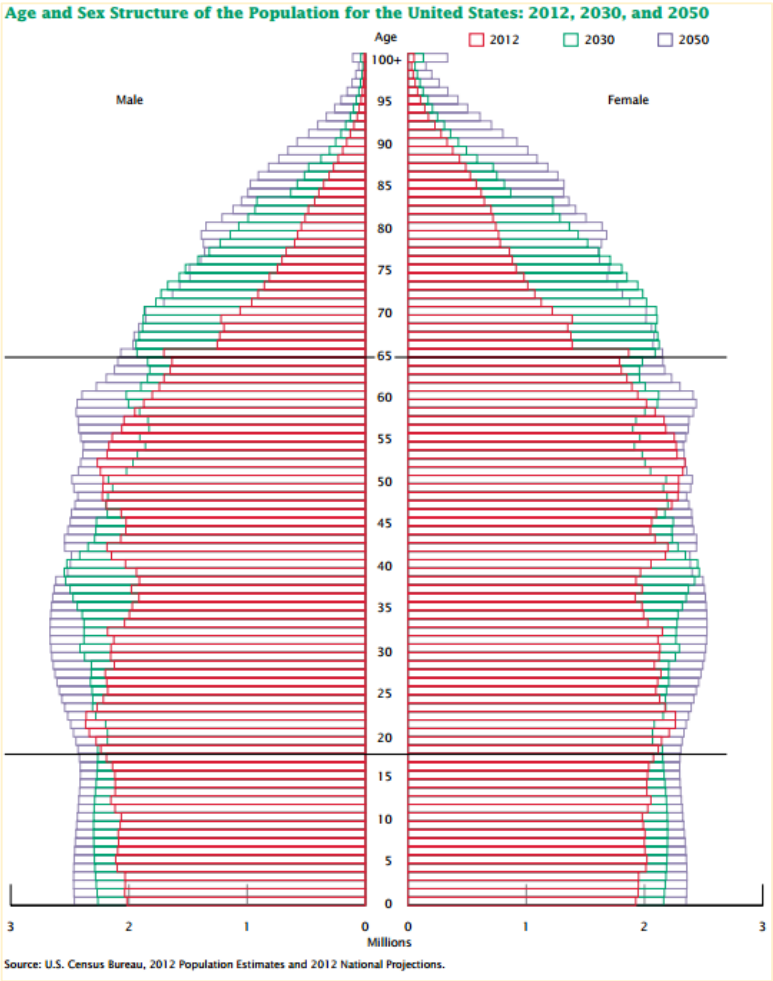
**Biosketch:**

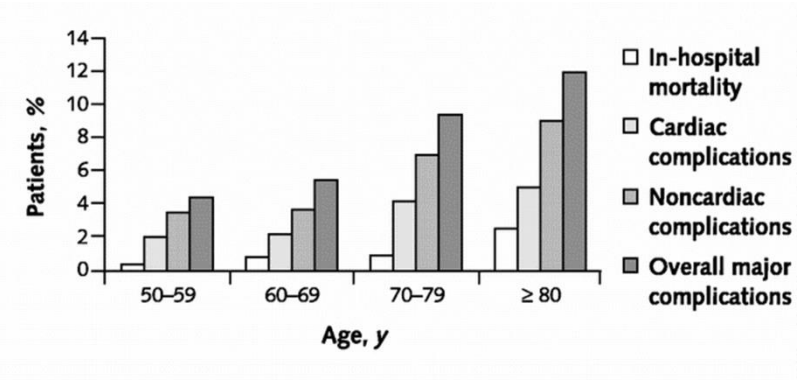
Dr. Thomas O. Dalton is an Assistant Professor of Medicine at UT Southwestern Medical Center in the Division of Geriatric Medicine. Dr. Dalton graduated from medical school at UT Southwestern in 2008 and stayed for his internal medicine residency training which he completed in 2011. He stayed for an additional year as a chief resident before going to Duke University Medical Center for fellowship. After completing a one year clinical fellowship, he stayed on at Duke to complete an advanced fellowship focused on medical education and acute care geriatrics. During his time at Duke, he helped build and study the Perioperative Optimization of Senior Health program. He joined the faculty at UT Southwestern in 2014. Dr. Dalton practices primary care at the Mildred Wyatt and Ivor P. Wold Center for Geriatric Care, and he is the director of the Eisenberg Acute Care for Elders service at Clements University Hospital where he regularly attends on the wards. Dr. Dalton has served as a mentor for the medical school's Colleges course since 2014, and in 2016, he became an Associate Program Director for the Internal Medicine Residency Training Program.

## Introduction and Demographic Challenges

The population in the United States is aging. Between 2010 and 2050, the number of individuals over the age of sixty-five is expected to more than double from 40.5 million to 89 million.[1] Improvements in the management of common medical conditions means that people are living longer, often with multiple chronic medical problems. The life expectancy of an 85 year-old woman is about 7.5 years currently, and this is expected to increase to 8.5 years by 2050. Between 2013 and 2025, there is projected to be a 15% or more growth in the prevalence of conditions such as hypertension, diabetes, history of stroke and arthritis, and these numbers are likely to increase even more as the baby boomer generation continues to age in the following decades.[2] Of the 51.4 million surgical procedures performed in 2010, 19.2 million (38%) were performed on people over the age of 65.[3] For some surgical specialties, like cardiovascular and thoracic surgery, patients over the age of 65 make up half or more of their cases.[4]

The risk of postoperative complications increases as patients age, and complications lead to longer lengths of stay, increased risk of long-term disability and increased health care costs.[5]






Surgical complications increase with age. Annals of Internal Medicine. 2001

Faced with threats to their function and cognition, older patients often emphasize quality of life and maintenance of independence over quantity of life, but the aging process is heterogeneous and health care professionals cannot assume patient's goals and preferences based on age, the presence of disease or disability. Traditional metrics of surgical quality focus on short-term outcomes such as 30-day mortality, 30-day readmissions, and surgical site infections. Recognizing that these metrics do not tell the story of quality for a multimorbid geriatric population, the American College of Surgeons (ACS) has recently taken efforts to develop more meaningful quality measures. In collaboration with the American Geriatrics Society (AGS), the ACS National Surgical Quality Improvement Program (NSQIP) released best practice guidelines in 2012 and 2016 on the preoperative assessment of and the perioperative management of the geriatric patient.[6,7] In 2014, the ACS NSQIP launched a Geriatric Surgery Pilot which will collect a set of novel geriatric-specific variables, endorsed by the National Quality Forum, focused on cognition, function, mobility and decision making.[8] Finally, recognizing the need for interdisciplinary collaboration in caring for the complex geriatric surgery population, the ACS partnered with the John A. Hartford Foundation to assemble the Coalition for Quality in Geriatric Surgery (CQGS).[9] Comprised of 58 stakeholders, the CQGS's goal is to establish an independent verifiable quality improvement program aimed at improving geriatric surgical care. The first phase of hospital standards for optimal surgical care of the older adult was recently published, and a pilot project is currently underway looking at the feasibility of implementing these standards.[10]

