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Perioperative Anesthetic Issues for Ambulatory Surgery

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Stem Case and Key Questions Content

Your hospital chairman has appointed you as director of the hospital's only freestanding Ambulatory Surgical Center. Recently a high number of unexpected hospital admissions from the center have raised concern. In fact, last year a patient suffered a serious complication after ambulatory surgery resulting in ongoing litigation and negative publicity for your ambulatory facility. As a direct result of this publicity, and in an effort to improve quality, patient selection for the ambulatory center has veered to a more 'defensive minded' approach. So much so, that the economic viability of the outpatient center is now in question. You have been given the opportunity to assess the situation and develop solutions for any problems.

- 1) As a measure of quality, what is a 'reasonable' rate of unanticipated admission for an ambulatory surgery center?
- 2) What are the rates of major morbidity and mortality after ambulatory surgery?
- 3) Are unanticipated admission and major M&M even the best benchmarks to measure 'quality' in ambulatory surgery?
- 4) What quality indicators, if any, should be collected for ambulatory surgery?

After discussions with your anesthesiology colleagues a number of issues arise regarding patient selection for ambulatory surgery. In fact the surgical, anesthetic, and nursing staffs all seem to have a differing view of what 'appropriate' patient selection means.

Some of the recurring patient characteristics that cause concern for your staff focus on the following groups:

- The elderly
- The premature or ex-premature infant
- The infant or child with an upper respiratory tract infection
- Coronary artery disease
- COPD
- Obesity
- Obstructive Sleep Apnea
- "Major" medical condition (ASA >3)

Some of the recurring surgical characteristics that cause concern for your staff focus on the following types of surgery:

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- Airway surgery
- “Long” operations
- “Invasive” surgery
- “Painful” surgery
- “Bloody” surgery

5) Are there any limits as to what patients or procedures can qualify for ambulatory surgery?

6) Is there any way to identify which patients are at higher risk for complication or unanticipated admission following ambulatory surgery?

7) What are, if any, the guidelines for ambulatory procedures involving patients with the aforementioned conditions?

8) Rather than the aforementioned surgical characteristics, what is a more current, or ‘state of the art’, approach to selecting appropriate surgical procedures for ambulatory surgery? You decide to spend a few days exclusively in the Ambulatory PACU to get a good idea of all that goes on and the problems that can occur. It quickly becomes apparent that there is a significant variation in clinical practice amongst attending anesthesiology staff in basic areas such as PONV prophylaxis and analgesic regimens.

9) What are, if any, the treatment guidelines for PONV/PDND and perioperative analgesia? Finally, the hospital has asked you to review and if necessary revise discharge criteria and discharge instructions for ambulatory surgery patients.

10) What are the discharge criteria for ambulatory surgery patients? Do any patients need to drink before discharge? Do any patients need to void before discharge? What systems do you need in place for outpatient peripheral nerve blocks/catheters?

11) What is the incidence of postoperative cognitive dysfunction? When is it safe for ambulatory surgical patients to resume driving?

Model Discussion Content

Over 70% of elective surgery in this country is done in an ambulatory setting. The main goal of the post-anesthesia care unit (PACU) is to discharge patients quickly, efficiently, and safely. It is often considered a ‘failure of the system’ if a patient is admitted after outpatient surgery. For ambulatory surgery to be successful patients require appropriate preoperative screening, anesthetics must have an adequate recovery profile, and systems must be in place to manage common complications.

What is a ‘reasonable’ rate of unanticipated admission for ambulatory surgery depends on both the patient population and the surgical procedure. National standards are lacking. Rates from <1% to greater than 10% are reported (1, 2). Admissions can be grouped into 4 broad categories:

- Medical - due to complications from pre-existing conditions
- Surgical - due to direct complication or from pain or bleeding

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(ENT, General Surgery, and Urology tend to be consistently over-represented)

- Anesthesia - due to aspiration, post-operative nausea and vomiting (PONV), or somnolence
- Social - due to lack of escort or long distance from home

