

## Adverse Drug Events with HYDROmorphine: How Preventable are They?

### ABSTRACT

Despite the fact that HYDROmorphine (Dilaudid®) is widely used, there appear to be gaps in understanding its efficacy and potency, which can lead to serious medication errors. Analysts reviewed medication errors and adverse drug reactions (ADR) involving HYDROmorphine that were reported to the Pennsylvania Patient Safety Authority. Seventy percent of the wrong drug reports involved mix-ups with morphine. Wrong dose/overdosage medication error reports show that the most common nodes associated with this event type are administering, prescribing, and dispensing. Review of ADR reports shows that the most common reactions reported involved central nervous system reactions and/or respiratory complications. Sixty-five percent of these adverse reactions appear to have been preventable events. Effective risk reduction strategies include establishing standardized protocols for pain management and protocols for reversal agents that can be administered without additional physician orders when warranted, as well as requiring an independent double check before administering intravenous HYDROmorphine doses. (*Pa Patient Saf Advis 2010 Sep;7[3]:69-75.*)

### Introduction

HYDROmorphine (Dilaudid®) is a semisynthetic opioid agonist and a derivative of morphine. It differs pharmacodynamically from its parent drug in potency, onset, duration, and the presence of an active metabolite, but the analgesic effect is the same.<sup>1</sup>

HYDROmorphine is used for moderate to severe pain. Historically, it was only used to treat chronic pain (e.g., cancer pain), but it is now widely used in the management of acute pain, including postoperative pain, acute trauma pain, and other indications.<sup>2,3</sup> HYDROmorphine is usually used as an alternative for morphine in patients who cannot tolerate morphine or cannot achieve adequate analgesia with morphine. Although HYDROmorphine is a potent analgesic, to date, there is no evidence to support its superiority over morphine for the management of moderate to severe pain.<sup>2</sup>

HYDROmorphine can be administered by various routes including intravenous (IV), intramuscular (IM), epidural, and oral routes.<sup>4</sup> The onset of action after an IV dose is 5 minutes and peaks in approximately 20 minutes, which is useful in postoperative patients who require postoperative analgesia.<sup>5</sup> The duration of action ranges from four to five hours.<sup>6</sup>

Despite the fact that HYDROmorphine has been around for decades and is widely used, there appear to be gaps in understanding the efficacy and potency of HYDROmorphine.<sup>2</sup> Clinical studies comparing IV

morphine and HYDROmorphine are scarce.<sup>5</sup> However, studies have shown that HYDROmorphine, by any route, is a much more potent mu-opioid receptor agonist than morphine.<sup>5</sup> This difference in potency makes it difficult to compare morphine and IV HYDROmorphine. Most of the doses in equi-analgesic charts are, often times, based on single dose studies, and the exact potency equivalence ratios are uncertain.<sup>4</sup> The estimated relative potency of IV HYDROmorphine compared to IV morphine is 7.5:1; recent reviews of opioid conversions find ratios ranging from around 4:1 to as high as 8:1.<sup>5</sup> For example, an order for an opioid-naïve patient for 2.5 mg to 5 mg of IV morphine would be equivalent to 0.3 mg to 0.67 mg of HYDROmorphine.

The literature has various and inconsistent recommendations about the appropriate starting dose and frequency of administration for HYDROmorphine. For example, HYDROmorphine's product label states that the initial IV dose for opioid-naïve patients is 1 mg to 2 mg IV (slowly) every four to six hours as needed.<sup>7</sup> However, there is literature that recommends *against* using 2 mg IV as a starting dose even in nonelderly patients. Chang et al. showed that one-third of adult, nonelderly patients who received 2 mg presented to the emergency department (ED) complaining of acute severe pain and developed oxygen desaturation.<sup>8</sup> In 2002, one drug information reference publisher, Lexi-Comp, revised its HYDROmorphine dosing recommendations based on advice from clinical experts. For opioid-naïve patients, the revised monograph states: "IV: Initial: 0.2-0.6 mg every 2-3 hours as needed; patients with prior opioid exposure may tolerate higher initial doses. Patient controlled analgesia (PCA): Initial: Opioid-naïve: Consider lower end of dosing range; after loading: 0.05-0.4 mg/dose; usual lockout range: 5-10 minutes."<sup>9</sup>

