

# Stemming the Tide of Opioid Addiction—Dramatic Reductions in Postoperative Opioid Requirements Through Preoperative Education and a Standardized Analgesic Regimen

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## ABSTRACT

### Introduction

Surgery is a known gateway to opioid use that may result in long-term morbidity. Given the paucity of evidence regarding the appropriate amount of postoperative opioid analgesia and variable prescribing education, we investigated prescribing habits before and after institution of a multimodal postoperative pain management protocol.

### Materials and Methods

Laparoscopic appendectomies, laparoscopic cholecystectomies, inguinal hernia repairs, and umbilical hernia repairs performed at a tertiary military medical center from 01 October 2016 until 30 September 2017 were examined. Prescriptions provided at discharge, oral morphine equivalents (OME), repeat prescriptions, and demographic data were obtained. A pain management regimen emphasizing nonopioid analgesics was then formulated and implemented with patient education about expected postoperative outcomes. After implementation, procedures performed from 01 November 2017 until 28 February 2018 were then examined and analyzed. Additionally, a patient satisfaction survey was provided focusing on efficacy of postoperative pain control.

### Results

Preprotocol, 559 patients met inclusion criteria. About 97.5% were provided an opioid prescription, but prescriptions varied widely (256 OME, standard deviation [SD] 109). Acetaminophen was prescribed often (89.5%), but nonsteroidal anti-inflammatory drug (NSAID) prescriptions were rare (14.7%). About 6.1% of patients required repeat opioid prescriptions. After implementation, 181 patients met inclusion criteria. Initial opioid prescriptions decreased 69.8% (77 OME, SD 35;  $P < 0.001$ ), while repeat opioid prescriptions remained statistically unchanged (2.79%;  $P = 0.122$ ). Acetaminophen prescribing rose to 96.7% ( $P = 0.002$ ), and NSAID utilization increased to 71.0% ( $P < 0.001$ ). Postoperative survey data were obtained in 75 patients (41.9%). About 68% stated that they did not use all of the opioids prescribed and 81% endorsed excellent or good pain control throughout their postoperative course.

### Conclusions

Appropriate preoperative counseling and utilization of nonopioid analgesics can dramatically reduce opioid use while maintaining high patient satisfaction. Patient-reported data suggest that even greater reductions may be possible.

## BACKGROUND

Opioid use and abuse have become a blossoming health crisis in the United States since prescribing habits expanded in the 1980s.<sup>1</sup> In 2017, approximately 130 Americans died every day

from opioid overdoses.<sup>2</sup> Furthermore, the growing national opioid epidemic also has caused significant morbidity in the general population. These truths have necessitated the reevaluation of common opioid prescribing practices among health care providers.

One well-known gateway to opioid use is the treatment of postoperative pain. Postoperative prescribing by general surgeons accounted for 77.6 million opioid prescriptions in 2012 alone.<sup>3</sup> While this accounts for 36.5% of all opioid prescriptions in the United States, it is readily justified by providers seeking to utilize short courses of analgesics to ameliorate acute pain. Recent data, however, suggest that up to 6% of opioid naïve patients will develop a long-term dependence after their first prescription.<sup>4-6</sup>

A 2017 study by the CDC recently found that the duration of a patient's first prescription was directly correlated with the risk of long-term opioid use.<sup>6</sup> Although this might lead physicians to instinctively limit opioid prescriptions, undertreating

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a patient's pain can also lead to long-term complications.<sup>7</sup> Failure to achieve adequate pain control leads to a physiologic and psychologic change that may also lead to chronic pain and opioid use.<sup>8</sup> Therefore, efforts to limit opioid prescriptions must be careful not to create the very problem that they are trying to avoid.<sup>9</sup>

Over the past 20 years, there has been a dramatic increase in the number of opioid prescribing guidelines and recommendations.<sup>10–15</sup> Although the surgical community agrees that postoperative over prescribing of narcotics significantly contributes to the current opioid crisis, the implementation of opioid reduction strategies is often met with hesitation and skepticism.<sup>16,17</sup> Concern as to whether standardized guidelines can limit prescriptions while continuing to adequately treat patients may lead providers to question whether implementation of a standardized postoperative regimen is feasible within their practice model.

