NEET SS ANESTHESIA

Updated Notes 2026

PAIN MANAGEMENT

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PAIN : ANATOMY AND PHYSIOLOGY

Introduction

00:00:19

Definition of pain :

- An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.
- It was recommended by the subcommittee on taxonomy and adopted by the IASP council in 1979.

Revised in 2020 :

- An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.

Classification :

- Total pain : Based on biopsychosocial model, behavioural, spiritual aspects of pain.

On the basis of duration :

- Acute.
- Chronic : >3 months.

As per pathophysiology :

- Nociceptive :
  - Visceral :
    - Vascular : Ischemia, vascular headache.
    - Organ involvement : MI, pancreatitis.
  - Somatic : Musculoskeletal system (Ligaments, tendons, bursa etc).

Neuropathic :

- CNS : Spinal cord injury, multiple sclerosis, post stroke pain.
- PNS : Diabetic neuropathy, post herpetic neuralgia, trigeminal neuralgia.

Nociplastic :

- Fibromyalgia (Earlier known as dysmorphic pain).
- Chronic fatigue syndrome.

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Terminology :

- Allodynia : Previously not painful, but currently painful.
- Causalgia : Abnormal pain with vasomotor and sudomotor dysfunction.
- Dysthesia : Unpleasant abnormal sensation.
- Hyperalgesia : Primary or secondary (Due to mediators).
- Hyperesthesia : Includes allodynia and hyperalgesia.
- Anaesthesia dolorosa : Associated with trigeminal pain, deafferentation pain.
- Hyperpathia : Abnormal painful reaction to repetitive stimulus.
- Hypoesthesia : Decrease in sensation.

Theories of pain :

Specificity theory of pain :

- Intensity as per tissue injury.

Pattern theory :

- Receptors of pain are shared.
- All receptors are common.
- As we increase stimulus, touch will change into pain.

Neuromatrix theory :

- Proposed by Melzack and Wall in 1999.
- Not only genetic makeup leading to pain.
- Also depends on past experiences, psychosocial factors which influence pain.

Gate theory of pain :

- By Melzack and Wall (1965).
- Physiology :
  - C fibres :
    - Stimulus to spinal cord for slow pain.
    - From spinal cord, brain is stimulated & perceived sensation as pain.
  - A beta fibres :
    - Normally not painful.
    - In TENS and accupuncture, stimulate A beta fibres.
    - Exercise positive inhibition.
    - Stop signal at spinal cord.
    - No pain stimulus is transmitted to brain.

Mechanism of pain

00:12:42

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Sympathetic mediated pain :

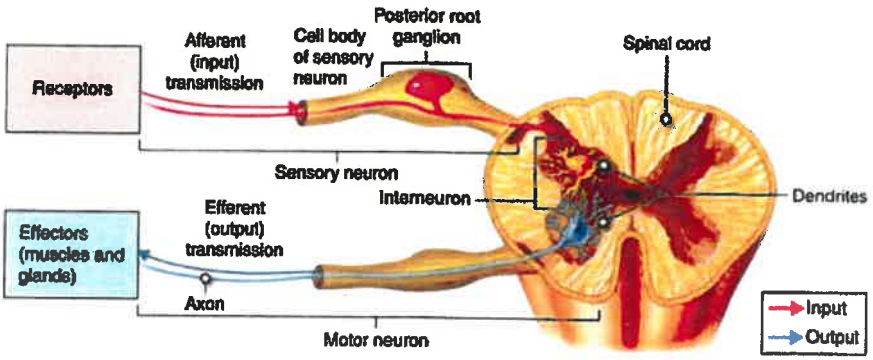
Arises from :

- Crosstalk between C fibres and sympathetic fibre (DRG/peripheral nerve).
- Alpha adrenergic receptors are generally unregulated on C fibres due to sympathetic stimulation.

