

New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults

Brummett CM, Waljee JF, Goesling J, et al. New Persistent Opioid Use After Minor and Major Surgical Procedures in US Adults. *JAMA Surg.* 2017;152(6):e170504. doi:10.1001/jamasurg.2017.0504

- New persistent opioid use after surgery is common, with approximately 6% of patients who were not on opioids before surgery continuing to use opioids more than 3 months after surgery.
- Patients continue to use their opioids for reasons other than the pain from surgery.
- New persistent opioid use after surgery is an underappreciated surgical complication that warrants increased attention.

Persistent Opioid Use Among Pediatric Patients After Surgery

Harbaugh CM, Lee JS, Hu HM, et al. Persistent Opioid Use Among Pediatric Patients After Surgery. *Pediatrics.* 2018;141(1):e20172439. doi:10.1542/peds.2017-2439

- Rates of new persistent opioid use among pediatric patients are comparable to those for adults, with 4.8% of patients refilling opioid prescriptions between 3 and 6 months after surgery.
- Risk factors for new persistent opioid use include type of surgical procedure and patient traits such as older age, female sex, previous substance use disorder, chronic pain, and preoperative opioid fill.
- Understanding the risks contributing to new persistent opioid use among adolescents and young adults may help clinicians to minimize opioid exposure and reduce risk for later misuse.

New Persistent Opioid Use Among Patients with Cancer After Curative-Intent Surgery

Lee JS, Hu HM, Edelman AL, et al. New Persistent Opioid Use Among Patients With Cancer After Curative-Intent Surgery. *J Clin Oncol.* 2017;35(36):4042-4049. doi:10.1200/JCO.2017.74.1363

- 10.4% of cancer patients not on opioids prior to a curative-intent surgery fill prescriptions at daily doses similar to chronic opioid users one year after surgery.
- New persistent opioid use in patients receiving adjuvant chemotherapy is consistently higher than in those with no chemotherapy across different procedures.
- Changing prescribing guidelines and patient counseling in the surveillance and survivorship phases of care may reduce new persistent opioid use among cancer patients after surgery.

Reduction in Opioid Prescribing Through Evidence-Based Prescribing Guidelines

Howard R, Waljee J, Brummett C, Englesbe M, Lee J. Reduction in Opioid Prescribing Through Evidence-Based Prescribing Guidelines. *JAMA Surg.* 2018;153(3):285-287. doi:10.1001/jamasurg.2017.4436

- Prior to the intervention, post-laparoscopic cholecystectomy (gall bladder removal surgery) opioid prescribing exceeded patient pain management needs by approximately 88%, based on patient-reported opioid use.
- Implementation of evidence-based prescribing guidelines reduced post-laparoscopic cholecystectomy opioid prescribing by 63% without increasing the need for medication refills.
- Patients who received smaller opioid prescriptions after the intervention reported using fewer opioids, indicating that anchoring and adjustment heuristics may impact patient opioid use.

Postoperative Opioid Prescribing and the Pain Scores on Hospital Consumer Assessment of Healthcare Providers and Systems Survey

Lee JS, Hu HM, Brummett CM, et al. Postoperative Opioid Prescribing and the Pain Scores on Hospital Consumer Assessment of Healthcare Providers and Systems Survey. *JAMA.* 2017;317(19):2013-2015. doi:10.1001/jama.2017.2827

- The Center for Medicare & Medicaid Services' Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) captures key elements of patient satisfaction, including pain management. The study found no correlation between HCAHPS pain measures and postoperative opioid prescribing in surgical patients in Michigan.
- Clinicians can feel empowered to reduce their initial opioid prescription without harming patient satisfaction or their hospitals' reimbursement.

Probability of Opioid Prescription Refilling After Surgery: Does Initial Prescription Dose Matter?

Sekhri S, Arora NS, Cottrell H, et al. Probability of Opioid Prescription Refilling After Surgery: Does Initial Prescription Dose Matter?. *Ann Surg.* 2018;268(2):271-276. doi:10.1097/SLA.0000000000002308

- Approximately 9% of patients who were not using opioids preoperatively refilled an opioid prescription after surgery.
- The probability of a patient refilling a postoperative opioid prescription was not correlated with their initial prescription strength.
- Surgeons could prescribe smaller opioid prescriptions without influencing the probability of a refill request.

Preoperative Opioid Use is Independently Associated with Increased Costs and Worse Outcomes After Major Abdominal Surgery

Cron DC, Englesbe MJ, Bolton CJ, et al. Preoperative Opioid Use is Independently Associated With Increased Costs and Worse Outcomes After Major Abdominal Surgery. *Ann Surg.* 2017;265(4):695-701. doi:10.1097/SLA.0000000000001901

- The study considered patients at a single center having abdominopelvic surgeries (appendectomy, cholecystectomy, gynecologic and bowel procedures, etc.) and found that patients using opioids preoperatively had 9.2% higher costs.
- Patients with preoperative opioid use had longer length of stay at the hospital, more complications and more readmissions, indicating that preoperative opioid use is a modifiable risk factor for surgery.

Transitions of Care for Postoperative Opioid Prescribing in Previously Opioid-Naïve Patients in the USA: A Retrospective Review

Klueh MP, Hu HM, Howard RA, et al. Transitions of Care for Postoperative Opioid Prescribing in Previously Opioid-Naïve Patients in the USA: a Retrospective Review. *J Gen Intern Med.* 2018;33(10):1685-1691.

- Among surgical patients who developed new persistent opioid use, surgeons provided the majority of opioid prescriptions during the first three months after surgery.
- By nine to twelve months after surgery, however, the majority of opioid prescriptions were provided by primary care physicians.
- Enhanced care coordination between surgeons and primary care physicians could allow earlier identification of patients at risk for new persistent opioid use to prevent misuse and dependence.

