ANALGESIA

INTRODUCTION

- 30 - 70% of ICU patients endorse some level of pain during their ICU stay
- >50% of these patients rate their pain as moderate to excruciating
- 50% of ICU patients report pain as their worst ICU memory
- Routine analgesia is important in ICU because:
    - Reduces pain & anxiety commonly seen in trauma & critically ill patients thereby reducing post traumatic stress disorder (PTSD) that is being increasingly recognized in these patients
    - Unrelieved pain evokes stress response (tachycardia, hypercoagulability)
    - Useful to maintain a level of comfort in critically ill patients that are mechanically ventilated reducing ventilator asynchrony
- A major barrier to effective management of pain in the ICU is under-recognition of pain, inaccurate assessment of pain, and incomplete achievement of satisfactory analgesic goals.
    - A liberal goal of <3/10 on the VAS has been suggested
    - Use of the Visual Analog Scale, 0 = no pain to 10 = worst pain in life, is useful in patients who are alert and aware.
    - These models are not validated in the ICU setting
- In semiconscious, sedated, or comatose patients, proxies for subjective reports of pain are grimacing and/or writhing along with tachycardia, hypertension, and diaphoresis
- *Some literature has suggested that all ICU patients should be presumed to have pain*.

Pain Physiology

Local tissue damage causes a release of pro-inflammatory and pro-nociceptive mediators such as bradykinin, Substance P, prostaglandins, and intracellular K+ along *with* histamine and 5-HT. This leads to sensitization of nociceptors (TRP receptors) and fibers (Aδand c-fibers) thus increased firing and transmission to CNS occurs.

- Pharmacological intervention:
    - limiting production of mediators (NSAIDS)
    - inhibition of transmission (local anesthetic blockade)
    - alteration of CNS pain perception (opioids, APAP)
- NSAIDS and APAP are adjuncts in the ICU setting. Be wary of high-dose NSAIDS or Ketorlac with renal insufficiency as prolonged treatment can result in ulcers or hypoperfusion (renal ischemia).

Assessment

- Best way to assess pain: Ask pt. Use Numerical Rating Scale 0-10.
- If unable to directly communicate, physiological parameters (HR, BP, RR) or subjective observation of pain-related behaviors (facial expression, movement, posturing).

Opioid Analgesics

- Mediate analgesia by interacting with the opiate receptors located both centrally (CNS) and peripherally (spinal cord)

- Preventing pain more effective than treating established pain
    - Continuous infusion or scheduled doses preferred over PRN to ensure consistent analgesia
    - PCA used if patient can use the device
- Adverse Effects of opioids:
    - Respiratory depression
    - Hypotension may occur in hemodynamically unstable or hypovolemic patients
    - Opioid-induced depression & hallucination
    - Constipation

Recommended opioids include:

- Fentanyl:
    - Preferred for rapid onset of analgesia in acutely distressed patients
    - Has the most rapid onset & shortest duration of action
    - Preferred for patients with hemodynamic instability
    - No active metabolites in fentanyl, so no dosage adjustment needed in renal failure
    - Fentanyl preferred over morphine: fentanyl is faster acting because it is much more lipophilic as compared to morphine (580:1), but also prolonged effects if infused >4h; has no active metabolites; less likely to decrease BP (morphine causes histamine release resulting in vasodilation and thus hypotension)
    - Fentanyl patches not recommended for acute analgesia (12-24h delay to peak effect)
- Hydromorphone:

        - Preferred for patients with hemodynamic instability or renal insufficiency
        - Intermittent duration of action, lacks significant active metabolite or histamine release
    - Morphine:
        - Preferred for intermittent therapy b/c of longer duration of action
        - Causes histamine release
        - Has active metabolite and may cause prolonged sedation especially in renal insufficiency

Opiophobia Rules Of Thumb:

1. Opioid use in hospitalized pts does not cause drug addiction
2. Effective opioid dose should be determined by patient response, rather than by some predetermined notion of what an effective dose ought to be.

	MORPHINE	FENTANYL	HYDROMORPHONE
EQUIANALGESIC DOSING (IV)	10 mg	100mcg	2mg
DOSE (IV)	2-10 mg q1-4hrs	50-100mcg q 1 hr Continous infusion: 1.5mcg/kg/hr	0.5mg-2mg q 2-4hrs

ONSET/ PEAK / DURATION OF ACTION (IV)	10 min/15-20min/3-5hrs	Rapid/5min/30-60min	15 min/15-20min/4-5hrs
HALF LIFE (hrs)	3-7	1.5-6	2-3
METABOLISM	Glucoronidation	Oxidation	Glucoronidation
EXCRETION	Renal	Renal	Renal
ACTIVE METABOLITE	Yes	No, parent accumulates	No
ADVERSE EFECTS	Rigidity in high dose	Histamine release	

Non-Opioid Analgesics

- Ketorolac:
    - IV NSAID (noncompetitive inhibition of COX enzyme)
    - Opioid sparing effect; can reduce concomitant opioid dose by 25-30%.
    - Should not be used >5 days
    - Associated with 2X increased risk of GI and operative-site bleeding, with greatest risk age>65.
    - Adverse effects: GI bleeding, bleeding secondary to plt inhibition, renal insufficiency.