

Patient Safety Alert

File Number: 17/18 - 02
June 15, 2017

HYDROMORPHONE RELATED ADMINISTRATION ERRORS

Opiates such as morphine and hydromorphone are high-alert medications. Opioid-related errors involving inadvertent administration of hydromorphone instead of morphine or incorrect dosing of hydromorphone, which is approximately five times more potent than morphine, can lead to serious adverse events, including allergic reactions, failure to control pain, over-sedations, respiratory depression, seizures and death.

RECOMMENDATIONS

The Ministry of Health recommends that regional health authorities and health care organizations:

- **Ensure all staff who administer high alert medications are aware of the high alert medication doses and narcotic potency comparisons.**
- **Develop and utilize systems to reduce the potential for confusion when distinguishing between products:**
 - **Utilize “tall man” lettering (e.g., HYDROmorphine) on pharmacy labels and medication administration records.**
 - **Include the brand-name equivalent for hydromorphone (Dilaudid) on pharmacy labels and medication administration records.**
- **Implement measures to reduce the availability and accessibility of hydromorphone when morphine is also available on patient-care units.**
 - **Each medication should be stored in a separate, individual bin or drawer to help prevent errors in drug selection.**
 - **Pre-filled syringes and vials of hydromorphone and morphine should be segregated by pharmacy before distributing to the patient care units, especially if they contain the same concentration.**
- **Ensure that a process for double-checks when administering high alert medications is followed.**

Supporting Documents:

1. An Omnipresent Risk of Morphine-Hydromorphone Mix-ups – ISMP Volume 4 Issue 6 (2004). <https://www.ismp.org/newsletters/acutecare/articles/20040701.asp>
2. Hydromorphone remains a high-alert drug – ISMP Canada Issue 2 (February 2013). https://www.ismp-canada.org/download/ocil/ISMPCONCIL2013-2_HYDROmorphineRemainsAHighAlertDrug.pdf

3. Pallium Palliative Pocketbook 2008 Table 5.4 Opioid Equianalgesic Dose

Opioid equianalgesic dose conversion table (equivalence to 10 mg of morphine PO)			
Drug	PO Dose	PO:SC* Ratio	SC Dose
morphine	10 mg	2:1	5 mg
codeine	100 mg	2:1	50 mg
tramadol	100 mg	-	-
oxycodone	5 – 7.5 mg	-	-
hydromorphone	2 mg	2:1	1 mg
<i>*PO to IV dose ratio is generally 2 – 3:1</i>			
Table adapted from Pallium Palliative Pocketbook 2008 page 5-47 Table 5-4			

Background of Critical Incidents:

Critical incident # 1 - An oncology patient received Hydromorphone IR 2mg po for pain every two hours rather than the ordered/intended dose of Hydromorphone IR 2mg po every six hours. A code was called, Narcan was administered with some improvement detected. The patient was then intubated and transferred to the intensive care unit. The patient recovered from the overdose.

Critical incident #2 - A renal patient was given pain relief of Hydromorphone IR 8mg x 2 (over 5 hours) rather than the ordered dose of 2 – 4 mg every 4 hours. The patient was found unresponsive, given Narcan and transferred to the intensive care unit for further monitoring. The patient recovered from the overdose.

Critical incident #3 - A patient received multiple doses of hydromorphone in the emergency department (ED) and on the ward prior to experiencing a respiratory arrest. The ED orders were for hydromorphone 1 mg intravenously every 15 minutes as needed to a maximum of 4mg with no time frame indicated. Six doses totaling 6.5 mg hydromorphone were administered over the course of 5 hours. At that time, the patient was transferred to the ward with an order for Dilaudid 1 – 4mg intravenously every 2 hours as needed. A seventh dose of 2.0 mg was administered within 2 hours of the previous dose. Four hours later the patient had a respiratory arrest and was admitted to the intensive care unit in critical condition. Seven doses totaling 8.5 mg of hydromorphone had been administered to the patient during the 10 hours from the time of the first dose to the time of the respiratory arrest. The medication administration record showed only the last dose given in the ED.

Contributory Factors

Incidents involving hydromorphone which resulted in harm to patients were associated with:

- Lack of familiarity with dose equivalencies between opioid entities leading to increased likelihood of administration of incorrect medication and/or doses;
- Lack of distinction between morphine and hydromorphone as two separate and distinct pharmaceutical entities, leading to misreading prescribed orders/directions resulting in incorrect administration of drugs/doses;
- Incorrect interpretation of hand-written orders due to illegibility of handwriting;
- Interruptions/distractions in the hospital units; and
- Lack of timely entries in the medication administration record.

