Pain Management

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Definition

* Pain is the most common symptoms that brings a pt to a physician's attention

* Management depends on determining its cause, alleviating triggerings and potentiating factors and providing rapid relief whenever possible.

* Pain may be a somatic (skin, joints, Muscle), Visceral or neuropathic (Injury to nerves), Spinal Cord pathways or thalamus)

Origin.

Neuropathic pain

* Neuralgia : Pain in the distribution of a single nerve, as in trigeminal neuralgia

* Dysesthesia : Spontaneous, unpleasant, abnormal sensations.

* Hyperalgesia and Hyperesthesia : Exaggerated responses to nociceptive or touch stimulus respectively.

* Allodynia

Perception of light mechanical stimuli as painful, as when vibration evokes painful sensation Reduced pain Perception is called hypalgesia or when absent, analgesia.

* Causalgia

Causalgia is continous severe burning ~~pain~~ pain with indistinct boundaries and accompanying sympathetic nervous system dysfunction (sweating, vascular, skin and hair changes - Sympathetic dystrophy) that occurs after injury to a peripheral nerve.

Sensitization refers to a lowered threshold for activating primary nociceptors following repeated stimulation in damaged or inflamed tissues.

Inflammatory mediators play a role. Sensitization contributes to tenderness, soreness and hyperalgesia.

Referred Pain results from the convergence of sensory inputs from skin and viscera on single spinal neurons that transmit pain signals to the brain. Because of this convergence, input from deep structures is mislocalised to a region of skin innervated by the same spinal segment.

CHRONIC PAIN

* Problem is often difficult to diagnosis and patient may appear emotionally distracted.

* Several factors can cause perpetuate on exacerbate Chronic pain.

(i) Painful diseases for which there is no cure
eg: Arthritis, Cancer, Migrane, headache, diabetic Neuropathy

(ii) Neural factor initiated by a bodly diseases that persist after the disease has resolved.
eg: Damaged Sensory or Sympathetic Nerves.

(iii) Psychological Conditions. Special attention to the Medical history and to depression. Major depression is common treatable potentially fatal (Suicidal)

Acute pain: pain of less than 3 to 6 months duration.

Chronic pain: pain lasting for more than 3-6 months or persisting beyond course of acute disease

Acute on chronic pain: Acute pain flare superimposed on underlying chronic pain

Characteristics

Visceral pain

→ activation of nociceptors of thoracic, pelvic, abd. visiera

- Most commonly activated by inflammation
- pain poorly localized & usually referred
- Described as diffuse comfort Eg: nausea, bleeding.
- Relieved by narcotic analgesics

Neuropathic pain

- No obvious nociceptive stimulus
- Associated evidence of nerve damage

  Eg: Sensory impairment, weakness
- unusual, dissimilar from somatic pain - often shooting
  - or of electrical quality
- only partially relieved by narcotic analgesics
- May respond to antidepressants or anticonvulsants.

Somatic pain

Nociceptive pain, usually evident

Usually well localized

Relieved by anti inflammatory narcotic analgesics.

Caused by injury to skin, muscles, bones, joint

Connective tissue

Etiology

→ Injury to the body

→ time [at 3 o'clock, early morning, body'll be more fatigue]

→ Spare

→ emotions

→ Cognition

→ Motivation

→ diseases

→ Cancer cause Malignant pain

→ Age: infants less sensitive to pain, less tolerance to pain
pain threshold increases with age

→ psychogenic pain is caused by no obvious physical cause

→ fatigue

→ Gender:
women have more sensitivity to pain than men

Mainly

- Mechanical, chemical, thermal factors
- Release of bradykinins, K+, prostaglandins, histamine & leukotrienes, ~~bra~~ serotonin, substance P

May sensitise or activate nociceptors

Receptor activation leads to action potential transmitted along afferent neurons to spinal cord

Pathophysiology

The pain impulse is transmitted from the site of transduction along the nociceptor fibres to dorsal horn in the spinal cord to the brain stem -

Injury → potentially dam. Mechanical, thermal, chemical stimuli are detected by nerve endings → nociceptors (skin, periostrum, joint surfaces)
→ pain impulses via dorsal root →

Spinal cord — form synapses on neurons ē in the spinal cord segment
Also form synapses ē neurons above & below their segment of entry

↓ **Secondary neurons**

Secondary neurons send their signal upward through spinothalamic tract [area of spinal cord's white matter]

↓ → Signals

Medulla

~~Synapse on neurons in the medulla~~

↓

Synapse on neurons in the **thalamus** brain's relay centre

↓

Nerves from thalamus send signals to various areas of **somatosensory cortex** ~~Centre~~

Somatosensory cortex
- present in the parietal lobe
- It processes sensory input from the skin, muscles, joints.