The lack of knowledge about HYDROmorphine potency and the difference in potency between morphine and HYDROmorphine has frequently led to serious medication errors, especially when a patient is switched from morphine to HYDROmorphine.<sup>10</sup> In a prospective, randomized, double-blind, clinical trial conducted in an academic medical center of 198 adult patients presenting to the ED with acute severe pain, Chang et al. observed that many of the center's emergency physicians and nurses were hesitant to give 7 mg to 10 mg of morphine as an initial IV dose. In contrast, they observed that these same healthcare providers were not similarly reluctant to administer a roughly equi-analgesic dose of HYDROmorphine (1 mg to 1.5 mg), perhaps because the more potent HYDROmorphine is given in much smaller milligram quantities than morphine, thus providing the illusion that substantially less opioid is

being administered to the patient.<sup>11</sup> In a prospective interventional cohort study to evaluate the safety and efficacy of 2 mg IV HYDROmorphine administered to nonelderly adult (i.e., 21 to 64 years of age) ED patients in acute severe pain, Chang et al. noted that the lower milligram amount of HYDROmorphine causes less concern among providers and leads, albeit inadvertently, to better analgesia for patients.<sup>8</sup> However, this difference in perception could contribute to harm to patients. In its 2007 Advisory, the Commonwealth of Massachusetts Board of Registration in Medicine reported four patient deaths resulting from the administration of 2 mg to 4 mg of HYDROmorphine as a bolus, with repeat doses of 1 mg to 4 mg.<sup>12</sup>

An adverse drug event (ADE) is defined by the Joint Commission as “any incident in which the use of a medication (drug or biologic) at any dose, a medical device, or a special nutritional product (e.g., dietary supplement, infant formula, medical food) may have resulted in an adverse outcome in a patient.”<sup>13</sup> ADEs can be divided into two categories: (1) medication errors, which are considered to be *preventable* ADEs and (2) adverse drug reactions (ADR), which are considered to be *unpreventable* ADEs. Despite this distinct difference in definition, ADR reports may be a source of potentially preventable events, even though the reporter thought the ADE could *not* have been prevented. This article presents an analysis of both medication errors and ADRs involving HYDROmorphine reported to the Pennsylvania Patient Safety Authority and discusses the predominant types of events involving HYDROmorphine.

### Medication Errors with HYDROmorphine

Pennsylvania healthcare facilities submitted 1,694 medication error reports to the Authority from January 2008 to October 2009 that described medication errors involving the use of HYDROmorphine. Categorization of the reports by harm score, which is adapted from the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) harm index,<sup>14</sup> shows that 68.2% (n = 1,155) of the events reached the patient (harm index = C to I) and 1.8% (n = 30) of the events resulted in patient harm (harm index = E to I). The care areas most often cited in these reports include medical/surgical units (26.5%, n = 449), pharmacy (15.1%, n = 255), and ED (5.8%, n = 99). The majority of the reports, almost 70% (n = 1,179), involved the adult population between the ages of 17 and 64, while 1.7% (n = 28) involved pediatric patients (ages less than 17 years).

The predominant medication error event types associated with HYDROmorphine (see Table 1) were wrong dose/overdosage (16.9%, n = 287), wrong drug (10.9%, n = 185), and monitoring error/documented allergy (8.1%, n = 137).

### Wrong-Drug Errors with HYDROmorphine

In 2007, a review of 8,400 wrong drug medication error reports submitted to the Authority showed that

the most commonly involved drug pair was morphine and HYDROmorphine.<sup>15</sup> Present analysis of wrong drug medication errors mentioning HYDROmorphine reveals that 70% involve mix-ups with morphine. (See Table 2.)

