



## Results of the PA-HEN Organization Assessment of Safe Practices for a Class of High-Alert Medications

Matthew Grissinger, RPh, FISMP, FASCP  
Manager, Medication Safety Analysis  
Pennsylvania Patient Safety Authority

Rebecca L. Lamis, PharmD, FISMP  
Medication Safety Analyst  
Institute for Safe Medication Practices

### ABSTRACT

*Proactively assessing practices and processes that involve high-alert medications such as anticoagulants, insulin, and opioids can enable hospitals to identify the weaknesses that exist within their medication-use systems. As a part of the Pennsylvania Hospital Engagement Network adverse drug event collaboration, a 45-item organization assessment tool was developed to assess the safety of opioid practices in hospitals, identify opportunities for improvement, and enable participating hospitals to compare their results with the aggregate results of all participating hospitals in Pennsylvania. Almost 60% (n = 17) of participating hospitals in the project completed the assessment. The highest-scoring items in the assessment were the use of standardized pain scales, the use of commercially available or pharmacy-prepared opioid solutions, and the availability of standardized preprinted order forms or computerized prescriber order entry (CPOE) order sets for patient-controlled analgesia therapy. The lowest-scoring items were inclusion of the mg/kg or mcg/kg dose along with the calculated patient-specific doses for pediatric parenteral opioid orders, pharmacists' ability to easily access the patient's opioid status, and restriction of the use of long-acting opioids to opioid-tolerant patients. Findings from the assessment revealed opportunities to improve medication safety and established a baseline of current practices regarding opioid use that can be used to evaluate ongoing improvement. (Pa Patient Saf Advis 2013 Jun;10[2]:59-66.)*

### Corresponding Author

Matthew Grissinger

### INTRODUCTION

Proactively assessing practices and processes in the medication-use system, especially those involving high-alert medications such as anticoagulants, insulin, or opioids, can provide hospitals with valuable information about the weaknesses that exist within their systems before harmful events occur. As the harm from errors involving high-alert medications can be potentially devastating, proactively identifying the risks associated with opioid use should be considered a priority by hospitals.

Pennsylvania Patient Safety Authority analysts developed an assessment tool for the Pennsylvania Hospital Engagement Network (PA-HEN) adverse drug event (ADE) opioid project to help participating hospitals assess the safety of practices in their facility, identify opportunities for improvement, and compare their experiences with the aggregate results of other participating hospitals in Pennsylvania. The aggregate findings also may be used to develop an action plan for the PA-HEN collaboration for implementing recommended error reduction strategies in order to assist hospitals in enhancing safety with this class of medications.

This article provides a descriptive analysis of the key findings from the assessment, with a focus on areas where significant improvements in opioid medication safety are needed.

### METHODS

#### Hospital Team

Since medication use is a complex, interdisciplinary process, the value and accuracy of the assessment would be significantly reduced if it was completed by a single discipline. Therefore, hospitals were asked to establish an interdisciplinary team consisting of as many of the following key personnel (or similar personnel) as possible:

- Chief medical officer
- Nurse executive
- Director of pharmacy
- Clinical information technology specialist
- Medication safety officer or manager
- Risk management and quality improvement professionals
- At least two staff nurses from different specialty areas
- At least two staff pharmacists (one clinical and one distribution)
- At least one active staff physician who regularly orders opioids

The hospital's team was charged with the responsibility to accurately and honestly evaluate the current status of opioid practices in its facility. Also, hospital leadership was asked to provide their team with sufficient time to complete the assessment.

#### Instrument

The organization assessment comprised 15 demographic questions, followed by 45 assessment items subdivided into the nodes of the medication-use process (i.e., prescribing, order review, compounding, product storage, administration, and monitoring), as well as items addressing overall organizational structure and patient-controlled analgesia (PCA) therapy. Unless otherwise stated, assessment items refer to opioids

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prescribed, dispensed, and administered to all inpatients and outpatients typically seen in most hospitals, including patients admitted from the emergency department and ambulatory surgery/procedure units.

As necessary, each team was to investigate and verify the level of implementation with other healthcare practitioners external to the team. When a consensus on the level of implementation for each assessment item was reached, hospitals selected the appropriate choice for each item within the assessment.

