Review Article

Prevention and treatment of noncognitive complications

ABSTRACT

Patients aged 65 and older are the fastest growing segment in the population of many countries. Based on evolving demographics showing increasing life expectancies, it is expected that there will be a concurrent rise in the demand for a large variety of surgical and anesthesia services. Surgery offers definitive management of many age-related diseases and provides symptom-relieving (morbidity) and life-extending (mortality) benefits. However, elderly adult surgical patients, especially the frail ones, often require a different level of care than younger patients during the perioperative period. As many have chronic illnesses and acquired deconditioning and functional decline, older patients are prone to develop untoward outcomes such as postoperative complications and loss of independence. This manuscript focuses on the holistic quality person-centered care, supported by a wide stakeholder team of health-care workers, ensuring fidelity to comprehensive geriatric assessment and optimization services where possible, offering a systematic approach to early health risk assessment and risk modification in the perioperative period, with the ultimate goal of reducing postoperative complications and health-care costs. The "comprehensive geriatric assessment and optimization" cost-effective approach builds on robust evidence with older people more likely to be alive, a shorter length of hospital stay due to fewer postoperative medical complications, and improved rates of return to usual residence. Prehabilitation programs are delivered focusing on primary (through counseling) and secondary prevention (through screening) with an aim to improve fitness for surgery, by evaluating functional capacity, nutritional and psychological health, prompting interventions, targeting physical exercise, lifestyle and nutritional advice, and psychological support.

Key words: Anesthesia, geriatrics, noncognitive complications, prevention

Introduction – Healthy Aging and Frailty

For the last 150 years, human beings have enjoyed a nonstop increase in life expectancy at birth. An average person can expect to live a longer life than in the past, irrespective of what age they are and where they live in the world [Figure 1].[1] After remaining nearly static for thousands of years at around 35 years, the increase in life expectancy in the 19th century was driven mainly by improvements in public health, sanitation and hygiene, more abundant and safer foods, clean running water and sewage systems, better housing and education, and nonmedical social improvements such as less crime.[2] Key explanatory factors for better health and doubling the life expectancy in the 20th century were mainly a decrease in child mortality and a battle against

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infections (e.g., smallpox, malaria), the development of effective vaccines and antibiotics, better medical knowledge, and advances in science and technology for effective treatment of noncommunicable diseases like cardiovascular diseases and cancer.[3,4]

However, with the increase in age comes a decrease in physiologic reserves [Figure 2]. Following a process of homeostasis (through which the body maintains equilibrium), more physiologic reserves are needed with natural aging. Homeostasis is the normal decline in physiologic reserves with aging. Aging is the natural process of losing functional and physiologic reserves in virtually all organs. Older adults are less able to maintain equilibrium in times of stress, such as following a surgical intervention.[5] Especially frail patients are at risk for marked and often disproportionate decompensation, adverse events, procedural complications, prolonged recovery, functional decline, disability, and mortality [Figure 3]. Frailty represents a complex of clinical syndromes characterized by decreased physiologic reserves and increased vulnerability to stressors as a result of multiple impairments across different organs.[5] The process of accelerated aging is seen in frail people [Figure 3]. Therefore, it is vital to stay physically and mentally active, eat healthy, and maintain a healthy weight throughout life.

Woolford *et al*.[8] showed that the ideal healthy aging paradigm (thick blue line) is free of illness and physiologic vulnerability, whereas frailty (thin red line) develops as a continuum from a state of being physiologically robust and independent to being at risk of disability/dependency and, ultimately, to being hospitalized, institutionalized, or at risk of dying [Figure 4]. Usually, more robust younger patients recover rapidly after an injury, an operation, or an illness that leads to reduced functional capacity. In the elderly, cumulative physiologic decline (multiple body systems) leads to episodic functional, mental, or cognitive decompensation, whereby recovery from these stressor events (e.g., surgery) takes longer as reserves (physiologic and cognitive) are depleted. When the disability threshold is crossed, the patient no longer can compensate adequately, which diminishes the ability to perform daily activities. Because of relatively minor stressors/insults, the likelihood of disability, use of health-care service, hospitals, and institutionalization, and the risk of dying is increased.

