Development of an opioid reduction protocol in an emergency department


Purpose. Results of a study of an opioid-sparing protocol for acute pain management in the emergency department (ED) are reported.

Methods. The ED of a large hospital conducted a project, the "Opioid-Free Shift," to test a multimodal pharmacologic approach to analgesic therapy as an alternative to routine use of opioids. During a specified eight-hour period, all adults arriving at the ED with a complaint of pain were treated according to an opioid-sparing protocol based on principles of channel enzyme receptor–targeted analgesia (CERTA). Pain severity was assessed at baseline and at 30 and 60 minutes after analgesia administration using a validated rating scale.

Results. Seventeen patients were treated in the ED for acute or chronic pain during the study period. The median pain score on the 11-point rating scale was 8 (range, 4–10) at baseline, declining to 6 (range, 0–10) at 30 minutes and to 5 (range, 1–10) at 60 minutes. At 30 minutes, 7 patients (41%) had a pain score reduction of ≥30% and 3 (18%) had a reduction of ≥50%. Six of the 15 patients (40%) reassessed at 60 minutes had a pain score reduction of ≥30%; 4 patients (27%) had a reduction of ≥50%. More than 80% of patients were satisfied with the pain relief provided through the CERTA-based protocol, and no adverse drug reactions were reported.

Conclusion. The 17 patients treated for acute or chronic pain during the opioid-free shift were managed mainly with i.v. ketorolac and oral ibuprofen, with only 1 patient requiring rescue opioid therapy.

Emergency medicine practitioners who treat patients in pain must balance beneficence (rapidly resolving the pain) with maleficence (prescribing opioids and increasing the risk of opioid-related adverse events, opioid dependency, misuse, and diversion). To aid emergency care providers in resolving this medico-ethical dilemma, several prescribing recommendations and guidelines have recently been developed on
the state and national levels.5-11 The Joint Commission recommends the use of a multimodal treatment plan including nonpharmacologic approaches and both nonopioid and opioid pharmacologic therapies.12 State prescription drug monitoring programs have been implemented to detect “doctor shopping” and overuse of opioids.13-15 Doctor shopping occurs when patients obtain controlled substances from multiple healthcare practitioners without the prescribers’ knowledge of the other prescriptions.16 Every state in the United States has general doctor-shopping laws that prohibit patients from obtaining drugs by any or all of the following means: fraud, deceit, misrepresentation, subterfuge, and concealment of material fact. Twenty states have also enacted specific doctor-shopping laws that prohibit patients from knowingly withholding information from a healthcare practitioner regarding controlled substances or prescriptions they have received from other healthcare providers.16 Early education during medical school and residency training to help guide providers toward standardized and safe prescribing has also been advocated and developed.15,17-19 The goal of each of these strategies is to ensure appropriate opioid prescribing.

The objective of the research initiative described here was to observe the pain resolution of patients treated with a strategy of channel enzyme receptor–targeted analgesia (CERTA) in order to determine if this therapy was safe and efficacious. We hypothesized that the use of opioid-based pain management can be reduced by a CERTA-based multimodal pharmacologic approach.

Methods

The department of emergency medicine at Maimonides Medical Center implemented a public health initiative, the “Opioid-Free Shift,” to test a multimodal pharmacologic approach to analgesic therapy for patients with acute pain as an alternative to routine prescribing of standard opioids such as morphine, hydromorphone, and oxycodone. The opioid-free shift was conducted in the center’s ED over an eight-hour period. Multimodal therapy was defined as using a combination of pharmacologic agents to target multiple receptors known to mediate pain transmission as a means of treating the acute pain episode without including an opioid. The multimodal pharmacologic approach is not uncommon and has been used by surgeons, anesthesiologists, and pain specialists postoperatively as an opioid-sparing strategy.15 There are no published reports on the use of this approach in the ED for the management of acute pain.