We sought to investigate system-wide prescribing habits and uniformity both before and after the institution of a multimodal postoperative pain management protocol. Our objective was to test whether department-wide implementation of a minimal opioid prescribing protocol would be sustainable and safe. Secondary outcomes evaluated patient satisfaction and need for ongoing pain medication beyond the acute postoperative period.

## METHODS

Madigan Army Medical Center is a Department of Defense tertiary referral center with an associated General Surgery residency program. Before October 2017, we prescribed opioids at the discretion of the attending provider. In November 2017, using best available data, the department formulated and implemented a standardized prescription regimen for patients undergoing the four most common general surgical procedures at our institution—laparoscopic appendectomies, laparoscopic cholecystectomies, umbilical hernia repair, and inguinal hernia repair (laparoscopic or open).

### Creating a Protocol

The standardized protocol was intentionally formulated to minimize provider-specific preferences and utilize data-driven guidance whenever possible. A multimodal approach was derived from the Michigan OPEN prescribing recommendations<sup>18</sup> and the Guidelines on the Management of Postoperative Pain created by the American Pain Society.<sup>19</sup>

Patients undergoing laparoscopic appendectomy, laparoscopic cholecystectomy, umbilical hernia repair, and inguinal hernia repair (both open and laparoscopic) were selected for study. At the time of the patient's preoperative visit—or at the time of their emergency department admission—patients were counseled on postoperative pain using a standardized education brochure (Fig. 1). Key aspects of preoperative counseling included the following:

- Pain is common after surgery and some pain is very normal.
- Medications are a common way to help manage your pain after surgery but are not intended to make you completely pain free.

At the time of discharge, patients were prescribed opioid and nonopioid analgesic medications (Table I). Patients were encouraged to schedule their nonopioid medications for the first 3 days, using the prescribed opioid only for breakthrough pain.

Alternate opioids were allowed at the provider's discretion and based on relevant allergies to include tramadol or Dilaudid. Opioid combinations, such as oxycodone/acetaminophen, were avoided so as to allow for split dosing of opioid and nonopioid analgesics. In the event that an individual had an allergy or contraindication to ibuprofen, they were provided acetaminophen alone with instructions to take this medication every 4 hours along with an opioid medication as needed. Patients with an allergy or contraindication to acetaminophen were excluded from the study. At the time of discharge, providers again ensured that patients were counseled on appropriate analgesic use. The previously utilized educational brochure was adapted into electronic form and attached to the patient's discharge paperwork.

### Implementing the Protocol

The developed protocol was implemented in three steps: provider education, prescription codification, and follow-up surveillance. Efforts were made to include all possible stakeholders throughout the hospital in the implementation of the final protocol. The purpose of this step was to reinforce the rationale for the change, improve provider buy-in, and ensure a unified message for patients throughout their surgery experience.

Four separate groups of providers—spanning the operative process—were identified for the education component. Surgical clinic staff were engaged in a series of morning huddles. Emergency department staff was notified and educated during grand rounds. Surgeons and surgical residents, who were present at the protocol's inception, were formally coached on patient education methods during biweekly quality improvement meetings and then reminded of the protocol on a regular basis. Lastly, medical-surgical ward nurses were engaged through a series of in-service style discussions regarding the importance of nonopioid analgesic optimization.

Codifying the standardized prescription was performed to facilitate ease of compliance. The electronic health record was utilized to create a way of prescribing the same quantity of the three analgesic medications proscribed above with minimal effort and time. Additionally, to ensure that new surgical residents and rotating interns were also aware and able to follow the protocol, prescription reminders were posted in the resident work spaces and placed within the new resident guidebook.

## **Managing Pain After Surgery**

Pain is common after surgery and some pain is very normal. We would like for you to be able to walk, participate in some light activity, and gradually increase your level of activity throughout the healing process. You will likely be sore as you increase your activity. This is expected and will gradually improve.

Medications are a common way to help manage your pain after surgery but are not intended to make you completely pain free. There are several different types of medications that can be used to control your pain. Opioids are the strongest type of pain medication you will be given following your surgery.

Opioid medications have many side effects that include sleepiness, itchiness, and constipation. We recommend taking the smallest number of opioid pills needed to reasonably control your pain. The vast majority of patients who have your same procedure require *fewer than* 10 pills.

