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Review

Compliance With Opioid Disposal Following Opioid Disposal Education in Surgical Patients: A Systematic Review

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A B S T R A C T

Purpose: The present opioid epidemic in the United States is a significant cause for concern in healthcare. In 1995, the concept of pain was introduced as the fifth vital sign. Since then, the sales of opioids have increased dramatically, as have the number of opioid deaths. The misuse and diversion of retained opioids following surgical procedures contribute to the problem. The objective of this project was to review the latest scholarly work and evaluate the findings related to patient education and disposal of opioid medications to decrease opioid misuse and increase disposal.
Design: A systematic review.
Methods: The systematic search strategy included PubMed, Ovid Technologies (OVID), and Cumulative Index of Nursing and Allied Health Literature (CINAHL) electronic databases.
Findings: A total of 4 randomized controlled trials (RCTs), 2 quasi-experimental studies, and 2 quality improvement projects met the criteria for inclusion. The studies found that as many as 92% of patients had leftover unused opioids. The retention rate of opioids among surgical patients was found to be 33 to 95%. When educational material was provided about disposal, the studies found that the disposal rate was as high as 71%.
Conclusions: Patient education about opioid misuse, diversion, and disposal are essential topics that need to be addressed with patients and caregivers.

Inadequate patient education and awareness regarding proper opioid disposal of leftover medication leave excess opioids for inappropriate use by the patient or others.[1] Upon discharge after surgery, patients often receive education via pamphlet or discharge paperwork describing their prescription opioids and side effects. The discharge nurse reviews the proper use of opioid medications with the patient. Often, the discussion of misuse and disposal is omitted or not emphasized with the patient, sometimes due to reliance on outsourced information (computer printouts) for education.[2] Educating patients on the proper use, storage, and disposal of opioids may be effective in mitigating opioid abuse, but no standardized educational platform exists to deliver education to postoperative patients.[3]

The Centers for Disease Control and Prevention has declared the increasing abuse of opioids and opioid-related deaths an epidemic, with 131 Americans dying every day from a prescription or illicit opioid overdose.[2] More than 191 million opioid prescriptions were dispensed to American patients in 2017, with wide variation across states.[4] Many opioid-naïve patients are first exposed to opioids after general surgery procedures.[5] With >70% of opioids prescribed after an operation left unused, opioid stewardship is critical in preventing misuse and abuse of opioids by the patient and the community.[5]

Background

In 1995, Dr. James Campbell introduced the concept of "pain as the fifth vital sign" at his American Pain Society's presidential address.[1] Opioid prescribing increased dramatically after the introduction of this concept. From the late 1990s to the late 2000s, there was a fourfold increase in the number of opioid overdose deaths in the United States (U.S.), which paralleled a fourfold increase in the sale of opioids.[1] The total cumulative cost associated with opioid use disorder (OUD) for this extrapolated 50-state sample over 15 years

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amounts to more than $72.4 billion.[6] The direct costs to the healthcare, criminal justice, foster care, and educational systems are substantial and represent only a part of the vast economic damage caused by the loss of tens of thousands of people in the prime of their lives every year.[7]

Leftover opioids following surgery represent a significant public health issue.[8] Prescription opioids are used to treat moderate to severe pain, and are often prescribed following surgery.[4] Currently, multimodal (non-narcotic), regional anesthesia techniques and opioids are provided while the patient is in the hospital. The patient leaves the hospital with an opioid prescription to manage pain after discharge, leading to misuse or abuse. A systematic review shows more than half of individuals who misuse prescription opioids obtain them from a friend or relative's supply.[8] Most patients keep unused medications at home without realizing this is a common source of opioid misuse.[1]

The quantity of prescription opioids varies by provider and type of surgery. The current trend is to decrease the number of prescription opioids prescribed after surgery.[9] Recent policy initiatives enacted by states, insurers, and pharmacies have sought to decrease opioid diversion and misuse by limiting opioid quantities prescribed after surgical procedures.[8] Despite the provider decreasing the number of opioids prescribed, the patient may still have unused opioids.