With a further increase in the proportion of elderly undergoing surgery in the future, anesthesiologists can expect to see multiple complications associated with anesthesia in an ever-aging population. For a surgeon, it does not matter too much whether he needs to operate

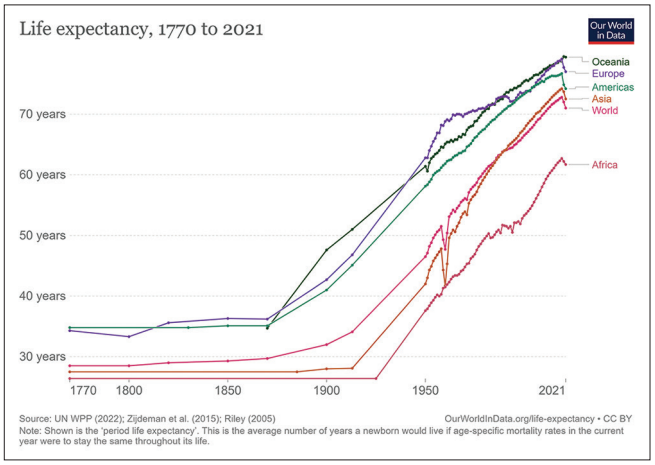

Figure 1: Increase in the life expectancy at birth in all parts of the world, at all ages, both in women and men. Max Roser, Esteban Ortiz-Ospina and Hannah Ritchie (2013).[3,4] – "Life Expectancy". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/life-expectancy'

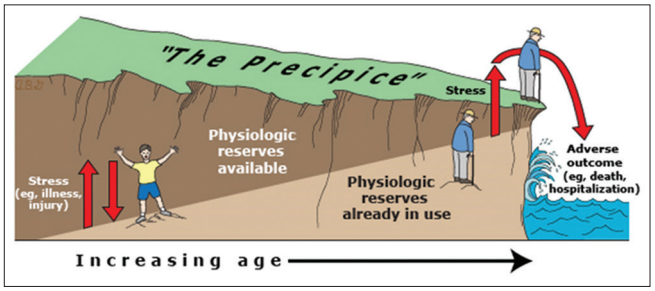

Figure 2: The physiology of aging. Taffet GE.[6] In: Cassel CK, Leipzig RM, Cohen HJ, *et al* [eds]. Geriatric Medicine: An Evidence-Based Approach, 4th ed. New York, Springer, 2003

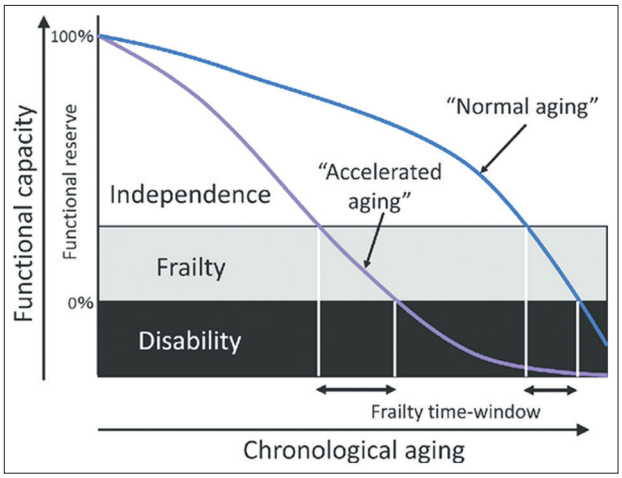

Figure 3: Accelerated aging is seen in frail patients, requiring more use of their functional reserve capacity at an earlier age[7]

on a 20-year-old or an 80-year-old person and replace a broken hip. But for the anesthetist, the elderly may present a huge challenge depending on the presence of multisystem impairment, multi-pharmacy use, frailty, issues of mobility and lack of physical activity, malnutrition, sarcopenia, and poor functional status, which are all associated with

