

## SAFE ANESTHESIA FOR OUTPATIENT COSMETIC SURGERY

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### ABSTRACT

Over the last 30 years, an increasing proportion of operations are being performed in offices or ambulatory surgery centers (ASCs). Office-based surgical suites often provide substantial advantages for both the patient and the surgeon, but they also provide unique challenges and mandate unique considerations with respect to anesthesia care and patient safety. As operations and patients continue to increase in complexity, additional oversight and regulation will likely help improve safety in the office setting.

Rather than provide a prescriptive detail of instructions for safe office-based surgery, our present report highlights key concepts and considerations for safe and effective cosmetic surgical care. We focus on common key safety considerations in oxygen delivery, lidocaine toxicity, non-steroidal anti-inflammatory drug usage, and analgesic techniques used to enhance postoperative recovery. We review the concepts of Enhanced Recovery After Surgery (ERAS) as a comprehensive approach to improve postoperative pain and patient outcomes, including the use of regional blocks and oral and intravenous non-opioid adjuncts. We also review the utility of intraoperative liposomal bupivacaine and its effects on postoperative pain. Finally, we address the utility and review the data for surgical safety checklists and patient decision-making aids as parts of a comprehensive approach to maximizing anesthetic safety in the outpatient setting. As an increasing proportion of patients receive their operations in these settings, this review may prove useful for practitioners in most fields of medicine. Even non-surgical practitioners will see and treat patients undergoing procedures in the outpatient setting, and a broad understanding of outpatient anesthetic safety will help improve patient care.

## **INTRODUCTION**

Over the last 30 years, an increasing proportion of operations are being performed in offices or ambulatory surgery centers (ASCs). In 2016, over 11.7 million cosmetic procedures were performed in an office-based setting, representing 72% of all cosmetic procedures performed nationwide. Hospital operative volume is commensurately decreasing; in the last 5 years, the proportion of cosmetic surgery performed in the hospital setting has decreased to 9% from 36% (1). Office-based surgical suites often provide substantial advantages for both the patient and the surgeon, but they also provide unique challenges and mandate unique considerations with respect to anesthesia care and patient safety.

A recent review of office-based anesthesia care in the United States highlighted the importance of several factors in assuring patient safety in ambulatory operative settings. Facility and personnel accreditation and board certification, proper patient and procedure selection, perioperative anesthesia practices, and improved outcomes assessments each play a vital role in the success of operative care in the ambulatory setting (2). Although those authors cite a general lack of high-quality, randomized-controlled trials to evaluate patient safety in these settings, they do suggest that risk profiles are similar to other locations. As operations and patients continue to increase in complexity, additional oversight and regulation will likely help improve safety in the office setting.

Rather than provide a prescriptive detail of instructions for safe office-based surgery, our present report highlights key concepts and considerations for safe and effective cosmetic surgical care. We focus on common key safety considerations in oxygen delivery, lidocaine toxicity, non-steroidal anti-inflammatory drug usage, and analgesic techniques used to enhance postoperative

recovery. Subsequently, we introduce the important concepts of quality improvement with safety checklists, and support the inclusion of patient education in safety improvement. As an increasing proportion of patients receive their operations in the ambulatory setting, this information may prove useful for practitioners in all fields of medicine.

## **OXYGEN DELIVERY**

Operating room fires are “never events” and an important surgical safety concern. Oxygen serves as an oxidizer in most surgical fires. Without attention or consideration, open oxygen sources can collect beneath the drapes and dressings, and they can subsequently be ignited by electrocautery source. Because of open oxygen sources via nasal cannula and face mask, the risk is particularly increased during conscious sedation in procedures involving the head and neck. Between 2000 and 2009, 97% of reported electrocautery-induced fires in the operating room involved head, neck, and upper chest operations performed under MAC (3).

In another experimental study, Kung et al designed a simulated mannequin model to examine how vacuum suctioning and strategic draping can reduce oxygen concentration during operations involving the head and neck (4). They equipped a mannequin with nasal cannula that delivered oxygen at a rate of 6 L/min. The head was draped and oxygen levels were measured via a sensor placed 1cm from the nasal cannula. Overall, the authors found that the use of vacuum suctioning under the drapes reduced the time for oxygen to dissipate by one third. Tenting of the surgical drapes did increase the rate of oxygen dissipation as well, but this effect was not statistically significant.

In another publication, Engel et al proposed an alternative technique of oxygen delivery in which nasal cannulae are passed

through a nasopharyngeal airway tube in procedures involving conscious sedation (5). In their study, they compared oxygen concentrations at different locations of the face when using a traditional nasal cannula versus when they used nasal cannula cut and inserted into a nasal trumpet placed in the patient. They found that delivering oxygen directly into the posterior pharynx via their nasopharyngeal method yielded the lowest oxygen concentrations above the nose of patients.

Regardless of the exact method of oxygen delivery, surgical fires are an important concern that must not be overlooked. Facial cosmetic surgery is commonly performed in the office-based setting, and assuring patient safety and quality outcomes mandates careful attention to fire prevention in the operating room.

### **LIDOCAINE TOXICITY**

Lidocaine is among the most frequently used local anesthetics in both the hospital and ambulatory setting. Lidocaine is an amino amide local anesthetic with rapid onset and moderate duration of action. The drug is rapidly metabolized in the liver, and any concomitant drug or disease process that affects hepatic function could subsequently affect serum lidocaine concentrations. Traditional teaching suggests that the maximum safe dosage for lidocaine with epinephrine in serum is 7mg/kg. These recommendations, however, are more historic than evidence-based, and were established 70 years ago to guide epidural dosing. They often do not account for site of injection or patient factors that may influence distribution, metabolism, and drug excretion.

Toxic effects of lidocaine and local anesthetic systemic toxicity (LAST) are related to serum drug concentrations. Adverse effects have been demonstrated at levels between 3-6  $\mu\text{g/mL}$ , with the generally accepted safe threshold for serum of 5 $\mu\text{g/mL}$

(6). Nausea, lightheadedness, and perioral numbness typically present as early signs of toxicity, with skeletal muscle and CNS involvement as levels increase. Cardiac effects and coma have been demonstrated at levels greater than 10 $\mu\text{g/mL}$ .

With its instillation of dilute subcutaneous lidocaine, the use of tumescent analgesia in the outpatient cosmetic surgery arena can be used safely and efficaciously, but it may make lidocaine dosing guidelines more confusing and inappropriate. The tumescent technique typically involves the instillation of relatively large volumes of dilute lidocaine and epinephrine in lactated ringers into the subcutaneous plane. It is particularly useful for liposuction and fat grafting, both of which are commonly performed in the outpatient surgical setting. Current recommendations suggest that the maximal safe dose for tumescent lidocaine in these situations is between 35-55 mg/kg (7), but the American Society of Plastic Surgeons currently recommends 35 mg/kg as the maximum dose in tumescent solutions (8).