This review focuses on patient education to reduce opioid misuse and increase the proper disposal of opioids. Currently, no superior education model exists to decrease misuse or increase disposal, but educating patients on the proper use, storage, and disposal of opioids may help mitigate opioid abuse.[3] Educating patients about the dangers of opioid misuse and the importance of proper disposal of opioids may prevent them or someone else from developing an OUD. Healthcare providers should address patient expectations surrounding pain management combined with information regarding the risk of opioid use and disposal instructions.[1]

Methodology

The objective of this review was to appraise the latest scholarly work and evaluate the findings related to patient education about in-home disposal of opioid medications to decrease opioid misuse and increase disposal. The PICO question guiding the systematic review is:

(P) In surgical patients prescribed opioids upon discharge, (I) does additional pre-discharge education (C) compared to printed discharge instructions, (O) provide increased compliance to reduce opioid misuse and increase proper disposal of opioids?

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist was used to guide the systematic review search and format.[10] The PICO question guided the literature search. The search strategy used PubMed, Ovid Technologies (OVID), and Cumulative Index of Nursing and Allied Health Literature (CINAHL) electronic databases. Search terms and filters used with each electronic database are listed in Table 1.

Results

Study Selection and Screening Method

The PubMed database yielded 88 articles, OVID 75 articles, and CINAHL 33 articles, with a total of 196 articles from the combined databases. Five additional articles were found by reference search and Google Scholar. After removing duplicates, 71 articles remained for appraisal. To make the appraisal more reliable and prevent bias, two investigators screened the 71 remaining articles. The inclusion and exclusion criteria (Table 2) were used for screening the title and abstract. After the initial screening, 59 articles were excluded. The two investigators then completed a full-text screening process of the remaining 12 articles based on the strict inclusion and exclusion criteria. During the full-text review, an additional 4 articles were excluded due to not including an educational intervention. Eight studies met the eligibility requirements and were included in this systemic review, 4 RCTs, 2 quasi-experimental, and 2 quality improvement projects. A PRISMA flow diagram (Figure 1) is included to visualize the screening process utilized in this systematic review.

The John Hopkins Research Evidence Appraisal Tool was used to determine the quality of the 8 remaining articles.[11] All 8 articles were prospective studies, including 4 randomized control trials (RCT), 2 quasi-experimental studies, and 2 quality improvement projects. The 4 RCTs were level I evidence, with 2 high and 2 being low quality.[11] The 2 quasi-experimental studies were level II evidence with 1 high and 1 good quality. The 2 quality improvement projects were both good quality according to the John Hopkins' appraisal scale.[11]

Study Characteristics

Included studies are highlighted in Table 3. The systematic review consisted of a total of 2,660 total participants.[12-19] A total of 1,546 (58%) participants received opioid education about the indications, risk, usage, and disposal. [12-19] The most common difference among participant demographics was sex (male/female). More females were noted in 5 of the 8 studies ranging from 58 to 86%.[12,13,15,16,18] Nahhas et al had more females in 2 of the 3 groups (58.5 – no education, 45% pamphlet group, and 62.6% pamphlet and text message group).[14] One study had a 100% female population undergoing surgery for breast cancer.[21] All eight studies were conducted at academic medical centers, with 7 of 8 in the United States[13-19] and 1 in Canada.[12] The studies were published between 2016 and 2021, with data

Table 1
Database Search Table

Database	Medication	Intervention	Outcome	Filters Applied
CINAHL	(MH "Narcotics") OR (MH "Analgesics, Opioid") OR (MH "Oxycodone") OR (MH "Opioid Epidemic")	(Education OR Patient Education OR Training OR Counseling)	(Disposal OR Opioid disposal OR Opioid Waste) AND (Misuse OR Abuse)	• Academic Journals • English Language • 2000-2020 • 33 results found
PubMed	(Opioid* OR Narcotic* OR Hydrocodone OR Lortab OR Oxycodone OR Percocet OR Oxycontin)	(Education OR Patient Education OR Training OR Counseling)	(Disposal OR Opioid disposal OR Opioid Waste) AND (Misuse OR Abuse)	• Academic Journals • English Language • 2000-2020 • 88 results found
OVID	(Opioid* OR Narcotic* OR Hydrocodone OR Lortab OR Oxycodone OR Percocet OR Oxycontin)	(Education OR Patient Education OR Training OR Counseling)	(Disposal OR Opioid disposal OR Opioid Waste) AND (Misuse OR Abuse)	• Academic Journals • English Language • 2000-2020 • 75 results found

