Special Considerations of the Elderly Patient Requiring Anesthesia

By Pat Corey-Plett, R.N., B.N.

Abstract

Aging is a complex phenomena involving both anatomical and physiological changes. As the aging, or geriatric population increases we are faced with many of these patients having surgery. The risk of surgery for many elderly patients is complicated by chronic disease processes. It has been reported that more than 100,000 patients over 65 years of age die postoperatively each year. When adequately prepared, elderly patients can tolerate many types of surgery as well as younger patients. The success of these patients' perioperative experience depends on the knowledge and expertise of the entire perioperative team.

Objectives

This presentation will define the term Geriatric, identify the changes that occur with aging, and discuss the risk factors of this population when having surgery. The effects of drugs and the anesthetic management of the geriatric patient will be discussed.

Introduction

Who is the geriatric patient? They are very special patients requiring dedicated personal attention.

Why? This phase of life is where the body functions are slowing and perhaps declining. Preventative health care and conscientious nursing care is needed when they are ill.

Increasing numbers of elderly patients are presenting for surgery. Much of it is major surgery requiring lengthy and complicated operative and postoperative courses. Medicine and nursing are being faced with increasing challenges in anesthetic management of geriatric patients.

Definition

First of all we must define the term: *geriatric patient.* Definitions have changed over the years. In the early 1900s, 50 years of age and older was a contraindication for surgery. In 1937 reports indicated that 70 years or older was considered as elderly. For convenience, and our society's present standards, most physicians and authors define a geriatric patient as being 65 years of age or older.

In 1900 only 4% of the population was 65 or older. Today, 11% is older than 65 years of age. Due to lengthening lifespans it is estimated to grow to 13% by the year 2000. In the United States, 5,000 people reach the age of 65 everyday. Since 11-13% of our patients are geriatric it is important to understand how to care for their specific needs. It is further estimated that 50% of the geriatric population will have at least one operative procedure before they die.

Anatomical and Physiological Changes

Nevertheless more important than chronological age is the patient's physiological age. The aging process varies from person to person and from one organ system to another. People appear to reach their peak physiologic function in their late 20's or early 30's. From then on it's, in general, downhill decreasing approximately one percent per year.

With aging many body parts and systems show signs of wear and tear.

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Aging Tissues

An elderly body is 10% drier than a younger one. There is 5% less water constituting the total body weight. In younger adults, one/third of the water is extracellular and increases in relation to intracellular water as the body ages. There is also a decrease in salivation leading to a much drier mouth and tongue during laryngoscopy. The tissue is drier and wrinkles with aging due to less water and muscle mass in the body composition. Lean body mass (muscle) has been reduced approximately 10% and there is a simultaneous increase in total body fat by 10%, contributing to dehydration of the aging process. Due to their high lipid solubility, anesthetic agents will be stored in adipose tissue. This can lead to a delay in emergence of drugs to the circulation. Total body weight remains fairly constant through the aging process but metabolically active cells decline contributing to as much as 24% decrease in the Basal Metabolic Rate (BMR). A depletion of muscle mass and a more sedentary lifestyle account for the decreased BMR.

Thermoregulation

Due to the decreased BMR, heat production for the whole body varies inversely with age. Thermoreceptors in young skin are capable of discriminating 1°C. Skin thermoreceptors in the elderly cannot distinguish 2°C or greater temperature gradients. As well, concomitant disease processes can reduce input even further (e.g. Diabetes or strokes). Like the very young, the elderly possess a very narrow window of temperature around their thermal set point, even to the point of cardiovascular collapse. Autonomic control of cutaneous, or superficial, vasculature declines and vessels eventually fail to vasoconstrict. This creates more bloodflow to the surface and increases heatloss thereby lowering the core temperature quite quickly.

General anesthetics interfere with heatloss in the elderly by lowering their thermostatic setpoint ,which normally ranges 37 ± 0.4°C, as much as 2°C. Regional anesthetics (i.e. spinals and epidurals) cause vasodilation below the block creating more heatloss through cutaneous bloodflow. Above the block, the body normally compensates by vasoconstricting. This can create hypothermia into the recovery period. Hypothermia is defined as a core temperature < 36°C.

