Patient-Controlled Analgesia (PCA)

Self-administered IV Opioid Delivery System

Class: Opioid Analgesic | **System: Pain Management** | **HIGH-ALERT Medication**

Common drugs: Morphine • Hydromorphone (Dilaudid) • Fentanyl

1. Drug Overview

- **What it is:** Programmed IV pump that delivers opioid bolus when patient presses button
- **Goal:** Steady-state pain control; avoid PRN peaks/troughs
- **Indications:** Post-op pain, cancer pain, sickle cell crisis, trauma, labor, burns
- **Components:** Demand dose + lockout interval (± basal/continuous rate)
- **Key benefit:** Patient autonomy + faster pain relief than calling nurse for PRN

2. Mechanism of Action

- Opioid → binds **mu (μ) receptors** in CNS
- → ↓ pain perception + ↑ pain tolerance
- → CNS depression (drowsiness, ↓ RR)
- Pump releases preset bolus on button press
- **Lockout** = minimum time between doses (prevents stacking)
- Basal rate = continuous background infusion

⚠ **Basal rates are NOT routine for opioid-naïve patients — ↑ respiratory depression risk**

🟧 3. Therapeutic Effects

- Pain score ↓ to patient's acceptable level (often ≤4/10)
- Improved ability to **cough, deep breathe, ambulate**
- ↓ Anxiety and restlessness
- Improved sleep and appetite
- Patient reports tolerable pain without oversedation

✅ SIGNS IT'S WORKING:

- Pain score decreased from baseline
- Patient using button appropriately (not too frequent/rare)
- RR ≥12, alert, engaging in recovery activities

🟩 4. Side Effects & Adverse Reactions

COMMON:

- Nausea / vomiting
- Constipation (give stool softener!)
- Pruritus (itching)
- Urinary retention
- Dry mouth, mild sedation

SERIOUS 🚨:

- **RESPIRATORY DEPRESSION** (RR <12) — #1 killer
- Oversedation → unresponsive
- Hypotension, bradycardia
- Ileus / severe constipation

🚨 **Opioid Toxicity Triad: PINPOINT pupils • RESPIRATORY depression • COMA**

5. Priority Nursing Considerations

→ ASSESS / MONITOR:

- **Respiratory rate & depth** (q1–2h × 24h, then q4h)
- **Sedation scale** (POSS — Pasero scale)
- Continuous SpO_2 ± **capnography ($EtCO_2$)** — most sensitive
- Pain score, BP, HR, LOC, bowel sounds
- Button press history (attempts vs delivered doses)

→ HOLD / STOP PCA IF:

- RR <10–12 breaths/min
- SpO_2 <90%
- Sedation score 3–4 (difficult to arouse)
- Systolic BP drop / hypotension

CONTRAINDICATIONS:

- Altered mental status / confusion (can't self-dose)
- Inability to understand concept
- Known opioid allergy
- Severe untreated sleep apnea (relative)

💊 **Interactions: CNS depressants (benzos, alcohol, sleep aids) → additive respiratory depression**

6. Labs & Diagnostics

- **Capnography ($EtCO_2$):** Earliest sign of hypoventilation — rises BEFORE SpO_2 drops
- **SpO_2:** Late indicator (can be falsely reassuring with supplemental O_2)
- **LFTs:** Baseline — opioids metabolized in liver
- **BUN/Creatinine:** Morphine metabolites accumulate in renal failure → prefer hydromorphone or fentanyl
- No routine "therapeutic level" lab — dose to clinical effect

📊 **Critical values: RR <10, SpO_2 <90%, $EtCO_2$ >50 mmHg → intervene NOW**

7. Administration & Safety

- **Route:** IV (most common), subcutaneous, epidural
- **HIGH-ALERT medication** per ISMP
- **TWO-NURSE independent double-check** at:
  - Initial pump setup
  - Concentration or drug changes
  - Shift handoff
  - Syringe/bag changes
- Verify: patient, drug, concentration, demand dose, lockout, basal rate, 1-hr limit
- **Keep naloxone (Narcan) at bedside**
- Use dedicated IV line or anti-reflux valve
- Continuous pulse ox + capnography for high-risk patients

⛔ **NO PCA BY PROXY — ONLY the patient presses the button. Never family, visitors, or nurses (outside of nurse-controlled protocol).**