The Effect of Preoperative Opioid Use on Healthcare Utilization and Expenditures Following Elective Abdominal Surgery

Waljee JF, Cron DC, Steiger RM, Zhong L, Englesbe MJ, Brummett CM. Effect of Preoperative Opioid Exposure on Healthcare Utilization and Expenditures Following Elective Abdominal Surgery. *Ann Surg.* 2017;265(4):715-721. doi:10.1097/SLA.0000000000002117

- Preoperative opioid use is an independent risk factor for longer hospital stays, higher 30-day readmission rates, higher probability of being discharged to a rehabilitation facility, and greater healthcare expenses in the postoperative period.
- Identifying strategies to minimize opioid consumption prior to surgery will aid in reducing patient risk, improving outcomes, and lowering healthcare costs.

Opioid Overdose-the Surgeon's Role

Vu JV, Lin LA. Opioid Overdose-the Surgeon's Role. *Ann Surg.* 2018;268(1):32-34. doi:10.1097/SLA.0000000000002713

- It is crucial for surgeons to perform a series of preoperative assessments (check for history of substance abuse, previous overdose, past opioid prescriptions, comorbid conditions, etc.) in order to identify patients with an increased risk of opioid overdose.
- More surgeon involvement in research, evidence-based practice, and education will help to combat opioid misuse and overdose after surgery.

Persistent Opioid Use after Wisdom Tooth Extraction

Harbaugh CM, Nalliah RP, Hu HM, Englesbe MJ, Waljee JF, Brummett CM. Persistent Opioid Use After Wisdom Tooth Extraction. *JAMA.* 2018;320(5):504-506. doi:10.1001/jama.2018.9023

- Approximately 80% of patients who were not using opioids before wisdom tooth extraction filled an opioid prescription at the time of surgery.
- Opioid prescriptions at the time of wisdom tooth extraction lead to a 3-fold increased odds of developing persistent opioid use in the year after surgery among adolescents and young adults.
- Given the effectiveness of non-opioid analgesics, the practice of any routine opioid prescribing must be questioned in the face of the potential morbidity and long-term consequences of opioid use.

Patterns of Initial Opioid Prescribing to Opioid-Naive Patients

Larach DB, Waljee JF, Hu HM, et al. Patterns of Initial Opioid Prescribing to Opioid-Naive Patients. *Ann Surg.* 2020;271(2):290-295. doi:10.1097/SLA.0000000000002969

- The proportion of initial prescriptions for surgery, emergency, and dental care increased by nearly 16% from 2010 to 2016.
- Dental care prescribing saw the greatest growth, with a 68% increase, while surgical patients received the highest proportion of potent opioids (90.2%).
- Evidence-based guidelines for surgical and dental prescribing are necessary to curb iatrogenic opioid morbidity and mortality.

Factors Associated with New Persistent Opioid Usage After Lung Resection

Brescia AA, Harrington CA, Mazurek AA, et al. Factors Associated With New Persistent Opioid Usage After Lung Resection. *Ann Thorac Surg.* 2019;107(2):363-368. doi:10.1016/j.athoracsur.2018.08.057

- 14% of opioid-naive patients continue to fill opioid prescriptions in the 3 to 6 months after lung resection.
- Adjuvant therapy and thoracotomy are the greatest risk factors for persistent opioid use following lung resection.
- Future studies should focus on reducing excess prescribing, perioperative patient education, and safe opioid disposal.

Association of Hydrocodone Schedule Change with Opioid Prescriptions Following Surgery

Habbouche J, Lee J, Steiger R, et al. Association of Hydrocodone Schedule Change With Opioid Prescriptions Following Surgery [published correction appears in *JAMA Surg.* 2018 Dec 1;153(12):1164]. *JAMA Surg.* 2018;153(12):1111-1119. doi:10.1001/jamasurg.2018.2651

- After hydrocodone was changed from a schedule III to schedule II controlled substance, the mean OMEs filled in the initial opioid prescription increased by approximately 35 OMEs, equivalent to 7 tablets of hydrocodone.
- Opioid-related policies, and any subsequent edits, must be closely monitored to identify unintended effects.

Provider Characteristics Associated with Outpatient Opioid Prescribing After Surgery

Cron DC, Lee JS, Dupree JM, et al. Provider Characteristics Associated With Outpatient Opioid Prescribing After Surgery. *Ann Surg.* 2020;271(4):680-685. doi:10.1097/SLA.0000000000003013

- Advanced practice providers account for 1-in-5 postoperative opioid prescriptions.
- Postoperative opioid prescriptions written by advanced practice providers are 18% larger than those written by physicians.
- All providers should be involved in postoperative care to understand prescribing practices and identify barriers to reducing prescribing.

A Statewide Comparison of Opioid Prescribing in Teaching Versus Nonteaching Hospitals

Cron DC, Hwang C, Hu HM, et al. A statewide comparison of opioid prescribing in teaching versus nonteaching hospitals. *Surgery*. 2019;165(4):825-831. doi:10.1016/j.surg.2018.10.005

- In Michigan, surgical patients discharged from teaching hospitals fill significantly larger opioid prescriptions and have higher rates of high-risk prescribing compared with patients discharged from nonteaching hospitals.
- All hospitals, particularly teaching hospitals, should devote adequate resources to facilitating safe postoperative opioid prescribing.

Persistent Opioid Use Among Children, Adolescents, and Young Adults After Common Cleft Operations

Bennett KG, Harbaugh CM, Hu HM, et al. Persistent Opioid Use Among Children, Adolescents, and Young Adults After Common Cleft Operations. *J Craniofac Surg*. 2018;29(7):1697-1701. doi:10.1097/SCS.0000000000004762

- 4.4% of patients who undergo cleft-related surgery continue using opioids following surgery, compared with 0.1% of nonsurgical patients.
- Patients undergoing distractor placement have higher rates of opioid use three months after surgery.
- New persistent opioid use occurs after cleft-related procedures and can lead to chronic use in children, adolescents, and young adults.