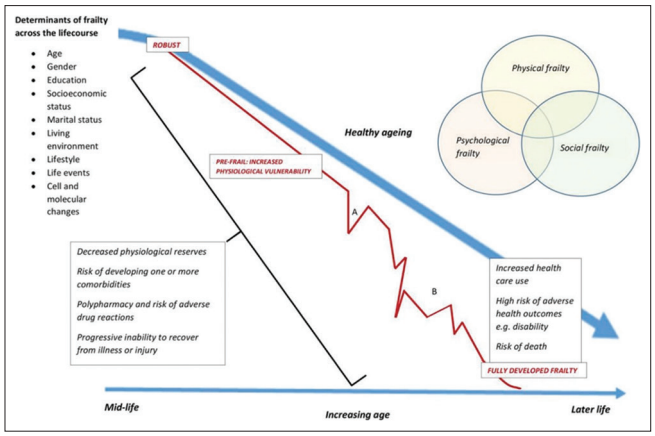

Figure 4: Determinants and development of frailty. Patel HP, Clift E, Lewis L, Cooper C. Epidemiology of Sarcopenia and Frailty [Internet]. Frailty and Sarcopenia – Onset, Development and Clinical Challenges. InTech; 2017. Available from: http://dx.doi.org/10.5772/intechopen0.69771[9]

increased vulnerability to stressors such as undergoing surgery.

Postoperative noncognitive complications in elderly patients across surgical disciplines

Birkelbach *et al*.[10] implemented routine frailty assessment for patients 65 years and older at their preoperative anesthesia clinic to identify elderly patients at risk undergoing a variety of noncardiac elective surgery. Authors found that the rate of complications was significantly higher in the prefrail (34.7%) and frail (47.4%) groups, compared to the nonfrail group (27.5%). The authors screened 15,376 patients and classified 1186 elderly patients as prefrail (n = 556, 46.9%) or frail (n = 135, 11.4%). The incidence of postoperative complications was strongly associated with the presence of characteristics of frailty, that is, cardiac arrest (3%), pneumonia (3.7%), acute kidney injury (8.9%), wound infections (5.9%), urinary tract infection (24.4%), sepsis (3%), reintubation (4.4%), and a prolonged length of stay (8 days) with discharge to care facilities in 17.8%. All above data about postoperative complications were significantly higher in the preoperative group of frail patients.

Quality of life in older adults after major surgery

The population is aging, with the number of older cancer patients increasing rapidly. We, as anesthetists, see an increasingly older population undergoing major cancer surgery, and it can have a significant impact on the patient's outcome. These elderly patients often show multimorbidity, polypharmacy use, age-related physiologic changes and loss of physiologic reserve, frailty, a prevalence of geriatric syndromes, including preoperative decline in cognition and depression, and may have risk factors for falls, pressure injuries, malnutrition, bowel and bladder dysfunction, sensory impairments, aspiration and cardiopulmonary complications. Preoperative assessment, risk stratification, and optimization by prehabilitation, delivered by a multicomponent team, of which the anesthetist is one of the team members, are the vital components of comprehensive geriatric assessment (CGA) and management. In-depth discussions with older adult patients, their families, and the whole team before surgery are essential. Informed patients, especially the elderly frail ones, need to take a balanced decision about whether or not to undergo surgery, knowing the impact on the quality of life (QoL), living conditions, the potential of loss of independence, the possibility of discharge to a nursing facility and no longer to their own home, the associated complications, readmissions, morbidity, and mortality. Partridge *et al*.[11] underpin that perioperative CGA facilitates shared decision-making, with 15% of patients electing not to proceed with the surgical intervention, and that 1:7 patients expressed decisional regret following surgery.

Due to a lack of sufficient geriatricians, orthogeriatric services in hospitals, which provide care involving geriatricians, vary substantially in different countries as follows: Ireland (50%), Scotland (78%), England (91%), the Netherlands (78%), Germany (85%), New Zealand (80%), and Australia (92%).[12] Geriatrician service is available at any time in the last four countries, but may vary from telephone only to 5 or 7-days in-house availability. Although most hospitals in Australia and New Zealand provide an orthogeriatric service (87%), two thirds provide a traditional reactive consultation and only 18% provide a proactive CGA service. The Australian and New Zealand College of Anaesthetists (ANZCA) currently provides a 1-year fellowship in perioperative medicine to gain additional qualifications in an attempt to upskill nongeriatricians with the aim to providing better quality care for the older surgical population, provided by a united multispecialty group that embraces holistic person-centered care for the older person undergoing surgery. The American College of Surgeons (ACS) has recognized the relevance of perioperative multidisciplinary care for older patients by launching the "Geriatric Surgery Verification Program" and has provided a specific publicly available App, the "National Surgical Quality Improvement Program" risk calculator using geriatric-specific predictors of length of hospital stay and a whole series of outcomes.[13]

