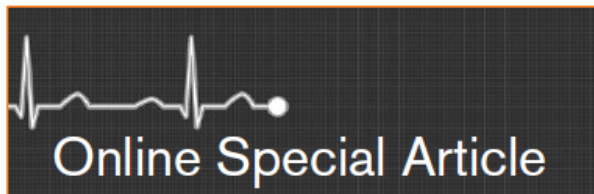




Spreading Knowledge – Improving Outcomes

Pharmacologic Management of Pain in the ICU

Pain Management in the ICU

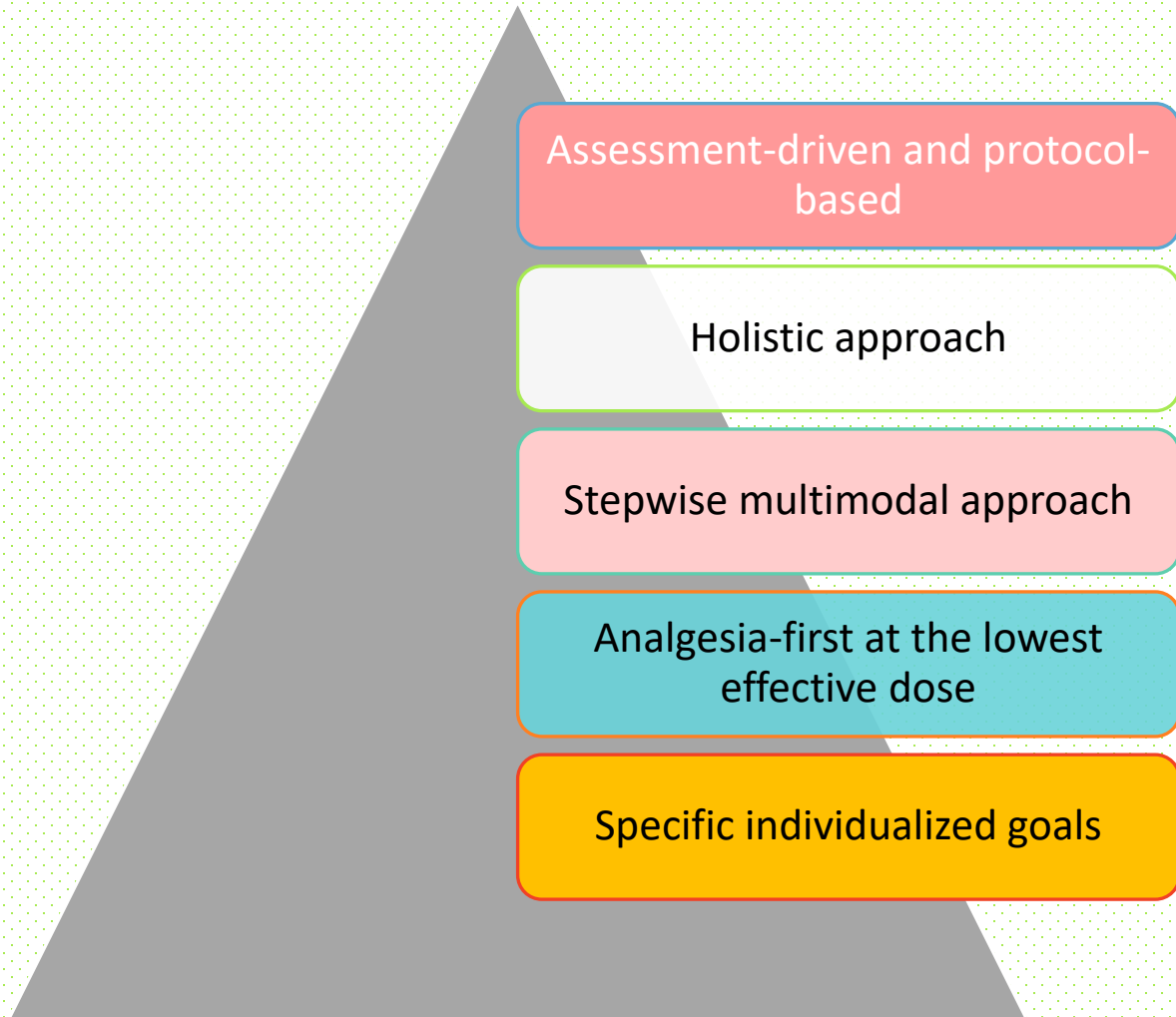


