Considerations for Patient Selection and Procedures in Ambulatory Surgery

HIGH LEVEL EXECUTIVE SUMMARY
Despite the many benefits of ambulatory surgery, there remain inherent risks associated with any surgical care environment that have the potential to jeopardize patient safety. This document provides an overview of the preoperative steps that should be completed to ensure appropriate patient selection for ambulatory surgery settings. In conjunction, it identifies several physiologic stresses commonly associated with surgical procedures, in addition to potential postoperative recovery problems, and provides considerations for how best to minimize these complications.

TABLE SUMMARY

Provider Qualifications	1. Board Eligible or Board Certified by appropriate member of the American Board of Medical Specialties for the specific procedure
	2. Licensed properly by State medical board

History and Physical Examination (HPE)	1. A complete preoperative History and Physical Examination serves several important purposes. a. First, the findings determine the patient's suitability for a given procedure(s). b. Second, the preoperative HPE provides baseline information to assist the medical team in interpreting their possible findings while monitoring the patient intraoperatively and postoperatively. c. Finally, the findings help to determine the most appropriate facility setting and timing of the planned procedure.

Age or Frailty	1. Physiologic age or Frailty is more important than Chronologic Age in determining surgical risk. Compared to Non-frail patients of advanced chronologic age, Frail patients experience a multi-organ system physiologic decline that is associated with increased risk of Post-Operative Cognitive Dysfunction, surgical complication and discharge to skilled nursing facility.

Social support	1. Social support is a key pillar of success in surgical patients, especially those patients that are going home. Every patient will recover differently from surgery and it is important to have a reliable person

	to receive postoperative instructions and to help supervise and assist with care in the first 18-24 hours.

BMI	1. Optimize airway and respiratory management
	2. DVT prophylaxis
	3. Screen for and anticipate concerns from co-morbidities
	4. Screen for drug-drug interactions
	5. Decrease or eliminate use of opioids

OSA	1. Careful selection of opioid and anesthesia
	2. Consider prolonged post-operative monitoring of patient

Past history of cardiac disease or related symptoms?	1. Possibility of increased risk of morbidity. 2. Consider pre-operative risk assessment or evaluation by a cardiologist.
Prior history of cardiac stenting, pacemaker or implantable defibrillator?	1. Determine nature of device and obtain pre-operative cardiology consultation
Current medications include antiplatelet agents or anticoagulants?	1. Consider pre-operative consultation with cardiologist, hematologist or internist/primary care physician to determine whether medication should be continued or held perioperatively.

Risk for thrombosis or embolism	1. Assess risk factors: a. Patient history, including the use of contraceptives and hormone replacement, stillbirth, preterm delivery, and possibly recurrent miscarriage b. Family history, including past episodes of thrombosis or embolism c. Genetic disposition to clotting disorders (e.g., factor V Leiden, prothrombin G20210A) d. Edema, swelling, or other signs of venous insufficient in the lower extremities.
Thromboprophylaxis: Implement thromboprophylaxis	1. Low risk: (REF 91-93) (GRADE A) a. Patient education b. Early and frequent ambulation (continuing at home)

according to risk rating: (REF 39, 47, 48) (GRADE D)	c. Flexion/ extension of ankles (continue at home) d. Optional: GCS (may be used at home) 2. Moderate risk (REF 91- 93) (GRADE A) a. Same as low risk, plus b. IPC if anticoagulation is not an option (continue until good ambulation) c. LMWH (30-40 mg SQ qdday; initial dose 2 hour before surgery or 12 hours after; continue until patient is fully ambulatory and evaluate need for longer prophylaxis) or LDUH (q12hr until patient is fully ambulatory) 3. High risk (REF 91, 93 – 96) (Grade A) a. Same as low risk, plus b. IPC and /or GCS (until good ambulation) c. LMWH (40 mg SQ qday; initial dose 2 hr before surgery or 12 hr after; continue for 5-10 days) or fondaparinux (2.5 mg SQ qday; initial dose 6-8 hr after surgery; do not give <6 hr postoperatively; continue for 5-10 days) 4. Very high risk (REF 91, 93-96) (Grade A) a. Same as low risk, plus b. IPC and/or GCS (until good ambulation) c. LMWH (40 mg SQ qday; initial dose 2 hr before surgery or 12 hr after; continue for 7-12 days and seriously consider longer prophylaxis) or fondaparinux (2.5 mg SQ qday; initial dose 6-8 hr after surgery; do not give < 6 hr postoperatively; continue for 7-12 days and evaluate need for longer prophylaxis) d. Longer term prophylaxis with warfarin or convert to warfarin at INR 2-3 (if patient risk factors indicate the need for other vitamin K antagonist long-term prophylaxis)
Mechanical prophylaxis (REF 39, 47, 48) (Grade D)	1. Methods recommended for patients with a high risk of bleeding or as an adjunct to chemoprophylaxis: a. GCS b. IPC devices c. VFP d. IPC devices or VFP are recommended for any procedure that lasts > 1 hr, and for all patients receiving general anesthesia; begin 30-60 min before surgery e. Also consider patient positioning on the operating room table. f. Flex the patient's knees at 5 degrees or g. Reposition the patient's legs at regular intervals throughout a procedure.
Chemoprophylaxis (REF 39, 47, 48) (GRADE D)	1. Use chemoprophylaxis (e.g., LMWH, fondaparinux, idraparinux, direct thrombin inhibitors) in patients undergoing: a. Abdominoplasty b. Circumfirential body contouring

	c. Thighplasty d. Combine procedures e. Procedures lasting > 4 hr f. Surgery requiring open-space dissection g. TRAM flap procedures h. Surgical procedures likely to contribute to venous stasis or compression 2. Recognize the increased risk of bruising or hematoma and the possible need for blood transfusion when using chemoprophylaxis; bleeding incidence is strongly associated with dosage.

ASA Status (REF 17, 24, 50, 51) (GRADE B)	1. Patients categorized as ASA class 1-3 can be considered for ambulatory surgery; however, the setting should be determined by the ASA class, the type of procedure, and the type of anesthesia. 2. ASA class 4 patients can be considered for ambulatory surgery; however, the setting is dependent on the type of procedure and type of anesthesia. (REF Expert opinion) (GRADE D) 3. Office-based procedures: a. ASA class 1 and 2 patients are generally considered the best candidates for ambulatory surgery and reasonable candidates for the office-based surgery setting. b. ASA class 3 patients may also be reasonable candidates for office-based surgery facilities when local anesthesia, with or without sedation, is planned and the facility is accredited. (REF Expert opinion) (GRADE D) c. ASA class 4 patients are appropriate candidates for the office-based surgery setting only when local anesthesia without sedation is planned. 4. If a free-standing ASC or office-based setting is chosen, it should be accredited with appropriate hospital transfer arrangements. (REF Expert opinion) (Grade D)

Hypothermia	1. General strategies (REF 58-62, 64, 65, 97, 98) (GRADE B) a. Equip the ambulatory surgery suite so that temperatures can be adequately monitored and adjusted. b. Have equipment available (e.g., Bair Huggers, forced-air warming blankets, intravenous fluid warmers) to warm the patient, as necessary, especially during more extensive procedures. c. When no hypothermia prevention measures are available, the procedures performed should be of short duration (1-2 hours) and limited to no more than 20% of the body surface area.

	2. Recommended protocol for hypothermia prevention during general or regional anesthesia: a. Actively prewarm patients. b. Monitor core temperature throughout administration of general and regional anesthesia. c. Cover as much body surface area as possible with blankets or drapes to reduce radiant and convective heat loss through the skin. d. Actively warm patients intraoperatively with a forced-air heater or resistive-heating blanket to prevent heat loss and add heat content; rearrange covers every time the patient is repositioned to warm as much surface area as possible. e. Minimize repositioning time as much as possible so that the active warming method can be quickly continued. f. Warm intravenous fluids and/or infiltration fluids if large volumes are used. g. Warm incision irrigation fluids. h. Aggressively treat postoperative shivering with a forced-air heater or resistive-heating blanket and consider pharmacologic intervention.

Type of anesthesia (REF 17, 27, 66-75) (GRADE B)	1. General anesthesia, moderate sedation, and local anesthesia can be used safely in the ambulatory setting. The type of anesthesia administered depends on the invasiveness of the procedure, the health status of the patient, and the preference of the physician and patient. The physician should discuss anesthetic options with the patient and determine the most appropriate regimen. 2. The ASA and AAOMS recommends the following measures for patients undergoing deep sedation / general anesthesia: (REF 66, 100) (GRADE D) a. Continuous use of pulse oximetry b. Recording of blood pressure every 5 min c. Continuous cardiovascular monitoring with an electrocardioscope d. Use of supplemental oxygen throughout the anesthesia period e. Ventilatory monitoring should include auscultation of breath sounds and at least one of the following: i. Observation of the chest wall ii. Observation of the reservoir bag iii. Monitoring the color of skin, nails, mucosa, and the surgical site

	iv. Capnography f. Additional monitoring should include either auscultation of heart sounds or palpation of peripheral pulses. g. Capnography – end tidal carbon dioxide when endotracheal anesthesia or laryngeal mask airway (LMA) is inserted.

