

Preoperative evaluation in geriatric surgery: comorbidity, functional status and pharmacological history

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ABSTRACT

The demand for elective and emergency surgery by older patients is increasing. This review examines the current practice of preoperative evaluation in geriatric anesthesia and provides an overview of new insights in this field. Preoperative anesthesia consultation is essential to examine the patient, evaluate the operative risk and plan preventive perioperative actions. Chronological age probably represents an independent risk factor. Age should not be considered an exclusion criterion from surgery per se. More than 50% of patients over 70 years old suffer from one infirmity, and 30% suffer from two or more infirmities. Hypertension is the most common disease, followed by coronary artery disease, diabetes and chronic obstructive pulmonary disease. Aging processes, illnesses, malnutrition, difficulties in communication and comprehension, psychological alterations and social needs may coexist and overlap. Changes in pharmacodynamics and pharmacokinetics induced by aging make elderly patients very sensitive to drugs, especially those administered perioperatively. Drug underuse, misuse and abuse are described, together with criteria to manage perioperative medications. Disability, dementia and frailty are risk factors for adverse outcomes and delirium after surgery. Traditional anesthesia consultation captures only a small portion of the necessary information, especially about functional status and frailty. Although the association between older age and surgical complications is well known, most anesthetists and surgeons do not measure physical and cognitive function preoperatively. Extending anesthesia consultation to functional status provides useful information for preoperative counseling and planning of postoperative care. A strong joint action with the surgical team is essential. Currently, while many resources are employed to assess preoperative cardiac risk and despite the dramatic increase in the number of elderly surgical patients, the association between older age itself and surgical complications has not been fully investigated, and preoperative evaluation of functional status is not yet a part of routine preoperative practice. Creating a new culture and developing appropriate clinical, scientific and relational approaches to these patients represent the core of the challenge. (*Minerva Anesthesiol* 2011;77:637-46)

Key words: Aged - Geriatrics - Anesthesia.

In the last 50 years, the number of people over 65 years of age has tripled in the world. In Europe, they are expected to represent 30% of the population within 40 years. As a consequence, the demand for surgery by older and sicker patients is increasing.¹

The elderly population may present conditions that have long been known as factors of increased surgical risk, such as polyopathy, polymedica-

tion and disorders at the cellular level. Moreover, progress in technology and medicine in recent years has allowed a large number of elderly patients to survive illnesses. These improvements have consistently increased the number of vulnerable and frail patients presenting for surgery and have caused debates about surgical decisions in many cases. Although many surgical procedures can enhance the quality and duration of

life, even in the very elderly, the balance between the expected benefits and the risks of adverse events (such as cognitive disorders, infection or cardiac complications) determining unfavorable outcomes remains a key issue.

The term “elderly” refers to a person in which aging processes, illnesses, malnutrition, difficulties in communication and comprehension, psychological alterations and specific social needs may coexist and overlap, consistently affecting surgical outcome. The traditional anesthesia consultation, which is based on the ASA (American Society of Anesthesiologists) Physical Status Classification, clinical history and physical examination,² captures only a small portion of the information about these characteristics, especially information regarding functional status³ and frailty,⁴ which are pivotal elements in geriatric medicine.

A number of studies using functional status,⁵ which has been proven to predict mortality among older hospitalized patients, and Comprehensive Geriatric Assessment (CGA)⁶ as tools for preoperative evaluation have been reported in recent years.

This review examines the present status of the preoperative evaluation in geriatric anesthesia and provides new insight from recent literature in this field.

Aging processes, lifestyle, genetics and biological age

In the second century B.C., the Latin poet Publius Terentius Afer wrote “*Senectus ipsa est morbus*.”⁷ Although this statement was closer to the truth in that period than it is currently, it is recognized that aging coincides with progressive functional decline, limits physical performance and creates a condition of vulnerability toward aggression and reduced adaptation to stress.