**Opioids can become addicting with long-term use. They also impair clear thinking and the decision making process. This is why you should not drink, drive, operate heavy machinery, or sign important legal paperwork while taking opioids.**

We recommend taking pain medication before your pain becomes severe. It is often more difficult to control severe pain than it is to prevent it. To help reduce the number of opioid pills you need, we will prescribe for you to take Tylenol (acetaminophen) and/or Motrin/Advil (ibuprofen) around the clock. Take these medications on a schedule throughout the day regardless of your current pain level.

- If you are prescribed both Tylenol and Motrin, they may be safely taken at the same time. You may also want to stagger these medications so that you have pain medication available more frequently.
- Stronger opioid pain pills should only be used for more severe or “breakthrough” pain management.

Many patients find it useful to take the stronger opioid pills at bedtime for the first few days after surgery.

**Any unused opioid pills should be disposed of in the blue medication disposal bin in front of the main pharmacy at the time of your follow-up appointment.**

**If you have any questions regarding your pain control, you should contact:  
General Surgery Nursing Line at 253-\*\*\*-\*\*\*\* (Option \*).**

**If the clinic is closed, our Chief Surgical Resident may be reached by calling the  
Operator at 253-\*\*\*-\*\*\*\*. Ask the Operator to page the General  
Surgery Chief Resident to address your concerns.**

FIGURE 1. Standardized Preoperative Patient Education Tool.

**TABLE I.** Standard Postoperative Prescriptions

| Medication (strength)  | Instructions                            | Quantity (tablets) |
|------------------------|---|--------------------|
| Acetaminophen (325 mg) | Take 2 tabs PO Q6H                      | 100                |
| Ibuprofen (600 mg)     | Take 1 tab PO Q6H                       | 30                 |
| Oxycodone (5 mg)       | Take 1 tab PO Q6H PRN breakthrough pain | 10                 |

Lastly, follow-up was performed to assess for balancing outcomes and ensure that no harm was coming to the patients as a result of the protocol. Patients within our hospital system are provided a 2-week follow-up appointment with the general surgery clinic to ensure their incisions are healing well and review relevant surgical pathology. At this visit, a patient satisfaction survey was performed utilizing a combination of binary and 5-point Likert scale questions.

### Patient Cohort

To test the implementation of this protocol, this study was designed as a retrospective control and prospective case cohort design. Laparoscopic appendectomies, laparoscopic cholecystectomies, open umbilical hernia repairs, and inguinal hernia repairs (laparoscopic or open) from 01 October 2016 through 30 September 2017 were examined for our retrospective controls. Patients were excluded if their medical record demonstrated exposure to opioids within 6 months of their surgery, if they had a complicated operative course (as defined by a hospital stay greater than 48 hours, or postoperative event requiring reporting to the Washington State Surgical Care and Outcomes Assessment Program), or if they underwent an unrelated additional procedure within 3 months. Medical records that met these criteria were then queried for demographic information, analgesic prescriptions provided at discharge, amount of opioid prescribed at discharge converted to oral morphine equivalents (OMEs), and repeat opioid prescriptions within 3 months of surgery.

From 01 November 2017 until 28 February 2018, patients undergoing the above procedures were then prospectively identified and treated according to the standardized protocol. Demographic information, analgesic prescriptions provided at discharge, and amount of opioid prescribed at discharge were compiled in real time. At each patient's 2-week follow-up appointment, satisfaction surveys were used to identify if patients had utilized all of the opioids they were prescribed (yes vs no), overall postoperative pain control (1–5 Likert scale), and overall surgical experience (1–5 Likert scale). Individual patient charts were then reexamined 3 months postoperatively to assess for repeat opioid prescriptions and screen for exclusion criteria as listed above.

### Outcomes

The primary outcomes were the mean postoperative prescriptions (in OME) and requests for opioid refills within 3 months

of surgery. Secondary outcomes included the percentage of patients prescribed acetaminophen and the percentage of patient prescribed ibuprofen.

As a Department of Defense funded facility, all patients were covered under the Tricare federal insurance program. Under this plan, all care and prescription medications are provided at no cost to the individual. All prescriptions provided under this insurance plan, whether filled at the hospital of record or at an outside facility, were captured within the electronic health record and available for review. Any prescriptions that may have been written, filled, and paid for outside the Tricare system would not have been captured.