Association of Opioid Prescribing with Opioid Consumption After Surgery in Michigan

Howard R, Fry B, Gunaseelan V, et al. Association of Opioid Prescribing With Opioid Consumption After Surgery in Michigan. *JAMA Surg*. 2019;154(1):e184234. doi:10.1001/jamasurg.2018.4234

- The quantity of opioid prescribed is associated with higher patient-reported opioid consumption, with patients using .5 more pills for every additional pill prescribed.
- The use of patient-reported opioid consumption to improve prescribing practices is key to combating the opioid epidemic.

Spillover Effect of Evidence-Based Postoperative Opioid Prescribing

Howard R, Alameddine M, Klueh M, et al. Spillover Effect of Evidence-Based Postoperative Opioid Prescribing [published correction appears in J Am Coll Surg. 2019 Apr;228(4):720]. J Am Coll Surg. 2018;227(3):374-381. doi:10.1016/j.jamcollsurg.2018.06.007

- After introducing evidence-based prescribing recommendations for laparoscopic cholecystectomy, prescribing decreased for four other surgical procedures, with no significant increase in refill requests.
- Implementing evidence-based prescribing recommendations contributes to increased awareness of safe and appropriate opioid prescribing practices.

Classifying Preoperative Opioid Use for Surgical Care

Vu JV, Cron DC, Lee JS, et al. Classifying Preoperative Opioid Use for Surgical Care. Ann Surg. 2020;271(6):1080-1086. doi:10.1097/SLA.0000000000003109

- Preoperative opioid use is common among patients who undergo elective surgery, with 38% filling an opioid prescription in the 12 months before surgery.
- Even minimal opioid use before surgery increases the probability of needing additional postoperative prescriptions in the 30 days after surgery.
- Surgeons should take into account any preoperative opioid use in patients when prescribing and coordinating postoperative pain management.

Persistent Opioid Use and High-Risk Prescribing in Body Contouring Patients

Bennett KG, Kelley BP, Vick AD, et al. Persistent Opioid Use and High-Risk Prescribing in Body Contouring Patients. Plast Reconstr Surg. 2019;143(1):87-96. doi:10.1097/PRS.0000000000005084

- More than 10% of opioid-naive patients develop persistent opioid use after body contouring surgery.
- Plastic surgeons must encourage opioid-alternative pain management strategies and optimize transitions of care in vulnerable patients.

Care Coordination for Patients on Chronic Opioid Therapy Following Surgery

Lagisetty P, Bohnert A, Goesling J, et al. Care Coordination for Patients on Chronic Opioid Therapy Following Surgery: A Cohort Study. *Ann Surg.* 2020;272(2):304-310. doi:10.1097/SLA.0000000000003235

- 10% of patients did not have a usual prescriber preoperatively and were more likely to have prescriptions from multiple prescribers and new long-acting opioid prescriptions.
- 73.8% of patients were exposed to high risk prescribing postoperatively.
- Among patients with a usual prescriber, earlier return was associated with decreased odds of receiving prescriptions from multiple prescribers.

Association Between Long-term Opioid Use in Family Members and Persistent Opioid Use After Surgery Among Adolescents and Young Adults

Harbaugh CM, Lee JS, Chua KP, et al. Association Between Long-term Opioid Use in Family Members and Persistent Opioid Use After Surgery Among Adolescents and Young Adults. *JAMA Surg.* 2019;154(4):e185838. doi:10.1001/jamasurg.2018.5838

- Persistent opioid use occurred in 4.1% of patients with long-term opioid use in a family member compared with 2.4% of patients without long-term opioid use in a family member.
- Long-term opioid use among family members is associated with persistent opioid use among opioid-naïve adolescents and young adults undergoing surgical and dental procedures.
- Physicians should screen young patients for long-term opioid use in their families

Effect of an Activated Charcoal Bag on Disposal of Unused Opioids After an Outpatient Surgical Procedure: A Randomized Clinical Trial

Brummett CM, Steiger R, Englesbe M, et al. Effect of an Activated Charcoal Bag on Disposal of Unused Opioids After an Outpatient Surgical Procedure: A Randomized Clinical Trial. *JAMA Surg.* 2019;154(6):558-561. doi:10.1001/jamasurg.2019.0155

- 28.6% of patients who received usual care reported disposing of opioids, compared with 33.3% who received education regarding disposal locations and 57.1% of patients who received a charcoal activated bag.
- The odds of opioid disposal were almost four times higher among participants who received a charcoal bag compared with those who received usual care.

New Persistent Opioid Use and Associated Risk Factors Following Treatment of Ankle Fractures

Gossett TD, Finney FT, Hu HM, et al. New Persistent Opioid Use and Associated Risk Factors Following Treatment of Ankle Fractures. *Foot Ankle Int.* 2019;40(9):1043-1051. doi:10.1177/1071100719851117

- The rate of new persistent opioid use among patients who underwent one of four open treatments for an ankle fracture was 8.8%, compared with 6.8% among patients who underwent closed treatment.
- New persistent opioid use was not directly linked to injury severity.
- Limiting the peritreatment opioid dose was the largest modifiable risk factor related to new persistent opioid use.

New Persistent Opioid Use Following Common Forefoot Procedures for the Treatment of Hallux Valgus (Bunion)

Finney FT, Gossett TD, Hu HM, et al. New Persistent Opioid Use Following Common Forefoot Procedures for the Treatment of Hallux Valgus. *J Bone Joint Surg Am.* 2019;101(8):722-729. doi:10.2106/JBJS.18.00793

- The rate of new persistent opioid use among patients who underwent open treatment of hallux valgus was 6.2%
- Patients who underwent treatment with a first metatarsal-cuneiform arthrodesis were 1.2 times more likely to have new persistent opioid use than those who underwent distal metatarsal osteotomy.
- Prescriptions filled before surgery and the amount of opioids prescribed are factors that can be modified by the physician to help counsel at-risk patients.