Table 2
Inclusion and Exclusion Criteria

Inclusion	Exclusion
Population: • Pediatric • Adolescent • Adult • Surgical Patients Facilities: • Ambulatory Surgery Centers • Hospital • Outpatient Office-Based Procedures Intervention: • Prescribed Opioids at Discharge • Opioid Education • Opioid Disposal Peer-Reviewed Journals Peer-Reviewed Studies English Language Publication date 2000-2020	Outcomes: • Patient Not Prescribed Opioids • No Education Intervention Type of Study: • Non-Academic Journals • Non-Peer Reviewed Journals • Publication date before 2000 • Non-English language

collection occurring between 2014 to 2019.[12-19] There was heterogeneity within this systematic review as 7 of 8 studies included adult and pediatric surgical patients that required opioid prescriptions for a variety of procedures, including orthopedic, general surgery, urology, dental, breast, and peripheral nerve clinic.[12-17,19] One study was from a palliative care clinic.[18]

Patients were provided with educational material in all of the studies. In 5 studies, education was provided about opioids and disposal,[12,14-16,18] and in 3 studies education was provided about a form of disposal.[13,17,19] Eight studies had a control arm of routine education or no education, while the intervention arm received specific education about indications, risk, usage, and disposal.[12-15] Of the 8 studies, five provided a 1 to 2-page educational pamphlet or brochure pre-operatively (clinic or joint class) or in the office,[14,16-19] and 2 studies provided written discharge instructions.[12,15] Only one study provided a web-based program for educational material.[13] In 6 of the 8 studies, the education material was provided by nurses,[12] trained assistants,[13] research assistants,[15] clinic staff,[16,17] and one anesthesiologist.[19] Nahhas et al[14] did not specify who provided the educational material to the patient. De La Cruz et al required the nurses, pharmacists, and physicians to attend an in-service about the education material and document the educational material reviewed with the patient and caregiver.[18] De La Cruz et al also allowed time for questions and answers.[18] No other studies mentioned if time was allowed for questions and answers. Educational content for 5 of 8 articles included information about the risk of opioid use.[12,13,17-19]

A disposal product was provided to the participants in 3 of 8 studies.[13,17,19] Voepel-Lewis et al[13] provided a Ziploc bag that contained coffee grounds, Hite et al[17] provided a charcoal disposal bag, and Zhang et al[19] provided DisposeRx. The education material by Bettlach et al[16] provided instruction on how to use a zip lock bag and dish soap to dispose of opioids. Two of 8 studies specified FDA opioid disposal recommendations,[14,18] (Figure 2) while Maughan et al requested participants return opioids to the pharmacy for disposal.[15]

All researchers collected data using surveys completed by the participants. Five of the 8 studies had the patients complete the surveys at the follow-up visits, ranging from 1 week to 12 weeks.[14,16-19] Two

