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Patient Safety Tip of the Week

October 6, 2020

Successfully Reducing Opioid-Related Adverse Events

Opioid-induced respiratory depression (OIRD) is a significant issue in hospital inpatients, as well as in post-anesthesia care patients. Many of our initial columns on OIRD focused on post-surgical patients. But in our January 2020 What's New in the Patient Safety World column "Opioids and Apnea: Not Just Surgical Patients" we pointed out that over half of non-surgical inpatients receive opioids, often in high doses. And high percentages of both medical and surgical patients have undiagnosed obstructive sleep apnea (OSA) that is a major risk factor for OIRD.

Our many columns on OIRD have emphasized several key elements to consider in order to avoid OIRD:

- Proper patient selection
- Proper selection of an opioid and dose
- Proper monitoring (using capnography)

Patient selection includes both asking whether use of opioids is necessary and assessment for risk factors for OIRD. Foremost is assessment for possible obstructive sleep apnea (OSA), using a tool such as the STOP-BANG questionnaire. But you also need to consider whether there are other medical comorbidities (eg. COPD) that might predispose to OIRD and whether the patient is also receiving other medications that might depress respiration.

Once you have determined that an opioid is necessary, you need to decide which one to use and proper dosing. That includes determination as to whether the patient is opioid naïve or opioid tolerant. We recommend that you avoid providing too many choices for specific opioids, since issues of equipotency always come into play. In particular, we recommend avoiding HYDROmorphone (Dilaudid) because clinicians often underestimate the potency on a milligram basis (see our multiple columns on Dilaudid dangers listed below). We encourage standardization on a few products and incorporation of those into standardized order sets. And, if you are going to use PCA (patient-controlled analgesia), we recommend you use our PCA Pump Audit Tool and PCA Pump Criteria

tools or the PCA Safety Checklist put out by the Physician-Patient Alliance for Health & Safety (PPAHS 2012).

Proper monitoring is essential. Monitoring end-tidal carbon dioxide (ETCO2) by capnography is now the accepted gold standard. We'd like to see every patient on opioids monitored with capnography. Realistically, some hospitals may not have the resources to use capnography on all patients receiving opioids. But clearly those at high risk for OIRD should be on capnography. Monitoring with only pulse oximetry is inadequate and often leads to a false sense of security. Hypoxemia occurs relatively late in opioid-induced respiratory depression. Much earlier, pCO2 begins to rise and leads to obtundation and eventually respiratory arrest. Patients usually don't become hypoxemic until substantial reduction in respiration has occurred. Hence, the need for monitoring for hypercapnia by using continuous capnography to monitor end-tidal carbon dioxide (ETCO2).

One hospital recently published its results from implementation of a comprehensive program aimed at avoiding OIRD incidents (Steele 2020). A midwest medical center found that it continued to experience frequent opioid-related adverse events despite introduction of some interventions intended to reduce them. Most of those consisted primarily of educational interventions (aimed at both clinicians and patient/families) but we've pointed out so many times that educational interventions are in the lowest tier of effectiveness for any interventions. So, they introduced a number of measures, including staff education, sleep apnea risk assessment documentation and communication, revisions to PCA policies and procedures, and revisions to preprinted PCA orders. In addition, a smart infusion pump system with continuous capnography to monitor end-tidal carbon dioxide (ETCO2) was introduced for use with all PCA patients, epidural patients, and patients considered at high risk of respiratory depression. (Prior to 2010, monitoring of at-risk patients receiving opioids had been done primarily by pulse oximetry.) The smart infusion pump system incorporated a PCA pause functionality automatically stopping opioid delivery to those patients who are identified as compromised.

They measured opioid-related adverse reactions (ADR's) before and after those interventions. Compared with the pre-implementation period, the post-implementation period the number of severe adverse reactions dropped from 3.08 to 0.64 per 10,000 patients treated with opioid, a statistically significant 79.2% reduction. The relative proportion of code blue events decreased from approximately 40% before the introduction of capnography monitoring to just more than 10% per year after introduction, to nearly 0% by the end of the study period. Moreover, there was also a reduction in the duration of opioid treatment (average 2.05 vs 1.37 days).

Rates of mild and moderate ADR's actually increased in the post-capnography period, but that should not be surprising. The addition of capnography monitoring likely led to earlier recognition of respiratory depression and intervention before serious respiratory depression had occurred.

