

# Actionable Patient Safety Solutions™ (APSS™): Monitoring for Opioid-Induced Respiratory Depression

## How to use this guide

This APSS provides evidence-based actions and resources for executives, leaders, clinicians, and performance improvement specialists. This document is intended to be used as a guide for healthcare organizations to examine their own workflows, identify practice gaps, and implement improvements. In it, you'll find:

**Best Practice Summary:** A high level summary of evidence-based, clinical best practices. (page 2)

**Executive Summary:** Executives should understand the breadth of the problem and its clinical and financial implications. (page 2)

**Leadership Checklist:** This section is for senior leaders to understand common patient safety problems and their implications related to opioid-induced respiratory depression. Most preventable medical harm occurs due to system defects rather than individual mistakes. Leaders can use this checklist to assess whether best practices are being followed and whether action is needed in their organization around monitoring for opioid-induced respiratory depression. (page 3)

**Clinical Workflow:** This section includes more specific information about monitoring for opioid-induced respiratory depression across the continuum of care. Leaders should include the people doing the work in improving the work. This section outlines what should be happening on the frontline. Clinicians can use this section to inform leaders whether there are gaps and variations in current processes. This is presented as an infographic that can be used for display in a clinical area. (page 4)

**Education for Patients and Family Members:** This section outlines what frontline healthcare professionals should be teaching patients and family members about opioid-induced respiratory depression. Clinicians can inform leaders whether there are gaps and variations in the current educational processes. (page 6)

**Performance Improvement Plan:** If it has been determined that there are gaps in current practice, this section can be used by organizational teams to guide them through an improvement project. (page 7)

**What We Know about Monitoring for Opioid-Induced Respiratory Depression:** This section provides additional detailed information about opioid-induced respiratory depression. (page 11)

**Resources:** This section includes helpful links to free resources from other groups working to improve patient safety. (page 13)

**Endnotes:** This section includes the conflict of interest statement, workgroup member list, and references. (page 13)

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# Best Practice Summary

## Monitoring After Prescribing Opioids

- Ensure patients receiving opioids are continuously monitored.
- Set actionable alarms with clear requirements for the clinician's and patient's response.
- Reassess pain routinely. Titrate opioid dose as early as possible and consider non-opioid pain management alternatives.
- Evaluate new or changed medications that may interact with the opioid medication.
- Monitor for signs of deterioration, such as slow respiration and altered mental status.
- Include patient signs of deterioration as a discussion point in hand-offs and multidisciplinary rounds.
- Use the organization's escalation criteria to call a Rapid Response if needed.
- Ensure that a reversal agent is located near the patient.

## Discharge

- Plan for home monitoring if the patient is going home with opioids.
- Ensure patients and family members understand the importance of monitoring, how to use monitoring equipment, how to appropriately take the opioids, non-opioid pain management strategies, patient-specific risk factors, and when to call for help.
- Consider providing reversal agents to patients and family members upon discharge.

# Executive Summary

## The Problem

Over 50% of patients in the hospital receive opioids at some point in their care and of those patients, between 0.003% and 4.2% will experience an adverse event between hospitalization and post-discharge, contributing to 55% longer length of stay, 47% higher costs, 36% increased risk of readmission after 30 days, and 3.4 times greater likelihood of mortality (Jungquist et al., 2020). It is estimated that 97% of opioid-induced respiratory depression events within 24 hours of surgery could be prevented with better patient monitoring (Jungquist, Smith, Wiltse Nicely, & Polomano, 2017).

## The Cost

It is not uncommon for settlements for death or severe brain injury to range from \$650,000 to \$7.7 million (Jungquist et al., 2020). Post-operative overdoses in the hospital and in the home/community have doubled between 2002 to 2011, indicating that, despite national attention from governing bodies, opioid-related adverse events are still prevalent (Cauley et al., 2017).

## The Solution

Many healthcare organizations have successfully implemented and sustained improvements and reduced death from opioid-induced respiratory depression. This document provides a blueprint that outlines the actionable steps organizations should take to successfully improve monitoring for opioid-induced respiratory depression-related harm and summarizes the available evidence-based practice protocols. This document is revised annually and is always available free of charge on our website.

# Leadership Checklist

On a monthly basis, or more frequently if a problem exists, the executive team should review the outcomes of patients prescribed opioids in healthcare organizations and discharged with an opioid prescription. Use this checklist as a guide to determine whether current evidence-based guidelines are being followed in your organization:

## Pain Management

- Develop a multimodal pain management program that is linked with clinical workflows in an easily-accessible way. See [Pain Management](#) APSS topic.
- Standardize workflows to ensure pain is continuously assessed and alternative strategies are considered thoroughly.