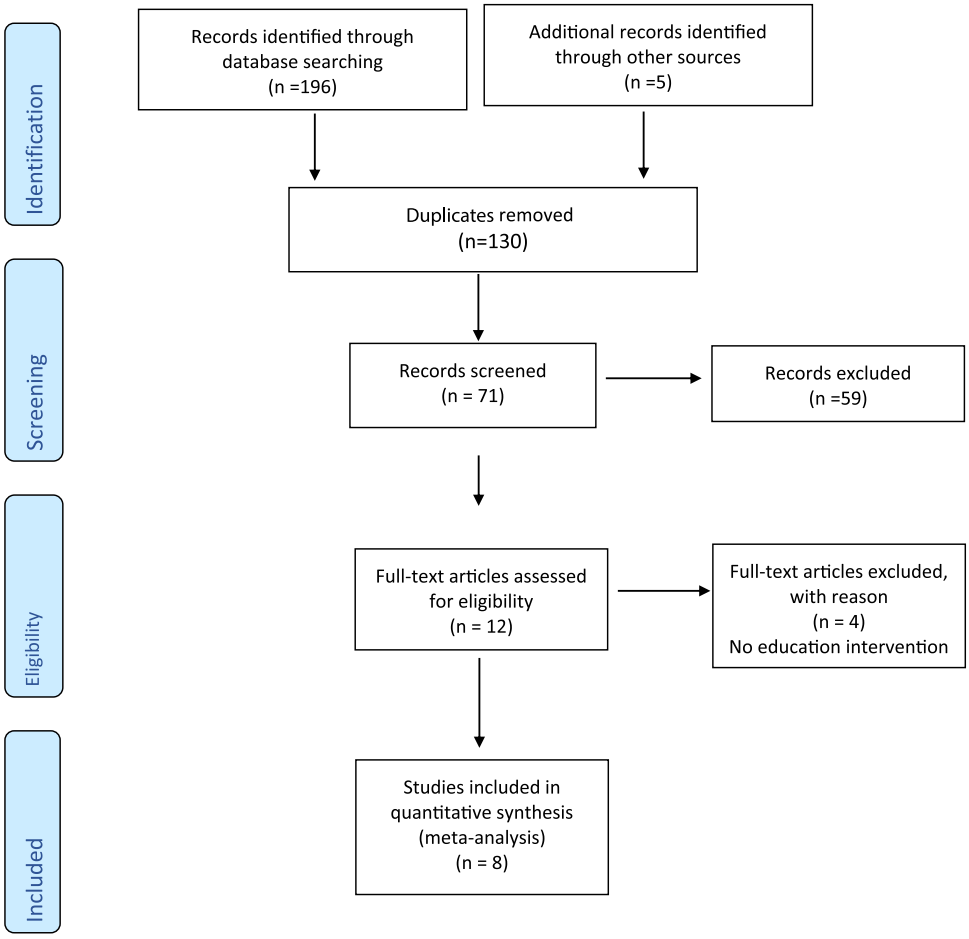

Figure 1. PRISMA flow diagram. This figure is available in color online at www.jopan.org.

Table 3
Evidence Table

Authors (Year) and Level of Evidence	Study Design and Setting	Sample Size	Timing of Education	Intervention and Disposal Rates	Findings
Voepel-Lewis et al[13] (2020) Level I Quality A	RCT Outpatient	517	Pre-op	Control - no disposal or routine information = 19.2% Nudge - disposal Ziploc = 33% STOMP - web based education + Nudge = 38.5%	Prompt disposal was highest for the STOMP and Nudge group (38.5%), Nudge alone (33.3%), or STOMP alone (31%) compared with the control group (19.2%; OR 2.64 [95% CI 1.46-4.80]) Planned retention was significantly lower for STOMP intervention (5.6% vs 12.5% without STOMP; OR 0.41 [95% CI 0.21-0.81]
Nahhas et al[14] (2020) Level I Quality A	RCT Inpatient	539	Pre-op	No education = 9% Educational pamphlet = 32.8% Educational pamphlet + text messages = 38.5%	Patients who underwent THA were twice as likely to dispose of unused opioids compared to patients who underwent TKA (OR 2.1; $P = .005$)
Maughan et al[15] (2016) Level I Quality C	RCT Outpatient	79	Post-op	Routine post-op instructions = 30% Same as above + pharmacy-based return program = 52%	Intervention arm reported disposal or intended to dispose at a 22% higher rate than the control arm (Fischer exact $P = .11$)
Singh et al[12] (2018) Level I Quality C	RCT Inpatient	78	Post-op	No instruction = 12% Written instructions = 5%	Fewer people in the intervention returned unused opioids to the pharmacy but was not statistically significant ($P = .33$)
Bettlach et al[16] (2020) Level II Quality A	Quasi-Experimental Outpatient	265	Pre-op	No brochure = 19.6% Simple brochure = 46.7%	The absolute difference of 27.1% (CI=13.2%-41.9%) represents an approximately 138% relative increase in disposal Older age had slight increase with odds of disposal (OR=1.03, Ci 1.003-1.06, $P = .03$)
De la Cruz et al[18] (2017) Level II Quality B	Quasi-Experimental Outpatient	600	Pre-op	No education material = 28% Education material = 76.5% aware of proper disposal	After educational material fewer patients had unused opioids in home (38.1% vs 46.6%; $P = .0497$), kept in safe place (locked, 14% vs 9.5%; hidden 75.4% vs 69.9%; $P = .0025$), and aware of proper disposal (76.5% vs 28%; $P < .0001$)
Zhang et al[19] (2021) Level V Quality B	Quality Improvement	452	Pre-op	Educational flyer + DisposeRx = 71%	Hypothesize that greater usage could be related to a combination of DisposeRx being given to patients and repeated reminders to dispose
Hite et al[17] (2020) Level V Quality B	Quality Improvement	119	Pre-op	Education handout + charcoal bag = 37%	70% of patients reported receipt of charcoal bag and 37% reported using the bag Despite education and providing disposal method, low compliance was found in the use of the charcoal bag