Patient safety alerts may be issued by the Ministry of Health following the review of at least one critical incident reported to the Ministry. A critical incident is defined as a serious adverse health event including, but not limited to, the actual or potential loss of life, limb or function related to a health service provided by, or a program operated by, a regional health authority, Saskatchewan Cancer Agency or health care organization.

The purpose of a patient safety alert is to recommend actions that will improve the safety of patients who may be cared for under similar circumstances.

Recommendations are intended to support the development of best practices and to act as a framework for improvement and can be adapted to fit the needs of the health service organization. When possible, policies or initiatives that have been developed by RHAs or the Saskatchewan Cancer Agency will be shared, to encourage adoption of similar policies or actions.

The Institute for Safe Medication Practices Canada (ISMP Canada) is an independent Canadian nonprofit agency established for the collection and analysis of medication error reports and the development of recommendations for the enhancement of patient safety.



The Healthcare Insurance Reciprocal of Canada (HIROC) is a member-owned expert provider of professional and general liability coverage and risk management support.

Volume 4, Issue 6

ISMP Canada Safety Bulletin

June, 2004

An Omnipresent Risk of Morphine-Hydromorphone Mix-ups

The following bulletin is written jointly by ISMP Canada and ISMP (US). This article also appears in the July 1, 2004 issue of the ISMP Medication Safety Alert!

ISMP Canada recently received an error report in which a 69-year-old patient was given 10 mg of hydromorphone IM instead of 10 mg of morphine. The error may have contributed to the patient's death. The patient presented to the emergency department (ED) with a chest injury sustained while horseback riding. Prior to discharge, the ED physician wrote an order for morphine 10 mg IM for pain, but hydromorphone was mistakenly selected from a narcotic drawer. Both hydromorphone and morphine were stocked in 1 mL, 10 mg/mL ampuls. In Canada, the two products are visually distinct in appearance; nevertheless, the names are similar and the concentrations are identical. According to equianalgesic dose conversion charts, the patient, who was likely opiate-naïve, received an equivalent dose of about 60 to 70 mg of morphine. Shortly after the patient was discharged, the nurse discovered the error after a scheduled narcotic count showed a discrepancy between the two drugs. Hospital staff immediately tried to contact the patient, and finally located him in a rural hospital ED close to his home. By then, the patient's condition had deteriorated, and he arrested a short time later. Despite rescue efforts, the patient died.

Over the years, we've received many reports of confusion between hydromorphone and morphine, some of which have been fatal. In fact, mix-ups between these drugs are among the most common and serious errors that can occur involving two high-alert drugs. It's a risk that exists in almost every acute care facility. Assume that this error will eventually happen in your facility, and take the following steps now to reduce the risk of patient harm.

Limit access. Reduce stock amounts of hydromorphone wherever possible, and eliminate it from floor stock entirely if usage is low. For example, the health system where this error occurred has now removed all hydromorphone from every ED in the health region. If the drug is needed on patient care units, only the 2 mg/mL strength is available, except in palliative care units. The distribution of other high potency narcotics is also being revised. The pharmacy will continue to stock hydromorphone for compounding PCA or continuous infusions.

Reduce options. If both drugs are available in patient care units, avoid stocking morphine and hydromorphone in the same strength. For example, since both drugs are available in 2 mg and 4 mg prefilled syringes (in the US), stock 2 mg of hydromorphone and 4 mg of morphine (but not vice versa, since 4 mg of hydromorphone could be an excessive dose). If the drugs are stored in an automated dispensing cabinet, consider allowing access to morphine via an override function in emergencies, but require pharmacy order review before removing a first dose of hydromorphone. Also be sure to store each medication in a separate, individual bin or drawer in the cabinet to help prevent drug selection errors. In the pharmacy, segregate prefilled syringes and vials of these drugs, especially if they contain the same concentration.

Reduce "look-alike" potential. When able, use tall man lettering to emphasize the "HYDRO" portion of hydromorphone on pharmacy labels, auxiliary labels, medication administration records, and drug listings on computer screens or automated dispensing cabinets. Consider adding label reminders on hydromorphone indicating the brand name equivalent, "DILAUDID," to help prevent confusion. Some automated dispensing cabinets may also offer the capability of asking, "This is

DILAUDID. Is that correct?" when nurses retrieve hydromorphone.