This is a good example of how a multi-pronged plan can be successfully implemented and deliver the outcomes desired.

Other Patient Safety Tips of the Week pertaining to opioid-induced respiratory depression and PCA safety:

- January 4, 2011 "Safer Use of PCA"
- July 13, 2010 "Postoperative Opioid-Induced Respiratory Depression"
- May 12, 2009 "Errors With PCA Pumps"
- September 21, 2010 "Dilaudid Dangers"
- November 2010 "More on Preoperative Screening for Obstructive Sleep Apnea"
- February 22, 2011 "Rethinking Alarms"
- May 17, 2011 "Opioid-Induced Respiratory Depression – Again!"
- September 6, 2011 "More Tips on PCA Safety"
- December 6, 2011 "Why You Need to Beware of Oxygen Therapy"
- February 21, 2012 "Improving PCA Safety with Capnography"
- September 2012 "Joint Commission Sentinel Event Alert on Opioids"
- September 2012 "FDA Warning on Codeine Use in Children Following Tonsillectomy"
- July 3, 2012 "Recycling an Old Column: Dilaudid Dangers"
- February 12, 2013 "CDPH: Lessons Learned from PCA Incident"
- February 19, 2013 "Practical Postoperative Pain Management"
- May 6, 2014 "Monitoring for Opioid-induced Sedation and Respiratory Depression"
- March 3, 2015 "Factors Related to Postoperative Respiratory Depression"
- June 2, 2015 "Reminders of Dilaudid Dangers"
- August 11, 2015 "New Oxygen Guidelines: Thoracic Society of Australia and NZ"
- August 18, 2015 "Missing Obstructive Sleep Apnea"
- December 2015 "Opioid Alert Fatigue"
- March 2016 "Guideline for Management of Postoperative Pain"
- June 14, 2016 "Nursing Monitoring of Patients on Opioids"
- October 11, 2016 "New Guideline on Preop Screening and Assessment for OSA"
- December 6, 2016 "Postoperative Pulmonary Complications"
- May 2017 "Another Twist in Opioid-Induced Respiratory Depression"
- June 2017 "Masterpiece: Monitoring for Opioid-Induced Respiratory Depression"
- June 20, 2017 "Dilaudid Dangers #4"
- October 3, 2017 "Respiratory Compromise: One Size Does Not Fit All"
- November 2017 "Bad Combination: Gabapentin and Opioids"
- November 21, 2017 "OSA, Oxygen, and Alarm Fatigue"
- July 31, 2018 "Surgery and the Opioid-Tolerant Patient"

- February 12, 2019 "2 ER Drug Studies: Reassurances and Reservations"
- March 2019 "Gabapentin and Pregabalin on the Radar Screen"
- June 18, 2019 "Found Dead in a Bed"
- January 2020 "FDA Warning on Gabapentinoids"
- January 2020 "Opioids and Apnea: Not Just Surgical Patients"

- Tools: PCA Pump Audit Tool and the PCA Pump Criteria

Our prior columns on patient safety issues related to Dilaudid/HYDROmorphone:

- September 21, 2010 "Dilaudid Dangers"
- November 2011 "FDA Changes on Dilaudid/HYDROmorphone"
- July 3, 2012 "Recycling an Old Column: Dilaudid Dangers"
- November 19, 2013 "Can We Improve Dilaudid/HYDROmorphone Safety?"
- June 2, 2015 "Reminders of Dilaudid Dangers"
- October 13, 2015 "Dilaudid Dangers #3"
- June 20, 2017 "Dilaudid Dangers #4"

References:

PPAHS (Physician-Patient Alliance for Health & Safety). PCA Safety Checklist. PPAHS 2012
http://ppahs.org/2012/07/physician-patient-alliance-for-health-safety-announces-new-expert-checklist-for-facilitating-safety-of-hospital-based-intravenous-patient-controlled-anesthesia-pumps/

Steele T, Eidem L, Bond J. Impact of Adoption of Smart Pump System With Continuous Capnography Monitoring on Opioid-Related Adverse Event Rates: Experience From a Tertiary Care Hospital, Journal of Patient Safety: September 2020; 16(3): e194-e198
https://journals.lww.com/journalpatientsafety/Fulltext/2020/09000/Impact_of_Adoption_of_Smart_Pump_System_With.27.aspx


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