1. Drug Take-Back Location – Pharmacy or Police Station
2. Dropbox locations
3. Mail back Programs
4. Disposal Products
5. DEA website for take-back locations and dates
6. Flushing – check the FDA flush list for approved medications to flush
7. Trash disposal – seal medications in a bag with an unappealing substance such as dirt, cat litter, or coffee grounds.

Figure 2. FDA recommended medication disposal.

of the 8 studies used electronic surveys that included email[13] and text messaging.[15] The survey sent via email[13] was sent on post-operative days 7 and 14, while the text messaging survey[15] was sent on days 1 to 7, 14, and 21. Only one survey was conducted by phone interview, 4-weeks from the post-operative day.[12] Finally, only one study requested proof of disposal. Voepel-Lewis et al requested a photograph of the disposal as a secondary validation.[13] Forty percent of the participants who disposed of their opioids e-mailed a photograph to confirm disposal.[13]

Findings and Outcomes

The studies found that 54 to 92% of patients had leftover, unused opioids.[12-19] Five of the 8 studies found educational material about opioids, and disposal of opioids increased disposal rates between 32.8% and 71%.[13,14,16,17,19] Zhang et al reported 71% of patients who received education had disposed of their opioids.[19] Hite et al found that 70% of the intervention group received the charcoal disposal bag and educational material, but only 37% had disposed of unused opioids.[17] One study found the educational material had increased the participants' awareness of disposal by 22%,[15] while another author reported a 76.5% increase in disposal awareness.[18] Two of the 8 studies provided educational material postoperatively[12,15] and found disposal rates for the intervention groups were 5%[12] and 52%.[15] While 7 of the 8 studies found that education increased disposal, Singh et al found the control group (no education) had a higher disposal rate than the intervention group (education), 12% versus 5%.[12]

Patients who keep their excess opioids provide a source of accidental overdose, diversion, and misuse among adults and children.[19] In these 8 studies, the surveys found retention rates were between 33% and 95%.[12-19] Common reasons for patients to retain opioids were patients still taking opioids, fear of future need or pain, paid for medications, lack of knowledge on how to dispose of, waiting on take-back days (twice a year), an extra trip to law enforcement or pharmacy, and the pharmacy refusal to take back medications.

