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Recent Publications Impacting Ambulatory Anesthesia Practice

Girish P. Joshi, MB, BS, MD, FFARCSI
Professor of Anesthesiology and Pain Management

DISCLOSURE: Consultant Baxter International Inc.

1

Expansion in ambulatory surgery provides opportunity for anesthesiologists to expand our role as perioperative physicians

2

Ambulatory Surgery Centers and Their Intended Effects on Outpatient Surgery

Hooenbeck BK, et al: Health Services Research DOI: 10.1111/1475-6773-12278

Objectives. To assess the impact of ambulatory surgery centers (ASCs) on rates of hospital-based outpatient procedures and adverse events.
Data Sources. Twenty percent national sample of Medicare beneficiaries.
Study Design. A retrospective study of beneficiaries undergoing outpatient surgery

- Opening an ASC in the hospital service area resulted in a decline in hospital-based outpatient surgery without increasing mortality or readmission
- ASC growth was greater than the decline in outpatient surgery use at their respective hospitals
- Opening ASCs increase surgical growth

3

Association of Race, Health Insurance Status, and Household Income With Location and Outcomes of Ambulatory Surgery Among Adult Patients in 2 US States

Janeway MG, et al: JAMA Surg 2020; 155: 1123-31

- 2011-2013 State Ambulatory Surgery and Services Databases of New York (n=5.6 million) and Florida (n=7.5 million)
- Surgery in free-standing ASC was lower in Blacks and Hispanics
- Patients with public insurance (Medicare & Medicaid) were less likely to receive surgery in ASC in both NY & FL
- 30-day unplanned hospital admission higher for public insurance
- No difference in unplanned hospital visits by race and ethnicity
- Unplanned visits after surgery in ASC were less than HOPD

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Percutaneous Coronary Interventions in ASCs

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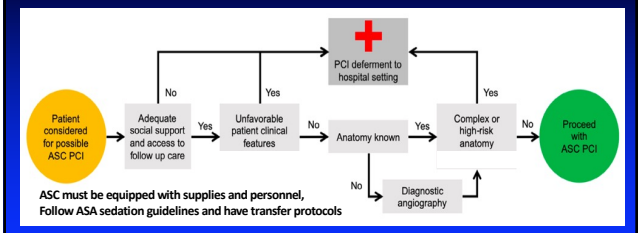
Percutaneous Coronary Interventions in ASCs: A Bridge Too Far!

- In January 2020, CMS began reimbursement for PCIs in ASCs
  - Change based on evidence supporting safety of same-day discharge after PCI performed in hospitals
  - Patient selection is critical for safety
- When PCI was introduced, ORs were held open with cardiac surgeons standing by should complications occur
- PCI without on-site cardiac surgery is now accepted, but patients were hospitalized overnight for observation

Dehmer GJ: J Am Coll Cardiol Intv 2021; 14: 301-3

6

Patient Pathway for ASC PCI: ACC/SCAI Position Statement



Box LC, et al: Catheter Cardiovasc Interv 2020; 96: 862-70
Society for Cardiovascular Angiography and Interventions (SCAI)

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Patient Selection

8

High Risk Patients For Ambulatory General Surgery

- Analysis of NSQIP database 2005-2017 to evaluate outcomes after ambulatory general surgery in high-risk patients (ASA 3=95%, ASA 4= 5%, n=137,175)
- Mortality: 0.04% at 3 days and 0.1% at 30 days
- 30-day major morbidity: 1.25% (low-risk patients <1%)
- 30-day hospital readmission: 2.5%
- Predictors of major morbidity and hospital admission
  - Non-independent functional status, ascites, renal failure, and bleeding disorder, disseminated cancer, CHF
  - COPD, DM, hypertension, steroid use, dyspnea, male sex, BMI >40

Pang G, et al: J Surg Res 2021; 263: 71-7

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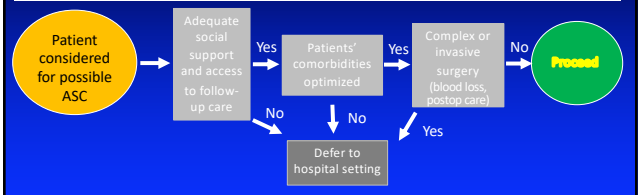
Patient Selection for Adult Ambulatory Surgery: A Narrative Review