Montroni *et al*.[14] were the first to report a prospective analysis about QoL derangements after surgery and factors predicting worsening of QoL. Frailty screening tools were used, which included the "Timed Up and Go" test, the "Geriatric 8" test, the "Nutritional Risk Screening" test, the American Society of Anesthesiologists score, the "Charlson

Age Comorbidity Index" (CACI), and the "Mini-Cog' test, which is a 3-min instrument that can increase detection of cognitive impairment in older adults. These authors provide data on how the surgical team can prolong life while preserving quality in older patients undergoing major cancer surgery and suggest metrics which are probably going to worsen the postoperative QoL. The GOSAFE study (Geriatric Oncology Surgical Assessment and Functional Recovery after Surgery) highlights previously unknown patient-reported outcomes (PROs) and functional recovery (FR) and indicates that cancer surgery in older patients can provide a definitive treatment for their cancer while preserving QoL, thereby improving pain, discomfort, anxiety, and depression. Involvement of a whole team is important, including surgeon, anesthetist, nutritionist, dietician, physiotherapist, pharmacist, geriatrician, and so on. The team needs to be involved in taking a final decision with the patient and their family on whether or not to pursue surgery and what kind of surgery to conduct and to help direct patient's expectations, facing realistic outcomes. Zietlow *et al*.[15] presented structured goals of care discussions in a review summarizing best practice for the geriatric preoperative assessment and optimization, utilizing a question-prompt list to ensure the elderly patients have a realistic understanding of their surgery, the risks involved, and the recovery phase.

What is the nonoperative survival following conservative bowel cancer management?

Surgery is one of the key curative cornerstones of bowel cancer treatment. However, it confers a significant risk in the form of 30-day postoperative mortality following colorectal cancer surgery, which is 2.9%–5.9% (all ages) or 13%–15% in patients aged 80 and over. The 60-day mortality in the 80+ group is even 30%. An additional 12% will not return home and go on to live in supportive care, while 69% will experience deterioration in activities of daily living. Therefore, QoL is at least as important as prolonging life. Especially in the frail elderly patient, one needs to ask whether frail patients with conditions such as bowel cancer are better off with nonoperative strategies. Age itself is not a reason for deciding to operate or not on a patient. The reason not to operate should be the increased risks surgery brings to these frail patients. Well-informed patients should be part of the decision-making process. Elderly patients with bowel cancer will less likely die of their cancer compared to younger patients, and therefore will gain less benefit from surgery for cancer. Colonic tumors remain fairly asymptomatic in the frail elderly, except the occasional need for transfusion, diverting stoma, or stent.[16] Any degree of frailty is linked with worse postoperative outcome.

What is frailty in a surgical patient?

Frailty is not an illness, but a vulnerable state/syndrome of decreased resistance to stress resulting from deterioration/disruption in a variety of homeostatic mechanisms and decreased functional reserves. It is an aggregate expression of susceptibility to poor outcomes owing to age-related and disease-related deficits.[16-19] Frailty is an important risk factor for postoperative mortality, institutional discharge, and resource use and should become a routine component of preoperative assessment and planning.[19-22] At all ages, a higher Frailty Index is associated with a higher mortality and a greater use of health-care services.[22]

Elderly patients are disproportionately affected by cancer, with more than one-third of cancers diagnosed in those aged 70 and over. Half of the older cancer patients are in a state of vulnerability (prefrail or frail). Older cancer patients are often undertreated, have poorer outcomes, and are underrepresented in clinical trials. Hence, they are at an increased risk of chemotherapy intolerance, postoperative complications, and mortality.[18]

Frail patients tend to have worse health in all illness settings and will likely not cope well with major stressors such as undergoing surgery due to advanced age and decreased physiologic reserves. Characterizing frailty is, therefore, a useful tool for predicting both mortality and functional postoperative outcomes.[17] Implementation of Frailty Screening Initiatives is associated with significantly improved survival at 30, 180, and 365 days.[23] Routine assessment of frailty in elderly cancer patients helps to guide treatment decisions. Preoperative frailty screening should be performed regardless of the magnitude of the stress level of surgery.[24]

