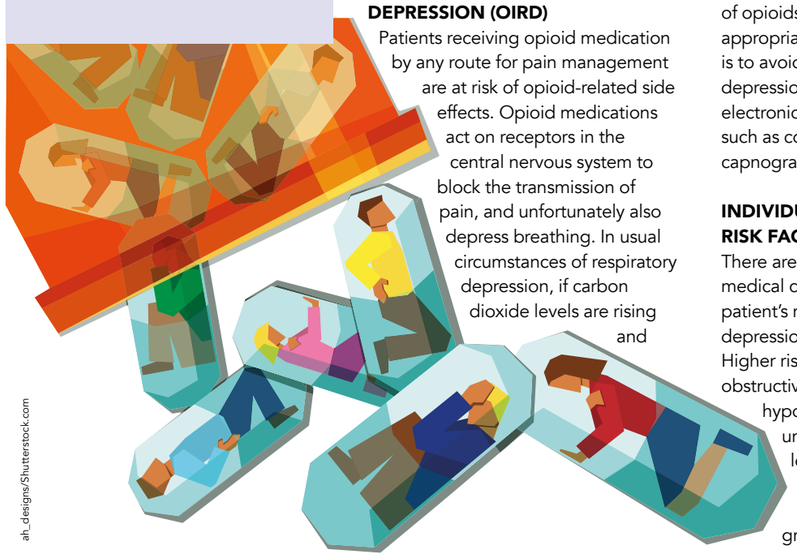
Patient safety and opioid medications

Hospitalised patients often require appropriate pain relief as part of their treatment. Opioids are effective medications for pain management, but can cause excessive sedation and respiratory depression resulting in patient harm. Dr Carla Jungquist of the University at Buffalo, School of Nursing, and a panel of fellow experts reviewed evidence from the past decade to provide an important update on the prevention of patient harm when using opioid medications for acute pain management. The information in this article will inform patients and their loved ones how to advocate for safe and effective pain management.

Fifty percent of patients that are hospitalised will receive opioid medications to control acute pain. Six out of every 1000 postoperative patient receiving opioids will experience a serious adverse event (Herzig, *et al,* 2014). One class of pain relief medication is the opioids, which include such medications as codeine, oxycodone, hydrocodone, buprenorphine, fentanyl, morphine and methadone. Whilst effective in relieving pain, opioids can also have undesired and potentially dangerous side effects. In 2011, the American Society for Pain Management Nursing published guidelines on monitoring hospitalised patients for opioid-induced respiratory depression. In 2019, a panel of 14 experts convened to review scientific evidence from the last decade to provide the following up-to-date revisions to these guidelines.

OPIOID-INDUCED RESPIRATORY DEPRESSION (OIRD)

Patients receiving opioid medication by any route for pain management are at risk of opioid-related side effects. Opioid medications act on receptors in the central nervous system to block the transmission of pain, and unfortunately also depress breathing. In usual circumstances of respiratory depression, if carbon dioxide levels are rising and oxygen levels falling, the body's response is to increase respiration to rectify this. By acting on receptors in the respiratory centre in the brain, opioids mute this response, which can lead to a lack of oxygen getting to the brain and in turn, brain injury and death. Death can occur if opioid-induced unintended advancing sedation (OIUAS) that advances to opioid-induced respiratory depression (OIRD) is not quickly recognised by the healthcare team.



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Adverse events from OIRD can occur in 0.6% to 4.2% of cases. To manage this, it is recommended that all patient and environmental risk factors should be assessed, quality measures implemented, opioid-related adverse events tracked, and all members of the healthcare team be educated on opioid-related risks to patients. In the event of life-threatening opioid-induced adverse events, naloxone (a medication used to block the respiratory depression effects of opioids) should be administered at an appropriate dose. But the best approach is to avoid excessive respiratory depression by early recognition using electronic respiratory monitoring devices such as continuous pulse oximetry, capnography or minute ventilation.

INDIVIDUAL PATIENT RISK FACTORS

There are certain characteristics and medical conditions that increase a patient's risk of developing respiratory depression from opioid medications. Higher risk characteristics include obstructive sleep apnea, obesity hypoventilation disorder, undernourished or obese (BMI less than 20 or more than 35), impaired kidney, liver, heart, or lung function, and/or age greater than 60 years.

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The review of the evidence of opioid medications for acute pain management will inform patients and their loved ones how to advocate for safe and effective pain management.