To simplify the scoring process, for the majority of the assessment items, hospitals had the following scoring options and corresponding definitions to indicate their level of implementation of practices:

- **Not implemented.** This item has not been implemented within the hospital.
- **Partially implemented.** This item has been partially implemented in some or all areas of the hospital, or this item has been fully implemented in some areas of the hospital.

— **Fully implemented.** This item is fully implemented throughout the hospital.

Therefore, the choice of “Fully implemented” should only have been selected if all components of the item were present in all areas of the hospital. If only one or some of the components had been partially or fully implemented in some or all areas of the hospital, a choice of “Partially implemented” was selected.

### Distribution

The assessment was distributed in June 2012 by e-mail to hospitals participating in the PA-HEN ADE project. It was also posted to the PA-HEN ADE project collaboration pages on the Authority’s Patient Safety Knowledge Exchange (PassKey), a secure website to share information, ideas, and solutions. Each participating hospital was asked to complete and submit only one assessment. If multiple hospitals from a single health system were participating, each individual hospital was to complete the assessment individually.

From September until December 2012, facilities submitted their assessment data

by means of an online data submission tool available on PassKey.

### RESULTS

Tables 1 and 2 list the assessment items on which hospitals scored highest and lowest, respectively. The complete results of the assessment can be found online at [http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2013/Jun;10\(2\)/Pages/home.aspx](http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2013/Jun;10(2)/Pages/home.aspx).

### Organization Characteristics

Of the 29 participating hospitals in the PA-HEN ADE project, 58.6% (n = 17) completed the assessment. Of the hospitals responding, 35.3% (n = 6) had fewer than 100 beds, 35.3% (n = 6) had 100 to 299 beds, 11.8% (n = 2) had 300 to 499 beds, and 17.6% (n = 3) had 500 beds or more. These hospitals provided a range of services. Roughly 94.1% (n = 16) provided pediatric services, 70.6% (n = 12) provided oncology services, 52.9% (n = 9) provided trauma services, 29.4% (n = 5) provided neonatal intensive care services, and 17.6% (n = 3) provided transplant services.

Table 1. Pennsylvania Hospital Engagement Network Opioid Organization Assessment Items Scored Highest by Hospitals (N = 17)\*,†

ITEM NO.	ITEM DESCRIPTION	% NOT IMPLEMENTED	% PARTIALLY IMPLEMENTED	% FULLY IMPLEMENTED
2	The organization uses a standardized pain scale(s) appropriate to the patient population to assess a patient’s level of comfort/pain.	0.0	5.9	94.1
17	Pharmacy purchases commercially available parenteral opioid infusions or prepares opioid infusions in the pharmacy (i.e., nurses do not prepare opioid infusions).	0.0	5.9	94.1
37‡§	Standardized preprinted order forms/CPOE [computerized prescriber order entry] order sets are used for PCA [patient-controlled analgesia].	6.3	N/A	93.8
18	A pharmacist double-checks all opioid products before they are dispensed from the pharmacy, including those opioids placed into ADCs [automated dispensing cabinets].	0.0	11.8	88.2
21	Morphine and HYDROmorphine are segregated from one another in pharmacy storage.	5.9	5.9	88.2

\* Based on percentage of “Fully implemented” responses. In cases in which multiple items had the same percentage of “Fully implemented” responses, items were ranked based on percentage of “Partially implemented” responses.

† Percentages may not add up to 100% because of rounding.

‡ One participating organization indicated that it does not provide intravenous PCA therapy (item no. 33) and was directed to skip the remaining assessment items. Therefore, only 16 out of 17 hospitals answered item no. 37.

§ Item no. 37 contained “No” and “Yes” answer choices. “No” answer selections are categorized as “Not implemented,” and “Yes” answer selections are categorized as “Fully implemented.”