### Statistical Analysis

The primary comparison was between the preprotocol and postprotocol patient cohorts. Data analysis was performed using SPSS 22 Software (IBM; Armonk, NY). Results were analyzed using comparative and descriptive statistical analysis. Continuous variables were analyzed using 2-tailed *t*-test to compare the equality of mean values. Binary values were compared utilizing Fisher exact test for independence, and categorical endpoints were analyzed using Pearson  $\chi^2$ . Results were deemed statistically significant at a *P* value threshold of <0.05.

### RESULTS

During the year before protocol implementation (01 October 2016 through 30 September 2017), 698 patients underwent surgery and 559 patients met inclusion criteria. After protocol implementation (01 November 2017 through 28 February 2018), 210 patients underwent surgery with 181 meeting inclusion criteria (Table II). The two cohorts were similar in regard to both gender (*P* = 0.771) and age (*P* = 0.478).

Before protocol implementation, 89.5% were prescribed acetaminophen, 14.7% were prescribed a nonsteroidal anti-inflammatory drug (NSAID), and 97.5% of patients were prescribed an opioid medication. The most commonly prescribed opioid was oxycodone (*n* = 445, 79.6%) followed by oxycodone/acetaminophen (*n* = 78, 14.0%) and hydrocodone/acetaminophen (*n* = 10, 1.8%). The average discharge prescription was 255.5 OME (SD 109.9) or the equivalent of 34.4 tablets of 5 mg oxycodone. Repeat opioid prescriptions were required by 6.1% of patients within 3 months of the date of surgery.

**TABLE II.** Composition of the Procedures Meeting Inclusion Criteria and Percentage of the Cohort

|   | 01 October 16–30 September 17 | 01 November 17–28 February 18 |
|---|-------------------------------|-------------------------------|
|   | Preprotocol                   | Postprotocol                  |
| Total number of procedures                | 698                           | 210                           |
| Procedures meeting inclusion criteria (%) | 559 (80)                      | 181 (86)                      |
| Gender (% female)                         | 65.0                          | 66.0                          |
| Age (years)                               | 45.0                          | 46.0                          |
| Laparoscopic appendectomy (%)             | 95 (17)                       | 25 (14)                       |
| Laparoscopic cholecystectomy (%)          | 205 (37)                      | 69 (38)                       |
| Umbilical hernia repair (%)               | 98 (17)                       | 23 (13)                       |
| Inguinal hernia repair (%)                | 161 (29)                      | 64 (35)                       |

After protocol implementation, acetaminophen prescriptions rose to 96.1% (+6.6%,  $P = 0.002$ ), NSAIDs were provided to 71.0% (+56.3%,  $P < 0.001$ ), and opioids were prescribed to 94.5% (−3.0%,  $P = \text{NS}$ ). Oxycodone prescribing increased to 92.8% (+13.2%,  $P < 0.001$ ). Average discharge prescriptions decreased 69.8% to 77.1 OME (SD 34.5,  $P < 0.001$ ), the equivalent of 10.4 tablets of 5 mg oxycodone. Repeat prescriptions over the 3 months after surgery remained statistically unchanged at 2.8% (−3.3%,  $P = \text{NS}$ ) (Table III).

Postoperative surveys were completed by 75 patients (41.4%). Of those who responded, 81.1% reported either good or excellent pain control (average score 4.22/5.0) and 94.4% reported either a good or excellent surgical experience (average score 4.72/5.0). Patients reported using an average of 4.6 tablets, and 70.2% stated that they did not use all of the tablets provided.

## DISCUSSION

These data show that the combination of preoperative education with a standardized approach to postoperative prescribing can result in dramatic reductions in opioid prescriptions. Moreover, this goal can be accomplished without compromising patient comfort or creating undue burden on the outpatient clinic through increased calls for opioid refills.