8. Patient Education

- "Press the button when pain **starts** — don't wait until severe"
- "The pump has a **lockout** — you cannot overdose by pressing too often"
- **"ONLY YOU press the button** — never family, friends, or visitors"
- Expect: constipation (take stool softener), nausea, possible itching — these usually ease
- Report: difficulty breathing, extreme drowsiness, inability to urinate, uncontrolled pain
- Don't be afraid to use it — controlled pain = faster recovery
- After discharge: NO alcohol, sleeping pills, or other opioids without provider approval

9. NCLEX Test Traps ⚠️

- **TRAP #1:** "Family pressing button because patient is sleeping" → ❌ NEVER. Teach family, don't allow.
- **TRAP #2:** Patient reports 8/10 pain but RR is 10 → **HOLD the PCA**. Respiratory status > pain score.
- **TRAP #3:** First action for respiratory depression = **STOP the pump** (not "call the doctor" first, not "give naloxone" first — STOP infusion, stimulate, support airway).
- **TRAP #4:** Confused/disoriented patient = NOT appropriate candidate — cannot self-administer safely.
- **TRAP #5:** SpO_2 94% on 2L — do not be reassured. Assess **RR and sedation** (capnography catches it first).
- **TRAP #6:** Sedation precedes respiratory depression → increasing sedation score is the earliest warning.
- **TRAP #7:** Basal rate for opioid-naïve post-op patient → red flag; question the order.
- **TRAP #8:** Patient pressing button frequently with no relief → assess for tolerance, pump malfunction, or wrong dose — NOT drug-seeking assumption.
- **TRAP #9:** Naloxone has a **shorter half-life than most opioids** → monitor for re-sedation, may need repeat doses.
- **TRAP #10:** "Nurse-activated dosing" is allowed in some protocols (NCA) — but PCA-by-proxy (family) is never permitted.

10. Memory Boosters

- **"PCA = Patient, and only Patient, pushes"**
- **Opioid Toxicity = 3 P's: P**inpoint pupils • **P**ause (respiratory depression) • **P**assed out (coma)
- **"Narcan Narrows the Narcotic"** — naloxone reverses opioid effects
- **Sedation precedes respiratory depression** — the POSS scale is your early warning
- **"RR before BP"** for opioid assessment priorities
- 🚨 **5 S's for Respiratory Depression:**
  - **S**top the PCA
  - **S**timulate the patient
  - **S**upport airway/O_2/positioning
  - **S**ummon help (rapid response/provider)
  - **S**upply naloxone per order
- **Morphine in renal failure?** "Morphine Makes Metabolites" — they accumulate → pick hydromorphone or fentanyl

💊 Most Tested Opioids Used in PCA

Drug	Key NCLEX Points	Best For / Avoid
Morphine	Gold standard; causes histamine release (itching, hypotension); active metabolites	✅ Typical post-op ❌ Renal failure
Hydromorphone (Dilaudid)	~7× more potent than morphine; less histamine release; safer in renal dysfunction	✅ Renal impairment, morphine allergy ⚠️ Dose errors common — verify concentration
Fentanyl	Rapid onset, short duration; minimal histamine; safe in renal failure	✅ Hemodynamically unstable, renal failure ⚠️ Rigid chest wall with rapid IV push
Meperidine (Demerol)	Neurotoxic metabolite (normeperidine) → seizures; avoid in elderly and renal impairment	❌ Rarely used for PCA anymore ❌ NEVER with MAOIs

🧠 CLINICAL JUDGMENT SNAPSHOT

❓ What is the #1 priority risk with PCA?

RESPIRATORY DEPRESSION leading to hypoxia, respiratory arrest, and death. All other side effects are secondary.

❓ What will harm the patient FIRST?

Progressive sedation → hypoventilation → rising CO_2 → hypoxia. Sedation is the earliest warning; capnography detects it before SpO_2 drops.

❓ FIRST nursing action when patient has RR 8 and is difficult to arouse?

1. **STOP the PCA pump immediately**
2. Stimulate the patient + open airway (head tilt-chin lift / jaw thrust)
3. Apply O_2, position to maintain airway, bag-mask if needed
4. Call for help / activate rapid response
5. Administer **naloxone (Narcan)** IV per order — titrate to RR, not full alertness
6. Continuous monitoring — watch for re-sedation (naloxone half-life < opioid half-life)
7. Document event and notify provider

❓ FIRST action if family member says "I've been pressing the button for her while she sleeps"?

Stop the pump, assess the patient immediately (RR, LOC, SpO_2), and educate the family that PCA by proxy is unsafe and not permitted. Document the event and notify the provider — patient may need naloxone and closer monitoring.