Aging delays the onset and the intensity of shivering thermogenesis. Shivering normally can increase heat production 200-600%. Shivering, however, is a late defense mechanism in which workload is increased and therefore, oxygen demand is increased. The modern operating suite acquires heat from the older patient by evaporation (skin prep, cool irrigant), conduction (in contact with cool surfaces), radiation (exposure) and convection (cool air currents). Radiation and convection are due to the increased efficiency of the air exchange systems, the temperature of the environment (no less than 21°C), and exposure. Conductive and evaporative losses are directly related to the procedure. Each litre of room temperature crystalloid intravenous solution robs the patient of 16 kilocalories. Each litre of 4°C blood product transfuses away double that amount in conductive heatloss. Larger than necessary areas of skin prepped, extensive soaking and visceral exposure increase the resting evaporative heatloss 30 times.

Consequently, older patients must be monitored for temperature change very carefully. Core temperature should be monitored intraoperatively by an esophageal temperature probe, foley catheter and or a pulmonary arterial catheter. Rectal probes are the next fair alternative. Admission and discharge temperature of the geriatric patient is usually lower than normal in the recovery room. Hypothermia leads to hypoxia and increased cardiac workload. It is very difficult to regain normothermia, therefore it is very important to maintain temperature intraoperatively. The workload created by postoperative shivering can be catastrophic to the aged.

The Brain

Atrophy of the brain's neurons begins following age 30 years. By the age of 80, the brain will shrink up to 85% of its original weight with one neuron dying every other second. The older brain (i.e. >65 years) loses its capacity to resist loss of consciousness, therefore the amount of drugs and inhalational agents must be adjusted accordingly. There is a reduced requirement for anesthetics due to a decline in CNS activity as well as a decline in fluid volume thereby increasing the amount of crossover from the blood-brain barrier. Confusion and disorientation along with hearing and sight loss can greatly affect the perioperative care of these patients. Familiarity with the nurses and physicians involved is helpful to alleviate some confusion. Transient disorientation can oc-

cur for several days following a general anesthetic. Acute brain syndrome, with impaired judgement and varying levels of consciousness, extending beyond one week postoperative occurs in 6-25% of the elderly. Older patients undergoing cardiac surgery are susceptible to postcardiotomy psychosis. There is also a 2% risk of perioperative Cerebral Vascular Accidents (CVA) or strokes. From the elderly population presenting, 5% have had one or more CVAs.

Cardiovascular

The cardiovascular changes associated with aging are perhaps of more importance to the anesthetist than any other physiologic change. Coronary artery disease must rank high in suspicion of your assessment due to our society and sedentary lifestyles. An enlarged heart is also common due to coronary artery disease not just the normal aging process. The gradual dilation of the ascending aorta with relaxation of the arch represents another morphological change. Hypertrophy of the left ventricle occurs. Heartrate does not change with age but may be affected by medications the elderly may be on. When there is an increased workload demand on the heart, the elderly cannot compensate as well due to aging receptors that trigger the heart to beat faster increasing cardiac output in stressful situations. The elderly are very dependent on maintaining blood pressure and heartrate for optimal filling. There is a delay in circulation due to a decrease in circulating volume per body surface area thereby delaying the effects of intravenous medications. Arterial stiffening and wall thickening occurs in the elderly. These changes lead to an increase in blood pressure. In normal aging most regard an excess of 160/95 mm of Hg as hypertensive. A mean pressure is decided upon and maintained intraoperatively.

Airway

The elderly patient's airway may be at risk for anesthesia. Often arthritic changes of the cervical spine can prevent hyperextension for optimum visualization.

Most elderly patients are edentulous. Loose, single peg-like or decaying teeth can pose a hazard for intubation with the threat of knocking a tooth out and lodging it within the airway.

During laryngoscopy it is not uncommon to find foreign material retained in the posterior pharynx. Airway reactivity or reflexes are less effective. This is important to understand since the risk of aspiration is greater due to a lack of protection of the airway.