Pain reflex arc :

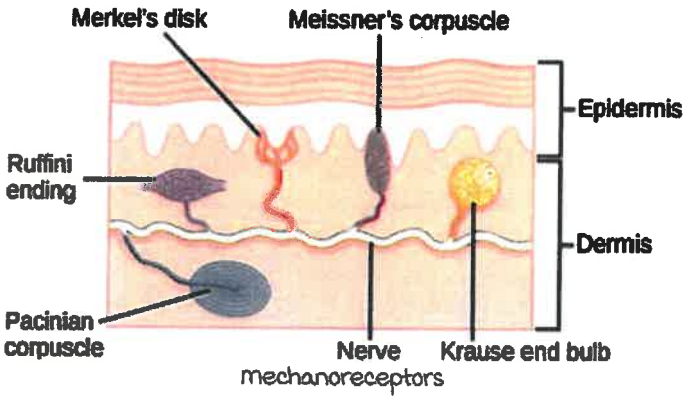
Components :

- Afferent.
- CNS.
- Efferent.
- Reflex arc.



Pain arc

Receptors :



mechanoreceptors

Sites :

- Cutaneous.
- Muscle, fascia, adventitia.
- Blood vessels.
- Viscera, joints, dura.

Types :

- Merkels disk : Only unencapsulated receptor; carry signals of light touch.
- Meissner's corpuscle : Touch, light vibration.
- Pacinian corpuscle : High intensity vibration, transient pressure.
- Ruffini endings : Stretch, joint movement, warmth.
- Krause end bulb : Cold.

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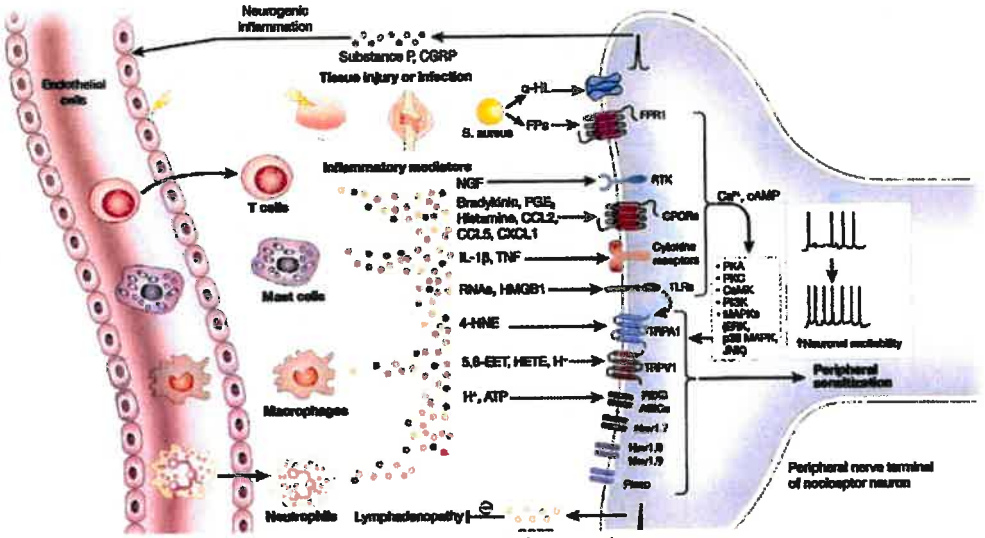
Sensory fibre types :

Type	Erlanger-Gasser Classification	Diameter (μm)	Myelin	Conduction velocity	Associated sensory receptors
Ia	Aα	13 to 20	Yes	80 to 120 m/s	Primary receptors of muscle spindle
Ib	Aα	13 to 20	Yes	80 to 120 m/s	Golgi tendon organ
II	Aβ	6 to 12	Yes	35 to 75 m/s	Secondary receptors of muscle spindle All cutaneous mechanoreceptors
III	Aδ	1 to 5	Thin	3 to 30 m/s	Free nerve endings of touch and pressure Nociceptors of neospinothalamic tract Cold thermoreceptors
IV	C	0.2 to 1.5	No	0.5 to 2.0 m/s	Nociceptors of paleospinothalamic tract Warmth receptors

Inflammation :

- Can lead to complex type of pain.
- Mediators : NO, Substance P, CGRP, bradykinin, histamine.
- Serotonin, nor epinephrine, endorphins → Inhibit pain signal.



