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Ambulatory surgery in the '90s

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Ambulatory surgery is on the increase. As with any new development, there are issues of appropriate utilization and patient safety. This article reviews some of these issues and presents a framework for evaluating the effectiveness and quality of modern ambulatory surgery.

Key words: Safety; assessment; anaesthesia; patient management

The spectacular growth and development of ambulatory surgery in the past decade can hardly go unnoticed. Indeed, it is generally agreed that 50–60% of all surgical procedures are being done on an outpatient basis and the developments in minimally invasive surgical procedures may push this figure even higher. Our surgical forefathers would stand in awe at these changes. The time spent in a health care facility for a patient undergoing cataract correction including intraocular lens implant has decreased by two orders of magnitude; from an old standard of 10 days (2400 h) to 4 h, which is now a reasonable stay. Cholecystectomy as a same-day procedure – unthinkable 15 yr ago – is relatively common today. Many procedures previously requiring hospitalization, even for a few days, are now done on an outpatient or ambulatory basis.

Given this remarkable evolutionary development, the Pre- and Post-Operative Care Committee of the American College of Surgeons, in the Fall of 1991, decided it was time to explore this phenomena. The Committee's deliberations led to structuring a postgraduate course on ambulatory surgery presented at the Annual Clinical Congress in October 1993. This article summarizes some of the important issues presented and discussed there; it is a synthesis of the ideas and concepts of many individuals.

Four major areas were discussed in lecture, debate, panel discussion and audience interactive question and answer sessions. The latter, a most interesting adjunct to the educational experience, will not be explored further here.

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The areas of discussion were:

1. Preoperative assessment of the ambulatory surgery patient
2. Anesthesia and analgesia for ambulatory surgery
3. Patient management in ambulatory surgery
4. Quality assurance in ambulatory surgery

A matter of definition

With technological and economic pressures rising, the definition of ambulatory surgery appears to be in flux. In general, the expectation is that the patient will return home that day, without an overnight stay. Technically, this definition excludes recovery centers and 23-h admissions, important for purposes of describing and comparing facilities and outcomes. Clearly there are economic considerations for institutions, regulatory bodies, third party payors and patients related to the definition. This discussion is about those patients who go home after an ambulatory surgical procedure, usually without an overnight or 23-h stay. The economics will not be discussed, as that is a subject worth exploration unto itself. Economic aspects of specific patient evaluation and risk assessment will be noted.

Preoperative assessment

The critical and overriding issue in ambulatory surgery must be patient safety. Selecting patients for surgical procedures in this setting is a crucial process. Overall in this setting there are few valid predictors of patient risk. Moreover, the factors that result in significant morbidity or the occasional mortality are themselves difficult to identify. How, then, is it decided that a given patient is an appropriate candidate for ambulatory surgery?

The process is multifactorial and indeed multidimensional. Just because a procedure can be done as an out-

Table 1. Essential points to consider – decision making in ambulatory surgery

Patient history
Diabetes, bleeding disorder, smoking, alcohol intake
Possible pregnancy, previous surgery, previous anesthesia, family history of malignant hyperthermia
Current medications
History of steroids, history of anticoagulants, diuretics, digoxin, non-steroidal anti-inflammatory agents, antidepressants, chemotherapy
Age
Extent of systemic physiologic compromise
Renal, pulmonary, liver, cardiovascular
Expected blood loss
Physical exam
Airway assessment, scoliosis

Table 2. Stratification of surgical procedures – ambulatory surgery

Category A
Non-invasive with minimal blood loss (< 250 ml)
Endoscopic procedures, skin, eye, subcutaneous or superficial lymph tissue
Minimal risk, independent of anesthesia
Category B
Invasive procedures with mild blood loss (< 500 ml)
Laparoscopic procedures, hernia repairs, arthroscopy, invasive biopsy, tonsilectomy, dilatation & curettage, extensive cosmetic surgery, hand reconstruction
More invasive procedures or those for which patients will require a prosthesis or significant postoperative care are generally excluded.

patient procedure does not mean it should be done as one. To minimize risks, an appropriate patient evaluation is necessary and then an active decision made concerning the patient's risk in an ambulatory setting. In the preoperative evaluation, appropriateness of setting, type of anesthesia and duration of procedure are scaled against the patient's overall health status, presence of intercurrent disease, the planned procedure, and home support systems. This process remains very much an art; to the general credit of the medical profession there are few reported problems. Whether an innate conservatism works to minimize risk or a very good screening process is in place is not clear. If there was a predominant general theme in the presentations, it was the lack of objective data to address the safety of ambulatory surgery.