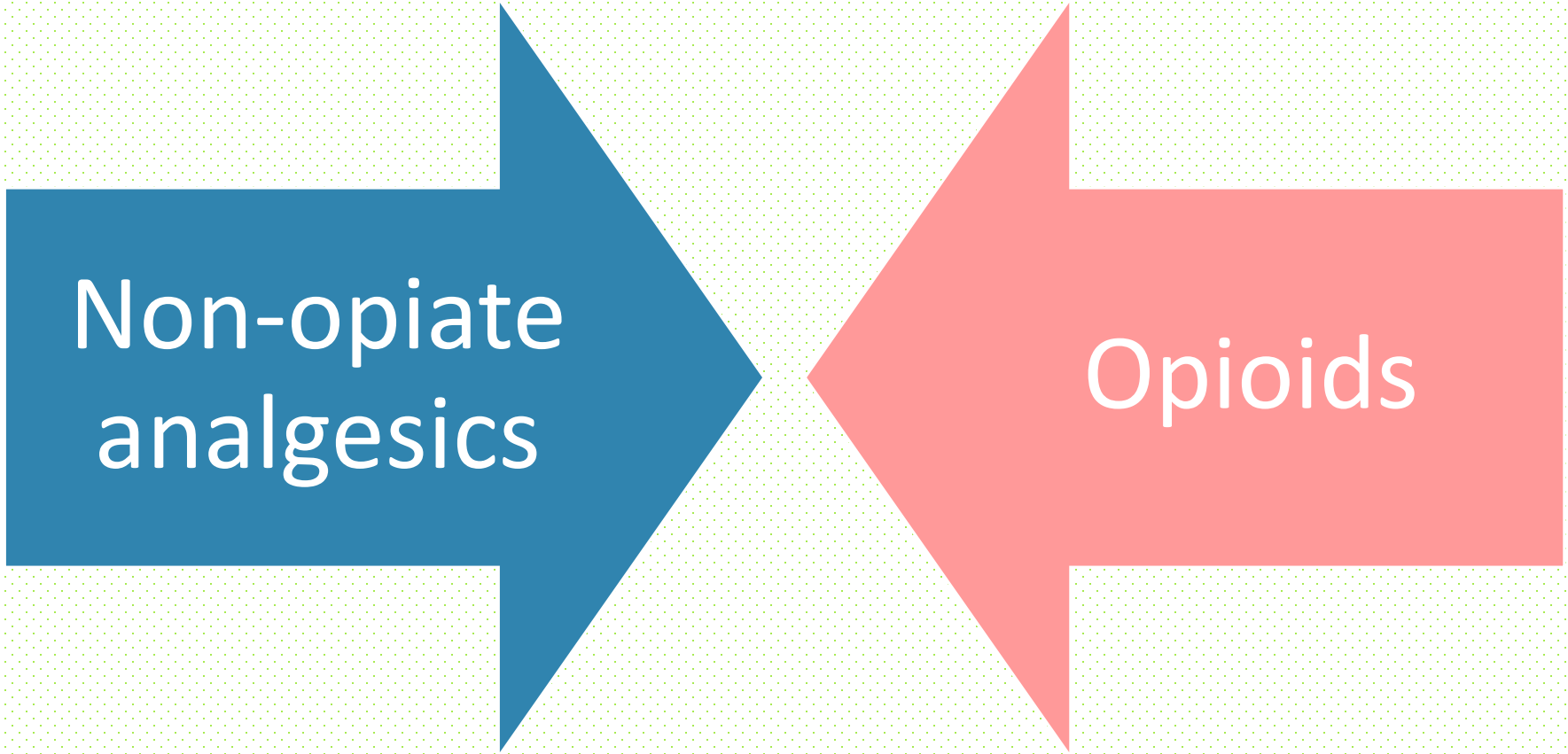
Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU

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Principles of Pain Management in the ICU