Inflammatory mediator release

Pain pathways :

- With the delivery of a noxious stimulus a series of electrical and chemical events occur.

Stages :

i. Transduction : Where external noxious energy is converted into electrophysiological activity.

ii. Transmission : Coded information is relayed via spinal cord to brainstem and thalamus.

iii. Modulation : Process of alterations of pain signals along transmission.

iv. Perception : Connections between thalamus and higher cortical centers control perception and integrate the affective response to pain.

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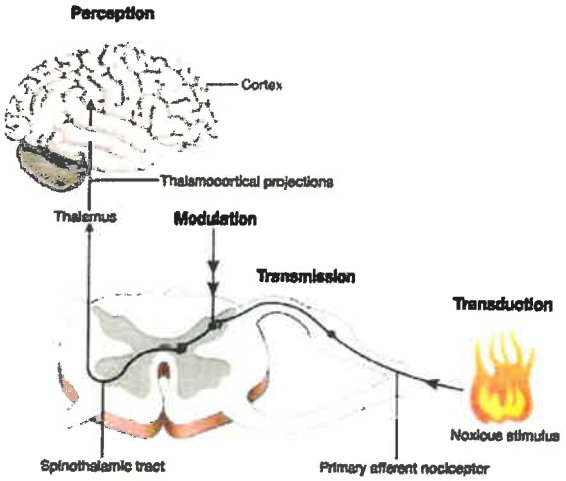
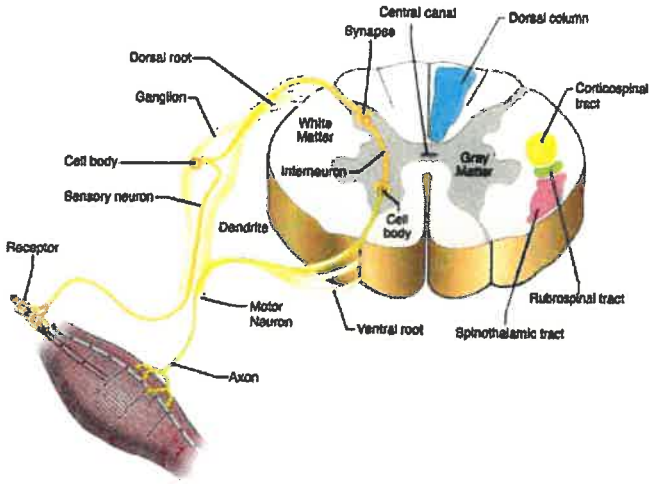
Pain Pathway