Niraja Rajan, MD,* Eric B. Rosero, MD, MSc,† and Girish P. Joshi, MBBS, MD, FFARCSI†

Anesth Analg 2021; 133: 1415-30



ASC must be appropriately equipped, and have personnel, transfer protocols

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Patient Selection For Ambulatory Surgery

- ASA Physical Status:
  - ASA-PS ≤3 are suitable
  - ASA-PS 4 with stable comorbid conditions may undergo low-risk procedures such cataract surgery under local/regional anesthesia
- Age:
  - Age alone should not be an exclusion factor
  - Consider comorbid conditions, frailty, cognitive function
  - Consider type of surgery and anesthesia
  - Consider social factors such as lack of home care support

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Patient Selection For Ambulatory Surgery

- Obesity:
  - BMI<40 kg/m^2 – suitable for ambulatory surgery
  - BMI40-50 kg/m^2 – manage OSA
  - BMI>50 kg/m^2 – for low-risk procedures in absence of severe cardiopulmonary comorbidities
- Sleep Apnea:
  - Screen for OSA and optimize comorbid conditions
  - Preoperative sleep study not required
  - Use opioid-sparing multimodal non-opioid analgesia
  - Encourage use of CPAP, if prescribed

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Cardiac Patient Ambulatory Surgery

- Asymptomatic cardiac patients do not require preop testing
- Do not postpone surgery based solely upon BP
- Not suitable for ambulatory surgery
  - Within 30 days of acute MI
  - Decompensated, new onset, or untreated HF
  - Symptomatic patients (i.e., fatigue, dizziness, dyspnea, syncope, palpitations, chest pain, shortness of breath)
  - Patients with low (<35%) LVEF, new onset AF, or severe valvular disease
- Patients with CIED suitable if low potential for EMI
- Patients with coronary stents suitable is not on DAPT

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Patient Selection For Ambulatory Surgery

- **COPD:** Exclude patients with severe disease
  - Optimize bronchodilator therapy, respiratory infection, smoking cessation
- **DM:** Exclude only if unstable metabolic conditions (e.g., DK)
  - Continue anti-diabetic drugs, as appropriate
  - Resume oral intake and hypoglycemic regimen as soon as possible
- **ESRD:** Exclude if not on dialysis
  - Accept anemia and asymptomatic hyperkalemia
- **TIA/Stroke:** Delay elective surgery for at least 3-6 months
  - Need to manage antiplatelet therapy
- **MH:** Proceed with non-triggering GA, No prophylactic dantrolene

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Pro-Con Debate: Are Patients With a Cardiovascular Implantable Electronic Device Suitable to Receive Care in a Free-Standing Ambulatory Surgery Center?

Eric B. Rosero, MD, MSc,* Niraja Rajan, MD,† and Girish P Joshi, MBBS, MD, FFARCSI*

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CIED Patients Not Suitable for ASC

- Patients with unoptimized comorbidities
- CIED implanted within 3 months prior to the procedure
- Lack of CIED information
- Recurrent ICD shocks
- CRT devices in patients with LVEF ≤35%
- No access to CIED team to reprogram, when necessary
- Complex CIED patients undergoing procedures generating EMI

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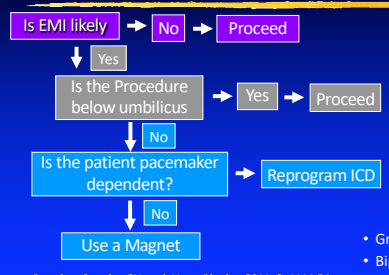
ICD Perioperative Management



Minimize EMI

- Grounding patch near surgical site
- Bipolar or ultrasound scalpel

Based on Crossley GH et al: Heart Rhythm 2011; 8: 1114-54

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Interrogation Prior to Discharge

- Patients with ICD programmed preoperatively
- Patients undergoing major cardiovascular/thoracic procedures
- Emergent/urgent above umbilicus surgery
- Patients with intraoperative hemodynamic instability
- Logistical problems preventing reliable device evaluation within one month of the procedure