MH susceptible patient?	1. Risk evaluation in pre-operative history 2. Use of non-triggering agents 3. Monitoring for at least 2.5 hours post procedure.
Procedures and Protocols for management	1. Halt the procedure ASAP: Discontinue volatile agents and succinylcholine. If surgery must be continued, maintain general anesthesia with IV non-triggering anesthetics (e.g., IV sedatives, narcotics, amnestics and non-depolarizing neuromuscular blockers as needed) 2. Hyperventilate with 100% oxygen at flows of 10L/min to flush volatile anesthetics and lower ETCO2 3. Give IV dantrolene 2.5 mg/kg rapidly through large-bore IV, if possible. Repeat as frequently as needed until the patient responds with a decrease in ETCO2, decreased muscle rigidity, and/or lowered heart rate. 4. Transfer patient to acute care facility emergently

INTRODUCTION

Increased utilization of outpatient surgery over the past two decades has been driven by new surgical technology, anesthetic techniques and patient preferences. According to government statistics, more than 60 percent of surgical procedures performed in the United States annually are performed on an outpatient basis. These include one of three outpatient settings: hospital-based ambulatory surgical units, freestanding ambulatory surgery centers, or office-based surgery facilities. These ambulatory surgery facilities offer several advantages for both patients and providers including accessibility, flexibility, and convenience; lowering cost; and maintaining high-quality care.

Although surgical and anesthetic techniques have become safer, wider definitions of procedural types deemed acceptable for outpatient surgery and changing patient demographics have contributed to the inherent risk in ambulatory surgery. Therefore, there is ongoing research on outpatient surgical safety. Most of the clinical research published on ambulatory surgery has been completed in the hospital-based ambulatory surgical unit setting, whereas research that specifically addresses freestanding ambulatory surgery centers and office-based surgery facilities are beginning to emerge.

To ensure patient safety in the ambulatory surgery setting, the American Society of Plastic Surgeons (ASPS) Health Policy Committee has continued to produce statements to assist decision-making in numerous areas of patient care. This document serves to update, combine, and expand on prior practice advisories issued by the ASPS.

This statement provides an overview of the preoperative steps that should be completed to ensure appropriate patient selection and management for ambulatory surgery settings. In conjunction, attention is paid to various patient characteristics and comorbidities that may predispose the ambulatory surgical patient to intraoperative or postoperative complications. It further identifies several physiologic stresses commonly associated with surgical procedures, and potential postoperative recovery problems, and offers recommendations for how best to minimize these complications.

This statement was developed through a targeted review of the scientific literature and a consensus of the Healthcare Delivery Subcommittee. The supporting literature was critically appraised for study quality according to criteria referenced in key publications on evidence-based medicine. Depending on study design and quality, each reference was assigned a corresponding level of evidence (I through V) with the ASPS Evidence Rating Scale (Table 1), and the evidence was synthesized into practice considerations . The considerations were then graded (A through D) with the ASPS Grades of Recommendation Scale (Table 2); grades correspond to the levels of evidence provided by the supporting literature for that considerations. Practice considerations are discussed throughout this document, and graded recommendations are summarized in Appendix A.

DATA SOURCE SUMMARY

There are two or possibly three data sources for ambulatory surgery NSQIP, HCUP and possibly closed claims insurance data, they each have advantages and disadvantages. NSQIP is excellent data rigorously verified but only applies to participating hospitals and only applies to a sampling of procedures chosen by the hospital which may or may not include plastic surgery procedures and only applies to the immediate 30-day post op period so long term results cannot be analyzed. HCUP data can be either the Nationwide inpatient sample or Statewide Ambulatory Surgery, Statewide Inpatient or Statewide Emergency Department Sample. The statewide information does include all discharge information and patients can be uniquely identified to follow for longer term complications. The disadvantages are less rigorous standards in terms of data accuracy and not every state submits data to the statewide databases so you might be practicing in a state that isn't providing data to the statewide HCUP. Your practice may be not be represented by the HCUP database due to regional differences in location and the demographics i.e. charges, comorbidities and procedures.

METHODOLOGY

Literature review was evaluated using the American Society of Plastic Surgeons Evidence Rating Scales which has advantages and disadvantages. Literature review was done based on the old rating scale to stay consistent with what had been done in the initial version of this statement.

DISCLAIMER

This statement is not intended to define or serve as the standard of medical care. This document was developed to assist physicians in decision-making. It describes a range of generally acceptable approaches to diagnosis, management, or prevention of specific diseases or conditions. This document attempts to define principles of practice that should generally meet the needs of most patients in most circumstances. However, it should not be construed as a rule, nor should it be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the appropriate results. The ultimate judgment regarding the care of a patient must be made by the physician in light of all the circumstances presented by the patient, the diagnostic and treatment options available, available resources, and local and regional regulations.

This document reflects the state of knowledge current at the time of publication. Given the inevitable changes in the state of scientific information and technology, periodic review and revision will be necessary.

PROVIDER QUALIFICATIONS

Summary and considerations: It is important to ensure your provider is qualified and trained to perform the procedure in accordance to applicable laws such as medical licensure and is either board eligible or board certified a member of American Board of Medical Specialties for the particular procedure in question.

Provider Qualifications	Board Eligible or Board Certified by appropriate member of the American Board of Medical Specialties for the specific procedure
	Licensed properly by State medical board

The media has highlighted numerous adverse events associated with illicit, or “black market” surgical procedures. The dangers of engaging in these transactions is confirmed by existing literature on the subject.

Regardless of procedure location, both surgeon and anesthesiologist (if present) should have approved hospital privileges for the given procedure, and should be either board-certified or board-eligible to perform the procedure by a surgical board recognized by the American Board of Medical Specialties, such as the American Board of Plastic Surgery or the American Board of Anesthesiology. As well, local, state and federal regulations should be followed by the provider as this may vary depending one practice location.

SURGICAL FACILITY REQUIREMENTS

According to the bylaws of the American Society of Plastic Surgeons, surgical procedures performed under anesthesia, other than minor local anesthesia and/or minimal oral anxiolysis, should be performed in a surgical facility that meets at least one of the following criteria:

• Accredited by a national or state-recognized accrediting agency/organization, such as the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF), the Accreditation Association for Ambulatory Health Care (AAAHC), or the Joint Commission on Accreditation of Healthcare Organizations.
• Certified to participate in the Medicare program under Title XVIII.
• Licensed by the state in which the facility is located.

Each of these entities will inspect and certify compliance with the following:

- General environment
- Operating room environment
- Facility safety
- Handling of blood and medications
- Medical records
- Peer review and quality control
- Personnel
- Governance
- Americans with Disabilities Act (ADA) compliance

In general, outpatient surgical facilities are classified as A, B, or C.

A *type A* facility is defined as a facility where procedures are performed under local and or topical anesthesia.

A *type B* facility is defined as a facility where procedures are performed under intravenous or parenteral sedation, regional anesthesia, analgesia or dissociative drugs (excluding propofol) without the use of intubation, laryngeal mask or inhalation general anesthesia.

A *type C* facility is defined as a facility where procedures are performed using propofol, spinal or epidural anesthesia, endotracheal intubation, laryngeal mask airway or inhalation anesthesia by an anesthesiologist, certified registered nurse anesthetist (CRNA), or under the direction of an anesthesiologist.

Although the classification covers all types of facilities, it does not provide standardized methods by which anesthesia and sedation should be administered other than to require heart rate, blood pressure, and pulse oximetry monitoring.

These considerations are supported by evidence showing decreased adverse events, proven patient safety protocols, and improved medico-legal compliance in facilities accredited by supervising agencies.

APPROPRIATE PATIENT SELECTION BASED ON PREOPERATIVE HISTORY AND PHYSICAL EXAMINATION

Summary: A complete preoperative History and Physical Examination (HPE) serves several important purposes. First, the findings determine the patient's suitability for a given procedure(s). Second, the preoperative HPE provides baseline information to assist the medical team in interpreting their possible findings while monitoring the patient intraoperatively and postoperatively. Finally, the findings help to determine the most appropriate facility setting and timing of the planned procedure.

A preoperative HPE should include:

- Pertinent history of present illness or condition being addressed at surgery
- Functional status, if this is possibly an issue
- Past medical & surgical history, including identification of psychological comorbidities, previous interventions
- Social history including nicotine use, vaping, drugs and alcohol use & home situation/support structure, if pertinent
- Family history, particularly any anesthesia reactions or unexpected death
- Medication regimen (prescription and nonprescription),
- Allergies or adverse reactions (e.g., to anesthesia, drugs/medications, latex, tape),
- Review of body systems.
- Physical exam including height, weight, vital signs; an evaluation of the heart and lungs; and an examination of the anatomical area of the operation.