Setting. Maimonides Medical Center is an urban teaching hospital located in Brooklyn, New York. Yearly visits to the ED are in excess of 130,000. The ED occupies more than 22,000 square feet of clinical space, which is divided into three separate patient care areas: adult critical care, adult acute care, and pediatric emergency care. The adult treatment areas, including four designated resuscitation bays, have the capacity to accommodate over 100 patients simultaneously. A fast-track program is available from 11 a.m. to 11 p.m. for patients whose problems require treatment but are not critical. Fast-track patients are treated by physicians assistants or nurse practitioners under the supervision of emergency physicians. The ED has an accredited three-year emergency medicine residency training program that accepts 16 residents each year, bringing the total ED medical staff to 48 residents and more than 40 full-time attending physicians. Additionally, the ED has an accredited postgraduate year 2 (PGY2) emergency medicine pharmacy residency program that accepts one resident each year. Clinical pharmacy services have been provided in this ED since 1997, when the clinical pharmacy manager, who is PGY2 residency–trained in emergency medicine pharmacy, was hired to establish a clinical site via an appointment at a local college of pharmacy. Since then, a clinical pharmacy team has been developed. The clinical pharmacy team is composed of three postgraduate year 1 (PGY1) pharmacy residents, one PGY2 emergency medicine pharmacy resident, and the clinical pharmacy manager of the department of emergency medicine. Clinical pharmacy services are provided to the ED from 8 a.m. to 11 p.m. Monday through Friday and from 8 a.m. to 8 p.m. on the weekends by the clinical pharmacy team. The weekday shifts are covered by the PGY2 emergency medicine pharmacy resident, while the three PGY1 pharmacy residents and the PGY2 emergency medicine

RUKHSANA HOSSAIN, M.P.H., is Research Assistant, Department of Emergency Medicine; and ANTONIOS LIKOUREZOS, M.A., M.P.H., is Research Manager, Department of Emergency Medicine, Maimonides Medical Center. SAMANTHA E. JELLNER-COHEN, PHARM.D., BCPS, CGP, is Assistant Clinical Professor, Department of Clinical Health Professions, St. John’s University College of Pharmacy and Health Sciences, and Emergency Medicine Clinical Pharmacy Specialist, Mount Sinai Beth Israel, New York. JOHN MARSHALL, M.D., is Chair of Emergency Medicine, Department of Emergency Medicine, Maimonides Medical Center.

Address correspondence to Dr. Cohen (vcohen@maimonidesmed.org).

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resident rotate to provide coverage for evening and weekend shifts. All shifts are supervised by the clinical pharmacy manager. In addition to procuring medications for acutely ill ED patients and dispensing medications for patients from the ED satellite pharmacy, the clinical pharmacy team works side by side with the emergency physicians and nurses to optimize pharmacotherapy and manage critically ill patients. Among other roles, the clinical pharmacy team recommends appropriate treatment based on the clinical suspicion of the provider, adjusts the dosages of medication infusions as appropriate based on the patient’s clinical status, and monitors the effectiveness and toxicity of the medications administered. Emergent medications for acutely ill ED patients that do not require procurement are retrieved by the nurse from floor stock and automated dispensing cabinets that are reserved for narcotics. During times when the ED satellite pharmacy is closed, nurses use floor-stock medications and request any medications that are not available in the floor stock or must be procured from the main pharmacy. Prospective medication order review is conducted by the clinical pharmacy team for most high-risk, high-cost, or infrequently used medications. This review entails a seven-step process of checking for an appropriate indication, contraindications, proper dosing, drug interactions, adverse effects, monitoring requirements, and outcomes. Prospective medication order review is not required before a medication is made available and administered but is done for most medications. Nurses may retrieve and administer an ordered medication that is available from floor stock without pharmacist review so as not to delay therapy; this is the case with low-risk medications such as acetaminophen, famotidine, ondansetron, metoclopramide, and ketorolac. Most high-cost and high-risk medications are stored in the ED satellite pharmacy to be dispensed by the clinical pharmacy team. Prior to implementation of the opioid-free shift initiative, nonopioid medications were prescribed at the discretion of the treating practitioner, and there were no formal protocols in place to guide pain management.

CERTA strategies. Through an interprofessional collaborative approach including representatives of the department of emergency medicine (physicians and research staff), the department of pharmacy (the clinical pharmacy manager for the ED), and the division of clinical informatics of the ED (a nurse who served as project manager and a physician who served as director), a list of CERTA strategies and corresponding order sets for a variety of common acutely painful presenting complaints was developed and entered into the computerized prescriber order-entry (CPOE) system based on data supporting the use of these agents for varying types of pain within the ED setting.20–23 This list was used to guide care during the opioid-free shift.