Crossley GH et al: Heart Rhythm 2011; 8: 1114-54

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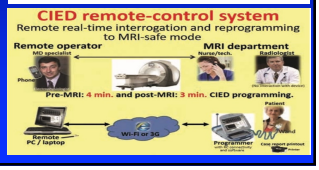
Remote Control of CIEDs

- Program CIEDs remotely
  - Currently being used at UTSW Medical Center, Dallas Childrens Hospital, Parkland MRI Center
- FDA approved App perform remote control
- Saves personnel time
  - Waiting for MRI to start and finish and commuting to locations
- Program uses Bluetooth to communicate with CIED

Remote Control of Cardiac Implantable Electronic Devices: Exploring the New Frontier—First Clinical Application of Real-time Remote-control Management of Cardiac Devices Before and After Magnetic Resonance Imaging

Kloosterman EM, et al: J Innov Cardiac Rhythm Manage 2019; 10: 3477-84



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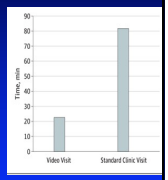
Telemedicine for preanesthesia evaluation: review of current literature and recommendations for future implementation

Omaira Azizad and Girish P. Joshi *Curr Opin Anesthesiol 2021; 34: 672–7*

- Telemedicine definition: audiovisual 2-way clinical encounter between physician and patients
- Since COVID-19 pandemic, burdensome regulations have been removed and payments have improved
- Telemedicine can reduce anxiety, improve patient satisfaction, reduce hospitalization, reduce costs



Ellimoottil C, Boxer RJ: JAMA Surg 2018;153:177-8

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Fast-Track Anesthetic Technique

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Consider Local/Regional Anesthesia

- Avoids airway manipulation
- Avoids residual effects of drugs used for GA
- Provides postop analgesia and reduces opioid use
- Allows shorter time to home readiness
- Suitable when
  - Airway easily accessible
  - Patient can tolerate surgical position
  - Surgery can be quickly terminated
- Use minimal or no sedation

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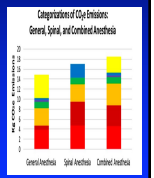
Spinal anesthesia for ambulatory surgery: current controversies and concerns

Jesse Stewart, Irina Gasanova, and Girish P. Joshi

Curr Opin Anesthesiol 2020; 33: 746-52

- Benefits over fast-track GA technique questionable
- Delay in start time: placement/onset time, failure
- Delay in ambulation and discharge home
  - Delayed recovery of motor function
  - Postural hypotension (orthostatic intolerance)
  - Urinary retention in older male patients
- SA and GA have similar carbon footprint
  - McGain F, et al: Anesthesiology 2021; 135: 976-91



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Spinal versus general anesthesia for patients undergoing outpatient total knee arthroplasty: a national propensity matched analysis of early postoperative outcomes

Kendall MC, et al: BMC Anesthesiol 2021; 21: 226

- ACS-NSQIP database (2005-2018) queried for outpatient TKA
  - Of these, GA (n=2034) and SA (3540), propensity matching (n=1962)
- No differences between GA and SA for serious adverse events at 72 h after surgery
  - Composite of return to OR, SSI, VTE, ARF, MI, cardiac arrest, stroke or CVA, on ventilator >48 h, unplanned intubation, sepsis/septic shock, death
- Minor adverse events greater with GA
  - Blood transfusion, pneumonia, wound dehiscence, UTI, renal insufficiency
- Use of TXA, VTE prophylaxis, avoidance of urinary catheter, fast-track GA technique (opioid sparing) should address minor events
- Overall, no differences between GA and SA

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General anesthetic techniques for enhanced recovery after surgery: Current controversies

Girish P. Joshi, MBBS, MD, FFARSCI, Professor of Anesthesiology and Pain Management *

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Best Practice & Research Clinical Anaesthesiology 35 (2021) 531–541

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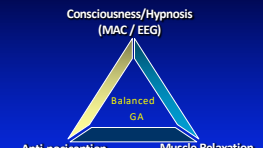
Fast Track General Anesthesia



