

Anaesthesia for the elderly patients and Techniques: preoperative assessment and evaluation, Peri and Post-operative care of the elderly patients' pain management

^{1*} Arunachala D Edukondalu, ² Yamuna Devi .V.R , ³ E.Prabhakar Reddy

^{1 & 3} Professor of Anaesthesia, Professor of Biochemistry, Bhaarith Medical college and Hospital, Affiliated to Bharath Institute of Higher Education & Research, Chennai, India.

² Consultant Microbiologist (Infection Control Department), Apollo Hospital, Chennai.

***CORRESPONDING AUTHOR**

Dr. Arunachala D Edukondalu,

Professor of Anaesthesia, Bhaarith Medical college and Hospital, Affiliated to Bharath Institute of Higher Education & Research, Chennai, India.

E-mail ID: drpebyreddy@gmail.com

Abstract

Elderly person of 80 years of age and older presents a specific challenge to anesthetists, who needs to acquire and maintain skill and expertise in the management of such patients. Departments should have a lead clinician with an interest in the care of the elderly. Development in anesthesia and operative techniques has considerably reduced morbidity and mortality in the elderly patients. Several anesthetic techniques have been used for elderly patients including general anesthesia, regional anesthesia, intravenous sedation and monitored anesthesia care. However, anesthesia related mortality in these patients is still high. All elderly patients undergoing surgical procedures require a preprocedural evaluation to assess the risks of anesthesia and procedure and to manage problems related to the preexisting medical conditions, monitoring patients during intra-procedural and post-procedural periods as well as post-procedural management. This article considers the age-related physiological changes, pre-procedure assessment and preparation, anesthetic techniques, intraoperative care and postoperative care. Age does not obtund the perception of pain. Acute and chronic pain management teams should be available to treat the elderly. Prophylaxis for Thrombo embolic disease should be initiated to prevent further complications.

Keywords: Anesthesia; Analgesia; Elderly, day surgery, Inpatient

Introduction:

Functional reserve and organ functions are normally decreased in the elderly patients. Morbidity and mortality rates after surgery in the elderly patients are significantly greater than the younger patients. Moreover, in-hospital adverse events and prolonged duration of hospital stay are commonly observed in these patients [1]. However, age itself is not a disease process but instead serves as a chance for developing age-related diseases. These adverse events could

bemimized by proper preoperative assessment, appropriate anesthetic technique and careful postoperative care.

The incidence of morbidity and mortality is high in elderly patients. Age is not a disease, but it increases the chance for developing age related diseases. Inadequate preparation and evaluation is common in these days, in over work and over crowded hospitals, especially for emergency cases.

In a review conducted for emergency procedures in the elderly patients, it was found that, incidence of correctable deficiencies in blood volume, electrolyte imbalance or oxygen delivery was demonstrated in 65% of the cases. People over 65 years of age have conventionally been regarded as elderly and this is still used as a social definition. For the purpose of this document the elderly are defined as over 80 years of age, based on physiological parameters. The older a patient is on presentation for surgery, the greater is their risk of morbidity and mortality.

Discussion:

It has been estimated that elderly people require surgery four times more often than the rest of the population, and that this number will increase by 25% by 2020 [2]. As this will happen in a context of limited resources and growing costs, it is foreseeable that there will be an increasing demand for outpatient treatments and an increasing pressure on surgeons and anaesthetists to operate in ambulatory settings [3]. This review summarizes current selection criteria, anaesthetic techniques and methods for peri and postoperative pain control in geriatric outpatient surgery.

This review of research on anesthesia for elderly patients first summarizes the normal physiologic changes that occur with aging, an overview that is essential to frame the discussion of research in the three sections that follow, on preoperative assessment, intraoperative management, and postoperative management of the older surgical patient. Postoperative respiratory complications and delirium are emphasized, and issues of acute and chronic pain management for elderly surgical patients are also highlighted. The goal throughout is to identify needed research in elderly patients' anesthesiology.

Selection criteria

Specific, evidence-based selection criteria for elderly outpatient do not exist, due to a lack of specific studies. Moreover, due to high interindividual variability, elderly represent a nonhomogeneous population and are difficult to catalogue as a single group.