Studies implementing prehabilitation result in significant improvements in functional capacity and psychological and QoL outcomes.[25] The catabolic response to major surgery is well known and is accompanied by proinflammatory responses, muscle and neuroinflammation, and metabolic dysregulation.[26] Muscle mitochondrial function is acutely impaired after surgery, as evidenced by muscle pyruvate dehydrogenase complex activation and maximal mitochondrial adenosine triphosphate (ATP) production. Prehabilitation through exercise training and nutritional and psychological support helps to withstand the metabolic dysregulation and fatigue produced by major surgery and also helps to withstand postoperative complications, facilitating earlier return to independent function.[26] Undergoing major surgery can be stressful; patients can experience fear, anxiety, isolation, and frustration and benefit from cognitive–behavioral therapies, relaxation techniques, mindfulness interventions, coping

strategies, hypnosis, coaching, and narrative medicine. In the postoperative period, rehabilitation needs to be as effective as interventions during the multimodal prehabilitation period. Roxburgh *et al*.[27] provided epidemiological evidence of a strong relationship between cardiorespiratory fitness and surgical outcomes. Fitter patients possess heightened resilience to withstand the stress caused by a surgical intervention, and fitness affords perioperative benefit. When metabolic demands increase in the postoperative period, higher fitness is beneficial, as indicated by higher peak oxygen consumption, the ability to sustain metabolic homeostasis through greater antioxidant capacity, metabolic flexibility, glycemic control, and improved mental state.

End-of-life care is costly

Most patients prefer to die at home, surrounded by family, friends, and people they trust, rather than in a hospital setting. Assumptions that more medical care (diagnostic tests, procedures) translates to better health-care outcomes are not supported by evidence. Much of the costs incurred for health care in a patient's life are for care at the end of life, which are often futile. It is not age or cognitive function that needs to determine whether or not to provide comfort care versus aggressive management, but rather the patient's articulated goals following a meaningful informed discussion of prognosis, risks, benefits, and alternatives and the impact on the QoL both in the short term and long term. It is paramount that health-care workers be consistent with the patient's expressed wishes (living will, verbally stated). It is imperative that both overtreatment and undertreatment should be avoided.

Prevention in health care

Bentzen[28] categorizes prevention in health care into four categories: a) *primary prevention* refers to interventions in asymptomatic persons or a population that are designed to prevent the occurrence of diseases and avoid or remove causes of health issues before they arise; b) *secondary prevention* refers to prevention of significant morbidity at an early stage in an individual or a population using screening tests to attain cure, altering the course of illness and its prognosis or reducing its spread; c) *tertiary prevention* refers to actions taken to reduce the chronic effects of a health disorder and minimize functional loss or additional complications (e.g., prevention of complications of diabetes); and d) *quaternary prevention* refers to actions that identify the risk of overmedicalization, to protect individuals from ethically unacceptable interventions that more likely cause harm than good and to suggest interventions which are ethically acceptable. While primary prevention is significant in young individuals, there is a major role for all three forms of prevention (I–II–III), with secondary and tertiary prevention being more utilized in older adults.[29]

CGA is the multidimensional, multidisciplinary diagnostic process that helps to identify medical, functional, psychological, and social needs and develop an integrated or coordinated plan to meet the needs of elderly patients.[30] Early identification of patients at highest risk of complications and poor outcomes enables implementation of adequate treatment plans and using resources to improve outcomes. Individuals who are either in ideal health or too ill may not benefit from CGA. Benefits are common in geriatric patients with, for example, mobility issues, gait imbalance, falls, incontinence, multiple chronic and acute conditions, cognitive impairment, visual or auditory sensory impairment, and polypharmacy.

The central theme of CGA is patient-centered care. The multidisciplinary competencies in the care of older adults include six domains: a) health promotion and safety, b) evaluation and assessment, c) care planning and coordination, d) interdisciplinary team care, e) caregiver support, and f) health-care systems and benefits. The approach in CGA includes an understanding of the approximate life expectancy to enable and incorporate appropriate evidence-based care as applicable. Short-term issues attempt restoration of previous state of health; mid-range issues may address preventive care and the identification of geriatric syndromes; long-term aspects will require planning for eventual decline and end-of-life care.[10,29]