## Appropriate Monitoring

- Prioritize continuous monitoring.
- Set institution-specific criteria that tailors alarms based on individual patient care needs ([Ruppel et al., 2018](#); [McGrath, Pyke & Taenzer, 2017](#)).
- Adopt a human factors approach to design of all technologies, such as patient-controlled analgesia pumps ([Lin et al., 1998](#)).
- Standardize hand-off reports to include information about trends (e.g., end tidal CO<sub>2</sub> threshold values). Use this information to adjust alarm thresholds per individual patient. See [Hand-Off Communication](#) APSS.
- Create a shared chain of command system between care team members when alarms go off and aren't addressed.
- Ensure all appropriate reversal agents are readily available. Standardized order sets for emergency administration.
- Standardize debrief expectations and interventions post-rapid response call. See [Rapid Response Teams](#) APSS.
- Complete an alarms inventory, display in a grid or other clear visual, and clearly define which disciplines are able to change the alarms and settings and which alarms and settings require interdisciplinary discussion during rounds before changing.

## Patient Involvement

- Clearly define expectations for patient education for all disciplines. Evaluate the patient's environment and journey throughout the system to stage opioid educational material and discussion throughout. See [Education for Patients and Family Members](#) section for information that should be included.
- Engage patients and caregivers as partners in multiple levels throughout the organization and solicit their expertise for patient-facing monitoring educational material, decision making around discharge planning, etc. ([Carman et al., 2013](#)).

## System-Wide Expectations and Policies for Monitoring

- Use [patient stories](#) to reinforce the seriousness of the problem, to reinforce the importance of seeking alternatives, etc.
- Build the system curriculum around advanced objectives to reinforce concepts and determine where education around opioids can be linked with other related education (e.g., education around sedation).

- Clearly define criteria that would warrant a rapid response call and establish a culture that praises the use of rapid response teams. Ensure steps after a rapid response team call are clearly defined for those on the frontline. See [Rapid Response Teams](#) APSS.
- Standardize assessment tools (e.g., sedation assessment tools).

## Measurement and Sustainment

- Display performance data visually in a place that everyone can see and in a way that is easily understood. Use this board as a focal point during debrief sessions and update accordingly with actions for improvement.
- Ensure organizational committees related to monitoring for opioid-induced respiratory depression are closely linked with the monitoring efforts to increase attention to the issue. Solicit input from members of other committees when determining how a change in monitoring protocols will impact other areas of care.
- Monitor alarm overrides and identify disciplines or individuals that have overridden alarms iteratively and understand the reasons behind the overrides for continuous quality improvement of systems. Regularly review alarm settings to avoid false positives/negatives.
- When a problem is indicated based on data or adverse events, implement a performance improvement plan.

# Clinical Workflow

## 1. MONITORING AFTER PRESCRIBING OPIOIDS

- Establish the patient's baseline and risk(s) (HQI, 2017). Have multiple clinicians involved in and contributing to the baseline assessment. Include in assessment what opioid alternatives have worked in the past, if applicable, and what the patient might be willing to try.
- Consider moving high-risk patients to an area more visible from the nursing station.
- Make sure the patient is continuously monitored and the alarms are appropriately set (Ruppel et al., 2018). Respond to all alarms as quickly as possible.
- Use a defined sedation score on a routine basis.
- Reassess pain as frequently as defined by the provider. At a minimum, reassess at designated intervals per policy and with a change in patient condition.
  - o If pain persists, order consultation with the care team to discuss pain management strategy.
    - ◊ Involve palliative care team members, adjunct therapies, and alternatives. Distinguish the type of pain (acute versus chronic).
  - o If pain decreases, titrate dose for desired effect and consider introducing other pain management strategies.
  - o Reassess the patient's reaction to the short-term initial dose before advancing treatment.
- Reassess vital signs and sedation level as frequently as defined by the provider ([Jungquist et al., 2017](#)).

- If vital signs indicate potential deterioration, alert provider. Reassess and analyze trends.
- If vital signs indicate improvement or no change in condition, alert provider.
- If sedation levels are deeper than intended, mobilize a team for rescue by contacting rapid response and the provider.
- Raise a concern about any new medications that may adversely influence the current opioid therapy (e.g., benzodiazepines).
- Remain sensitive to early indications of deterioration, such as slow respiration, ineffective treatment of pain requiring increased dosages, altered mental status, oxygen saturation, etc.
  - If an emergency occurs due to respiratory depression, check for pulse and ensure an open airway.
    - ◇ If there is a pulse, provide assisted ventilation and oxygenation as needed.
    - ◇ If there is no pulse, start CPR.
    - ◇ Weigh risks versus benefits of using a reversal agent. Use naloxone in small doses. If the dose is ineffective, repeat titrated doses every 1-2 minutes.
  - If a non emergency occurs but vital signs are indicating a need for increased ventilation support, contact respiratory therapist and/or call [rapid response](#). Start implementing basic changes to prevent further deterioration (e.g., repositioning).
    - ◇ If false alarms are frequent, request that the alarm settings are changed. Reassess positioning of the equipment on the patient.
- Include patient's trends in hand-off report.