This area detects & interupts — information on
touch
temperature
pain
pressure — and allow us to perceive
size, shape, texture of
an object via touch.

Somatosinsory neurons sent information to the brain
on somatic sensation &
pain, temperature, touch, etc

pain information on the face

Somatosensory neurons
↓
trigeminal nerves
↓
CNS
↓
Synapse on trigeminal nucleus in mid medulla and
neurons of lower medulla

Modulation of pain

Endogenous opiate system & receptors found in CNS
CNS also contain a descending system for control of
pain transmission

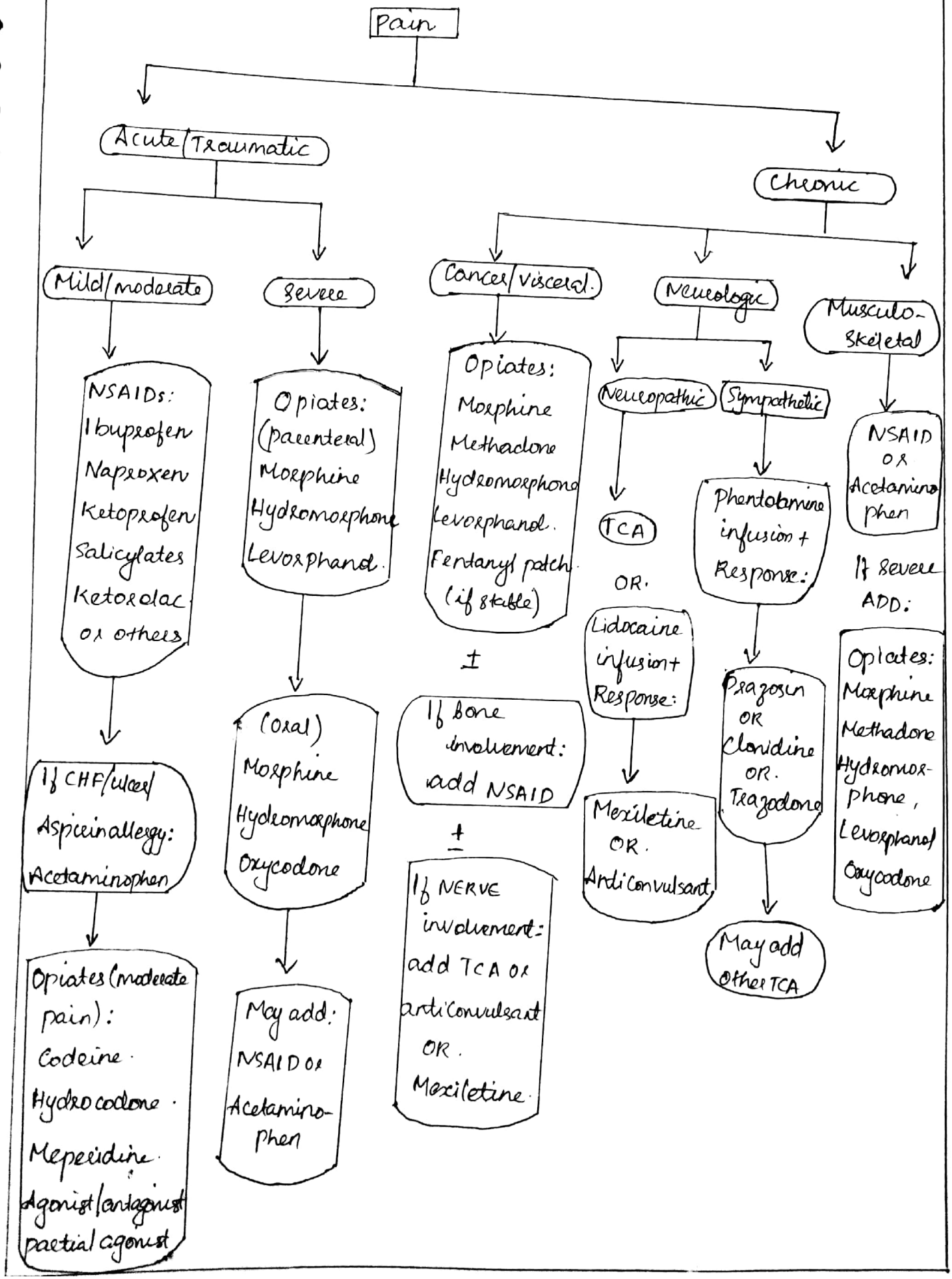
PAIN TRANSMISSION AND MODULATORY PATHWAYS

A Transmission system for nociceptive messages. Noxious stimuli activate the sensitive peripheral ending of the primary afferent nociceptor by the process of transduction. The message is then transmitted over the major ascending pain pathway, the spinothalamic tract. The message is relayed in the thalamus to the anterior cingulate (C), Frontal insular (F), and somatosensory cortex (SS).

B Pain modulation network, inputs from frontal cortex and hypothalamus activate cells in the midbrain that control spinal pain-transmission cells via cells in the medulla

Treatment

Treatment Algorithm



Pharmacological therapy

Centrally Acting Analgesic characteristics

	IM Dose (mg)	Oral Equivalent	Routes	$T_{1/2}$ (hour)
Opioid agonists for Severe pain				
Phenanthrenes:				
Morphine	10	30	PO, SC, IV, IM	2-3
Hydromorphone	1.5	7.5	PO, SC, IV, IM	2-4
Phenylpiperidines:				
Fentanyl	0.1	N/A	IV, Spinal, buccal	3-4
Diphenylheptanes:				
Methadone	5	5	PO, SC, IM	21-25
Opioids for mild to moderate pain				
Phenanthrenes:				
Codeine	120	200	PO, SC, IV, IM	
Oxycodone	N/A	20	PO	
Phenylpiperidines:				