Table 1 shows a list of strategies whereby CGA involves all sorts of prevention, that is, primary, secondary, tertiary, and quaternary prevention. Counseling is very important in the primary prevention and includes a) lifestyle strategies, b) diet advices, c) improvements in physical activities, d) guidance regarding use of tobacco, alcohol, and unhealthy drugs, e) recommendations to prevent falls and unintentional injuries from occurring, f) the importance of timely vaccinations and immunizations in the elderly population, and g) a critical value of hormone replacement therapy. Secondary prevention measures include early screening of a) cognitive impairment and depression, b) visual and hearing loss, c) osteoporosis, d) diabetes mellitus, dyslipidemia, and hypertension, e) abuse of elders, and f) a variety of cancers. Based on clinical judgment and prudence, other screening may be needed, for example, anemia, Vitamin B12 deficiency, thyroid disorder (hypothyroidism is common in elderly), or a urine screen for the presence of protein and/or blood, although there are no indications for screening for asymptomatic bacteriuria nor is a periodic urine

Table 1: CGA involves all sorts of prevention and some examples of primary and secondary prevention are shown

Prevention	Category	Advantages	Key recommendations	Deficits	Barriers
Primary	**Counseling**		**Actions to avoid or prevent the cause before it arises**		
	Lifestyle medicine: Effective strategy to prevent/manage severe disorders in elderly patients	Adopting a healthy lifestyle prolongs life expectancy	Discuss Advance Care Plan Everybody will benefit	Not all physicians have lifestyle counseling competencies	Lack of Adherence to recommendations
	Diet: A healthy, balanced diet includes a variety of vegetables, fruits, dairy, proteins, dietary fibers. This also includes dental health	Prevention of diet-related chronic diseases, that is, cardiovascular, T2DM, obesity, hypertension	Responsibilities in supportive healthy eating should come from patients, health-care professionals, industry, government, societies, organizations	The strongest association with mortality is caused by high sodium intake and processed foods and a low intake of nuts, seeds, and seafood omega-3 fats	Lack of Sufficient income to pay for help from dietician or to pay for healthy food, vegetables, and others
	Physical activity: Aerobic, muscle strengthening, balance activities; brisk walking, cycling, dancing, gardening Move more, sit less	Improved cognition Less likely to fall Better QoL Better health/sleep Lower risk of all-cause mortality/cancers	Assess physical activity Decrease total sitting time Engage in physical and muscle-strengthening activities Ideally, 150–300 min/week Little activity is better than none; more is better than less	Restrictions in mobility have severe consequences: cardiometabolic, depression, pressure ulcers, deep vein thrombosis, deconditioning Less than 20% of elderly are engaged in physical activities	Lack of Motivation, time, safe walking areas, proper apparel, shoes
	Tobacco and alcohol use: Behavior and pharmacotherapy Screening unhealthy drugs: Illegal drugs; using prescription drugs in ways not recommended by a physician	Strategy to stop smoking and limit alcohol intake results in benefits which occur at any age	Smoking cessation is a critical component of cancer prevention Avoid excessive alcohol use Limits: up to a drink/day (women) and up to two/day (men)	Multiorgan diseases Chronic alcoholism causes gastrointestinal bleeding/cancer	Lack of Motivation Help (marginalization in society)
	Prevention of falls: A multifactorial risk assessment is indicated in elderly patients and all frail patients. Unintentional injuries at home (water heaters) or motor vehicle accidents (no use of safety belts or helmets)	Falls prevention toolkit in hospitals/institution Correct Vitamin D deficiency and calcium Stimulate physical activity	History of falls in elderly last year Check/adjust medication Evaluation: gait (Timed Up and Go test) and balance (Romberg) Reduction in falls, injurious falls, fractures	Cerebellar signs, weakness, rigidity, vision/cognition deficits, musculoskeletal and environmental disorders may lead to falls Falls may result in mortality High number of motor crashes	Lack of Adjustment of medication: antipsychotics, sedative hypnotics/anticholinergics Home modifications Driving skills
	Immunizations: Vaccinations are essential in elderly: influenza, pneumococcal, herpes zoster, tetanus, diphtheria, pertussis, hepatitis	Infections are common in elderly, with much more devastating consequences	Several polyvalent vaccines, specifically adjusted to elderly people, cover many disease cases	No vaccination increases the likelihood for infection and the severity of infection, hospitalization, and death	Lack of Knowledge about the impact of infectious diseases on elderly people
	Hormone replacement therapy: Therapy with estrogen/progestin is now considered more harmful than beneficial	The benefits for reducing risk of fracture are outweighed by risks	Short-term use of estrogen for menopausal symptoms is acceptable; questionable safety over the long-term use of estrogens	Unopposed estrogen appears carcinogenic, with an increased risk for venous thromboembolism, arterial thrombosis, breast cancer	Lack of Safety of long-term use of estrogens

Contd...