## 2. DISCHARGE

- Plan for at home monitoring if the patient is going home with opioids.
- Ensure the patient and family members are well-equipped to use the home monitor and respond appropriately.
- Ask about the patient's expectations for pain and function.
- Consider non-opioid pain management methods.
- Consider sending patients prescribed opioids home with naloxone, which can be given as either an auto-injector or nasal spray.
  - Educate family members on the proper use, storage, and administration technique of naloxone.
- Educate patients and family members on basic CPR and when to use CPR.
- See [Education for Patients and Family Members](#) for information to share with patients and family members.

# Education for Patients and Family Members

The outline below illustrates all of the information that should be conveyed to the patient and family members by someone on the care team in a consistent and understandable manner.

## **Within shared decision making conversations, discuss:**

- Risks versus benefits.
- [Alternatives to opioids](#) and why opioids are indicated.
- Side effects of opioids.
- The initial benefits of opioids therapy may decrease with prolonged use.
- The purpose of the monitor and what to watch out for, particularly when the patient is going home with opioids and a monitor. Ensure patients and family members know exactly how to use the monitor and respond appropriately.
- How to use naloxone or other reversal agents and the appropriate next steps after administration.
- How to properly do CPR and when.
- The policies regarding prescribing, refills, etc. and why those policies exist.
- How patients will get their medications and afford their medications.
- The methods for monitoring the patient's opioid use (e.g., urine drug testing) and why those methods exist.
- Other members of the care team the patient may encounter and what their roles are in opioid therapy.

## **Explain taking and storing opioids properly. This education should include the following directions:**

- Take opioids exactly as prescribed.
- Always let your doctor know of any side effects immediately.
- Do not combine with alcohol or other medications without talking to your doctor first.
- Do not share your prescription at all.
- Store your prescriptions in a secure place, out of reach of others (including children, family, friends, and visitors).
- If you have unused prescription opioids at the end of your treatment, find your community drug take-back program or your pharmacy mail-back program to dispose of them safely. Do not flush the opioids down the toilet.

## **Resources for Patients and Family Members:**

- [Tapering Off Opioids: When and How](#)
- [Example Treatment Agreement for Prescribing Opioids](#)
- [Having Difficult Conversations guide](#)
- [Alternatives to Opioids](#)
- [Opioid Overdose Basics: Responding to Opioid Overdose](#)
- [PatientAider](#)

# Performance Improvement Plan

Follow this checklist if the leadership team has determined that a performance improvement project is necessary:

- Gather the right project team.** Be sure to involve the right people on the team. You'll want two teams: an oversight team that is broad in scope, has 10-15 members, and includes the executive sponsor to validate outcomes, remove barriers, and facilitate spread. The actual project team consists of 5-7 representatives who are most impacted by the process. Whether a discipline should be on the advisory team or the project team depends upon the needs of the organization. Patients and family members should be involved in all improvement projects, as there are many ways they can contribute to safer care.

## Complete this Lean Improvement Activity:



Conduct a [SIPOC](#) analysis to understand the current state and scope of the problem. A SIPOC is a lean improvement tool that helps leaders to carefully consider everyone who may be touched by a process, and therefore, should have input on future process design.

### RECOMMENDED MONITORING FOR OPIOID-INDUCED RESPIRATORY DEPRESSION IMPROVEMENT TEAM

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Admitting and registration staff</li><li>• Quality and safety specialists</li><li>• Pain management specialists</li><li>• Palliative care specialists</li><li>• Nurses</li><li>• Physicians</li><li>• Pharmacists</li></ul> | <ul style="list-style-type: none"><li>• Anesthesia providers (e.g., anesthesiologists, CRNAs, etc)</li><li>• Mental health professionals (e.g., psychologists, psychiatrists, addiction specialists, etc)</li><li>• Occupational, physical, and respiratory therapists</li><li>• Chiropractors</li><li>• Care coordinations and social workers</li></ul> |
|---|--|

*Table 1: Understanding the necessary disciplines for a monitoring for opioid-induced respiratory depression improvement team. Involve all specialists who may have a touch point with the patient at any point throughout their journey to standardize expectations across the system.*

