

# Patient Safety Tip of the Week

## June 20, 2017 Dilaudid Dangers #4

A recent Canadian study described 8 cases of fatalities of inpatients in hospitals or long-term care related to morphine or hydromorphone ([Lowe 2017](#)). Though there were only 8 cases reported, they really run the gamut of the types of errors in every phase of the medication process that contribute to or cause these lethal mishaps. And, as belied in our numerous columns listed below, Dilaudid/HYDROmorphine is the central figure in most of these cases.

As we have seen so often in the past, conversion from one opioid to another presents several vulnerabilities. Of course, failure to recognize the difference in relative potency between morphine and hydromorphone was an issue in several cases. But in other cases there was a failure to discontinue morphine administration when hydromorphone was begun so the patient was receiving multiple opioid preparations simultaneously. In another case a patient was receiving both intravenous hydromorphone and oral codeine.

Problems reconciling the correct dosage with the concentration in the vials used for preparation were also prominent. In several cases nurses on the patient care units, rather than pharmacists in the pharmacy, prepared the doses and drew up a fluid amount they thought was the correct dose, not realizing that the vial contained a higher concentration of drug.

LASA (look-alike sound-alike) confusion also occurred. Even when using tall man lettering, many healthcare workers still confuse morphine and HYDROmorphine.

Failure to rescue was also noted. In several of the cases, because the patient had DNR (do not resuscitate) status, decisions were made not to use naloxone for reversal of the opioid effect. However, in one case in which naloxone was used in a patient receiving both morphine and hydromorphone, the patient's vital signs normalized after the naloxone administration but an hour later the patient was found unresponsive with a low respiratory rate. This was likely an example of "renarcotization" where there was a disparity between the time of action of naloxone and that of the opioid(s).

Perhaps somewhat surprising was the relative lack of cases in which non-opioid drugs used in combination with opioids had an additive respiratory depression effect. Such co-administration has been an issue in other cases of opioid-related respiratory depression.

Monitoring was an issue. We are not told what, if any, electronic monitoring was being done on any of the patients. But one provides an example of a common error: use of respiratory rate by itself as a monitoring parameter. In that case, morphine was to be held

“if the respiratory rate was less than 10”. Respiratory rate by itself is actually a poor parameter for early identification of opioid-induced respiratory depression. Actually one of this month’s What’s New in the Patient Safety World columns (June 2017 [“Masterpiece: Monitoring for Opioid-Induced Respiratory Depression”](#)) has a nice discussion on some of the pitfalls of monitoring as well as the appropriate ways to monitor patients receiving opioids.

The Canadian study authors note that errors occurred in all stages of the medication process: prescribing, order processing and transcription, dispensing, administration, and monitoring. Moreover, for 7 of the 8 cases there were multiple (2 or more) possible intervention points. At least six cases could have been prevented by additional patient monitoring.

At the prescribing/ordering phase, use of clinical decision support tools can be very useful. For example, you might use an automatic warning any time hydromorphone is prescribed or ordered (eg. a reminder that hydromorphone is 5-7 times more potent than morphine on a mg basis, or a reminder that the initial dose of hydromorphone in opioid-naïve patients is 0.2 to 0.5 mg IV or limiting that initial dose to 1 mg with a “hard” stop). And you can use standardized order sets (electronic or paper-based) to minimize the risk of an order for too high a dose.

CPOE and medication administration systems need to be designed and programmed to prevent simultaneously prescribing or administering more than one opioid. While there may be very rare instances where use of more than one opioid is necessary, programming in a “hard stop” that requires specific action to override the order should be mandatory.

Limiting the number of opioid products available is also useful.

Pharmacist review of all orders and all medications is an important patient safety tool. In one of the cases described the order for a hydromorphone infusion came after pharmacy hours when no pharmacist was available for review.

On the dispensing side, in many of the cases reported in the Canadian study nurses, rather than pharmacists, prepared the medication to be administered. One problem the authors noted was that high-concentration products were readily available on patient care units, thus increasing the chance that an inappropriately high dose might be inadvertently prepared and administered. Removal of such high-concentration products from patient care areas (requiring that only pharmacy have such products) makes sense.

The authors note that independent double checks are important as a potential tool to help avoid medication errors with opioids. We concur but note that in one of the cases reported above an independent double check was performed but a nurse noted the discrepancy between the dosage and the concentration about 90 minutes after the infusion had started.

The authors also noted that 6 of the 8 deaths might have been prevented by additional patient monitoring. We, of course, have done multiple columns on monitoring for opioid-related respiratory depression (see list below). And, because it is so hard to predict which patients will suffer respiratory depression, it is not enough to simply have intensive monitoring for high-risk patients. We really need to be monitoring all hospitalized patients receiving opioid treatment. Note also that the PPAHS (Physician-Patient Alliance for Health & Safety) has just released a position paper calling for continuous electronic monitoring for all patients receiving opioids ([PPAHS 2017](#)). It emphasizes, as we have, that use of pulse oximetry alone is not sufficient. It states patient monitoring plans should provide continuous monitoring of multiple physiologic metrics, with the inclusion of capnography monitors alongside other methodologies. Most importantly, PPAHS notes that monitors are “not meant to remove clinicians from the equation; instead, monitoring technology should be a multiplying factor for hands-on, proactive care.”