Respiratory

Combined with chest wall rigidity there is thoracic kyphosis and spinal shortening which generates a barrel chest. Costochondral calcification stiffens the chest wall by decreasing movement between ribs with expansion. Lung capacity decreases with age. The alveoli are fewer and larger thereby decreasing surface area for gas exchange. The level of oxygen in the blood decreases 10-15% while the CO_2 remains the same. Oxygen utilization under stress decreases due to decreased perfusion and diffusion. There is, however, a high prevalence for COPD in the aged; as well as a higher incidence of postoperative atelectasis. Upon exhalation the amount of air that is trapped and not exhaled, expands with age. This volume is further exaggerated by the supine position, smoking, anaesthesia and surgery.

Gastrointestinal

Swallowing disorders (e.g. hiatus hernia) are common to the elderly. As well, as one ages the gastric pH rises allowing for more alkaline less damaging gastric contents; if aspirated. Delayed gastric emptying is a consequence of aging (they may be treated like a "full Stomach"). The use of Metochlopramide (Reglan) to alleviate gastric emptying can produce Parkinsonian characteristics. H_2 antagonists (Cimetidine) can exagerate some drugs' effects such as Propranolol, Diazepam, Warfarin, and Fentanyl. Ranitidine avoids these effects and is the drug of choice.

Hepatorenal

Hepatic bloodflow declines as much as 45 % with aging which is important when we realize that the majority of drugs are metabolized by the liver (e.g. Fentanyl, inhalational agents). There is therefore a delay in the clearance of these drugs. There is a decrease in production of albumin which is an important protein in extracellular fluid volume. An increased level of active drugs unbound to plasma proteins (e.g. barbiturates, local anesthetics and certain muscle relaxants) can result.This depletion causes edema and a decrease in cardiac output. The liver enzyme, plasma pseudocholinesterase, is decreased as well. This enzyme breaks down and eliminates local anesthetics and muscle relaxants such as Succinylcholine. Dosages should be adjusted with this in mind.

Changes in renal function influence other body physiology. Degenerative changes in renal circulation begin early. Renal perfusion decreases 1.5 % per year, which means that there is a 40-50% decrease by the age of 65 years. Creatinine clearance is the most sensitive indicator of renal filtration in the elderly. Dehydration poses a hazard, therefore urine output should be 1 ml/kg/hr in the perioperative period.

Obstruction is another problem in elderly men due to prostatic hypertrophy.

These changes reduce drug elimination and prolong levels in the blood and tissue.

Musculoskeletal

There is decreased muscle mass, strength and joint movement. Tremors often occur. Bones become brittle and easy to fracture. The team must handle the elderly patient very gently. Between the ages of 2-70 years there is approximately a two inch height reduction due to thinner intervertebral discs.

Perioperative Risk Factors

Chronic Illnesses

Nearly 90% of all older people suffer from chronic illnesses which are more than four times more prevalent in this age group. More often than not they have several chronic illnesses for which medications and treatments must be juggled. When acute illnesses arise in this population, there is a higher rate of complications and mortality.

The leading causes of death in the 65 years of age and over population are heart disease, cancer and stroke. From a study of 1,000 patients a list was developed of common preanesthetic complications for the geriatric age group. The first seven pertain to heart disease. Hypertension is first and is defined as a blood pressure greater than 160/90 mm of Hg. Hypertension is a risk for end organ failures. Patients may be more hemodynamically unstable in the perioperative period especially with intubation, fluid shifts and the emergency period where there is increased catecholamines from stress, pain and hypoxia. Elective procedures should be postponed until a hypertensive patient is well controlled and when the diastolic pressure is less than 100 mm of Hg. Hypertension, arteriosclerosis, cardiomegaly, congestive heart failure, cardiovascular accident, ischemia, myocardial infarction and angina can all lead to disastrous events if there is not a well thought out plan of management. Dehydration can lead to hypovolemia. Extra strain on the heart can cause cardiovascular collapse and infarction to name a few. The geriatric population is more prone to cardiac dysrhythmias and may have evidence of old myocardial infarctions.