Table 1: Contd...

Prevention	Category	Advantages	Key recommendations	Deficits	Barriers
Secondary	**Screening**		**Actions to detect health problem at an early stage to help cure**		
	Cognitive impairment: Common in older adults; 12%–13% (mild form); distinguish dementia from depression, delirium, and age-related mild cognitive decline Depression: Common in elderly following the loss of a loved one, illness, or accident	Early detection of mild dementia reduces the risk of dementia and comorbidity. Screening tests are an adjunct to clinical assessment	Cognitive Impairment tests: For example, MMSE, Mini-Cog, MoCA, clock drawing test. Variety exists in assessment times and number of items tested. Depression tests: Geriatric Depression Scale (15), Patient Health Questionnaire	Lack of screening of cognitive impairment Underrecognition of cognitive impairment	Lack of Knowledge of providers about when and how cognitive impairment is determined in individuals Denial problem from the patient
	Visual and hearing loss: High prevalence in elderly (11.3% in 80+) Prevalence of hearing loss (80% in 80+), with only a few wearing hearing aids	Visual aids and hearing aids help elderly to better view/in speech understanding and improve QoL	Visual: Snellen chart/Jaeger card Hearing tests	Visual impairment predisposes to safety impairment, driving accidents, falls, impaired QoL Hearing impairment is bilateral, gradual, and progressive	Risk factors: Older age, history of smoking, alcohol, diabetes, use of corticosteroids, and exposure to sunlight and radiation
	Osteoporosis: A silent disease until fractures arise, with much morbidity	Screening to prevent osteoporotic fractures	FRAX: a computer-based fracture risk assessment tool to estimate the 10-year probability of major fractures	Fractures of hip, wrist, and spine	Risk factors: Balance of risks and benefits for osteoporosis screening in women>men
	Diabetes mellitus: Screening recommended for patients with HDL cholesterol <35 mg/dl, hypertension, BMI >25 kg/m^2, physically inactive patients Dyslipidemia and hypertension, and ECG	At home screening for: hemoglobin, HbA1c, fasting plasma glucose. Heart-healthy lifestyle	Target HbA1c between 7% and 8% in older people Aim for normal blood pressure: <120/80 mmHg. US-screening diameter abdominal aorta (<3 cm)	Hypoglycemia is riskier than hyperglycemia. Retinopathy, kidney/nerve damage, macro-/microvascular diseases Coronary artery disease, AAA	Risk factors: Lack of self-discipline, diet, major overweight/obesity, physical inactivity, smoking
	Elder abuse: Common, but an underrecognized condition, often involving family members. Consequences include neglect, injury, and death	Red flags or indicators of elderly abuse are unexpected/hard-to-explain injuries/bruises, depression/apathy/fear withdrawal, excessive tearing	Health-care workers should take steps to report the matter when reasonable suspicion arises Failure to report may have legal consequences Steps are required for prevention of elderly abuse	Mistreatment of elderly may result in financial, physical, emotional, fiduciary, sexual abuse; self-neglect, increased morbidity/mortality	Underreporting due to Lack of knowledge, losing patient rapport, patient denial, doubts about the intervention
	Cancers: • Lung (smokers) • Breast • Colorectal • Prostate • Skin • Ovarian • Cervical		Spirometry and CT scan till age 75 Mammography till age 75 Discontinue colonoscopy if >85+ Discontinue screening if >70+ Annual check + skin protection No screening in asymptomatic patients Discontinue screening if >65; >2 HPV (−) and PAP (−) tests	If untreated – high mortality Small number of breast cancer deaths	

CGA = comprehensive geriatric assessment, CT = computed tomography, HbA1c = glycated hemoglobin, HPV = human papillomavirus, MMSE = Mini-Mental State Examination, MoCA = Montreal Cognitive Assessment, PAP = Papanicolaou, QoL = quality of life, T2DM = type 2 diabetes mellitus, AAA = Abdominal aorta aneurysm

culture recommended. Medication review, reconciliation, and minimizing polypharmacy (deprescribing) help prevent adverse drug events. Long-term use of sedative hypnotics and anticholinergic and antipsychotic medication should be avoided. Mohanty *et al*.[31] provide an extensive list of immediate preoperative, intraoperative, and postoperative management consensus recommendations, focusing on prevention and treatment. In addition, specific recommendations are provided about fall risk assessment and targeted falls prevention, prevention of pulmonary

complications, urinary tract infection, and pressure injuries, and recommendations about care transition.