A recent prospective study on serum lidocaine concentrations following tumescent anesthesia analyzed sequential serum lidocaine concentrations for 24 hours following tumescent infiltration under both non-liposuction and liposuction conditions (7). In 14 subjects, tumescent lidocaine dosages ranged from 19-52 mg/kg, and all serum concentrations remained below 6 $\mu\text{g/mL}$ . The addition of liposuction following tumescent improved estimated toxicity risk profiles. Although a small study, the authors concluded that true maximum safe dosages for tumescent lidocaine are closer to 45 mg/kg and 28 mg/kg with and without liposuction, respectively.

### **NON-STEROIDAL ANTI-INFLAMMATORY DRUGS**

Among plastic surgeons, the use of non-steroidal anti-inflammatory drugs

(NSAIDs) continues to be a debated issue, and one that is often decided based more on personal preference and surgical lore rather than on evidence. Despite the fact that the American Society of Anesthesiologists (ASA) recommendations for acute perioperative pain management include the routine use of NSAIDs (9), surgeons have been comparatively hesitant to uniformly adopt the practice.

NSAIDs exert their effects through the non-selective, reversible inhibition of cyclooxygenase, which ultimately inhibits the production of thromboxane and subsequently platelet aggregation. They have been shown to increase bleeding time in experimental models, but the effects on the perioperative bleeding risk in plastic surgical patients have historically been incompletely documented.

However, studies within the plastic surgery literature suggest that oral postoperative NSAID administration may not increase the risk of bleeding (10). A recent meta-analysis and systematic review of postoperative ibuprofen administration in plastic surgical patients failed to demonstrate a significant difference in postoperative bleeding compared to non-NSAID controls. Pain relief was equivalent to opioid control groups.

Another recent meta-analysis of double-blind, placebo controlled trials of ketorolac in postoperative patients demonstrated that there is no clinically significant increased risk of bleeding either (11). Although the authors could not stratify their findings by age or extended duration of treatment beyond 5 days, they concluded that intraoperative or postoperative administration of standard ketorolac doses did not increase significant bleeding events. Furthermore, they found decreased levels of adverse perioperative events, including postoperative nausea and vomiting (PONV). Pain control was equivalent to opioid-based medications as well.

Given the growing recognition of opioid overprescribing among healthcare practitioners, these data suggest that the use of NSAID adjuncts can substantially improve postoperative pain control without increasing postoperative morbidity. In this, the ASA recommendations for NSAID inclusion in perioperative analgesia is sound, and it is one that can result in improved care for outpatient cosmetic surgical patients.

### **ANALGESIC TECHNIQUES FOR ENHANCED RECOVERY AFTER SURGERY (ERAS)**

Uncontrolled postoperative pain can result in increased recovery time, delayed return to normal function in patients, and it is one of the most common reasons for unanticipated readmission and emergency department visits (12). Traditionally, postoperative pain has been treated with a substantial reliance on opioid analgesics. However, narcotics can also contribute to many potential adverse effects, including nausea, vomiting, constipation, respiratory depression, and altered mental status.

Perioperative multimodal anesthetic approaches have been in practice for over a decade, utilizing the concepts of synergistic and additive pain relief from several sources in an effort to improve postoperative outcomes (13). Enhanced Recovery After Surgery (ERAS) pathways and protocols have subsequently been developed in a wide range of surgical specialties to decrease postoperative pain, postoperative nausea and vomiting (PONV), opioid use, and length of hospital stay (14). Accordingly, ERAS considerations are important for office-based cosmetic surgical patients as well.

Initially implemented in colorectal surgery, the use of ERAS pathways has demonstrated significant improvements in patient morbidity, length of stay, and survival. Within the context of outpatient cosmetic surgery, an expert panel has developed a set

of ERAS protocol guidelines for the perioperative care of patients undergoing breast surgery (15). A recent systematic review and subsequent set of consensus recommendations suggested various methods by which to address perioperative pain in patients undergoing breast operations. When adopted together as a comprehensive

protocol, appropriate preadmission education and counseling, patient optimization, increased implementation of multimodal non-opioid analgesia, goal directed fluid management, and early patient postoperative mobilization can result in improved postoperative outcomes (15).

	Extended Mastectomy/ and or any Plastic Reconstruction of the breast or face	Lumpectomy/ Partial Mastectomy
<b>Goals</b>	Reduce PACU length of stay and increase patient satisfaction by reducing post-op pain, PONV, and sedation by minimizing opioids and incorporating a multimodal analgesic regimen.	
<b>To whom it applies</b>	<ul style="list-style-type: none"> <li>• Axillary node dissections</li> <li>• Simple mastectomies</li> <li>• Any plastic surgery except free flaps.</li> <li>• Includes IP, SDA and outpatients</li> </ul>	<ul style="list-style-type: none"> <li>• Partial mastectomies <del>without</del> axillary node dissection.</li> <li>• Breast cases using MAC sedation.</li> <li>• Includes IP, SDA and outpatients</li> </ul>
<b>Meds ordered night before</b>	<ul style="list-style-type: none"> <li>• Gabapentin 300-400 mg PO x 1 <del>QD</del></li> <li>• Pregabalin 75mg PO x 1.</li> <li>• Acetaminophen 1000mg PO x 1.</li> <li>• Celecoxib 400mg PO (except for facial plastics)</li> <li>• <b>Scopolamine Patch for PONV</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>NO Gabapentinoids</b></li> <li>• Acetaminophen 1000mg PO x 1</li> <li>• Celecoxib 400mg PO</li> </ul>
<b>Consider a HOLDING AREA HUDDLE: between surgeons, patient and anesthesia to discuss:</b>	<ul style="list-style-type: none"> <li>• PO meds administered in holding area.</li> <li>• Prescriptions that the patient will take home (so that PACU orders can be coordinated).</li> </ul>	<ul style="list-style-type: none"> <li>• PO meds administered in holding area.</li> <li>• Prescriptions that the patient will take home (so that PACU orders can be coordinated).</li> </ul>
<b>Blocks</b>	<ul style="list-style-type: none"> <li>• <b>All cases that need a block will be booked as such. if not booked as a block, surgeon will infiltrate locally.</b></li> <li>• Suggested guideline for blocks: All mastectomies if booked and combined cases if booked as such.</li> </ul>	
<b>Induction</b>	<ul style="list-style-type: none"> <li>• Dexamethasone 8mg IV SLOW.</li> </ul>	<ul style="list-style-type: none"> <li>• Dexamethasone 4mg IV SLOW.</li> <li>• MAC anesthesia if appropriate.</li> </ul>
<b>Surgeon</b>	<ul style="list-style-type: none"> <li>• if block not performed, surgeon to instill local anesthetic into wound as appropriate</li> </ul>	<ul style="list-style-type: none"> <li>• Surgeon to instill local anesthetic into wound as appropriate</li> </ul>
<b>Intraop</b>	<ul style="list-style-type: none"> <li>• <b>NO Ketorolac</b></li> <li>• Ondansetron 4mg IV at end of case.</li> <li>• Minimal opioids. Short acting (Fentanyl or Dilaudid in low doses)</li> </ul>	<ul style="list-style-type: none"> <li>• Consider Ketorolac if Celecoxib has NOT been given at end of case</li> <li>• Ondansetron 4mg IV at end of case</li> </ul>
<b>Consider using:</b>	<ul style="list-style-type: none"> <li>• Esmolol infusion in place of opioids: 10 mcg/kg/min, adjusted 5-15 mcg/kg/min based on HR. Start during induction, end with removal of airway device</li> </ul>	
<b>PACU</b>	<ul style="list-style-type: none"> <li>• PO Opioid as needed when able to tolerate PO.</li> <li>• IV opioid (fentanyl or hydromorphone in low doses) for breakthrough pain, if unable to tolerate PO, or VAS&gt;5.</li> </ul>	<ul style="list-style-type: none"> <li>• PO Opioid as needed when able to tolerate PO.</li> <li>• IV opioid (fentanyl or hydromorphone in low doses) for breakthrough pain, unable to tolerate PO, or VAS&gt;5.</li> </ul>