Table 2. Pennsylvania Hospital Engagement Network Opioid Organization Assessment Items Scored Lowest by Hospitals (N = 17)\*,†

ITEM NO.	ITEM DESCRIPTION	% NOT IMPLEMENTED	% PARTIALLY IMPLEMENTED	% FULLY IMPLEMENTED
9	Parenteral opioid orders include the mg/kg or mcg/kg dose for pediatric patients along with the total calculated patient-specific dose (e.g., morphine 0.1 mg/kg x 15 kg = 1.5 mg IV every 4 hours prn severe pain).	58.8	23.5	17.6
13	Pharmacists have easy access to the patient's opioid status (opioid-naïve/opioid-tolerant) and take it into consideration when profiling or reviewing orders for opioids.	58.8	23.5	17.6
10	Long-acting opioids (e.g., fentaNYL patches, MS Contin® 100 and 200 mg tablets, OxyCONTIN® doses greater than 40 mg) are restricted for use in opioid-tolerant patients and are not used for acute pain management.	52.9	29.4	17.6
3‡	Pain management protocols define opioid-naïve and opioid-tolerant patients and outline the differences in the management of these patients.	52.9	17.6	5.9
6§	Standardized preprinted order forms/CPOE [computerized prescriber order entry] order sets are used to prescribe oral and parenteral opioids. (This question does not apply to PCA [patient-controlled analgesia] therapy.)	52.9	N/A	47.1
40**	Smart infusion pumps with computer software that is capable of alerting the user to unsafe opioid doses (i.e., soft and hard stops) are utilized when PCA is administered.	50.0	6.3	43.8
5	Equianalgesic dosing charts for oral, parenteral, and transdermal opioids (e.g., fentaNYL patches) have been established and are easily accessible to all practitioners when prescribing, dispensing, and administering opioids.	47.1	23.5	29.4

\* Based on percentage of "Not implemented" responses. In cases in which multiple items had the same percentage of "Not implemented" responses, items were ranked based on percentage of "Partially implemented" responses.

† Percentages may not add up to 100% because of rounding.

‡ Item no. 3 included a fourth answer choice: "Not applicable: Our hospital does not have pain management protocols." This answer was selected by 23.5% of respondents.

§ Item no. 6 contained "No" and "Yes" answer choices. "No" answer selections are categorized as "Not implemented," and "Yes" answer selections are categorized as "Fully implemented."

\*\* One participating organization indicated that it does not provide intravenous PCA therapy (item no. 33) and was directed to skip the remaining assessment items. Therefore, only 16 out of 17 hospitals answered item no. 40.

Hospitals were asked to list all of the opioids currently used by their practitioners to provide parenteral pain management. Every hospital (n = 17) indicated that they used morphine and HYDROMORPHONE, while 94.1% (n = 16) stated they used fentaNYL and 70.6% (n = 12) stated they used meperidine. A majority of hospitals (70.6%, n = 12) stated that morphine was the primary opioid used in their facility, followed by HYDROMORPHONE (23.5%, n = 4). One facility (5.9%) mentioned that it did not have a primary opioid prescribed for parenteral pain management.

Hospitals were asked if they had an interdisciplinary pain management team and

if so, which disciplines were represented on that team. Only six hospitals (35.3%) stated they had such a team; each of those teams was composed of at least an anesthesia provider, nurse, and pharmacist.

### Opioid Status

As discussed in the March 2013 issue of the *Pennsylvania Patient Safety Advisory*,<sup>1</sup> the PA-HEN ADE project's opioid knowledge assessment, used to assess practitioners' knowledge of opioids, revealed significant gaps in the knowledge of opioids. Specifically, practitioners scored low when asked to determine a patient's opioid status (i.e., opioid-naïve versus opioid-tolerant). The

question asked practitioners to identify the treatment regimen that would make a patient tolerant to opioids. Only one of the four proposed orders was correct. Overall, only 29.1% of all hospitals answered the question correctly; 34.2% of physicians, 25.5% of nurses, and 40.5% of pharmacists answered correctly. In addition, 52.9% of all practitioners answered "all of the above"; 49.3% of physicians, 57.4% of nurses, and 37.8% of pharmacists thought any one of the treatment regimens would classify a patient as opioid-tolerant.

This assessment also included items to identify gaps in an organization's practices



regarding a patient's opioid status, including the following:

- No. 3: Pain management protocols define opioid-naïve and opioid-tolerant patients and outline the differences in the management of these patients.
- No. 10: Long-acting opioids (e.g., fentaNYL patches, MS Contin® 100 and 200 mg tablets, OxyCONTIN® doses greater than 40 mg) are restricted for use in only opioid-tolerant patients.
- No. 13: Pharmacists have easy access to the patient's opioid status and take it into consideration when profiling or reviewing orders.
- No. 38: PCA basal infusion rates are not routinely ordered for opioid-naïve adult patients.