Lifestyle and nutritional factors can strongly influence aging and contribute to disease development. Both aging processes and the effects of lifestyle seem to be modulated by biological and genetic factors. A common mediator involved in age-related diseases is inflammation. Inflammatory processes have been implicated in the genesis of cardiovascular disease, osteoarthritis, osteoporosis, Alzheimer’s disease, diabetes,

muscle wasting and frailty. Moreover, emerging evidence suggests that there is a symbiotic relationship between inflammation and age-related diseases such as cancer.⁸

Due to this high inter-individual variability, the elderly represent a non-homogeneous population and are difficult to catalog as a single group.

Chronological age is likely to be an independent risk factor in surgery and anesthesia, but due to statistical issues and the need for wide-ranging studies, its specific role as a risk factor is difficult to assess precisely. Nevertheless, there is general agreement that age *per se* should not be considered an exclusion criterion for surgery.

Biological age, which is the result of pathophysiological aging processes, comorbidity and genetic factors, seems to be more predictive than chronological age in defining the degree of fitness and performance of a given individual when facing health problems.⁹

Clinical history and comorbidity

More than 50% of the patients over 70 suffer from at least one infirmity, and 30% suffer from two or more. This feature, also known as poly pathology, indicates a condition where clinical patterns, evolution and treatment are more complicated than the simple sum of all illnesses, and a decreased capability to cope with stress and aggression coexists.

Hypertension, which affects 45-50% of the patients over 70, is the most common disease occurring in the elderly, followed by coronary artery disease (CAD) (35%). Other common conditions are diabetes (12-15%) and chronic obstructive pulmonary disease (COPD) (9%).

Three factors contribute to increased perioperative risk in elderly patients:¹⁰

1. progressive functional decline and reduced reserve capacity to compensate for impaired function or increased demand (functional disability occurs more quickly and takes longer to correct);

2. associated illnesses (e.g., pulmonary or renal) together with further limitation in baseline function and an altered neurohumoral response to stress (diseases may present atypically);

3. increased incidence of unexpected reactions to medications, anesthesia and surgery (outcomes are difficult to predict).

Preoperative consultation should occur several days before surgery to allow further investigation if needed. A full history and meticulous clinical assessment is required, especially for older and more compromised patients. Clear medical information about the surgical plan is essential. The collection of clinical history may be challenging due to patient sensorial impairment or cognitive deterioration. The presence of a relative or caregiver may be helpful in these cases. Laboratory testing is indicated by associated conditions and the surgical procedure involved; age itself does not justify extensive testing.

Cardiovascular disease

Cardiovascular disease (CVD) includes a history of myocardial infarction or CAD, congestive heart failure (CHF), angina, hypertension and conduction disorders. The cardiac performance of an elderly patient is the net result of physiological age-related changes occurring in the cardiovascular system and CVD. Stiffened myocardium and vasculature, blunted beta-adrenoreceptor responsiveness and impaired autonomic reflex control of heart rate are the most important changes that occur with aging.

Preoperative risk assessment should focus on three elements: the surgical risk for cardiac events after the procedure, patient functional capacity and risk indices.¹¹

Surgery elicits a stress response with increased myocardial oxygen consumption and alters the balance between prothrombotic and fibrinolytic factors. Vascular surgery is of specific interest due to both the higher risk of cardiac complications and the higher probability that the atherosclerotic process may affect coronary arteries. Laparoscopic procedures cause less tissue trauma, resulting in diminished postoperative fluid shifts related to reduced bowel paralysis, but the elevated intra-abdominal pressure reduces cardiac output and increases vascular resistance; therefore, cardiac risk in patients with heart failure is not diminished in laparoscopy compared

to open procedures.¹² The surgical risk of perioperative cardiac adverse events increases with urgency, magnitude, duration, blood loss and fluid shifts.