- Use minimal number of drug combinations
- Use shortest-acting drugs at the lowest possible doses

- Pre-operative
  - Avoid routine use of midazolam
- Prevention of Recall
  - Inhalation anesthesia + N_2O (or TIVA)
  - Depth: MAC 0.8–1 and/or EEG monitoring
- Neuromuscular blockade
  - Minimize NMB, reverse appropriately
- Anti-nociception
  - Opioid-sparing NOT opioid-free approach

Joshi GP: Best Parct Res Anesthesiol 2021; 35: 531-41

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Association of perioperative midazolam use and complications: a population-based analysis

Athanassoglou V, et al. Reg Anesth Pain Med 2022;47:228–33

- Patients undergoing TKA/THA (n=2,848,847) identified from a National administrative database (2006-2019)
- 75% patients received midazolam perioperatively
- Use of midazolam was associated with increased in-hospital falls (OR 1.1), decrease in adjusted odds for cardiac (OR 0.94) and pulmonary complications (OR 0.92)
- Concurrent use of midazolam and gabapentin significantly increased pulmonary complications (OR 1.22), naloxone use (OR 1.56), and postoperative delirium (OR 1.45)

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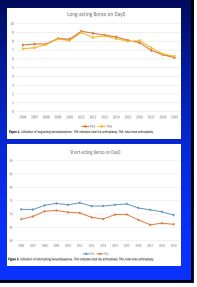
Preoperative Benzodiazepines Increase Postoperative Opioid Use

	Use of benzodiazepine		Standardized difference (short versus control)	Long	Standardized difference (long versus control)	Standardized difference (benzo versus control)
	None	Short				
N (%)	364,983 (19.6)	1,352,381 (72.6)		146,632 (7.9)		
Multimodal analgesia			0.325		0.354	0.353
0 mode	63,883 (17.5%)	106,948 (7.9%)		10,407 (7.1%)		
1 mode	86,274 (23.6%)	264,872 (19.6%)		29,410 (20.1%)		
2 modes	84,050 (23.0%)	337,178 (24.9%)		39,852 (27.2%)		
3 modes+	130,776 (35.8%)	643,383 (47.6%)		66,963 (45.7%)		
Duramorph			0.174		0.114	0.154
Steroids	17,178 (4.7%)	117,267 (8.7%)	0.021	10,632 (7.3%)	0.079	0.026
Gabapentenoid	8103 (2.2%)	33,882 (2.5%)	0.037	5285 (3.6%)	0.075	0.043
Ketamine	111,037 (30.4%)	435,307 (32.2%)	0.148	50,902 (34.7%)	0.122	0.143
NSAID	13,325 (3.7%)	93,333 (6.9%)	0.320	9129 (6.2%)	0.287	0.322
COX2	150,495 (41.2%)	774,600 (57.3%)	0.115	81,953 (55.9%)	0.055	0.105
Paracetamol/acetaminophen	135,926 (37.1%)	575,204 (42.5%)	0.104	58,541 (39.9%)	0.104	0.109
Neuraxial anesthesia	187,940 (51.5%)	770,011 (56.9%)	0.142	82,857 (56.5%)	0.138	0.147
PNB	53,067 (14.5%)	271,196 (20.1%)	0.155	29,749 (20.3%)	0.063	0.143
Total opioid consumption, median [IQR]	192 [83–345]	256 [153–431]	0.388	329 [195–540]	0.686	0.408

An absolute standardized difference >0.1 indicates a meaningful difference between groups.



Cozowicz C, et al: Anesth Analg 2022; 134: 486-95

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Comparison of Percentage Prolonged Times to Tracheal Extubation Between a Japanese Teaching Hospital and One in the United States, Without and With a Phase I Postanesthesia Care Unit

Sugiyama D, et al: Anesth Analg 2021; 133: 1206-14

Factors Influencing Tracheal Extubation and PACU Stay

- Patients undergoing gynecological surgery at a US hospital (n=785) or Japanese hospital (n=699), surgical duration of >4h
- Incidence of prolonged extubation times (>15 min from end of surgery) were 39% in US hospital vs 6% in Japanese hospital
- 97% of the patients in US hospital transferred to PACU with average stay of 2.4±0.9 h (3% sent to ICU), while 0% in Japanese hospital transferred to PACU (transferred directly to wards)
- Mean time from end of surgery to discharge to ward at the US hospital was 2.2 h longer than at the Japanese hospital