Risk of Prolonged Opioid Among Opioid-Naïve Patients After Common Shoulder Arthroscopy Procedures

Gil JA, Gunaseelan V, DeFroda SF, Brummett CM, Bedi A, Waljee JF. Risk of Prolonged Opioid Use Among Opioid-Naïve Patients After Common Shoulder Arthroscopy Procedures. *Am J Sports Med.* 2019;47(5):1043-1050. doi:10.1177/0363546518819780

- 8.3% of patients who underwent common shoulder arthroscopy procedures developed new persistent opioid use.
- The patient characteristic associated with the highest odds of prolonged opioid use was greater opioid use in the early postoperative period, followed by mental health disorder, alcohol dependence or abuse, female sex, older age and a history of pain diagnosis.
- Patients at high risk should be provided with appropriate preoperative education regarding their risk and close surveillance and treatment with alternative pain medications during the postoperative period.

Eliminating Unnecessary Opioid Exposure After Common Children's Surgeries

Harbaugh CM, Vargas G, Streur CS, et al. Eliminating Unnecessary Opioid Exposure After Common Children's Surgeries. *JAMA Surg.* 2019;154(12):1154-1155. doi:10.1001/jamasurg.2019.2529

- A discharge opioid was prescribed to 22% of 675 children younger than 18 years with median 10 doses (25th to 75th percentile, 6-15) undergoing umbilical or epigastric herniorrhaphy; laparoscopic appendectomy; inguinal herniorrhaphy and/or hydrocelectomy; adenolectomy; circumcision; percutaneous pinning for elbow fracture; or scrotal-incision orchiopexy at a tertiary care facility.
- Circumcision, elbow fracture, and orchiopexy had the highest opioid use; yet only 1 in 3 patients used an opioid, typically for 3 days or less.
- Overall, pain control was reported as good among 82% of children with or without a discharge opioid prescription.

Statewide Implementation of Postoperative Opioid Prescribing Guidelines

Vu JV, Howard RA, Gunaseelan V, Brummett CM, Waljee JF, Englesbe MJ. Statewide Implementation of Postoperative Opioid Prescribing Guidelines. *N Engl J Med.* 2019;381(7):680-682. doi:10.1056/NEJMc1905045

- Evidence-based prescribing guidelines reduced postoperative opioid prescription size across a statewide population without negatively affecting patient satisfaction or pain
- Despite the reductions in prescription size and opioid use, there were no clinically important changes in satisfaction or pain scores
- Mean prescription size decreased by 8 pills after the guidelines were released and opioid consumption also decreased by 3 pills

Rates of New Persistent Opioid Use After Vaginal or Cesarean Birth Among US Women

Peahl AF, Dalton VK, Montgomery JR, Lai YL, Hu HM, Waljee JF. Rates of New Persistent Opioid Use After Vaginal or Cesarean Birth Among US Women. *JAMA Netw Open.* 2019;2(7):e197863. Published 2019 Jul 3. doi:10.1001/jamanetworkopen.2019.7863

- Rate of new persistent opioid use among women who underwent vaginal delivery was 1.7%, and 2.2% among those having cesarean birth.
- Modifiable factors, filling an opioid prescription before delivery, and among women underwent vaginal deliveries, receiving a prescription ≥ 225 OMEs, were associated with increased odds of new persistent use.
- Rates of new persistent use have decreased between 2008 and 2016

New persistent opioid use among older patients following surgery: A Medicare claims analysis.

Santosa KB, Hu HM, Brummett CM, et al. New persistent opioid use among older patients following surgery: A Medicare claims analysis. *Surgery.* 2020;167(4):732-742. doi:10.1016/j.surg.2019.04.016

- Among opioid naïve Medicare patients who underwent major or minor surgery, 9.8% developed new persistent opioid use.
- Modifiable factors were filled a preoperative opioid, received ≥ 300 OMEs of opioids in the perioperative period, filled prescriptions for a benzodiazepine, sedative, hypnotic, or anxiolytic within 90 days before surgery.
- High risk prescribing, including filling overlapping opioid prescriptions, having a concurrent benzodiazepine prescription, new receipt of long-acting opioids for acute postsurgical pain, and opioid doses of ≥ 100 OME, was associated with an increased risk for new persistent opioid use.

Impact of Prescribing on New Persistent Opioid Use After Cardiothoracic Surgery

Brescia AA, Waljee JF, Hu HM, et al. Impact of Prescribing on New Persistent Opioid Use After Cardiothoracic Surgery. *Ann Thorac Surg.* 2019;108(4):1107-1113. doi:10.1016/j.athoracsur.2019.06.019

- Among opioid-naive Medicare patients undergoing cardiothoracic surgery between 2009 and 2015, 12.8% developed new persistent opioid use.
- New persistent opioid use rate declined over time, from 17% in 2009 to 7.1% in 2015.
- Modifiable factors, such as prescription size and preoperative prescription fills, were associated with increased risk of new persistent opioid use. Other patient characteristics associated with higher odds of new persistent opioid use were black race, gastrointestinal complications, disability status, open lung resection, dual eligibility (Medicare and Medicaid), drug and substance abuse, female sex, tobacco use, high comorbidity, pain disorders, longer hospital stay, and younger age.