Complication rates relate closely to the associated diseases with which the patient presents. Cardiac failure (15.8%) leads the perioperative mortality list, followed by renal failure (10.8%) and vomiting (10.1%) due to decreased airway reflexes and decreased gastric emptying in the geriatric population.

Confusion and lack of cooperation is a concern and can be attributed to many possible causes such as: electrolyte imbalances, cerebral hemorrhages (due to hypertension), increased blood levels of drugs from slowed release and clearance, and other conditions which may be exaggerated due to anesthesia (e.g. Alzheimer's). Changes in respiratory reserve can be related to extensive smoking or lung disease history with a morbidity and mortality rate as high as 40%. Many patients present with varying degrees of osteoarthritis. Mobility and extension of the neck can be affected as well as decreased vertebral spaces leading to difficulties with regional anesthetic techniques. Many may be on nonsteroidal antiinflammatory drugs (NSAID) which can affect platelet function and coagulation. Injury is common as well due to brittle bones and fragile tissue. Positioning requires close scrutiny.

ASA Physical status

The American Society of Anesthesiologists (ASA) physical status classification is not affected by patients' age but rather by the number and severity of pre-existent medical conditions. The ASA classification predicts with reasonable accuracy, the risks of elderly patients having anesthesia. One study showed patients with ASA class II resulted in a 10% mortality rate. Those in ASA class III increased their risk 10-15% and class IV to 20%. Complication rates per 1,000 anesthetics related to ASA physical status was studied, for elective versus emergency procedures. Not only does the higher the ASA score lend to higher risk but those of an emergency basis exaggerated the perioperative risk of complications and death.

Emergency Procedures

There is an increase in perioperative complications and death by 3-10 times in this age group when surgery is performed on an emergency basis. There is usually a delay in seeking health care until there is advanced pathology. There is little time controlling pre-existing disease or gathering a thorough preoperative history and significant lab data.

Surgical Diagnosis and Procedure

The condition which may have lead up to the surgical procedure may play a very important role in the anesthetic management. Diabetes Mellitus, for example may have predisposed a patient to amputation. Blood sugars need to be controlled and observed, as well as fluid volume and hypertension. The type of incision and location (e.g. radical neck or thoracotomy) can be very detrimental to quality management.

Pharmacokinetics/Dynamics

Approximately 25% of all drugs prescribed are consumed by the elderly. Eighty-five percent (85%) of all elderly individuals receive drugs. The rate of compliance, however, is only 50%. It is important to be familiar with the drugs your patients are on and how they might interact with other drugs. The most commonly used drugs are cardiovascular, antihypertensives, antiarthritics, analgesics and sedatives. The likelihood of adverse drug interactions is increased due to the types of medications the elderly may be on and the type of anesthetic management. The risk of drug interactions increases with age.

It is important to understand how drugs react in the body.

Pharmacokinetics is what the body does to the drug; how it is absorbed (uptake), distributed, metabolized and eliminated. *Pharmacodynamics* is what the drug does to the body; the half-life (T1/2 β) of the specific drugs and the relationship to protein and the percentage of body lipid to bind.

Lipid soluble agents, such as Barbiturates (Thiopental), Benzodiazepines (Diazepam or Midazolam) and Opioids (Sufentanil, Fentanyl) have an increased (T1/2 β) in the elderly since there is a decrease in protein available for binding and more fat cells than muscle to store and slowly release the drug.

A decrease in extracellular volume and body water increases the plasma concentration of drugs. Thiopental should be decreased 20-40% in the elderly. Benzodiazepines and Opioids should be titrated due to their profound effect.

Premedications are not always safe ideas due to their effect on respiratory function and the patient's level of orientation.

Many drugs the anesthetist gives are eliminated by the kidneys which are less functional in this age group (e.g. muscle relaxants such as Vecuronium).

