

Preoperative evaluation of the elderly patient

ABSTRACT

Nowadays, the pre-operative evaluation of older patients is a critical step in the decision-making process. Clinical assessment and care planning should be considered a whole process rather than separate issues. Clinicians should use validated tools for pre-operative risk assessment of older patients to minimize surgery-related morbidity and mortality and enhance care quality. Traditional pre-operative consultation often fails to capture the pathophysiological and functional profiles of older patients. The elderly's pre-operative evaluation should be focused on determining the patient's functional reserve and reducing any possible peri-operative risk. Therefore, older adults may benefit from the Comprehensive Geriatric Assessment (CGA) that allows clinicians to evaluate several aspects of elderly life, such as depression and cognitive disorders, social status, multi-morbidity, frailty, geriatric syndromes, nutritional status, and polypharmacy. Despite the recognized challenges in applying the CGA, it may provide a realistic risk assessment for post-operative complications and suggest a tailored peri-operative treatment plan for older adults, including pre-operative optimization strategies. The older adults' pre-operative examination should not be considered a mere stand-alone, that is, an independent stage of the surgical pathway, but rather a vital step toward a personalized therapeutic approach that may involve professionals from different clinical fields. The aim of this review is to revise the evidence from the literature and highlight the most important items to be implemented in the pre-operative evaluation process in order to identify better all elderly patients' needs.

Key words: Co-morbidities, elderly patients, pre-operative assessment, risk stratification

Introduction

Pre-operative anesthetic assessment has been evolving due to developments in medical understanding, patient expectations, demographics, and epidemiology changes over the years.^[1] Nowadays, age is not considered an exclusion criterion for surgery as biological age does not always match with the chronological one and is more predictive of

the outcome, especially in terms of the ability to react to a stressful condition such as surgery.^[2] The number of older patients undergoing surgery has been rising, and a better understanding of geriatric medicine is crucial in surgical and anesthesia fields.^[3,4] Indeed, older people are more likely to have higher peri-operative complications due to their age, greater rates of multi-morbidity, polypharmacy, functional status changes, and cognitive impairment.^[5]

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Experience shows that in elderly patients, a normally not particularly harmful issue may still severely influence post-operative recovery and lead to the development of complications, which may also be fatal. Pre-operative evaluation of older patients is a critical step in the decision-making process. Clinical assessment and care planning should be considered a whole process rather than separate issues. Specifically, risk assessment represents a preliminary step that merely precedes the adoption of pre-operative optimization measures and the appropriate peri-operative organizational strategies. Thus, the pre-operative examination should detect possible risks and optimize patients' conditions, if surgery is far enough away from pre-operative assessment. Since the surgeon is the first to see the patient, he/she should screen older patients for frailty. In case of positive frailty screening or other clinical issues requiring further assessment or optimization (such as malnutrition), the surgeon should send the patient to the pre-hospitalization process as soon as possible. In this regard, it has been recommended that the Timed Up-and-Go (TUG) test be performed for all patients and act as a screening test to indicate the need for Comprehensive Geriatric Assessment (CGA), in case of pathological values.^[6] Moreover, a satisfactory communication process and an interactive discussion of the care process associated with a critical evaluation of modifiable risk factors might enhance surgery results and patients' satisfaction.^[7]

The aim of this review is to critically revise the evidence from the literature and highlight the most important items to be implemented in the pre-operative evaluation process in order to better identify elderly patients' needs.

Literature search

A comprehensive literature search was performed in PubMed/MEDLINE, The Cochrane Library, EMBASE, Scopus, and Google Scholar in order to identify the relevant articles (published up to 30 June 2023) relating to the pre-operative evaluation and definition of patients' needs. Reviews, meta-analyses, and randomized clinical trials were included. A total of 52 articles were included based on relevance.

Demographic and epidemiological changes affecting pre-operative evaluation

In 2016, the 65-and-over population represented 16.8% of the whole world population, while the 80-and-over population is expected to double over the next 3 decades (from 5.3 to 9% in 2040).