Non-opiate
analgesics

Opioids



Opioid Receptors

MOP

- Analgesia, sedation, respiratory depression, bradycardia, GI effects, tolerance, and addiction

DOP

- Spinal and supraspinal analgesia in pro-inflammatory states, and reduced gastric motility

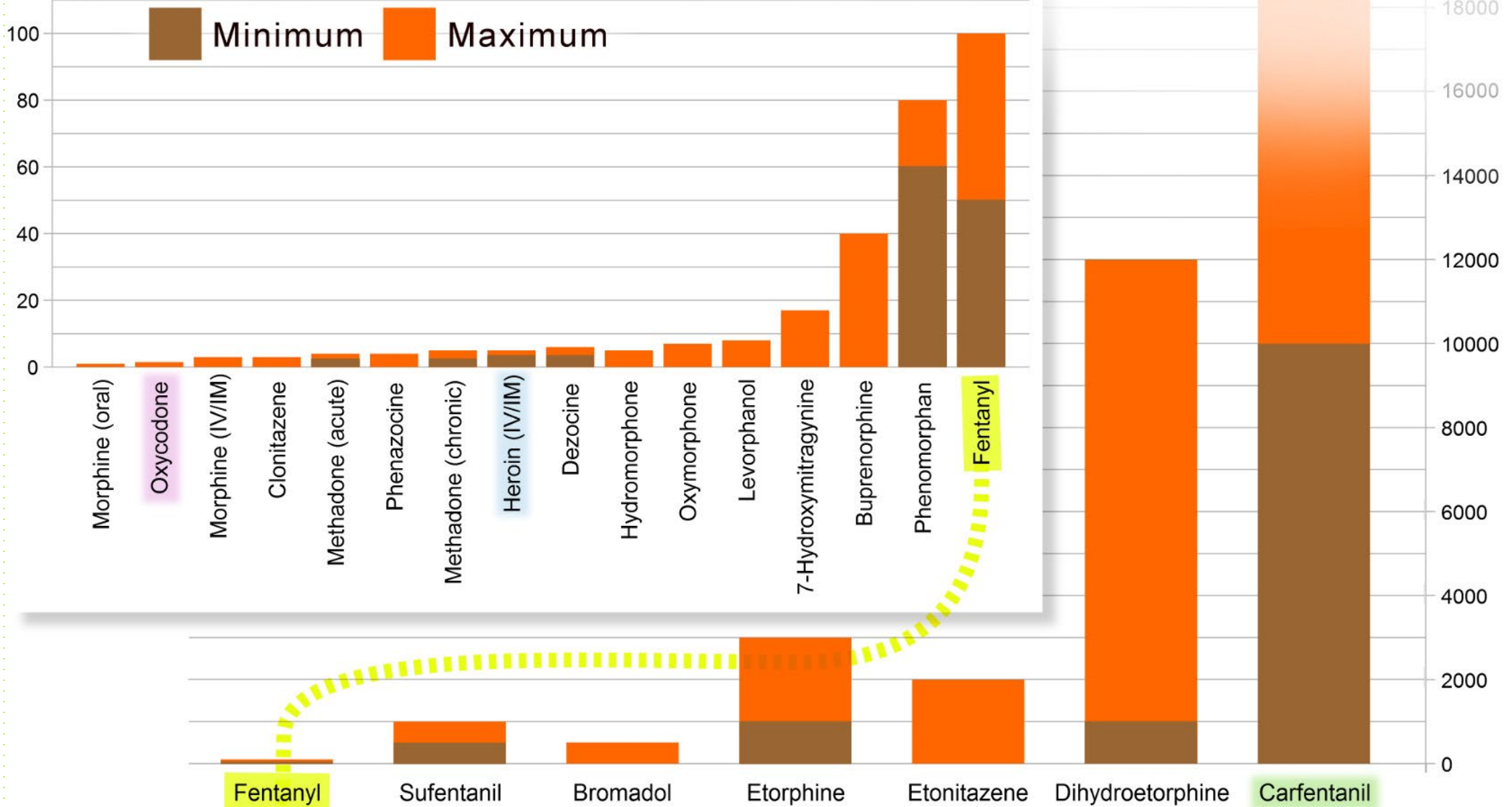
KOP

- Spinal analgesia, diuresis, and dysphoria

NOP

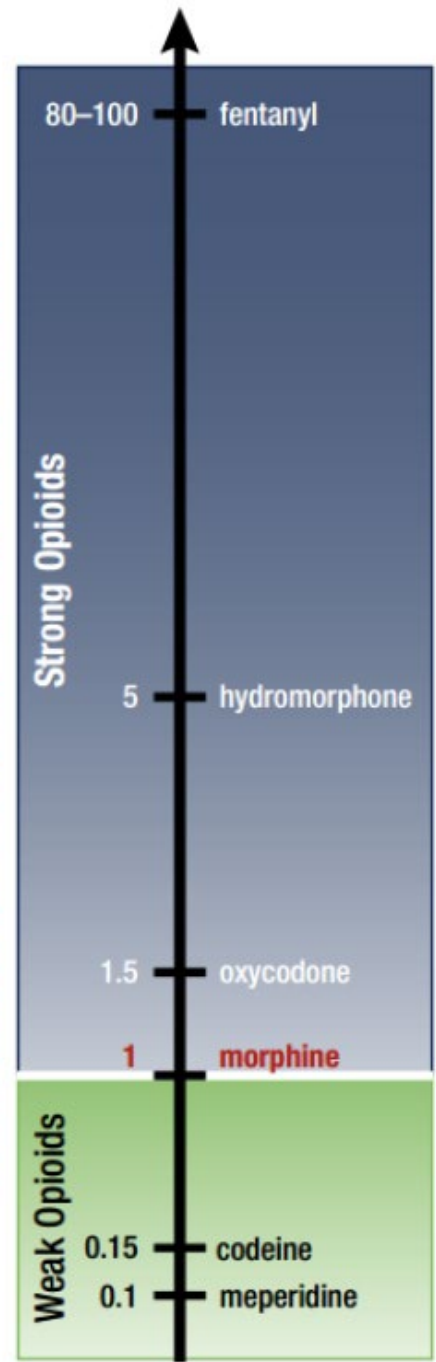
- Nociception, diuresis, heart rate, anxiety

Relative strength of opioid painkillers





Relative Strength of Opioids – Morphine Equivalents



Relative Strength of Opioids

Fentanyl

Opioid Receptor	PK	Dose Adjustments	Metabolism	Active Metabolites	Drug Interactions
Mu agonist	IV onset: 1-2 min t1/2: 2-4 hours	Accumulation with hepatic impairment	CYP3A4 substrate	None	SSRI/SNRI/MAOI: Serotonin syndrome

Hydromorphone

Opioid Receptor	PK	Dose Adjustments	Metabolism	Active Metabolites	Comments
Primary: mu agonist Secondary: delta and kappa agonist	IV onset: 5-15 min t1/2: 2-3 hours	Accumulation with renal and hepatic impairment	Glucuronidation	Hydromorphone-3-glucuronide (H3G)	Accumulation of H3G can result in neuroexcitatory adverse effects

Morphine

Opioid Receptor	PK	Dose Adjustments	Metabolism	Active Metabolites	Comments
Mu agonist	IV onset: 5-10 min t1/2: 3-4 hours	Accumulation with renal and hepatic impairment	Glucuronidation	Morphine 6- and 3-glucuronide metabolites	Histamine release Accumulation of M3G can result in neuroexcitatory adverse effects

Pharmacology of Non-Opiate Analgesics

Agent	Onset	Elimination Half-Life	Metabolism	Active Metabolites	Side Effects
Acetaminophen	30-60min	2 – 4 hr	Glucuronidation, sulfonate	None	Avoid caution with significant hepatic impairment
Ketamine	30-40s	2 – 3 hr	N-demethylation	Norketamine	Attenuates acute tolerance to opioids; May cause hallucinations and other psychological disturbances
Gabapentin	N/A	5 – 7 hr	Renal excretion	None	Sedation, confusion, dizziness, ataxia. Dose adjust in renal failure Abrupt discontinuation assoc with withdrawal
Ketorolac	10 min	2 – 8 hr	Hydroxylation, conjugation/renal excretion	None	Avoid in renal dysfunction, GI bleeding, ACEI use, CHF, platelet abnormalities



Thank You