The first three items listed above were among the lowest-scoring items in the entire assessment. More than half of participating hospitals stated that these items were not in place.

### Patient Screening and Assessment

Certain patient characteristics and pre-existing conditions place patients at a higher risk for adverse events. These characteristics include sleep apnea, preexisting respiratory conditions, morbid obesity, and concurrent use of other drugs that are central nervous system and respiratory depressants.<sup>2</sup>

The assessment included a number of items that asked hospitals about specific patient criteria or elements that should be considered when prescribing opioids, as well as patient assessments that should be performed before and after the administration of an opioid.

For example, hospitals were asked to identify the elements for which patients are screened that might affect the dose, monitoring parameters, or appropriateness of general opioid use (no. 7). The most commonly selected elements for

general opioid use were allergies (94.1%, n = 16), age (88.2%, n = 15), and weight (76.5%, n = 13). The elements selected least often were obstructive sleep apnea (29.4%, n = 5), asthma/chronic obstructive pulmonary disease (35.3%, n = 6), and opioid status (47.1%, n = 8); these items were also the lowest-scoring items for elements screened before PCA therapy (see Figure 1).

Patients are at highest risk for opioid-induced respiratory depression during the first 24 hours of opioid therapy, and the apnea-hypopnea index in sleep apnea patients is highest on the third night after surgery and remains above the preoperative baseline out to the seventh postoperative night.<sup>3,4</sup> Pre- and postadministration assessment and monitoring are critical to preventing and mitigating respiratory depression. Although respiratory rate is an important parameter to obtain, clinically significant respiratory depression is not defined by a specific number of respirations per minute.<sup>5</sup> Rather, it is defined by several characteristics of a patient's respiratory status and is compared with the patient's baseline respiratory status. For example, a proper respiratory assessment during opioid treatment requires the nurse to watch the rise and fall of the patient's chest to determine the rate, depth, and regularity of respirations.<sup>6</sup> In addition, sedation is a very sensitive indicator of impending opioid-induced respiratory depression and precedes clinically significant episodes. Therefore, a comprehensive assessment by nursing of respiratory status goes along with an assessment of sedation and requires more than counting a patient's respiratory rate over a 30- or 60-second period.

Items that addressed specific elements that are a part of patient assessments performed by nurses for patients receiving opioids were broken down into four distinct items:

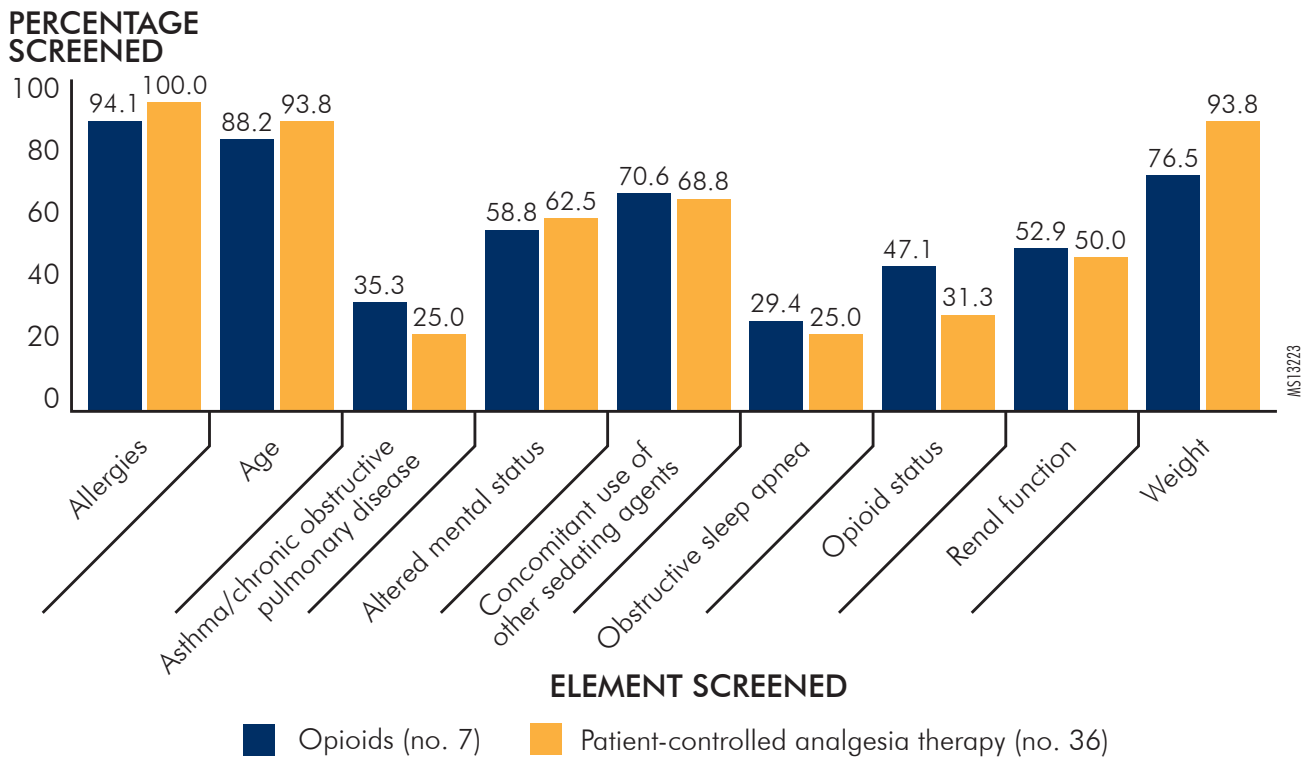
- No. 25a: *Prior* to the administration of oral opioids, nurses perform a baseline assessment.