Specifically, the 65-and-over population still represents 40% of the whole population, with no major variations between the United States and Europe.^[8-10] According to the World

Health Organization's recently released 'World Report on Ageing and Health,' 10 to 24% of Europeans over the age of 80 have several morbidities. Furthermore, the prevalence of disability in everyday active living among Europeans aged 75 and up ranges from 14 to 50%.^[11] Peri-operative complications have raised according to the patient's age. Indeed, the 80-and-over population has a complication rate of 20% compared to 12.1% of patients under 80 years.^[12] This aspect is undoubtedly related to the surgical geriatric population's peculiar epidemiological patterns. Indeed, data from patients admitted to hospitals for surgical procedures, especially in emergency settings, reveal a higher prevalence of cardiovascular, respiratory, and metabolic diseases.^[13]

Furthermore, as the physiologic functions decline with age and co-morbidities, the elderly population's pre-operative evaluation should be focused on determining the patient's functional reserve and reducing any possible peri-operative risk. Despite the great developments in surgical and anesthetic procedures and peri-operative care, post-operative complications in older people still determine a longer hospital length of stay (LOS), great patient discomfort and suffering, and relevant economic burden.^[14] Post-operative complications have a significant negative impact in terms of care management; that is, the higher rate of surgical complications is a more significant predictor of death following major non-cardiac surgery.^[11]

Unfortunately, as the older population is more vulnerable to surgery-associated adverse sequelae, it is imperative to rely on validated tools for accurate and reliable identification of any possible issue during the pre-operative evaluation. Therefore, a careful review of typical geriatric symptoms such as frailty, cognitive impairment, dementia, polypharmacy, nutrition, and functional ability should be performed at the time of the pre-operative evaluation.^[15]

Risk stratification

Nowadays, age and medical co-morbidities represent the main factors in the risk-stratifying evaluation of surgical outcomes in older patients,^[16] and several surgical risk-stratification tools, such as the American Society of Anesthesiologists (ASA) Physical Status Classification System, the Acute Physiology and Chronic Health Evaluation (APACHE-II), the Physiologic and Severity Score for the Enumeration of Mortality and Morbidity (POSSUM), and the Goldman Cardiac Risk Index, are still being used by clinicians worldwide.^[17] The American College of Surgeons (ACS) Surgical Risk Calculator (National Surgical Quality Improvement Program, ACS-NSQIP) is an easy-to-use tool sustained by updated studies to enhance prediction performance in older adults.^[4,18] A recent prospective

multi-center study found that age-adjusted Charlson Comorbidity Index (CCI) ≥ 7 is a risk factor for not achieving functional recovery in older patients after colorectal cancer surgery.^[19] The predictive value of these tools varies greatly depending on patient demographics, surgical procedures, and age. Despite their strength, these risk-stratification algorithms that analyze specific physiologic patterns have some limitations. Specifically, these tools evaluate the biological asset of a few selected organs (e.g., heart failure, renal failure). However, the functional evaluation of specific organs cannot represent the global homeostatic decline linked to the decreased resilience to stressors in older patients. Therefore, quantifying the physiologic reserve in older patients is critical to improve the pre-operative risk assessment.^[20,21]

Identifying the specific features that could assist clinicians in performing a comprehensive evaluation and evaluating the patient's health status is a crucial step in the pre-operative examination of elderly patients. Furthermore, all clinicians involved in the care process should work cooperatively in tailoring the clinical assessment to the needs and expectations of this population for a more personalized approach. Accordingly, some specific features should be considered, that is, a depressed state and risk of post-operative delirium (POD) and post-operative cognitive decline (pCD), the likelihood of post-operative respiratory complications (PPCs), nutritional status, polypharmacy, need of psychological support and/or family counseling, requirement of physical assistance during the peri-operative pathway, and/or caregiver attendance in the operating room (OR).^[6]

Frailty

Despite frailty being generally recognized as a medical syndrome, no gold standard definition could be universally accepted in research and medical settings. Frailty can be defined as a geriatric condition characterized by multi-system physiologic deterioration as well as increased susceptibility to stresses and negative clinical consequences.^[22,23] According to the current literature, frailty in the non-surgical population is independently predictive of incident falls, decreasing mobility, hospitalization, morbidity, and death.^[24,25] Frailty also implies a heightened sensitivity to stressors such as surgery and anesthesia and is related to higher post-operative mortality, increased complications, longer hospital LOS, and a higher discharge rate to a facility rather than home.^[26-29] Regardless of the definition, the relationship between frailty and post-operative outcomes has recently become a "hot issue" in a wide range of medical specialties.^[2]

Nowadays, the frailty scales evaluate either a specific phenotype that includes physical qualities (i.e., the frailty phenotype, or