Require redundancies. Require an independent double check before administering IV narcotic doses. Since nurses routinely obtain narcotics from floor stock, the typical pharmacist-nurse double-check is not in place (as it is with specific patient doses dispensed from the pharmacy). Some automated dispensing cabinets can be programmed to require a "witness" when selected narcotics are removed, or when the override feature is used to access selected narcotics. Reminders can also appear on the screen.

Educate staff. Provide safety information on the use of potent narcotics via newsletters and inservices. Educate staff about the differences between hydromorphone and morphine, as some of the reported mix-ups have been due to the mistaken belief that hydromorphone is the generic name for

morphine. (Visit www.ismp.org/IMAGES/Posters/Poster_10.gif to order a poster that helps highlight this problem.)

Employ technology. Technological solutions (e.g., bar coding, automated dispensing technology that requires pharmacy order screening prior to dose retrieval) may reduce, but not eliminate, the risk of mix-ups.

Educate patients. Prior to administration of a narcotic, repeat the name of the medication out loud to the patient as another source of confirmation.

Monitor patients. Implement policies that specify the scope, frequency, and duration of monitoring that should occur before discharging patients who have just received a parenteral narcotic.

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ISMP Canada is a national voluntary medication incident and 'near miss' reporting program founded for the purpose of sharing the learning experiences from medication errors. Implementation of preventative strategies and system safeguards to decrease the risk for error-induced injury and thereby promote medication safety in healthcare is our collaborative goal.

To report a medication error to ISMP Canada: (i) visit our website www.ismp-canada.org or (ii) email us at info@ismp-canada.org or (iii) phone us at 416-480-4099. ISMP Canada guarantees confidentiality and security of information received. ISMP Canada respects the wishes of the reporter as to the level of detail to be included in our publications.

***A Key Partner in the Canadian Medication Incident Reporting and Prevention System
(CMIRPS)***

Ontario

CRITICAL Incident Learning

Issue 2
February 2013

Distributed to:

- Chief executive officers
- Chiefs of staff
- Board chairs
- Quality/patient safety leads
- Directors of pharmacy

Suggested action items:

- Refer bulletin to pharmacy and therapeutics committee for evaluation of pharmacy practices and for comment to the medical advisory committee
- Refer bulletin to nursing leadership committees for evaluation of nursing practices and for comment to senior administration
- Refer bulletin to quality/patient safety committees for evaluation of hospital practices
- Circulate bulletin to physicians and other front-line staff
- Use bulletin as an educational resource in your hospital safety huddles or rounds



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HYDRomorphone remains a high-alert drug

The following report shares learning from a fatal HYDRomorphone incident that occurred in an Ontario hospital.

Background

- HYDRomorphone 0.2 to 0.4 mg subcutaneously every hour as needed for pain was prescribed for a patient.
- A 10-fold dosing error occurred, whereby HYDRomorphone 4 mg was administered instead of the 0.4 mg ordered.
- The dose had been drawn from a high-concentration (10 mg/mL) vial of HYDRomorphone.
- Although the facility did not maintain high-concentration HYDRomorphone as floor stock, it was not uncommon for nurses to borrow HYDRomorphone from patient-specific stock.
- The patient was found without vital signs shortly after administration of the HYDRomorphone.

Learning from Analysis

- Consistent with other reported HYDRomorphone administration errors, the availability of a high-concentration HYDRomorphone product played a significant role in the incident.¹
- The practice of borrowing opioids from patient-specific stock, which sometimes occurred in this facility, may have introduced the risk of misidentifying the drug or the intended patient.
- An independent double-check,² which might have uncovered the error before administration, was not mandated by the facility's drug-administration procedures and was not performed in this case.

Call to Action for Hospitals

- Remove HYDRomorphone vials containing a total dose greater than 2 mg from floor stock, in accordance with Accreditation Canada's Required Organizational Practices³ and ISMP Canada recommendations,⁴ and audit compliance with this policy frequently.
- If high-concentration HYDRomorphone must be dispensed for a specific patient, create a mechanism for the prompt and secure return to the pharmacy of unused doses (e.g., after the patient is discharged or transferred to another care area).
- Develop drug access mechanisms specifically designed to reduce the need to borrow medications from other patients or other care areas.
- Design a standard chart for typical facility doses of HYDRomorphone with instructions for proper preparation of low doses.
- Require independent double checks before administration of high-alert medications.
- Consider having pharmacy repackage injectable HYDRomorphone into low-dose syringes or patient-specific doses.