- No. 25b: *Prior* to the administration of parenteral opioids, nurses perform a baseline assessment.
- No. 26a: *Following* the administration of oral opioids, nurses perform a postadministration assessment within the hospital-designated time frame.
- No. 26b: *Following* the administration of parenteral opioids, nurses perform a postadministration assessment within the hospital-designated time frame.

Across all four items, the most commonly selected elements that hospitals indicated were assessed were pain level and level of sedation (see Figures 2 and 3). It should be noted that assessing the pain level does not constitute a complete assessment for a patient on opioid therapy. In fact, the least frequently selected elements in the assessment across all four items included pulse oximetry, capnography, heart rate, blood pressure, and quality of respirations. Interestingly, nurses assessed fewer elements after the administration of either an oral or parenteral opioid as compared with before administration.

The previously published results of the opioid knowledge assessment also revealed that practitioners had difficulty identifying which medications could potentiate the effects of an opioid, specifically HYDRomorphone, on ventilation.<sup>1</sup> Overall, only 51.5% of all practitioners answered the question correctly; 47.6% of physicians, 49.9% of nurses, and 59.6% of pharmacists answered correctly. In addition, practitioners struggled to select the most important predictor of respiratory depression in patients receiving intravenous (IV) opioids. Overall, only 22.4% of all practitioners answered the question correctly as sedation level; 33.0% of physicians, 20.1% of nurses, and 16.0% of pharmacists answered correctly. Thus, both project assessments identified weaknesses in identifying factors contributing to respiratory depression and in having processes in place to detect patients experiencing respiratory depression.

Figure 1. Elements That Patients Are Screened for When Opioids and Patient-Controlled Analgesia Therapy Are Prescribed