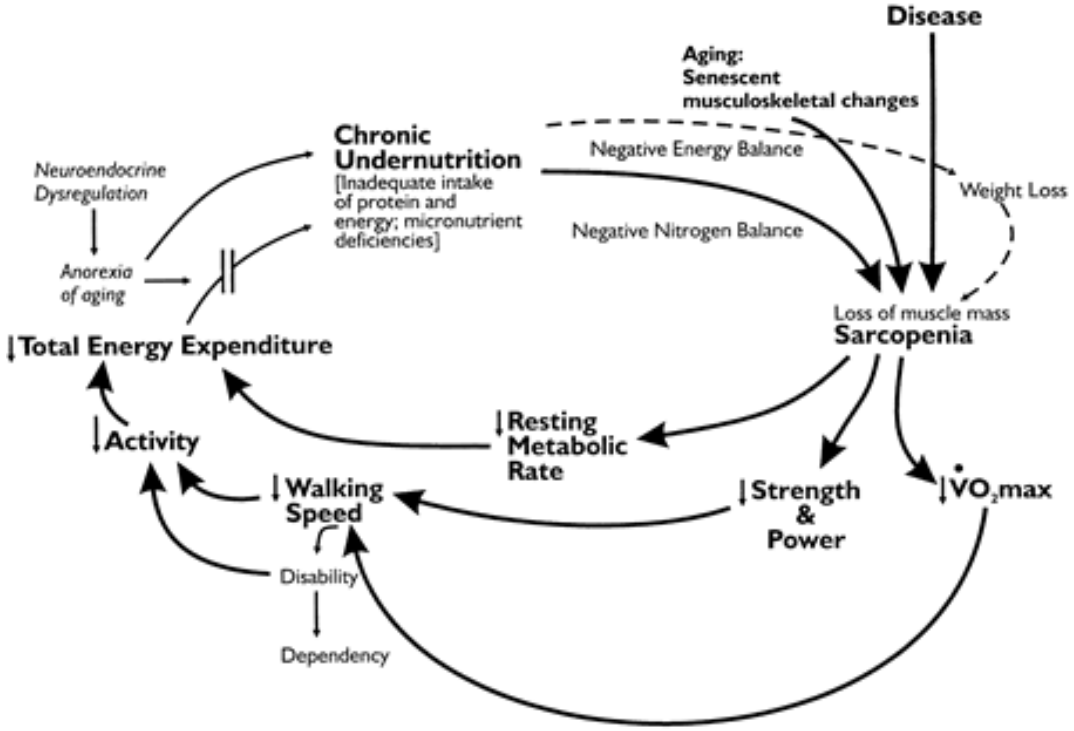
The perioperative period is complicated. Geriatric patients often interact with surgeons, anesthesiologists and internists in addition to a broad range of other health professionals as they prepare for, undergo and recover from surgery. Too often these professionals function in silos, communication is not timely and care feels disjointed; this can lead to confusion and frustration on the part of patients and their caregivers. There are several opportunities to improve the care we provide to this vulnerable patient population, and some will be discussed here.

## Assessing Surgical Risk

Traditional assessment of surgical risk has focused on single organ systems such as risk of an adverse perioperative cardiac event or risk of a postoperative pulmonary complication. The internist has long had the role of assessing the risks of surgery in order to determine if any preoperative testing or intervention is warranted prior to surgery.

*Frailty Background*

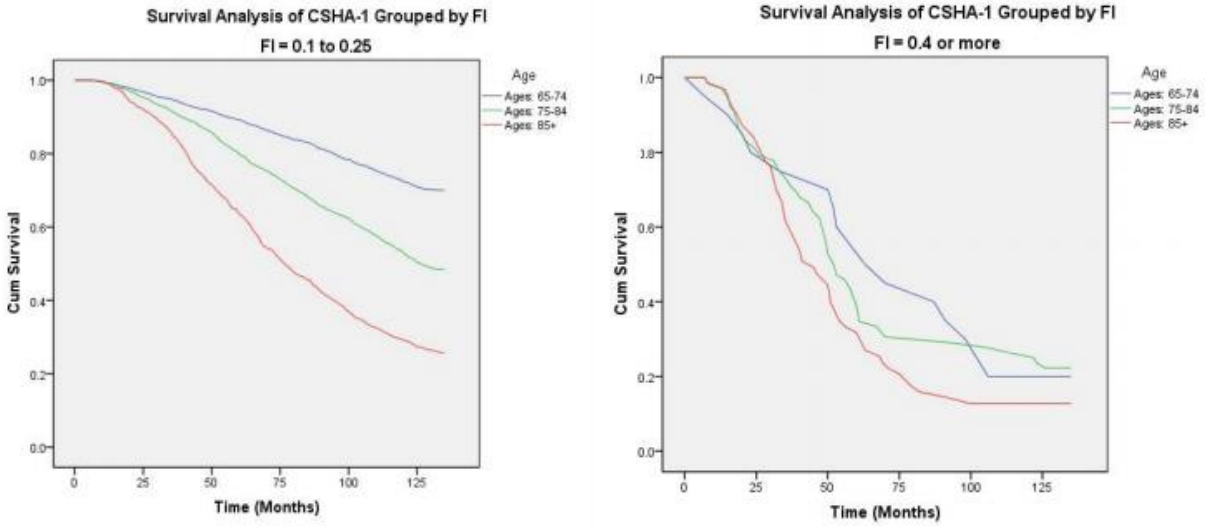
Frailty is a term that has a rich history in the geriatric medicine literature. It is widely accepted to be a state of increased vulnerability to poor resolution of homeostasis after a stressor event, which increases the risk of adverse outcomes.[11] There is no consensus as to what precisely causes frailty, but there are two competing constructs. Linda Fried and colleagues proposed the first standardized definition of frailty in 2001 through their work using data from over 5300 men and women over age 65 in the Cardiovascular Heart Study. Fried and colleagues proposed that frailty is a distinct clinical syndrome driven by biologic hallmarks of the aging process (e.g. mitochondrial dysfunction; cellular senescence; decreased levels of HGH, IGF-1, sex hormones; elevated levels of circulating inflammatory markers like IL-6 and TNF-alpha; changes in the nervous system; and genetic factors). These processes contribute along with disease to the unifying pathophysiologic impairment of sarcopenia and a pernicious cycle of frailty which manifests clinically as decreased strength, decreased walking speed, decreased activity, decreased energy expenditure, and a chronically malnourished state.[12]




*Fried's scientific explanation of the cycle of frailty*

By operationalizing a definition of frailty as the presence of 3 or more of 5 clinical measurements of the frailty cycle, Fried and colleagues demonstrated that frailty is predictive of falls, incident disability, worsening mobility, hospitalizations and death over 3 years; in addition, they demonstrated that frailty is a distinct and powerful risk factor independent from disability and comorbidity, conditions with which it had previously been treated as synonymous with.