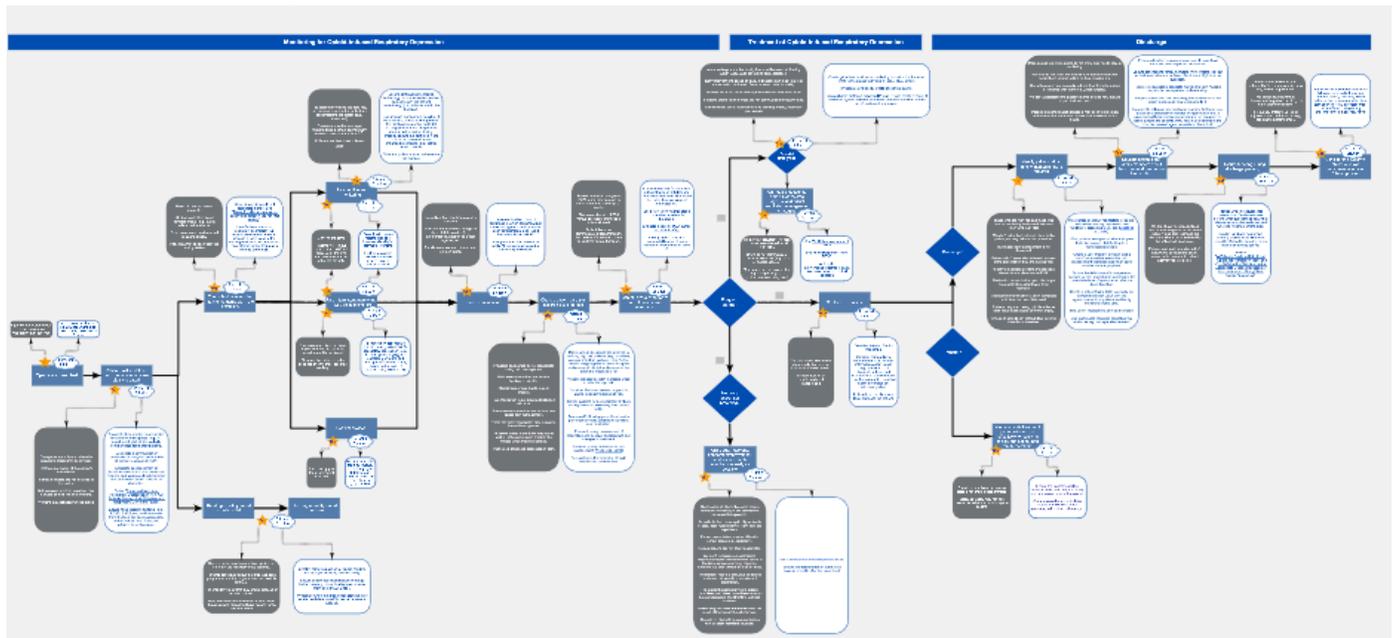
- Understand what is currently happening and why.** Reviewing objective data and trends is a good place to start to understand the current state, and teams should spend a good amount of time analyzing data (and validating the sources), but the most important action here is to go to the point of care and observe. Even if team members work in the area daily, examining existing processes from every angle is generally an eye-opening experience. The team should ask questions of the frontline during the observations that allow them to understand each step in the process and identify the people, supplies, or other resources needed to improve patient outcomes.

Create a [process map](#) once the workflows are well understood that illustrates each step and the best practice gaps the team has identified (IHI, 2015). Brainstorm with the advisory team to understand why the gaps exist, using whichever [root cause analysis tool](#) your organization is accustomed to (IHI, 2019). Review the map with the advisory team and invite the frontline to validate accuracy.





- **Prioritize the gaps and potential solutions.** Identify root causes of the gaps identified. Conduct a prioritization exercise to understand the organizational impact and effort of identified solutions, as many of the gaps may be addressed with the same solution. Determine which are priorities of focus for the organization. Be sure that the advisory team supports moving forward with the project plan so they can continue to remove barriers.



**Examples of potential solutions. Click [here](#) to expand. Ensure solutions are only determined after a thorough review of current state, process mapping, and gaps analysis.**

#### TYPICAL GAPS IDENTIFIED IN TRANSFUSION PROCEDURES

- Lack of standardized processes for patient identification and confirmation pre-transfusion
- Poor blood product labeling
- Lack of thorough evaluation of alternatives to transfusion
- Lack of standardization of storage protocols
- Unclear standards for labeling products
- Poor shared decision making
- There is no documentation post-transfusion to determine if the transfusion solved the issue.
- There's significant emphasis on the laboratory values without consideration of other factors, like physical assessment, when determining the need for a transfusion.
- Blood bank personnel and providers use terms that represent different ideas (e.g., "unit").

Table 3: By identifying the gaps in transfusion processes, organizations can tailor their project improvement efforts more effectively

- **Develop an action plan and implement small tests of change.** Design an experiment to be trialed in one small area for a short period of time and create an action plan for implementation.

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don't move so quickly that you don't consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

**The action plan should include the following:**



- Assess the ability of the culture to change and adopt appropriate strategies
- Revise policies and procedures
- Redesign forms and electronic record pages
- Clarify patient and family education sources and content
- Create a plan for changing documentation forms and systems
- Develop the communication plan
- Design the education plan
- Clarify how and when people will be held accountable

- **Evaluate outcomes, celebrate wins, and adjust the plan when necessary.** Measure both process and outcome metrics. Outcome metrics include the rates outlined in the leadership checklist. Process metrics will depend upon the workflow you are trying to improve and are generally expressed in terms of compliance with workflow changes. Compare your outcomes against other related metrics your organization is tracking.