An integral part of patient selection involves identifying characteristics and comorbidities that may predispose the patient to adverse events. An assessment of the patient's functional status such as ability to climb a flight of stairs without chest pain or shortness of breath, etc., is helpful in determining if there are undiagnosed conditions that should be further evaluated prior to surgery. The surgeon should consider referring patients with significant comorbidities or concerning answers to basic screening questions such as ambulatory/stair climbing tolerance, bleeding gums or weight loss/weight gain to their PCP or appropriate medical specialist for clearance or investigation when indicated. Patients who have experienced massive weight loss either with or without surgical intervention, often develop nutritional deficiencies that can lead to postoperative complications such as anemia, poor healing and/or occasionally neurologic deterioration. Clearance by a bariatric physician may be indicated.

A recent ACS-NSQIP analysis of 244,397 day case-eligible surgeries from the 2005-2010 datasets identified a number of factors significantly associated with early (<72 hour) postoperative morbidity and mortality. After controlling for the complexity of surgery, elevated BMI, COPD, history of TIA or CVA, HTN, previous cardiac intervention, and prolonged operative time were all associated with increased postoperative adverse events. This study was unique in that it identified all cases on the basis of CPT codes, irrespective of inpatient or outpatient status, thus yielding an internal comparison cohort.

Patients with a history of mental disorders and/or substance abuse issues pose special issues in the outpatient plastic surgical setting. A 2015 analysis of unplanned hospital admissions and emergency room visits in patients after 116,597 outpatient cosmetic plastic surgical procedures found a significantly increased rate of ER utilization and hospital admission in patients with mental health, and substance abuse diagnoses, with a median hospital admission charge of $35,637. Anticipating potential issues with ambulatory procedures, patients with baseline pain or poor coping mechanisms may be better served with overnight observed care after a significant procedure.

Routine preoperative blood testing in young and healthy patients can often be avoided, but surgeons should follow the established screening guidelines at each facility. An ACS-NSQIP analysis of 5359 patients undergoing outpatient plastic surgical procedures, without any defined NSQIP comorbidities, found that neither testing, nor abnormal results after blood testing were associated with 30-day postoperative adverse event of any kind, suggesting that routine preoperative testing is both costly and of limited clinical benefit.

However, given that many patients have undergone massive weight loss and/or bariatric surgery, these patients can have a myriad of nutritional deficiencies. These include protein, iron, folic acid, B-12, vitamin A, zinc, selenium thiamine, vitamin D, vitamin K and Calcium. Patients who do not maintain vitamin supplementation or attend to their nutrition, are more likely to have deficiencies. Oral iron supplementation has been shown to correct only 43% of iron deficiencies in gastric bypass patients. Consider limiting the extent of excisional and/or liposuction procedures in these patients to lower the risk of postoperative transfusion.

Diabetes Mellitus and perioperative hyperglycemia are known risk factors for surgical complications. Beyond testing HgbA1c, which has decreased accuracy in patients with iron deficiency anemia, renal disease and cirrhosis, optimizing glycemic control in the days to weeks prior to surgery may ward off avoidable complications. HgbA1c $\leq$8.0 is generally recommended for elective operations. Fasting blood sugar of $\geq$140 mg/dL is indication for further testing and optimization prior to elective surgery.

AGE AND FRAILTY

Summary: Physiologic age or Frailty is more important than Chronologic Age in determining surgical risk. Compared to Non-frail patients of advanced chronologic age, Frail patients experience a multi-organ system physiologic decline that is associated with increased risk of Post-Operative Cognitive Dysfunction, surgical complication and discharge to skilled nursing facility.

Studies conducted in the hospital-based ambulatory surgical unit setting report conflicting findings as to whether older age contributes to the risk of intraoperative and/or postoperative complications associated with ambulatory surgery. A prospective cohort study of 17,638 consecutive ambulatory surgery patients found that, compared with individuals younger than 65 years, those who were 65 years or older were 1.4 times as likely to experience an

intraoperative event and 2.0 times as likely to experience an intraoperative cardiovascular event. In contrast, elderly patients had a much lower incidence of any postoperative event (adjusted OR, 0.4), postoperative pain (adjusted OR, 0.2), nausea and vomiting (adjusted OR, 0.3), and dizziness (adjusted OR, 0.4).

Additional studies have documented a slightly greater risk of unanticipated hospital admission following ambulatory surgery in older aged patients (i.e., age 65 years or older, or older than 80 years), whereas other studies have found no effect of age on unanticipated hospital admission or postoperative complications.

Medicare databases appear to show a higher risk of adverse events, compared with published literature in patients < 65 years old. An analysis of 564,267 outpatient surgical procedures from the Medicare database showed increasing risk of inpatient hospitalization after outpatient surgery for patients in increasing quartiles of age (i.e., 54-69, 70-74, 75-79, 80-84, and 85 years or older, $p < 0.05$). However, this study analyzed data from 1994 through 1999, and there was no direct comparison to normal-age controls. Alternatively, two separate analyses of approximately 7,000 outpatient plastic surgery patients in NSQIP showed no effect of age on unplanned readmission, reoperation, or adverse events.

Although various data illustrate that older age can modestly increase the risk of complications associated with ambulatory surgery, this is arguably not great enough to constitute a contraindication to ambulatory surgery based on advanced age alone. Over the past decade, there has been increased recognition that frailty is a better indicator of increased postoperative risk than chronological age.

Frailty is a geriatric syndrome reflected by physiologic decline across multiple organ systems that conveys decreased reserves and increased vulnerability to stressors. It affects about 26% of persons over age 85. It is often diagnosed based on a clinical impression, but there are many objective diagnostic tools, such as based on a phenotype – popularized by Fried, et al, where clinical features such as a decline in lean body mass, grip strength, endurance, walking speed and physical activity are graded and patients with $\geq$3 are frail, 1-2 are pre-frail and 0 are non-frail. There are dozens of tools in use to diagnose frailty with the aim towards identifying patients in advance that may have complicated courses postoperatively.

Frailty is characterized by physical changes such as decreased muscle mass, increased adipose tissue, reduced total body water, decreased renal and hepatic clearance, which all affect the way anesthetics and other perioperative medications peak and endure.

Frailty is also characterized by progressively stiff vessels and myocardium. There is a 75% prevalence of heart failure in the frail patient population, as well as cardiac autonomic dysfunction, which can be responsible for blood pressure lability and extreme hypotension with anesthesia. This is worsened with prolonged NPO times. There are progressive pulmonary changes as well with stiffer parenchyma, decreased functional alveolar surface area and

reduced respiratory muscle strength, that all work together in the milieu of lingering medications to reduce reflexes and increase risk of aspiration and hypoventilation.

Frail patients are also more likely to have pre-surgical cognitive impairment and this predisposes to compounded *postoperative* disturbances, such as Postoperative Cognitive Dysfunction (POCD) or Post-Operative Delirium (POD). Both of these can have profound effects on postsurgical dependence on care, quality of life and mortality. Caretaker presence throughout the peri-surgical episode is often helpful.

While chronologic age showed mixed predictive value for complications, studies such as that by Hewitt, et al, found that in both elective and emergent general surgeries, frailty correlated with the highest rates of adverse events. Frail/Pre-frail vs. Non-frail had 30-day mortality rates of 8% vs 1%; postoperative complications were 24% in Frail, 9% in Pre-frail and 5% in Non-frail. A prospective study of elective procedures in patients >65 by Makary, et al, found that Frail and Pre-frail patients were far more likely to be discharged to a skilled nursing facility.

Prehabilitation is the effort to target key organs with physiologic decline and optimize function prior to surgery.

SOCIAL SUPPORT

Summary: Social support is a key pillar of success in surgical patients, especially those patients that are going home. Every patient will recover differently from surgery and it is important to have a reliable person to receive postoperative instructions and to help supervise and assist with care in the first 18-24 hours.

The amount of support required postoperatively will vary based on patient characteristics, the type and duration of anesthesia and the nature of the surgical procedure. However, understanding the patient's social situation and support system *in advance* will reduce the stress of the surgical procedure for the patient – and sometimes for the surgeon. A study of 56 male surgical patients were split into married/high support, married/low support and unmarried in 1989. The speed of recovery in this small study showed that married/high support group recovered the fastest and the unmarried group the slowest.

It is important that the patient's caretaker, custodian or social support accompany them to ambulatory surgical facility. Many surgical centers have policies requiring the transportation person to be present for the duration of the procedure. This isn't to say that patients with poor or no social support cannot have surgery – but that they may require an overnight facility from a safety standpoint and modifications to the surgical plan may be indicated to allow better independent coping. For example, if an elderly person has no reliable social support, then it may be reasonable to perform that operation at the hospital.

BODY MASS INDEX (BMI)

Summary and considerations: Obese and morbidly obese patients represent a high-risk population for Ambulatory Surgery settings, please consider following point:

Careful consideration of airway and respiratory issues which includes positioning of patients to optimize airway and respiratory management

Follow DVT prophylaxis guidelines and use as appropriate

Consideration of co-morbidities in management of patients in the ambulatory center

Use of opioids can be detrimental due to both drug to drug interactions and in the setting of underlying obstructive sleep apnea that may or may not be diagnoses thus consider lowering opioid dosage to eliminating opioid usage which will improve safety/decrease risk for airway complications in the post-operative setting.