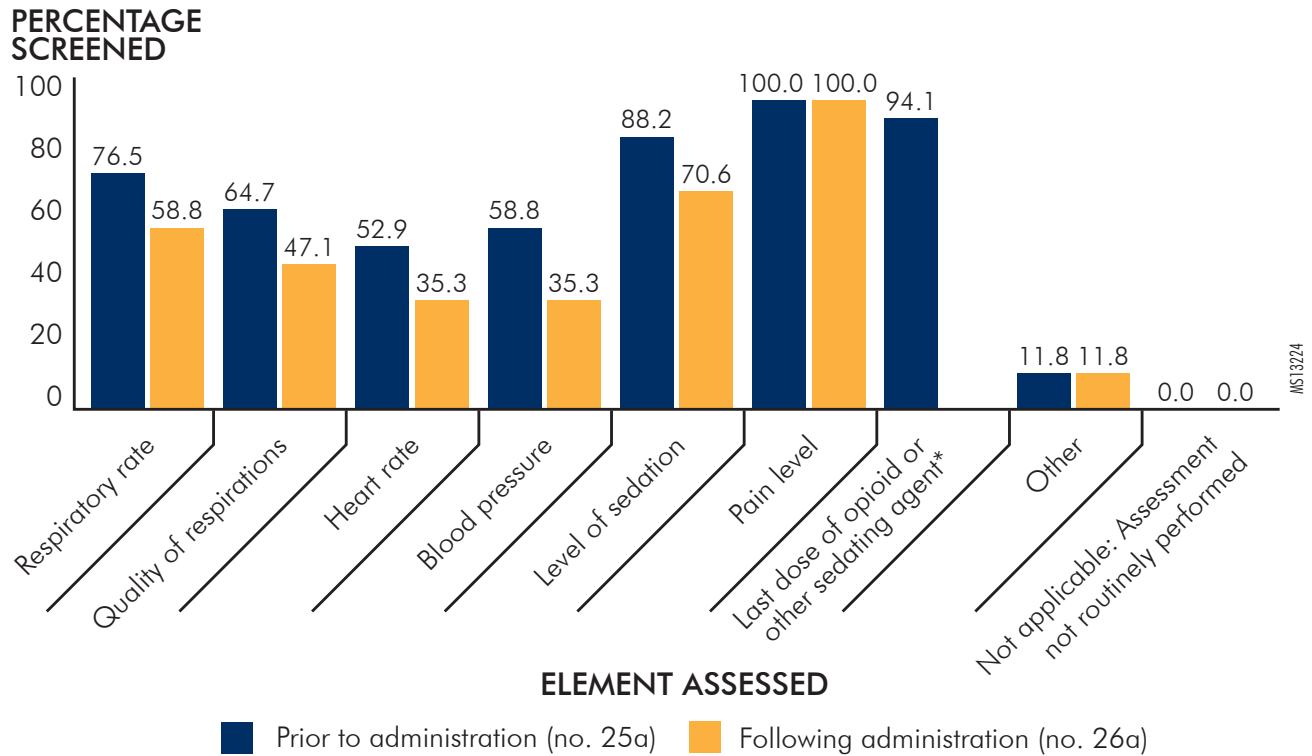
**Note:** Results are for item no. 7 (“Patients are screened for the following elements which might affect the dose, monitoring parameters, or appropriateness of opioid use...”) and item no. 36 (“Patients are screened for the following elements which might affect the dose, monitoring parameters, or appropriateness of PCA use...”).

### Standardization

The organization assessment queried about standardized practices in place for safe opioid use. Examples of items addressing the standardization of practices include the following:

- No. 1: Current pain management protocols and guidelines for opioid use are available to guide prescribers, pharmacists, and nurses when opioids are prescribed, dispensed, administered, or monitored.
  - No. 2: The organization uses a standardized pain scale(s) appropriate to the patient population to assess a patient’s level of comfort/pain.
  - No. 6: Standardized preprinted order forms/computerized prescriber order entry (CPOE) order sets are used to prescribe oral and parenteral opioids.
  - No. 15: Concentrations of parenteral opioid infusions for adult patients are standardized to a single concentration per drug and are used in at least 90% of the cases.
  - No. 16: Concentrations of parenteral opioid infusions for pediatric patients (including neonates) are standardized to a single concentration per drug and are used in at least 90% of the cases.
  - No. 37: Standardized preprinted order forms/CPOE order sets are used for PCA.
- Standardized protocols and order sets, either electronic or preprinted in paper systems, that incorporate pain and sedation scales can serve as a guide to help clinical personnel quickly and accurately select the appropriate dose of medication and adjust it as needed. Well-designed standard order sets, both in electronic and paper formats, can improve safe medication use by the following means:<sup>8,9</sup>
- Integrating and coordinating care by communicating best practices through multiple disciplines, levels of care, and services
  - Modifying practice through evidence-based care
  - Reducing variation and unintentional oversight through standardized formatting and clear presentation of orders
  - Enhancing workflow with pertinent instructions that are easily understood, intuitively organized, and suitable for direct application to current information management systems

Figure 2. Assessments Performed by Nurses Prior to and Following Administration of Oral Opioids



**Note:** Results are for item no. 25a (“Prior to the administration of oral opioids, nurses perform a baseline assessment of the following...”) and item no. 26a (“Following the administration of oral opioids, nurses perform a postadministration assessment within the hospital-designated time frame of the following...”).

\* “Last dose of opioid or other sedating agent” was not an answer selection for item no. 26a.

