

Surgical Residency Programs Should Leverage Recent Advances in National Policy, Real-World Data, and Public Opinion to Improve Post-Surgery Opioid Prescribing

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Overprescribing of opioids, particularly after surgery, is an important contributor to the opioid crisis in the United States, where more than half of all patients receive opioids after surgery.¹ Junior surgical residents do the majority of post-surgical opioid prescribing at academic medical centers.² Two studies from 2018 found that, in surgery residency programs, residents prescribed 76% to 100% of opioids after surgery, while only 20% of programs required opioid prescribing education; 90% of residents did not receive any form of opioid prescribing education.^{3,4} Instead, 95% of residents reported attending surgeon preferences and 60% reported concern over patient satisfaction as motivating factors for how much to prescribe.^{3,5}

In 2019, the Accreditation Council for Graduate Medical Education mandated that all residency programs begin to “provide instruction and experience in pain management if applicable for the specialty including recognition of the signs of addiction.”⁶ This mandate included resident education on chronic pain management, for which there are Centers for Disease Control and Prevention guidelines.⁷ It was a critical step in the right direction for better opioid prescribing among residents overall. However, progress on improving appropriate opioid prescribing within the field of surgery lags behind; no similar coordinated national effort exists to improve the management of acute pain among opioid-naïve and opioid-exposed patients after surgery.⁸ Few resources exist to provide surgical residents with awareness of their patients’ typical opioid consumption patterns or the number of unused opioids leftover due to their prescribing decisions.³

Fortunately, the scientific and policy communities have developed several resources to address this problem. We are in a unique time during which recent advances in national policy, information

technology, and data have the potential to significantly improve evidence-based opioid prescribing practices. The responsibility now falls on surgical residency programs to integrate these tools and make them accessible to their residents. The Leapfrog Group, a health care safety nonprofit rating group, has recently begun collecting annual quality metrics from health systems on post-surgical opioid prescribing, heightening the urgency of action on the part of residency programs to ensure their residents are engaging in evidence-based prescribing practices.⁹

In this piece, we highlight some of the existing resources that may help with appropriate opioid prescribing for post-surgical management of acute pain (TABLE). We also suggest how surgical residency programs might go about adopting and leveraging these rapidly growing bodies of evidence, real-world data, and national policies so that their residents are no longer working in a vacuum of opioid prescribing guidance.

Consumption Data-Based Interventions

As others have previously emphasized, efforts to improve post-surgical opioid prescribing must be evidence-based.²⁰ To that end, in recent years several research groups have collected post-discharge opioid consumption data from surgical patients and used that data to put forth evidence-based procedure-specific prescribing recommendations.^{21,22} Making these recommendations accessible to residents at the point-of-care represents an important opportunity to improve the appropriateness of opioid prescription amounts. Post-surgical opioid prescribing is often left to junior residents who have little data on which to guide their prescribing decisions and few clear restrictions on how much they are allowed to prescribe. To fully realize the potential of these excellent evidence-based recommendations, efforts must be made to put them in front of residents when they are making prescribing decisions.

TABLE

Recent Advances in National Policy, Technology, and Data That Can Be Leveraged by Surgical Training Programs to Promote Responsible Post-Surgical Opioid Prescribing for Acute Pain

Resources	Examples
Department-level interventions based on consumption data	<ul style="list-style-type: none"> Automated collection of post-surgical opioid consumption data¹⁰ Institution-specific prescribing guidelines for common surgical procedures based on consumption data¹¹ Educational seminars and reference materials for residents, advanced practice providers, and other prescribers
Personalized prescribing technologies	<ul style="list-style-type: none"> Machine learning models that predict post-surgical opioid requirements for individual patients¹² Electronic Prescribing of Controlled Substances programs¹³
National opioid prescribing regulations	<ul style="list-style-type: none"> Initial acute opioid prescription size and duration limits put in place by states, pharmacies, and insurers¹⁴
Prescribing feedback loops	<ul style="list-style-type: none"> Prescription drug monitoring programs¹⁵
Patient culture change	<ul style="list-style-type: none"> Educating residents on pain management conversations with patients and setting goals for post-surgical pain control and functional status^{2,16–19}