Age and functional status

Age as independent risk factor is difficult to assess, due to statistical reasons and need for sufficiently wide studies. Nevertheless, there is general agreement that age as an independent risk factor for perioperative complications and death should not be considered as an exclusion criterion from surgery. In previous outpatient studies, age above 65 years did not predict unanticipated admission [4-5], but was associated with increased risk of intraoperative adverse events not affecting discharge [6]. In another study, age above 85 years, prolonged operative room stay, cardiovascular and cerebrovascular disease, and general anaesthesia have been found to be independent predictors of hospitalization and death after day surgery [7].

Biological age, which is the result of pathophysiologic ageing processes, comorbidity and genetic factors, seem to be more important than chronological age in defining the degree of fitness and performance of a given individual when coping with health problems [8]. Functional status [9], which has proven to predict mortality among older hospitalized patients, is the sum of behaviours that are necessary to maintain daily activities, including social and cognitive functions. Comprehensive geriatric assessment (CGA) is currently used by geriatricians to evaluate the degree of frailty in elderly patients.

Its use in preoperative assessment of surgical risk before cancer [10-12] and noncancer [13] surgery has been recently reported. It is foreseeable that such an approach will be extensively used in the future in preoperative evaluation of elderly patients. Even though routinely prescribed, preoperative laboratory testing is of little value, as its abnormalities do not predict outcome. As preoperative screening before cataract surgery, it has no relevance [14].

Social criteria

Availability of caregivers, which is usually ensured by relatives, can be lacking if the patient is older or lives alone. Social service availability varies considerably from one country to another. Patient comprehension, which is an important selection criterion for day surgery, can be altered or reduced due to sensorial deficits (visual, auditory) or cognitive impairment. As a consequence, patient information may become time-consuming and require specific skills and empathy. Willingness to undergo day surgery, which is influenced by psychological status and may swing between enthusiasm and fear, seems to be greater in individuals with higher educational qualification, working activity and availability of home assistance [15].

Pathophysiology of ageing

Physiological decline is a feature of normal ageing and takes place in all organ systems at a rate of ~1% function per year after 40 years of age. Fundamentally, there is a reduction in organ reserve, which limits the physiological response to stressors, including acute illness, anaesthesia and surgery. Functional decline of the cardiovascular, respiratory, renal, central nervous, haematological/immunological and musculoskeletal systems is of greatest concern peri-operatively, and may influence outcome from elective or emergency surgery.

Cardiorespiratory systems

The inevitable physiological changes that occur in the ageing cardiovascular system are associated with changes in the autonomic nervous system, resulting in reduced cardiac responsiveness to stress [4]. A reduction in the responsiveness of beta-receptors renders the older patient effectively 'beta-blocked', which limits the ability to increase cardiac output and to respond to fluid losses. Cardiac output is further limited by age-related reductions in cardiac compliance. Baroreceptor dysfunction and reduced responsiveness to angiotensin II further limit the response to hypovolaemia. These factors may be compounded by co-morbid myocardial ischaemia related to atherosclerosis, and consequent cardiac polypharmacy. Lung function declines with age due to loss of both lung and chest wall compliance, and oxygen diffusion capacity [4], more so if the patient has been a smoker. The closing volume increases, and ventilation/perfusion mismatch increases during tidal breathing when supine.

Together with an age-related decline in oxidative capacity, cardiopulmonary changes contribute to a decline in both oxygen uptake and oxygen delivery with age, rendering the

patient at greater risk of perioperative (myocardial and cerebral) ischaemia, resulting in poorer outcome.

Renal system

There is considerable variation in the decline of renal function with age, related to the nephrotoxic effects of co-morbidities (hypertension, diabetes) and drugs (particularly non-steroidal anti-inflammatory drugs and ACE inhibitors) [5]. Renal function affects the pharmacokinetics and pharmacodynamics of anaesthetic drugs, and therefore should be assessed routinely before elective or emergency surgery in elderly patients [6].

Central nervous system

Age-related decline in cerebral and cerebrovascular function contributes to the relatively high prevalence of postoperative delirium and cognitive dysfunction experienced by elderly patients, which delays discharge and ongoing functional recovery [7].