Figure 1: ERAS protocol for breast surgery, Beth Israel Deaconess Medical Center, Harvard Medical School. Reproduced with permission from the Department of Anesthesia, Critical Care, and Pain Medicine, Beth Israel Deaconess Medical Center. Available at: [https://anesthesia.bidmc.harvard.edu/Clinical\\_Pathways/documents/Breast\\_and\\_Plastics\\_Pathways.pdf](https://anesthesia.bidmc.harvard.edu/Clinical_Pathways/documents/Breast_and_Plastics_Pathways.pdf)

The implementation of an ERAS protocol for same day breast surgery has been successful. Our hospital has adopted a formalized ERAS protocol for breast surgery that has been effectively implemented across multiple disciplines (Figure 1). Dumestre et al, conducted a prospective study to compare outcomes within 30 days of surgery in patients following a traditional surgical recovery and in those following their iteration of an ERAS protocol (16). A post-operative quality of recovery questionnaire was completed by patients to assess their degree of satisfaction with the perioperative experience in categories including PONV, pain, quality of sleep, ability to tolerate diet. Overall, with the adoption of ERAS protocols, average length of stay was reduced from 1.6 nights in the traditional recovery group to 0 nights in the ERAS group. Furthermore, the group of patients in which the ERAS protocol was implemented reported less pain, PONV, and improved satisfaction with their postoperative experience. The ERAS group received preoperative consultation and education, preoperative antiemetics, and pre- and postoperative emphasis on non-opioid analgesia, including celecoxib, acetaminophen, gabapentin, and intraoperative local anesthetic.

Successful ERAS implementation relies on analgesia from several different modalities. Below we highlight key components to a comprehensive ERAS implementation. Safe and effective anesthesia for outpatient cosmetic surgery relies on an understanding and appreciation of the various tools available for perioperative pain optimization.

### **REGIONAL BLOCKS**

More effective perioperative non-opioid pain control is a cornerstone of ERAS protocols, and encompasses several different

approaches to pain management. One facet of these approaches includes regional blocks. The paravertebral block is one modality by which several dermatomes can be anesthetized in a safe, reliable manner. It has been shown to be efficacious in several retrospective studies (17,18). A recent randomized controlled trial of the effectiveness of paravertebral blocks demonstrated significant reductions in both postoperative pain and opioid consumption in patients receiving blocks compared to general anesthesia alone in outpatient breast reconstruction (19). Additionally, among cosmetic breast surgical patients, preoperative paravertebral block appears to improve postoperative pain control compared to intraoperative injection of local anesthetic or general anesthesia alone (20,21).

Another form of regional block, the transversus abdominis plane block (TAP) holds similar potential for patients undergoing abdominally-based plastic surgical procedures. The TAP block provides a sensory blockade for the lower thoracic and lumbar nerves, and is administered in the plane between the internal oblique and transversus abdominis muscles. A recent randomized trial on the effects of TAP block during abdominoplasty demonstrated significantly reduced postoperative pain scores and accelerated recovery (22).

### **ORAL AND INTRAVENOUS NON-OPIOID ADJUNCTS**

Both pre- and postoperative non-opioid medications comprise another element of a successful ERAS protocol, and are especially important in office-based surgical procedures. Steroids, pregabalin, NSAIDs, and acetaminophen are each common components of a broad perioperative pain regimen (23). Table 1 provides an overview of some of the more commonly used adjuncts.

Table 1. Perioperative adjuncts in the ERAS pathway for improved analgesia after operation. Adapted from Gritsenko et al (45).

Treatment Modality	Dosing	Notes
Acetaminophen	15 mg/kg in adults, 650-1000mg q6h	- Consider for all procedures - May be used in conjunction with NSAIDS
NSAIDS/COX-2 inhibitors	Multiple	- Consider for most procedures
Gabapentinoids	Gabapentin: - 600 mg PO preoperatively - 100-600 mg q8h postoperatively Pregabalin: - 150-300 mg PO preoperatively - 50-100 mg q12h postoperatively	- Consider for all procedures
$\alpha$ 2 agonists	Clonidine: - Bolus 2-5 mcg/kg PO/IV preoperatively	- Can induce hypotension, bradycardia - Decreases postoperative pain and nausea
Lidocaine	- Bolus: 1-1.5 mg/kg over 10 minutes - Infusion: 1-3 mg/kg/hr	- May augment with perineuraxial topical lidocaine
Dexamethasone	0.1 mg/kg	- Consider preoperative administration via infusion

### ***Dexamethasone***

Glucocorticoids have potent immunomodulatory effects, and dexamethasone is commonly used in the perioperative setting for the prevention of post-operative nausea and vomiting (24). Waldron et al conducted a systematic review and analysis to evaluate the impact of a single intraoperative intravenous dose of dexamethasone on post-operative pain and adverse effects associated with its administration (25). Opioid consumption was analyzed across all time points and was standardized to morphine equivalents for comparison. Overall, patients who received dexamethasone demonstrated significantly lower pain scores at 2 hours, 24 hours, and 48

hours postoperatively. This led to a respective decrease in postoperative opioid requirements of 13% and 10.3% at 2hrs and 24hrs, respectively. Patients receiving dexamethasone also had significantly shorter PACU stays with no increase of adverse effects. As such, because of its effect on PONV reduction and decrease in postoperative pain and opioid consumption, perioperative dexamethasone may enhance the postoperative recovery.