We believe that the success of this protocol is due, in large part, to the strength of the anticipatory guidance and iterative education provided to patients throughout their surgical experience. This list of surgical procedures represents some of most common, and often some of the most straight-forward, operations in general surgery. Despite its commonplace occurrence, surgery of any kind is often anxiety-provoking for patients. There are many psychological reasons for this anxiety including expectation of pain, fear of harm, lack of control, and lack of understanding. Regardless of its cause, increased anticipatory anxiety has been found to predict higher pain scores in postoperative patients.<sup>20,21</sup> Fortunately, presurgical counseling and education has been shown to lower these same postoperative pain scores.<sup>14,22</sup>

Our preoperative counseling stressed several important aspects. First and foremost, we stressed that pain was a normal part of the healing process. In the late 1990s, the medical community made a shift to considering pain as the 5th vital sign.<sup>15</sup> The intention of this addition was to “improve treatment of acute pain” and ensure that “a report of unrelieved pain raise [d] a ‘red flag’ that attract [ed] clinicians attention.”<sup>23</sup> The unintended consequence of this more patient-centered focus, was the implication that pain, in and of itself, was a bad thing that merited concern. The normalization of pain in the postoperative period preemptively assuages patients’ fears and reduces the risk that patients will binge their medications in order to obtain a pain-free postoperative course.

The second point that is clarified in the counseling is the nonopioid medications that will serve as a patient’s baseline pain control. Many practitioners will have noticed that the dosing regimen used for acetaminophen remained well below the standard 4 g prescribing limit. At 650 mg every 6 hours, this only provides 2.6 g in a 24-hour period. In creating a standard that could be applied to the broadest group of patients, we intentionally limited our acetaminophen dosing as some individuals appear to experience acetaminophen toxicity at therapeutic doses less than 4 g per day.<sup>24</sup> In addition, this limitation in dose allowed us to have patients schedule this medication offset with ibuprofen, thereby allowing the patient to take an analgesic medication every 3 hours. This offset protocol meant that patients would be more likely to remain in a nonopioid therapeutic window than if they took both medications together. Providing a clear explanation of this plan, we found, increased patient compliance with nonopioid medications.

The last emphasis of our preoperative education was to inform patients of the ways in which they could dispose of their leftover narcotics. Opioids leftover from valid prescriptions have become increasingly more common. A recent survey of American adults living with at least one child found that 57.2% had or expected to have leftover opioid medications in their home. The same survey also found that 45.3% had received no information on proper

**TABLE III.** Prescribing Practices Before and After Initiation of a Standardized Prescribing Protocol

|                                     | Preprotocol | Postprotocol | Delta | P-value |
|-------------------------------------|-------------|--------------|-------|---------|
| <b>All procedures</b>               |             |              |       |         |
| Number of subjects                  | 559         | 181          |       |         |
| Opioid prescription, mean (SD), OME | 256 (110)   | 77 (35)      | -70%  | <0.001  |
| Prescribed acetaminophen (%)        | 500 (89)    | 174 (96)     | +7%   | 0.002   |
| Prescribed NSAID (%)                | 82 (15)     | 128 (71)     | +56%  | <0.001  |
| Required repeat opioid (%)          | 34 (6)      | 5 (3)        | -3%   | 0.122   |
| <b>Laparoscopic appendectomy</b>    |             |              |       |         |
| Number of subjects                  | 95          | 25           |       |         |
| Opioid prescription, mean (SD), OME | 231 (120)   | 79 (79)      | -66%  | <0.001  |
| Prescribed acetaminophen (%)        | 88 (93)     | 23 (92)      | -1%   | >0.99   |
| Prescribed NSAID (%)                | 12 (13)     | 18 (72)      | +59%  | <0.001  |
| Required repeat opioid (%)          | 3 (3)       | 0 (0)        | -3%   | >0.99   |
| <b>Laparoscopic cholecystectomy</b> |             |              |       |         |
| Number of subjects                  | 205         | 69           |       |         |
| Opioid prescription, mean (SD), OME | 266 (108)   | 72 (31)      | -73%  | <0.001  |
| Prescribed acetaminophen (%)        | 171 (83)    | 65 (94)      | +11%  | >0.99   |
| Prescribed NSAID (%)                | 18 (9)      | 48 (70)      | +61%  | <0.001  |
| Required repeat opioid (%)          | 10 (5)      | 2 (3)        | -2%   | 0.736   |
| <b>Umbilical hernia repair</b>      |             |              |       |         |
| Number of subjects                  | 98          | 23           |       |         |
| Opioid prescription, mean (SD), OME | 238 (102)   | 85 (49)      | -64%  | <0.001  |
| Prescribed acetaminophen (%)        | 89 (91)     | 23 (96)      | +5%   | >0.99   |
| Prescribed NSAID (%)                | 13 (13)     | 14 (61)      | +48%  | <0.001  |
| Required repeat opioid (%)          | 6 (6)       | 0 (0)        | -6%   | 0.597   |
| <b>Inguinal hernia repair</b>       |             |              |       |         |
| Number of subjects                  | 161         | 64           |       |         |
| Opioid prescription, mean (SD), OME | 268 (107)   | 78 (21)      | -71%  | <0.001  |
| Prescribed acetaminophen (%)        | 152 (94)    | 64 (100)     | +6%   | >0.99   |
| Prescribed NSAID (%)                | 39 (24)     | 48 (75)      | +51%  | <0.001  |
| Required repeat opioid (%)          | 15 (9)      | 3 (5)        | -4%   | 0.291   |