The basic principles in prescribing and providing preanesthetic medications for the geriatric patient includes:

a) Evaluation of the need for drug therapy.
b) Obtaining a complete history of habits and drug usage. NSAIDs must be discontinued preoperatively, antihypertensives and other cardiac drugs should be continued up until time of surgery, etc. Orders may include preoperative aerosol treatments or intraoperative steroid coverage.
c) Understanding the pharmacokinetics / dynamics of the drugs.
d) Preoperative teaching for patient compliance.
e) Assessment of appropriate lab data such as Creatinine, electrolytes, and glucose. Follow-up with the family physician for past history and other investigations.

Anesthetic Management

No short-cut anesthetic regimen can be used for the geriatric patient because their physiologic condition and associated risks leave a very narrow margin of safety.

Monitoring

Basic monitoring includes pulse oximetry (i.e. O_2 saturation), end tidal CO_2 temperature, blood pressure and ECG. Monitoring should be individually assessed beyond the basic Canadian Anaesthesia Society (CAS) Standards. A five lead ECG should be used for all patients 65 years or older. For major surgical procedures, or those which will be lengthy, an intraarterial line may be inserted to monitor blood pressure more accurately, and obtain blood samples (e.g. blood gases). A CVP or Swan Ganz catheter may be inserted to monitor further hemodynamics and core temperature.

Fluid intake should be accurately assessed for that particular patient and replaced as necessary to prevent overload, hypovolemia or electrolyte imbalances. Urine output and bloodloss should also be assessed.

Intervention

Hypothermia can be prevented by warm blankets, headwraps, warmed gel pads, bloodwarmers, humidivents, and warmed irrigant.

Prevention of hypothermia, hypotension and hypoxia will reduce the incidence of confusion post operatively with a faster recovery from anesthetic agents.

Monitoring for blood sugar levels may be required.

Careful assessment of hypertension is crucial and a mean pressure as a goal intraoperatively.

Titration of drugs for desired effect and observation of alveoli saturation of inhalational agents is necessary.

Intervention

Preoperative aerosol, steroidal treatments and aspiration prophylaxis may be ordered. An awake intubation may be planned and/or the use of cricoid pressure.

Anesthetic Technique

Once a thorough assessment is complete the anesthetic technique is selected.

Regional anaesthesia is commonly the technique of choice in this population for several reasons. Dose requirements for regionals; as with generals; is reduced due to decreased CNS activity, less myelin sheath covering the neurons, a decrease in vertebral column height and therefore more rapid spread of the drug. Intravenous agents as well as inhalational anesthetics need to be adjusted due the aging process. The patient may have concomitant diseases that would increase their risk for general anaesthesia. There is less cardiorespiratory compromise with regional blockade as well as a faster recovery from the medications postoperatively allowing for a more oriented and cooperative patient. There is less bloodloss as well as less risk of emboli formation. Spinal anesthetics have been studied and show a decrease in mortality rates from deep vein thromboses (DVT) in hip surgery. Spinal and epidural techniques are ideal for hip surgery and transurethral prostatectomies, to name a few. The blockade can, however, cause profound hypotension and cardiovascular collapse. The anesthetist must be prepared for this possibility. Often these patients require intra-arterial blood pressure monitoring and a bolus of crystalloid (e.g. Ringers Lactate) intravenous solution preoperatively to prevent a hypotensive episode. Usually a vasopressor (e.g. Phenylephrine) is prepared and attached to the I.V. line for immediate availability for pressure control. Epidural anaesthesia has an advantage over spinals in that there is a more gradual blood pressure drop as absorption is slower than the spinal route. Temperature is important to maintain with regional blockade. A warm blanket to cover the arms is helpful.

In the disoriented or uncooperative patient, or when the surgical approach warrants, a general anaesthesia is usually the choice. Due to a decrease in cardiac output one can expect a delayed onset of action. Risks that have been mentioned previously; such as decreased liver and renal function, airway protection from aspiration, the need for higher oxygen content inspired, close hemodynamic monitoring, hypovolemia, hypothermia, etc... need to be prevented. Careful positioning and padding is essential for prevention of injury and tissue breakdown, as well as ongoing treatment and awareness of concomitant diseases the patient may have.