### ***Pregabalin***

Pregabalin is an analogue of  $\gamma$ -aminobutyric acid and exerts its effect by reducing dorsal horn neuronal excitability. It is commonly used as part of a multimodal



perioperative analgesic regimen. Mishriky et al conducted a systematic review and meta-analysis of the impact of pregabalin administration on postoperative pain scores and opioid consumption (26). Patients who received at least 100mg of pregabalin preoperatively reported decreased pain at 2 hours and 24 hours postoperatively compared to control. Moreover, postoperative opioid consumption was reduced at both 2 hours and 24 hours. Despite improvements in pain scores and opioid consumption, the meta-analysis found no statistically significant difference in duration of PACU stay between the two groups. Overall, the results of this study suggest that, like glucocorticoids, pregabalin administration preoperatively may help to improve postoperative pain and decrease postoperative opioid.

### **INTRAOPERATIVE LIPOSOMAL BUPIVACAINE**

In addition to regional blocks and perioperative multimodal oral medication regimens, the use of intraoperative local anesthetic has been studied as an important component to ERAS pathways (27).

Bupivacaine is a local amide amino anesthetic with a duration of action typically less than 10 hours. It has been administered in a variety of modalities for surgical patients, including direct injection, peripheral nerve blocks, and continuously eluting pumps. A newer, liposomally-based formulation increases the drug's duration of action to 3-4 days. Among plastic surgical procedures, it has been approved for use in breast surgery, and it has been shown to improve patients' perception of pain control postoperatively. In retrospective analyses, patients have typically reported low postoperative pain scores, high overall satisfaction, and, notably, a willingness to pay additional fees for its use (28).

A recent meta-analysis of the data on liposomal bupivacaine in plastic surgery also

demonstrated overall high satisfaction scores with respect to postoperative pain without adverse events reported (29). Although the data were variable and encompassed several different types of plastic surgical procedures (abdominoplasty, augmentation mammoplasty, abdominal wall reconstruction, and breast reconstruction), most of it suggests that patients experienced improved pain relief and decreased usage of adjunctive oral narcotics. Although promising, liposomal bupivacaine is typically administered in conjunction with intraoperative narcotic analgesia as well, so the data may be confounded by multimodal treatments.

Several studies, however, do demonstrate a benefit to liposomal bupivacaine compared to bupivacaine injected directly or via elastomeric pump. A recent double blind, randomized controlled trial of bupivacaine versus liposomal bupivacaine in augmentation mammoplasty demonstrated a statistically significant decrease in postoperative pain with the use of liposomal bupivacaine (30). Cost remains a factor in the widespread adoption of liposomal bupivacaine in plastic surgery, and consequently many offices and surgical centers are hesitant to adopt its implementation into their perioperative analgesic protocol. However, some data suggest that overall healthcare costs are actually lower with use of liposomal bupivacaine (31). Future prospective studies on the clinical and cost-effectiveness of the drug will help construct the formulation of standardized protocols for liposomal bupivacaine and facilitate the standardization of its use.

### **SURGICAL SAFETY CHECKLISTS**

In recent years, the use of checklists in the surgical setting has gained both public and academic attention, largely in part for its ability to encourage cooperation and communication between surgical, anesthesia,

and OR nursing staff. Surgical safety checklists have proven to be effective in preventing major surgical errors and reducing complications in various settings (32,33). Widespread use of the World Health Organization (WHO) surgical safety checklist improves perioperative morbidity and mortality: the 19-point checklist decreased operative mortality from 1.5% to 0.8%, and it decreased inpatient complications from 11.0% to 7.0% (34). In a prospective trial, De Vries et al compared the outcomes of multidisciplinary surgical patients before and after implementation of a surgical checklist across six hospitals. Use of their comprehensive surgical checklist resulted in an absolute risk reduction of 10.6% (27.3% to 16.7%) for postoperative complications (35).

Several authors have assessed the efficacy of a safety checklist in hospitals, but its impact on operations in the office-based setting has been relatively unstudied. Given

the success of surgical checklist implementation in the hospital setting, the Institute for Safety in Office-Based Surgery (ISOBS) developed a 28-step perioperative checklist to identify and control safety risks during invasive office procedures (36). Design of the checklist included stop points at multiple stages of the surgical process and necessitated involvement from all disciplines of the surgical setting including the surgeon, anesthesiologist, nursing and OR staff. It was partitioned into 5 sections, each corresponding to different phases of the office procedure; introduction, setting, operation, before discharge, satisfaction. Moreover, the checklist was designed to be altered to suit the individual needs of a practice (Figure 2). This ISOBS surgical safety checklist has now been included in the office-based guidelines resource handbook for the American Academy of Healthcare Risk Management.

## Safety Checklist for Office-Based Surgery

from the Institute for Safety in Office-Based Surgery (ISOBS)



Introduction	Setting	Operation	Before discharge	Satisfaction
Preoperative encounter; with practitioner and patient	Before patient in procedure room; with practitioner and personnel	Before sedation/analgesia; with practitioner and personnel*	On arrival to recovery area; with practitioner and personnel	Completed post-procedure; with practitioner and patient
<p><i>Patient</i></p> <p>Patient medically optimized for the procedure?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No, and plan for optimization made <p>Does patient have DVT risk factors?</p> <input type="checkbox"/> Yes, and prophylaxis plans arranged <input type="checkbox"/> No <p><i>Procedure</i></p> <p>Procedure complexity and sedation/analgesia reviewed?</p> <input type="checkbox"/> Yes <p>NPO instructions given?</p> <input type="checkbox"/> Yes <p>Escort and post-procedure plans reviewed?</p> <input type="checkbox"/> Yes	<p>Emergency equipment check complete (e.g. airway, AED, code cart, MH kit)?</p> <input type="checkbox"/> Yes <p>EMS availability confirmed?</p> <input type="checkbox"/> Yes <p>Oxygen source and suction checked?</p> <input type="checkbox"/> Yes <p>Anticipated duration ≤ 6 hours?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No, but personnel, monitoring, and equipment available	<p>Patient identity, procedure, and consent confirmed? <input type="checkbox"/> Yes</p> <p>Is the site marked and side identified?</p> <input type="checkbox"/> Yes <input type="checkbox"/> N/A <p>DVT prophylaxis provided?</p> <input type="checkbox"/> Yes <input type="checkbox"/> N/A <p>Antibiotic prophylaxis administered within 60 minutes prior to procedure? <input type="checkbox"/> Yes <input type="checkbox"/> N/A</p> <p>Essential imaging displayed?</p> <input type="checkbox"/> Yes <input type="checkbox"/> N/A <p><i>Practitioner confirms verbally:</i></p> <input type="checkbox"/> Local anesthetic toxicity precautions <input type="checkbox"/> Patient monitoring (per institutional protocol) <input type="checkbox"/> Anticipated critical events addressed with team <input type="checkbox"/> Each member of the team has been addressed by name and is ready to proceed	<p>Assessment for pain?</p> <input type="checkbox"/> Yes <p>Assessment for nausea/vomiting?</p> <input type="checkbox"/> Yes <p>Recovery personnel available?</p> <input type="checkbox"/> Yes <p><i>Prior to discharge: (with personnel and patient)</i></p> <p>Discharge criteria achieved?</p> <input type="checkbox"/> Yes <p>Patient education and instructions provided?</p> <input type="checkbox"/> Yes <p>Plan for post-discharge follow-up?</p> <input type="checkbox"/> Yes <p>Escort confirmed?</p> <input type="checkbox"/> Yes	<p>Unanticipated events documented?</p> <input type="checkbox"/> Yes <p>Patient satisfaction assessed?</p> <input type="checkbox"/> Yes <p>Provider satisfaction assessed?</p> <input type="checkbox"/> Yes