Discussion

From October 1, 2011, to December 31, 2012, a total of 35 Ontario incidents involving HYDROmorphine were reported to the National System for Incident Reporting.^{5,6} HYDROmorphine continues to be 1 of the top 3 medications involved in incidents associated with harm or death that are voluntarily reported to ISMP Canada.^{7,8} Provincial ministries of health, Accreditation Canada, various offices of the chief coroner or medical examiner, and other organizations have supported initiatives such as removal of high-concentration HYDROmorphine from patient care areas, use of TALLman lettering, implementation of independent double checks, and development of commercial low-dose products by Canadian manufacturers.

In the case presented above, the availability of high-concentration HYDROmorphine in the patient care unit, the lack of a standardized independent double-check process, the practice of borrowing doses of medication from other units or from patient-specific stock, and frequent distractions in the work area were all identified as factors contributing to the error. In its report, the facility also identified other aspects of the medication-use process where improvements in medication safety could be realized, including segregation of morphine from HYDROmorphine in storage areas, increased automation and computerization, improvements in warnings on medication labels and medication administration records, routine audits of opioid storage areas, staff education, and policy review.

Conclusion

HYDROmorphine is a high-alert drug with substantial potential for harmful consequences if involved in medication incidents. ISMP Canada recommends high-leverage, system-focused safety strategies. In this case, removal of the high-concentration preparation of HYDROmorphine from the care unit would have made a 10-fold dosing error unlikely; in addition, a standardized, independent double-check procedure might have prevented the error from reaching the patient. The ideal scenario would be availability of a dosage form in the prescribed dose (e.g., as a prefilled syringe), prepared and administered with the support of an independent double-check process. Individual practitioners and administrators in Ontario healthcare facilities are encouraged to closely examine the processes for use of HYDROmorphine in their organizations and to take steps to improve patient safety.

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*We gratefully acknowledge the review
of this bulletin by the facility where
the incident described took place.*

© 2013 ISMP Canada. Funding for this communication is provided by the Ontario Ministry of Health and Long-Term Care. Although the analyses described in this bulletin were based on data provided by the Canadian Institute for Health Information, the opinions expressed are those of ISMP Canada only.

¹ Report to the Attorney General – Public inquiry into the death of Lucy Lecavalier. Edmonton (AB): Alberta Justice and Solicitor General; 2012 [cited 2013 Jan 31]. Available from: http://justice.alberta.ca/programs_services/fatality/Publications_Sudden_death_investigation/Report-Lecavalier.aspx/DispForm.aspx?ID=150

² Lowering the risk of medication errors: independent double checks. ISMP Can Saf Bull. 2005 [cited 2013 Feb 25];5(1):1-2. Available from: <https://www.ismp-canada.org/download/safetyBulletins/ISMPSCSB2005-01.pdf>

³ Required organizational practices 2012. Ottawa (ON): Accreditation Canada; 2012 [cited 2013 Feb 4]. Available from: <http://www.accreditation.ca/uploadedFiles/ROP%20Handbook.pdf>

⁴ Priority recommendations for Ontario hospital narcotic (opioid) project. Toronto (ON): Institute for Safe Medication Practices Canada; 2005 [cited 2013 Feb 4]. Available from: https://www.ismp-canada.org/download/Narcotic_Priority_Recommendations.pdf

⁵ National System for Incident Reporting. Ottawa (ON): Canadian Institute for Health Information. Analysis generated on 2013 Jan 7.

⁶ Minimum data set. In: National System for Incident Reporting. Ottawa (ON): Canadian Institute for Health Information; 2012.

⁷ Top 10 drugs reported as causing harm through medication error. ISMP Can Saf Bull. 2006 [cited 2013 Feb 4];6(1):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPSCSB2006-01Top10.pdf>

⁸ Shared learning – reported incidents involving hydromorphone. ISMP Can Saf Bull. 2006 [cited 2013 Feb 4];6(9):1-3. Available from: <https://www.ismp-canada.org/download/safetyBulletins/ISMPSCSB2006-09Hydromorphone.pdf>

Collaborating parties of the Ontario Critical Incident Reporting program