Stratification by the American Society of Anesthesiologists (ASA) physical status classification alone is questionable. This evaluation tool was not designed for use in an ambulatory surgical application. There was a general belief amongst the faculty and audience that ASA I and II patients had surgery at free-standing sites while the slightly more physiologically deviated patients, ASA III and IV, were treated in hospital-associated facilities. The latter presumably because of a perceived increased risk for an untoward event necessitating admission. On this issue, there is a paucity of data which limits and thus constrains a meaningful discussion. The economics of 'skimming' low risk patients to free-standing sites was noted but not explored. Ambulatory surgery was performed at a hospital site by 74% of the attendees; 59% did not have access to a free-standing facility. Of note, 85% said they would use a free-standing site if they had access to one.

If patient safety is the objective and minimizing risks the primary tactic, what tools and aids are available to assist in the decision making? Elements considered helpful are listed in Table 1. Patient factors and planned surgical procedure, including site, are primary determinants of risk. A stratification schema for ambulatory surgical procedures is shown in Table 2, after Pasternak[1]. Calculating risk is a complex process using elements of history, physical examination findings, and appropriate laboratory tests to make the assessment.

Because of significant system-wide functional and economic implications it seems reasonable to develop a rationale for an effective and appropriate use of preoperative laboratory testing. Key factors to consider are noted in Table 1 with emphasis on patient age, sex, underlying physiologic status, presence of chronic disease and acute illness superimposed on the baseline state. The timing of the preoperative studies is also a factor and in some instances performing certain tests (e.g. UA, H/H) is actually part of state regulatory facility licensing.

The timing of preadmission testing (PAT) with respect to ambulatory surgery requires comment. For low-risk 'healthy' patients, few could argue with doing them on the same day, possibly preceded by a nurse-conducted telephone survey. For patients with significant intercurrent disease – diabetes, heart disease, COPD, chronic renal failure – an earlier interview (7–10 days before planned surgery) may be more appropriate to assess stability. Even then, some tests must be done on the day

Table 3. Preoperative testing schema – general-regional anesthesia

	HGB/Hct	*PT/PTT platelets BT*	*Electro-lytes*	*BUN creatinine*	*Liver function*	*CXR*	*ECG*	*Glucose*
Neonates	×							
All women	×						> 50 yr	
Male > 65 yr	×						> 40 yr	
Cardiovascular disease				×		×	×	
Pulmonary disease						×	×	
Hepatic disease		×			×			
Renal disease	×		×	×				
Bleeding disorder		×						
Diabetes			×	×				×
Smoking history	×					×		
CNS disease			×	×			×	×
Anticoagulant use	×	×						
Diuretic use			×	×				
Digoxin use			×	×				
Chronic steroid use			×					×

of surgery to assure patient safety: a blood glucose on a diabetic or a serum potassium for patients with renal failure or on diuretics. These studies establish a baseline for that day, an essential element in determining whether discharge criteria have been met.

In surgery and anesthesia there is a need to address the issue of appropriate preoperative laboratory testing, independent of site. That test ordering has been changed from general to specific is well documented[2]. Although a dollar savings was demonstrated, an unpredictable cost was identified: justified tests were omitted along with unwarranted tests. The authors argued that the net change was not beneficial. The analysis points out the need to define an algorithm or a system that matches patients and needed tests.

Truly 'healthy' patients probably need no preoperative laboratory screening[3]. Site specific, few ambulatory surgery patients are 'healthy'; an argument can be made that preadmission testing should be selective and undertaken only for specific indications[4,5]. If one accepts necessary laboratory tests as part of risk assessment and the establishment of baselines as being important, it is possible to identify specific tests which could be used for the majority of patients. The first consideration with respect to which tests should be performed is related to the anesthetic proposed. If general or regional anesthesia is proposed, a more extensive list of required tests is used compared to procedures done with only local anesthetics or monitored anesthetic care, see Table 3.

Certain variables are considered when dealing with children; blood tests are often not required. One should always consider the possibility of the presence of an infection – upper respiratory or urinary tract – around the time of a proposed elective procedure. A good history is essential to exclude such a possibility. As patient safety is the critical issue, rescheduling to minimize the risk of a concurrent infection is not unreasonable. This principle is generally applicable to the population as a whole; our pediatric surgical colleagues have educated us by placing a greater emphasis on it.