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Factors Influencing Tracheal Extubation and PACU Stay

- Patient and case characteristics do not account for the differences in prolonged extubation
- Prolonged extubation due to differences in GA techniques
- At the Japanese hospital: GA maintenance with desflurane ~4.8% and Remifentanil (0.1–0.3 μg/kg/min)
- At the US hospital: GA maintenance with sevoflurane or isoflurane and fentanyl intermitted boluses

Sugiyama D, et al: Anesth Analg 2021; 133: 1206-14

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Effect of therapeutic suggestions during general anaesthesia on postoperative pain and opioid use: multicentre randomised controlled trial

Nowak H, et al: BMJ 2020; 371: m4284

- Blinded randomized controlled trial
  - Hypnotherapeutic principles; Intraoperative audio – music and positive suggestion played repeatedly for 20 min followed by 10 min silence
  - Control Group: blank tape
- Lower opioid 24-h use in intervention group median 4 mg (0-8 mg) vs. 5.3 mg (2-12 mg) morphine units
- Number patient requiring opioid 63% vs. 80%
- Number needed to treat to avoid opioid requirements = 6
- Pain scores 25% lower in the intervention group
- Care about the background noise in the OR

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Effects of Intraoperative Auditory Stimulation on Pain and Agitation on Awakening After Pediatric Adenotonsillectomy
A Randomized Clinical Trial

Enrico Muzzi, MD, AM; Luca Ronfani, MD, PhD; Benedetta Bossini, MD; Cecilia Lezcano, MD; Eva Orzan, MD; Egidio Barbi, MD

JAMA Otolaryngol Head Neck Surg 2021 147 638-45

- Randomization: auditory stimulation with music, with noise, ambient noise insulation with masking earplugs, and control group receiving no intervention
- Intraoperative music resulted in clinically meaningful reduction in severe pain on awakening and emergence delirium in the immediate postoperative period

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Pressure Support Ventilation During Emergence

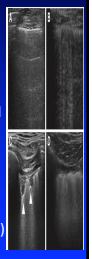
ANESTHESIOLOGY

Pressure Support *versus* Spontaneous Ventilation during Anesthetic Emergence—Effect on Postoperative Atelectasis: A Randomized Controlled Trial

Heejoon Jeong, M.D., Pisitpitayasaree Tanaporn, M.D., Hyun Joo Ahn, M.D., Ph.D., Mikyung Yong, M.D., Ph.D., Jae Ik Kim, M.D., Ph.D., Hyeon Yeo, M.D., Woojin Kim, M.D.

Anesthesiology 2021; 135:1004–14

- RCT patients undergoing laparoscopic surgery in Trendelenburg position
  - Intermittent manual vs. PSV during emergence (end of surgery to extubation)
- Outcomes:
  - Primary outcome: incidence of atelectasis diagnosed by ultrasound in PACU
  - Secondary outcome: PaO2 in PACU and SaO2 <92% during 48 h postop
- Conclusions
  - No difference in emergence times
  - Atelectasis in PACU lower in PSV group (33% vs. 57%)
  - PaO2 were higher with PSV, no difference in SaO2



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Blood Management and TXA

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Blood Management: Ambulatory Surgery

- Leading complication after outpatient TJA in the Medicare population was blood loss requiring blood transfusion
  - Greenky MR, et al: J Arthroplasty 2019; 34: 1250-4
- Blood Management
  - Presurgical hemoglobin >12 gm/dL
  - Administration of TXA
  - Use of bipolar sealers
  - Intraoperative blood pressure control
  - Reduced surgical duration
  - Acceptance of lower postoperative hemoglobin
    - McClatchy SG, et al: Orthop Clin N Am 2021; 52: 201–8

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Tranexamic Acid (TXA)