Health Care Costs and New Persistent Opioid Use After Surgery

Lee JS, Vu JV, Edelman AL, et al. Health Care Spending and New Persistent Opioid Use After Surgery. *Ann Surg.* 2020;272(1):99-104. doi:10.1097/SLA.0000000000003399

- For patients undergoing major or minor surgery, new persistent use was associated with significantly higher health care spending during the 180 days after surgery.
- Patients with new persistent opioid use continued to have significantly higher monthly health care spending in contrast to patients who develop other common postoperative complications, in which health care spending returns to baseline by 180 days after surgery.
- Early identification of patients vulnerable to persistent use may enhance the value of surgical care.

Association of Opioid Overdose Risk Factors and Naloxone Prescribing in US Adults

Lin LA, Brummett CM, Waljee JF, Englesbe MJ, Gunaseelan V, Bohnert ASB. Association of Opioid Overdose Risk Factors and Naloxone Prescribing in US Adults. *J Gen Intern Med.* 2020;35(2):420-427. doi:10.1007/s11606-019-05423-7

- While there is a growing prevalence of naloxone fills among insured U.S. adults receiving opioids, overall prevalence of naloxone prescribing remains extremely low.
- Key factors associated with opioid overdose risk were also associated with receiving naloxone. However, history of overdose was not associated with filling of a naloxone prescription.
- Substantial further work is needed to increase naloxone access for patients at risk for opioid overdose.

Inappropriate Preoperative Gabapentinoid Use Among Patients With Carpal Tunnel Syndrome

Billig JI, Sears ED, Gunaseelan V, et al. Inappropriate Preoperative Gabapentinoid Use Among Patients With Carpal Tunnel Syndrome. *J Hand Surg Am.* 2020;45(8):677-689.e5. doi:10.1016/j.jhsa.2020.04.011

- 6% of patients are prescribed a gabapentinoid prior to surgery
- Of the patients with preoperative gabapentinoid use, 24% had prolonged gabapentinoid use and 20% of the preoperative gabapentinoid users also filled opioid prescriptions at 91 to 180 days after carpal tunnel release
- Given the effectiveness of surgical release and the risks associated with gabapentinoids, greater attention is needed to ensure that gabapentinoids are prescribed appropriately, avoided when possible, and stopped after surgery.

The Association Between Preoperative Opioid Exposure and Prolonged Postoperative Use

Katzman C, Harker EC, Ahmed R, et al. The Association Between Preoperative Opioid Exposure and Prolonged Postoperative Use [published online ahead of print, 2020 May 18]. *Ann Surg.* 2020;10.1097/SLA.0000000000003723. doi:10.1097/SLA.0000000000003723

- 41% of patients had nonchronic, periodic opioid fills in the year prior to general, gynecologic, and urologic surgical procedures.
- Patterns of preoperative fills were most strongly associated with persistent postoperative opioid use. Patients with recent intermittent use were significantly more likely to have prolonged fills after surgery compared with opioid-naïve patients
- Identifying opioid use before surgery is a critical opportunity to optimize care after surgery.

Opioid Fills for Lumbar Facet Radiofrequency Ablation Associated with New Persistent Opioid Use

Southren DL, Moser S, Abu-Amara H, et al. Opioid Fills for Lumbar Facet Radiofrequency Ablation Associated with New Persistent Opioid Use. *Anesthesiology.* 2020;132(5):1165-1174. doi:10.1097/ALN.0000000000003164

- 21.1% of patients undergoing lumbar facet radiofrequency ablation filled a perioperative opioid prescription, while 78.9% of patients did not have a perioperative opioid fill.
- The unadjusted rate of new persistent opioid use was 5.6% in the group with a perioperative opioid fill versus 2.8% for those without an opioid fill.
- Perioperative opioid prescription fill was independently associated with increased odds of new persistent opioid use
- Opioid prescribing after radiofrequency ablation should be reevaluated and likely discontinued in this population.

High-Risk Prescribing Increases Rates of New Persistent Opioid Use in Total Hip Arthroplasty Patients

Delaney LD, Gunaseelan V, Rieck H, Dupree JM 4th, Hallstrom BR, Waljee JF. High-Risk Prescribing Increases Rates of New Persistent Opioid Use in Total Hip Arthroplasty Patients [published online ahead of print, 2020 Apr 14]. *J Arthroplasty*. 2020;S0883-5403(20)30349-1. doi:10.1016/j.arth.2020.04.019

- Patients of surgeons with the highest rates of high-risk prescribing were more likely to develop persistent use compared with patients of surgeons with the lowest rates (adjusted rates: 9.7% vs 4.6%)
- Patients of surgeons with initial prescription sizes in the "high" (third) quartile and of surgeons in the "highest" (fourth) quartile of 30-day prescription dosage were more likely to develop persistent opioid use compared with patients of surgeons with low initial and 30-day prescription sizes, respectively.
- While the development of persistent opioid use after surgery is multifactorial, surgeon prescribing patterns play an important role.
- Reducing prescribing and encouraging opioid alternatives could minimize postoperative persistent opioid use.

Rate of Opioid Prescriptions for Patients With Acute Ankle Sprain

Finney FT, Gossett TD, Hu HM, et al. Rate of Opioid Prescriptions for Patients With Acute Ankle Sprain. *Ann Intern Med*. 2019;171(6):441-443. doi:10.7326/M19-0679

- Among opioid naïve patients who did not fill an opioid prescription one year before sprain diagnosis, 8.3% filled an opioid prescription within 7 days of diagnosis, and, in this group, the rate of new, persistent opioid use (filled an opioid prescription 91 to 180 days after diagnosis and initial opioid exposure) was 8.4%.
- The most commonly prescribed opioid was hydrocodone (62.3%), followed by tramadol (15.6%) and oxycodone (11.5%).
- Most prescriptions were provided by physicians (77.4%) and advanced practice providers (18.9%) in emergency medicine and primary care settings.