The demographics

With more ambulatory procedures being done on sicker patients, it seems reasonable to consider the demographics of the population with respect to concurrent and intercurrent illness. Natof[6] showed a significant incidence of pre-existing disease present in the ambulatory surgery population as a whole. Hypertension, asthma, renal and heart disease, obesity, diabetes, central nervous system disease, liver disease and allergies head the list. Given a population with significant illness it makes sense to screen for problems and, if identified, correct them before elective surgery, implement appropriate measures to minimize the risks or perform the procedure on an inpatient basis.

Is age a limiting factor for ambulatory surgery?

As the population ages the question of an age limit for ambulatory surgery becomes obvious. Few would argue that older patients have a higher incidence of concurrent illness and less physiologic reserve, increasing their risk. The real question is whether age in itself is a limiting factor. Aging is a naturally occurring phenomena with a normal scenesence of physiological processes. The effects may be manifest as little functional impairment or exaggerated because of an intercurrent/concurrent disease. Scenesence may thus limit physiological reserves so that the stress of a surgical procedure places excess demands and the physiologic response mechanism cannot respond, resulting in untoward or unexpected outcomes. Obviously, with significant underlying disease the responses may be further blunted[7]. It is reasoned that physiologic status is a more appropriate measure of a patient's ability to respond to a surgical procedure than chronological age. There are few outcome predictor systems available and those generally used risk assessment tools (e.g. ASA classification) were not designed for the ambulatory environment. In addition the events they predict for inpatients are infrequent in the ambulatory

surgical population. Mortality in ambulatory surgery is so rare an event[8] that it should be considered random and perhaps age- and population-independent. There is insufficient data to identify cause because of the infrequent nature of the event. Whether mortality by itself is an adequate measure of quality of care or a quality assurance measure in an ambulatory surgical environment can be argued.

The patient's ability to undergo the proposed procedure, with the chosen anesthetic is the issue of risk assessment; that assessment is based on an appreciation of the underlying physiology and not age alone. How to minimize the risk is the question. The basic elements of history, physical exam, screening tests and disease-directed laboratory tests are critical elements of the risk assessment process.

Table 4. Reasons for admission after ambulatory surgery – unplanned

	n
Nausea and/or vomiting	20
Pain	20
Cardiac problems	17
Airway difficulty	7
Wound and/or bleeding	19
Iv antibiotics	3
Urinary tract problems	7
Control diabetes	5
Other	11
Bigger procedures	3
Unable to ambulate	2

Anesthesia

There remains an assumption on the part of the population in general and some elements of the medical profession specifically that ambulatory surgery has less risk than the same procedure done as an inpatient. To some extent this may be true. Moreover, there is a perception that general anesthesia is to be avoided and procedures done under 'local' are less stressful and therefore better for the patient. With improved anesthetic and surgical techniques and methods for appropriate patient assessment it seems reasonable to question these assumptions.

In reality, straight local anesthesia is rarely practised. Indeed, if a case could be performed using this technique alone one could question the validity of using an ambulatory surgery site. Procedures done under local anesthesia are nonetheless anxiety provoking and can be associated with catecholamine release, inducing vasoactive responses potentially harmful to a patient. Any number of commonly used antihypertensives or psychotropic agents temper this response, potentially increasing patient risk by eliminating a protective reflex.

The most likely ambulatory surgery scenario is monitored anesthesia care (MAC) where intravenous sedation or an anxiolytic is used in conjunction with local infiltration, field block or regional anesthesia (e.g. axillary block, bier block, ankle block, etc.). Few would argue that a calm relaxed patient is a prerequisite for performing an efficient procedure; there will be fewer interruptions to deal with patient restlessness. However, MAC requires skilled personnel and the ability to convert, rapidly if necessary, to a general endotracheal anesthetic technique should the conditions require it. This is a low frequency-high impact event, a good quality measure; there is no hard reference data addressing this event. When the audience was asked if it was possible to screen patients for low frequency significant events, 82% of attendees felt they could.

Modern general endotracheal anesthesia and the pharmacopeia available for dealing with the immediate side effects make it a safe choice for many ambulatory surgery patients. In many ways general anesthesia affords a better, more accurate and therefore safer level of physiologic control, especially for patients with significant cardiopulmonary disease when compared to local anesthesia. General anesthesia is a safe and effective technique in ambulatory surgery. Obviously, this statement does not endorse its use for endoscopy or similar procedures as the practice standard there is iv sedation and pain medication.