Facilities did not enter enough detail into most of the event descriptions to determine all the reasons why these events took place. It was not possible to categorize and determine the most common types (e.g., wrong drug written by prescriber, wrong drug selected during order entry, wrong drug retrieved from stock, drug mislabeled in the pharmacy) of reported wrong-drug errors. Examples of reports with limited information regarding the causes and contributing factors of the events include the following:

*Patient was inadvertently given Dilaudid 1 mg by intravenous push (IVP) instead of morphine 2 mg IVP as ordered.*

*Patient prescribed Dilaudid 1mg IV but was given Demerol® 2.5 mg IV.*

Analysts were able to determine the following:

- Of the reports of wrong drug HYDROmorphine errors, 146 (78.9%) specifically mentioned that the breakdown occurred in the administration node.

**Table 1. Predominant Medication Error Event Types Associated with the Use of HYDROmorphine (n = 1,135, 67%), January 2008 to October 2009**

EVENT TYPE	NUMBER	% OF TOTAL REPORTS (N = 1,694)
Wrong dose/overdosage	287	16.9%
Wrong drug	185	10.9
Monitoring error/ documented allergy	137	8.1
Wrong route	131	7.7
Wrong dose/underdosage	106	6.3
Other (specify)	289	17.1

**Table 2. Predominant Medications Associated with Wrong Drug Errors involving HYDROmorphine (n = 146, 78.9%), January 2008 to October 2009**

MEDICATION PRESCRIBED	MEDICATION ADMINISTERED	NUMBER	% OF TOTAL REPORTS (N = 185)
HYDROmorphine	morphine	66	35.7%
morphine	HYDROmorphine	63	34.1
HYDROmorphine	lorazepam	6	3.2
HYDROmorphine	mepiridine	6	3.2
oxycodone	HYDROmorphine	5	2.7

A patient was admitted to the ED for chest pain. The ED physician ordered morphine 2 mg, but the patient instead received Dilaudid 2 mg. The morphine and Dilaudid were located next to each other in the narcotic drawer.

- Twenty-seven (14.6%) of the reports involved the dispensing or storage of the wrong medication by the pharmacy.

A nurse went to administer a “prn” dose of Dilaudid to the patient. The nurse found 24 vials of medication in the drawer: 20 were Dilaudid, but 4 were morphine sulfate. The RN [registered nurse] had previously given patient a “prn” dose of Dilaudid but is not sure if the dose was Dilaudid or morphine.

The pharmacist dispensed morphine PCA [patient-controlled analgesia] (as seen on manufacturer’s labeling) with a pharmacy label for HYDROmorphone PCA. The patient was to have HYDROmorphone. The nurse receiving the PCA did not catch it, but another nurse, who was about to hang it on the patient, did catch it. The morphine did not reach patient.

- Thirty-five (18.9%) of wrong drug administration errors involved PCA therapy.

At the beginning of night shift, the nurse noticed the patient was very sleepy and found it hard to keep the patient awake. The nurse notified the resident on call and received a verbal order to change the rate of the morphine PCA from a basal rate of 2.8 mg/hr to 1 mg/hr and to continue the “as needed” dose at 1 mg every five minutes. When the nurse and the verifying nurse opened the PCA machine to change the settings, the nurses saw that instead of the syringe being morphine 1 mg/mL, [it] was HYDROmorphone 0.2 mg/mL. The infusion was immediately stopped and vital signs were taken, which were stable.

### Wrong Dose/Overdosage Errors

Wrong dose/overdosage medication error reports involving HYDROmorphone show that the most common nodes associated with this event type are administering (67.9%, n = 195), prescribing (18.8%, n = 54), and dispensing (6.6%, n = 19).

**Administration.** Analysis of the descriptions of events that occurred during the administration node shows that most of the reported cases did not give enough detail to determine specifically what went wrong but simply stated that the patient received a higher dose than what was intended (57.4%, n = 112). However, nurses were able to determine the following for wrong drug/overdosage events occurring in administration node:

Fifty-two (26.7%) reports involved PCA therapy.

A patient had an order for a PCA pump. The pump was programmed for morphine (1 mg/mL) instead of Dilaudid (0.2 mg/mL). Dilaudid was the prescribed medication. We are unsure of how much medication the patient received because all of the settings were not right.