Haematological/immunological systems

Anaemia is common in the elderly (~10%), particularly within the surgical population, and of often unexplained aetiology possibly related to erythropoietin resistance and stem-cell ageing [8]. 'Immunosenescence' describes the multifactorial deterioration of the immune system with age that reduces the capacity to counter infection and heal wounds, and may contribute to the development of inflammation-mediated organ dysfunction [9].

Musculoskeletal system

There is a general decline in muscle volume and function that, together with arthritic and osteoporotic skeletal changes, increases the likelihood of fragility fracture requiring orthopaedic surgery, and of impaired rehabilitation after all types of surgery. Immobility contributes to a greater prevalence of thromboembolism and pressure necrosis [10].

Preoperative assessment and evaluation

A full history and thorough clinical assessment is required, especially in older and more compromised patients. Patients over 70 years suffer from at least one associated condition and in 30% of them comorbidities are two or more. Polypharmacy is common and may increase the risk for drug interaction. Compliance toward medications may be insufficient. Analgesics and drugs acting on central nervous system (CNS) may increase the risk of falls. As the risk of thromboembolic complication is increased, a proper preventive treatment should be prescribed.

As a principle, not compensated, poorly stabilized patients should be treated as inpatient, as they are at high risk of perioperative complications. Many studies indicate that the risk of perioperative complications after day surgery increases in the presence of pre-existing conditions, especially cardiovascular and respiratory, but little evidence supports correlation between outcome and coexisting disease.

Cardiovascular disease

Prevalence of cardiovascular disease (CVD) increases with age and it is estimated that in Europe 19% of men and 12% of women over 65 years have some degree of CVD [25]. Preoperative risk assessment should focus on three elements: the surgical risk for cardiac events

after the planned procedure, patient functional capacity and risk indices [16]. The surgical risk for day surgery procedures is estimated below 1%, but randomized controlled studies supporting this statement are not available.

Functional capacity should be more than four metabolic equivalents (METs), which corresponds to the ability of climbing two flights of stairs. In some elderly patients it may be difficult to evaluate, due to coexisting motor disturbances. Heart insufficiency has been reported as the main risk index of perioperative complications [17]. Heart failure more than mild-to-moderate excludes day surgery. Specific patterns of CVD in the elderly are the high prevalence, the increased risk for perioperative mortality in case of heart failure and the relatively high frequency of aortic stenosis. Patients who received drug-eluting stent (DES) in the previous 12 months need to be treated with double antiaggregative medication (aspirin + clopidogrel) and are formally excluded from day surgery during that period.

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is a very frequent condition in the elderly and is a recognized risk factor for complication after surgery. Elderly patients with COPD are often inveterate smokers and obese and, given their scarce compliance toward medical instructions, are difficult to treat as outpatients. Mucus hypersecretion, respiratory infection and cardiovascular comorbidity are prognostic risk factors which should be carefully evaluated before deciding to treat them as outpatients. Recent findings have emphasized the recurrent

association between COPD and heart failure in the elderly: in fact, due to increased pulmonary vascular pressure and chronic hypoxemia, patients with COPD are at increased risk of developing heart failure. The association between these conditions poses important diagnostic and therapeutic challenges [18].

Diabetes:

Diabetes affects 12–15% of patients over the age of 70. Elderly diabetic patients may need to undergo day surgery for skin ulcers, amputation and abscesses. The degree of diabetes stability and patient adherence to medical instructions are to be evaluated before accepting them as outpatients. Diabetic neuropathy is accompanied by increased risk of aspiration, orthostatic hypotension and urinary retention. Dehydration is common, especially in elderly diabetic patients. Risk-stratification, informing doctors, patients and their relatives/carers about the risks and benefits of having, or not having, surgery; Proactive identification and optimisation of modifiable risk factors, improving the likelihood of a successful surgical outcome [19]. Peri-operative risk' defines the likelihood of an adverse outcome resulting from surgery and/or anaesthesia, and represents the sum of risk related to both the surgical procedure and the patient's pre-morbidity and pathophysiological condition. Pre-operative assessment is more resource-efficient when targeted towards patients with higher peri-operative risk. Risk related to the surgical procedure: Observational data can be used to estimate the risk of adverse outcome after a range of surgical procedure, but is subject to operator and institution-specific variation [20]. Adverse outcomes are much more likely after emergency, rather than elective, surgery in older people [21]. Procedural risk may be reduced by using new surgical techniques, adapting perioperative pathways to include high dependency/intensive care, or by performing a less invasive operation in the first instance to permit patient stabilisation before definitive surgery [22]; • Risk related to the patient [23]: Age-related physiological decline, multi-morbidity and frailty are independently associated with increased perioperative risk. Pre-operative assessment of the higher-risk elderly patient, involving a structured multifactorial