Major complications in ambulatory surgery are rare, a classic study by Warner et al. reported a 0.07% (1:1366) incidence of major morbidity and mortality (M&M) within one month of ambulatory surgery (3). In 2007, using a New York State database, Fleisher et al. reported a 0.002% (1:49,012) incidence of mortality after ambulatory surgery (4). Comparing the relative risk of office-based surgery vs. freestanding ambulatory surgery centers (ASC's) vs. outpatient hospital facilities is difficult due to inherent selection bias in most studies. A claims analysis of Medicare beneficiaries from 1994 to 1999 found the 7-day mortality rate to be 25 per 100,000 procedures (0.025%) for ASC's, 35 per 100,000 procedures (0.035%) for office-based, and 50 per 100,000 procedures (0.05%) for outpatient hospitals (5). Similarly, when Vila et al. reviewed outcomes of procedures performed in physician offices vs. ASC's they found an adverse incident rate of 5.3 per 100,000 procedures (0.0053%) in ASC's and 66 per 100,000 procedures (0.066%) for office-based procedures. Prospective studies are lacking and these rate-based quality indicators do not standardize for case-mix complexity. Overall, the risk of major morbidity and mortality is very low for ambulatory surgery.

With the advent of ambulatory surgery centers in the 1970's, patient selection was generally limited to short surface operations on otherwise healthy (ASA I) patients. Today, the envelope has been pushed significantly to include ASA III and IV patients for a wide variety of surgical procedures. The decision to proceed with ambulatory surgery is often based more on practitioner or institutional preference and practice patterns rather than more definitive measures of quality or safety. Patient selection for ambulatory surgery typically involves some non-empiric consideration of surgical risk, anesthetic risk, and patient co-morbidity.

What then are the best measures of quality for ambulatory surgery? Given the low rate of major M&M, quality and patient safety programs need to consider more than outcome data. Quality indicators related to structure and process measure quality indirectly but given the multi-dimensional aspects of 'quality ambulatory surgery' it is useful to assess many different domains. Perhaps most importantly, quality indicator data must be risk adjusted in order to make valid comparisons across varying health systems. Misguided attempts at quality can drive the system in unintended ways and actually impede access to ambulatory surgery by making practitioners avoid certain cases and/or patients.

Efforts are underway to gather more data regarding quality of care in ambulatory surgery. Current 'standards' for ambulatory surgery depend on your accrediting body. The 3 major bodies are:

- The Joint Commission (JCAHO)
- Accreditation Association for Ambulatory Health Care (AAAHC)
- American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF).

Outcome data required for accreditation include unanticipated sequelae within 30 days of procedures: unplanned admission, unscheduled return to OR, complications (bleeding, infection, injury, etc), cardiorespiratory problems, allergic reactions, patient/family complaints, equipment malfunction, and death.

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In 2012, the Centers for Medicare and Medicaid Services (CMS) initiated an Ambulatory Surgical Center Quality Reporting (ASCQR) Program. Data reporting is required for procedures where Medicare is the primary or secondary payer. The program is voluntary, although ASCs that do not participate may receive a 2% reduction of their annual payment update .

In 2013, the ASA Committee on Ambulatory Surgical Care and the Task Force on Office-Based Anesthesia updated their 2003 recommendations on outcome indicators for office-based and ambulatory surgery. The ASA House of Delegates approved the recommendations on October 16, 2013. Overall, the committee encouraged states to develop legally privileged incident reporting systems. A sampling of recommended outcome indicators included: cancellation rates and reasons, new neurological deficits, need for narcotic or benzodiazepine reversal agents, unplanned transfusion, pulmonary aspiration, pulmonary embolus, local anesthetic toxicity, anaphylaxis, unplanned hospital admission, wrong site regional anesthesia, and cardiopulmonary arrest or death. Other quality indicators included: cardiovascular complications requiring treatment (hypertension, hypotension), respiratory complications requiring treatment (asthma), uncontrolled nausea, uncontrolled pain, delayed discharge - any reason, medication error, and incidence of common sequelae such as sore throat, muscle pain, or headache.

Reasons for “Unanticipated” Admission after Ambulatory Surgery

The most common complications of ambulatory surgery include pain, postoperative nausea and vomiting (PONV), postdischarge nausea and vomiting (PDNV), cardiovascular problems, respiratory problems, sore throat, headache, drowsiness and confusion (12).

Pain is the most common cause of admission after outpatient surgery. Orthopedic surgery, general surgery, and plastic surgery patients have the highest incidence of significant postoperative pain. Aggressive pain management with a multi-modal approach to therapy is probably the best way to handle these cases (13). Outpatient peripheral nerve catheters may be an effective component of a multi-modal analgesic plan. However, a successful program may require additional resources to ensure proper patient education and adequate on-call availability for telephone or inpatient consultation (14).