Preoperative Opioid Use and Readmissions Following Surgery

Tang R, Santosa KB, Vu JV, et al. Preoperative Opioid Use and Readmissions Following Surgery [published online ahead of print, 2020 Mar 13]. *Ann Surg.* 2020;10.1097/SLA.0000000000003827. doi:10.1097/SLA.0000000000003827

- Among the Medicare patient population who undergo elective surgery, 55% were opioid naïve while the remaining 45% filled one or more opioid prescriptions in the 12 months before surgery.
- Patients were grouped into five levels of preoperative opioid exposure – naïve, minimal, low, moderate, and high/chronic.
- Higher levels of preoperative opioid exposure were associated with higher rates of opioid-related readmissions, pain-related readmissions, respiratory-related readmissions, and all-cause readmissions.

Association of Opioid Use with Pain and Satisfaction After Dental Extraction

Nalliah RP, Sloss KR, Kenney BC, et al. Association of Opioid Use With Pain and Satisfaction After Dental Extraction. *JAMA Netw Open.* 2020;3(3):e200901. Published 2020 Mar 2. doi:10.1001/jamanetworkopen.2020.0901

- Among patients who underwent surgical and routine extractions, patients who used opioids reported higher levels of pain compared with those who did not use opioids
- No statistically significant difference in satisfaction was found between patients after surgical extraction who used and did not use opioids, and between those after routine extraction who used and did not use opioids.

Increased opioid prescription fills after dental procedures performed before weekends and holidays

Priest CR, Kenney BC, Brummett CM, Waljee JF, Englesbe MJ, Nalliah RP. Increased opioid prescription fills after dental procedures performed before weekends and holidays. *J Am Dent Assoc.* 2020;151(6):388-398.e1. doi:10.1016/j.adaj.2020.03.014

- Patients with dental procedures the day before weekends and holidays were more likely to fill an opioid prescription than patients with procedures on other weekdays, an odds ratio 1.27.
- The odds of filling an opioid prescription for patients aged 13 to 29 were 1.43 times of the odds for patients aged 50-64 years.

New Persistent Opioid Use after Acute Opioid Prescribing in Pregnancy

Peahl AF, Morgan DM, Dalton VK, et al. New persistent opioid use after acute opioid prescribing in pregnancy: a nationwide analysis [published online ahead of print, 2020 Mar 23]. *Am J Obstet Gynecol.* 2020;S0002-9378(20)30342-2. doi:10.1016/j.ajog.2020.03.020

- 6.0% of pregnant women filled an opioid prescription during pregnancy, and 4.0% of the women who filled developed new persistent opioid use.
- Having a non-delivery procedure in pregnancy and having an emergency room visit during pregnancy are factors associated with filling an opioid in pregnancy
- Filling a peripartum opioid prescription (1 week prior to or 3 days post-discharge) was significantly associated with new persistent opioid use.

Association between Insurance Cost-sharing Subsidy and Postoperative Opioid Prescription Refills among Medicare Patients

Kirsch M, Montgomery JR, Hu HM, et al. Association between insurance cost-sharing subsidy and postoperative opioid prescription refills among Medicare patients. *Surgery.* 2020;168(2):244-252. doi:10.1016/j.surg.2020.04.013

- 84.6% of Medicare patients in Michigan who underwent orthopedic procedures filled an opioid prescription after the procedure, and 66.4% of patients who filled a prescription refilled another opioid prescription within 90 days of discharge.
- Among patients with full low-income subsidy, the odds of filling an initial postoperative prescription were 1.29 times higher, and the odds of refilling another prescription were 1.39 times higher than patients without low-income subsidy.

Association of State Opioid Duration Limits with Postoperative Opioid Prescribing

Agarwal S, Bryan JD, Hu HM, et al. Association of State Opioid Duration Limits With Postoperative Opioid Prescribing. *JAMA Netw Open.* 2019;2(12):e1918361. Published 2019 Dec 2. doi:10.1001/jamanetworkopen.2019.18361

- In Massachusetts, the implementation of 7-day limits on initial opioid prescriptions for acute pain was associated with a decrease in prescription size (-38 OMEs) and additional reduction of 1.5 OMEs per month. The implementation was also associated with an average decrease of 0.4 days supplied and the proportion of prescriptions exceeding a 7-day supply (-5.9 percentage points).
- In contrast, the 7-day limit implementation in Connecticut was not associated with significant changes in opioid prescription.

Higher Amounts of Opioids Filled After Surgery Increase Risk of Serious Falls and Fall-Related Injuries Among Older Adults

Santosa KB, Lai YL, Brummett CM, et al. Higher Amounts of Opioids Filled After Surgery Increase Risk of Serious Falls and Fall-Related Injuries Among Older Adults [published online ahead of print, 2020 Aug 3]. *J Gen Intern Med.* 2020;10.1007/s11606-020-06015-6. doi:10.1007/s11606-020-06015-6

- Among opioid naïve Medicare patients aged 65 and older who underwent elective outpatient surgery, 76.3% filled a perioperative opioid prescription, and 0.62% suffered a serious fall or fall-related injury within 30 days after surgery.
- Higher amount of opioid filled over 30 days prior to surgery through to 30 days after surgery was strongly associated with increased risk of serious falls after surgery; patients who filled ≥ 225 OMEs after surgery were over twice as likely to fall after surgery compared with the group who filled < 150 OME (RR 2.29, 95% CI 1.72–3.07).
- Older age, being female, and dual Medicaid eligibility were also associated with higher risk of serious falls and fall-related injuries.