The competing construct, developed by Rockwood et al., is frailty as an accumulation of deficits. The approach states simply, the more health deficits a person has, the greater their risk for an adverse outcome; and frailty is the result of an age-associated accumulation of health deficits.[13] This is operationalized by assessing individualized for a predefined broad list of potential deficits then dividing the number of deficits found by the number of potential deficits to formulate a frailty index. According to Rockwood and colleagues, the precise deficits that go into calculating a frailty index do not matter. As long as a sufficient number of potential deficits are considered (most studies include between 30 and over 100), the potential deficits are associated with health status (e.g. graying hair would not count), and prevalence of each deficit increases with increasing age.[14] The frailty index, when originally applied to the population of over 10,000 men and women over the age of 65 in the Canadian Study of Health and Aging, demonstrated strong predictive power for mortality. It has been subsequently applied to multiple populations of older adults being exposed to stresses and has been shown to be strongly predictive of adverse outcomes.

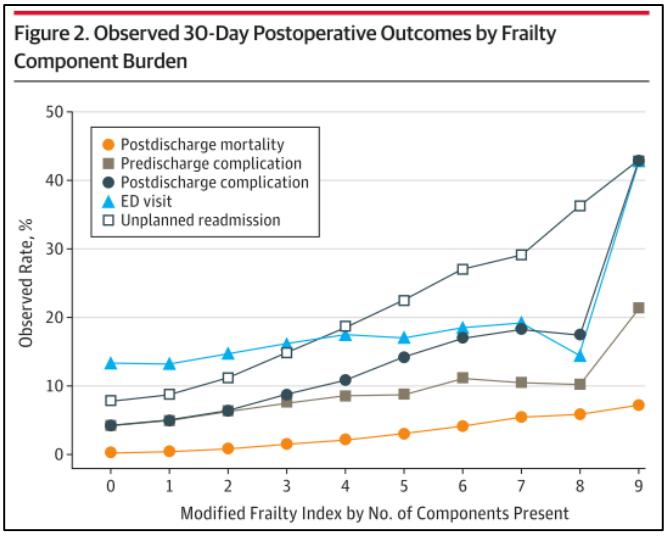



*The Rockwood Frailty Index is a strong predictor of mortality and other adverse outcomes*

*Frailty as a Predictor of Outcomes after Surgery*

Recent criticisms relating to the use of frailty in the preoperative risk assessment process have revolved not around its validity in predicting negative outcomes but in the time and administrative burden that would be involved in applying traditional frailty criteria to the broad geriatric surgery population. The Fried Frailty criteria requires the use of special equipment such as a dynamometer and the measurement of gait speed, for example, while the original Rockwood Index requires one to account for 70 potential health deficits. Several novel frailty models have been developed, primarily modified from the original deficit accumulation paradigm due to the perception that it is more clinically pragmatic, with the aim of integrating frailty into traditional preoperative risk assessment processes.

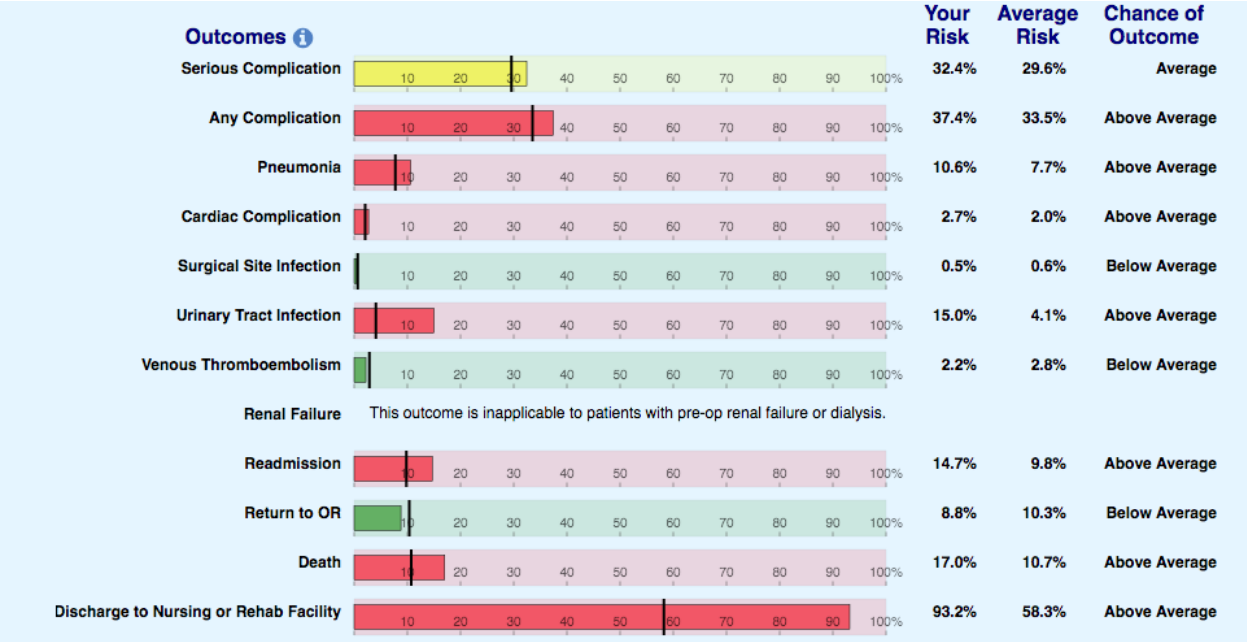
Robinson and colleagues at the University of Colorado developed a frailty score by prospectively evaluating 110 patients undergoing major general, thoracic, vascular and urologic surgery. Geriatric variables assessed preoperatively included cognition, weight loss, body mass index, albumin, falls in the 6 months preceding surgery, depression, hematocrit, Katz ADL index, and comorbidity as assessed by the Charlson index, ASA score and number of medications (polypharmacy). Univariate logistic regression was used to examine the impact of each variable on 6-month mortality.[15] Their analysis revealed six strong predictors of both 6-month mortality and post-discharge institutionalization. These were a Mini-Cog score <4, albumin <3.4, one or more fall in the previous 6 months, hematocrit <35, dependence in at least one ADL, and a Charlson comorbidity index of >2. Post-hoc clinical prediction modeling revealed that 4 or more of the 6 markers could predict 6-month mortality with a sensitivity of 81% and a specificity of 86%. Further work by this group has demonstrated that this frailty score predicts hospital and 6-month health care costs in patients undergoing elective colorectal surgery.[16] A similar approach was recently used by Farhat and colleagues. Using the 70 deficits in the initial Rockwood frailty study on the Canadian Study in Health and Aging cohort, they took the 11 deficits that are being collected as a part of the ACS National Surgery Quality Improvement Project (NSQIP) to create the modified frailty index (mFI). They then applied this index to over 35,000 patient who had undergone general surgery in the NSQIP database and found that it was a more powerful predictor of postoperative 30 day mortality and postoperative infection than ASA class, age or wound class.[17] This same index was applied to over 230,000 patients in the VASQIP database undergoing