TREATMENT RISK FACTORS

It is common practice to use supplemental oxygen in the initial 24 hours following surgery. This is recommended for patients with intermittent or constant low oxygen levels after their procedures, but using higher concentrations of oxygen in patients that do not require it may lead to respiratory depression as well as dulling the ability to use pulse oximetry to recognise respiratory depression. Type of anaesthesia used is another factor, patients given a general anaesthetic are at higher risk of OIUAS and OIRD than patients given local anaesthesia.

HOW TO AVOID PATIENT HARM – ASSESS AND COMMUNICATE LEVEL OF RISK

It is the responsibility of the healthcare team to ensure patient safety. Before starting opioid and other sedating medications, patient's level of risk should be assessed. Risk should be reassessed throughout the patient's treatment. Electronic health records (EHRs) could facilitate this by providing a checklist for clinicians to follow during assessment, or by an alert system whenever a patient requires frequent opioid dosing, when other potentially sedative medications are given in addition to opioids, or when different formulations of opioids are used (for example, swapping from a long-acting to a short-acting medication).

Patients should educate themselves on their risk factors and advocate for opioid sparing pain management if they are at high risk.

A patient's plan of care should be based on the individual's level of risk, which may change over their hospitalisation period. Plans should be revised as necessary and communicated between all members of the team caring for the patient. Poor communication between team members increases the likelihood of adverse events. Patient safety can also be improved by communicating the patient's level of risk and monitoring recommendations to the patient themselves, as well as their family and the healthcare team, especially at shift changeovers.

Opioid drugs act on receptors in the central nervous system to block the transmission of pain.

Patients with obstructive sleep apnoea (a syndrome involving the stopping and starting of breathing whilst asleep, due to throat muscles relaxing and causing an obstruction) will be more likely to suffer brain injury or death following opioid-related respiratory arrest. Use of positive airway pressure therapy (treatment involving a constant flow of air to keep the airway open) following anaesthesia can reduce the incidence of adverse events in patients with obstructive sleep apnoea.

If OSA has been diagnosed and treated with PAP therapy at home, the patient should take their device with them to wear in the hospital or they should ask to use a hospital device.

Nausea and vomiting as well as muscle spasms are often treated with benzodiazepines and antihistamines/ antiemetic medications. These classes of medications increase respiratory depression and should be used very cautiously with opioid medications.

HOW TO AVOID PATIENT HARM – OPIOID SPARING PAIN MANAGEMENT

When a patient is found to be at higher risk, opioid sparing pain management strategies should be used. Multi-modal analgesia refers to the use of non-opioid medications and non-pharmacological therapies concurrently with low dose opioid medications to reduce the dose required of each individual component, and therefore reduce the risk of side effects.

Acetaminophen is one commonly used opioid-sparing pain relief medication, and has been shown to reduce the opioid requirement during surgery.

Nonsteroidal anti-inflammatory medications are also opioid-sparing, however can have side effects such as increased risk of bleeding and kidney failure, so individual patients should be assessed for these risks prior to use.

Anticonvulsant medications (including gabapentin and pregabalin) may cause increased sedation but do reduce the amount of opioid required and are not associated with opioid-induced adverse events.

Antidepressants may be used in the treatment of chronic pain, and may cause increased drowsiness if combined with opioids.

Clonidine is another drug used to treat pain which may offer opioid-sparing effects, although it may also cause increased sedation when used with opioids.

Functional Pain Scale (FPS)

Suggested FPS for Hospital Use
No pain
Tolerable: Able to perform *all* permitted activities
Intolerable: Able to perform *most* permitted activities
Tolerable: pain that becomes intolerable with movement and limits the ability to perform prescribed physical activities (e.g. out of room ambulation, or physical therapy)
Intolerable: Unable to perform prescribed activities requiring physical exertion. Passive activities* unaffected by pain
Intolerable: Unable to perform prescribed activities requiring physical exertion and passive activities* are limited by pain
Intolerable: *Unable to do anything* or even speak because of pain and exhibits constant pain behaviours (grimacing, moaning, etc.)

* Active activities include walking and activities of daily living. Passive activities include reading, watching TV, and talking on the phone. Redrawn from P. Arnstein *et al. Pain Management Nursing* 2019.

Patient care plans should be based on the individual's level of risk, which may change over their hospitalisation period.

Ketamine is an anaesthetic medication which can be used at low doses for pain relief. Evidence exists to support the use of ketamine at low doses to reduce opioid requirements without increasing the risk of respiratory depression. It is associated with many side effects even at low doses, including delirium, agitation, hallucinations and sedation.