Can this patient go home?

Another element in the risk assessment equation is defining post-procedure stability. If unstable, an admission may be required. It is generally agreed that the unplanned admission rate for ambulatory surgery, as previously defined, is 1–2%. This is certainly a low incidence event and its frequency may or may not reflect the quality of care provided by the surgeon and/or facility.

To appreciate the extent of the unplanned admission problem the incidence and knowledge of precipitating causes is needed. Then, working backwards, if one could identify a population at risk for admission following a procedure, that information could be used to effect a more appropriate scheduling. There is scant data available in the literature on the magnitude of this problem. Data from my institution was analyzed to determine the frequency of admission and the reasons for unplanned admissions to obtain a perspective on the problem. In the period from May 1990 to September 1993 we did 5000 cases per year in our hospital-based surgicenter; there were 90 unplanned admissions in this time. By broad category the reasons for admission are shown in Table 4. All urinary tract problems occurred in males; four were over 70 years of age. Cardiac problems occurred in 12 women and five men; 11 of the 17 were over 70 years of age. All of the diabetics were ophthalmology patients and four were under 50 years of age. Admission for pain was required by 12 women and eight men. This brief analysis has some interesting observations. Looking at the distribution of reasons by type it would appear that older women are represented in the pain and cardiac area more frequently than men. Diabetes admissions for control of blood sugar were younger patients, no doubt representing their basic underlying instability.

Obviously a more refined analysis on a much larger,

more sophisticated scale is required. The fact remains that even these events are infrequent. It will require a major multicenter trial really to identify the patients at risk. Nonetheless, these early emerging patterns could be helpful in guiding those efforts directed at early risk identification. The missing piece is the number of patients treated as inpatients who could have been treated as outpatients; the current selection process may be effective.

Ideally, discharge criteria should be established to assure a minimum of unplanned admissions and a minimum of admissions within 24 h of ambulatory surgery; two potential measures of quality. As the 23-h admission creeps into wider application, the data becomes fuzzy and more elusive. Absolute definitions of ambulatory surgery and its variations are necessary to avoid a semantics game while providing the ability to compare appropriate populations.

What then are the discharge criteria for ambulatory surgery?

The issue of when to discharge a patient home is not very complex and really very practically oriented. If the patient has stable vital signs relative to preoperative values that morning, is able to ambulate, void, and feed him/herself, discharge is reasonable. It is often said that the ability to lift the emesis basin to the mouth is an additional criteria. Management of pain in the immediate perioperative period is a critical factor. Judicious use of local anesthetic agents in the wound if possible is helpful. Excessive pain after reasonable doses of medication is a major cause for admission following ambulatory surgery; it is usually a preventable event but other reasons must be identified.

It should go without saying that a proper home environment with support is critical for discharge. Clearly most patients cannot drive themselves home; it is highly desirable to have another individual at home at least for the first night. The use of a Visiting Nurse Association (VNA) or other professional groups can perhaps extend this criterion with caution. Assessment of the home support environment, transportation, and other social and societal issues should be done prior to scheduling or at the latest at the time of PAT.

Perioperative analgesia

This is a topic unto itself with respect to differences in approach and concept. It is difficult to do it specific justice in the space provided so only a few principles will be noted. As in the management of perioperative pain for inpatient surgery, it helps to prepare the patient with early discussions of expectations. Then, it is crucial to keep ahead of the pain by (a) using local long-acting injectable anesthetics, and (b) having the patient begin to take pain medication before the pain becomes significant. The latter is generally accepted by directed dosing of pain medication at specific intervals and not on a 'prn pain' basis for at least the first 24 h. The first dose should be timed to the expected loss of effect of local anesthesia to maximize the benefit.

Narcotics, synthetic narcotics and various non-steroidal anti-inflammatory agents make up the bulk of anodynes used. Non-steroidal agents are used when bleeding risks are minimal or when the risk of a post-procedure bleed with hematoma is minimal. The addition of acetaminophen to a synthetic narcotic (opiate) is reasonably effective. However, a number of patients have gastrointestinal upset with non-steroidal agents or codeine and most do not appreciate the constipating effect of this class of pharmocologic agents.

If patients can be kept reasonably comfortable with respect to pain and the expected pattern of pain explained this is generally not a problem area. Any acute, significant, not-easily-explained pain in the perioperative period demands investigation.