Wahl T, et al. JAMA Surgery. Published online May 3,

orthopedic, vascular and general surgery and was found to be predictive of postoperative complications and 30-day readmissions among other undesired outcomes.[18]

At present, one of the most widely available and feasible methods of incorporating a frailty assessment into traditional preoperative visit is through the use of the ACS NSQIP Surgical Risk Calculator, which is publically available online - http://riskcalculator.facs.org/RiskCalculator/. This calculator estimates the chance of several unfavorable outcomes after surgery based on the proposed procedure, information from the patient's history, and a few objective measures. The estimates are calculated based on NSQIP population outcomes from patients with similar risk factors undergoing similar procedures.




Screenshot of ACS NSQIP Surgical Risk Calculator Result

## Informed Consent

Improving risk assessment by operationalizing frailty in the preoperative assessment will improve clinicians' ability to select appropriate surgical cases, but no matter how accurate the ability to predict outcomes becomes, the decision whether or not to pursue a surgical procedure ultimately resides primarily with the patient or their surrogate. In older multimorbid adults faced with elective surgery, shared decision making has become the expectation, but there are several challenges to attaining true shared decision making in this population.

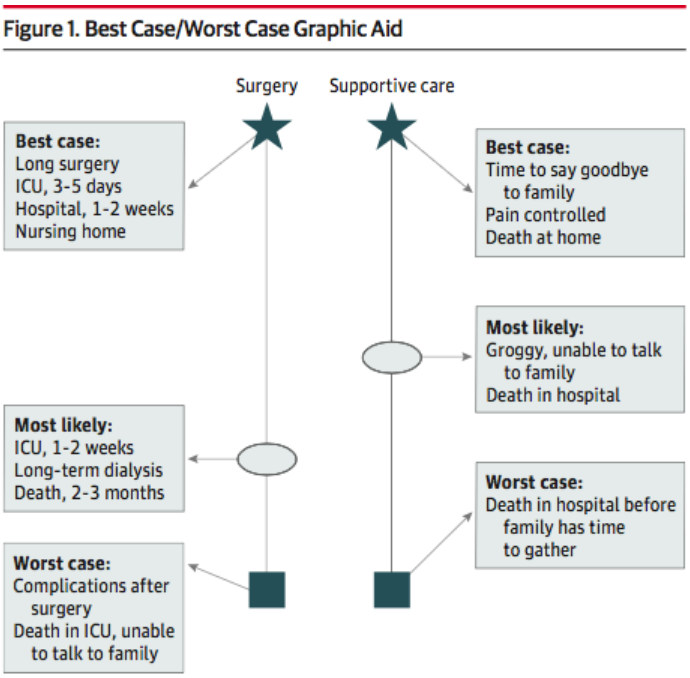
The importance of capacity cannot be overstated when it comes to high stakes decision making such as whether or not a frail older adult should undergo a high-risk surgery.

The capacity to consent for a procedure carries large ethical and legal consequences. In order to participate in the consent process, a patient must be able to clearly indicate his or her treatment choice; understand the relevant information communicated by the physician; acknowledge their medical condition, the treatment options, and the likely outcomes; and engage in a rational discussion about the treatment options.[19] Cognitive impairment is prevalent in older surgical patients. Despite its prevalence, surgeons and other health professionals often fail to recognize cognitive impairment in the perioperative process. Partridge and colleagues screened 114 patients 60 and older undergoing vascular surgery at a tertiary referral hospital. Cognitive impairment was defined as a Montreal Cognitive Assessment (MoCA) score of less than 24. Overall, 68% of patients were found to have cognitive impairment, and it was previously unrecognized in 88% of these patients.[20] Another study of 139 patients consecutively admitted to an orthopedics or general surgery ward in the UK assessed to what extent nursing staff, junior surgeons and senior surgeons were able to recognize cognitive impairment in their patients. Using the Abbreviated Mental Test (AMT), a 10-item screening test with a cutoff of <8 which correlate well with the presence of cognitive impairment, researchers demonstrated that all members of the team did a poor job of determining whether or not patients were cognitively impaired. Nursing staff mislabeled 17% of patients with a score of 0-7 as cognitively intact and 32% of patients with scores of 8-10 as impaired. Likewise, junior surgeons mislabeled 23% as intact and 29% as impaired while senior surgeons mislabeled 27% as intact and 22% as impaired. In fact, 12% of procedures performed on the study patients were performed on patients who scored <8 on the AMT using the consent form for patients who have the capacity to consent.[21] The presence of cognitive impairment does not preclude the capacity to give consent in all circumstances, but recognizing the presence of cognitive impairment ought to at least trigger perioperative health professionals to specifically assess decision-making capacity. Best practice guidelines recommend preoperative geriatric assessment include screening for cognitive impairment using a tool such as the Mini-Cog Test, and that patients be referred to a geriatrician or mental health specialist if cognitive impairment is suspected.[6]

Even when risk is well-understood and the patient has intact cognition and decision-making capacity, discussing surgical risk in such a way that activates patient participation in the decision-making process is a significant challenge. Older patients, in particular, are less likely to be actively engaged in asking questions of their physicians and making sure that their concerns are addressed.[22] Though traditional models of clinical decision-making suggest that patient preferences tend to be unique, with some desiring to participate heavily in the decision making process while others prefer to defer the decision to the physician, new models propose that most patients want to be involved in the decision-making process but often don’t feel empowered to do so.[23] Schwarze and colleagues have done excellent work in this arena. In a study published in 2016, they describe their work with a Patient and Family Advisory Council in which they developed a question prompt list (QPL) for patients aimed at improving their ability to effectively participate in shared decision making in the face of high-risk surgery. Over

the course of three years, they performed qualitative research, interviewing patients before (n=34) and after (n=27) surgery as well as surgeons (n=11) in depth about their surgical experience. Over another year, they developed and iteratively distilled 271 potential question down to a 12-question QPL prototype which they presented to a series of diverse community focus groups, including Spanish-speaking older adults as well as surgeon stakeholders, which led to further revisions. They then pilot-tested the QPL on patients presenting to a vascular surgery clinic. Both patients and surgeons found the tool to be useful and felt that it brought forth questions that otherwise would have gone un-asked. The researchers recently received funding from the Patient-Centered Outcomes Research Institute to test the effects of the QPL in its ability to improve high-stakes conversations involving decisions about potential surgery, support value-directed deliberation, set realistic postoperative expectations, and avoid conflict in the setting of unwanted outcomes in a randomized clinical trial.[24]