Routinely review all metrics and trends with both the advisory and project teams and discuss what is going well and what is not. Identify barriers to completion of action plans, and adjust the plan if necessary. Once you have the desired outcomes in the trial area, consider spreading to other areas ([IHI, 2006](#)).

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don't move so quickly that you don't consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

[Read this paper](#) from the Institute for Healthcare Improvement to understand how small local steps



**MONITORING FOR OPIOID-INDUCED RESPIRATORY DEPRESSION METRICS TO CONSIDER ASSESSING**

**Process metrics**

- Frequency of pain assessment.
- Patient assessment with changes in treatments.
- Use of organizationally-standardized tools for risk factor assessment.
- Justification of reasons documented for alarm adjustments.
- Patient's understanding during conversations around shared decision making, review of treatment agreements, and risks and benefits.
- Number of patients prescribed opioids who were also referred to non-pharmacologic therapy.

- Concurrent opioid and benzodiazepine treatments.
- False alarm rate.
- Alarm overrides.
- The frequency that aggregate monitoring data is reviewed to determine whether there is a need to adjust alert threshold.
- Number of reversal agents utilized or frequency of naloxone administration.
- Post-discharge follow-up visit frequency.
- Patient and family advisory council (PFAC) involvement in monitoring-related decision making.

#### **Structural Metrics**

- Whether a protocol exists that includes standard monitoring for opioid-induced respiratory depression processes and what to do upon an alarm.
- Whether a rapid response team exists.
- Whether the organization has a clear protocol for pain assessment.
- Whether the organization has a standardized pain assessment tool.
- Whether the organization has a mechanism to follow-up with patients discharged with opioids.

#### **Outcome Metrics**

- Mortality.
- Length of stay.
- Codes due to opioid-induced respiratory depression.
- Rapid responses due to opioid-induced respiratory depression.
- Rate of patients with postoperative respiratory failure per 1,000 elective surgical discharges for patients 18 years and older.

*Table 3: Consider evaluating related metrics to better understand opioid safety presence and contributing factors.*

## **What We Know About Monitoring for Opioid-Induced Respiratory Depression**

Opioids are commonly administered to patients to relieve acute pain and rank among the drugs most frequently associated with adverse events ([The Joint Commission, 2012](#)). While the administration of opioids is pivotal for the well-being and treatment of many hospitalized patients, there are a significant number of adverse effects from opioid administration. Among the plethora of other adverse effects, sudden death due to decreased respiration and addiction are among the most significant.

### **Clinical and Financial Implications**

It has been shown that most adverse drug events are a result of drug-drug interactions, with up to 16% involving opioids ([Wright et al., 2012](#); [Davies et al., 2009](#)). Over 80% of patients receive opioids even after receiving low-risk surgeries and the subsequent incidence of respiratory depression among postoperative patients is approximately 0.5% ([Hah et al., 2017](#); [The Joint Commission, 2012](#)). Of the opioid-related adverse drug events reported, it has been estimated that nearly one third of deaths were due to inappropriate monitoring of patients on opioids ([The Joint Commission, 2012](#)).

As many as 1 in 4 patients receiving prescription opioids report struggling with addiction ([AHA, n.d.](#)).

Patients receiving opioids in the hospital have almost twice the incidence of cardiac arrest compared to other patients ([Overdyk et al., 2016](#)). The cost associated with respiratory failure after surgery alone in the US Healthcare System is an estimated \$2 billion ([Reed et al., 2011](#)).

While opioid use is safe for many patients, opioid analgesics are associated with adverse effects, including respiratory depression, in many post-surgical patients ([Vila et al., 2005](#); [Jarzyna et al., 2011](#)).

Adverse effects associated with opioids not only include respiratory depression, but also hyperalgesia, early development of tolerance, ileus (inability of the intestine to move food or waste), constipation, sedation, nausea and vomiting, and delayed recovery ([Kane-Gill et al., 2014](#)). If these adverse events lead to death or serious harm to a patient, they are labeled as "failure to rescue."

Administration of supplemental oxygen complicates the monitoring issue, as it can delay detection of depressed ventilation and further impair hypoxic respiratory drive.

The Institute of Medicine (IOM) described failure to rescue as a key issue in healthcare quality in 2001.

Reports by hospitals to the Joint Commission's Sentinel Event database (2004-2011) show that the causes of opioid-related adverse events and deaths include:

- 47% from dosing errors.
- 29% related to improper monitoring of the patient.
- 11% related to other factors including excessive dosing, medication interactions, and adverse drug reactions.

The following are solutions to reduce postoperative opioid-induced respiratory depression:

- Properly monitor and identify patients at risk for "failure to rescue".
- Create systems to notify staff of important changes in patient condition.
- Ensure proper pain management and opioid dosing.
- Use automated decision support to ensure staff use the right therapy at the right time.