Fried Index), or several domain impairments (i.e., the deficit accumulation approach, such as in the Modified Frailty Index).^[30] The Fried phenotype is the most well-known clinical examination, consisting of five criteria: weight loss, poor hand grip strength, tiredness, sluggish walking, and limited physical activity. Patients with scores ≥ 3 are deemed fragile, those with 1 or 2 are considered intermediately feeble, and those with 0 are not regarded as frail. This scale has been verified and has shown solid prognostic capabilities.^[24] However, this tool requires specialized training and equipment often unavailable in regular pre-operative evaluation clinics. Furthermore, employing one or two criteria can help identify people likely to be frail that can be labeled as high-risk and referred for a thorough geriatric evaluation.^[31] The TUG test is a widespread tool used by geriatricians. It assesses muscle strength and gait speed and is a useful test that could be included in a pre-operative routine evaluation.^[32]

There is no agreement on which frailty screening tool is most adequate for surgical elderly patients; peri-operative staff should choose a tool that is suitable for their hospital setting. The commonly used G8 and Vulnerable Elders Survey-13 (the last one can be also self-administered) reflect frailty issues. Clinical Frailty Scale (CFS) is another commonly used frailty screening tool used to predict outcomes.^[33] CFS is based on the face-to-face assessment method which allows the identification of nine categories from very fit patients to those in terminal conditions. CFS is a nine-point ordinal scale pointing out the degree of frailty that may address care planning (e.g., a patient with a CFS of 3 is considered as 'managing well' and may not need additional care, while CFS = 6 is considered as 'moderately frail' and may require challenging pre-operative optimization and careful post-operative planning). A recent meta-analysis showed that compared to other scores, CFS had a greater association with mortality and higher feasibility. As regards frailty screening, surgeons can use CFS or other similar scores, or if they are familiar with another score, they can use that one instead.^[33]

Cardiac evaluation

The incidence of cardiovascular problems, such as coronary artery disease, hypertension, and diabetes, has been increasing in older adults due to the influence of age-related changes on the cardiovascular system.^[14] The pre-operative cardiologic evaluation is related to patient and surgical-specific criteria and should be recommended to those at high risk and with limited exercise ability. Despite not usually being acknowledged, the threshold for pursuing coronary treatments should be considered not only in the non-operative periods but also in the peri-operative phase.^[34]

Among currently used tools, the Revised Cardiac Risk Index is widely adopted for pre-operative cardiac evaluation. It comprises six independent predictors, such as high-risk surgery, a history of ischemic heart disease, congestive heart failure, cerebrovascular surgery, diabetes mellitus needing insulin therapy, and a pre-operative serum creatinine level above 2.0 mg/dL. The rate of complications increases according to the number of risk factors, with rates of 0.5%, 1.3%, 4%, and 9% with 0, 1, 2, or more than 3 risk factors, respectively. Any interventional procedure might be performed without additional cardiac non-invasive testing if the patient's stated functional ability shows more than 4 metabolic equivalents. Functional capacity should be measured via cardiopulmonary exercise testing before major surgery (e.g., cardiovascular or thoracic). It provides an individualized risk estimation that can be used to plan the appropriate peri-operative care (e.g., post-operative care unit admission), optimize medical conditions pre-operatively, and target a personalized pre-habilitation program.^[6] Nonetheless, either non-invasive or invasive cardiac testing, based on specialistic consultation, may be necessary for patients with severe clinical risk factors for coronary artery disease undergoing high-risk surgery when the functional capacity cannot be determined.^[35]

Pulmonary evaluation

Aging-related lung changes increase the likelihood of peri-operative pulmonary complications due to reduced pulmonary reserve. The operation procedure (upper abdominal and thoracic carrying a higher risk), emergent status, poor functional status and physical reliance, pre-operative infection, and high ASA classification represent the five key risk factors for post-operative respiratory failure. The prospectively validated ARISCAT (Assess Respiratory Risk in Surgical Patients in Catalonia) score may allow us to assess the risk of PPC also in older adults.^[36] Extensive respiratory system evaluation or pre-operative spirometry, not routinely recommended before high-risk surgery, could be useful in patients with unexplained dyspnea or exercise intolerance and in those with chronic obstructive pulmonary disease (COPD) or asthma with an unknown degree of airflow obstruction.^[37-39]