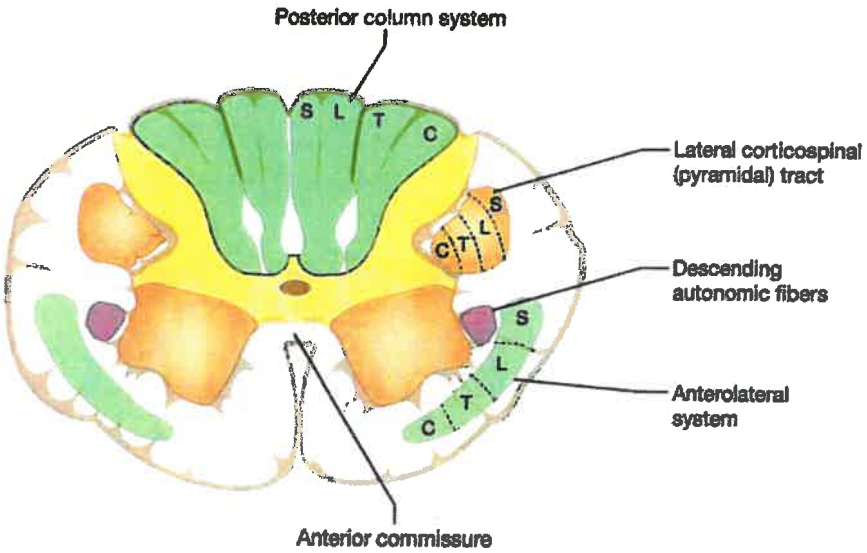


Cross section of the spinal cord connected to the muscle



Ascending and descending spinal tracts 00:22:56

Combined anterior horn and corticospinal tract disease



Ascending pathways Descending pathways Affected area

S = sacral, L = lumbar, T = thoracic, C = cervical

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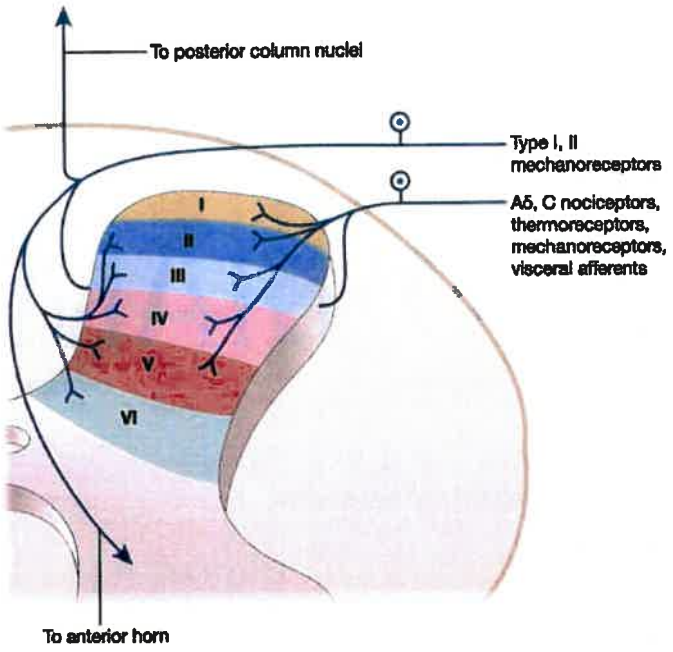
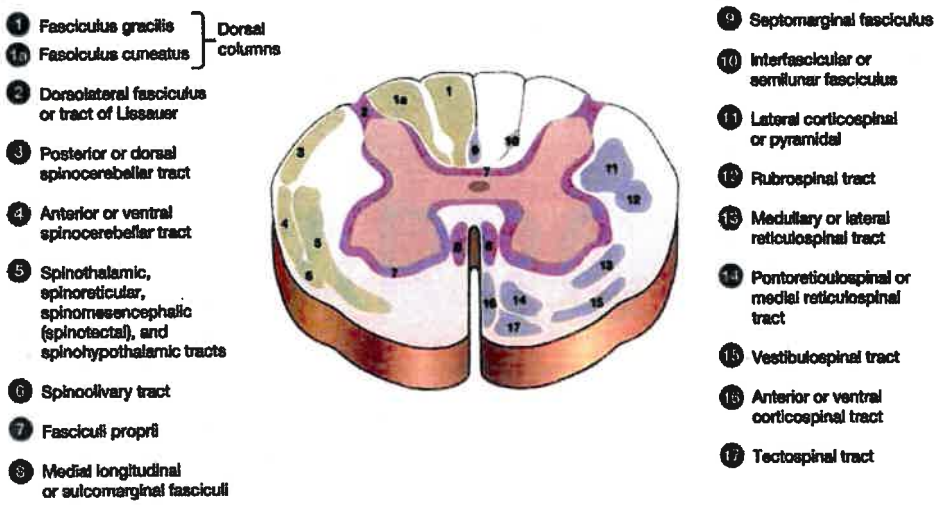
Rexed lamina :

- Type I, II : Related to nociceptors.
- A delta, C fibres : Bring signals to type I, II.
- Type II : Opioid signals.
- Lamina V : Wide dynamic range fibres, can produce neuropathic pain.