- Reducing the potential for medication errors through integrated safety alerts and reminders
- Reducing unnecessary calls to physicians for clarifications and questions about orders

However, if standard order sets are not carefully designed, reviewed, and maintained to reflect best practices and ensure clear communication, they may actually contribute to errors. In relation to opioids, one study demonstrated that the implementation of standard order sets for PCA therapy resulted in a dramatic decrease in the number of cases of severe respiratory depression and increased use of the order set for patients new to opioid therapy.<sup>10</sup> Furthermore, changing the order sets to improve medication

safety did not appear to negatively affect patients' satisfaction with pain management.

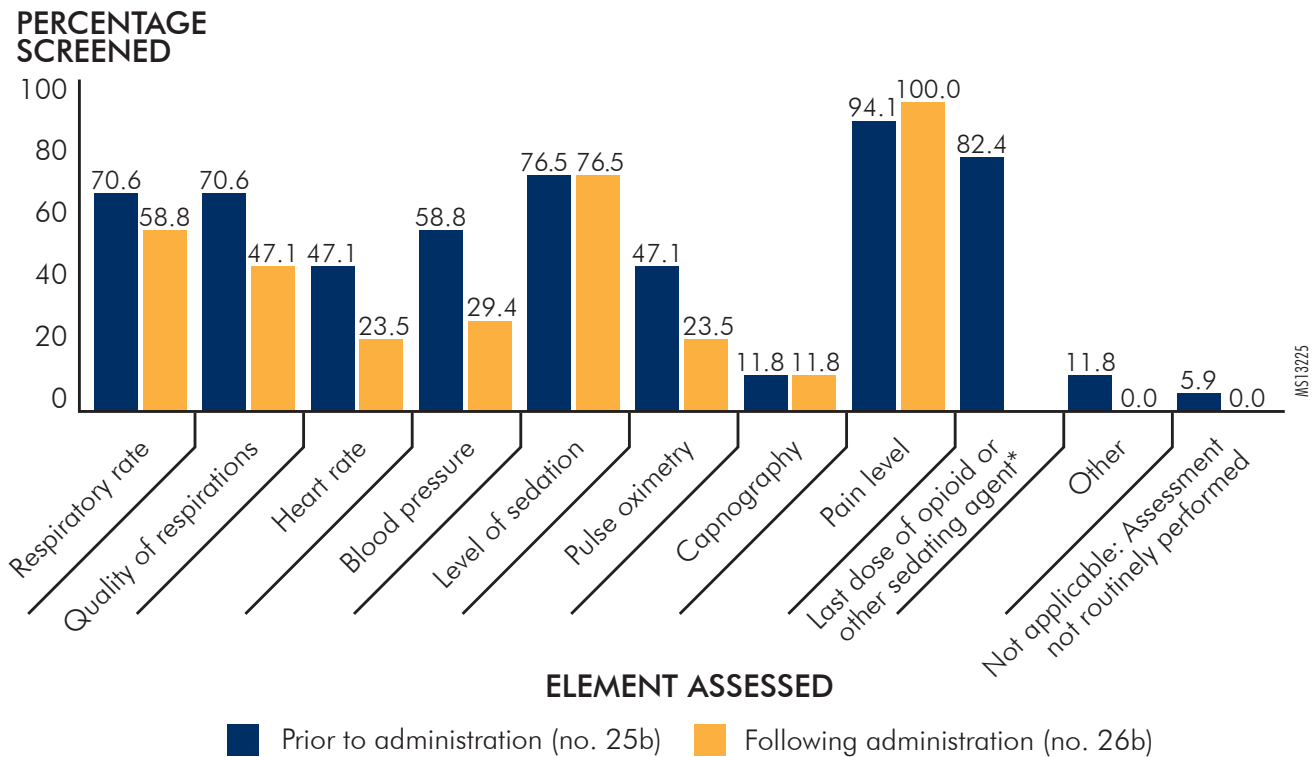
The first item in the assessment asked if hospitals have current pain management protocols and guidelines for opioid use available to guide prescribers, pharmacists, and nurses when opioids are prescribed, dispensed, administered, and monitored. Roughly one-third (35.3%, n = 6) of the hospitals indicated that this item was not in place, while almost half (47.1%, n = 8) stated that this item was partially implemented.