disposal.<sup>25</sup> This has become increasingly problematic as legal opioid medications prove to be an ever increasing gateway to illegal drug use. In fact, over 70% of people over the age of 12 who use pain relievers nonmedically have been found to obtain their pills from friends or family members.<sup>26</sup> Although this did not have a direct effect upon our study outcomes, we believe it provided an important public service.

Multiple efforts have been made to standardize and limit the use of opioids following surgical procedures.<sup>27,28</sup> The most high-profile of these efforts has been the Michigan Surgical Quality Collaborative. Drawing data from the Blue Cross Blue Shield of Michigan (BCBSM) Value Partnerships database, this consortium was able to shine a light on the correlation, or lack thereof, of opioid prescriptions and actual opioid usage among patients. One in-depth study of 2,392 patients from 33 hospitals found that patients only took 27% of the opioids they were prescribed. Most surprising, however, was the fact that the single greatest determining factor in the number of opioid pills taken by a patient was, in fact, the number of pills they were initially prescribed.<sup>29</sup> With their data, the MSQC published a set of recommended opioid prescriptions that were reported to cover the needs of greater

than 80% of patients undergoing common general surgical procedures.<sup>18</sup>

The focus on opioid reduction over the past several years has created an environment ripe for change. Providers are becoming increasingly aware of overprescribing, and patients are becoming more educated on the risks of opioid medications. These conditions made it significantly easier for us to gain the necessary buy-in to enact a 69.8% overall reduction in opioid prescribing. After sharing our early results with our institution, however, we have also seen a remarkable follow-on response from other departments within our facility. By building upon a staff already educated in and engaged in nonopioid optimization, both our orthopedic and urologic surgery departments have taken on medication standardization and opioid minimization efforts. Their efforts seem to have garnered faster results suggesting that an educated system can reinforce changes and ease patient compliance.

Our data suggest that our reduction in opioids through standardization and preoperative education was effective without compromising the comfort of the patient. Some might argue that additional reductions are possible given that over 70% of patients did not use all of the opioids prescribed. While

this may be the case, we posit that further reduction would provide diminishing returns while increasing the risk of not providing sufficient pain relief. As such, our institution's next step will be toward expanding our protocol to include additional procedures and patient populations.

Our experience with a standardized protocol has been very positive and it has yielded benefits throughout our institution. We strongly encourage other surgical practices to similarly engage in these efforts.

## AUTHOR CONTRIBUTION

**CPT Rowan Sheldon, MD**—This author was the study lead. He was primarily responsible for protocol development, implementation, data collection, data analysis, data interpretation, writing, and revision of the manuscript. He was also the presenting author at each of the conferences listed.

**CPT Jessica B. Weiss, MD**—This author assisted in protocol development, protocol implementation, data collection, and manuscript revision.

**CPT Woo S. Do, MD**—This author assisted in protocol development, protocol implementation, data collection, and manuscript revision.

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**COL Preston L. Carter, MD (Ret.)**—This author assisted with data analysis, manuscript revision, and presentation logistics.

**LTC Matthew J. Eckert, MD**—This author oversaw protocol development, assisted with protocol implementation, and provided key guidance for data analysis and manuscript production.

**LTC Vance Y. Sohn, MD**—This author was the senior author for this protocol. He was instrumental in protocol formation, implementation, and data analysis. He provided key revisions to the manuscript.

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