Fear of future need or pain was the most common reason to retain medications in 4 of 8 studies.[13,14,17,18] At the time of the surveys, 3% to 35% of patients still required opioids for pain in 4 of 8 studies.[12,14,15,17]

Limitations of Included Studies

The authors stated limitations within the studies included in this systematic review. Surveys were used to gather information and were at risk of several bias forms. The timing of the survey related to the type of surgery may not correlate with end of surgical pain. The surveys in these studies varied from 2 weeks to 12 weeks. Three of 8 studies noted that the survey's timing related to the time since surgery might have been a limitation.[12,14,16] Nahhas et al chose to survey patients at 6-week follow-up but stated a survey at 3 or 6 months would likely have enhanced the study results.[14] The studies varied in their disposal recommendations that have been set forth through many established disposal modalities, such as FDA recommendations, Drug Enforcement Administration (DEA) take-back events, return to a pharmacy or law enforcement, simple disposal pouch (coffee/soap), or commercial disposal pouch. The lack of consistency with the presentation and delivery of educational material was a limitation. The opioid and disposal educational material should be in different formats (written, digital, and video) and various languages. Two studies stated a limitation of having "well-educated" patients but did not define what "well educated" meant.[13,15] The last limitation was that 2 of the 8 studies reported being underpowered or lacked power in the sample size studied.[14,15]

Risk of Bias

Surveys were used to collect data in all the studies. Risk of bias is common with data collection by surveys. Inappropriate responses may be generated due to the timing of the survey and what the patient accurately remembers, while some patients may answer questions with a socially desirable response. Recall bias was cited in 4 of 8 studies,[14,16-18] social desirability bias in 3 of 8 studies,[13,15,16] self-reporting bias in 3 of 8 studies,[12,15,19] and selection bias in 2 of 8 studies.[15,16] Some studies pointed out the potential for more than one type of bias.

Discussion

Summary of Evidence

This systematic review identified 8 studies with 2,660 participants prescribed opioids for post-operative pain control and cancer pain. Fifty-eight percent (n=1,546) of patients received an educational intervention, including information on opioid disposal. Nahhas et al found the control group (no educational material) had a 9% disposal rate, similar to previous studies that had reported 5 to11%.[14] By providing patients with educational pamphlets (once pre-operatively and twice via mail) along with three reminder text messages, Nahhas et al had a threefold increase in opioid disposal.[14] The study with the highest rate of disposal (71%) provided every surgical patient with a DisposeRx packet, an educational flyer about at-home storage and how to use DisposeRx, and verbal instructions by an anesthesiologist about how to use Dispose Rx.[19] Providing patients with education material on opioids and providing an opioid disposal product are significant factors in increasing the rates of disposal.

The educational material was delivered across many different learning modalities, such as preoperative pamphlets, brochures, handouts, and web-based tools. Two studies provided post-operative or discharge opioid education and disposal information,[12,15] while the other 6 studies provided preoperative education material.[13,14,16-19] The two studies that provided active education had the highest rate of disposal at 71%.[18,19] The educational intervention by Zhang et al[19] was provided by an anesthesiologist in the clinic before prescribing the opioid and had a 71% disposal rate.

The survey was delivered at varying times in each study, ranging from 1 to 12 weeks. In each study, the survey's timing may not have correlated with the appropriate time for disposal. Post-surgical pain varies based on patient and type of procedure. Patients who are required to take a survey too soon may still have post-operative pain, while patients who are surveyed at later times may have forgotten to dispose of their medications. Nahhas et al administered the post-operative survey at the 6-week follow-up visit for total joint patients and stated that administering the survey at 3 or 6 months may have enhanced the study.[14] As stated previously, 4 of the 8 studies found 3% to 35% of patients still required opioids for their pain at the time of the surveys.[12,14,15,17]

Facilitators and Barriers

Facilitators to increasing opioid disposal include providing every patient with educational material about opioids and a disposal product with every opioid prescription. Educational material should be provided to patients multiple times throughout their care (surgeon's office, pre-admission testing (PAT), pre-operatively, and post-operative/discharge). Repetitively providing consistent educational material about opioid use, risk, and disposal will reinforce the importance of disposing unused opioids. In 5 of the 8 studies, the educational material was provided pre-operatively, and disposal rates were between 37 and 71%.[13,14,16,17,19]