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged. \*Adapted from the WHO Surgical Safety Checklist. © 2010 Institute for Safety in Office-Based Surgery (ISOBS), Inc. – All Rights Reserved – [www.isoobs.org](http://www.isoobs.org)

Figure 2. The Institute for Safety in Office-Based Surgery constructed a 28-step perioperative checklist to identify and control safety risks during the different phases of an invasive office procedure. The can be used as a customizable template to suit the needs of each individual office setting. Reproduced with permission from the Institute for Safety in Office-Based Surgery (ISOBS). <http://isoobsurgery.org>.

Rosenberg et al studied the implementation of the office-based surgical safety checklist (32). In total, 219 procedures were performed prior to implementation of the checklist and 184 procedures after implementation. Complication rates decreased from 15.1% to 2.72%, suggesting that adoption of the checklist resulted in improved patient safety and outcomes. Furthermore, medical optimization of patients improved from 90.9% to 99.5%, ensuring that patients had an up-to-date history and physical. Importantly, the implementation of the safety checklist also improved patient satisfaction scores from 57.1% to 90.8%.

Another recent study demonstrated a reduction in preventable “never events” in patients undergoing laser vision correction via the implementation of a specialty-specific preoperative checklist when compared to the incidence of “never events” when using the WHO time out procedure (37). Although this checklist was specifically designed to be used in an ophthalmologic setting, its efficacy suggests applicability to other fields and procedures. Taken together, these studies demonstrate that the use of a customizable surgical safety checklist tailored to an office-based plastic surgical setting can significantly reduce patient morbidity and mortality while

improving patient outcomes and satisfaction.

The use of checklists in the office-based surgical setting is effective in improving outcomes by providing the framework for a safe office based procedure. In doing so, use of the checklist helps to reveal deficiencies and thus guides tangible and deliverable improvements in patient care.

### **PATIENT EDUCATION AND SHARED DECISION MAKING**

Any comprehensive approach to quality improvement and patient safety should include the patient as an active participant in their own care. Patient engagement has been linked to improved patient outcomes, lower healthcare costs, and increased patient satisfaction. Conceptually, shared decision making includes patients' participation in managing their own health to maximize physical and mental wellbeing (38). Decision aids are patient education tools designed to clearly and simply outline an evidence based explanation of the procedure outcomes, risks, and benefits. A recent Cochrane review showed that patients who use decision aids

feel better informed about their options and more convicted of their preferences. Moreover, they have more accurate outcome expectations and can better participate in the informed decision-making process (39).

Patient-centered checklists represent one form of decision aid. While checklists have proven to be effective tools for providers, their use by patients had not been completely explored. However, a recent cross-sectional survey including both patients and providers demonstrated that 94% of patients indicated that they would be willing to participate in their healthcare and decision making, suggesting that implementation of an ambulatory surgical checklist may benefit the patient by facilitating education, encouraging participation, and increasing overall satisfaction (40). Figure 3 represents an example of a patient-centered checklist designed to improve patient engagement. This ISOBS-sponsored patient safety checklist has since been added to the Harvard Pilgrim Healthcare website and featured by the organization to an estimated 400,000 subscribers (41).

# Patient's Checklist for Office-Based Procedures

from the Institute for Safety in Office-Based Surgery (ISOBS)



<b>Inquire</b>	What are my doctor's credentials?	Does the doctor have privileges to perform the same procedure at a hospital? <input type="checkbox"/> Yes <input type="checkbox"/> No What is your doctor board-certified in? <input type="checkbox"/> Yes <input type="checkbox"/> No How many times recently has the doctor performed your type of procedure? <input type="checkbox"/> Yes <input type="checkbox"/> No What is your doctor's reputation? <input type="checkbox"/> Yes <input type="checkbox"/> No Who will be giving sedation/anesthesia, if needed, and who will be monitoring me while during sedation? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Stable</b>	Are my medical conditions stable?	Are my medical conditions under control? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Office</b>	Is the office accredited and licensed?	Is the office accredited and the sign posted on the wall? <input type="checkbox"/> Yes <input type="checkbox"/> No Who inspects and certifies the office for safety and infection control? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Best</b>	Is this office the best place for my procedure?	Is the office the right setting for my procedure? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Suited</b>	Can this office handle an emergency?	Is the office prepared for an unexpected emergency, such as drugs, equipment and training? <input type="checkbox"/> Yes <input type="checkbox"/> No If I need additional medical care, where will I be transferred? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Plan</b>	What is the plan for my recovery after the procedure?	Who will monitor my recovery and who will supervise my discharge home? <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Communication</b>	How will I be able to communicate with the office?	Have you had a follow-up call or visit with your doctor or nurse? <input type="checkbox"/> Yes <input type="checkbox"/> No Have you communicated your questions and overall satisfaction to the office staff? <input type="checkbox"/> Yes <input type="checkbox"/> No

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged. \*Adapted from the WHO Surgical Safety Checklist. © 2011 Institute for Safety in Office-Based Surgery (ISOBS), Inc – All Rights Reserved – www.isoobs.org

Figure 3. A patient-centered checklist encourages better understanding before undergoing an office based procedure. Reproduced with permission from the Institute for Safety in Office-Based Surgery (ISOBS). <http://isobsurgery.org>.

Particularly when there is no standard of care or “medically-best” choice, shared decision making can be critical to the patient-centered care process. These sensitive situations warrant careful patient-physician interplay before the final treatment decision is made. Although the engagement process

includes weighing individual patient preferences based on risks and benefits, patients often neglect to voice their concerns when discussing their medical plans. This may be particularly evident in anesthetic discussions with a physician with whom they have no prior relationship. For example, the

option of regional anesthesia over general anesthesia is a commonly encountered preoperative decision. Brochures and handouts are forms of decision aids that can encourage patients to preoperatively discuss anesthesia and pain relief options with their physicians. Recently, the American Society of Anesthesiologists (ASA) developed and added to their website a preoperative patient education decision aid on regional anesthesia that increased patient knowledge about peripheral nerve blocks (42, Appendix 1).