Widespread adoption of evidence-based educational materials by surgical residency programs for their residents, advanced practice providers, and other prescribers might be one way to address this problem. Studies by Yorkgitis et al,² Hill et al,¹⁸ and Linder et al²³ have all designed educational interventions within surgical residency programs that use actual opioid consumption data to give residents concrete quantitative recommendations at the point-of-care on quantities to prescribe for specific procedures. These interventions all resulted in clinically significant reductions in opioid prescribing, no change in patient-reported satisfaction or worsened pain control, and increased use of nonnarcotic alternatives for pain. Hill et al emphasized the importance of giving prescribers actual patient opioid consumption data in their study, stating that simply providing prescribers with these consumption-based guidelines was sufficient to change their prescribing behaviors. Similarly, at our institution, evidence-based educational materials are developed annually for residents using a prospective database of patient opioid consumption data that is continuously updated. Educational seminars, prescribing guidance cards, feedback emails, and an online prescribing guidance dashboard²⁴ for residents are all informed by this consumption data.¹⁹ We have chosen to use consumption data gathered at our institution to build these resources, since we have previously shown that most national consensus guidelines for post-surgical opioid prescribing significantly overestimate patients' opioid needs.²⁵ After a year of consumption-based feedback on resident opioid prescribing, the size of the largest opioid prescriptions at our institution fell

by over 50%. These studies are encouraging and suggest that more surgical residents should be equipped with easily accessible patient opioid consumption data to use as a reference when deciding how much to prescribe for their patients.

Personalized Prescribing Technologies

Resident education is merely one small way to address the herculean challenge of curbing excess post-surgical opioid prescribing. Thankfully, there are many other concurrent trends in medicine that surgical residency programs can leverage to make progress on promoting responsible opioid prescribing practices. One is a shift toward personalized prescribing. Pain is an intricate, subjective experience in which patients who undergo the same surgery may need vastly different quantities of narcotics. Use of personalized opioid prescribing tools—tools that use patient-specific characteristics and machine learning techniques to predict individual post-surgical pain control needs—is an important next step to address overprescribing. Several research groups, including ours, have developing robust models that provide prescribing guidance tailored to patient needs and can be made available to prescribers.^{12,24,26}

Electronic Prescriptions for Controlled Substances (EPCS) is another important new technology that is removing barriers to reduced prescribing and should be embraced as a tool for mitigating opioid overprescribing by surgical residency programs. Legislation passed by Congress in 2018 promoted the use of EPCS for opioids to combat the opioid crisis: it encouraged providers to prescribe opioids through their electronic health record by transmitting these

electronic prescriptions securely and automatically to pharmacies. Doing so makes it easier for physicians to prescribe opioid refills when appropriate, so their patients can access smaller, safer amounts of additional opioids if needed for pain control.¹³ Integration of EPCS within existing workflows at surgical residency programs would allow residents to feel comfortable with smaller opioid prescriptions while more easily meeting the needs of patients who require refills. Widespread adoption of EPCS in some states has indeed been associated with significant declines in opioid prescribing.²⁷

National Policies

Since 2017, multiple states, insurance companies, and pharmacies have developed regulations on opioid prescribing.^{14,28} A 7-day limit on opioid prescriptions is a common policy across most states and institutions.²⁹ In 2018, Walmart limited initial acute opioid prescriptions to 7 days in length and doses of 50 morphine milligram equivalents per day.³⁰ These blanket restrictions on duration and daily dose of opioid analgesia have faced some criticism for being imprecise tools that do not meet the needs of all patients and have had little impact so far on curbing opioid prescribing.^{29,31} Nonetheless, educating surgical residents on these restrictions is important: it will make them aware that many of their patients may have opioid requirements that exceed these limits, and that these patients should have carefully crafted pain management plans upon discharge, close outpatient follow-up, and the potential need for refills.

Feedback Loops

Electronic feedback systems represent an important shift toward designing processes of continual improvement around opioid prescribing. Prescription drug monitoring programs (PDMPs)—state-level databases that can track a patient's opioid prescriptions from multiple sources—are the most common existing feedback systems. While most states maintain PDMPs, results have been mixed regarding their ability to improve opioid prescribing practices.¹⁵ This may be because they are not typically updated in real time; they are useful only if the provider checks them prior to prescribing opioids, and not all PDMPs have been integrated into electronic health records for easy access. Better feedback tools will likely soon be available; in the meantime, encouraging use of PDMPs by residents as well as other health care team members such as pharmacists and advanced practice providers is still important as it remains one of the only existing tools that provides feedback to the prescriber. The recent acquisition of PatientPing (a care coordination

company) by Appriss (a prescription drug monitoring analytics company) highlights the growing national interest in using electronic systems of feedback to improve opioid prescribing and suggests that many more tools will be available soon.³²