Shared decision making is a two-way street (at least). Even when patients want to be engaged, how health care professionals discuss potential risks and benefits of treatment can have a significant impact on patients' willingness and empowerment to make decisions that are best for them according to their values and specific goals. As specific risks become more quantifiable, physicians often feel that transparency is the most critical element of the informed consent process. However, listing potential complications such as 25% risk of urinary tract infection, 40% risk of discharge to a nursing facility, 15% risk of renal failure and the like does not do enough to encourage patients to appropriately deliberate potential futures. Building on a rich literature in shared decision making using scenario planning as a strategy, Schwarze and colleagues recently published the Best Case/Worst Case framework. This approach combines narrative description with a handwritten graphic aid to help better engage patients and their families. In this study, the researchers targeted patients 65 years and older who had an acute, non-emergent surgical problem to whom both surgical and non-surgical options would be offered. Participating surgeons attended a 2-hour training session where they learned about the framework and simulated its use on a standardized patient with 1-on-1 coaching from an expert in palliative medicine and education. 25 surgeons completed the training followed by an encounter with at least one patient enrolled in the study. Using a validated measure of shared decision making




Best Case/Worst Case. Aimed to help surgeons and perioperative providers assist patients in shared decision

that uses a 100 point scale, researchers found that median scores improved from 41 pre-intervention (interquartile range, 26-66) to 74 post-intervention (interquartile range, 60- 81). Qualitative analysis also suggested an improvement in shared decision making using this framework, especially in three domains – presentation of treatment options, description of treatments, and deliberation over alternatives.[25]

### Optimization and "Prehabilitation"

Once risk has been assessed and the decision to move forward with surgery has been made, there is a window of opportunity between the decision to proceed with surgery and the surgery itself. Depending on the urgency of the surgery this window can vary from minutes to months. For a large number of non-urgent surgeries, it is not unusual to have a two to four-week window of opportunity between the initial preoperative evaluation and the surgery. The extent to which risk factors can be modified during this window in order to optimize surgical outcomes is a topic of great interest to perioperative providers.

Best practice guidelines state that geriatric patients are at risk for substantially higher morbidity than younger patients even for non-major surgery and that thorough assessment for modifiable risk factors should be performed, and any positive findings should be acted upon if time permits.[6,26] If patients are found to have cognitive impairment or if they have significant inadequately treated visual or hearing impairment, it is recommended that they be referred to a geriatrician. Patients who use assistive devices such as hearing aids, glasses, and dentures should be reminded to bring these items to the hospital as lack of access to these items in the postoperative period increases the risk of delirium. Patients should be screened for substance abuse, and referred to a specialist for detoxification if possible. Patients who are found to have impairment in one or more activities of daily living (bathing, dressing, grooming, toileting, transferring, eating), a recent history of falls, difficulty rising from a seated position or a Timed up and go test more than 15 seconds should be referred to physical therapy prior to surgery and should obtain assistive devices, if necessary, prior to surgery. Elderly patients should be screened for

Table 4. Preoperative Assessment and Optimization in the Older Patient

| Domain | Assessment | Preoperative Optimization Strategies |
|---|---|---|
| Cognition | Mini-Cog Test[74]<br>3-Item recall<br>Clock draw<br>Identify risk factors for delirium[71]<br>Visual and hearing impairment<br>Alcohol abuse<br>Medications | Formal assessment by geriatrician for patient identified to have cognitive impairment on screening[75]<br>Remind patient to be bring all assistive devices (glasses, hearing aids) to hospital<br>Limit use of sedating psychotropic medications preoperatively[76] |
| Function | Evaluate ability to perform activities of daily living and instrumental activities of daily living<br>Obtain history of falls[75]<br>Timed up and go testof more than 15 seconds[77] | Refer patients with functional deficiencies or history of falls for formal evaluation by a physical therapist before surgery[78,79]<br>Obtain assistive devices<br>Plan for in-hospital and postdischarge rehabilitation therapy |
| Nutrition | Perform a Mini Nutritional Assessment[80]<br>Measure albumin and prealbumin levels | Patients at severe nutritional risk by Mini Nutritional Assessment should be referred to dietician for formal assessment[78,79]<br>Consider preoperative nutritional supplementation in patients at severe nutritional risk according to European Society for Parenteral and Enteral Nutrition guidelines[78,81] |
| Frailty | Assess for the following indicators of frailty[72,82]<br>Mini-Cog score of 3 or less<br>Albumin level of 3.3g/dL or less<br>More than 1 fall in the last 6 months<br>Hematocrit level of less than 35%Timed up and go test of more than 15 seconds<br>More than 3 comorbidities | Consider preoperative strength training[78,79]<br>Provide nutritional supplementation[78,79] |

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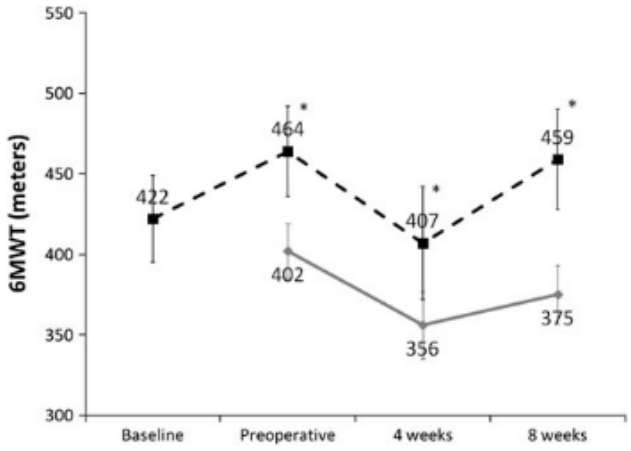
malnutrition using a validated assessment tool such as the Mini Nutritional Assessment, and an albumin or prealbumin level should be checked. If the patient exhibits evidence of malnutrition, they should be referred to a dietician for a comprehensive perioperative nutrition plan.