BMI	Optimize airway and respiratory management
	DVT prophylaxis
	Screen for and anticipate concerns from co-morbidities
	Screen for drug-drug interactions
	Decrease or eliminate use of opioids

Traditional literature has examined the effect of overweight and obese BMI on adverse events, although there is a growing literature examining the role of underweight BMI on complications. Obesity is a growing problem, approaching or exceeding the risk of a public health epidemic in some settings.

Individuals who are overweight (body mass index of 25 to 29.9 kg/m^2) or obese (body mass index of 30 kg/m^2 or greater) constitute an increasing proportion of the patients treated in the outpatient clinical setting—sometimes upward of 75 percent. Because excess weight can contribute to serious health-related causes of morbidity and mortality, additional precautions must be taken when obese patients undergo ambulatory surgery. In particular, many obese patients suffer from, and are at a particular risk for, airway and respiratory issues. Studies performed in hospital-based ambulatory surgical units have found that obesity correlates with an increased likelihood of failed regional anesthetic block, wound infection, unplanned hospital admissions, and complications. In addition, data from the nonsurgical setting indicate that obesity is an intrinsic risk factor that increases the odds of deep vein thrombosis 2.4-fold.

Obese patients often present with a number of comorbidities that can complicate their management. As such, patient histories/comorbidities should be taken into account, and prophylaxis against deep vein thrombosis (i.e., appropriate chemoprophylaxis, sequential compression devices, and postoperative ambulation) must be considered. Respiratory

abnormalities necessitate proper patient positioning and monitoring. A semi-upright position of the operating table is recommended for patients under sedation, because maintenance of an unobstructed airway and lung ventilation may be worsened in the supine position. The use of supplemental oxygen should be considered, and carefully sized airway adjuncts (e.g., oral/nasal pharyngeal airways, endotracheal tubes, laryngeal mask airways, emergency crash cart) should be immediately available for patients under moderate sedation or general anesthesia. Blood pressure measurements and auscultation of the heart and lungs can also be difficult to obtain in obese patients, thereby possibly necessitating the use of an arterial line and other approaches.

Recent large-cohort surgical datasets have attempted to quantify the risk of elevated BMI on surgical outcomes. A NSQIP analysis of body contouring patients (inpatient and outpatient) of 17,774 patients showed an odds ratio (OR) for VTE (i.e., DVT and PE) = 3.4 for BMI 30-34.9 ($p < 0.001$), 4.4 for BMI 35-39.9 ($p<0.001$), 3.1 for BMI>40 ($p<0.001$) on logistic regression analysis. However, VTE prophylaxis measures were not recorded, outcomes are limited to 30 days, and the VTE cohort was significantly different in multiple respects from the control cohort (DM, HTN, dyspnea, malnutrition, unclean wound class, ASA 3-4, increased operative time, increased length of stay), regardless of controlling for these factors in multivariable analysis.

A recent analysis of ambulatory surgery databases between 2009 to 2010 in California, Florida, Nebraska and New York identified 47,741 patients undergoing common outpatient plastic surgical procedures, of whom 2,052 were obese. Obese patients were significantly younger, had private insurance, and had increased rates of cardiovascular disease, HTN, COPD, DM, hypothyroidism, mental health diagnoses, OSA, and tobacco use. Obese patients had significantly more acute hospital-based encounters, serious adverse events, and hospital charges than their normal-weight counterparts. Based on these findings, the authors recommend that 1) obese patients undergoing abdominoplasty and with 3 or more medical comorbidities, and 2) obese patients undergoing liposuction, blepharoplasty, or breast reduction, who are less than 36 years of age, or 64 years or older, and have 4 or more medical comorbidities be stratified into a high risk patient data pool (level of evidence = 2, risk).

Pharmacologic approaches to sedation and pain management also require proper consideration in overweight patients. Intravenous access can be difficult to obtain, and it is recommended that a catheter-over-needle system be used to prevent loss of intravenous access. Also, short operation times and lighter levels of sedation are recommended. If the need for deeper anesthesia is required, obese patients are best managed in the hospital setting. Anesthetic agents in obese patients have a normal duration of activity that is only modestly decreased by an enlarged plasma volume. Adipose tissue has relatively low blood flow, and a calculated induction dose based on weight can lead to excess blood levels beyond what is recommended. Therefore, initial doses of pharmacologic agents should be calculated based on ideal body weight, as a reflection of lean body mass, rather than actual body weight.

The possibility of drug interactions should also be considered. Caution should be used when developing an anesthetic plan for an obese patient taking appetite suppressants or other

medications. Opioids may need to be avoided in obese patients with respiratory problems because of their dose-dependent depression of ventilation and muscle-relaxing properties. If obstructive sleep apnea is diagnosed or suspected, opioids should be avoided or titrated carefully, and patients should be observed for extended postoperative monitoring. Nonopioid analgesics should be considered, as should moderate sedation with reversible agents.

OBSTRUCTIVE SLEEP APNEA

Summary and considerations:
OSA is a significant concern in the choice of both opioid usage and anesthesia selection.

Minimize use of opioids if possible

Consider prolonged post-operative/post-anesthesia monitoring of patients

OSA	Careful selection of opioid and anesthesia
	Consider prolonged post-operative monitoring of patient

An increasing of surgical procedures performed in the United States are performed on an outpatient basis, and such procedures have become progressively more complex. Patients with known or suspected obstructive sleep apnea presents unique anesthesia challenges because of airway concerns, pain control, and postoperative monitoring requirements.

The significance of obstructive sleep apnea as a risk factor for complications during ambulatory surgery is unclear, in large part because of the difficulty of separating the effects of the surgery from the effects of the underlying apnea. Multiple studies have shown an increased, but statistically insignificant increased risk of postoperative adverse events in patients with OSA (in particular, hypoxemia).

Two retrospective studies that compared patients with obstructive sleep apnea to age-, sex-, and body mass index–matched counterparts without the condition, all of whom had outpatient surgical procedures performed in a hospital-based ambulatory surgical unit, reported no significant difference in the rate of unplanned hospital admissions or other perioperative adverse events between groups. Moreover, respiratory or cardiovascular complications were rarely the cause of unplanned admission in the apnea patients who were unexpectedly admitted to the hospital.

Although the literature is insufficient to contraindicate ambulatory surgery in patients with obstructive sleep apnea, American Society of Anesthesiologists guidelines state that these individuals are at increased risk for airway obstruction and respiratory depression, which may require a longer postoperative stay and monitoring. In a recent survey of physician opinion, more than 90 percent of Canadian Anesthesiologist Society members agreed that patients with

obstructive sleep apnea are suitable candidates for ambulatory surgery if the procedure is to be performed under monitored anesthesia care or regional anesthesia. In contrast, 84 percent of members deemed patients with the condition to be unsuitable for ambulatory surgery if they required general anesthesia with postoperative opioids. As a sobering reminder, a recent review malpractice rewards associated with complications related to OSA identified 24 cases between 1991 and 2010. Of these, the majority (83%) occurred in or after 2007. Ninety-two percent of cases were elective. Immediate adverse outcomes included death (45.6%), anoxic brain injury (45.6%). The use of opioids and general anesthetics was believed to play a role in 38% and 58% of cases, respectively. Verdicts favored the plaintiffs in 58% of cases, with an average financial penalty of $2.5 million.

CARDIOVASCULAR CONDITIONS

Summary and considerations: Cardiovascular complications are common after major non-cardiac surgery. Patients with low-grade or remote cardiovascular symptoms are suitable candidates for ambulatory surgery whereas those with more severe conditions are not. According to American College of Cardiology/American Heart Association guidelines, patients with active cardiac conditions should be evaluated and treated before noncardiac surgery. Asymptomatic patients undergoing low risk procedures in ambulatory facilities do not usually require preoperative assessment of cardiac risk factors. Continuing or discontinuing anticoagulant and antiplatelet medications before surgery depends on the medical necessity of the agents for preventing cardiovascular events, thereby warranting consultation with a cardiologist, hematologist, or internist. Performing outpatient surgery on patients with cardiovascular implantable electronic devices (CIEDs) can be accomplished safely. However, because these devices can be affected by electromagnetic interference, it is important to determine the type of the cardiac device before surgery and to develop an operative plan appropriate for the device.

Past history of cardiac disease or related symptoms?	Possibility of increased risk of morbidity. Consider pre-operative risk assessment or evaluation by a cardiologist.
Prior history of cardiac stenting, pacemaker or implantable defibrillator?	Determine nature of device and obtain pre-operative cardiology consultation
Current medications include antiplatelet agents or anticoagulants?	Consider pre-operative consultation with cardiologist, hematologist or internist to determine whether medication should be continued or held perioperatively.

Cardiovascular complications are common after major non-cardiac surgery. Almost one-third of patients who undergo major surgery, do so with at least one cardiovascular risk factor. The 30-day mortality rate for these patients is 0.5-2%. A previous history of cardiac intervention was

associated with an adjusted odds ratio of 1.7 for perioperative morbidity or mortality in ambulatory surgery patients.
There is general agreement in the medical community that patients with low-grade or remote cardiovascular symptoms (e.g., angina pectoris Canadian Cardiovascular Society class II, prior myocardial infarction occurring more than 6 months ago, congestive heart failure New York Heart Association class I, asymptomatic valvular disease) are suitable candidates for ambulatory surgery, whereas those with more severe conditions (e.g., angina pectoris Canadian Cardiovascular Society class IV, prior myocardial infarction within the past 1 to 6 months, congestive heart failure New York Heart Association class III/IV) are not.
The Revised Cardiac Risk Index is a simple validated risk index for predicting perioperative cardiac risk in non-cardiac surgery.