Postoperatively, delayed recovery from anaesthesia can occur. Hypoxia is common, therefore oxygen supplementation is necessary postoperatively. Continual reorientation will help alleviate confusion and uncooperativeness. Access to their hearing aids may be helpful. Assessment of their fluid balance and electrolyte levels will assist in evaluating their status. Shivering can increase oxygen demand and cardiac workload, therefore, Hypothermia should be avoided. Among the most frequent complications are those that are pulmonary in nature. Suctioning before removal of the endotracheal tube and oropharyngeal suctioning are basic methods of ensuring good air exchange. Tenacious sputum and atelectasis of the lung may still cause postoperative complications. Deep breathing and coughing is important, as well as frequent position changes. ECG monitoring should be done postoperatively, especially when there is a possibility of myocardial ischemia. Narcotics should be given with caution due to respiratory depression. Pulse oximetry can be utilized to monitor oxygen saturation levels. Early ambulation and mobilization should be encouraged to prevent DVTs in lower extremities and pelvic vessels and to decrease the incidence of pulmonary infection.

Conclusion

In conclusion, as the aging population increases our geriatric surgical population increases. Aging is an all encompassing multifactorial process that results in a decreased capacity to adapt. There is a gradual decline in bodily function which is affected by other disease processes that may be present. Optimal anesthetic management in the geriatric patient requires careful preoperative identification and correction of specific conditions, a thorough anesthetic plan tailored to the specific needs of the patient. The anesthetic plan should include prevention and management of postoperative complications. This plan is a collaborative effort of the entire perioperative team.

An understanding of the changes that take place in the elderly will allow for safe and individualized care. In turn we will contribute to increasing the lifespan of our society. We will help our patients to maintain their full physiologic function and as high quality lifestyle as near to the end as possible.**(Continued on page 33)**

Continuous Quality Improvement: A Staff Nurse Perspective

By Lynda Wilson, R.N.

As the cost of health care is rising and government funding is falling to an all-time low, hospitals are being forced to evaluate their overall environments. Hospitals are becoming more business-like and are assuming corporate attitudes. It is for these reasons that most health care institutions have made commitments to move towards a Continuous Quality Improvement philosophy. It is hoped that continuous evaluation of the processes will result in improvement in the quality of care to the customers. It is expected that this will eventually lead to lower costs through greater integration and less duplication of activities. This would then be in keeping with the key determinants of health and the principles of the new approaches to the provision of care as established by the Ontario Premier's Council on Health Strategy for establishing reforms in the health care system.

The overall goals include:

- to promote general good health, thus reducing the need for care services in institutions.
- to provide as much care as possible in households and communities.
- to restructure institutional care.

According to the Council this will be accomplished in part by:

- continuous quality improvement using quality assurance mechanisms.
- teamwork in everything.
- customer or patient satisfaction.
- a total quality approach.
- employee empowerment.
- automation.
- innovation by everyon.
- management by vision and values.
- strategic choices.
- developing core competencies (basic, minimal accepted skills).
- focus on the interdependencies in the organization (multidiscipline).

The St. Catharines General Hospital is no exception, in that commitments to quality have been made. During the past year, the administration of the hospital has committed a great deal of time and effort to establish a Continuous Quality Improvement Program (CQI) throughout the hospital. Unfortunately, the atmosphere which resulted from the many layoffs of staff and the job insecurity which has loomed over the staff of the hospital has hindered the pursuit of quality. This atmosphere no doubt is common to all hospitals in Canada. St. Catharines is also a community that has suffered the recession keenly.

It is my belief that the concept of CQI has within its program the means whereby these attitudes and fears can be overcome. In the process, the staff is challenged to make their own decisions about their jobs and to be accountable for those decisions. This will result with our hospital becoming a viable business, a happy place to work, and an institution genuinely pursuing quality care for its customers (the patients, their families, physicians, suppliers, staff and government).

In the Operating Room we have Team Leaders (Resource Nurses) in each specialty area. In addition,

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