

# Chapter 14

## Management of Pain in the ICU



### 14.1 Introduction

Pain management is a critical component of care in the intensive care unit (ICU). Critically ill patients often experience pain from various sources, including surgical procedures, trauma, mechanical ventilation, and invasive monitoring devices. Uncontrolled pain can lead to adverse outcomes such as increased stress responses, hemodynamic instability, impaired wound healing, prolonged mechanical ventilation, and the development of chronic pain syndromes. This chapter outlines a systematic approach to pain assessment and management in the ICU, emphasizing the use of appropriate assessment tools, differentiation of pain types, and implementation of multimodal analgesia strategies to optimize patient comfort while minimizing opioid-related side effects [1] (Ref. Algorithm 14.1).

#### 1. Assess the Patient's Ability to Communicate

- **Clinical Considerations:** Determine if the patient can self-report pain. Factors such as sedation, mechanical ventilation, delirium, or cognitive impairment may hinder communication.
- **Action:** If the patient is able to communicate, utilize self-reporting tools like the Numeric Rating Scale (NRS), where the patient rates their pain on a scale from 0 (no pain) to 10 (worst possible pain).

#### 2. Use Behavioral Pain Assessment Tools for Noncommunicative Patients

- **Clinical Considerations:** For patients unable to self-report, employ validated behavioral pain assessment tools such as the Behavioral Pain Scale (BPS) or the Critical-Care Pain Observation Tool (CPOT) [2].

### Description of Tools:

- **BPS:** Assesses facial expression, upper limb movements, and compliance with mechanical ventilation, with scores ranging from 3 (no pain) to 12 (maximum pain).
- **CPOT:** Evaluates facial expressions, body movements, muscle tension, and compliance with the ventilator or vocalization, with scores ranging from 0 to 8.
- **Action:** Train staff on the proper use of these tools to ensure accurate and consistent pain assessment.

### 3. Identify the Type and Source of Pain

#### Types of Pain:

- **Acute Pain:** Typically arises from recent injury, surgery, or acute illness.
- **Chronic Pain:** Persistent pain existing before ICU admission, such as due to arthritis or neuropathy.
- **Neuropathic Pain:** Results from nerve injury, characterized by burning or tingling sensations.
- **Clinical Considerations:** Identifying the pain type guides the selection of appropriate analgesic agents. Neuropathic pain may require adjunctive medications not typically used for nociceptive pain.

### 4. Manage Mild Pain (NRS 1–3, BPS 3–4, CPOT 0–2)

#### Pharmacological Interventions:

- Administer non-opioid analgesics such as acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs), provided there are no contraindications (e.g., liver dysfunction for acetaminophen, renal impairment or bleeding risk for NSAIDs) [3].

#### Non-pharmacological interventions:

- Reposition the patient to alleviate discomfort.
- Apply ice or heat packs as appropriate.
- Ensure optimal body alignment and supportive devices.

Drug doses and side effects are given in Table 14.1.

#### *Note*

- **Acetaminophen:** IV formulation should be used cautiously in patients with liver dysfunction. Oral and rectal routes may have variable absorption, especially in critically ill patients.
- **NSAIDs (Ibuprofen, Ketorolac):** Should be used cautiously in patients with renal impairment or those at risk for gastrointestinal bleeding. Limit the duration of Ketorolac to 5 days to minimize risk of adverse effects.

**Table 14.1** Pharmacotherapy in pain

Drug class	Drug	Initial dose	Max dose	Duration of action	Monitoring for side effects
Non-opioid	Acetaminophen	650 mg orally/ rectally q6h; 1 g IV q6h	4 g/day (oral/ rectal); 4 g/day (IV)	4–6 h	Monitor for liver toxicity, especially in liver disease patients
NSAID	Ibuprofen	400–800 mg orally q6h	3200 mg/day	4–6 h	Monitor for GI bleeding, renal impairment, and cardiovascular events
NSAID	Ketorolac	15–30 mg IV/IM q6h	120 mg/day (IV/IM) for 5 days	4–6 h	Monitor for GI bleeding, renal impairment, and increased risk of bleeding
NSAID	Celecoxib	100–200 mg orally q12h	400 mg/day	12–24 h	Monitor for cardiovascular events and renal function
Opioid	Morphine	2–4 mg IV q1-2h	No max dose, titrate to effect	3–4 h	Monitor for respiratory depression, hypotension and constipation
Opioid	Fentanyl	25–100 mcg IV q1-2h	No max dose, titrate to effect	1–2 h (IV bolus)	Monitor for respiratory depression and bradycardia
Opioid	Hydromorphone	0.2–0.6 mg IV q2-3h	No max dose, titrate to effect	3–4 h	Monitor for respiratory depression, hypotension, and sedation
Opioid	Remifentanyl	0.5–1 mcg/kg/min IV infusion	No max dose, titrate to effect	5–10 mins (infusion)	Monitor for rapid onset and offset respiratory depression
Opioid adjunct	Ketamine	0.1–0.3 mg/kg IV bolus, then 0.1–0.2 mg/kg/hr. infusion	No max dose, titrate to effect	5–10 mins (bolus); 30 min (infusion)	Monitor for dissociative reactions, hypertension, and tachycardia