## **Proper Monitoring Can Prevent Opioid-Induced Respiratory Depression**

In 2011, the Anesthesia Patient Safety Foundation recommended continuous monitoring for all patients receiving parenteral opioids, and using a system to notify caregivers when alarming conditions occur or are anticipated ([Weinger et al., 2011](#)).

In August 2012, the Joint Commission issued a sentinel event alert (a change in policy based on death or serious harm to a patient), urging all healthcare systems to introduce measures to improve safety for patients receiving opioids, including systematic protocols to assess pain and proper opioid dosing, as well as continuous monitoring of oxygenation and ventilation ([Joint Commission, 2012](#)).

In 2014, the Center for Medicare and Medicaid Services (CMS) clarified the surgical services Condition of Participation (CoP) for hospitals to have adequate provisions for immediate postoperative care and to emphasize the need for monitoring after surgery for patients receiving parenteral opioid medications, regardless of where they are in the hospital ([CMS, 2014](#)).

Research has studied the development of early warning systems and these systems have been validated in Europe and Australia ([Alam et al., 2014](#); [Ludikhuizen et al., 2012](#); [Fullerton et al., 2012](#); [Smith et al., 2013](#)).

One study demonstrated that clinicians using continuous pulse oximetry measured through motion and low perfusion pulse oximetry and a robust clinician notification system identified patient distress earlier, which decreased rapid response team activations by 65% and ICU transfers by 48%, thereby reducing ICU days by 135 days annually ([Taenzer, 2010](#)).



## Resources

### For Monitoring for Opioid-Induced Respiratory Depression Improvement:

- [Reducing Harm from Respiratory Depression in Non-ICU Patients Through Risk Mitigation and Respiratory Monitoring](#)
- [American Society of Anesthesiologists: Incidence, Reversal, and Prevention of Opioid-Induced Respiratory Depression](#)
- [CDC: Quality Improvement and Care Coordination: Implementing the CDC Guideline for Prescribing Opioids for Chronic Pain](#)
- [Kaiser Permanente: Patients on Chronic Opioid Therapy for Chronic Non-Cancer Pain Safety Guideline](#)
- [Oregon Pain Guidance: Opioid Prescribing Guidelines](#)
- [AHA: Prescription Opioids: What You Need to Know](#)
- [CDC: Prevent Opioid Misuse](#)
- [The Joint Commission: Pain Assessment and Management Standards for Hospitals](#)
- [Monitoring Hospitalized Adult Patients for Opioid-Induced Sedation and Respiratory Depression](#)
- [Continuous Respiratory Monitoring and a “Smart” Infusion System Improve Safety of Patient-Controlled Analgesia in the Postoperative Period](#)
- [Mayo Clinic: When is an Opioid the Right Choice?](#)
- [CDC: Guideline for Prescribing Opioids for Chronic Pain](#)
- [University of Maryland Medical System: Adult Procedural Moderate and Deep Sedation](#)
- [Anesthesia Patient Safety Foundation: Pros and Cons of Continuous Electronic Monitors](#)

### For General Improvement:

- [CMS: Hospital Improvement Innovation Networks](#)
- [IHI: A Framework for the Spread of Innovation](#)
- [The Joint Commission: Leaders Facilitating Change Workshop](#)
- [IHI: Quality Improvement Essentials Toolkit](#)
- [SIPOC Example and Template for Download](#)
- [SIPOC Description and Example](#)

## Endnotes

### Conflicts of Interest Disclosure

The Patient Safety Movement Foundation partners with as many stakeholders as possible to focus on how to address patient safety challenges. The recommendations in the APSS are developed by workgroups that may include patient safety experts,

healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers. Workgroup members are required to disclose any potential conflicts of interest.

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## References

- Agency for Healthcare Research and Quality. Efforts to Improve Patient Safety Result in 1.3 Million Fewer Patient Harms. Retrieved from <http://www.ahrq.gov/professionals/quality-patient-safety/pfp/interimhacrate2013.html>
- American Hospital Association . Prescription Opioids: What You Need to Know: AHA. [www.aha.org/factsheet/2018-02-20-prescription-opioids-what-you-need-know](http://www.aha.org/factsheet/2018-02-20-prescription-opioids-what-you-need-know).
- American Psychological Association (APA). doi:10.1037/e586012010-001
- Alam, N., Hobbelenk, E. L., van Tienhoven, A. J., van de Ven, P. M., Jansma, E. P. and Nanayakkara, P. W. B. (2014). The Impact of the Use of the Early Warning Score (EWS) on Patient Outcomes: A Systematic Review. *Resuscitation*, 85(5), 587-594. doi:10.1016/j.resuscitation.2014.01.013
- Brady, P. W., Zix, J., Brilli, R., Wheeler, D. S., Griffith, K., Giaccone, M. J., ... Tegtmeyer, K. (2014). Developing and Evaluating the Success of a Family Activated Medical Emergency Team: a Quality Improvement Report. *BMJ Quality & Safety*, 24(3), 203-211. doi:10.1136/bmjqs-2014-003001
- Cauley, C. E., Anderson, G., Haynes, A. B., Menendez, M., Bateman, B. T., & Ladha, K. (2017). Predictors of In-hospital Postoperative Opioid Overdose After Major Elective Operations: A Nationally Representative Cohort Study. *Annals of surgery*, 265(4), 702-708. <https://doi.org/10.1097/SLA.0000000000001945>
- Centers for Medicare & Medicaid Services. (2014). Requirements for Hospital Medication Administration, Particularly Intravenous (IV) Medications and Post-operative Care of Patients Receiving IV Opioids. Retrieved from: <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-14-15.pdf>
- Davies, E. C., Green, C. F., Taylor, S., Williamson, P. R., Mottram, D. R., & Pirmohamed, M. (2009). Adverse drug reactions in hospital in-patients: a