Targets of primary afferent neurons in the posterior gray horn



Spinal Cord Cross Section



Ascending pathways :

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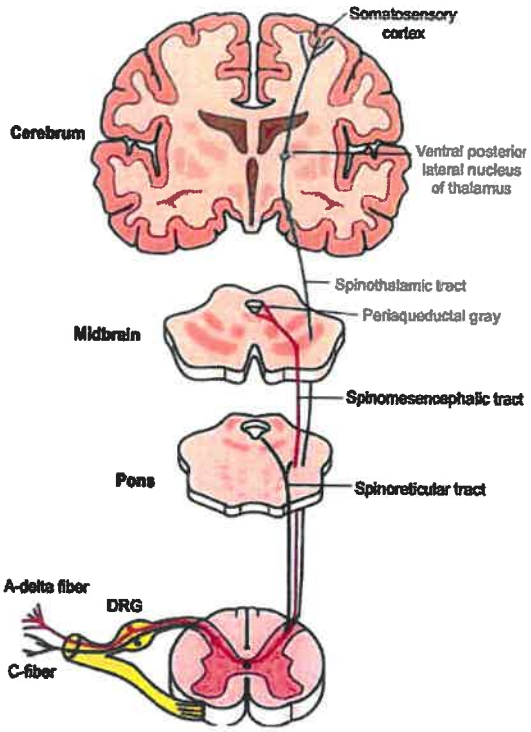
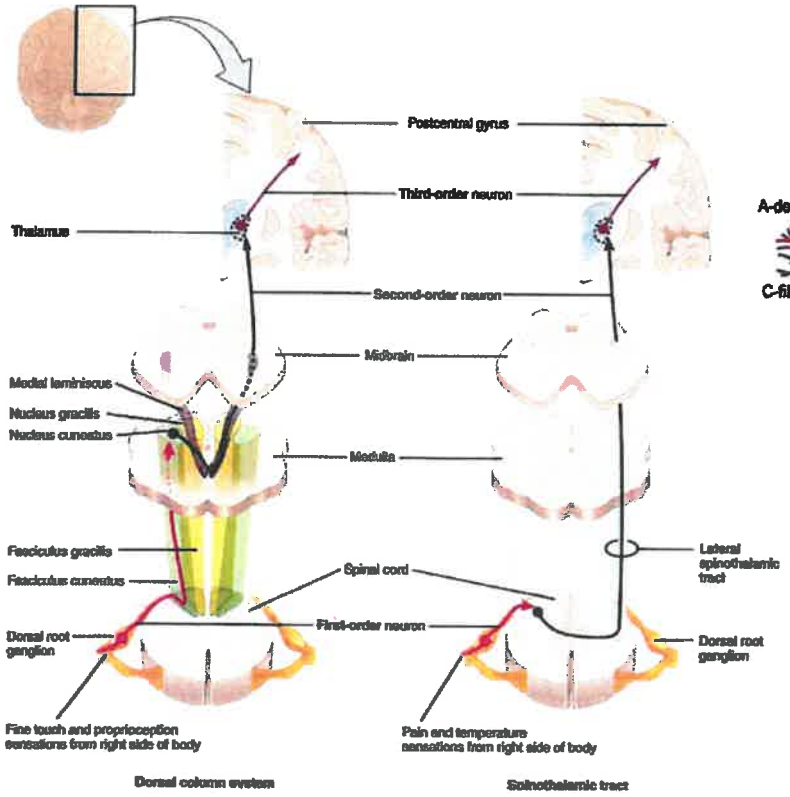
i. Dorsal column : Vibration, conscious proprioception, two point discrimination.
ii. Spinothalamic tract (Anterolateral) : Pressure, crude touch, pain and temperature sensations.
iii. Spinomesencephalic : Pain suppression.
iv. Spinotectal tract : Reflexive eye and head movements towards site of painful stimulus.
v. Spinoreticular tract : Attention to painful stimulus (Synaptic connection to limbic system, hypothalamus, thalamus and frontal lobe).
vi. Spinocerebellar tract : Unconscious proprioceptive information from voluntary musculature.