Preoperative determination of functional capacity (FC) is a pivotal step. FC <4 METs (*i.e.*, the ability to climb two flights of stairs) is associated with an increased risk of perioperative cardiac events. When FC is high, the prognosis is excellent even in the presence of stable ischemic heart disease. When it is poor or unknown, risk stratification should be made according to the presence and number of risk factors in relation to the risk of surgery.

Risk indices define the relationship between the clinical history and the risk of perioperative mortality and morbidity. Heart failure has been reported as the main risk index of perioperative complications, especially in the elderly.¹³

Table I reports an example of the use of the Goldman risk index in predicting cardiac outcome after surgery.

Preoperative noninvasive testing investigates left ventricle (LV) dysfunction, myocardial ischemia and valve abnormalities. LV dysfunction is investigated by radionuclide ventriculography, gated single photon emission computed tomography (CT), echocardiography or magnetic resonance imaging with a similar degree of accuracy. Stress echocardiography combines

TABLE I.—*Goldman Risk Index and expected risk of cardiac complication rate after surgery.*

Independent risk factors	Score
Third heart sound	11
Increased jugular venous pressure	11
Myocardial infarct within 6 months	10
More than 5 Premature Ventricular Contractions at the ECG	7
Premature Atrial Contraction or rhythm other than sinus	7
Age >70 years	5
Emergency procedure	4
Intrathoracic, intraabdominal or aortic surgery	3
Poor general condition	3

Pts scored 0-5: life-threatening complication = 0.7% death = 0.2%.
 Pts scored 6-12: life-threatening complication = 5% death = 2%.
 Pts scored 13-25: life-threatening complication = 11% death = 2%.
 Pts scored >26: life-threatening complication = 22% death = 56%.

information on LV function at rest, valve abnormalities and stress-inducible ischemia. Testing should be performed only if it changes perioperative management and in high-risk surgical patients with three or more clinical risk factors. However, cardioprotective therapy seems to be sufficient to preclude preoperative stress testing.¹⁴ Aortic stenosis (AS) is the most common valvulopathy in Europe, especially among older patients. Symptoms are a key for making decisions in cases of elective noncardiac surgery. In urgent procedures, intraoperative hemodynamic monitoring should be planned. Noninvasive monitoring techniques, such as esophageal Doppler ultrasound or impedentiometry, which have low or nonexistent complication rates, are of specific interest in the elderly.

Cognitive and sensorial impairment

Cognitive deterioration, from moderate cognitive impairment to Alzheimer's disease and severe dementia, represents a major health problem in aging societies. The prevalence of diagnosed cognitive disorders among people over 65 varies from 10% to 15%, depending on the information source. Postoperative cognitive disorders (POCD) are frequent after surgery (especially cardiac and vascular¹⁵) and are known risk factors of adverse long-term outcomes, longer hospital stays, increased costs, high risk of institutionalization after discharge and impaired quality of life.¹⁶

A preoperative mental status examination, together with careful investigation about risk factors, such as sensorial impairment (especially visual) anticholinergic medication, alcohol abuse and preoperative depression, should be considered for all geriatric surgical patients (Table II). The Mini Mental State Examination (MMSE) together with Geriatric Depression Scale (GDS) are the most frequently used evaluation tools, but a gold standard in preoperative cognitive screening has not been defined. Mental screening is also important in investigating a patient's ability to understand information about surgery and to give valid informed consent. However, there is no minimum MMSE score that allows a given patient to be considered as able or unable to give valid informed consent.

TABLE II.—*Risk factors for POCD in elderly patients.*

Age	
Male sex	
Cognitive status	<ul style="list-style-type: none"> – History of confusion – Dementia – Depression
Functional status	<ul style="list-style-type: none"> – Loss of autonomy – Falls
Sensorial status	<ul style="list-style-type: none"> – Hypovision – Presbycusis
General conditions	<ul style="list-style-type: none"> – Malnutrition – Dehydration
Intercurrent medications	<ul style="list-style-type: none"> – Anticholinergics – Benzodiazepines
Comorbidities	<ul style="list-style-type: none"> – Severe pathology – Polipathology – Neurologic disorders – Fractures, trauma – Renal/hepatic insufficiency

1 to 2 risk factors: moderate risk of POCD, no preventive strategy.
 3 to 4 risk factors: intermediate risk of POCD, nurse monitoring and active treatment if signs of agitation or confusion.
 More than 4 risk factors: avoid intense sensorial stimuli, nurse monitoring and active treatment if signs of agitation or confusion.