- 1 gm IV after induction and 1 gm IV at the end of surgery
- Potential adverse effects: DVT, PE, MI, seizures
- Potential contraindications
  - Anticoagulant therapy, coronary stents, stroke, subarachnoid hemorrhage, h/o PE or DVT, hypercoagulable diseases, acquired defective color vision
- If IV c/i: topical or add to LIA solution

Comparison of topical versus intravenous tranexamic acid in primary total knee arthroplasty: A meta-analysis of randomized controlled and prospective cohort trials

Wong H, et al: The Knee 2014; 21: 987-93

In primary TKA-topical TXA has similar efficacy to IV TXA in reducing blood loss and transfusion rate without sacrificing safety

Association of Intravenous Tranexamic Acid With Thromboembolic Events and Mortality
A Systematic Review, Meta-analysis, and Meta-regression

Taeuber I, et al: JAMA 2021 (Epub)

IV TXA, irrespective of dosing, is not associated with increased risk of any thromboembolic events

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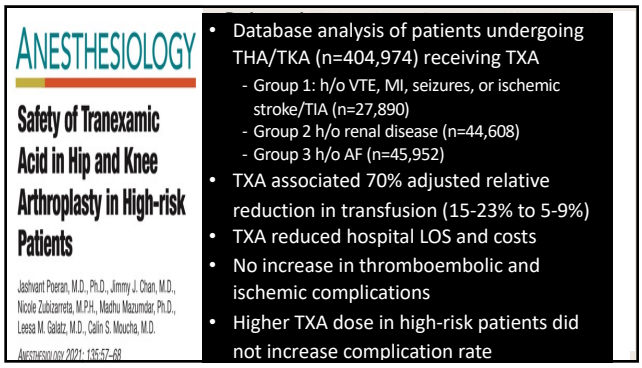

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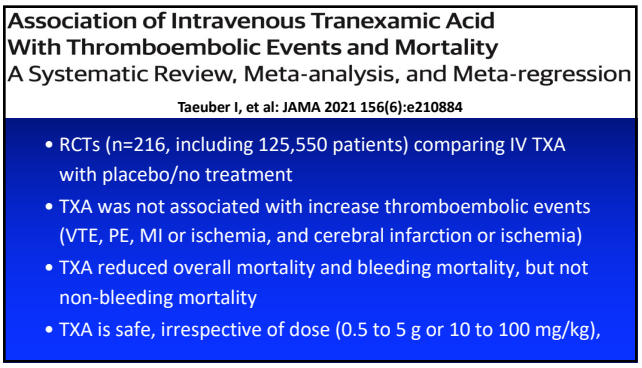

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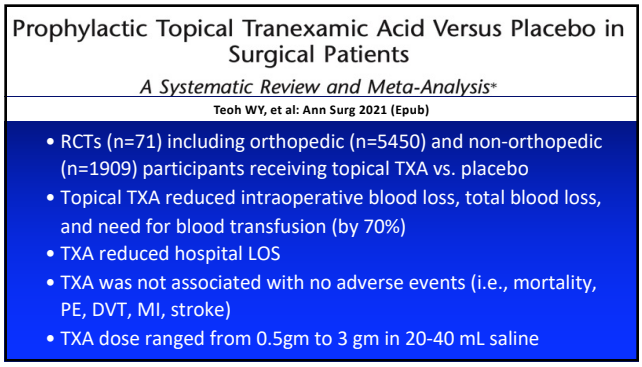

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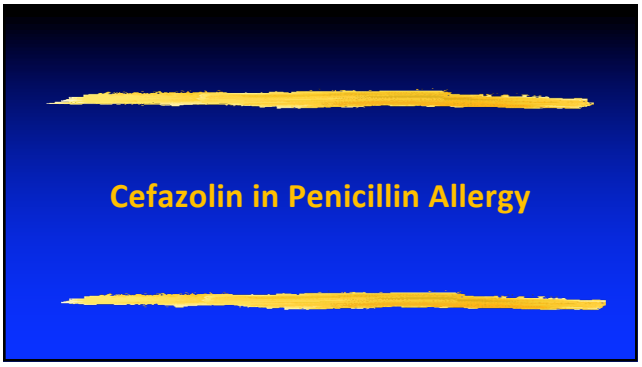