approach [24], therefore, should be undertaken by both a senior geriatrician and a senior anaesthetist with specific subspecialty training in geriatrics (depending on resources and time available). It represents the minimum criteria for adequate pre-operative geriatric assessment specific to anaesthesia [25-27]. Geriatricians and allied health professionals properly assess other domains, such as social circumstances, within a comprehensive geriatric pre-operative assessment.

Organ-specific morbidity: Numerous guidelines are available concerning the peri-operative management of important co-morbidities, including diabetes, cardiorespiratory disease and anaemia. However, these should be tailored to suit the older patient, and may require more than one guideline, or conflicting guidance, to be taken into account, along with any adverse effects relating to over-investigation or extending polypharmacy;

- **Ischaemia:** Age and disease-related declines in physiological reserve render the older patient at risk of organ-specific and generalised ischaemia. The brain and heart have an absolute requirement for oxygen, with peri-operative ischaemia increasing the likelihood of cardiac and cerebral dysfunction. Intervention, therefore, should aim to reduce oxygen uptake (analgesia, thermoregulation, antibiotics) and improve oxygen delivery (oxygen, fluids, medication review, avoidance of hypotension and severe anaemia);

Anaesthesia techniques

In general terms, all anaesthesia techniques, from local to general anaesthesia, may be applied.

General anaesthesia

Depletion in neurotransmitters, reduced neuronal density and reduced innervation of skeletal muscles are induced by ageing and may cause reduction in anaesthetic drug consumption. Both reduced cardiac index (which causes increased induction time) and reduced baroreflex response (which causes reduced compensatory tachycardia) increase the risk for intravenous anaesthetic overdosing. Discrepancies between end-tidal and plasma concentration, which are due to reduced alveolar exchanges, may allow overdosing of inhaled anaesthetics. Changes in pharmacokinetics (reduced hepatic and renal flow, reduction in total body water) and pharmacodynamics (increased sensitivity to CNS depressant agents, reduction in minimum alveolar concentration with age by 4–5% per decade after 40 years) which can be observed in the elderly are related to ageing processes. These changes interfere substantially with the final action of anaesthetic drugs and increase their side-effects. Combining all these metabolic changes together with fast-track anaesthesia and day surgery may be challenging. Reducing dosage and carefully titrating drugs is essential.

Spinal anaesthesia

Age-related cardiovascular alterations, sympathetic block and consequent decrease in peripheral vascular resistance may produce intense hypotension and bradycardia together with potentially dangerous consequences in the case of reduced cardiovascular reserve. The risk of urinary retention, especially in men and/or diabetic patients, is known in elderly patients. Skeletal degeneration may increase technical difficulty. Specific patterns of spinal anaesthesia in the elderly are: reduced latency time, reduced cerebrospinal fluid (CSF) volume and increased density. These two last factors cause greater diffusion of local anaesthetics. Demyelination of nervous fibres also causes wider block extension.

Consequently, a 40% reduction in local anaesthetic dosage has been suggested [28]. Due to reduced volume and increased density of CSF, baricity of hyperbaric solutions is

reduced and they become 'less hyperbaric'. Increased risk of urinary retention and need for postoperative catheterization (40% of over 60s) after 2% hyperbaric prilocaine in ambulatory setting has been recently reported [29].

Postoperative care

It is recommended that all patients with a predicted peri-operative mortality of more than 10% should be admitted to a level 2 or 3 critical care facility [30]. However, the Working Party recognises that, although access to critical care should not discriminate on the basis of age, there is a chronic mismatch between the number of beds needed to satisfy the 10% recommendation and the actual number of beds available, with no imminent prospect of the number of beds increasing significantly in the UK. Pragmatically, therefore, the Working Party recommends that anaesthetists routinely risk assess older patients towards the end of surgery with regard to the level of postoperative care they require, discharging patients into critical care facilities if this is likely to reduce morbidity or mortality significantly, or if identifiable organ support is required.