Recent work suggests that increased and intentional patient involvement may improve outcomes in the office-based plastic surgical setting as well. For example, despite technical advances over recent decades, patient dissatisfaction following breast augmentation results in a substantial rate of reoperation, from 15 to 24% at 3 years (43,44). In a prospective study of 300 patients, Adams et al analyzed outcomes, complications, and recovery of patients who underwent breast augmentation following a defined perioperative process that included structured patient education and informed consent, tissue-based preoperative consultation, and defined postoperative instructions (44). Each patient was required to complete a specific set of breast augmentation and informed consent documents in addition to participating in an education consultation performed by a patient education specialist. Subsequent surgical consultation occurred only after the process of patient education and consultation was completed. Overall reoperation rates for the entire cohort within the follow up time was 3.7 %. The author attributes this to a well-executed patient education process in which patients understand their personal characteristics and tissue limitations. Moreover, in this prospective cohort, 97% of the patients returned to their normal daily activities within

24 hours of their operation. Results of this study demonstrate that the nonsurgical steps of education, consultation, and shared decision making are essential to optimizing operative outcomes and improving patient satisfaction with their procedure.

Patient education and assistance with decision making encourages patients to play an active role in their care, and it strengthens the surgeon-patient relationship. Although it is a frequently neglected process, formalized patient education can improve outcomes and satisfaction with outpatient cosmetic surgery.

## **CONCLUSION**

An increasing proportion of operations and of cosmetic plastic surgical operations in particular, are being performed in the office-based, ambulatory setting. Outpatient facilities are inherently different than hospitals with respect to infrastructural and personnel capacity. Although this offers distinct advantages to both patients and providers alike, office-based surgery also demands that all members of the medical community understand the multifaceted challenges involved in assuring the highest quality patient care and safety. With a continued increase in the number and complexity of both patients and procedures, in addition to a lack of uniform regulations on the standard of care in office-based surgical centers in the USA (2), health care providers are faced with the challenge of following safe and efficient patient care practices to optimize outcomes and morbidity. Procedures performed in the office-based environment can be as safe as those traditionally performed in hospitals. Providers should continue to develop evidence-based practices for the outpatient environment to more clearly measure and delineate essential components of safe surgical care.

## REFERENCES

1. American Society of Plastic Surgeons: Plastic Surgery Statistics Report 2016. [www.plasticsurgery.org](http://www.plasticsurgery.org). Accessed September 12, 2017.
2. Shapiro FE, Punwani N, Rosenberg NM, Valedon A, Twersky R, Urman RD. Office-based anesthesia: safety and outcomes. *Anesth Analg* 2014; 119:276-285.
3. Domino KB. Operating Room Fires. *Anesthesiology* 2013; 118:1133-9
4. Kung TA, Kong SW, Aliu O, Azizi J, Kai S, Cederna PS: Effects of vacuum suctioning and strategic drape tenting on oxygen concentration in a simulated surgical field. *J Clin Anesth* 2016; 28:56-61
5. Engel SJ, Patel NK, Morrison CM, Rotemberg SC, Fritz J, Nutter B, Zins JE: Operating Room Fires. *Plast Reconstr Surg* 2012;1 doi:10.1097/PRS.0b013e31825dc14a
6. Holt NF. Tumescent anesthesia: its applications and well tolerated use in the out-of-operating room setting. *Curr Opin Anaesthesiol* 2017;30:518-524.
7. Klein JA and Jeske DR. Estimated maximal safe dosages of tumescent lidocaine. *Anesth Analg* 2016; 122: 1350-1359.
8. Chia CT, Neinstein RM, Theodorou SJ. Evidence-based medicine: Liposuction. *Plast Reconstr Surg* 2017; 139: 267e-274e.
9. American Society of Anesthesiologists Task Force on Acute Pain Management. Practice guidelines for acute pain management in the perioperative setting: An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology* 2012;116:248-273.
10. Kelley BP, Bennett KG, Chung KC, Kozlow JH. Ibuprofen may not increase bleeding risk in plastic surgery: A systematic review and meta-analysis. *Plast Reconstr Surg* 2016; 137: 1309-1316.
11. Gobble RM, Hoang HLT, Kachniarz B, Orgill DP. Ketorolac does not increase perioperative bleeding: A meta-analysis of randomized controlled trials. *Plast Reconstr Surg* 2014; 133: 741-755.
12. Coley KC, Williams BA, DaPos S V., Chen C, Smith RB: Retrospective evaluation of unanticipated admissions and readmissions after same day surgery and associated costs. *J Clin Anesth* 2002; 14:349-53
13. Buvanendran A and Kroin JS. Multimodal analgesia for controlling acute postoperative pain. *Curr Opin Anaesthesiol* 2009; 22:588-593
14. Armstrong KA, Davidge K, Morgan P, Brown M, Li M, Cunningham L, Clarke H, Semple JL: Determinants of increased acute postoperative pain after autologous breast reconstruction within an enhanced recovery after surgery protocol: A prospective cohort study. *J Plast Reconstr Aesthetic Surg* 2016; 69:1157-60
15. Temple-Oberle C, Shea-Budgell MA, Tan M, Semple JL, Schrag C, Barreto M, Blondeel P, Hamming J, Dayan J, Ljungqvist O, ERAS Society: Consensus Review of Optimal Perioperative Care in Breast Reconstruction: Enhanced Recovery after Surgery (ERAS) Society Recommendations. *Plast Reconstr Surg* 2017; 139:1056e-1071e
16. Dumestre DO, Webb CE, Temple-Oberle C: Improved Recovery Experience Achieved for Women Undergoing Implant-Based Breast