Although the risk factors for postoperative delirium are well defined, relatively few patients receive targeted intervention for prevention. In the presence of a high risk of POCD, a specific perioperative nursing strategy¹⁷ should be implemented to promptly detect and treat the mental disorder.^{18, 19} The impact of mental screening on perioperative management of elderly patients has not yet been defined; therefore, it represents a wide potential area of research.

Sensorial deficits are common in patients after the age of 60 years. The prevalence of presbycusis varies from 25% (in patients 65-75 years old) to 50% (in patients over 75 years old). Visual impairment due to cataract affects 50% of the patients over 65. Macular degeneration and glaucoma affect 14% and 12%, respectively, of the same group. Discomfort in oral communication and difficulties in understanding written information represent frequent challenges when approaching an elderly patient.

Chronic obstructive pulmonary disease

Aging reduces the capacity of all pulmonary functions due to a decline in thoracic elasticity, a weakening of respiratory muscles and a decrease

in both the alveolar surface and central nervous system responsiveness. The tendency of the lung to assume a larger volume and the stiffness of the thoracic cage modify all components of total lung capacity, with progressive decline in vital capacity and thoracic compliance. Pulmonary compliance also decreases, with collapse of the small bronchi and increased mismatch in the ventilation/perfusion rates. The respiratory responses to hypoxia and hypercapnia are reduced. The protective reflexes involved in coughing and swallowing are diminished, increasing the possibility of chronic pulmonary contamination with oral and gastric contents.

COPD is a very frequent condition in the elderly and is a recognized risk factor for post-surgical complications. Specific patterns are a rapid progression and association with heart failure,²⁰ especially in elderly patients, as a consequence of increased pulmonary vascular pressure and chronic hypoxemia.

Postoperative pulmonary complications (PPCs) are more frequent than cardiac complications; nevertheless, risk assessment for PPCs is frequently not performed, with the exception of cases of resectional thoracic surgery, where poor postoperative lung function not supporting an independent lifestyle contraindicates surgery. The reported risk factors for PPCs are COPD, age >64 years, smoking, NYHA Class II or higher, obstructive sleep apnea, malnutrition, sub-umbilical surgery, general anesthesia, duration of the operation and emergency surgery. In a sample of 1,055 patients, McAlister²¹ found 8 variables that were significantly associated with pulmonary complications, 4 of which were independently associated with PPCs (Table III).

Medical history should focus on smoking, occupational exposures, respiratory symptoms,

limited exercise capacity, pre-existing lung disease and infections.

Spirometry identifies patients who are not likely to survive after pulmonary resection and those who will not have prolonged survival after resection. In cases of patients undergoing other types of surgery, the usefulness of preoperative spirometry is questionable. A chest X-ray is usually performed in respiratory patients, but the results rarely affect perioperative management (1-4% of cases).

Serum albumin <3.5 g/L and BUN <8 or >21 mg/dL have been shown to be predictors of mortality and PPCs.²¹

Elderly patients with COPD are often inveterate smokers and obese; given their scarce compliance toward medical instructions, they are difficult to treat, especially as outpatients.²²

Diabetes

Diabetes mellitus (DM) affects 12-15% of the patients over 70, and its prevalence increases strongly with age. If the condition has been present for many years, the risks of complications, such as microvascular disease, dysautonomic neuropathy and CAD, are increased. Higher rates of unpredicted death, functional disability and chronic illness such as hypertension, cerebrovascular accidents and CAD often affect elderly diabetics.²³ Among older adults, diabetes alone results in a risk of cardiovascular mortality similar to that of established CAD.²⁴

Diabetic neuropathy is accompanied by increased risks of aspiration, orthostatic hypotension and urinary retention.