Postoperative follow-up and evaluation

Because there are no patients to see the concept of postoperative rounds in the traditional sense has been replaced by other modes of communication directly with the patient, or through other care providers. Clearly a physician is responsible for the decision to discharge from a postanesthesia care unit (PACU) after ambulatory surgery. A physician need not personally examine the patient to determine appropriateness for discharge, if discharge criteria approved by the facility's medical staff are in place and have been rigorously adhered to by the nursing staff. This decision is not at all unilateral and is based on input from the operating physician, nurses and anesthesiologists as part of the process. Postoperative rounds are then by phone and/or through the use of VNA-like organizations as needed. The surgeon should call patients the evening of surgery to assess status and answer any questions. Similarly, the nursing staff and anesthesiology staff should call within 12–24 h to see if any problems have arisen. Depending on the surgical specialty, follow-up may be scheduled daily or in a week or at other perceived appropriate intervals. To assist in the follow-up and to minimize office visits, changes in surgical technique may have been implemented, such as the use of clips and/or subcuticular closure.

As patients do not usually return to the site for follow-up, there is some concern that anesthesiologists do not have the opportunity to see the outcome of their efforts. This is a real problem with no obvious solution. The next day call is one step in resolving this dilemma. Indeed, the same can be said of teaching institutions where surgical residents often do not have the opportunity to follow ambulatory surgery patients because of office logistics.

Q/A issues

If one assumes ambulatory surgery is safe, effective and even economical, how does one proceed to assess the quality of care provided by the surgeon and the system? This topic is quite real, for pressures to reform health care costs are driving more and more procedures to the

outpatient arena in the absence of well-defined outcome measures. One popular measure of quality is the unplanned admission rate and to an extent, taken broadly, it may indeed reflect quality. To be a really useful measure more analysis is required, including patient stratification criteria and risk assessment. Moreover, although the ASA classification is not a good risk predictor for the setting – or, more appropriately it has not yet been demonstrated to be effective – it may be one of the few standard patient classification references that allows comparisons across sites and patients. Significantly, many free-standing units tend to do ASA I and II patients, while hospital-based facilities tend to be the site for more ASA III and IV patients. If one is to compare sites for quality, and relate the outcome evaluation to cost, these variables must be considered. When institutions care for the same group of patients, an effective comparison of outcome and cost is possible. Once again, the rational reduction is to create a patient classification schema that affords the ability to accomplish this goal. That effort must, of necessity, be multidisciplinary to be effective.

Are there limits for ambulatory surgery?

If one considers that the length of stay for cataract surgery has decreased by two orders of magnitude over the last 20 years and cholecystectomy is routinely a 1-day stay or an outpatient procedure, the possibilities seem limitless. Driven largely by technology, but also various economic pressures, our ability to perform surgical procedures more effectively has grown rapidly. The only issue left to raise is one of propriety: should we be doing these procedures on an outpatient basis? Just because we can does not automatically mean we should for every patient. There are still inherent risks that need to be considered. Moreover, in some cases advances in technology have caused new surgical techniques to be accepted without the benefit of scientific clinical trials. These are exciting times in surgery and anesthesia. There are many challenges that lie ahead. Assuring safe and efficient ambulatory surgery is one of the most critical and we must all work to accomplish that objective.

References

1 Pasternak. Admission Patient, Welcome Trends in Anesthesiology 1991; **9**; 3–11
2 Macario A, Roizen MF, Thisted RA, et al. Reassessment of pre-operative laboratory testing has changed the test-ordering patterns of physicians. *Surg Gynecol & Obstet* 1992; **175**: 539–47
3 Narr BJ, Hansen TR, Warner MA. Pre-operative laboratory screening in healthy Mayo patients: Cost-effective elimination of tests and unchanged outcomes. *Mayo Clinic Proc* 1991; **66**: 155–9
4 Golub R, Cantu R, Sorrento JJ, Stein HD. Efficacy of pre-admission testing in ambulatory surgical patients. *Am J Surg* 1992; **163**: 565–71
5 Velanovick V. The value of routine pre-operative laboratory testing in predicting post-operative complications. A multi-variant analysis. *Surg* 1991; **109**: 236–43
6 Natof HE. Complications associated with ambulatory surgery. *JAMA* 1980; **244**: 1116–18
7 Amaral JA, Greenburg AG. Surgery in the elderly. *Problems in Gen Surg* 1988; **5**: 296–308
8 Warner MA, Shields SE, Chute CG. Major morbidity and mortality within 1 month of ambulatory surgery and anesthesia. *JAMA* 1993; **270**: 1437–41