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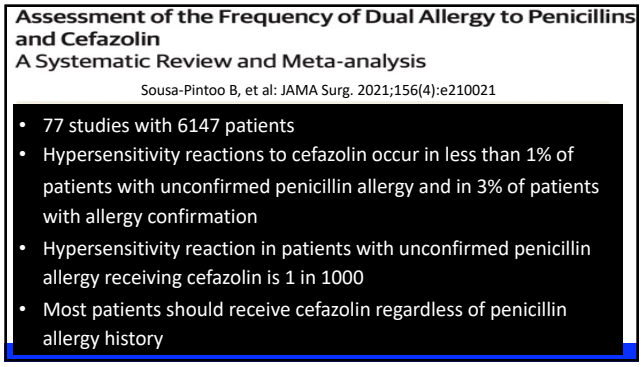

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Ambulatory Surgery: Opioid Stewardship

Opioids Are Infrequently Required following Ambulatory Otologic Surgery

Mavrommatis MA, et al: Otol Neurotol 2021; 42: 1360–15

Assessment of Unused Opioids Following Ambulatory Surgery

Dixit AA, et al: Am Surgeon 2002; 86: 652-8

Opioid prescribing and unused opioid prescription are prevalent in ambulatory surgical population

43

Patient and Surgeon Education

Nudging patients and surgeons to change ambulatory surgery pain management: Results from an opioid buyback program

Liu JY, et al: Surgery 2021; 170: 485-92

Patient-Centered Decision-making for Postoperative Narcotic-Free Endocrine Surgery
A Randomized Clinical Trial Zhu DY, et al. JAMA Surg 2021;156(11):e214287.

- Preoperative counseling combined with a patient-choice strategy for prescribing opioid analgesics reduced the number of opioids prescribed without worsening postoperative pain or health-related quality of life
- Allow patients to choose whether to include opioids

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Opioid Prescribing Recommendations For Opioid-naïve Patients

Patient- and procedure-specific opioid prescription (dose and duration), partial fills when available

Procedure	Oxycodone* 5mg tablets
Laparoscopic Cholecystectomy	10
Open Cholecystectomy	15
Appendectomy – Lap or Open	10
Hernia Repair – Major or Minor	10
Colectomy – Lap or Open	15
Ileostomy/Colostomy Creation, Re-siting, or Closure	15
Open Small Bowel Resection or Enterolysis	20
Thyroidectomy	5
Sleeve Gastrectomy	10
Prostatectomy	10
Laparoscopic Anti-reflux (Nissen)	10
Laparoscopic Donor Nephrectomy	10
Cardiac Surgery via Median Sternotomy	15

Procedure	Oxycodone* 5mg tablets
Hysterectomy – Vaginal, Lap/Robotic, or Abdominal	15
Cesarean Section	15
Breast Biopsy or Lumpectomy	5
Lumpectomy + Sentinel Lymph Node Biopsy	5
Sentinel Lymph Node Biopsy Only	5
Wide Local Excision ± Sentinel Lymph Node Biopsy	20
Simple Mastectomy ± Sentinel Lymph Node Biopsy	20
Modified Radical Mastectomy or Axillary Lymph Node Dissection	30
Carotid Endarterectomy	10
Total Hip Arthroplasty	30
Total Knee Arthroplasty	50
Dental	0

opioidprescribing.info

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Postoperative Opioid Use: Educate Surgeons

- Communication between anesthesiologists and surgeons critical
- Primary aim to promote return of function
- Avoid sedating medications
  - Benzodiazepines, muscle relaxants, gabapentinoids
- Wean opioids first (reverse ladder)
- Refer pain specialist for complex pain or opioid-tolerant patients
- Plan pain and opioid therapy transition to primary service
- Patient education for discharge planning, pain management, and opioid use, storage, disposal/return

Kharasch ED, et al: Anesthesiology 2022; 136: 10-30

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Post-Discharge Monitoring

- Create and enable triggers to aid identification of chronic and high-risk opioid users
- Recognize and monitor high risk opioid users
  - >90 days use in opioid naïve patients
- Implement strategies to ensure safe prescribing and dispensing of opioids
  - Check the prescription monitoring program (PMP)
  - E-prescribing for all controlled substances
- Mitigate overdose risks
- Implement transitional pain service