The emerging evidence on frailty and its impact on surgical outcomes has led many investigators to wonder to what extent programs aimed at improving functional capacity can help patients better withstand physiologic stress and improve postoperative outcomes. This process has been coined prehabilitation. In 2013, Li et al. published a prehabilitation trial in patients undergoing colorectal cancer resection. Researchers compared 42 patients who went through a month long prehabilitation program to 45 historic controls. The prehabilitation intervention consisted of a 1-hour visit with a physical therapist to develop an individualized exercise program including aerobic and resistance training; a 1-hour visit with a dietician to identify one or two modifiable dietary behaviors and instructions to eat 1.2g/kg body weight of a whey protein isolate daily that was provided to the patients in the preoperative period; and a 90-minute visit with a trained psychologist to provide anxiety-reduction techniques including a home compact disc for home practice. The intervention group demonstrated improvement in their functional exercise capacity as demonstrated by a 6-minute walk test as well as their self-reported physical activity at both 4 and 8-weeks after surgery. In a series of papers in 2016 and 2017, Minnella published updated data on the 5-year experience of this group using a trimodal prehabilitation program in anticipation of colorectal surgery. They showed sustained gains in functional capacity as measured by 6MWT prior to and after surgery, similar to their originally published data, and patients with poorer baseline function saw larger gains.[27,28]



Trajectory of change in 6MWT in prehab vs intervention group. Li et al. Surg Endoscopy 2013.

A narrative review currently in press in the American Journal of Surgery written by authors experienced in a prehabilitation program at the University of Michigan makes five salient points about the current state of pre-operative optimization of older adults. (1) The evidence for prehabiliation is minimal; but the potential to transform perioperative care is remarkable. (2) The time available for presurgical conditioning may be limited, and focus should be on protocols that yield the most gains in a short period of time. (3) A more nuanced and global approach to presurgical preparation that takes into account the emotional engagement of the patient may yield more meaningful outcomes. (4) Prehabiliation that encompasses an integrative model where patients are

supported to have a sense of control over their destiny during the challenge of surgery will optimize outcomes. (5) Clinical trials do not address the complexity of implementing prehabilitation programs; clinical outcomes such as decreased short-term morbidity will be difficult to prove, but if preoperative interventions are liked by patients and save money, they should be implemented.[29] These authors speak from the experience of having established prehabilitation programs in 20 hospitals serving over 1000 patients. Their program is discussed further below.

## The Postoperative Period

The American College of Surgeons and the American Geriatrics Society published a best practice guideline for optimal perioperative management of the geriatric surgery patient in 2016.[7] In it, the authors discuss considerations that need to be given to patient care in the immediate preoperative period, intraoperatively, and in the postoperative period. The authors discuss critical issues including protocols for preoperative fasting, anesthesia considerations, perioperative analgesia, and care transition among other important topics. While there is interesting ongoing research in each of these areas and opportunities to improve care abound, review of these topics is beyond the scope of this talk. The authors provide a postoperative rounding checklist that could serve as an excellent guideline to hospitalists who do co-management and other acute care specialists who are interested in creating programs in their own hospitals aimed at improving the postoperative care of geriatric surgery patients.

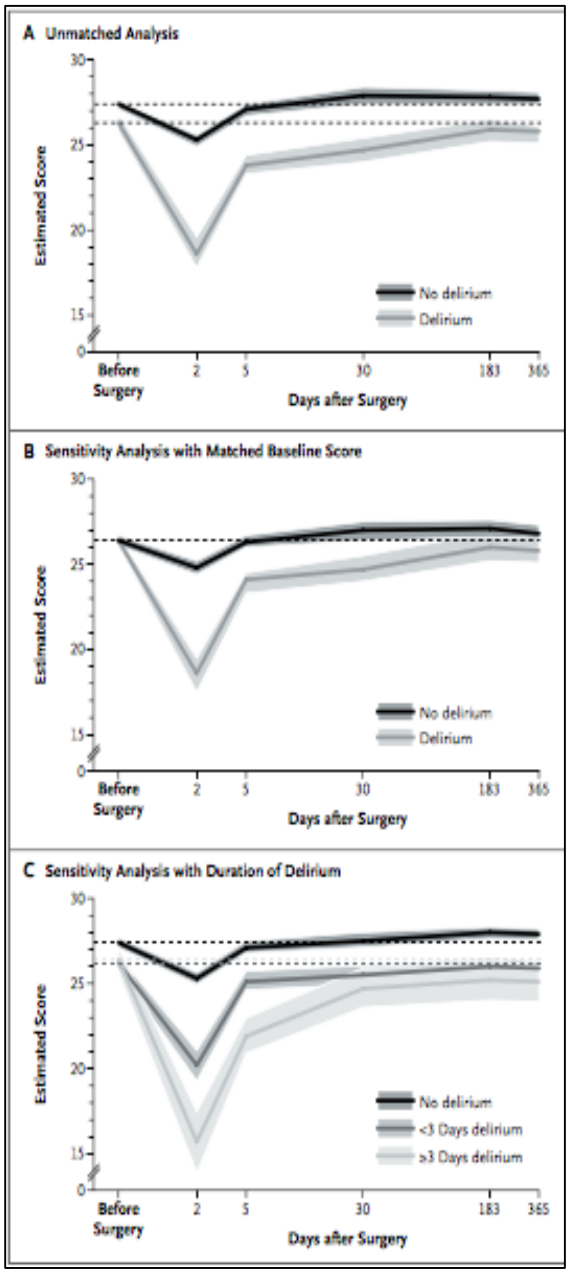
**Table 2.** Postoperative Rounding Checklist

| Daily evaluation | Prevention/management strategies |
|---|---|
| Delirium/cognitive impairment | Pain control.<br>Optimize physical environment (eg sleep hygiene, sleep protocol, minimize tethers, encourage family at bedside).<br>Vision and hearing aids accessible.<br>Remove catheters.<br>Monitor for substance withdrawal syndromes.<br>Minimize psychoactive medications.<br>Avoid potentially inappropriate medications (eg Beers' criteria medications). |
| Perioperative acute pain | Ongoing education regarding safe and effective use of institutional treatment options.<br>Directed pain history.<br>Multimodal, individualized pain control.<br>Vigilant dose titration. |
| Pulmonary complications | Chest physiotherapy and incentive spirometry.<br>Early mobilization/ambulation.<br>Aspiration precautions. |
| Fall risk | Universal fall precautions.<br>Vision and hearing aids accessible.<br>Scheduled toileting.<br>Appropriate treatment of delirium.<br>Early mobilization/ambulation.<br>Early physical/occupational therapy if indicated.<br>Assistive walking devices. |
| Ability to maintain adequate nutrition | Resume diet as early as feasible.<br>Dentures made available.<br>Supplementation if indicated. |
| Urinary tract infection prevention | Daily documentation of Foley catheter indication.<br>Catheter care bundles, hand hygiene, barrier precautions. |
| Functional decline | Care models and pathways.<br>Structural: uncluttered hallways, large clocks, and calendars.<br>Multidisciplinary rounds.<br>Early mobilization and/or physical therapy/occupational therapy.<br>Family participation.<br>Nutritional support.<br>Minimize patient tethers. |
| Pressure ulcers | Reduce/minimize pressure, friction, humidity, shear force.<br>Maintain adequate nutrition.<br>Wound care. |