Patient Culture Change

One final trend working in our favor is the general public's heightened awareness of the dangers of opioids. In the experience of the authors, it is increasingly common to see patients avoid opioids and request nonnarcotic alternatives for pain. As physicians struggle to find ways to quell the ongoing epidemic, some patients are clearly taking these important decisions into their own hands. But we cannot rely on this culture change alone to solve the problem. Residents should be trained to have care conversations with their patients around pain management and to set goals with them for post-surgical pain levels and functional status.

As the educators of our future surgeons, surgical residency programs should take full advantage of the growing number of policies, technologies, and other resources that will help their surgical residents become responsible prescribers of opioids while treating the real pain of surgery.

References

1. 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
2. Yorkgitis BK, Paffett C, Brat GA, Crandall M. Effect of surgery-specific opioid-prescribing education in a safety-net hospital. *J Surg Res*. 2019;243:71–74. doi:10.1016/j.jss.2019.05.003
3. Chiu AS, Healy JM, DeWane MP, Longo WE, Yoo PS. Trainees as agents of change in the opioid epidemic: optimizing the opioid prescription practices of surgical residents. *J Surg Educ*. 2018;75(1):65–71. doi:10.1016/j.jsurg.2017.06.020
4. Yorkgitis BK, Bryant E, Raygor D, Brat G, Smink DS, Crandall M. Opioid prescribing education in surgical residencies: a program director survey. *J Surg Educ*. 2018;75(3):552–556. doi:10.1016/j.jsurg.2017.08.023
5. Coughlin JM, Xu TQ, Ritz EM, Myers JA, Qureshi JS. Understanding opioid prescribing practices of resident physicians. *J Am Coll Surg*. 2019;229(suppl 4):116–117. doi:10.1016/j.jamcollsurg.2019.08.261
6. Accreditation Council for Graduate Medical Education. Opioid Use Disorder. <https://www.acgme.org/What-We-Do/Initiatives/Opioid-Use-Disorder>. Accessed November 5, 2021.