- prospective analysis of 3695 patient-episodes. *PloS one*, 4(2), e4439. <https://doi.org/10.1371/journal.pone.0004439>
- Fazio, S., & Firestone, R. (2020, May). Fatal Patient-Controlled Analgesia (PCA) Opioid-Induced Respiratory Depression. *Patient Safety Network*. <https://psnet.ahrq.gov/web-mm/fatal-patient-controlled-analgesia-pca-opioid-induced-respiratory-depression>.
- Jarzyna, D., Jungquist, C. R., Pasero, C., Willens, J. S., Nisbet, A., Oakes, L., Dempsey, S. J., Santangelo, D., & Polomano, R. C. (2011). American Society for Pain Management Nursing guidelines on monitoring for opioid-induced sedation and respiratory depression. *Pain management nursing: official journal of the American Society of Pain Management Nurses*, 12(3), 118-145.e10. <https://doi.org/10.1016/j.pmn.2011.06.008>
- Joint Commission. (2012). Safe Use of Opioids. Retrieved from [https://www.jointcommission.org/assets/1/18/SEA\\_49\\_opioids\\_8\\_2\\_12\\_final.pdf](https://www.jointcommission.org/assets/1/18/SEA_49_opioids_8_2_12_final.pdf)
- Institute for Safe Medication Practices. ISMP 2007 Survey on High-alert Medications. Retrieved from <http://www.ismp.org/survey/Survey200702W.asp>
- Ferrell, B. R. Pain Assessment and Pharmacologic Management
- Forum, N. Q. Safe Practices for Better Healthcare. Retrieved from [http://www.qualityforum.org/publications/2010/04/safe\\_practices\\_for\\_better\\_healthcare\\_%E2%80%932010\\_update.aspx](http://www.qualityforum.org/publications/2010/04/safe_practices_for_better_healthcare_%E2%80%932010_update.aspx)
- Fullerton, J. N., Price, C. L., Silvey, N. E., Brace, S. J. and Perkins, G. D. (2012). Is the Modified Early Warning Score (MEWS) Superior to Clinician Judgement in Detecting Critical Illness in the Pre-hospital Environment?. *Resuscitation*, 83(5), 557-562. doi:10.1016/j.resuscitation.2012.01.004
- Hah, J. M., Bateman, B. T., Ratliff, J., Curtin, C., & Sun, E. (2017). Chronic Opioid Use After Surgery: Implications for Perioperative Management in the Face of the Opioid Epidemic. *Anesthesia and analgesia*, 125(5), 1733-1740. <https://doi.org/10.1213/ANE.0000000000002458>
- Hueckel, R., Turi, J., Kshittij, M., Mericle, J. and Meliones, J. (2006). Beyond Rapid Response: Instituting a Rover Team Improves Management of at Risk Patients Facilitate Proactive Interventions and Improves Outcomes. *Critical Care Medicine*, 34, A54. doi:10.1097/00003246-200612002-00191
- Institute for Healthcare Improvement. Overview of the 100,000 Lives Campaign. Retrieved from <https://www.ihc.org/Engage/Initiatives/Completed/5MillionLivesCampaign/Documents/Overview%20of%20the%20100K%20Campaign.pdf>
- Institute of Medicine (US) Committee on Quality of Health-care in America. (2001). Crossing the Quality Chasm: A New Health System for the 21st Century. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/25057539>
- Jarzyna, D., Jungquist, C. R., Pasero, C., Willens, J. S., Nisbet, A., Oakes, L., ... Polomano, R. C. (2011). American Society for Pain Management Nursing Guidelines on Monitoring for Opioid-Induced Sedation and Respiratory Depression. *Pain Management Nursing*, 12(3), 118- 145.e10. doi:10.1016/j.pmn.2011.06.008
- Kane-Gill, Rubin, Smithburger, Buckley, & Dasta. (2014). The Cost of Opioid-Related Adverse Drug Events. *Journal of Pain & Palliative Care Pharmacotherapy*, 28.
- Louie A, Feiner JR, Bickler PE, Rhodes L, Bernstein M, Lucero J. (2017) Four Types of Pulse Oximeters Accurately Detect Hypoxia during Low Perfusion and Motion. *Anesthesiology*. doi:10.1097/ALN.0000000000002002. [Epub ahead of print] PMID: 29200008