The rationale of an opioid-free shift is to evaluate the feasibility of controlling acute painful conditions without oral and parenteral opioid analgesics by using alternative medications and techniques. Pain scores were determined using an 11-point numeric rating scale (NRS), with a score of 0 indicating “no pain” and a score of 10 indicating “the worst pain imaginable.”24 If a patient’s baseline pain score was 1–4, he or she was a candidate to receive oral analgesics, which could include (1) ibuprofen 400–800 mg as a single loading dose, (2) acetaminophen 500–1000 mg, (3) gabapentin 300 mg, (4) prednisone 50 mg, (5) naproxen 250–500 mg, or (6) 1 or 2 tablets of butalbital 50 mg, acetaminophen 325 mg, and caffeine 40 mg. Parenteral analgesics were reserved for patients with baseline pain scores of 5–10, for whom the treatment options were (1) i.v. acetaminophen 1000 mg via infusion over 15 minutes, (2) ketamine 0.3 mg/kg (of actual body weight) in 100 mL of 0.9% sodium chloride injection administered over 10 minutes, (3) ketamine infusion 0.15 mg/kg/hr (100 mg of ketamine diluted in 100 mL of 0.9% sodium chloride injection), (4) ketorolac tromethamine 10–15 mg by i.v. bolus, and (5) dexamethasone sodium phosphate 1.5 mg/kg by i.v. bolus (maximum dose, 16 mg). Lidocaine hydrochloride 1.5 mg/kg administered over 10 minutes was reserved for patients with nephrolithiasis characterized by crampy, intermittent pain originating in the flank and radiating toward the groin and patients with renal colic characterized by pain associated with rebound tenderness, guarding, rigidity, nausea, and vomiting. Propofol 10–20 mg by i.v. bolus every 10 minutes (maximum dose, 1.5 mg/kg) was reserved for patients with intractable migraine headaches. Patients without vascular access were candidates for intranasal analgesia using ketamine 1 mg/kg (at a concentration of 50 mg/mL), with a half dose administered in each nostril (no more than 1 mL per nostril). Regional anesthesia (with lidocaine or bupivacaine) was deemed suitable for dental blocks and upper or lower extremity nerve blocks. All patients were eligible for rescue opioid analgesia (with morphine, fentanyl, or hydromorphone) at 30 minutes if pain was still severe enough and warranted parenteral analgesia.

The opioid-free shift. The opioid-free shift took place on Wednesday, September 9, 2014, from 7 a.m. to 3 p.m. in the adult acute care area of the ED. The physicians working in this area during the shift were those involved in the development of the CERTA strategies. One of these physicians was responsible for educating the medical and nursing staffs. The physicians were provided a two-hour lecture on the CERTA strategies and common adverse effects that may
occur with each drug. The lecture included patient cases and occurred during the regular weekly staff seminar. One-hour in-services were provided to the nursing staff during each shift. E-mails containing information on the CERTA strategies and the date of the opioid-free shift were sent to all ED physicians and nurses so that they would be aware of the initiative even if they were not able to attend one of the educational sessions. During the opioid-free shift, patient care procedures and medication order processing were carried out as usual.

During the opioid-free shift, parenteral analgesic i.v. admixtures including lidocaine, ketamine, and acetaminophen were dispensed from the ED satellite pharmacy. The pharmacist alerted the nurse to any medication-specific administration techniques or monitoring requirements and addressed any nurse concerns. All patients 18 years of age or older who arrived at the ED via ambulance or walk-in triage with a complaint of pain and were assigned to the adult acute care area of the ED during the shift were included in the initiative. There were no changes in triage procedures; patients were assigned to a treating physician and nurse by standard protocol. Patients were provided nonopioid analgesic therapy based on the strategies developed. Only if additional analgesia was deemed necessary 30 minutes after initial analgesic administration would a rescue dose of an opioid be prescribed. Patients were not made aware of the opioid-free shift initiative.

Data collection. The Maimonides Medical Center institutional review board provided approval for the publication of the results of the initiative as a healthcare operations improvement activity. No protected health information was collected from the patients. Data collection was conducted by the ED research staff. Medications administered were recorded along with NRS scores at the time of medication administration and 30 and 60 minutes later. The frequency of rescue opioid doses within the first 60 minutes of an ED encounter was documented. The patient’s level of satisfaction was recorded as a binary variable (satisfied or not satisfied), and any adverse drug reactions were recorded at 30 and 60 minutes.