The risk of PPCs in older surgical patients may be reduced by minimizing risk factors (e.g., pre-operative smoking cessation), optimizing treatment of obstructive diseases (i.e., COPD or asthma), prescribing deep breathing exercises or pre-operative physiotherapy, and ensuring appropriate post-operative analgesia.^[14,40]

Renal function evaluation

Post-operative renal complications are frequent in older adults. Indeed, 99% of the 85-and-over population have a glomerular filtration rate (GRF) drop that requires medical

therapy.^[41] Furthermore, aging is related to a deterioration in glomerular function in as many as 30% of older patients who require surgery despite normal creatinine levels due to a concurrent drop in muscle mass. An accurate estimation of renal function can be obtained by calculating GFR using the chronic kidney disease-epidemiology collaboration equation.^[6] Therefore, the pre-operative renal evaluation of older adults should be focused on the underlying reasons for the decline in renal reserve, often related to co-morbidities such as hypertension and/or diabetes that impair the number of functioning nephrons. A careful management of hypovolemia, hypotension, electrolyte balances, and nephrotoxic medications (e.g., non-steroidal anti-inflammatory drugs and angiotensin-converting enzyme inhibitors) should also be considered in the pre-operative phase.^[42] Finally, we should also take into account that patients with chronic kidney disease have a high risk of cardiovascular death, which is independent from surgery. Endothelial dysfunction, inflammation, and atherosclerosis have a central role in the pathogenesis of both renal and cardiovascular diseases.^[43]

Polypharmacy

The term polypharmacy refers to the use of several drugs, the administration of more than five (in most definitions) clinically necessary pharmaceuticals per day, the use of unsuitable medications, or any combination of these. It has been estimated that nearly half of older adults receive more than 5 drugs per day. It is related to negative outcomes such as falls, functional impairment, adverse drug reactions (ADRs), prolonged hospital LOS, readmissions, and death.^[44] It is crucial to investigate polypharmacy and perform an accurate medication review in the pre-operative setting in order to avoid adverse post-operative outcomes.^[45] To minimize the risk of peri-operative-related complications, in particular POD and adverse ADRs, all pre-operative medications should be reviewed to establish how appropriate they are and any inadequate drugs should be stopped based on Beers criteria or other validated tools such as the Screening Tool of Older Person's Prescriptions (STOPP) and Screening Tool to Alert to Right Treatment (START) criteria.^[46] The primary goal of medication review should be the reduction of anticholinergic burden considering that this principle is contained in a number of medications. Peri-operative use of anticholinergics and benzodiazepines should be avoided, so de-escalation should be planned in advance in order to prevent POD.^[6]

Nutrition status assessment

Nutrition status represents an essential factor that should be pre-operatively evaluated. The malnutrition incidence in older patients widely varies among different settings, with rates for community-dwelling older persons around

6%. This rate rises to 14% in nursing home patients, 39% in inpatients, and 50% in older patients receiving rehabilitation.^[51] Furthermore, malnutrition is often related to surgical site infections, pneumonia, urinary tract infections, and slower wound healing.^[47] It often causes a longer hospital and intensive care unit LOS and a higher risk of post-operative ADR (due to altered drug pharmacodynamics) mortality and morbidity.^[47,48] Several tools and methods to establish the nutritional status are adopted by clinicians worldwide.

For example, albumin values less than 3.0 g/dL are frequently used as a surrogate marker for malnutrition. Specifically, the Mini-Nutritional Assessment is a widely adopted tool, with scores ranging from 0 to 14, where 12 to 14 is deemed normal, 8 to 11 indicates nutritional risks, and 7 or below indicates malnutrition. Malnourished patients may benefit from rigorous nutritional assessment and rehabilitation according to the recommendations of the European Society for Clinical Nutrition and Metabolism.^[49] Oral protein supplements and carbohydrate-rich liquids are used to restore nutritional impairments, and their intake should be started 10–14 days before surgery.^[50,51] In the last years, immunomodulating formulas containing arginine, Omega-3-fatty acids, and nucleotides have been administered.^[52]

Assessment of neurocognitive impairment

POD and pCD, including delayed neurocognitive recovery and post-operative neurocognitive disorder, are among the most serious post-operative neurologic complications for elderly patients and their families.^[53,54] Moreover, mild-moderate cognitive impairment symptoms, sometimes related to dementia, are often misleading and lead to delayed diagnosis and management.^[55]