Fifty-seven (29.2%) reports involved programming errors or failure to change the program of an infusion device (both PCA and general infusion pumps).

*The patient was on a standard 1 mg/mL of Dilaudid, but an automatic substitution of a 5 mg/mL concentration was sent due to the high dose requirement of patient. The nurse did not reprogram PCA pump, which led [to respiratory distress].*

Nineteen (9.7%) reports mentioned problems documenting and/or witnessing “wasting” amounts of HYDROmorphone.

**Prescribing.** A majority of the HYDROmorphone overdoses that occurred during the prescribing node involved orders for a wrong dose (79.6%, n = 43), followed by an incorrect frequency (18.5%, n = 10). For example, some reports indicated orders were written without designating that HYDROmorphone should be given “as needed,” which could have led to the administration of this medication more frequently than was needed.

*The prescriber wrote for every five-minute dosing of hydromorphone tablets (2 mg) prn. When contacted, the physician assistant prescriber intended “every 6-hour PRN” dosing. The order was discontinued and rewritten.*

*An order was written for 1.5 mg/hour of hydromorphone with a 1.5 mg bolus every 10 minutes instead of a bolus of 0.3 mg every 10 minutes. The patient received 16.8 mg over a six-hour period and then was found unresponsive.*

*An order was written for a postoperative patient to receive 1 mg Dilaudid PCA every 15 minutes with a 16 mg 4-hour dose limit. This was a high dose (usual 0.1 mg to 0.2 mg), which was dispensed; the nurse questioned the order. The original prescriber insisted on the dose, and the nurse then brought the order to the attention of the director of anesthesia, who did not change the order. The patient received the dose as ordered and became difficult to arouse. The PCA order was changed by another prescriber to 0.2 mg every 8 minutes.*

It should be noted that 14.8% (n = 8) of the wrong dose prescribing errors involved dangerous dose designations, such as failure to write a dose with a leading zero.

*An order was written for “Dilaudid .2 mg IV q 1hr prn pain” without a leading zero, and it was difficult to see if there was a decimal point. The ordering physician was called but was no longer in the hospital. The covering physician returned the call and asked for clarification. That physician asked what is usually given and the nurse replied “2 mg,” so the order was clarified as “2 mg.” The nurse administered the 2 mg, which led to severe respiratory depression. The covering physician contacted the ordering physician, who intended for the order to be “0.2 mg.”*

### ADR Reports

HYDROmorphone has the typical opioid associated side effects, including light-headedness, dizziness,

sedation, nausea, vomiting, sweating, flushing, dysphoria, euphoria, dry mouth, and pruritus.<sup>7</sup> HYDROmorphone binds to mu-receptors to produce its analgesic effect. However, it also binds to mu-receptors in the respiratory centers of the medulla, which can lead to clinically significant respiratory depression.<sup>16</sup> Some of the factors that raise patients' risk of harm from opioid-induced respiratory depression include older age (i.e., 65 years of age or older), diseases affecting the respiratory (e.g., asthma, chronic obstructive pulmonary disease) or cardiovascular systems, concomitant use of respiratory-function depressants other than opioids, opioid-naïve patients who are overweight, and patients with sleep disorders (e.g., sleep apnea).<sup>17</sup>

Analysts reviewed ADR reports submitted to the Authority to determine if there were cases that may have been preventable (e.g., errors caused by an excess dose of HYDROmorphone). Analysts searched for "HYDROmorphone" or "Dilaudid" in the suspected medication, other medication, and the event description fields to find ADR reports that may have involved HYDROmorphone alone or in combination with other medications.

There were 937 ADR reports submitted to the Authority between June 2004 and October 2009. Almost 90% (n = 842) of the ADR reports discussed events that were considered to have *not* harmed patients. The three most common broad categories of reactions described in the narratives include allergic reactions, respiratory depression, and central nervous system effects (see Table 3). It was expected that the most common reported type of reactions would have been allergic reactions (38.5%, n=361); for example, patients that experienced itching, rashes, and hives. However, the most common types of reactions reported were events (47.9%, n = 449) in which patients experienced central nervous system reactions (e.g., decreased level of consciousness, oversedation, mental status changes) and/or respiratory complications (e.g., shortness of breath, respiratory depression, respiratory arrest), a known consequence of the drug.