- Reconstruction Using an Enhanced Recovery after Surgery Model. *Plast Reconstr Surg* 2017; 139:550–9
17. Coopey SB, Specht MC, Warren L, Smith BL, Winograd JM, Fleischmann K. Use of preoperative paravertebral block decreases length of stay in patients undergoing mastectomy plus immediate reconstruction. *Ann Surg Oncol*. 2013;20:1282–1286.
  18. Fahy AS, Jakub JW, Dy BM, et al. Paravertebral blocks in patients undergoing mastectomy with or without immediate reconstruction provides improved pain control and decreased postoperative nausea and vomiting. *Ann Surg Oncol*. 2014;21:3284–3289.
  19. Wolf O, Clemens MW, Purugganan RV, Crosby MA, Kowalski AM, Kee SS, Liu J, Goravanchi F. A prospective, randomized, controlled trial of paravertebral block versus general anesthesia alone for prosthetic breast reconstruction. *Plast Reconstr Surg* 2016; 137:660e-666e.
  20. Gardiner S, Rudkin G, Cooter R, Field J, Bond M. Paravertebral blockade for day-case breast augmentation: A randomized clinical trial. *Anesth Analg* 2012; 115: 1053-1059.
  21. Salviz EA, Sivrikoz N, Ozonur A, Orhan-Sungur M, Savran-Karadeniz M, Altun D, Hocaoglu E, Celet-Ozden B, Tugrul KM. Ultrasound-guided bilateral thoracic paravertebral blocks as an adjunct to general anesthesia in patients undergoing reduction mammoplasty: A historical cohort study. *Plast Reconstr Surg* 2017; 139:20e-28e.
  22. Sforza M, Andjelkov K, Zaccheddu R, Nagi H, Colic M. Transversus abdominis plane block anesthesia in abdominoplasties. *Plast Reconstr Surg* 2011; 128: 529-535.
  23. Ramaswami S, Wilson JA, Colvin L. Non-opioid-based adjuvant analgesia in perioperative care. *Contin Educ Anaesthesia, Crit Care Pain* 2013; 13:152–7.
  24. Gan TJ, Diemunsch P, Habib AS, Kovac A, Kranke P, Meyer TA, Watcha M, Chung F, Angus S, Apfel CC, Bergese SD, Candiotti KA, Chan MT, Davis PJ, Hooper VD, Lagoo-deenadayalan S, Myles P, Nezat G, Philip BK, Tram MR. Consensus Guidelines for the Management of Postoperative Nausea and Vomiting. *Anesth Analg* 2014; 118:85–113
  25. Waldron NH, Jones CA, Gan TJ, Allen TK, Habib AS: Impact of perioperative dexamethasone on postoperative analgesia and side-effects: Systematic review and meta-analysis. *Br J Anaesth* 2013; 110:191–200
  26. Mishriky BM, Waldron NH, Habib AS: Impact of pregabalin on acute and persistent postoperative pain: a systematic review and meta-analysis. *Br J Anaesth* 2015; 114:10–31
  27. Afonoso A, Oskar S, Tan KS, Disa JJ, Mehara BJ, Ceyhan J, Dayan JH. Is enhanced recovery the new standard of care in microsurgical breast reconstruction? *Plast Reconstr Surg* 2017; 139(5): 1053-1061.
  28. Eberle N and Newman M. Patient perception of postoperative pain after administration of liposomal bupivacaine in plastic surgery. *Ann Plast Surg* 2015; 74: S198-S200.
  29. Vyas KS, Rajendran S, Morrison SD, Shakir A, Mardini S, Lemaine V, Nahabedian MY, Baker SB, Rinker BD, Vasconez HC. Systematic review



- of liposomal bupivacaine (Exparel) for postoperative analgesia. *Plast Reconstr Surg* 2016; 138:748e-756e.
30. Nadeau MH, Saraswat A, Vasko A, Elliott JO, Vasko SD. Bupivacaine versus liposomal bupivacaine for postoperative pain control after augmentation mammoplasty: A prospective, randomized, double-blind trial. *Aesthet Surg J* 2016; 36(2):NP47-52.
31. Miranda SG, Liu Y, Morrison SD, Sood RF, Gallagher T, Gougoutas AJ, Colohan SM, Louie O, Mathes DW, Neligan PC, Said HK. Improved healthcare economic outcomes after liposomal bupivacaine administration in first-stage breast reconstruction. *J Plast Resonstr Aesthet Surg* 2016; 69(10):1456-1457.
32. Rosenberg N, Urman R, Gallagher S, Stenglein J, Liu X, Shapiro F: Effect of an Office-Based Surgical Safety System on Patient Outcomes. *Eplasty* 2012; 12:493-9
33. Haynes AB, Weiser TG, Berry WR, Lipsitz S, Breizat A-H, Dellinger EP, Herbosa T, Joseph S, Kibatala P, Lapitan M, Merry A, Moorthy K, Reznick R, Tayler B, Gawande A: A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med* 2009; 360:491-9
34. Shapiro F, Grammer R, Punwani N, Urman R: The Evolution of Checklists and Implications for Anesthesiology. *Int Anesthesiol Clin* 2013; 51:53-64
35. De Vries EN, Prins HA, Crolla R, Outer A den, Andel G van, Helden S van: Collaborative Group Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med* 2010:1963-5
36. Shapiro FE, Punwani N, Urman RD: Checklist implementation for office-based surgery: A team effort. *AORN J* 2013; 98:305-9
37. Robert MC, Choi CJ, Shapiro FE, Urman RD, Melki S: Avoidance of serious medical errors in refractive surgery using a custom preoperative checklist. *J Cataract Refract Surg* 2015; 41:2171-8
38. Aimee M. Becker, M.D., Fred E. Shapiro, D.O.; Patient-Centered Care: Improving Patient Safety in Anesthesia Through Patient Engagement. *ASA Monitor* 2015;79(5):10-12.
39. Stacey D, Légaré F, Lewis K, Barry MJ, Bennett CL, Eden KB, Holmes-Rovner M, Llewellyn-Thomas H, Lyddiatt A, Thomson R, Trevena L. Decision aids for people facing health treatment or screening decisions. *Cochrane Database of Systematic Reviews* 2017, Issue 4. Art. No.: CD001431. DOI: 10.1002/14651858.CD001431.pub5
40. Fernando RJ, Shapiro FE, Urman RD. Survey analysis of an ambulatory surgical checklist for patient use. *AORN Journal* 2015; 102(3):290.e1-290.e10
41. Shapiro FE, Punwani N, Urman RD: Putting the Patient Into Patient-Centered Care. *AORN J* 2013; 98:413-8
42. Posner K, Mincer SL, Harvey AE, Xue AH, Van Norman GA, Domino, KB. Regional Anesthesia Decision Aids in the Pre-Anesthesia Clinic Improve Patient Engagement and Knowledge. *Anesthesiol Annu Meet* 2015
43. Adams WP: The Process of Breast Augmentation: Four Sequential Steps

- for Optimizing Outcomes for Patients. *Plast Reconstr Surg* 2008; 122:1892–900
44. Adams WP, Small KH: The Process of Breast Augmentation with Special Focus on Patient Education, Patient Selection and Implant Selection. *Clin Plast Surg* 2015; 42:413–26
45. Gritsenko K, Khelemsky Y, Kaye AD, Vadivelu N, Urman RD. Multimodal therapy in perioperative analgesia. *Best Pract Res Clin Anaesthesiol* 2014; 28(1):59-79.

**Appendix 1.** Peripheral Nerve Blocks – Decision Aid is reprinted with permission of the American Society of Anesthesiologists, 1061 American Lane Schaumburg, IL 60173-4973.