With pre-operative cognitive impairment being of the best predictors of POD, routine screening for cognitive impairment should be included in the pre-operative evaluation of older patients, even in those with no history of cognitive decline, and specialist consultation should be requested in patients with positive findings.^[56] Easy tools, such as the Mini-Mental State Examination (MMSE) or Mini-Cognitive (Mini-Cog) test, are often used for screening.^[57-59] Mini-Cog is a feasible test, suggested by guidelines, which requires no specific training or equipment and assesses visual-spatial agility, memory recall, and executive function. The test includes a 3-item memory recall test and a clock drawing test that is used as a distractor. Patients scoring 2 or less may experience cognitive impairment and often require additional workup or a specialist examination.^[60] Cognitive testing in pre-operative clinics is feasible and straightforward. Clinicians should be aware of

these powerful tools to identify susceptible individuals who may benefit from further testing or counseling.^[59]

Indeed, if there is no time for neuropsychological consultation during the post-operative phase, early cognitive impairment detection may help clinicians to tailor the peri-operative therapy in order to reduce POD onset.^[60]

Comprehensive geriatric assessment

Before pre-hospitalization, a nurse should deliver to patients (by phone or email) information about time of the pre-admission visit and fasting. Another useful measure is instructing patients to attend the anesthesia consultation with a complete list of assumed medication and documentation about previous admissions, treatments, or tests. The general practitioner should be contacted by patients or family members to have as complete as possible information. The CGA is a multi-dimensional assessment tool that assesses several aspects of elderly life, such as depression and cognitive disorders, social status, multi-morbidity, frailty, nutritional status, and polypharmacy.^[61,62]

The CGA provides a great, thorough picture of the individual's physiologic fitness and functional reserves when compared to clinical history alone, which only partially captures biological age and susceptibility to stressors. CGA, instead, identifies several age-related risk factors for poor surgical outcomes, which are not recorded by traditional evaluation. Several GCA elements, including functional status, nutrition, evaluation of associated diseases and prescriptions, and cognitive, sensory, and emotional health, have been acknowledged as helpful in identifying risk factors for POD.^[7] CGA-identified geriatric syndromes can offer a treatment roadmap for surgical older patients, including advice on need for advanced care planning including pre-habilitation, medication review, nutrition status improvement, and post-operative requirements. When geriatric consultations are available, a strict collaboration with a geriatrician adds benefit to the patient and to the clinicians involved in a shared pre-operative evaluation.^[63-65] Even if all guidelines recommend performing CGA during the pre-operative visit, it is rarely implemented in the clinical practice, probably because it is time-consuming and requires more resources. However, over the last decade, CGA has become more user-friendly and less strictly related to the original statement. In the literature, there are some examples of a brief CGA package that can be routinely applied for the pre-operative assessment of elderly surgical patients.^[66,67]

On the day of pre-hospitalization, the patient is welcomed by the nursing staff who assesses the degree of independence by exploring mobility/sensory impairments (e.g., aids use)

and history of falls during the past 6 months and using Basic Activities of Daily Living (BADL)/Instrumental Activities of Daily Living (IADL) scales. At this time, it is essential to consider the need of assistance to the patient given by the hospital staff during the whole peri-operative period. Nurses will also deliver a mini-nutritional assessment and geriatric depression forms to the patient to be filled out in the waiting room. The patient then undergoes routine exams according to the hospital protocol. Therefore, anesthesia visit in its first phase should include the following:

- Performing CGA (lacking items of short forms) [Figure 1].
- Positive screening should immediately target the intervention of the geriatric team for further assessment.
- Collecting medical history can be challenging due to communication issues linked to sensorial or cognitive alterations (see MMSE or Mini-Cog test).
- Physical examination should be focused on searching for age-related organ changes.
- If not previously performed by the surgeon, a TUG test is also required to assess functional status.
- Finally, risk estimation will be performed using ASA score, ACS surgical risk calculator (NSQIP), and CCI.

In order to avoid care fragmentation and to enable the transition of care along the surgical pathway, the anesthesiologist releases the final report, specifying all the results of pre-operative evaluation.

Therefore, the pre-operative pathway starts with the surgeon and anesthesia visit and continues with any CGA (short or complete according to hospital resources) and eventually ends with pre-habilitation. According to the outcome of CGA, the altered items will be addressed before hospital admission.