Results

We report here on a case series of 17 patients who were managed during the opioid-free shift for complaints of pain (Table 1). The majority of patients (12 of 17, or 70.6%) presented with acute pain, and 8 of 17 (47%) identified their pain as being neuromuscular in origin. None of the patients reported taking opioids at home prior to their ED visit, and only 1 patient was discharged from the ED with a prescription for opioids for management of acute pain. I.V. ketorolac was the medication most frequently prescribed to patients with acute pain, while oral ibuprofen was most frequently prescribed to patients presenting with chronic pain. Ten patients were initiated on combination pain therapy. Only 1 of the 17 patients received rescue therapy with morphine; that patient presented with acute pain secondary to renal colic.

The median baseline pain score for all patients was 8 (range, 4–10); at 30 minutes, the median score was 6 (range, 0–10), at 60 minutes the median score was 5 (range, 1–10). At 30 minutes, 7 of 17 patients (41%) reported a 30% or greater reduction in pain score, and 3 of 17 (18%) reported a 50% or greater reduction. At 60 minutes, 6 (40%) of the 15 patients for whom NRS scores were available reported a 30% or greater reduction in pain score, and 3 of 17 (18%) reported a 50% or greater reduction.

Table 1. Pain Sites and Patient Management During the “Opioid-Free Shift,” by Pain Type*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Acute Pain (n = 12)</th>
<th>Chronic Pain (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of pain, no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuromuscular</td>
<td>5 (42)</td>
<td>3 (60)</td>
</tr>
<tr>
<td>Abdominal</td>
<td>4 (33)</td>
<td>1 (20)</td>
</tr>
<tr>
<td>Renal colic</td>
<td>3 (25)</td>
<td>0</td>
</tr>
<tr>
<td>Bone/joint</td>
<td>0</td>
<td>1 (20)</td>
</tr>
<tr>
<td>Opioids prior to ED admission, no.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pain medication received in ED, no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KETOROLAC (i.v.)</td>
<td>6 (50)</td>
<td>1 (20)</td>
</tr>
<tr>
<td>Ibuprofen (oral)</td>
<td>5 (42)</td>
<td>3 (60)</td>
</tr>
<tr>
<td>ACETAMINOPHEN (i.v.)</td>
<td>4 (33)</td>
<td>2 (40)</td>
</tr>
<tr>
<td>LIDOCAINE (via secondary i.v. line)</td>
<td>3 (25)</td>
<td>0</td>
</tr>
<tr>
<td>METHOCARBAMOL (oral)</td>
<td>3 (25)</td>
<td>0</td>
</tr>
<tr>
<td>DIAZEPAM (oral)</td>
<td>0</td>
<td>1 (20)</td>
</tr>
<tr>
<td>Discharge pain prescription, no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonopioid</td>
<td>5 (42)</td>
<td>3 (60)</td>
</tr>
<tr>
<td>NSAID</td>
<td>3 (60)</td>
<td>1 (33)</td>
</tr>
<tr>
<td>Muscle relaxant</td>
<td>2 (40)</td>
<td>2 (67)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (60)</td>
<td>1 (33)</td>
</tr>
<tr>
<td>None</td>
<td>4 (33)</td>
<td>2 (40)</td>
</tr>
<tr>
<td>None, admitted inpatient</td>
<td>2 (17)</td>
<td>0</td>
</tr>
<tr>
<td>Opioid</td>
<td>1 (8)</td>
<td>0</td>
</tr>
</tbody>
</table>

*ED = emergency department, NSAID = nonsteroidal antiinflammatory drug.

Some patients received more than one pain medication in the ED and/or were discharged home with more than one prescription for pain.
reduction in pain score, and 4 of 15 patients (27%) reported a 50% or greater reduction. About 83% of the patients were satisfied with the pain relief at 30 minutes, and 86.7% reported satisfaction at 60 minutes. No adverse drug reactions were reported during the study. Data on pain resolution at 30 and 60 minutes after treatment, categorized by pain type on presentation, can be found in Table 2.