(continued)

**Table 14.1** (continued)

Drug class	Drug	Initial dose	Max dose	Duration of action	Monitoring for side effects
Neuropathic	Gabapentin	100–300 mg orally q8h	3600 mg/day	6–8 h	Monitor for sedation, dizziness, and renal function
Neuropathic	Pregabalin	50–150 mg orally q12h	600 mg/day	6–8 h	Monitor for sedation, dizziness, and peripheral edema
Local anesthetic	Lidocaine IV	1.5 mg/kg IV bolus, then 1–2 mg/min infusion	3 mg/kg/hr. infusion	10–20 mins (bolus)	Monitor for cardiac arrhythmias and CNS toxicity
Opioid adjunct	Dexmedetomidine	0.2–1 mcg/kg/hr. IV infusion	1.5 mcg/kg/hr	1–2 hours	Monitor for bradycardia, hypotension, and sedation

- **Opioids (Morphine, Fentanyl, Hydromorphone, Remifentanyl):** Titrate to patient response while monitoring closely for respiratory depression, sedation, and gastrointestinal side effects. Remifentanyl's short duration makes it suitable for procedures requiring rapid recovery.
- **Ketamine:** Useful for pain management in patients who are at risk of opioid side effects. Monitor for potential psychological side effects.
- **Gabapentin and Pregabalin:** Primarily used for neuropathic pain. Adjust doses in patients with renal impairment and monitor for CNS side effects.
- **Lidocaine IV:** Continuous monitoring is necessary due to potential for cardiac and CNS toxicity, especially with prolonged infusions.
- **Dexmedetomidine:** Provides sedative and analgesic effects without significant respiratory depression. Monitor for bradycardia and hypotension, especially at higher doses.

## 5. Manage Moderate Pain (NRS 4–6, BPS 5–6, CPOT 3–5)

### Pharmacological Interventions:

- Continue non-opioid analgesics.
- Add low-dose opioids such as intravenous morphine, fentanyl, or hydromorphone.
- Consider adjunctive agents like low-dose ketamine, especially in patients with opioid tolerance or neuropathic pain components.

### Clinical Considerations:

- Ketamine, an NMDA receptor antagonist, provides analgesia with minimal respiratory depression at sub-anesthetic doses.
- Regional anesthesia techniques (e.g., nerve blocks, epidurals) may be considered when feasible.

## 6. Manage Severe Pain (NRS 7–10, BPS 7–12, CPOT 6–8)

### Pharmacological Interventions:

- Administer higher doses of opioids, titrating to effect while monitoring for side effects.

Use multimodal analgesia by adding adjunctive medications such as:

- Gabapentinoids (gabapentin or pregabalin) for neuropathic pain.
- Ketamine for opioid-sparing effects.
- Lidocaine infusions (with caution and monitoring) in select patients.

### Clinical Considerations:

- Monitor for opioid-induced adverse effects: respiratory depression, sedation, gastrointestinal dysmotility.
- Frequent reassessment is essential to balance analgesia with safety.

## 7. Reassess Pain Regularly and Adjust Treatment

### Clinical Practice:

- Reassess pain at regular intervals, such as every 30–60 mins after initiating or adjusting therapy, and before and after procedures known to cause pain.
- Use the same pain assessment tool consistently to monitor trends.

### Action:

- Adjust analgesic regimens based on reassessment findings.
- Implement preemptive analgesia before painful procedures (e.g., dressing changes, repositioning) to reduce procedural pain.

## 8. Implement Multimodal Analgesia

- Principle: Utilize a combination of medications and techniques that act on different pain pathways to enhance analgesia and reduce reliance on opioids.

### Components:

- Non-opioid analgesics: Acetaminophen, NSAIDs.
- Adjuvant medications: Gabapentinoids, ketamine, alpha-2 agonists (e.g., dexmedetomidine).
- Regional anesthesia: Nerve blocks, epidural analgesia where appropriate.

### Benefits:

- Improved pain control.
- Reduction in opioid consumption and associated side effects.

## 9. Address Special Considerations

### Delirium and Sedation:

- Avoid over-sedation, which can mask pain and delay recovery.
- Use sedation protocols that prioritize analgesia-first approaches (analgo-sedation).