- Ludikhuize, J., Smorenburg, S. M., De Rooij, S. E., & De Jonge, E. (2012, August). Identification of Deteriorating Patients on General Wards; Measurement of Vital Parameters and Potential Effectiveness of the Modified Early Warning Score. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/22341727>
- McEvoy, M.D., Scott, M.J., Gordon, D.B., Grant, S.A., Thacker, J.K., Wu, C.L., Gan, T.J., Mythen, M.G., Shaw, A.D., Miller, T.E. and POQI Workgroup. American Society for Enhanced Recovery (ASER) and Perioperative Quality Initiative (POQI) Joint Consensus Statement on Optimal Analgesia Within an Enhanced Recovery Pathway for Colorectal Surgery: part 1 - from Perioperative Period to PACU. *Perioperative Medicine* 2017:6:8.
- McGrath, S. P., Pyke, J. and Taenzer, A. H. (2016). Assessment of Continuous Acoustic Respiratory Rate Monitoring as an Addition to a Pulse Oximetry-based Patient Surveillance System. *Journal of Clinical Monitoring and Computing*, 31(3), 561-569. doi:10.1007/s10877-016-9884-y
- McPherson, M. L. Strategies for the Management of Opioid-induced Adverse Effects.
- Mimoz, O., Benard, T., Gaucher, A., Frasca, D. and Debaene, B. (2012). Accuracy of Respiratory Rate Monitoring Using a Non-invasive Acoustic Method After General Anaesthesia. *BJA: British Journal of Anaesthesia*, 108(5), 872-875. doi:10.1093/bja/aer510
- Overdyk, F. J., Dowling, O., Marino, J., Qiu, J., Chien, H.-L., Erslon, M., ... Gan, T. J. (2016). Association of Opioids and Sedatives with Increased Risk of In-Hospital Cardiopulmonary Arrest from an Administrative Database. *PLOS ONE*, 11(2), e0150214. doi:10.1371/journal.pone.0150214
- Pearse, R. M., Moreno, R. P., Bauer, P., Pelosi, P., Metnitz, P., Spies, C., ... Rhodes, A. (2012). Mortality After Surgery in Europe: a 7 Day Cohort Study. *The Lancet*, 380(9847), 1059-1065. doi:10.1016/s0140-6736(12)61148-9
- Practice Guidelines for Acute Pain Management in the Perioperative Setting. (2014). *Anesthesiology*, 116(6), 248-273. doi:10.1097/ALN.0b013e31823c1030
- Reed, K. HealthGrades Patient Safety in American Hospitals Study.
- Smith, G. B., Prytherch, D. R., Meredith, P., Schmidt, P. E. and Featherstone, P. I. (2013). The Ability of the National Early Warning Score (NEWS) to Discriminate Patients at Risk of Early Cardiac Arrest Unanticipated Intensive Care Unit Admission, and Death. *Resuscitation*, 84(4), 465- 470. doi:10.1016/j.resuscitation.2012.12.016
- Taenzer, A. H. Postoperative Monitoring-the Dartmouth Experience.
- Taenzer, A. H., Pyke, J. B., McGrath, S. P. and Blike, G. T. (2010). Impact of Pulse Oximetry Surveillance on Rescue Events and Intensive Care Unit Transfers. *Anesthesiology*, 112(2), 282-287. doi:10.1097/aln.0b013e3181ca7a9b
- Vila, H., Smith, R. A., Augustyniak, M. J., Nagi, P. A., Soto, R. G., Ross, T. W., ... Miguel, R. V. (2005). The Efficacy and Safety of Pain Management Before and After Implementation of Hospital-Wide Pain Management Standards: Is Patient Safety Compromised by Treatment Based Solely on Numerical Pain Ratings?. *Anesthesia & Analgesia*, 101(2), 474-480. doi:10.1213/01.ane.0000155970.45321.a8
- Weinger, M. B. No Patient Shall be Harmed by Opioid-induced Respiratory Depression. 2014 CMS Recommendation for continuous monitoring reference page 23.
- Wright, A., Feblowitz, J., Phansalkar, S., Liu, J., Wilcox, A., Keohane, C. A., Seger, D. L., Bloomrosen, M., Kuperman, G. J., & Bates, D. W. (2012). Preventability of adverse drug events involving multiple drugs using publicly available clinical decision support tools. *American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists*, 69(3), 221-227. <https://doi.org/10.2146/ajhp110084>