Almost all (94.1%, n = 16) hospitals stated they used a standardized pain scale appropriate to the patient population to assess a patient's level of comfort/pain. However, their responses to whether range-of-dose

orders for parenteral opioids included the organization's approved pain scale to assist nurses in determining the appropriate dose to administer (e.g., Give 1 mg for moderate pain [scale 4-7] and 2 mg for severe pain [scale 8-10]) were diverse. Three hospitals (17.6%) stated they did not allow range-of-dose orders, five (29.4%) stated this was fully implemented, and nine (52.9%) indicated that they sometimes or never followed this practice.

Less than half of the hospitals (47.1%, n = 8) revealed that they used standardized preprinted order forms or CPOE order sets to prescribe oral and parenteral opioids. Of these, only 37.5% (n = 3) included the recommended doses for parenteral opioids to guide appropriate dosing of opioids and 25.0% (n = 2)

Figure 3. Assessments Performed by Nurses Prior to and Following Administration of Parenteral Opioids



**Note: Results are for item no. 25b (“Prior to the administration of parenteral opioids, nurses perform a baseline assessment of the following...”) and item no. 26b (“Following the administration of parenteral opioids, nurses perform a postadministration assessment within the hospital-designated timeframe of the following...”)**

\* “Last dose of opioid or other sedating agent” was not an answer selection for item no. 26b.

included orders for naloxone and directions for use on those forms. When combining those hospitals that did not have standardized order forms (52.9%, n = 9) with those that did not include recommend doses of opioids or orders for naloxone, 64.7% (n = 11) of the hospitals either did not provide guidance to prescribers on appropriate dosing or did not include an order for naloxone with the ordered opioid.

The opioid knowledge assessment asked practitioners which dose of IV HYDROMORPHONE best represents an equianalgesic dose of IV morphine 2 mg.<sup>1</sup> Overall, 67.2% of participants correctly selected IV HYDROMORPHONE 0.4 mg. Providing equianalgesic dosing charts within facilities can assist practitioners in appropriately converting a dose of one

opioid (e.g., morphine) to an equivalent dose of another opioid (e.g., HYDROMORPHONE) or when converting from an oral formulation (e.g., oral morphine) to a parenteral formulation (e.g., IV morphine). When asked whether hospitals had established equianalgesic dosing charts and made them easily accessible to all practitioners when prescribing, dispensing, and administering opioids, five hospitals (29.4%) had fully implemented this strategy, while almost half (47.1%, n = 8) stated this was not in place.

It could be assumed, then, that the aforementioned items reveal that many hospitals are not providing prescribers with guidance for the appropriate use of opioids and thus are relying solely on the knowledge and education of their prescribers and pharmacists to catch inappropriate

selection and dosing of opioids. But when asked whether pharmacists had access to a patient’s opioid status, almost 60% (n = 10) of facilities stated that the pharmacy did not have access to or did not take this into consideration when profiling or reviewing orders, while nearly 24% (n = 4) of hospitals sometimes provided this access. In addition, in the demographic section of the assessment, hospitals were asked whether their pharmacy order entry systems provided the following functionalities:

- Dose range checking for maximum single doses
- Dose range checking for maximum total daily doses
- Hard stops (catastrophic doses) for doses known to cause serious harm



Nearly 53% (n = 9) of participating hospitals stated that their system could check for maximum single doses, but less than a quarter (n = 4) provided maximum total daily doses checks and only 5.9% (n = 1) had hard stops for catastrophic doses. Therefore, most hospitals are relying solely on the diligence of their clinical staff to catch inappropriate doses of opioids.

## CONCLUSION

Findings from the PA-HEN Organization Assessment of Safe Opioid Practices demonstrate an opportunity to improve medication safety with the use of opioids within hospitals. Hospitals that completed the opioid organization assessment spent considerable time evaluating their medication-use systems and demonstrated an exemplary commitment to safety, regardless of the results. Equally important, this organization assessment established a

baseline of current practices around opioid use that can be used to evaluate improvement and identify statewide priorities. Certainly, technological solutions such as CPOE, bar coding, and fully integrated information systems can be helpful in improving safe practices with opioids. However, as these survey findings show, there is ample room for improvement with less costly and less difficult-to-implement error reduction strategies such as standardizing processes and practices within each organization.

## NOTES

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# PENNSYLVANIA PATIENT SAFETY ADVISORY

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