DM is an important risk factor for Alzheimer's disease and is related to a higher risk of cognitive impairment.²⁵ The association between diabetes and depression increases the severity of cognitive disorders.²⁶

Preoperative evaluation should focus on diabetes stability and sensitivity to the usual hypoglycemic therapy, cardiovascular and cognitive fallouts and dysautonomic neuropathy.

Older adults with recent onset of diabetes often do not exhibit the classic "3Ps" symptoms (polyphagia, polydipsia and polyuria). These patients may only suffer from falls, urinary in-

TABLE III.—Preoperative variables independently associated with occurrence of Postoperative pulmonary complications (PPCs).²¹

Variable	Odds Ratio	P
Age >65	5.9	P<0.001
Positive cough test	3.8	P=0.01
Perioperative nasogastric tube	7.7	P<0.001
Duration of anaesthesia >2.5 h	3.3	P=0.008

continence, fatigue, lethargy, weight loss and decreased cognition.²⁷ In the presence of such atypical symptoms, recent diabetes should be excluded before enrolling patients for surgery.

Functional status

Although the association between older age and surgical complications is well known and despite increasing evidence suggesting that impaired functional status (FS) is associated with poor postoperative outcome, most anesthetists and surgeons do not measure physical and cognitive function preoperatively, and routine preoperative evaluation of FS is performed by few groups.

FS is defined as the sum of behaviors that are needed to maintain daily activities, including social and cognitive functions.⁴ It determines the patient's ability to actively mobilize and attend to basic (BADL)²⁸ and instrumental (IADL)²⁹ activities of daily life by himself (Table IV). Scoring the number of abilities that are preserved, the patient's degree of independence can be assessed. An elementary way to roughly evaluate FS consists of observing patients when they enter the consultation room, asking them to sit, get up from the chair, walk around and sit down again, while computing the required time (Get Up And Go Test^{30, 31}).

In recent years, an approach to care for the elderly, called comprehensive geriatric assessment (CGA),⁵ has entered into routine use. Compared to the traditional monodimensional approach (which is centered on the health episode causing the hospital admission and focuses

exclusively on the reason why the patient requires care) CGA evaluates associated illnesses, mental and nutritional status, living circumstances, social support systems and polymedication.

The use of FS and CGA in the preoperative assessment of surgical risk has been studied by several groups. In a sample of 120 elderly patients undergoing thoracic surgery, Fukuse *et al.* reported that subjects who lack autonomy in performing BADLs and dementia were more likely to have complications, especially for long operation times.³² In another sample of 178 elderly patients, Kristjansson *et al.* found that CGA can identify frail patients who have a significantly increased risk of severe complications after elective colorectal surgery.³³ A study by the French Lung Oncology Group reported that CGA may help to initiate specific care plans for the management of lung cancer in the elderly.³⁴ A link between FS and surgical site infections was demonstrated by Anderson.³⁵ A more recent study found that CGA predicts postoperative mortality and post-discharge institutionalization.³⁶ Frailty was seen to be a risk factor for delirium after surgery.³⁷

Extending anesthesia consultation to FS evaluation requires a small amount of additional time (10-15 min) and provides useful information for both preoperative counseling about surgical risk and planning of postoperative care. As it is not unusual to observe *a posteriori* that a patient who developed delirium or physical decline postoperatively had cognitive or functional impairment that was not documented before surgery, information about the patient's ability to bathe, dress, walk, use the telephone and money, together with his/her mental and nutritional status and

TABLE IV.—*Basic and Instrumental activities of daily life.*

BADL		IADL	
Ambulating	1	Driving	1
Transferring	1	Preparing meals	1
Dressing	1	Doing housework	1
Eating	1	Shopping	1
Drinking	1	Managing finances	1
Personal hygiene	1	Managing medication	1
Taking medication	1	Using telephone	1

5 to 6 abilities maintained for each group: independence.