Reports that specifically mentioned a central nervous system and/or respiratory ADR were analyzed to determine if the reaction could have been preventable (e.g., caused by an inappropriate dose ordered, caused by a combination of medications with additive sedative effects with HYDROmorphone). For this analysis, an inappropriate dose was considered to be a dose that was one of the following:

- Greater than a 1 mg dose for the general adult population for an opioid-naïve patient
- 1 mg or greater for an elderly patient who was opioid-naïve
- A frequency of administration that allowed for the administration of HYDROmorphone too frequently for that patient population

**Table 3. Predominant Adverse Drug Reaction Categories Associated with the Use of HYDROmorphone, June 2004 to October 2009**

EVENT TYPE	NUMBER	% OF TOTAL REPORTS (N = 937)
Central nervous system and/or respiratory depression	449	47.9
Allergic reactions	361	38.5
Nausea/vomiting	39	4.2
Unknown/reaction not specified	34	3.6

Analyses of these events reveal problems with the prescribing of inappropriate doses and multiple medications that have sedative properties. Of the reported central nervous system and respiratory adverse reactions, 292 (65%) appear to have been preventable events, in which patients received a dose in excess of what would be needed to resolve pain symptoms or in which HYDROmorphone was prescribed and administered with other medications that would lead to additive sedative effects.

Overall, 205 (70.2%) of the identified preventable ADR reports that mentioned central nervous system and/or respiratory depressive type reactions to HYDROmorphone were due to inappropriate doses, with 44 (15.1%) of the reports demonstrating problems due to a combination of inappropriate dosing and the prescribing of multiple medications with a sedative side effect profile. (See Table 4.)

Examples of identified "preventable" ADR reports include the following:

*An elderly patient was admitted with left leg edema ulcerations with significant pain. Within an eight-hour period, the patient received morphine 2 mg IV, Dilaudid 2 mg IV two times, and was started on a Duragesic® (fentanyl) patch. One hour later, the patient was found unresponsive. Narcan® was given, and the patient responded immediately; pulse oximetry was monitored and was 100%. The Dilaudid prn order was discontinued, the Duragesic patch remained on, and the patient had no further episodes of unresponsiveness.*

*An adult patient was admitted with a right ureter stone. An order was written for Dilaudid 4 mg IV every three hours prn. The patient received a total of three doses within a six-hour time period. Two hours later, the patient was speaking with staff, but within a half hour, the patient was found unresponsive with shallow breathing and a faint heart rate of 40. A code was called, and atropine and Narcan (naloxone) was administered with good response. The patient was transferred to the intensive care unit for further care.*

*An adult patient was admitted with abdominal pain and received Demerol® (meperidine) 25 mg IV push*

**Table 4. Common “Preventable” Adverse Drug Reaction Categories Associated with the Use of HYDROmorphine (n = 284, 97.3%), June 2004 to October 2009**

EVENT TYPE	NUMBER	% OF TOTAL REPORTS (N = 292)
Inappropriate doses	205	70.2%
Inappropriate doses and multiple drugs	44	15.1
Multiple drugs	26	8.9
Inappropriate doses and contraindicated	9	3.1

at noon and 2 p.m., followed by Dilaudid 2 mg IV push at 2 p.m., 3 p.m., 4 p.m., and 6 p.m. At 7 p.m., the patient was found with shallow respirations and difficult to arouse. The patient responded to Narcan, and the orders were changed to Dilaudid 1 mg IV every 2 hours prn.

An elderly postoperative patient received Ativan® 0.5 mg IV at 4:20 p.m. and Dilaudid 2 mg IV at 6 p.m. and 9 p.m. At 11 p.m., the patient experienced decreased level of consciousness and required 2 mg of Narcan IV with immediate response.