According to American College of Cardiology/American Heart Association guidelines, patients with active cardiac conditions should be evaluated and treated before noncardiac surgery. Asymptomatic patients undergoing low risk procedures in ambulatory facilities do not usually require preoperative assessment of cardiac risk factors.
Patients who have previously undergone coronary stenting require an evaluation of stent type and time of placement. Management decisions should be made in collaboration with the anesthesiologist and patient's cardiologist. Patients with a history of bare metal stenting within 30 days should not undergo elective surgery. However, surgery should be delayed for one year in those with a drug-eluting stent. For unavoidable surgery, dual platelet therapy is continued unless the bleeding risk outweighs the high risk of stent thrombosis. Bridging strategies with heparin as substitutes for antiplatelet therapy are not appropriate for patients with coronary stents, as heparin administration can increase platelet aggregation and risk of stent thrombosis. Although continuing anticoagulant medications before surgery may place patients at increased risk for bleeding complications, ceasing such drugs may put patients with cardiovascular conditions at risk for other cardiac events, including thromboembolism, myocardial infarction, and cerebrovascular accident. Recent data has evaluated performing minor surgery in the outpatient setting, without interruption of anticoagulant/antithrombotic medication. A prospective cohort study of 271 patients undergoing skin cancer surgery showed an increased, but statistically insignificant risk of postoperative bleeding in patients with active anticoagulant/antithrombotic medications ($p = 0.063$). A recent case-control study of patients undergoing hand and wrist surgery did not find any significant difference in bleeding, hematoma, or postoperative bruising between patients on antiplatelet medications and controls, although the authors recommended caution in treating such patients. A randomized controlled pilot trial to evaluate continuation versus discontinuation of aspirin therapy 5 days before general and abdominal surgery did not find any difference in bleeding or thromboembolic events, although the study was inadequately powered to detect significant differences between the two groups.

In general, continuing or discontinuing anticoagulant and antiplatelet medications before surgery depends on the medical necessity of the agents for preventing cardiovascular events, thereby warranting consultation with a cardiologist, hematologist, or internist. A final option for

patients who are unable to stop antithombotic and/or anticoagulant medications is to delay surgery.
Performing outpatient surgery on patients with cardiovascular implantable electronic devices (CIEDs) can be accomplished safely. However, because these devices can be affected by electromagnetic interference (e.g., from electrocautery or radiofrequency ablation), it is important to determine the type and function of the cardiac device before surgery and to develop an operative plan appropriate for the device. A preoperative electrocardiogram will reveal the presence of active pacing, and a chest radiograph will show the type of device and possibly the manufacturer's code. Pacemakers ideally should be interrogated preoperatively during cardiac or electrophysiologic consultation.

Recommendations vary depending on the type of device and the patient's dependence on device functions. Pacemakers may require reprogramming to an asynchronous mode or suspension of rate-adaptive functions. Implantable cardioverter-defibrillators may require suspension of antitachyarrhythmia functions or, in patients who are dependent on pacing functions, alteration of pacing functions similar to pacemakers. Although some models can safely remain on during surgery if a magnet is placed over the device, this approach is no longer standard for every device, given the large variety of models on the market. Other recommendations include minimizing the adverse effects of electromagnetic interference by using bipolar cautery devices or ultrasonic (harmonic) scalpels, if available. The surgeon should consult with the patient's cardiologist and/or the device manufacturer's representative to develop the best course of action for the particular device.

VENOUS THROMBOEMBOLISM PREVENTION

Summary and Considerations:

- Venous thromboembilism represents a small, but significant risk of morbidity and mortality after outpatient procedures.
- Patients should be categorized as low risk, moderate risk, or high risk, as shown in Table 4, and thromboembolic prophylaxis should be implemented accordingly.
- Prophylactic measures that have proven to be effective for preventing deep vein thrombosis and pulmonary embolism in the ambulatory surgery setting include perioperative and postoperative administration of low-molecular-weight heparin, the use of intermittent compression devices, and early postoperative ambulation.

1) Risk for thrombosis or embolism	a) Assess risk factors: a. Patient history, including the use of contraceptives and hormone replacement, stillbirth, preterm delivery, and possibly recurrent miscarriage b. Family history, including past episodes of thrombosis or embolism c. Genetic disposition to clotting disorders (e.g., factor V Leiden, prothrombin G20210A)

	d. Edema, swelling, or other signs of venous insufficient in the lower extremities.
2) Thromboprophylaxis: Implement thromboprophylaxis according to risk rating: (REF 39, 47, 48) (GRADE D)	a) Low risk: (REF 91-93) (GRADE A) a. Patient education b. Early and frequent ambulation (continuing at home) c. Flexion/ extension of ankles (continue at home) d. Optional: GCS (may be used at home) b) Moderate risk (REF 91- 93) (GRADE A) a. Same as low risk, plus b. IPC if anticoagulation is not an option (continue until good ambulation) c. LMWH (30-40 mg SQ qdday; initial dose 2 hour before surgery or 12 hours after; continue until patient is fully ambulatory and evaluate need for longer prophylaxis) or LDUH (q12hr until patient is fully ambulatory) c) High risk (REF 91, 93 – 96) (Grade A) a. Same as low risk, plus b. IPC and /or GCS (until good ambulation) c. LMWH (40 mg SQ qday; initial dose 2 hr before surgery or 12 hr after; continue for 5-10 days) or fondaparinux (2.5 mg SQ qday; initial dose 6-8 hr after surgery; do not give <6 hr postoperatively; continue for 5-10 days) d) Very high risk (REF 91, 93-96) (Grade A) a. Same as low risk, plus b. IPC and/or GCS (until good ambulation) c. LMWH (40 mg SQ qday; initial dose 2 hr before surgery or 12 hr after; continue for 7-12 days and seriously consider longer prophylaxis) or fondaparinux (2.5 mg SQ qday; initial dose 6-8 hr after surgery; do not give < 6 hr postoperatively; continue for 7-12 days and evaluate need for longer prophylaxis) d. Longer term prophylaxis with warfarin or convert to warfarin at INR 2-3 (if patient risk factors indicate the need for other vitamin K antagonist long-term prophylaxis)
3) Mechanical prophylaxis (REF 39, 47, 48) (Grade D)	a. Methods recommended for patients with a high risk of bleeding or as an adjunct to chemoprophylaxis: i. GCS ii. IPC devices iii. VFP b. IPC devices or VFP are recommended for any procedure that lasts > 1 hr, and for all patients receiving general anesthesia; begin 30-60 min before surgery c. Also consider patient positioning on the operating room table. i. Flex the patient's knees at 5 degrees or

	ii. Reposition the patient's legs at regular intervals throughout a procedure.
4) Chemoprophylaxis (REF 39, 47, 48) (GRADE D)	a. Use chemoprophylaxis (e.g., LMWH, fondaparinux, idraparinux, direct thrombin inhibitors) in patients undergoing: i. Abdominoplasty ii. Circumfirential body contouring iii. Thighplasty iv. Combine procedures v. Procedures lasting > 4 hr vi. Surgery requiring open-space dissscton vii. TRAM flap procedures viii. Surgical procedures likely to contribute to venous stasis or compression b. Recognize the increased risk of bruising or hematoma and the possible need for blood transfusion when using chemoprophylaxis; bleeding incidence is strongly associated with dosage.

The development of deep vein thrombosis and pulmonary embolism poses a small but significant risk for surgical patients and may result in death or debilitating consequences. Very little information exists on the incidence of these events in the ambulatory surgery setting. A retrospective review of the AAAASF database between 2012 to 2017 retrieved 42 mortalities associated with outpatient cosmetic surgical procedures. Overall, 54.8% of these deaths occurred after abdominoplasty; 42.9% occurred in isolation; 9.5% occurred in combination with breast surgery; and 2.4% occurred in combination with facial surgery. Of great interest, in 25 of 42 cases, venous thromboembolism risk factor assessment was incorrect or absent.

A recent retrospective analysis of plastic surgical patients reviewed from the CosmetAssure database identified 129,007 cosmetic surgical procedures, performed across a range of settings including hospital inpatient, ambulatory surgical, and office based surgical suites. In total, 116 confirmed VTE events were recorded, which represented 4.63% of all complications in the database. On multivariate regression analysis, significant risk factors included body procedures (RR 13.47), combined procedures (RR 2.4), increasing BMI (RR 1.06), and age (RR 1.02). Gender, smoking, diabetes, and type of surgical facility were not found to correlate with VTE. While this study helped to illustrate factors associated with increased risk of VTE in cosmetic procedures, it was unable to provide guidance beyond the standard plastic surgery Caprini scoring system.