3 to 4 abilities maintained for each group: intermediate dependence.

1 to 2 abilities maintained for each group: total dependence.

BADL: basic activities of daily life; IADL: instrumental activities of daily life.

TABLE V.—Variables tested preoperatively in patients over 70 at the Department of Geriatric Surgery, INRCA – Italian National Research Centres on Aging (Ancona, Italy) and plan of perioperative actions.

BADL/IADL	If dependence more than moderate, alert for perioperative extra nursing
Mini Mental State Examination	If MMSE <20, alert for POCD preventive strategy
Geriatric Depression Scale	If score <13, alert for perioperative psychological support
Risk factors for POCD	If present 3 or more, alert for POCD preventive strategy
Mini Nutritional Assessment	If score <10, nutritional consultation and nutritional support when indicated
Need for psychological support	Provided in case of depression, loss of companion, loss of home
Need for social support	Provided in case of single person living alone or person living with disable companion

MMSE: mini mental state examination.

psychological and social needs, should become a routine part of the preoperative evaluation. This approach should also translate into effective preventive measures, such as intensive physical and occupational therapy, early postoperative mobilization, active prevention of delirium and perioperative nutritional support. Table V reports the variables that are tested at our institution as a part of anesthesia consultation and the actions that are planned postoperatively following this evaluation.

Strong joint action with the surgical team together with focused educational initiatives are essential to this approach. The data reported in the literature to date are not sufficient to establish whether this approach represents an effective method to stratify surgical risk and reduce the rate of postoperative complications and death in elderly surgical patients. However, we predict that it will be studied extensively and used in the near future.

To maximize the results of such an approach in the postoperative period, the established models of perioperative care should be revised, passing from the classical surgical wards, in which patients of different ages and baseline conditions are collected and whose care is managed by surgeons, to dedicated perioperative geriatric units^{38, 39} that are managed by anesthesiologists and geriatricians.

Pharmacological history

It is well known that elderly patients are great consumers of medicaments (3.9 medications/day for ages 65-80 years; 4.4 medications/day for ages over 80 years) and that adverse events related to drugs are the main reason for hospital

admittance (30%) in such patients. The more commonly prescribed medications are cardiovascular drugs (65%), followed by those acting on the central nervous system (41%).

Due to the changes in pharmacodynamics and pharmacokinetics induced by aging, elderly patients are very sensitive to the effects of drugs, especially to those administered perioperatively, when modifications in fluid balance and neuroendocrine modifications occur. This issue is of concern both in collecting preoperative documentation and planning anesthetic techniques.

Age-related changes and drug metabolism

Factors such as an increase in fatty mass, decreased muscle tissue and reduced total body water compared to younger subjects, together with age-related metabolic changes, increase the plasma concentration of water-soluble drugs and decrease the plasma concentration of lipid-soluble drugs.

A reduced serum albumin concentration and reduced hepatic blood flow cause changes in drug distribution and excretion. As a consequence of reduced hepatic clearance, there is an increase in the bioavailability of drugs metabolized during the first hepatic passage, such as midazolam, and an increased half-life of elimination with prolonged effects for drugs such as ketamine or propofol.

As a consequence of the reduced renal secretion, the glomerular filtration rate also decreases. This decrease causes reduced renal excretion of drugs and metabolites with risk of accumulation. Hypoalbuminemia together with reduced vascular compartment capacity cause increases in the early plasma concentration with increased effects of drugs.

Changes in pharmacodynamics cause a reduction in the consumption of anesthetics due to a depletion of neurotransmitters, reduced neuronal density and reduced innervation of skeletal muscles. A reduced cardiac index increases the induction time for intravenous drugs with an increased risk of overdose. A reduced baroreflex response causes reduced compensatory tachycardia with an enhanced hypotensive response to vasodilating drugs. Reduced alveolar exchanges cause discrepancies between tele-expiratory and plasma concentration of inhaled agents.