Does Surgical Intensity Correlate With Opioid Prescribing? Classifying Common Surgical Procedures

Cho HE, Hu H, Gunaseelan V, Chen J, Englesbe MJ, Chung KC, Waljee JF. Does Surgical Intensity Correlate With Opioid Prescribing? Classifying Common Surgical Procedures. *Ann Surg*: July 24, 2020. Publish Ahead of Print doi: 10.1097/SLA.0000000000004299

- Surgical intensity, classified as 5 ordinal clusters - low, mid-low, mid, mid-high, and high, is positively associated with initial opioid prescribing and rates of refill.
- Median amount of opioid prescribed increased as the cluster-order increased: 150 oral morphine equivalents (OME) for low-intensity, 225 OME for mid-intensity, and 300 OME for high-intensity surgeries.
- Rates of refill increased as surgical intensity also increased, from 17.4% for low, 26.4% for mid, and 48.9% for high-intensity procedures.

Surgeon Experience and Opioid Prescribing

Santosa KB, Wang CS, Hu H, Brummett CM, Englesbe MJ, Waljee JF. Surgeon Experience and Opioid Prescribing. *Am J Surg.* 2020; 220(4): 823-827.

- Among opioid naïve Medicare patients aged 65 and older who underwent major/minor surgery, 53.8% of patients filled an opioid prescription within seven days of discharge.
- Opioid prescription size was largest for patients whose surgeons were early in practice (< 7 years: 292 OMEs), with decreasing amounts of opioids filled among patients with surgeons who had been in practice longer (8-15 years: 279 OMEs; 16-25 years: 265 OMEs).

Assessment of a Quality Improvement Intervention to Decrease Opioid Prescribing in a Regional Health System

Brown CS, Vu JV, Howard RA, Gunaseelan V, Brummett CM, Waljee JF, Englesbe MJ. Assessment of a quality improvement intervention to decrease opioid prescribing in a regional health system. *BMJ Quality & Safety*. Published Online First: 16 September 2020. doi: 10.1136/bmjqs-2020-011295

- The use of procedure-specific prescribing guidelines reduced statewide postoperative opioid prescribing by 50%.
- Opioid consumption also decreased, while satisfaction and postoperative pain remained unchanged.
- Leveraging the continuous quality improvement infrastructure to implement evidence-based opioid prescribing guidelines has had a meaningful impact on opioid prescription.

Preoperative Opioid Use and Mortality After Minor Outpatient Surgery

Santosa KB, Lai Y, Oliver JD, et al. Preoperative Opioid Use and Mortality After Minor Outpatient Surgery. *JAMA Surg*. Published online October 21, 2020. doi:10.1001/jamasurg.2020.3623

- Preoperative opioid use was correlated with an increased mortality within 90 days after surgery
- Patients with high and medium preoperative opioid exposure were more likely to die within 90 days after outpatient surgery compared with opioid-naive patients
- Mortality did not differ between opioid-naive patients and patients with low preoperative opioid exposure.

New Persistent Opioid Use After Inguinal Hernia Repair

Howard RA; Gunaseelan, V; Brummett CM; Waljee, JF; Englesbe MJ; Telem D. New Persistent Opioid Use After Inguinal Hernia Repair. *Annals of Surgery*. Published Online 15 October 2020 DOI: 10.1097/SLA.0000000000004560

- 1.5% of patients develop new persistent opioid use after inguinal hernia repair.
- The strongest risk factor for this complication was filling an opioid prescription in the 30 days prior to surgery, which was most commonly provided by a surgeon.
- Other risk factors for new persistent opioid use included receiving a larger opioid prescription, having more comorbidities, having a major postoperative complication, and certain mental health disorders and pain disorders.

A national evaluation of opioid prescribing and persistent use after ambulatory anorectal surgery

Keller DS, Kenney BC, Harbaugh CM, Waljee JF, Brummett CM. A national evaluation of opioid prescribing and persistent use after ambulatory anorectal surgery. *Surgery*. Published Online 4 December 2020. DOI: <https://doi.org/10.1016/j.surg.2020.11.006>

- Over 2% of ambulatory anorectal procedures develop new persistent opioid use.
- Logistic regression found new persistent opioid use was associated with perioperative opioid fills, increased comorbidity, tobacco use, and pain disorders; there was no significant association with procedure performed.
- Despite small annual reductions in opioid prescriptions, there has been little change in the amount prescribed.
- This demonstrates a need to develop and disseminate best practices for anorectal surgery, focusing on eliminating unnecessary opioid prescribing.

Prevalence and Patterns of Opioid Use Before and After Liver Transplantation

Cron DC, Tincopa MA, Lee JS, Waljee AK, Hammoud A, Brummett CM, Waljee JF, Englesbe MJ, MD, and Sonnenday CJ. Prevalence and Patterns of Opioid Use Before and After Liver Transplantation. Transplantation. Published online 1 January 2021. DOI: 10.1097/TP.0000000000003155

- Prescription opioid use is common before and after liver transplant, with intermittent and chronic use largely persisting, and a small development of new chronic use posttransplant.
- Among previously opioid-naïve patients, 4% developed chronic use posttransplant.
- Among patients with pretransplant opioid use, 84% remained intermittent or increased to chronic use, and 73% of chronic users remained chronic users after transplant.
- To minimize the morbidity of long-term opioid use, it is critical to improve pain management and optimize opioid use before and after liver transplant.

Relationship between initial opioid prescription size and likelihood of refill after spine surgery

Massie L, Gunaseelan V, Waljee J, Brummett C, Schwalb JM. Relationship between initial opioid prescription size and likelihood of refill after spine surgery. The Spine Journal. Published online 16 January 2021. DOI:

<https://doi.org/10.1016/j.spinee.2021.01.016>

- About 26.3% of opioid-naïve patients obtained refills of their opioid prescriptions within 30 days of surgery.
- The likelihood of obtaining a refill was unchanged with the size of the initial perioperative prescription across procedure categories.
- Patient factors associated with increased likelihood of refills included age 30 to 39 years, female gender, anxiety disorder, mood disorder, and history of alcohol/substance abuse.
- For opioid-naïve patients, surgeons can prescribe lower amounts of opioids after elective surgery for degenerative spinal disease without concern of increased need for refills.