An elderly patient in the postanesthesia care unit, following a left laparoscopic colectomy, received fentanyl 125 mcg, Dilaudid 2 mg, and morphine 4 mg within a one-hour time period. Four hours later, on the post-operative surgical unit, the patient required Narcan 1 mg for decreased respirations and oversomnolence.

An elderly patient, admitted with back pain, received morphine 4 mg and a total of 2 mg of Dilaudid within a six-hour period in the ED. When the patient arrived to the nursing unit, the patient’s heart rate was 120 and oxygen saturation was 80% on room air. The staff was unable to keep the patient awake. The patient was transferred to a monitored bed for closer monitoring.

**Risk Reduction Strategies**

Healthcare facilities can strive to identify system-based causes of wrong drug and wrong dose/overdose errors with the use of HYDROmorphine and other opioids and implement effective types of risk reduction strategies to prevent harm to patients. Risk reduction strategies such as constraints and standardization, which focus on system improvement, will be more effective than education alone, which relies on individual performance. Consider the strategies described below, which are based on a review of events submitted to the Authority, observations at the Institute for Safe Medication Practices, and the literature.

**Constraints**

- Prescribing
  - Consider requiring prescribers to undergo a privileging process to verify proficiency with PCA pain management.<sup>18</sup>

- Implement standard order sets for PCA therapy, with all sections completed, and limit verbal orders to dose changes.<sup>18</sup>
- Avoid the use of basal rates with PCA for pain control of an opioid-naïve patient.<sup>19,20</sup>
- Take into consideration important information about the patient that could affect the prescribing of HYDROmorphine (e.g., patient’s current medication profile for drugs with additive central nervous system or respiratory depressant side effects, age, renal function, total current opioid therapy). For a list of HYDROmorphine’s contraindications for use and other warnings, see “Prescribing Considerations for HYDROmorphine” available at <http://www.patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx>.

■ Storage

- Reduce stock amounts of HYDROmorphine wherever possible, and eliminate it from floor stock entirely if usage is low.<sup>21</sup>
- Avoid stocking morphine and HYDROmorphine in the same strength if both drugs are available in patient care units. For example, since both drugs are available in 2 mg and 4 mg prefilled syringes, stock HYDROmorphine 2 mg and morphine 4 mg (but not vice versa, since 4 mg of HYDROmorphine would be an excessive dose for most patients, especially opioid-naïve patients).<sup>21</sup>
- If the drugs are stored in an automated dispensing cabinet (ADC), consider allowing access to morphine via an override function in emergencies, but require pharmacy order review before removing an initial dose of HYDROmorphine.<sup>21</sup>
- 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.<sup>21</sup>

**Standardization**

- Establish protocols for pain management, including a standard pain scale for assessment, guidelines for the use of specific analgesics, standard order forms and screens, guidelines outlining conditions that require a dose reduction, and requirements for monitoring.<sup>21</sup>
- Establish protocols for reversal agents that can be administered without additional physician orders when warranted.<sup>19</sup>
- In standard order forms, guide prescribers to an appropriate dose based on age and opioid tolerance by providing default doses for three types of patients: (1) most patients, (2) patients older than 64 years or with sleep apnea, and (3) opioid-tolerant patients.<sup>20</sup>

- Consider other medications that the patient has received (e.g., analgesics taken at home, intraoperative medications) or currently has been prescribed (e.g., antihistamines, nighttime sedatives) when determining appropriate doses.<sup>18</sup>

### Differentiation

- When able, use tall man lettering to emphasize the “HYDRO” portion of HYDROmorphine on pharmacy labels, auxiliary labels, medication administration records, and drug listings on computer screens or ADCs.<sup>21</sup>
- Consider adding label reminders on HYDROmorphine indicating the brand name equivalent, “DILAUDID,” to help prevent confusion with other drugs such as morphine. Some ADCs may also offer the capability of asking “This is DILAUDID. Is that correct?” when nurses retrieve HYDROmorphine.<sup>21</sup>

### Redundancies

- Require an independent double check before administering IV HYDROmorphine 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 ADCs 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.<sup>21</sup>