### Communication Barriers:

- Employ alternative communication methods (e.g., communication boards) to facilitate self-reporting in patients with speech impairments.

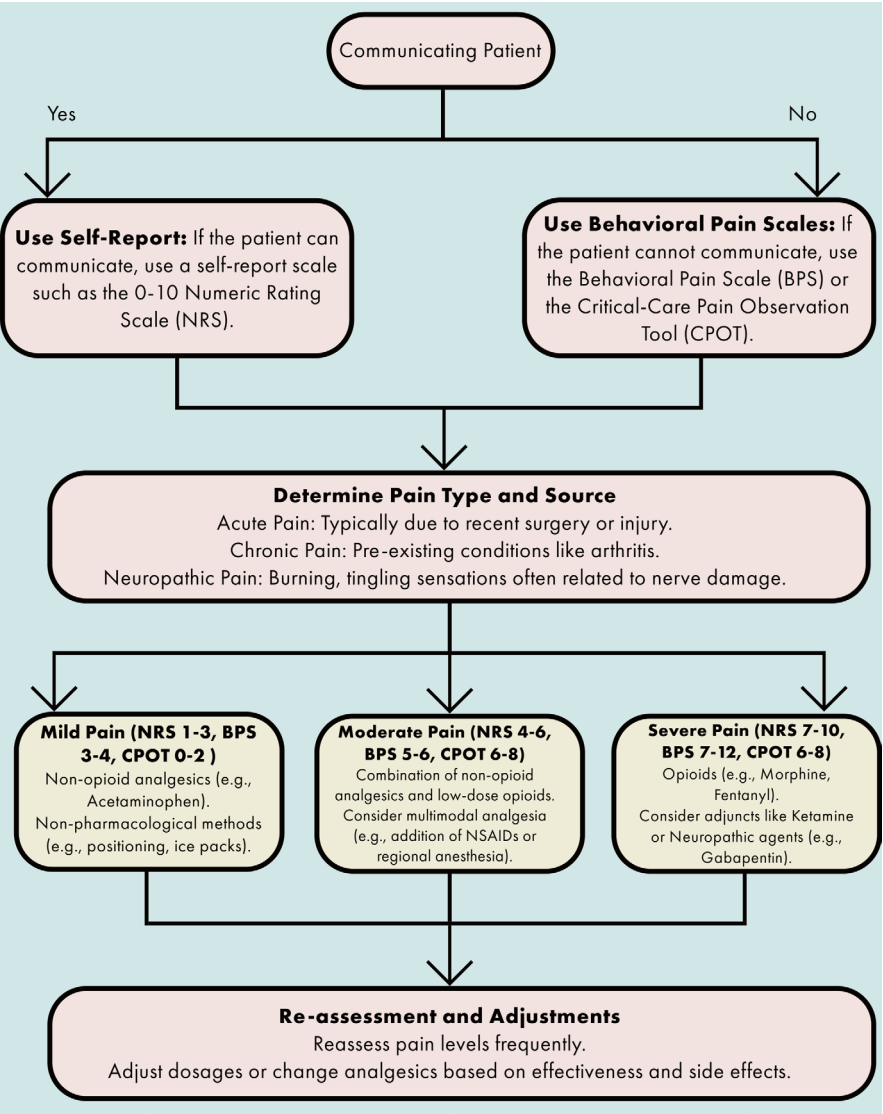
### Patient-Specific Factors:

- Adjust analgesic choices based on organ function (e.g., renal or hepatic impairment), allergy history, and potential drug interactions.

## 14.2 Conclusion

Effective pain management in the ICU requires a systematic approach that includes accurate assessment, identification of pain type, and implementation of individualized treatment plans. Utilizing validated assessment tools like NRS, BPS, and CPOT ensures consistent and reliable pain evaluation. A multimodal analgesia strategy, incorporating non-opioid analgesics and adjuvant therapies alongside opioids when necessary, optimizes pain control while minimizing adverse effects. Regular reassessment and adjustment of the analgesic regimen are crucial, as is the use of preemptive analgesia for painful procedures. By prioritizing pain management, ICU clinicians can improve patient comfort, facilitate recovery, and enhance overall outcomes.

Algorithm 14.1: Management of pain in the ICU



## Bibliography

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2. Zhai Y, Cai S, Zhang Y. The diagnostic accuracy of critical care pain observation tool (CPOT) in ICU patients: a systematic review and meta-analysis. *J Pain Symptom Manag*. 2020;60(4):847–56.e13.
3. Zhao H, Yang S, Wang H, Zhang H, An Y. Non-opioid analgesics as adjuvants to opioid for pain management in adult patients in the ICU: a systematic review and meta-analysis. *J Crit Care*. 2019;54:136–44.