Barriers to opioid disposal are the fear of future pain, frequency of DEA take-back events, disposal locations, and cost of medications or disposal products. Although there are many reasons patients do not dispose of opioids, these are the most common. Fear of future pain is the most common reason to retain opioids. Patients who have experienced significant pain in the past are afraid of having recurring pain and refuse to dispose of opioids. DEA take-back events are held twice a year (April and October).[20] The number of DEA take-back locations vary by state with North Dakota having one location and Wisconsin having 281 locations.[20] Patients have reported that DEA take-back timing does not correlate with their schedule, or they forget about them. Disposal locations are not always convenient for patients, so they avoid disposal. The cost of a disposal product is generally an additional cost, and patients may not want to spend the extra money to purchase a disposal product. Other patients feel they spent the money for the opioid prescription and disposal would be wasting money. Another barrier is opioid education. The educational material may only discuss the side effects and risk of taking opioids but not provide education about the dangers of improper disposal. Variability in educational content and lack of standardized educational information has been noted by others.[2]

Recommendations for Future Research

Recommendations for further research were noted by the authors of these studies in this review. Future research is needed about the retention of opioids. Four of 8 studies listed fear of future need or future pain as the most common reason to retain opioids.[13,14,17,18] The development of a screening tool to determine patients who are at risk of retaining opioids for fear of future need. Patients that are determined to be at risk may need additional information and education.

Another recommendation was to examine the timing and delivery of educational material. The provision of educational material can vary based on the type of procedure and facility for surgical procedure. Most patients are scheduled by the surgeon's office, seen in a preoperative setting, and discharged from the facility. Future research should expand

on the timing and delivery method of the educational material to enhance the disposal of unused opioids in the post-operative period.

Recommendations for Practice and Applications in Other Settings

Opioid education and disposal can extend beyond surgical patients. Any patient prescribed opioids should receive the appropriate education about the risk of using and retaining unused opioids, along with an in-home disposal product. In 6 of 8 studies, written and web-based educational material was provided in the preoperative setting, and disposal of opioids ranged from 37% to 71%.[13,14,16-19] Zhang et al provided active pre-op education along with a flyer and had the highest disposal rates (71%) within this review.[19] Recommendations for practice would be to provide active education to the patient in preoperative and post-operative settings. Educational material about opioids should include fear of future pain along with opioid use, dangers of retaining unused opioids, and a disposal product should be provided to patients at no cost to encourage compliance. Also, the delivery of educational material should be provided in multiple formats to allow for varying learning abilities. These can be written (pamphlet or brochures), videos, electronic communication (e-mail or text messaging), or web-based material. Information on disposal should be provided in the office and supported throughout the phases of care with disposal products such as Deterra or DisposeRx provided with each opioid medication.

Implications for Practice and Career Development

Opioid naïve patients are encountered in the surgical setting daily. With appropriate education about opioid use and disposal, we may prevent future encounters with patients with an opioid tolerance or dependency issue, making it difficult to treat their pain. Anesthesia providers can educate staff and patients on the appropriate use of opioids, side effects, risk of keeping opioids in the home, and properly dispose of opioids to help limit the number of opioids in the community.

Conclusions

Patient education about opioid misuse, diversion, and disposal are essential topics that need to be addressed with patients and caregivers. Healthcare professionals should initially provide and actively discuss the opioid educational material with the patient in the office when surgery is scheduled, and the opioid prescription is written. Patient education should be a combination of print, audio-visual, demonstration, verbal, or web-based. While verbal education should be part of an integrated, multimodal patient education session, the education must be delivered in a fashion that augments the patient's learning, comprehension, and retention level.[21] It is imperative that strategies to address the profound and growing problem of opioid abuse and addiction in the U.S. be devised, tested, validated, and implemented.[22] Proper opioid disposal is essential to prevent opioid misuse and diversion. The goal to increase opioid disposal requires a patient's awareness of the dangers of leftover opioids, providing the patients with an easy method to dispose of and reminders to dispose of via digital technology formats.

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