### Patient Monitoring

- Establish guidelines for appropriate monitoring of patients who are receiving opioids, including frequent assessment of the quality of respirations (not just a respiratory rate) and specific signs of oversedation. Ensure resources—both personnel and equipment—are available to monitor patients per established guidelines.<sup>19</sup>
- Use standardized formats for documenting pain control and monitoring parameters.<sup>19</sup>
- Ensure that oxygen and naloxone are available where opioids are administered.<sup>19</sup>
- Establish a process to screen patients for obstructive sleep apnea before initiation of PCA therapy, with further assessment by a respiratory therapist if the screening reveals two or more risk factors.<sup>20</sup>

### Education and Information

- Require annual competence assessments for all professionals who prescribe, dispense, and administer PCA.<sup>18</sup>
- Create mandatory education programs for all practitioners potentially involved with HYDROmorphine use. Include all aspects of safe use; accepted prescribing practices, including those related to the management of the opioid-naïve patient; dosing norms; assessment parameters; and monitoring techniques.
- Provide staff with safety information on the use of potent narcotics via newsletters and in-services.

Educate staff about the differences between HYDROmorphine and morphine, as some of the reported mix-ups have been due to the mistaken belief that HYDROmorphine is the generic name for morphine.<sup>21</sup>

### Monitoring of ADRs

- As demonstrated by the analysis of ADR reports submitted to the Authority, these reports serve as a potentially rich source of information to identify risk with the use of HYDROmorphine, as well as other opioids in the facility. Consider reviewing ADR reports, as well as the use of “trigger” drugs used to reverse the effects of opioids, like naloxone, to get a broader picture of the harm resulting from the misuse of HYDROmorphine.
- Consider measures other than practitioner reporting of medication errors to evaluate your organization’s safe use of HYDROmorphine, including assessing core processes associated with HYDROmorphine use by using process measures.

Visit the Authority’s Web site at <http://www.patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx> to view or download a sample tool that can be used to identify and monitor actual or potential problems with the use of HYDROmorphine.

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## Self-Assessment Questions

The following questions about this article may be useful for internal education and assessment. You may use the following examples or come up with your own.

A physician wrote an order for a 67-year-old opioid-naïve patient for HYDROmorphone 4 mg intravenous (IV) administration as needed for pain. The patient received one dose and was later found with a low oxygen saturation, low respiratory rate, and decreased responsiveness. The doctor was notified, and naloxone IV was administered to this patient.

1. What is the equianalgesic dose of morphine IV for this patient?
  - a. 4 mg
  - b. 7 mg
  - c. 15 mg
  - d. 30 mg
2. HYDROmorphone is to be started at lower doses when administered to all of the following patient populations EXCEPT:
  - a. Elderly patients
  - b. Patients with respiratory diseases (e.g., chronic obstructive pulmonary disease, obstructive sleep apnea)
  - c. Diabetic patients
  - d. Opioid-naïve patients
3. The most commonly reported type of medication error involving the prescribing of HYDROmorphone was:
  - a. Prescribing HYDROmorphone for patients with a pre-existing documented allergy to an opioid
  - b. Prescribing HYDROmorphone when it is contraindicated for that patient
  - c. Prescribing a wrong dose of HYDROmorphone
  - d. Prescribing HYDROmorphone for the wrong patient
4. The most commonly reported type of adverse drug reaction related to HYDROmorphone was:
  - a. Allergic reaction
  - b. Central nervous system/respiratory events
  - c. Nausea and vomiting
  - d. Seizures
5. The following strategies may help to mitigate the risk of harm from HYDROmorphone. Select the *least* effective strategy.
  - a. Adding label reminders on HYDROmorphone indicating the brand name equivalent, “DILAUDID,” to help prevent confusion with other drugs such as morphine.
  - b. Separating the storage of look-alike opioids.
  - c. Standardize protocols and concentrations for HYDROmorphone.
  - d. Implement redundancies and double checks in the administration process of HYDROmorphone.

# PENNSYLVANIA PATIENT SAFETY ADVISORY

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