Postoperative checklist. Best Practice Guideline from ACS NSQIP and AGS. 2016

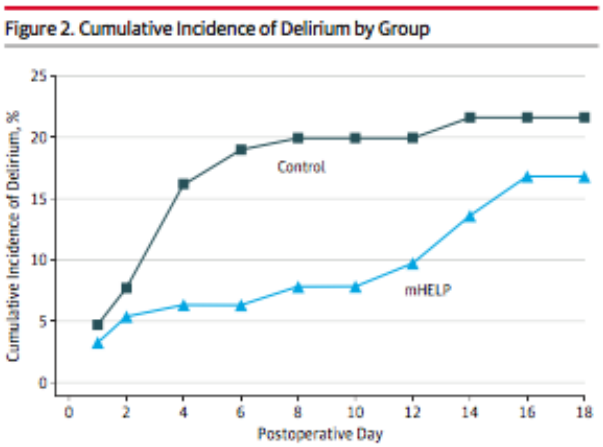
## Delirium

Delirium is characterized by an acute decline in cognitive function and attention, with evidence from the history that this is due to physiologic derangement, a medication or multifactorial.[30] Delirium is widely considered the most prevalent age-related postoperative complication in older adults, and when it occurs, it can have a significant impact on an older adult's trajectory in the postoperative period. Robinson and colleagues studied 144 patients over age 50 who underwent major abdominal, thoracic or vascular surgery. The overall incidence of postoperative delirium was 44%. The average time to onset after surgery was 2.1 days and the average duration of delirium was 4 days. Preoperative predictors of delirium were older age, hypoalbuminemia, impaired functional status, and the presence of multiple comorbidities; but the strongest predictor was the presence of pre-existing dementia. Patients who developed delirium had longer hospital stays, were more likely to be discharged to a nursing facility and were more likely to die in the 6 months following surgery.[31]




Postoperative trajectories in cognitive performance after cardiac surgery in patients who develop delirium vs those that don't.

Delirium is also associated with postoperative cognitive dysfunction. Saczynski et al. examined 225 adults over age 60 undergoing cardiac surgery and trended their performance on the Mini Mental Status Exam (MMSE) prior to surgery and at various intervals after surgery up to one year.[32] 44% of patients developed postoperative delirium, and their preoperative MMSE scores were, on average, lower than those who did not develop delirium (25.8 vs 26.9, P >0.001). Patients who developed delirium had more cognitive impairment in the immediate postoperative period than those who did not develop delirium, and the change from baseline persisted to at least 30 days postop. At 6 months postop, 40% of those who developed delirium had not returned to their preoperative cognitive state vs 24% of patients who did not develop delirium.



Delirium incidence, mHELP. JAMA Surgery, 2017.

Delirium is preventable. In a 2016 Cochrane Review, Siddiqi and colleagues state that multicomponent interventions reduce delirium rates in both medical and surgical inpatient population by about 33%.[33] There is no evidence to support the use of cholinesterase inhibitors, antipsychotics or melatonin products for prevention of delirium. The American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults published a best practice statement in 2014 that addresses multicomponent interventions for the prevention of postoperative delirium. See the table below for a list of behavioral and nonpharmacologic strategies for prevention of delirium.[30] These experts stress the importance of routine screening for delirium using a validated screening tool. Because delirium onset is usually rapid and often subtle, they also highlight the importance of frontline staff education on how to recognize delirium and how to implement prevention strategies for all patients who are at high risk. Chen and colleagues recently published the results of a delirium prevention program for patients 65 and older undergoing elective abdominal surgery.[34] The program is a modified version of the Hospital Elder Life Program (mHELP) and consists of 3 core nursing protocols: orienting communication, oral and nutritional assistance, and early mobilization. Using a cluster randomized design, they enrolled 377 patients (197 mHELP and 180 control). Postoperative delirium occurred in 6% of mHELP patients and 15% of controls (relative risk 0.44. 95% CI, 0.23-0.83; P=0.008).

If postoperative delirium does occur, a medical assessment should be performed to look for any possible precipitating factors. In the postoperative setting, precipitating factors could include infection, volume depletion, inadequate pain control, medications, hypoxia, and environmental factors among others. Postoperative complications such as myocardial infarction and pulmonary embolus can present initially as delirium in multimorbid older adults. Medications are not recommended in the routine treatment of postoperative delirium. If the patient represents a potential harm to themselves or others, antipsychotics are recommended as first-line treatment. They should be used at the smallest effective does for the shortest possible duration.

**Table 9.** Behavioral and Nonpharmacologic Strategies for Prevention of Delirium

1. Sensory enhancement (ensuring glasses, hearing aids, or listening amplifiers)
2. Mobility enhancement (ambulating at least twice per day if possible)
3. Cognitive orientation and therapeutic activities (tailored to the individual)
4. Pain control with scheduled acetaminophen if appropriate
5. Cognitive stimulation (if possible, tailored to the individual's interests and mental status)
6. Simple communication standards and approaches to prevent the escalation of behaviors
7. Nutritional and fluid repletion enhancement
8. Sleep enhancement (daytime sleep hygiene, relaxation, non-pharmacologic sleep protocol, and nighttime routine)
9. Medication review and appropriate medication management
10. Daily rounding by an interdisciplinary team to reinforce the interventions

Strategies should usually include these core elements but this list is not all inclusive.[5,14]

J Am Coll Surg. 2015 Feb;220(2):136-48

## Innovative Models of Care

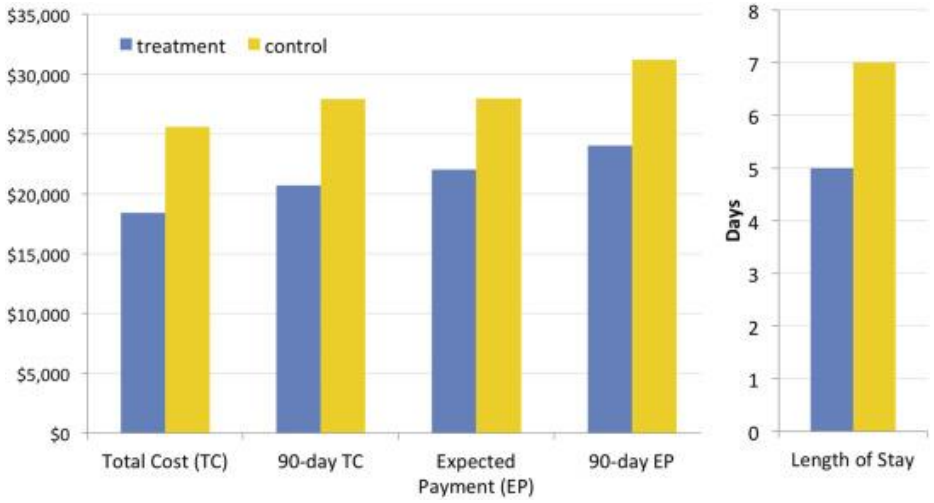
Some groups are taking advantage of the emerging evidence regarding optimal care of the geriatric surgery patient in light of shifting payment paradigms including care bundles and Next Generation ACO models to rethink the way they provide services to this population more broadly. There is a call to develop integrated care delivery models that break down traditional silos between surgery, nursing, anesthesia, geriatrics, rehabilitation and social work, among other disciplines.[35]