Anaesthetists are instrumental in reducing the need for, or required duration of, postoperative care, through appropriate intra-operative management of anaesthetic drug administration, blood pressure, patient temperature, fluid therapy and analgesia. Despite optimum management, however, patient pathophysiology may demand critical care admission. If this cannot be provided immediately, then postoperative care should be provided in the postoperative care unit (PACU), to a critical care standard and by suitably experienced personnel. The Working Party supports the discontinuation of an operating list (if appropriate) if anaesthetic personnel are required to provide such care in PACU, until such time as the patient can be transferred for definitive critical care.

Assessment of fitness for discharge from PACU is the decision of the responsible anaesthetist, and should take into consideration the patient's vital signs, temperature, urine output, pain and cognitive status. Good documented communication is essential to ensure the continuation of appropriate postoperative care. The elements of good peri-operative care continue into the postoperative period, and are aimed at avoiding complications and re-enabling the patient. These include analgesia, maintenance of core temperature, fluid therapy and pressure care. Basic monitoring should be continued upon return to the ward, with all hospitals ensuring employment of Modified Early Warning Scores and provision of Critical Care Outreach teams [31].

Postoperative pain management

It has been demonstrated that postoperative pain after day surgery may last more than 3 days and affect quality of life for more than 7 days [31]. Organizational aspects such as clear instructions at discharge, availability of analgesic drugs and follow-up are key factors [31], especially in geriatric day surgery. Pain perception does not decrease with age. Fear of addiction or cognitive impairment may restrain patients in reporting postoperative pain. Dementia or aphasia may make it difficult to assess. Easy and simple pain scales should be preferred [32]. Multimodality combines different drugs with the aim of reducing doses and minimizing side-effects of analgesics.

Local anaesthetics play a pivotal role both alone (field block) and/or as a part of the anaesthesia plan. In both cases, it should be remembered that they have limited duration and

that only continuous catheter administration can protect against the reappearance of pain. Given the risk of catheter misplacement, misunderstanding about instructions and loss of sensitivity, patient compliance and level of comprehension (of the patient himself and of caregivers) should be carefully evaluated before deciding to use such techniques. NSAIDs are effective as single drugs only in the case of light-to-moderate pain. In the elderly, an increased risk of severe gastric complications in comparison to younger patients has been reported [33]. Hypovolaemia and dehydration, which are common in the elderly, may aggravate the risk of acute renal insufficiency following their use, especially in association with angiotensin-converting enzyme (ACE) inhibitors [34] and in a dose-dependent way [35].

Acetaminophen has few peripheral effects and no anti-inflammatory action, and is widely used due to its high safety profile. At the recommended doses of 4 g a day is usually excellently tolerated. Associations of acetaminophen and minor opioids have shown to be well tolerated in postoperative pain in the elderly. Opioids are often indispensable in case of major day surgery. Tramadol is well tolerated and effective and is indicated in the case of moderate-to-severe pain. Slowly titrating the dose is effective in reducing emesis. Confusion after its use has been reported in the elderly. Oxycodone, alone or in association with acetaminophen, is widely used in the adult population. A recent review has confirmed that oxycodone pharmacokinetics are age dependent and that careful and individual titration of the doses is necessary in the elderly [36]. Oxymorphone is a minor metabolite of oxycodone and has been recently introduced in the marketplace as oral opioid. Its use in the elderly has been recently reviewed, but it does not seem to have any particular advantages and should be used with the same level of attention of similar drugs [37]. Context-sensitive analgesia is a synergic approach to postoperative pain which considers the patient, the surgical procedure and the postoperative scenario. Ageing processes, comorbidity, intercurrent medication, expected pain, together with factors specifically related to 'that' patient (such as the presence of preoperative pain, education and compliance to instructions, troubles in swallowing tablets, etc.) are to be considered as a part of context analysis.

Aging is a universal and progressive physiological phenomenon clinically characterized by degenerative change in both the structure and the functional capacity of organs and tissues. In general, geriatric patients are more sensitive to anesthetic agents. Less medication is usually required to achieve a desired clinical effect, and drug effect is often prolonged. The most important outcome and overall objective of perioperative care of geriatric population, is to speed recovery and avoid functional decline.