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Telemedicine and Remote Monitoring: Ambulatory Surgery

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Technology and Post-discharge Monitoring

- Post-discharge telephone calls (traditional approach) are insufficient in identifying potential impending complications
- Modern digital technology (text messaging, videoconferencing, smart phone applications, web-based platforms, e-connected devices) increases connectivity with patients and their caregiver
- Technology can be adapted for surveillance of patients at home and optimize surgical care, quality, and value
- Electronic patient symptom reporting daily survey with clinical alerts reduced potentially avoidable urgent care visits
  - Simon BA, et al: JAMA Surg 2021; 156: 740-6

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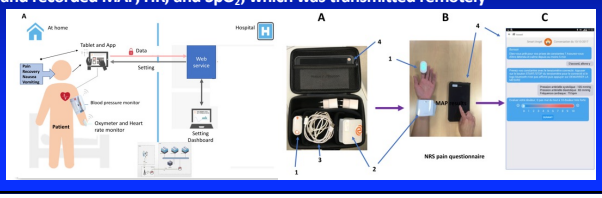
Feasibility of remote digital monitoring using wireless Bluetooth monitors, the Smart Angel™ app and an original web platform for patients following outpatient surgery: a prospective observational pilot study

Chevallier T, et al: BMC Anesthesiol 2020; 20: 259

Patients completed a self-report questionnaire (pain, comfort, nausea, vomiting) and recorded MAP, HR, and SpO_2, which was transmitted remotely



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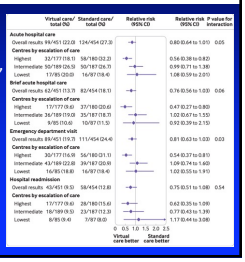
Post-discharge after surgery Virtual Care with Remote Automated Monitoring-1 (PVC-RAM-1) technology versus standard care: randomised controlled trial

McGillion MH, et al. BMJ 2021; 374: ;374:n2209

- Study group (n=451) received a tablet computer and remote automated monitoring (RAM) technology for daily biophysical measurements (HR, BP, RR, SaO_2, temp, weight) and wound photos
- Primary outcome: days alive at home during 31 days of follow-up
- Secondary outcomes: acute care, detection and correction of drug errors, pain at 7, 15, and 30 days
- Use of technology reduced acute care visit (by 5.3%), drug errors (by 24.4%), pain (by 13.9%), but did not affect days alive at home



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A Randomized Controlled Trial Evaluating Electronic Outpatient Symptom Monitoring After Ambulatory Cancer Surgery

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Ann Surg 2021;274:441–448

Association Between Electronic Patient Symptom Reporting With Alerts and Potentially Avoidable Urgent Care Visits After Ambulatory Cancer Surgery

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JAMA Surg 2021; 156: 740-6

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Summary

- Growth in ASC provides us with an opportunity to play a pivotal role in perioperative care, including post-discharge care
- Develop evidence-based procedure- and patient-specific pathways with multidisciplinary input
- Elements that influence outcomes after ambulatory surgery
  - Preoperative: patient selection, preoperative evaluation, and optimization
  - Fast-track anesthetic technique, aggressive pain and PONV prophylaxis
  - Post-discharge care: Patient education and monitoring for early identification of complications using modern technology

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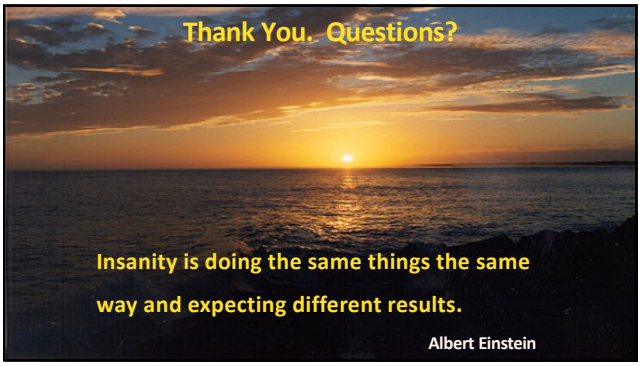

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