To reiterate from our multiple columns on Dilaudid dangers, here are strategies you should consider to reduce the risk of Dilaudid/HYDROmorphine (and other opioid) adverse events:

- Education of physicians, nurses, pharmacists, etc. on the different potencies of various opioids (but keep in mind that education and training are relatively weak patient safety interventions so other preventive interventions will be needed)
- Equipotency cards/posters/popups for commonly prescribed opioids
- Consider restricting ordering of HYDROmorphine to clinicians who you have specifically credentialed and privileged to order and administer HYDROmorphine (such as Pain Management physicians)
- Consider dose range alerts during CPOE (eg. note a typical dose is 0.2-0.5 mg. IV and limit dose to 1.0 mg for an opioid-naïve patient)
- Don't allow orders for dose ranges (eg. do not allow “Dilaudid 2-4 mg q3h prn for pain levels...”)
- Other alerts during CPOE (eg. if a patient is already on a sedative/hypnotic drug prompt “Are you aware sedative agents make patient more vulnerable to opioid-induced respiratory depression?”)
- Include a “hard stop” if an attempt is made to order one opioid in a patient already receiving another opioid
- Other decision support tools for ordering (eg. prompts asking about whether the patient is opioid-naïve or opioid-tolerant, then suggest starting dosages)
- Establish criteria for using intravenous opioids
- Patient selection/identify hi risk patients (the very young and the very old, those with obesity, sleep apnea, neuromuscular diseases, COPD, and those in higher ASA classes, those receiving sedative/hypnotic drugs)
- Screening for obstructive sleep apnea (OSA) prior to use of IV opioids with a tool such as STOP or STOP-Bang
- Look for other risk factors (renal function, coadministration of sedative/hypnotic drugs, etc.)
- Monitor, monitor, monitor...

- Continuous pulse oximetry and capnography or apnea monitoring
- Close monitoring (in an ICU setting if necessary for high-risk patients)
- Pain assessment, RASS (Richmond Agitation-Sedation Scale) or POSS (Pasero Opioid-Induced Sedation Scale) or other scale for level of arousal
- Enforce RASS or POSS (by requiring input of RASS or POSS score at BMV or when taking out of ADC)
- Tie recommended course of action to the RASS or POSS score
- Include section of opioids on your “Ticket to Ride” intrahospital transfer form for patients being taken to areas such as Radiology
- Always have narcotic reversal agents readily available where IV opioids are being used and have protocols that deal with issues like **renarcotization**
- Standardized order sets
- Different order sets for opioid-naïve and opioid-tolerant patients
- Avoid order sets that allow a provider to check boxes for contraindicated combinations such as IV morphine and epidural HYDROmorphone/bupivacaine on the same order set
- Avoid basal rates for PCA in opioid-naïve patients
- Warnings when taking it out of ADC (eg. “This is DILAUDID. Is this what you wanted?”) or require a witness for overrides when using ADC or eliminate overrides completely for HYDROmorphone
- Independent double checks
- Use tall man lettering “HYDROmorphone”
- Consider limiting the number of different opioids you use for acute pain management (eg. use morphine as your “preferred” opioid and reserve Dilaudid for rare patient who gets pruritis from morphine though even that is challenged by the meta-analysis showing no difference in pruritis between Dilaudid and morphine)
- Have pharmacists prepare and dispense the doses in prefilled unit dose syringes
- Stock HYDROmorphone only in lower doses on patient care floors and ADC’s
- Stock HYDROmorphone and morphine in different concentrations and keep them separate in stock
- Add labels to avoid confusion (consider using brand name “HYDROmorphone (DILAUDID)”)
- Involve patients and families in educational efforts about IV opioid therapy
- Perform regular audits with feedback for doses of HYDROmorphone exceeding 1 mg
- Make sure HYDROmorphone is on your “High-Alert” drug list
- Consider doing a FMEA (Failure Mode and Effects Analysis) to determine your potential vulnerabilities to Dilaudid incidents

**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/HYDRORomphone Safety?”](#)
- June 2, 2015 [“Reminders of Dilaudid Dangers”](#)
- October 13, 2015 [“Dilaudid Dangers #3”](#)

**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”](#)

- Tools: [PCA Pump Audit Tool](#) and the [PCA Pump Criteria](#)

## References:

Lowe A, Hamilton M, Greenall J, et al. Fatal overdoses involving hydromorphone and morphine among inpatients: a case series. CMAJ Open 2017; 5: E184-E189; published online March 2, 2017

<http://cmajopen.ca/content/5/1/E184.full.pdf+html>

PPAHS (Physician-Patient Alliance for Health & Safety). Patients Receiving Opioids Must Be Monitored With Continuous Electronic Monitoring. PPAHS Position Paper. June 2017

<http://www.ppahs.org/wp-content/uploads/2017/05/PPAHS-Continuous-Electronic-Monitoring-Position.pdf>



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