Meperidine	100	400	PO, SC, IV, IM	3-4
Diphenylheptanes:				
Propoxyphene	N/A	65-130	PO	6-12

Partial agonists/antagonists				
Buprenorphine	0·3	4	SC, IV, IM, Sublingual	2-3.
Nalbuphine	10	N/A	SC, IV, IM	2-3.
Opioid antagonists				
Naloxone.	0·4-0·8	N/A	IV	1-1.5
Naltrexone	N/A	50	PO	9-17.

Non-opioid Analgesics

Non-steroidal Anti-inflammatory Drugs.

Drug.	Usual Adult Dose	Maximum Recommended Daily Dose (mg)	
1). Aspirin	650-975 mg q 4h	3900	
2) Ibuprofen.	400-600 mg q 6h, 800 mg q 8h	3200	
3) Indomethacin	25-50 mg q 8h	200	
4) Ketoprofen.	150-300 mg/day as 3-4 doses	300	
5) Meferamic acid	250 mg q 6h	1600	
6) Naproxen	375-500 mg q 12h 250mg	1250.	

7) Phenylbutazone	100mg q 6h	400
8) Piroxicam	20mg q 24h	20
9) Salicylamide	325-667mg q 6-8h	6000
10) Sodium Salicylate	325-650mg q 4-8h.	3900
11) Sulindac	200mg q 12h	400

Analgesic Adjuncts

1) Antidepressants

Medication	Daily Dose (mg)
1) Tricyclic Tertiary Amines	
Amitriptyline	25-150
Imipramine	25-150
2) Tricyclic Secondary Amines	
Desipramine	25-150
Nortriptyline	25-100
3) Heterocyclic	
Nefazodone	100-200
Trazodone	50-300

2). Neuroleptics

→ Fluephenazine potentiate the effects of amitryptyline in patients with diabetes neuropathies and central pain.

Dose – 1mg hs ~~3mg/kg/day~~ ~~3mg/kg - 2-3 time a day~~

Maximum dose – ~~3mg/day/hs at bed time~~.
3mg/day at bed time

→ Methotrimeprazine is available was a treatment for mild to moderate pain.

3). Anticonvulsants.

→ Mechanism of carbamazepine and valproate is suppression of spontaneous neuronal firing.

→ Carbamazepine & valproate are prescribed for trigeminal neuralgia, cranial nerve disorders, neural invasion by cancerous tumors, radiation fibrosis

Carbamazepine

Initial Dosage → 10-20 mg/kg/day (p)
100-200 mg bid (A).