Nausea and vomiting, although generally not life threatening, are definitely a hindrance to patient comfort and discharge. PONV is most often associated with female sex, past history of PONV, nonsmoker, and the use of postoperative opioids (15). Surgery associated with PONV includes intra-abdominal, gynecologic, laparoscopic, breast, eye and ENT surgeries. Again multi-modal therapy is best for patients at high risk of PONV. This includes 5HT³ receptor antagonists and dexamethasone (16). Palonosetron and neurokinin 1 antagonists may have a role in treating PDNV beyond that of more commonly used and less expensive options (17). Common cardiovascular problems in the ambulatory surgery population include hypertension, hypotension, and dysrhythmias. These are most common in people already suffering from cardiovascular disease. More significant cardiovascular complications such as ischemia or cardiac arrest are rare (18).

Respiratory complications are associated most commonly with obesity, older age, abdominal surgery, long procedures, use of neuromuscular blocking agents, and airway obstruction during emergence. For *inpatient* surgery, COPD may double the risk of pneumonia and patients with a low FEV₁ (<50%) have an increased risk of postoperative respiratory events (19, 20). For

ambulatory surgery there is little evidence of increased risk of postoperative respiratory events (although selection bias complicates review of the literature). The face validity that symptomatic patients or those with COPD exacerbations should not undergo surgery is apparent. Cigarette cessation (>4 weeks) may help reduce the risk of respiratory and wound-healing complications. Overall, a high index of suspicion and immediate treatment of hypoxemia help to prevent long-term sequelae.

Patient Selection for Ambulatory Surgery

Overall, determining which patients are appropriate for ambulatory surgery is not always straightforward, as the literature is often contradictory or silent on numerous issues (18, 22). The ultimate decision rests with the medical team: anesthesiologist, surgeon, OR staff, and recovery room staff. All members of the team must be comfortable with their role and possible complications must be anticipated with systems in place for appropriate management. Two recent studies by Fleisher et al. attempt to stratify the risks of inpatient admission and death after ambulatory surgery (4, 5). For patients > 65 years of age, factors that were independently associated with inpatient admission or death within 7 days of surgery include:

- Age > 85
- Prior inpatient hospital admission within last 6 months
- Invasiveness of surgery
- Surgery at physician's office or outpatient hospital (as compared to ASC)

The second study examined inpatient admission after ambulatory surgery and a novel index for elevated risk of admission was developed. In this study the overall risk of inpatient admission was 0.09%. A scoring system included:

- Age > 65 = 1 point
- OR > 120 minutes = 1 point
- Any cardiac diagnoses = 1 point
- PVD = 1 point
- Cerebrovascular disease = 1 point
- Malignancy = 1 point
- HIV = 1 point
- General anesthesia = 2 points
- Regional anesthesia = 1 point

If >4 points were documented the risk of inpatient admission increased to 2.8% (odds ratio 32) (4).

Extremes of Age:

Elderly

Whether age is an independent risk factor for admission after ambulatory surgery is a contradictory topic in the literature. Age may be a marker of co-existing diseases or an independent risk factor that increases risk of complications or admission - evidence is building to demonstrate that age > 65 is an independent risk for unanticipated admission and age >85 is an independent risk for death (4, 5). Chung et al. found patients > 65 years old, ASA III, and undergoing either general surgery or urology procedures had the greatest risk of unanticipated admission.

Ex-premature infant

A major concern for ex-premature infants undergoing surgery is the risk of apnea. Anemia,

gestational age, and post-conceptual age (PCA) predict the risk of postoperative apnea. The literature (and hospitals) varies on whether 40, 56, or 60 weeks PCA is a safe threshold regarding postoperative apnea monitoring (23, 24). Many ASC's have a '1 year rule' but this is not evidence based. Obviously a major caveat for this special patient population is that the surgical center, physicians, and nursing staff must be comfortable caring for these patients. The adequate length of postoperative monitoring and whether regional or general anesthesia influences outcome in this population is not completely understood (22).

Child with upper respiratory infection (URI):

URI places children at an increased risk of respiratory 'events' particularly when general anesthesia and an endotracheal tube is used. Airway events include obstruction, transient desaturation, breath holding, cough, and possibly laryngospasm. Whether this has an impact on outcome is debated. Inexperienced anesthesiologists are also purported to be an independent risk factor for laryngospasm. A four-week delay is recommended for a child with an URTI presenting for elective surgery (22).

Coronary Artery Disease (CAD):

American College of Cardiology/American Heart Association guidelines should be followed to stratify risk and determine appropriate preoperative testing for patients with CAD (25). A past history of heart failure or hypertension may predispose patients to intraoperative events such as arrhythmia or intraoperative hypertension. Newer guidelines for patients with myocardial infarction treated with coronary stents (bare metal or drug eluting) suggest that elective procedures should be avoided in patients while they continue on antiplatelet therapy of aspirin and clopidogrel (Plavix) (26).