Patient-Reported Outcomes After Opioid-Sparing Surgery Compared With Standard of Care

Anderson M; Hallway A; Brummett CM; Waljee JF; Englesbe MJ; Howard RA. Patient-Reported Outcomes After Opioid-Sparing Surgery Compared With Standard of Care. JAMA Surgery. Published online 27 January 2021. DOI: 10.1001/jamasurg.2020.5646

- Patients participating in an opioid-sparing postoperative pathway received and used fewer opioids but reported less pain and similar satisfaction compared with patients receiving standard of care.
- In the opioid-sparing pathway, 36.8% of patients did not receive an opioid prescription compared with 0% of patients receiving standard of care.
- Importantly, more patients in the opioid-sparing group received no opioid prescription, which avoids the risk of diversion into communities.

Association of Opioid Type with Opioid Consumption after Surgery

Zikovich S; Gunaseelan V; Englesbe MJ; Waljee JF; Brummett CM. Association of Opioid Type with Opioid Consumption after Surgery. Annals of Surgery. Published online 10 February 2021. DOI: 10.1097/SLA.0000000000004793

- Patients prescribed hydrocodone consumed 7 tablets (95% CI 6.79-7.18) while patients prescribed oxycodone consumed 6 tablets (95% CI 5.58-6.40.)
- Although patients prescribed hydrocodone consumed more tablets than patients prescribed oxycodone, this difference was not clinically significant and did not result in differences in satisfaction, pain, or refills.
- Perioperative opioid prescribing guidelines may recommend the same number of 5 mg oxycodone and hydrocodone tablets without sacrificing patient-reported outcomes.

Association of Postoperative Opioid Prescription Size and Patient Satisfaction

Fry BT; Howard RA; Gunaseelan V; Lee JS; Waljee JF; Englesbe MJ; Vu JV. Association of Postoperative Opioid Prescription Size and Patient Satisfaction. Annals of Surgery. Published online 1 February 2021. DOI: 10.1097/SLA.0000000000004784

- In a large cohort of patients undergoing common surgical procedures, there was no association between opioid prescription size at discharge after surgery and patient satisfaction.
- This suggests surgeons may continue to decrease postoperative opioid prescription sizes in order to mitigate opioid-related risks without compromising patient satisfaction.

Opioid prescribing patterns by dental procedure among US publicly and privately insured patients, 2013 through 2018

Chua KP; Hu HM; Waljee JF; Brummett CM; Nalliah RP. Opioid prescribing patterns by dental procedure among US publicly and privately insured patients, 2013 through 2018.

JADA. Published online 23 February 2021. DOI:

<https://doi.org/10.1016/j.adaj.2021.01.001>

- Five procedures accounted for 95.2% of dental opioid prescriptions, and tooth extraction accounted for almost two-thirds of total prescriptions.
- Opioid prescribing for tooth extractions is declining but remains common, despite the availability of equally effective nonopioid alternatives.
- Eliminating routine opioid prescribing for tooth extraction could reduce dental opioid exposure substantially.

Predicting postoperative opioid use with machine learning and insurance claims in opioid-naïve patients

Hur J; Tang S; Gunaseelan V; Vu J; Brummett CM; Englesbe MJ; Waljee JF; Wiens J. Predicting postoperative opioid use with machine learning and insurance claims in opioid-naïve patients. American Journal of Surgery. Published online 26 March 2021.

DOI: <https://doi.org/10.1016/j.amjsurg.2021.03.058>

- Potential predictors included sociodemographic data, comorbidities, and prescriptions within one year prior to surgery.
- Undergoing major surgery, opioid prescriptions within 30 days prior to surgery, and abdominal pain were useful in predicting refills; back/joint/head pain were the most important features in predicting new persistent use.
- Preoperative patient attributes from insurance claims could potentially be useful in guiding prescription practices for opioid-naïve patients.

Persistent Opioid Use Associated With Dental Opioid Prescriptions Among Publicly and Privately Insured US Patients, 2014 to 2018

Chua KP; Hu HM; Waljee JF; Nalliah RP; Brummett CM; Persistent Opioid Use Associated With Dental Opioid Prescriptions Among Publicly and Privately Insured US Patients, 2014 to 2018. JAMA Network Open. Published online 16 April 2021. DOI: 10.1001/jamanetworkopen.2021.6464

- Persistent opioid use was defined as 1 or more dispensed opioid prescriptions 4 to 90 days after the index date and 1 or more prescriptions 91 to 365 days after the index date. Overall POU was 1.3%, and the risk of POU was higher among publicly insured (2.0%) than privately insured patients (0.9%).
- The initial dental opioid prescriptions were associated with a 1.0–percentage point higher risk of POU among publicly insured patients compared with privately insured patients.
- The results further highlight the importance of avoiding dental opioid prescribing when nonopioids provide effective analgesia, which is the case for most dental procedures.

Persistent Opioid Use After Ophthalmic Surgery in Opioid-Naive Patients and Associated Risk Factors

Ung C; Yonekawa Y; Waljee JF; Gunaseelan V; Lai Y; Woodward MA. Persistent Opioid Use After Ophthalmic Surgery in Opioid-Naive Patients and Associated Risk Factors. *Ophthalmology*. Published online 22 April 2021. DOI: <https://doi.org/10.1016/j.ophtha.2021.04.021>

- Exposure to opioids in the perioperative period is associated with new persistent use in patients who were previously opioid-naïve. New persistent opioid use was higher in patients having an initial perioperative opioid fill (3.4%) than patients without an initial perioperative fill (0.6%).
- After adjusting for patient characteristics, initial perioperative opioid fill was independently associated with an increased odds of new persistent use.
- Surgeons should be aware of those risks to identify at-risk patients in the current national opioid crisis and minimize prescribing opioids when possible.