## ***Patient Education***

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### ***Pre-Anesthesia***

# Peripheral Nerve Blocks

## *Decision aid*

**This decision aid is meant to help you decide what type of anesthesia is right for you. It explains the benefits and risks of peripheral nerve blocks. Read this decision aid, fill out the question boxes, and talk with your anesthesiologist to help you decide what type of anesthesia is your best choice.**

### **What are peripheral nerve blocks?**

- Anesthesia blocks pain during your surgery.
- Peripheral nerve blocks numb parts of your body. You may stay awake or receive a sedative during the surgery. You may recall parts of or all of the procedure.
- You may have a general anesthetic in addition to your peripheral nerve block for your procedure.
- For a peripheral nerve block, local anesthetic drugs are injected near a nerve or group of nerves to block pain in the part of the body supplied by the nerve. You may get an injection of the anesthetic drugs, or a nerve catheter (thin tube) may be put in to help deliver the drugs.
- Peripheral nerve blocks are used to provide anesthesia for operations on the hands, arms, feet, legs, or other types of procedures. They are also used for pain relief after surgery.
- You may feel pain or tingling as the anesthesiologist injects the local anesthetic.
- During your surgery, your anesthesiologist will closely watch how much oxygen is in your blood, how sleepy you are, your breathing, blood pressure and heart rate.

## **What are the possible benefits of peripheral nerve blocks?**

Some possible benefits of peripheral nerve blocks are:

- You may choose to stay awake or a little sleepy during your surgery.
- The level of sedation can be adjusted to your level of comfort.
- Improved pain relief after the procedure compared to pain medicine.
- Less nausea, less vomiting and feel less sleepy with regional blocks compared to general anesthesia.
- You may recover and be discharged quicker after your procedure compared to general anesthesia. This lets you to go home sooner.

**1. What benefits of peripheral nerve block matter most to me?**

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## **What are the possible risks of peripheral nerve blocks?**

All types of anesthesia have some risks. These risks depend on things such as your age, your health, the type of surgery and how you respond to the medicines used. Older people or people with conditions such as heart disease, diabetes, obstructive sleep apnea, nerve problems or obesity are at higher risk. Talk to your anesthesiologist about your risks for anesthesia and surgery.

Risks **specific to peripheral nerve blocks** include:

### Minor Risks

- Pain, tingling or a strange feeling that is not related to the surgery. 2 to 10 in 1,000 people may feel mild pain, tingling or a strange sensation that is not from their procedure.
- Muscle weakness – You will most likely feel some temporary muscle weakness right after you get the nerve block. After some nerve blocks for shoulder surgery, paralysis of your diaphragm (breathing muscle) may cause you to feel short of breath. Muscle function generally goes back to normal after the block wears off.
- You may need both a peripheral nerve block and general anesthesia to get the best level of sedation and pain relief.
- Redness, swelling, blisters or other kinds of skin reactions. These may be from tape, monitors, intravenous catheter or allergic reaction to medicines. A bruise, a sore spot or infection at the injection site.

### Major Risks - all very rare

- Nerve injury – 2 to 9 in 10,000 people may have nerve damage as a result of peripheral nerve blocks. This may cause you to feel numb in that spot, or to have pain, feel tingling, or lose some feeling, or a limb may be paralyzed (not move).
- Collapsed lung (pneumothorax) – 2 in 10,000 people may have a collapsed lung after they have a peripheral nerve block *for shoulder, arm, or hand surgery*. A chest tube may need to be put in to treat this.
- Seizure – 1 to 4 in 10,000 people may have a seizure due to rapid absorption of the anesthetic drug.
- Heart attack/cardiac arrest – 2 in 100,000 people may have a heart attack.
- Stroke or brain damage – Very rare.
- Death – 2 in 100,000 people may die.

**Put your risk in perspective:**



**Risk of death in an airplane:  
1 in 7,229**

**2. What are my concerns about these possible risks?**

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**What are the side effects after peripheral nerve blocks?**

- Pain – You will feel some pain and discomfort from your surgery as the nerve block wears off. This can be controlled with pain medicine.
- Reduced muscle control and coordination – The anesthetic may cause you to have problems with muscle control and coordination, but these effects do not last long.

**What are my choices?**

- You need to have anesthesia for your procedure. You may have a choice of peripheral nerve block, epidural or spinal anesthesia, general anesthesia, or some combination of these. Talk about these options, and what you prefer and what concerns you, with your anesthesiologist and with your surgeon.
- There may be choices for post-procedure pain relief, such as peripheral nerve block or pain medicine.
- Your anesthesiologist and surgeon will decide if a peripheral nerve block is an appropriate choice for you. They will consider your medical condition, history and the procedure that you will have.



## Questions?

Your questions are important. Call your doctor or health care provider if you have questions or concerns. Clinic staff are also available to help.

Pre-Anesthesia Clinic:  
(XXX) XXX-XXXX

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## Do I understand the pros and cons of peripheral nerve block so I can decide if it's the right choice for me?

1. Peripheral nerve blocks numb parts of your body. You may remain awake during your procedure.
  - True  False
2. Benefits of peripheral nerve block include:
  - Improved pain relief after the procedure compared to pain medicine.
  - Less nausea, less vomiting and feel less sleepy compared to general anesthesia.
  - You may recover and be discharged quicker after your surgery compared to general anesthesia; lets you to go home sooner.
  - All of the above.
3. Specific risks of peripheral nerve block include:
  - Temporary muscle weakness or permanent nerve injury.
  - Collapsed lung (with shoulder, arm or hand procedures).
  - Seizure.
  - All of the above.

Answers: 1) True; 2) All of the above; 3) All of the above

## References

1. Kessler J, Marhofer P, Hopkins PM, Hollmann MW. Peripheral regional anaesthesia and outcome: lessons learned from the last 10 years. *Br J Anaesth.* 2015;114(5):728-745.
2. Koivuranta M, Läärä E, Snåre L, Alahuhta S. A survey of postoperative nausea and vomiting. *Anaesthesia.* 1997;52(5):443-449.
3. Auroy Y, Benhamou D, Bagues L, et al. Major complications of regional anesthesia in France: The SOS Regional Anesthesia Hotline Service. *Anesthesiology.* 2002;97(5):1274-1280.
4. Sites BD, Barrington MJ, Davis M. Using an international clinical registry of regional anesthesia to identify targets for quality improvement. *Reg Anesth Pain Med.* 2014;39(6):487-495.
5. Barrington MJ, Watts SA, Gledhill SR, et al. Preliminary results of the Australasian Regional Anaesthesia Collaboration: a prospective audit of more than 7000 peripheral nerve and plexus blocks for neurologic and other complications. *Reg Anesth Pain Med.* 2009;34(6):534-541.
6. Barrington MJ, Kluger R. Ultrasound guidance reduces the risk of local anesthetic systemic toxicity following peripheral nerve blockade. *Reg Anesth Pain Med.* 2013;38(4):289-299.
7. Sites BD, Taenzer AH, Herrick MD, et al. Incidence of local anesthetic systemic toxicity and postoperative neurologic symptoms associated with 12,668 ultrasound-guided nerve blocks: an analysis from a prospective clinical registry. *Reg Anesth Pain Med.* 2012;37(5):478-482.

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