7. Dowell D, Haegerich T, Chou R. No shortcuts to safer opioid prescribing. *N Engl J Med.* 2019;380(24):2285–2287. doi:10.1056/NEJMp1904190
8. Fawcett WJ, Ljungqvist O, Lobo DN. Perioperative opioids—reclaiming lost ground. *JAMA Surg.* 2021;156(11):997–988. doi:10.1001/jamasurg.2021.2858
9. The Leapfrog Group. What's New in 2021 | Hospital and Surgery Center Ratings. <https://ratings.leapfroggroup.org/measure/asc/whats-new-2021>. Accessed November 13, 2021.
10. Kennedy CJ, Marwaha JS, Scalise PN, et al. Nonresponse adjustment using clinical and perioperative patient characteristics is critical for understanding post-discharge opioid consumption [published online ahead of print July 7, 2021]. *medRxiv.* doi:10.1101/2021.07.02.21259901
11. Michigan Opioid Prescribing Engagement Network. Opioid Prescribing Recommendations for Opioid-naïve Patients. <https://michigan-open.org/prescribing-recommendations/>. Accessed November 9, 2021.
12. Hur J, Tang S, Gunaseelan V, et al. Predicting postoperative opioid use with machine learning and insurance claims in opioid-naïve patients. *Am J Surg.* 2021;222(3):659–665. doi:10.1016/j.amjsurg.2021.03.058
13. The Office of the National Coordinator for Health Information Technology. Parasrampur S, Blanco M, Barker W. Electronic Prescribing of Controlled Substances among Office-Based Physicians, 2017. Accessed November 9, 2021. <https://www.healthit.gov/sites/default/files/page/2019-09/officebasedphysicianelectronicprescribingofcontrolledsubstance2017.pdf>.
14. Davis CS, Lieberman AJ, Hernandez-Delgado H, Suba C. Laws limiting the prescribing or dispensing of opioids for acute pain in the United States: a national systematic legal review. *Drug Alcohol Depend.* 2019;194:166–172. doi:10.1016/j.drugalcdep.2018.09.022
15. Centers for Disease Control and Prevention. Prescription Drug Monitoring Programs (PDMPs). Accessed November 9, 2021. <https://www.cdc.gov/drugoverdose/pdmp/states.html>.
16. Stepan JG, Sacks HA, Lovecchio FC, et al. Opioid prescriber education and guidelines for ambulatory upper-extremity surgery: evaluation of an institutional protocol. *J Hand Surg.* 2019;44(2):129–136. doi:10.1016/j.jhsa.2018.06.014
17. Chiu AS, Healy JM, DeWane MP, Longo WE, Yoo PS. Trainees as agents of change in the opioid epidemic: optimizing the opioid prescription practices of surgical residents. *J Surg Educ.* 2018;75(1):65–71. doi:10.1016/j.jsurg.2017.06.020
18. Hill MV, Stucke RS, McMahon ML, Beeman JL, Barth RJ. An educational intervention decreases opioid prescribing after general surgical operations. *Ann Surg.* 2018;267(3):468–472. doi:10.1097/SLA.0000000000002198
19. Robinson KA, Carroll M, Ward SB, et al. Implementing and evaluating a multihospital standardized opioid curriculum for surgical providers. *J Surg Educ.* 2020;77(3):621–626. doi:10.1016/j.jsurg.2019.12.012
20. Bicket MC, Brat GA, Hutfless S, Wu CL, Nesbit SA, Alexander GC. Optimizing opioid prescribing and pain treatment for surgery: review and conceptual framework. *Am J Health Syst Pharm.* 2019;76(18):1403–1412. doi:10.1093/ajhp/zxz146
21. Thiels CA, Ubl DS, Yost KJ, et al. Results of a prospective, multicenter initiative aimed at developing opioid-prescribing guidelines after surgery. *Ann Surg.* 2018;268(3):457–468. doi:10.1097/SLA.0000000000002919
22. 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
23. Linder BJ, Occhino JA, Wiest SR, Klingele CJ, Trabuco EC, Gebhart JB. Assessing the impact of procedure-specific opioid prescribing recommendations on opioid stewardship following pelvic organ prolapse surgery. *Am J Obstet Gynecol.* 2019;221(5):515.e1–515.e8. doi:10.1016/j.ajog.2019.06.023
24. Kennedy CJ, Marwaha JS, Robinson KA, Fleishman A, Brat GA. BIDMC Personalized Opioid Prescribing Dashboard. surgery.bidmc.org/opioids. Accessed November 9, 2021.
25. Robinson KA, Thiels CA, Stokes S, et al. Comparing clinician consensus recommendations to patient-reported opioid use across multiple hospital systems [published online ahead of print June 24, 2020]. *Ann Surg.* doi:10.1097/SLA.0000000000003986
26. Porter ED, Bessen SY, Molloy IB, et al. Guidelines for patient-centered opioid prescribing and optimal FDA-compliant disposal of excess pills after inpatient operation: prospective clinical trial. *J Am Coll Surg.* 2021;232(6):823–835.e2. doi:10.1016/j.jamcollsurg.2020.12.057
27. Danovich D, Greenstein J, Chacko J, et al. Effect of New York state electronic prescribing mandate on opioid prescribing patterns. *J Emerg Med.* 2019;57(2):156–161. doi:10.1016/j.jemermed.2019.03.052
28. National Conference of State Legislatures. Prescribing Policies: States Confront Opioid Overdose Epidemic. <https://www.ncsl.org/research/health/prescribing-policies-states-confront-opioid-overdose-epidemic.aspx>. Accessed November 9, 2021.
29. Chua KP, Kimmel L, Brummett CM. Disappointing early results from opioid prescribing limits for acute pain. *JAMA Surg.* 2020;155(5):375. doi:10.1001/jamasurg.2019.5891

30. Walmart. Walmart Introduces Additional Measures to Help Curb Opioid Abuse and Misuse. <https://corporate.walmart.com/newsroom/2018/05/07/walmart-introduces-additional-measures-to-help-curb-opioid-abuse-and-misuse>. Accessed November 9, 2021.
31. Eisenstein M. Treading the tightrope of opioid restrictions. *Nature*. 2019;573(7773):13–15. doi:10.1038/D41586-019-02687-1
32. PatientPing. Appriss Health Completes Acquisition of PatientPing. <https://patientping.com/news/appriss-health-completes-acquisition-of-patientping/>. Accessed November 9, 2021.



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