The elderly and medication

When collecting a patient's pharmacological history, it is important to remember that elderly patients often do not follow medical prescriptions. Moreover, the attitudes of both the general practitioner and the patient may induce a deficiency in an effective treatment (underuse), the use of drugs whose risks exceed their benefits (misuse) or the use of unnecessary drugs (overuse). Priebe *et al.* reported an increased incidence of perioperative infarction in elderly coronary patients compared to the general population that was related to the underuse of cardioprotective drugs such as ACE inhibitors or beta-blockers.⁴⁰

It has been reported that anticholinergic medications (such as antiemetics, antispasmodics, bronchodilators, antiarrhythmics, analgesics, antihistamines, antihypertensives, antiparkinsonian agents and ulcer drugs) are commonly prescribed to elderly patients (often with no concern about their association with cognitive dysfunction, no calculation to minimize dosage and no careful evaluation of the pros and cons of usage⁴¹). Inappropriate use of drugs acting on the CNS (such as benzodiazepines) is frequent and increases the risk of falls, confusion and cognitive deterioration.

One of the most debated questions is the perioperative use of beta-blockers. Current recommendations⁴² prescribe the maintenance of beta-blocker treatment in patients already receiving the drug and confirm the potential harm of acute beta-blocker withdrawal; patients with a history or findings of CAD who are undergoing vascular surgery probably benefit from perioperative beta-blockade. Specific data targeted on

advanced age are not available, and caution is mandatory in the elderly.

Angiotensin-converting enzyme inhibitors that are administered to control hypertension should be maintained perioperatively and withdrawn if they are prescribed to treat cardiac failure. Flecainide, which is used to prevent atrial fibrillation, should be withdrawn 24 hours before surgery and, if needed, reassumed postoperatively, due to its long half-life and risk of hypotension. Phytotherapy, which is frequently used by elderly patients to treat hypertension and diabetes, is not referred spontaneously in many cases. As it may cause alterations in coagulative processes and hypokalemia, its use should be ascertained prior to surgery.

An emerging group is represented by patients who received drug-eluting stents (DESs) in the previous 12 months. As data collected so far show that the risk of thrombosis is extended to one year in cases of surgery, these patients are maintained under double anti-aggregative medication (aspirin and clopidogrel) for one year after stent positioning. In cases of surgery, continuance of this treatment is mandatory. There is little evidence of increased surgical bleeding in noncardiac surgeries. No difference in transfusion requirements has been observed.⁴³

Conclusions

Elderly patients undergoing surgery and suffering from coexisting diseases will be increasingly frequent in the coming years.

Presently, although many resources are employed to assess preoperative cardiac risk, the association between older age and surgical complications has not been fully investigated, and preoperative evaluation of FS and CGA is not yet a part of routine preoperative practice.

Creating a new culture and developing appropriate clinical, scientific and relational approaches to elderly patients represent the core of the challenge. Extensive educational programs should be realized, aiming to introduce, in each anesthesia team, at least one anesthetist who has fulfilled the requirements of a specific core curriculum in geriatric anesthesia. Subspecialty educational courses should be created by universi-

ties, research hospitals and post-graduate schools of medicine.

Together with the promotion of dedicated educational programs, studies should be developed to answer the following:

— what is the gold standard of preoperative evaluation, and how does one appropriately weigh the complex interactions among physical and psychological aging processes, coexisting diseases, medications and stress responses to surgery and anesthesia?

— What is the best perioperative strategy to reduce complication and mortality rates, and what is the best model of care (possibly leading to perioperative geriatric units)?

Finally, ethical discussions on controversial aspects emerging from the possible mismatch between resources and results as well as cost and benefits analyses should be promoted and established in all countries and all cultural fields. Anesthesia teams, which are involved in both surgical operations and intensive care, make up the front line in facing this problem.

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