Discussion

The implications of the opioid-free shift initiative are notable due to clinician dependency on use of opioids for acute pain management. Pain is one of the main reasons for ED visits. In the 2012 National Ambulatory Medical Care Survey, analgesics were reported as the class of medications most frequently administered in the ED or prescribed at the time of discharge. The analgesic class includes almost 96,000 opioids, nonopioid analgesics, and nonsteroidal antiinflammatory drugs. Acetaminophen–hydrocodone, morphine, hydromorphone, and acetaminophen–oxycodone all appear in the list of the top 10 medications most frequently given in the ED or prescribed at the time of ED discharge in the United States.

Mazer-Amirshahi et al. reported rises in opioid prescribing in U.S. adult ED visits from 2001 to 2010. For example, for the indication of abdominal pain, hydrocodone prescribing increased by 4.4 percentage points (from 10.3% to 14.7%), oxycodone prescribing rose by 4.1 percentage points (from 3.0% to 7.1%), and morphine prescribing increased by 10.6 percentage points (from 4.9% to 15.5%). Rises in opioid prescribing have been seen in the treatment of back pain, headache, musculoskeletal pain, and other pain indications. During 2009, in the 10- to 19-year-old and 20- to 29-year-old patient groups, emergency medicine ranked third among all specialties in terms of opioid prescriptions, with approximately 12% of the total number of prescriptions written in each age group. In the 30- to 39-year-old group, emergency medicine ranked fourth. It is commonly postulated that the population served in EDs as a whole is at high risk for opioid abuse.

Strategies to reduce opioid prescribing in the ED have emerged, usually with the intention of targeting patients who may already be using opioids for nonmedical reasons. In a 2012 clinical policy document, the American College of Emergency Physicians addressed issues regarding curtail epidemic opioid use to date is the issue of opioid-treated patients who transition to nonmedical use and addiction despite their intention to use medications only as directed and only for pain relief. It has been argued that brief exposure to opioids for acute pain has a negligible role in iatrogenic addiction, particularly in contrast to chronic pain management, because it is assumed that addiction is related to the duration of exposure. There is evidence challenging this assertion, and it has been asserted that unscheduled care in settings where acute pain is treated can contribute to iatrogenic addiction. Emergency medicine providers routinely treat large numbers of patients for pain across numerous ED visits, and these patients may transition from subacute to chronic pain. Emergency care providers are unlikely to detect iatrogenic addiction resulting from the care they provide.

Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Acute Pain (n = 12)</th>
<th>Chronic Pain (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median baseline pain score</td>
<td>7.67</td>
<td>7.4</td>
</tr>
<tr>
<td>Median pain score at 30 min</td>
<td>6.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Median pain score at 60 min</td>
<td>5.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Satisfied with pain relief at 30 min, no. (%)</td>
<td>10 (83)</td>
<td>4 (80)</td>
</tr>
<tr>
<td>Satisfied with pain relief at 60 min, no. (%)</td>
<td>10 (91)</td>
<td>3 (75)</td>
</tr>
<tr>
<td>Pain reduction of ≥30% at 30 min, no. (%)</td>
<td>4 (33)</td>
<td>3 (60)</td>
</tr>
<tr>
<td>Pain reduction of ≥50% at 30 min, no. (%)</td>
<td>2 (17)</td>
<td>1 (20)</td>
</tr>
<tr>
<td>Pain reduction of ≥30% at 60 min, no. (%)</td>
<td>4 (36)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>Pain reduction of ≥50% at 60 min, no. (%)</td>
<td>3 (27)</td>
<td>1 (25)</td>
</tr>
</tbody>
</table>

*Patients rated pain severity using the 11-point Numeric Rating Scale (scoring range: 0 = “no pain” to 10 = “worst pain imaginable”).

*n = 11 for acute pain, n = 4 for chronic pain.
provide because the adverse consequences occur downstream, where the outcome or impact of their prescribing is not visible.28

The guidance document “Italian Intersociety Recommendations on Pain Management in the Emergency Setting” provides a broad range of practice recommendations, some of which are focused on opioid sparing. For example, the use of i.v. acetaminophen is recommended for acute pain, and combination treatment with ketamine–midazolam as opposed to fentanyl–midazolam or fentanyl–propofol is recommended in pediatric patients.29

For the variety of pain presentations observed in the opioid-free shift initiative, tailoring pain management with alternative analgesics is rational. For example, i.v. acetaminophen for renal colic has been shown to be an efficacious alternative to and associated with fewer adverse drug reactions than i.v. morphine.20,30–32 Craig et al.25 found no notable difference in analgesic effect and rescue analgesia administered between i.v. acetaminophen 1 g and i.v. morphine sulfate 10 mg in 55 patients 16–65 years of age presenting with severe pain (pain score of ≥7) secondary to isolated limb trauma. However, more adverse reactions were identified in the morphine group.