COPD:

The effect of COPD or asthma on risks during ambulatory surgery is not fully known. Some studies suggest asthmatics or smokers are at elevated risk of events such as bronchospasm but overall these respiratory events do not lead to significant increases in morbidity or mortality.

Obesity:

A body mass index (BMI) >30 increases the risk of respiratory complications such as desaturation and bronchospasm (22). Neck circumference rather than BMI may be a better predictor of difficult intubation. Overall, as an independent risk factor, obesity does not increase the likelihood of unplanned admission after ambulatory surgery. Obese patients should not be excluded from ambulatory surgery based on BMI alone.

Obstructive Sleep Apnea (OSA):

OSA increases the risk of difficult intubation and may also increase the risk of postoperative hypertension, desaturation, and airway obstruction (29, 30). Despite this there is evidence that OSA does not lead to an increase in unanticipated admission. Severity of sleep apnea, type of surgery, and requirement for postoperative narcotic analgesics are important determinants as to whether the OSA patient should be routinely admitted or discharged home after surgery. Whether it is appropriate for patients with OSA to undergo ambulatory surgery is controversial. Some studies show high risk OSA patients have very low risk of complications. In 2012, the Society for Ambulatory Anesthesia (SAMBA) published a consensus statement on preoperative selection of adults with OSA for ambulatory surgery (33). For patients with known OSA, SAMBA recommends optimization of co-morbid conditions and compliance with CPAP. For patients with

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presumed OSA, SAMBA recommends optimization of co-morbid conditions and postoperative pain management predominantly with non-opioids.

Eligible Procedures for Ambulatory Surgery

A wide variety of surgical procedures are successfully performed in the ambulatory setting including neurosurgery, vascular surgery, thoracic surgery, and major orthopedic surgery. What constitutes the 'limit' with respect to case selection is vague but obviously depends on practitioner and facility experience, previously documented safety record, and the following criteria:

- Ability to manage postoperative pain with regional or oral analgesia
- Employ minimally invasive surgical techniques
- No ongoing blood loss or need for intravenous fluids
- No hospital based postoperative care/observation required
- Overall low risk of complications

Discharge Post-Ambulatory Surgery

The modified Aldrete criteria and the post-anesthetic discharge scoring system (PADSS) are the two most common discharge scoring systems (34). Both evaluate 5 parameters to assess safe transfer or discharge. The modified Aldrete assesses activity, respiration, blood pressure, consciousness, and oxygen saturation. The PADSS assesses vital signs, activity, PONV, pain, and bleeding. As with any scoring system, some high risk patients may be overlooked and this may mandate different requirements in selective situations. Mandatory fluid intake before discharge does not change outcomes in adults while for pediatric patients it increases PONV. Voiding before discharge is not mandatory for low risk patients. Risk factors for postoperative urinary retention include: old age, male sex, spinal or epidural anesthesia, surgery > 60 minutes, intraoperative fluids > 750 ml, and type of surgery (anorectal, hernia, vaginal, pelvic). Postoperative cognitive dysfunction (POCD) has been termed a deterioration of cognition temporally associated with surgery. To contrast with postoperative delirium, POCD is subtle in onset, lasts for weeks to months, and is characterized by impaired attention and normal consciousness. POCD is usually reversible but can be long lasting. Detecting POCD depends on valid assessments of pre- and post-operative cognitive function. When elderly patients (>60) were assessed after minor surgery the 7-day incidence of POCD was 6.8% and at 3 months it was 6.6%. Age greater than 70 years and inpatient surgery rather than ambulatory surgery were risk factors (36). Ward et al. found that cognitive function is minimally impaired after ambulatory surgery. A small but statistically significant effect was found 3 days after general anesthesia but not with local anesthesia.

It is safe to resume driving 24 hours after surgery (38).

Conclusion

Overall, ambulatory surgery is extremely safe. The types of surgery done in the ambulatory setting will continue to expand and challenge the limits of care. Determining appropriate patients for ambulatory surgery is not always straightforward. The literature is often silent or contradictory. Research has identified certain patients that are at higher risk of unanticipated admission. The most common causes of admission are pain, bleeding, and PONV. Standardized discharge criteria may not apply in all cases. At risk patients need to be identified and systems must be in place to manage complications. All staff members must be comfortable with their role to ensure quality care.

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