The larger body of medical literature points to numerous intrinsic and transient risk factors that predispose a patient to deep vein thrombosis and pulmonary embolism. These include a personal or family history of the disorders, venous insufficiency, chronic heart failure, obesity (body mass index >30 kg/m2), standing for more than 6 hours per day, a history of more than three pregnancies, current pregnancy, violent effort or muscular trauma, deterioration in

general condition, confinement to a bed and/or armchair, long-distance travel, infectious disease, use of general anesthesia during surgery, and performance of abdominoplasty with or without another procedure.

On the basis of this information, patients should be categorized as low risk, moderate risk, or high risk, as shown in Table 4, and thromboembolic prophylaxis should be implemented accordingly. Prophylactic measures that have proven to be effective for preventing deep vein thrombosis and pulmonary embolism in the ambulatory surgery setting include perioperative and postoperative administration of low-molecular-weight heparin, the use of intermittent compression devices, and early postoperative ambulation.

AMERICAN SOCIETY OF ANESTHESIOLOGISTS STATUS

Summary and Considerations:

- The surgeon and/or anesthesiologist should assign an ASA physical status classification rating for each patient to select the appropriate facility for ambulatory surgery.
- Studies generally support the safety of ambulatory surgical procedures for patients with an ASA physical status class 1 to 3.

ASA Status (REF 17, 24, 50, 51) (GRADE B)	1) Patients categorized as ASA class 1-3 can be considered for ambulatory surgery; however, the setting should be determined by the ASA class, the type of procedure, and the type of anesthesia. 2) ASA class 4 patients can be considered for ambulatory surgery; however, the setting is dependent on the type of procedure and type of anesthesia. (REF Expert opinion) (GRADE D) 3) Office-based procedures: a. ASA class 1 and 2 patients are generally considered the best candidates for ambulatory surgery and reasonable candidates for the office-based surgery setting. b. ASA class 3 patients may also be reasonable candidates for office-based surgery facilities when local anesthesia, with or without sedation, is planned and the facility is accredited. (REF Expert opinion) (GRADE D) c. ASA class 4 patients are appropriate candidates for the office-based surgery setting only when local anesthesia without sedation is planned. 4) If a free-standing ASC or office-based setting is chosen, it should be accredited with appropriate hospital transfer arrangements. (REF Expert opinion) (Grade D)

The American Society of Anesthesiologists (ASA) physical status classification scheme is an accepted standard for gauging preoperative fitness. The surgeon and/or anesthesiologist

should assign an ASA physical status classification rating for each patient to select the appropriate facility for ambulatory surgery. This rating should be based on a combination of the preoperative history and physical examination, comorbidities, laboratory results, and the medical specialist's evaluation. Table 5 outlines the ASA physical classifications.

Studies conducted in hospital-based ambulatory surgical units tend to support the safety of ambulatory surgical procedures for patients with an ASA physical status class 1 to 3. A large prospective study did report that an ASA rating of class 2 or 3 was a predictive factor for unanticipated hospital admission after ambulatory surgery that increased the risk 2.1-fold. However, more recent retrospective studies identified no increase in the incidence of postoperative complications or unplanned admissions in ASA class 3 patients when compared with ASA class 1 and 2 patients undergoing similar procedures, regardless of whether local or general anesthetic was administered. Bolstering these latter findings, a survey of members of the Canadian Anesthesiologist Society found that 94 percent of respondents agreed that ASA class 1 to 3 patients are suitable for ambulatory surgery, whereas 82 percent agreed that ASA class 4 patients are not.

PHYSIOLOGICAL STRESSES ASSOCIATED WITH SURGICAL PROCEDURES

The types of procedures performed in the outpatient setting are constantly expanding, owing to improved surgical outcomes and technologies, cost pressures, and patient preference. However, general physiological stressors associated with surgical procedures are relatively consistent, and help determine the proper surgical setting for a given patient.

PERIOPERATIVE CARE BUNDLES

The last decade has seen grouping of performance-improvement measures into protocols, or "care bundles", in an attempt to minimize preventable adverse events. Such protocols have been applied to the prevention of ventilator-associated pneumonia, catheter-associated UTI, central-line associated bloodstream infections, and surgical site infections. Implementation of these care bundles in colorectal surgery, for instance, presents of cost savings opportunity of over $1.5 billion. Specific items in these protocols include:

- Using an antiseptic skin cleanser during showers the night before, and the morning of surgery
- Clipping, not shaving, hair in the surgical-site area on the morning of surgery
- Ensuring the optimal administration of antibiotics
- Maintaining normothermia in operating room and up to 4 hours after surgery
- Changing operating room gloves and instruments when the "dirty" or "contaminated" portion of the case is concluded
- Changing the incisional dressing at 48 hours and at postoperative shower
- Educating the patient and caregivers about infection prevention.

Plastic surgery has thus far mainly seen the application of such bundles in "enhanced recovery after surgery" (ERAS) protocols, with specific use in breast reconstruction. Reported outcomes

include improvements in length of stay, and opioid usage after microvascular breast reconstruction. Such applications of evidence-based "bundles" of interventions have the potential to dramatically affect the care of patients undergoing ambulatory surgery.

HYPOTHERMIA

Summary and Considerations:

- Hypothermia correlates with adverse events in surgical patients.
- Techniques for reducing hypothermia include forced-air warming blankets, resistive-heating blankets, and/or subcutaneous/intravenous fluid warming devices.

- Hypothermia	A) General strategies (REF 58-62, 64, 65, 97, 98) (GRADE B) a. Equip the ambulatory surgery suite so that temperatures can be adequately monitored and adjusted. b. Have equipment available (e.g., Bair Huggers, forced-air warming blankets, intravenous fluid warmers) to warm the patient, as necessary, especially during more extensive procedures. c. When no hypothermia prevention measures are available, the procedures performed should be of short duration (1-2 hours) and limited to no more than 20% of the body surface area. B) Recommended protocol for hypothermia prevention during general or regional anesthesia: a. Actively prewarm patients. b. Monitor core temperature throughout administration of general and regional anesthesia. c. Cover as much body surface area as possible with blankets or drapes to reduce radiant and convective heat loss through the skin. d. Actively warm patients intraoperatively with a forced-air heater or resistive-heating blanket to prevent heat loss and add heat content; rearrange covers every time the patient is repositioned to warm as much surface area as possible. e. Minimize repositioning time as much as possible so that the active warming method can be quickly continued. f. Warm intravenous fluids and/or infiltration fluids if large volumes are used. g. Warm incision irrigation fluids. h. Aggressively treat postoperative shivering with a forced-air heater or resistive-heating blanket and consider pharmacologic intervention.

Hypothermia occurs when a patient's core body temperature drops below 36.5°C, and can be a potentially serious event in any surgical setting. It can develop from a number of sources, including operating room environmental controls. Both regional and general anesthetics markedly impair the physiologic regulation of core body temperature, greatly contributing to hypothermia. Numerous studies indicate that even mild hypothermia (33.0° to 36.4°C) correlates with adverse postoperative outcomes, including wound infection, increased surgical bleeding, and morbid cardiac events.

Studies specifically carried out among outpatients undergoing surgery with general anesthesia in hospital-based ambulatory surgical units demonstrate that the use of warming devices (e.g., forced-air blankets, intravenous fluid warmers) maintain normothermia much more effectively during and after surgery than standard heat-conservation measures (i.e., cotton blankets). A wealth of studies performed in non-ambulatory surgical settings confirms the enhanced effectiveness of forced-air warming blankets, resistive-heating blankets, and/or subcutaneous/intravenous fluid warming devices for preventing hypothermia during and after surgery.

TYPE OF ANESTHESIA

Summary and Considerations:

- The goal of anesthesia in the ambulatory setting is to perform a given procedure, maintain patient comfort, and balance this with rapid anesthesia recovery and the minimization of side effects.
- While local-only anesthesia is generally very safe, it may be inadequate for many surgical procedures.
- All forms of anesthesia are safe when performed by competent staff, in a properly equipped and accredited facility.
- Enhanced Recovery After Surgery (ERAS) protocols, Total-Intravenous Anesthesia (TIVA), and conscious sedation each have potential to improve surgical anesthesia.

Type of anesthesia (REF 17, 27, 66-75) (GRADE B)	1) General anesthesia, moderate sedation, and local anesthesia can be used safely in the ambulatory setting. The type of anesthesia administered depends on the invasiveness of the procedure, the health status of the patient, and the preference of the physician and patient. The physician should discuss anesthetic options with the patient and determine the most appropriate regimen. 2) The ASA and AAOMS recommends the following measures for patients undergoing deep sedation / general anesthesia: (REF 66, 100) (GRADE D) a. Continuous use of pulse oximetry b. Recording of blood pressure every 5 min c. Continuous cardiovascular monitoring with an electrocardioscope

	d. Use of supplemental oxygen throughout the anesthesia period e. Ventilatory monitoring should include auscultation of breath sounds and at least one of the following: i. Observation of the chest wall ii. Observation of the reservoir bag iii. Monitoring the color of skin, nails, mucosa, and the surgical site iv. Capnography f. Additional monitoring should include either auscultation of heart sounds or palpation of peripheral pulses. g. Capnography – end tidal carbon dioxide when endotracheal anesthesia or laryngeal mask airway (LMA) is inserted.