Conclusion

The number of elderly patients undergoing day surgery will increase in the near future, due to clinical, epidemiological, social and economic reasons. This will bring new challenges for anaesthetists, surgeons and nurses operating in day surgery centres. Healthcare systems and social services will also be involved in the challenge. In the field of anaesthesia, the demand for advanced skills on perioperative management of elderly patients will make specific educational programmes mandatory. Future research should focus on development of specific selection criteria, minimally invasive surgical techniques and effective and well tolerated postoperative pain treatment. The quality improvement in assistance levels and

the development of telematic communication systems [44,45,46_] will lead to an extension of day surgery indications to the elderly.

Increasing numbers of elderly patients are undergoing an increasing variety of surgical procedures. Compared with younger surgical patients, the elderly are at relatively higher risk of mortality and morbidity after elective and (especially) emergency surgery. Peri-operative pain is common, but underappreciated, in elderly surgical patients, particularly if they are cognitively impaired. Anaesthetists should administer opioid-sparing analgesia where possible, and follow published guidance on the management of pain in older people. Elderly patients should be assumed to have the mental capacity to make decisions about their treatment. Good communication is essential to this process. If they clearly lack that capacity, proxy information should be sought to determine what treatment, if any, is in the patient's best interests. Anaesthetists must not ration surgical or critical care on the basis of age, but must be involved in discussions about the utility of surgery and/or resuscitation.

Elderly patients are exclusively vulnerable and particularly sensitive to the stresses of hospitalization, anesthesia and surgical procedure. No anesthetic agent or technique is unequivocally superior for all conditions or circumstances. Appropriate preoperative, intraoperative and postoperative management is needed of elderly patients. In addition, anesthesiologists must have knowledge of the physiological, pharmacokinetic and pharmacodynamic differences before they utilize their anesthetic techniques. An important principle must be kept in mind when dealing with an elderly patient: Aging involves a progressive loss of functional reserve in all organ systems, to variable extent. Compensation for age related changes is usually adequate, but limitation of physiological reserve is evident during times of stress such as the peri operative period.

References:

1. Kim KI, Park KH, Koo KH (2000) Comprehensive geriatric assessment can predict post-operative morbidity and mortality in elderly patients undergoing elective surgery. *Arch Gerontol Geriatr* 56: 507-512.
2. Naughton C, Feneck RO. The impact of age on six-month survival in patients with cardiovascular risk factors undergoing elective noncardiac surgery. *Int J Clin Pract* 2007; 61:768–776.
3. Etzioni DA, Liu JH, Maggard MA, Ko CY. The aging population and its impact on the surgery workforce. *Ann Surg* 2003; 238:170–177.
4. Fortier J, Chung F, Su J. Unanticipated admission after ambulatory surgery: a prospective study. *Can J Anaesth* 1998; 45:612–619.
5. Aldwinkle RJ, Montgomery JE. Unplanned admission rates and postdischarge complication in patients over 70 years following day surgery. *Anaesthesia* 2004; 59:57–59.
6. Chung F, Mezei G, Tong D. Adverse events in ambulatory surgery. A comparison between elderly and younger patients. *Can J Anesth* 1999; 46:309–321.
7. Fleisher LA, Pasternak LR, Herbert R, Anderson GF. Inpatient hospital admission and death after outpatient surgery in elderly patients. *Arch Surg* 2004; 139:67–72.
8. Demongeot J. Biological boundaries and biological age. *Acta Biotheor* 2009; 57:397–418.
18. Inouye SK, Peduzzi PN, Robinson JT. Importance of functional measures in predicting mortality among older hospitalized patients. *J Am Med Assoc* 1998; 279:1187–1193.