Dexmedetomidine is a sedative drug which reduces opioid requirement and provides pain relief without increasing the risk of respiratory depression post-operatively.

Local aesthesia/nerve blocks are often used during procedures and have been found to reduce the amount of opioid medication required to control acute pain.

HOW TO AVOID PATIENT HARM – FUNCTIONAL PAIN ASSESSMENT

Traditionally, patients are asked to rate their level of pain using a 0–10 pain scale. Over the years, it has been found that using a 0–10 scale increases the likelihood of over medicating the patient. More recent research has shown that using a functional pain scale that assesses the patients' ability to perform necessary movements and tasks reduces the risk of overdosing with opioids medications. An example of a functional pain assessment is above. As an example for a hospitalised patient, the goal for treatment should be related to tasks such as deep breathing, ambulating in the hall, rolling over in bed, attending physical therapy, and/or conversing with visitors.

HOW TO AVOID PATIENT HARM – MONITORING RESPIRATORY STATUS

The nature, timing, frequency and intensity of patient monitoring of breathing should be based on level of risk. Patients should be reassessed throughout their treatment for any change in their risk levels and their response to pain treatments and care plan adjusted accordingly.

Specifically, during the first 24 hours after surgery or starting opioid medications, a patient's response to pain medications should be assessed by a nurse before administering an opioid medication, at the time when the opioid medication is at peak effect, and every two hours with intermittent assessments or continuous using electronic respiratory monitoring. The nursing assessment should include oxygen saturation, respiratory rate and quality of breath, and level of sedation as well as pain level. The goal for pain management should be related to functional tasks.

Whilst patients at risk of OIUAS and OIRD should be evaluated for continuous electronic monitoring, this should not be a replacement for regular assessments by a nurse. Continuous electronic monitoring of many patients at one time may lead to alarm fatigue, where members of staff become desensitised to frequent alerts, rendering them less effective and impacting patient safety.

The type of electronic monitoring used should depend on the patient, for example the presence of supplemental oxygen, their comfort and adherence to the monitoring device, and the capability of the device itself. Devices used include pulse oximetry (to measure oxygen saturation), the acoustic respiratory rate monitor, capnography (to measure carbon dioxide levels in the airways when exhaling), and the minute ventilation monitor (to measure the volume of air inhaled or exhaled per minute). Patients should be monitored for trends (change over time) in variables (such as respiratory rate, sedation level and ventilation parameters from electronic devices) to evaluate improvement, stability or worsening of any values. This can facilitate early detection of OIUAS and OIRD and therefore timely intervention when required.

Hospital policies should ensure that all members of the patient care team are effectively communicating with each other, especially at shift changes or transitions of care, to reduce the risk of opioid related adverse events. Having an appropriate ratio of staff to patients can also increase patient safety. Hourly rounding by nursing staff should include a brief observation of patient safety, breathing, and pain control.

EDUCATION AND POLICIES

Clinicians should be educated on best practices for evaluating patient risk for OIUAS and OIRD, assessing sedation level and respiratory status, use of trend monitoring, appropriate use of positive airway pressure therapy, and early interventions if adverse events occur. Hospitals can improve patient safety by developing policies that focus on clinician, patient and family education on risks and monitoring procedures.

Behind the Research

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Detail

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Bio

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Research Objectives

Dr Carla Jungquist's research promotes safe and effective pain management. Specifically, she explores the interdependent relationship between pain, sleep and opioids.

References

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Personal Response

What can patients do to minimise risk of OIUAS and OIRD when being treated with opioid medications?

1. Patients and their family should be educated that pain is a necessary protective mechanism and the goal for management of pain should be directed at ability to perform necessary tasks. The goal should never be "no pain". Necessary tasks are ability to breathe, to take deep breaths, to move self in and out of bed or if limited to bed activity only, to be able to re-position self. In cases when the patient is not able to communicate their pain, the nurses will make observations for behaviours or facial expression thought to be pain related. The goal for pain management should always be related to function.
2. If the patient has been diagnosed with obstructive sleep apnea, they must use CPAP therapy when hospitalised. They should take their device with them or ask the hospital for a loaner device. Make sure the healthcare team has screened them for sleep apnea and applied PAP therapy or instituted opioid sparing pain treatment if they screen positive.
3. The patient or family member should ask the healthcare team how their breathing will be monitored. All patients at higher risk should ask to be continuously monitored with electronic devices.