Spinothalamic tract :

- Somatosensory area 1 & 2.
- Periaqueductal gray : GABA receptors, encephalins mediated.
- Pons (Locus cerulus) : Norepinephrine (NE) mediated.
- Medulla (Raphe magnum) : SHT (Serotonin).



Spinothalamic tract



Dorsal column and spinothalamic tract

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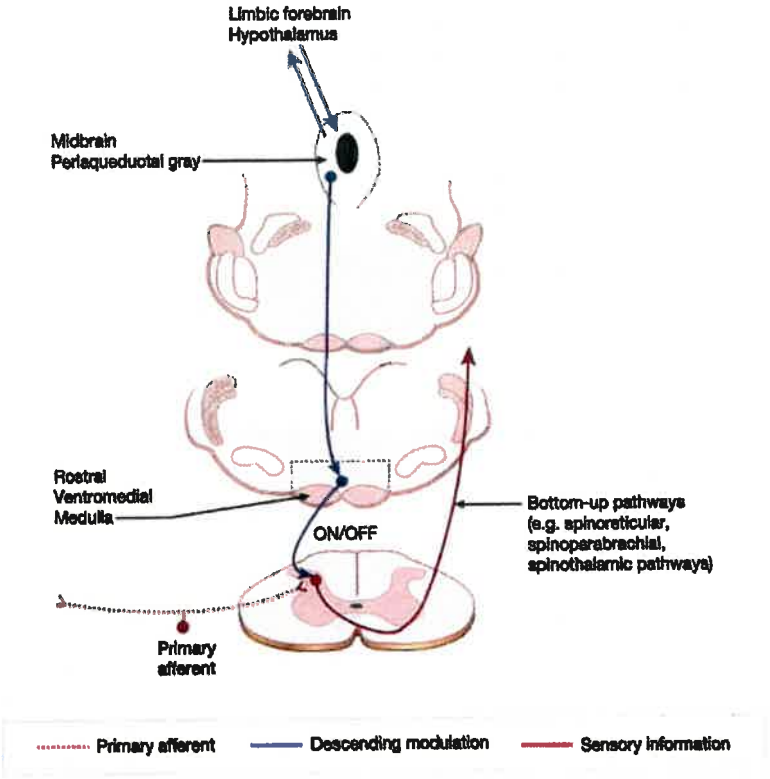
Descending pathway :

The PAG-RVM descending pain-modulating pathway



mediators :

- Midbrain : PAG GABA, enkephalins, endorphins.
- Pons (Locus ceruleus) : NE, enkephalins, endorphins.
- Medulla (Raphe magnus) : 5 HT.
- All working on spinal cord via negative feedback.

At dorsal horn :

- Inhibition of presynaptic substance P release
- Pre synaptic release of substance P is inhibited by :
  - Direct 5HT/NE inhibition.
  - At the level of interneuron, by release of endogenous opiods.
- Further inhibiting presynaptic release of substance P and postsynaptic depolarisation.
- Modulation : Via descending pathway, substantia gelatinosa and anterior pituitary gland.

Other important areas :

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- Anterior cingulate gyrus : Emotional interpretation of pain.
- Cerebellum and lentiform nucleus : Learning motor responsiveness to pain.
- SSI : Sensory discriminative aspect of pain.
- SSA : Pain associated learning and memory.
- Limbic system : Affective response to pain.
- Frontal lobe : Cognitive response to pain.
- Hypothalamus : Autonomic response to pain.