Definition of patients' needs and communication with patients and their families

The second phase of anesthesia visit consultation implies planning of patients' needs including pre-operative

treatment, for example, deprescribing and prehabilitation; we should also plan the need of a caregiver in the OR as well as peri-operative psychological or social support. The third phase, which includes informed consent and patients' education, often requires to be supported by family members and/or caregivers. Information should not be limited to the surgical procedure and anesthesia. Patients should be allowed to adopt all measures and behaviors aimed at ensuring the best possible outcome.

Instructing patients on smoking cessation, pre-operative medication management, and pre-operative fasting (following enhanced recovery after surgery protocols that are applied everywhere) represents one of the main goals of pre-operative consultation. Informing patients about the risk of pre-operative dehydration is mandatory, as well as telling them to not forget to take their hearing and visual aids, including batteries. Personal items like photographs, books, journals, calendars, and clocks should be immediately available in the wards.

Pre-operative evaluation should not be considered a mere clinical assessment as it involves communication, interactive discussion of treatment options, shared decisions, and tailored care plan. Furthermore, any clinician, including surgeons, anesthesiologists, geriatrics, nurses, and the patient alongside his/her family, should be included in the pre-operative evaluation to achieve the best outcomes in accordance with the team-based, patient-focused approach. Any aspect of care, such as expected outcomes, consent form considerations, and risks, should be extensively discussed with the patient and/or their family to achieve the greatest possible understanding, especially in situations involving sensory and intellectually challenged individuals.^[68]

Encouraging people to use informational resources, including movies, pamphlets, and virtual tours of the institution, may provide further additional benefits to the pre-operative assessment. Specifically, every step of the care pathway

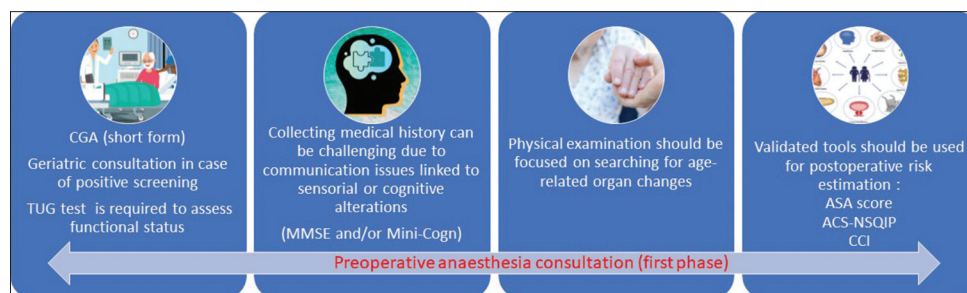


Figure 1: Preoperative evaluation: first phase. CGA, comprehensive geriatric assessment; TUG, Timed Up-and-Go; MMSE: mini-mental state examination; Mini-Cogn, Mini-Cognitive test; ASA, American Society of Anesthesiology; ACS-NSQIP, American College of Surgeons-National Surgical Quality Improvement Program, ACS-NSQIP Surgical Risk Calculator; CCI, Charlson Comorbidity Index

should be fully explained in detail, paying specific attention to any step that requires full patient cooperation, such as entering the OR, waking up from anesthesia, post-operative pain, early mobilization, and nourishment.

Pre-operative evaluation and surgical decision-making must be included in the informed consent, which has legal significance and should be handled in accordance with national legal requirements, ethical considerations, and patient rights.^[69] The communication also concerns planned strategies for patients' needs, that is, assistance to the patient throughout the peri-operative pathway, psychological support, and/or family counseling and caregiver attendance in the OR.^[70] Particular emphasis should be given to pre-operative psychological interventions for their effect in reducing pre-operative anxiety, stress, and post-operative pain with a positive impact on post-operative outcome. This is particularly valid in the case of pre-operative depression, psychological vulnerability, and chronic stress.^[71,72]

Comprehensive patient education concerning the peri-operative course also increases patients' adherence to treatments; reduces anxiety, pain, POD onset, and hospital LOS; and improves patient satisfaction.^[71]

In conclusion, there is a worldwide agreement that inter-disciplinary, committed teams of professionals from different clinical fields, including surgeons, anesthesiologists, geriatrics, nurses, physiotherapists, and nutritionists, can manage better the peri-operative care of older patients. Therefore, the older adults' pre-operative examination should not be considered a mere stand-alone, independent stage of the surgical pathway but rather a vital step toward a personalized therapeutic approach.

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Conflicts of interest

There are no conflicts of interest.

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