It needs to be stressed that CGA is a team-approach, whereby it is expected to unmask the illness and disability, improve prescribing of medication, help to lower the likelihood for adverse drug events, address function (physical, psychological, social, cognitive), improve QoL, and lower the costs of health care. Functional status includes "*activities of daily living"* (bathing, dressing, toileting, walking/locomotion, transferring in/out bed/chair, feeding) or "*instrumental activities of daily living"* (cooking, preparing meals, cleaning, housework, shopping, handling finances, management of medication, using the telephone and laundry, arranging for transportation). In all situations, assessment of the patient's capacity is the first step.

As such, CGA increases the likelihood of being alive, living at home, and avoiding institutionalization for an elderly patient. In particular, hospitalized elderly patients undergoing surgery will benefit from CGA as they are often ill, with complex issues and multimorbidities, presenting with geriatric syndromes (falls, delirium, frailty, dementia) and multiorgan dysfunction. The multidisciplinary team members may differ based on setting and individual patient profile and include a) physicians and specialists, based on indications, such as geriatrician, surgeon, anesthetist, b) nurse, nurse practitioner, and social worker, c) physiotherapist, d) nutritionist, e) pharmacist, f) psychiatrist, and g) others, based on an individual's need.

Best Practice Guidelines for Optimal Perioperative Management of the Geriatric Patient

Several guidelines, audits, and large-scale observational studies emphasize the need for implementation of a strategy to support CGA-based perioperative services to drive quality improvement for the (frail) elderly surgical patient. They all prompt a rethink of the perioperative pathway for elderly surgical patients. In the UK, a cross-specialty, interdisciplinary approach to the whole perioperative pathway has been developed through guidelines, polices, curricula, and training, that is, the Centre for Perioperative Care-British Geriatrics Society guideline.[10]

In the USA, the ACS partnered with the American Geriatrics Society (AGS) and the John A. Hartford Foundation to produce the National Surgical Quality Improvement Program (NSQIP) guidelines to optimize surgical care of elderly adults, that is, Optimal perioperative management of the geriatric patient: Best Practices Guidelines.[31]

In Italy, Aceto *et al*.[32] presented the Perioperative Management of Elderly patients (PriME) evidence-based recommendations for the integrated care of elderly surgical patients. A total of 81 recommendations were highlighted, covering preoperative evaluation (n = 30 items), intraoperative management (n = 19 items), and postoperative care and discharge (n = 32 items).

Adherence to published guidelines for perioperative care of the elderly is still low as a vast majority of centers (indeed, as shown by a survey in Scotland) lack access to specialist multidisciplinary input or specialist preassessment services. Reported screening for frailty and cognitive impairment is variable, with opportunities for improvement in communication and education.[33]

Limitations of this article include the following: a) not all studies demonstrate benefits, which may be due to limitations in the choice of the primary outcome or underpowering of the study; b) lack of fidelity to the CGA principles and recommendations; c) lack of geriatricians; d) the multidisciplinary approach without a specific leader/contact point for the patient; e) unsupervised prehabilitation regimens; f) lack of compliance with the proposed interventions; and g) limited generalizability as not all patients are eligible for prehabilitation.

Conclusions

While surgery is the cornerstone for many diseases, it comes with significant risks and complications, especially in the elderly, frail patient group. In this article, the focus was on integrated care coordination by a multiteam approach with a hospital-associated prehabilitation model in high-risk, older patients undergoing surgery and anesthesia. Implementing perioperative geriatric assessment, prehabilitation, and rehabilitation results in significant improvements in functional capacity, psychological well-being, and QoL outcomes. Future delivery of quality patient-centered perioperative care requires implementation of preventive measures (counseling and screening) as outlined in many practice guidelines for optimal perioperative management of geriatric surgical patients.

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Conflicts of interest
There are no conflicts of interest.

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