*POPS – Proactive care of Older People undergoing Surgery*

The POPS program consists of a comprehensive geriatric assessment and optimization in an outpatient clinic setting. The assessment is delivered by a multidisciplinary team consisting of a geriatrician, clinical nurse specialist, social worker, and occupational therapist. The assessment and intervention is documented in an individualized patient care plan in the electronic health record which is available to all healthcare providers and includes advice regarding the prevention and management of anticipated postoperative complications. In a recently published randomized trial of 176 patients undergoing elective vascular surgery at a single site, patients who participated in the POPS program had a shorter length of stay in the hospital (5.53 vs 3.32 days), a lower incidence of delirium (11% vs 24%), fewer cardiac complications (8% vs 27%), fewer bladder/bowel complications (33% vs 55%); and patients in the intervention group were less likely to require discharge to a higher level of dependency (5% vs 13%).[36]

*MSHOP – The Michigan Surgical Home and Optimization Program*

The Michigan Surgical Home and Optimization Program is a home-based, patient-centered, clinical prehabiliation program. The program is available to all patients undergoing major inpatient abdominal and thoracic surgery who have at least 2 weeks between enrollment and the operation date. Surgeons are encouraged to refer patients they think would benefit, and in a recently published retrospective cohort analysis of 18 months of MSHOP patients, the average age of the participants was 61. The intervention includes patients being provided a pedometer, incentive spirometer, a DVD and a brochure as well as specific training on a home-based walking program with daily reminders and feedback through automated phone messaging or email. Patients are given instruction on using the incentive spirometer for 1 week prior to surgery, education on nutrition, stress management and care planning and resources on smoking cessation as appropriate. In their analysis, they compared 182 patients who participated in MSHOP to 182 propensity-matched historic controls. They found that 82% of patients were actively engaged in the program and that participation was associated with a 31% reduction in hospital duration of stay and 28% lower total costs.[37]

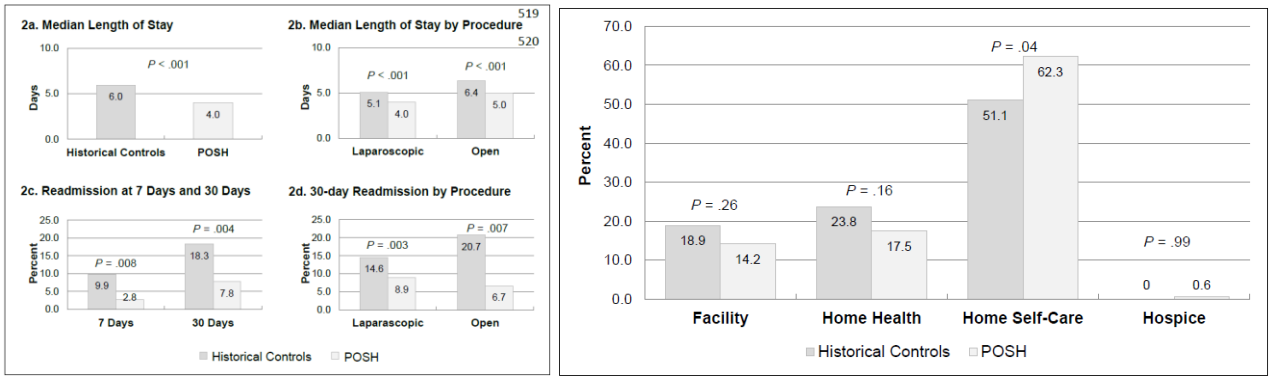



Median costs, payments, and LOS comparison between MSHOP and control populations

*POSH – Perioperative Optimization of Senior Health*

POSH is an integrated care program at Duke University Medical Center. Patients are referred to the program by their surgeons. Patients undergo a comprehensive geriatric assessment in the geriatrics clinic; the assessment is performed by a geriatrician, a geriatric resource nurse and a social worker. The patient also undergoes preoperative evaluation from a nurse practitioner from preoperative anesthesia testing during this visit in order to limit the number of visits and geographic travel for the patient. Preoperative risks are identified and an individualized risk modification plan is developed focusing on areas related to cognition, medications, management of comorbidities, mobility, functional status, nutrition, hydration, pain control, and advanced

care planning. Patients are followed throughout their hospitalization by a geriatric medicine consult service to assist the surgical team in management of medications, chronic medical conditions, pain control, and delirium prevention and management. In a recent analysis of 183 patients undergoing abdominal surgery who participated in POSH compared to 143 historic controls, POSH patients were found to have a shorter length of stay (4 vs 6 days), lower readmission rates at 7 days (2.8% vs 9.9%) and 30 days (7.8% vs 18.3%) and were more likely to be discharge to home with self-care (62% vs 51%). (under peer review)




POSH outcomes vs historic controls for patients undergoing abdominal surgery including lenghth of stay, 7- and 30-day readmission rates, and discharge destination.

## Conclusion

The demographics of aging and the increasing prevalence of chronic medical conditions represent a challenge to the health system, in particular to those who provide care to frail older adults faced with conditions that may be amenable to high-risk interventions such as surgery but for whom the potential risks and benefits of these intervention are unclear. This challenge represents an opportunity to define what quality geriatric surgery looks like, and agencies like the American College of Surgeons through their work in the NSQIP Geriatric Pilot program and the CQGS are leading the way in setting the standards for quality against which we will all be measured. In anticipation of this, opportunities abound to improve preoperative risk assessment in this population in order to better empower patients to participate in shared decision making and to identify risk factors that can be modified in the preoperative period in order to improve outcomes. Delirium, a prevalent and pernicious threat to the geriatric surgery patient, significantly impacts short and long-term outcomes following surgery, but it can be prevented through rather straightforward changes in the way we deliver inpatient postoperative care. New models of care that are collaborative, multidisciplinary and interprofessional are likely to improve the quality of care older adults receive in the perioperative period going forward.

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