Maintenance dose → 20-40 mg/kg/day (p).
1200 mg/day (A)

Gabapentin

Initial Dosage → 10-15 mg/kg/day (p).
300 mg/day (A).

Maintenance Dose → 25-40 mg/kg/day (p)
900-3600 mg/day (A).

4) Other medications

→ Lidocaine is given for neuropathic syndromes, enters the CNS after IV administration.

→ Mexiletine has been used in lidocaine-responsive patients

Dose of Mexiletine → 10 mg/kg/day.

→ Dextroamphetamine → 5-10 mg/day used in patients with cancer pain to overcome the sedation of opioids.

Non-pharmacologic therapy.

1. Transcutaneous electrical nerve stimulation (TENS):

- It is used for managing both acute and chronic pain (surgical, traumatic, low back, oral-facial pain etc) but it fail to show any sustained pain relief.

2. psychological Intervention:

- psychological intervention or treatment of acute pain were not widely used.

- simple interventions reduce patient distress and greatly reduce post procedure suffering.
- Other successful techniques including relaxation training, imagery and hypnosis have proven effective in management of post-procedure pain and in-cancer-related pain.
- Cognitive behavioural therapy and biofeedback also may be useful in managing chronic pain.

3) Physical Therapy:

- Physical and rehabilitative therapies have been used to treat acute pain resulting from sports injuries and chronic pain.
- The goals of physical therapy exercises and training are increased mobility, strength and function & a decrease in symptoms of pain or discomfort.

4) Neuroablative Blocks and Neurolysis:

- Neurolysis (or chemical destruct^{n} of nerves) is used at spinal nerve roots, and it is relatively simple and painless procedure that can be done with minimal equipment.
- It is shorter acting than Cordotomy & can be done in elderly & those c poor general health.

ACUTE SOMATIC PAIN

Drug	Usual Adult Dose	Maximum Recommended dose/mg
a) Nonnarcotic analgesics		
1) Aspirin	650 - 975 mg q 4 h	3900 mg
NSAIDs		
2) Choline Salicylate	870 mg q 3-4 h	5220 mg
3) Diflunisal	500 mg q 12h	1500 mg
4) Fenoprofen Calcium	300 - 600 mg q 6h	3200 mg
5) Ibuprofen	400 - 600 mg q 6h 800 mg q 8h	3200 mg.
6) Indomethacin	25 - 50 mg q 8h	200 mg
7) Ketoprofen	150 - 300 mg/day as 3-4 doses	300 mg
8) Mefenamic acid	250 mg q 6h	1600 mg
9) Naproxen	375 - 500 mg q 12h	1250 mg
10) Acetaminophen	325 mg - 1g q 4-6h	4000 mg

Parenteral Ketorolac	10 - 30 mg q. 4 - 6 hrs		90 mg	

b) opioid Antagonist	IM Dose (mg)	oral equivalent	Routes	T½ (hrs)
1. Naloxone	0.4 - 0.8	N/A	IV	1 - 1.5
2. Naltrexone	N/A	50	PO	9 - 17

CHRONIC PAIN

1) Antidepressants

Medication	Daily Dose (mg)
1) Tricyclic tertiary Amines	
Amitriptyline	25 - 150 mg
Doxepin	25 - 150 mg
Imipramine	25 - 150 mg
2) Tricyclic Secondary Amines	
Desipramine	25 - 150 mg
Nortriptyline	25 - 100 mg
3) Heterocyclic	
Nefazodone	100 - 200 mg
Trazodone	50 - 300 mg

Venlafaxine	75 - 225 mg

2) Anticonvulsants

a)

Drugs	Initial dosage	Maintenance dose
Carbamazepine	10 - 20 mg / kg / day (P)	20-40 mg / kg / day (P)
	100 - 200 mg bid (A)	1200 mg / day (A)
Gabapentin	10 - 15 mg / kg / day (P)	25 - 40 mg / kg / day (P)
	300 mg / day (A)	900 - 3600 mg / day (A)

3) Opioids

Drugs	IM dose (mg)	oral Equivalent	Routes	onset (minute)	Duration (hour)	t 1/2 (hr)
a) Phenanthrenes						
Morphine	10	30	PO, SC, IV IM, PR	IV: 5 PO: 60	3-6	2-3
Levorphanol	2	4	PO, SC, IM	30-90	4-6	4-12
b) Diphenylheptanes						
Methadone	5	5	PO, SC, IM	60	6-8	21-25