9. Audisio RA, Ramesh H, Longo WE, et al. Preoperative assessment of surgical risk in oncogeriatric patients. *Oncologist* 2005; 10:262–268.
10. Raynaud C, Le Caer H, Bourget I, et al. Comprehensive geriatric assessment and complications after resection of lung cancer. *Rev Mal Respir* 2010; 27:483–488.21._
11. Kristjanson SR, Nesbakken A, Jordy MS, et al. Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery for colorectal cancer: a prospective observational cohort study. *Crit Rev Oncol Hematol* 2009.
12. Robinson TN, Eiseman B, Wallace JI, et al. Redefining geriatric preoperative assessment using frailty, disability and comorbidity. *Ann Surg* 2009; 250:449–455.
13. Schein OD, Katz J, Bass EB, et al. The value of routine preoperative medical testing before cataract surgery. *N Engl J Med* 2000; 342:168–175.
14. Nardi M, Perri SG, Pietrangeli F, et al. The surgical needs of elderly patients in day surgery. *Minerva Chir* 2004; 59:61–67.
15. The Task Force for Preoperative Cardiac Risk Assessment and Perioperative Cardiac management in Noncardiac Surgery of the European Society of Cardiology (ESC) and endorsed by the European Society of Anaesthesia (ESA). Guidelines for preoperative cardiac risk assessment and perioperative cardiac management in noncardiac surgery. *Europ J Anaesth* 2010; 27:92–
17. Hammil BG, Curtis LH, Bennet-Guerrero E. Impact of heart failure on patients undergoing major noncardiac surgery. *Anesthesiology* 2008; 108:559–567.
18. Mascarenhas J, Azedevo A, Bettencourt P. Coexisting chronic obstructive pulmonary disease and heart failure: implications for treatment, course and mortality. *Curr Opin Pulm Med* 2010; 16:106–111.
19. American College of Surgeons National Surgical Quality Improvement Program/American Geriatrics Society. Optimal pre-operative assessment of the geriatric surgical patient.
20. Royal College of Surgeons of England. Emergency surgery. Standards for unscheduled surgical care. 2011.
21. Peden CJ, Grocott MPW. National Research Strategies: what outcomes are important in peri-operative elderly care? *Anaesthesia* 2014; 69(Suppl. 1): 61–69.
22. Stoneham M, Murray D, Foss N. Emergency surgery: the big three – abdominal aortic aneurysm, laparotomy and hip fracture. *Anaesthesia* 2014; 69(Suppl. 1): 70–80.
23. Carlisle JB. Pre-operative co-morbidity and postoperative survival in the elderly: beyond one lunar orbit. *Anaesthesia* 2014; 69(Suppl. 1): 17–25.
24. Partridge J, Harari D, Martin F, Dhesi J. The impact of preoperative comprehensive geriatric assessment on postoperative outcomes in older patients undergoing scheduled surgery: a systematic review. *Anaesthesia* 2014; 69(Suppl. 1): 8–16.
25. Martin F. Comprehensive assessment of the frail older patient.
26. Association of Anaesthetists of Great Britain and Ireland. Preoperative assessment and patient preparation. *The Role of the Anaesthetist*. 2010.
27. National Institute for Health and Care Excellence. CG 3. Preoperative tests. The use of routine preoperative tests for elective surgery. 2003.
28. Eledjam JJ. Rachianesthésie. *Encyclopedie Médecine Chirurgical* 1993; A10:36–324.

29. Kreutziger J, Frankenberger B, Luger TJ, et al. Urinary retention after spinal anaesthesia with hyperbaric prilocaine 2% in ambulatory setting. *Br J Anaesth* 2010; 104:582–586.
30. Royal College of Surgeons of England and the Department of Health. The higher risk general surgical patient. Towards improved care for a forgotten group. 2011.
31. National Institute for Health and Care Excellence. CG 50. Acutely ill patients in hospital. 2007.
32. Herr KA, Mobily PR, Kohout FJ, Wgenaar D. Evaluation of the faces pain scales for use with the elderly. *Clin J Pain* 1998; 14:29–38.
33. Zullo A, Hassan C, Campo SM. Bleeding peptic ulcer in the elderly: risk factors and preventive strategies. *Drugs Aging* 2007; 24:815–828.
34. Jolobe OMP. Nephrotoxicity in the elderly due to co-prescription of ACE inhibitors and NSAIDs. *J R Soc Med* 2001; 94:657–658.
35. Stillman MJ, Stillman MT. Choosing non selective NSAIDs and selective COX-2 inhibitors in the elderly: a clinical use pathway. *Geriatrics* 2007; 62:26–34.
36. Olkkola KT, Hagelberg NM. Oxycodone: new ‘old’ drug. *Curr Opin Anesthesiol* 2009; 22:459–462.
37. Guay DR. Use of oral oxycodone in the elderly. *Consult Pharm* 2007; 22:417–430.