Soleimanpour et al.22 demonstrated better pain reduction and fewer adverse drug reactions in 240 patients with renal colic who were treated with i.v. lidocaine 1.5 mg/kg as opposed to i.v. morphine sulfate 0.1 mg/kg. At low doses, lidocaine is safe, with the most frequently reported adverse reactions including periorbital numbness, dizziness, vertigo, and dysarthria, which are due to lidocaine accumulation in the body.34 Lidocaine sensitivity is rare but can be associated with dyspnea and an increased frequency of cardiac dysrhythmias.

I.V. ketamine 0.3 mg/kg was compared in a randomized controlled trial with morphine sulfate 0.1 mg/kg i.v. in 45 patients 18–55 years of age presenting to the ED with moderate-to-severe (NRS score of ≥5) acute abdominal, flank, or musculoskeletal pain.35 There was no significant difference between the two groups in the mean change in the pain NRS score at 15 minutes (mean difference, 0.1 point; 95% confidence interval [CI], −0.46 to 0.77 point) or at 30 minutes (mean difference, 0.2 point; 95% CI, −1.19 to 1.46 points). The most common adverse events reported by ketamine-treated patients were dizziness, disorientation, mood changes, and nausea. Forty-five patients 18–59 years of age with acute abdominal, flank, low back, or extremity pain were enrolled in a randomized, prospective, double-blind trial comparing the maximum change in NRS scores after the use of i.v. ketamine 0.3 mg/kg or i.v. morphine sulfate 0.1 mg/kg.36 The maximum change in NRS scores in the ketamine group was 4.9 points (95% CI, 4.0–5.8 points), compared with a maximum change of 5.0 (95% CI, 3.5–6.6 points) in the morphine group.

Mosier et al.37 published a case series report on four patients treated with 1 mg/kg of propofol for refractory migraine headaches. Informed consent was obtained for procedural sedation, and each patient received cardiac and end-tidal carbon dioxide monitoring, received supplemental oxygen by nasal cannula, and had one-to-one nursing care during sedation. Each patient had an initial pain score ranging from 8 to 9; at discharge after lengths of stay ranging from 2.0 to 4.8 hours, all patients had a pain score of 0 or 1, with no reported adverse reactions.

The observations made during our study reflect the experience of a small cases series of patients during one eight-hour period and have inherent limitations that impede generalization to all emergency care settings. For example, while the Nursing Care Quality Assurance Commission has concluded that nurses may administer sedating, analgesic, and anesthetic agents (including ketamine and propofol prescribed by authorized providers), individual state laws may not always support this practice.38 In South Carolina, for the purpose of analgesia and pain management, nurses who are not qualified anesthesia providers may not administer agents used primarily as anesthetics or induction agents, including ketamine and propofol.39 In Alaska, nurses are not allowed to administer ketamine for pain management.40 Obtaining informed consent prior to administering propofol may be another obstacle encountered with this approach; such consent is not required with opioid administration. Additionally, many of the treatment options proposed in the CERTA strategies are more costly than traditional opioid therapies. However, the concept of tailoring alternative combination nonopioid, channel-targeted analgesic therapy as a principle of pain management can be universally applied by clinicians to reduce dependency on use of opioids in patients with pain presenting to the ED.

The CERTA strategies used during the opioid-free shift are still available in the CPOE system at the study site and are used at the discretion of the treating physicians. Staff education on strategies to reduce opioid prescribing and on safe opioid prescribing continues to be provided in an attempt to change the culture of pain management within the ED over time.

Conclusion

The 17 patients treated for acute or chronic pain during the opioid-free shift were managed mainly with i.v. ketorolac and oral ibuprofen, with only 1 patient requiring rescue opioid therapy.

References

NOTE

Opioid reduction protocol