The principal goals of ambulatory anesthesia include adequate degree of anesthesia to perform a given procedure, balanced by rapid anesthesia recovery and the minimization of side effects. The choice of anesthetic technique for ambulatory surgery depends on both surgical and patient factors. Typically, general anesthesia tends to be associated with a slightly higher risk of undesired effects than local anesthesia or moderate sedation, although all of these methods (Table 6) are safe when performed by a competent, board-certified anesthesiologist in a properly equipped and accredited facility. The largest prospective study of office-based ambulatory anesthesia performed to date (*n* = 34,191) found an overall anesthesia complication rate of 1.3 percent, with no deaths or long-term adverse consequences observed. Local anesthesia had the lowest complication rate (0.4 percent), with slightly higher rates associated with moderate sedation (0.9 percent) and deep sedation/general anesthesia (1.5 percent).

There are numerous varieties of non-general anesthesia. Moderate sedation (i.e., local anesthesia with sedation) is a safe and effective anesthetic choice for routine ambulatory surgical procedures and may be used instead of general anesthesia. Moderate sedation (e.g., midazolam plus fentanyl) appears to be most beneficial during procedures of short duration (<3 hours), yielding relatively brief recovery periods and expedient discharge, few unintended admissions, and low rates of postoperative nausea and vomiting. Local anesthesia with sedation is preferred over spinal anesthesia based on a randomized study showing that the former method (i.e., bupivacaine/prilocaine/epinephrine infiltrate plus intravenous midazolam) resulted in shorter hospital stays and lower medical costs compared with the latter method (i.e., hyperbaric bupivacaine) in patients undergoing ambulatory surgery. Another randomized clinical trial confirmed that systemic opioid analgesics (i.e., fentanyl) are safe to administer in combination with sedatives (i.e., midazolam) immediately before ambulatory surgery to alleviate the pain associated with local anesthetic infiltration and patient positioning. Supplemental opioid administration throughout the procedure did not improve the quality of perioperative patient outcomes.

A single-center review of 2,611 procedures undergoing either totally-intravenous anesthesia (using either propofol and/or ketamine, not utilizing endotracheal intubation, and under the administration of an anesthesiologist) versus conscious sedation (with midazolam and fentanyl, under the administration of a plastic surgeon) reported no deaths, cardiac events, or hospital transfers in either group, suggesting that an increasing variety of procedures could be performed under TIVA.

Most patients are suitable candidates for local anesthesia regardless of age, ASA class, use of medications affecting coagulation, smoking status, or type of surgery; however, male patients with elevated systolic blood pressure have been reported to have a significantly higher risk of complications associated with local anesthesia. In addition, local-only anesthetic cases may be inadequate for many types of surgical procedures.

Finally, enhanced recovery after surgery (ERAS) protocols, which frequently incorporate multimodal analgesia, peripheral nerve catheters, or long-acting local anesthetics improve analgesia in both outpatient and inpatient surgery.

MALIGNANT HYPERTHERMIA

Malignant hyperthermia is a heritable disorder in which certain inhaled general anesthetics trigger an adverse biochemical chain reaction within the skeletal muscle of susceptible individuals. General signs of malignant hyperthermia include tachycardia, a surge in body metabolism, muscle rigidity, and/or fever that may exceed 110°F. In extreme cases, cardiac arrest, brain damage, internal bleeding, failure of other body systems, and death can result.

According to expert opinion, individuals susceptible to malignant hyperthermia can undergo ambulatory surgery provided that non-triggering anesthetics are used and patient temperature is carefully monitored for a minimum of 2.5 hours postoperatively. Patients should be queried before ambulatory surgery about whether they have a personal or family history of malignant hyperthermia or adverse anesthesia reactions, including intraoperative trismus, unexplained fever, or death during anesthesia. If no history is reported, surgeons should be alert for clinical signs of malignant hyperthermia during surgery, and the surgical suite should be equipped to handle any crises that may develop. Although malignant hyperthermia is rare, its occurrence can be catastrophic. Offices in which triggering agents are used, including the use of succinylcholine for laryngospasm, should have equipment and protocols, including dantrolene, for the initial treatment and stabilization of the patient for a safe transfer to an acute care facility. For more information and recommendations regarding treatment of malignant hyperthermia, see Gurunluoglu et al., “Evidence- Based Patient Safety Advisory: Malignant Hyperthermia”.

It should be noted that both AAASF and AAAHC require written protocols (incorporating the MHAUS malignant hyperthermia algorithm) and emergency equipment and drugs for the

treatment of MH are maintained and readily available if the facility administers agents known to trigger malignant hyperthermia. It is also required that all staff are trained and annual drills are conducted for an MH crisis.

Summary and Considerations: MH is triggered by certain inhalational anesthetics and can result in death. Individuals susceptible to MH can safely undergo ambulatory surgery with non-triggering anesthetic agents but should be monitored for at least 2.5hours postoperatively. ASCs using inhalational agents associated with MH should have equipment and protocols available for the management of the MH patient allowing for safe transfer to an acute care facility.

MH susceptible patient?	Risk evaluation in pre-operative history Use of non-triggering agents Monitoring for at least 2.5 hours post procedure.
Procedures and Protocols for management	Halt the procedure ASAP: Discontinue volatile agents and succinylcholine. If surgery must be continued, maintain general anesthesia with IV non-triggering anesthetics (e.g., IV sedatives, narcotics, amnestics and non-depolarizing neuromuscular blockers as needed) Hyperventilate with 100% oxygen at flows of 10L/min to flush volatile anesthetics and lower ETCO2 Give IV dantrolene 2.5 mg/kg rapidly through large-bore IV, if possible. Repeat as frequently as needed until the patient responds with a decrease in ETCO2, decreased muscle rigidity, and/or lowered heart rate. Transfer patient to acute care facility emergently

MULTIPLE PROCEDURES

Summary and Considerations: The cumulative effect of multiple procedures performed during a single operation may increase the potential likelihood that complications may develop. Nevertheless, many combined plastic surgery procedures are routinely and safely performed in ambulatory surgery settings.

Although studies that support the feasibility and safety of performing multiple simultaneous surgical procedures in the ambulatory setting are scarce and limited to the office-based setting, these findings are corroborated by additional studies carried out in non-ambulatory or

unknown surgical settings that identified no statistically significant differences in complication rates between single and multiple procedures (i.e., abdominoplasty with or without other procedures).

A recent longitudinal analysis of the California Ambulatory Surgery Database from 2005 through 2010 analyzed 477,741 patients, of whom 16,893 had undergone two or more concurrent procedures. Outcomes were analyzed for 30-day and 1-year VTE rates, 30-day hospital admissions, 30-day ER visits, and 30-day mortality. Greater than additive 30-day and 1-year VTE rates were observed among patients who underwent an abdominoplasty and liposuction, and those who underwent an abdominoplasty and hernia repair. Other adverse events were not affected by concurrent procedures.

Despite the general safety of performing multiple surgical procedures in concert, certain patient factors have been correlated with an increased complication rate during multiple procedures, most notably, elevated body mass index.

Some combination plastic surgery procedures are more controversial. For example, restricting liposuction in combination with multiple unrelated procedures has been the topic of many debates, largely because the actual volume of liposuction aspirate that can be safely removed during a combined procedure is as yet unknown. Given the lack of national consensus, some states have addressed this issue by implementing their own version of restrictions on liposuction aspirate. For instance, the state of Florida has determined that “liposuction may be performed in combination with another separate surgical procedure during a single Level II or Level III operation, only in the following circumstances: 1) when combined with abdominoplasty, liposuction may not exceed 1000 cc of supernatant fat; 2) when liposuction is associated and directly related to another procedure, the liposuction may not exceed 1000 cc of supernatant fat; 3) major liposuction in excess of 1000 cc supernatant fat may not be performed in a remote location from any other procedure.” Some data tend to support these limitations, whereas other data do not. However, these collective data tend to be anecdotal or derived from studies that lack the level of rigor necessary to establish clear standards of practice. The practice advisory on liposuction suggests limiting liposuction aspirate to no more than 5000 cc (see Haeck et al., “Evidence-Based Patient Safety Advisory: Liposuction”). If a greater volume is to be removed, the liposuction procedure should be performed in an acute care hospital or a facility that is either accredited or licensed, regardless of the anesthetic route, and monitoring of the patient postoperatively in the hospital or appropriate overnight facility. The state of Florida limits liposuction to less than 4000 cc of supernatant fat in the Level I or Level II setting.

The CosmetAssure database was used to identifify a prospective group of patients undergoing liposuction alone or in combination between 2008 and 2013 in multiple settings. Of the 31,000 procedures, 37% were performed alone. The combination procedures had a relative risk ratio of 5.65 for VTE, 2.72 for pulmonary complications, and 2.41 for infection. The same data was used to identify 25,000 patients undergoing abdominoplasty either alone (35%) or in

combination. The complication rate (including hematoma, infection, suspected or confirmed VTE, fluid overload, urinary retention, pain, cardiac, other or death) is listed:

- abdominoplasty alone - 3.1%.
- Abdominoplasty, liposuction - 3.8%;
- Abdominoplasty, breast procedure -4.3%
- Abdominoplasty, liposuction, breast procedure - 4.6%
- Abdominoplasty, body contouring procedure – 6.8%
- Abdominoplasty, body contouring procedure, liposuction – 10.4%
- Abdominoplasty, body contouring procedure, liposuction, breast procedure 12.0%

DURATION OF PROCEDURES

There is a continuing transition towards outpatient procedures across the medical spectrum, owing to improvements in pain management and anesthesia which allow for rapid recovery from even lengthy procedures. Additionally, cost savings, time efficiency , improved logistics, and in some cases, improved patient safety, including decreased stress response more robust early ambulation, less exposure to hospital associated pathogens, improved cognitive recovery in the elderly and enhanced safety through consistency in teams have been found, reinforcing a preference for this venue for some patients and surgeons.
Most individual plastic surgery procedures performed in an ambulatory setting (e.g., face lifts, rhinoplasties, breast reductions, mastopexies, liposuction, abdominoplasties) take longer than 1 hour to complete and commonly several procedures are performed during the same operative encounter , which increases the total duration of surgery.

A retrospective chart review of 1753 plastic surgery procedures between 2008 to 2012 found that duration of surgery was an independent predictor for complications. While the average case had 4.9 procedures performed concurrently, every hour increase in surgical duration beyond 3 hours was associated with a rise in postoperative complication risk by 21%. At 3.1 hours, the odds ratio increased to 1.6; at 4.5 hours to 3.1; and at 6.8 hours the odds ratio increased to 4.7.

Another retrospective review of 26032 consecutive, mostly cosmetic, plastic surgery cases performed 1995 to 2017 by board certified plastic surgeons at an accredited ambulatory surgery center found an overall low risk of complications, but the risks – particularly for transfer and VTE increased with surgical time over 3 hours and with multiple procedures.

A systematic review and meta-analysis across various surgical specialties from 2005 to 2015 found that the risk of complication increased by 14% for each 30 minute increment or 21% for every 60 minute increment over a 2 hour threshold.

A prospective study carried out on more than 15,000 ambulatory surgical patients treated in a hospital- based ambulatory surgical unit identified receipt of anesthesia for more than 1 hour and surgery ending after 3 PM as significant, independent predictors of unanticipated admission following surgery. Several other less rigorous studies performed in various ambulatory settings have found that operations lasting beyond 30 minutes to 2 hours put patients at increased risk for minor complications (e.g., postoperative pain, bleeding, fever), delays in discharge, and/or unplanned admissions. These risks may directly relate to the duration of the procedures performed, or they may indirectly reflect the complexity of surgery.

Long or complex procedures should be scheduled sufficiently early in the day to allow for adequate recovery time before discharge, and elective surgery should ideally be limited to no more than 6 hours. Judgment regarding the planned duration of surgery should account for the type of case, the combination of procedures to be performed, and the general health of the patient. Once the duration of the procedure has been determined, careful consideration of necessary postoperative elements such as pain control, appropriate monitoring, expected level of independence and ability to accept and manage the unexpected without excessive anxiety should help guide the surgeon into choosing the proper surgical venue

DISCHARGE CRITERIA

In order to be discharged, patients should be alert, hemodynamically stable, with controlled pain and nausea and at their baseline or expected postoperative ambulatory status. The criteria to eat and drink and urinate are controversial as the former often worsen nausea and vomiting in children. The latter may unnecessarily delay discharge, but should be acknowledged and assessed in some scenarios.

A responsible adult should be present and committed to receiving the discharge instructions, transporting the patient home, remaining with the patient overnight and providing assistance as needed for the first evening or more. Most facilities have a policy requiring this to enhance safety.

COST CONSERVATION CAVEAT

Summary: Matching the surgical venue to the procedure and the patient may help minimize cost and maximize safety.

In the age of rising healthcare spending, the major concept is using healthcare dollars on interventions that meaningfully contribute to safe and successful patient care. Matching the surgical venue - be it office suite, outpatient surgical facility or hospital operating room - to the needs of the patient is one practical means to do that. While it is safer *perhaps* to upgrade all patients to the highest-level venue, certainly the costs of doing so become more cumbersome not only to the patient but also to the healthcare system as a whole. To the other extreme, downgrading all patients to the lowest venues may save costs in the short term, but at a

potentially high cost to safety and the downstream economic costs associated with less than expected outcomes.

Differentiating high risk from low risk patients and high risk from low risk procedures will help the surgeon marry patient surgical encounters to the most appropriate venue, thereby maximizing both safety and healthcare dollars.

PREVENTION OF UNANTICIPATED ADMISSIONS

Averting unanticipated admissions is imperative for maintaining a high standard of patient care in the ambulatory setting. A recent study of California ambulatory plastic surgery facilities demonstrated significant variability in the rates of 30-day readmissions and ER visits, but was not designed to reveal the causes for this variability in outcomes.

A recent study examined 72,308 ambulatory plastic surgery cases from the 2009 to 2010 California, Florida, Nebraska, and New York ambulatory surgery databases. The outcome of interest was readmission and/or emergency room visits after outpatient plastic surgical procedures, specifically liposuction, breast augmentation, blepharoplasty, abdominoplasty, breast reduction, rhinoplasty, face and forehead lift, and mastopexy. A number of patient factors were associated with hospital-based acute care within 30-days of the index procedure, including: CHF; cardiac arrhythmia; HTN; COPD; diabetes mellitus; renal failure; liver disease; fluid and electrolyte disorders; drug abuse; depression. Neither obesity, nor smoking history were associated with hospital-based acute care. From a procedural standpoint, only abdominoplasty was associated with hospital-based acute care. Most importantly, specific centers were associated with either lower-than average, or above-average rates of hospital care; however, the study was not able to discern the causes for the variation in these outcomes. Significantly, median charges for hospital care were $2183 for emergency department visits, and $26,299 for hospital admissions.

A recent analysis of the 2011 NSQIP dataset identified 7005 outpatient plastic surgical procedures. Overall, outpatient plastic surgical cases had a low associated readmission rate, compared with other specialties (1.94 percent). Multivariate regression analysis identified obesity, wound infection within 30 days of the index surgery, and ASA class 3 or 4 as significant predictors for readmission.

Several studies carried out in hospital-based ambulatory surgical units reveal that postoperative bleeding, pain, nausea/vomiting, and dizziness are leading causes and significant predictors of unplanned admissions following surgery. In a large prospective study of ambulatory surgical patients treated in a hospital-based ambulatory surgical unit, these factors together accounted for 36 percent of all unplanned admissions. This same study also found that receipt of anesthesia for more than 1 hour and surgery ending after 3 PM significantly and independently predicted unanticipated ad- mission following surgery. It is important to recognize that many of these unplanned admissions may be avoided with proper patient screening, careful preoperative planning that minimizes the procedure duration and reduces the chance of

surgical complications, and routine postoperative planning to ensure adequate support for patient recovery. One report determined that 75 percent of all unanticipated admissions assessed were non–life threatening and potentially preventable, because they were attributable to poor control of postoperative pain, postoperative nausea/vomiting, surgical observation, and social reasons.

As mentioned above, proper postoperative care and management has the potential to minimize unnecessary readmissions. Important factors to consider include providing the patient with adequate pain medication and instructions on proper dosing; educating patients regarding wound care, movement/lifting, and complications; advocating early ambulation after surgery, especially after abdominoplasty, and/or the use of compression devices to decrease the risk for deep vein thrombosis; and scheduling a postoperative visit. Equally important, the surgical care team should ensure that a responsible adult will be available to assist the patient with postoperative instructions and care. Supplying the patient with an information packet before surgery that delineates postoperative care instructions for patients and their caregivers may avert the development of postoperative complications, and ensure that medical care is sought in a timely manner should complications arise. Compliance with new meaningful use requirements also require that patients are given formalized discharge instructions. Lastly, requirements for ambulatory or office-based surgery may vary state to state. Be sure to be in compliance with the state in which you practice.

SURGICAL SAFETY CHECKLISTS

While not yet mandatory under CMS guidelines, surgical time-outs and checklists have generated increased acceptance and are being integrated into quality reporting measures. They have largely eliminated the occurrence of "Never Events" (i.e., surgery on wrong body part, surgery on wrong patient, and performing the wrong surgery on a patient), but their effects on preventing more common adverse events (e.g., surgical site infection, wound dehiscence) and on improving measurable OR metrics (OR times, patient satisfaction) are less established. Additional research is needed to understand why the results after implementation of checklists and care bundles are inconsistent, prior to further dissemination and implementation to the population at large.

CONCLUSION

As more complex surgical procedures are performed in the ambulatory surgery setting, the surgeon must commit to quality assurance to ensure patient safety. Such measures include appropriate patient selection, thorough preoperative planning, perioperative monitoring and postoperative follow-up. Toward this end, completing a comprehensive preoperative evaluation to select the appropriate surgical facility for each patient will contribute to a positive experience for both the patient and the physician.

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