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HISTORY TAKING IN CHRONIC PAIN

Introduction 00:02:17

Important history :

- Pain history : Biomedical, psychosocial and behavioural factors.
- Rule out red flags and yellow flags.
- Past medical and surgical history.
- Drug history.
- Personal history.
- Family history.

Note :

- Give your time, undivided attention, understand chronology of events, be empathetic.

Pain 00:04:52

Pain history :

- Quantity/ severity.
- Quality/ nature : Burning, aching, tingling, sharp, dull.
- Mode of onset/ location.
- Duration/ course of events.
- Aggravating and relieving factors.
- Special character.
- Timing.
- Relation to posture changes.
- Associated complaints.

Quantity :

Unidimentional assessment tools :

1. Numerical rating scale (NRS), most commonly used : 0 → No pain, 10 → Worst pain
2. Points = 30% Change approx.
3. Verbal rating scale (None/ mild mod/ severe).
4. Binary scale %.

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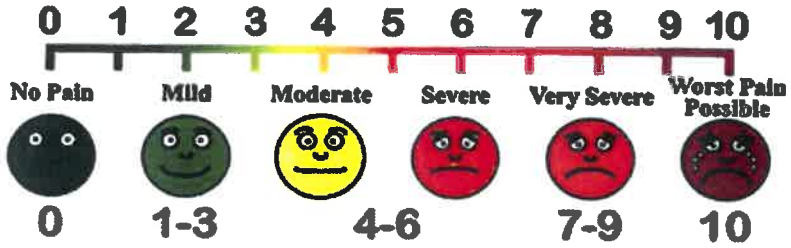
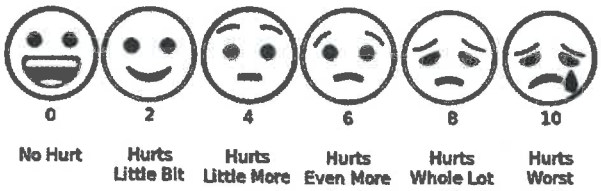
Visual analog scale :

- FACES/ WONG BAKER scale for children/ deaf and dumb.



Visual analog scale



FACES/WONG BAKER scale

FLACC scale :

- 0-2 Each category score 0-10.
- Face, legs, activity, cry and consolability.
- 2 years-8 years.
- Upto 18 years for critically ill & cognitive impairment.
- Take help of parents or caregivers.

Note :

OUCHER scale is also used in children.

Multidimensional :

- Mc Gill pain questionnaire (MPQ) : MELZACK/ TORGERSON.
- 3 Dimensions by 20 descriptive words.
- 10 Sets sensory discrimination (Nociception), 5 sets motivational (Reticular/ limbic), 1 set cognition, 4 sets miscellneous.
- Short form MPQ-II sensory and 4 affective (0-3 severity score).
- MPQ score.

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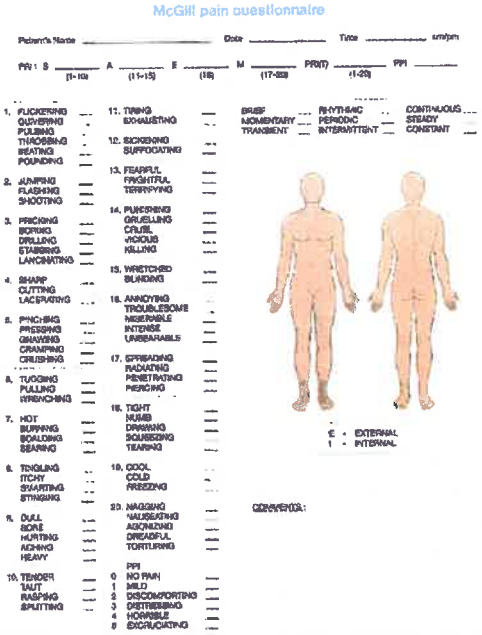

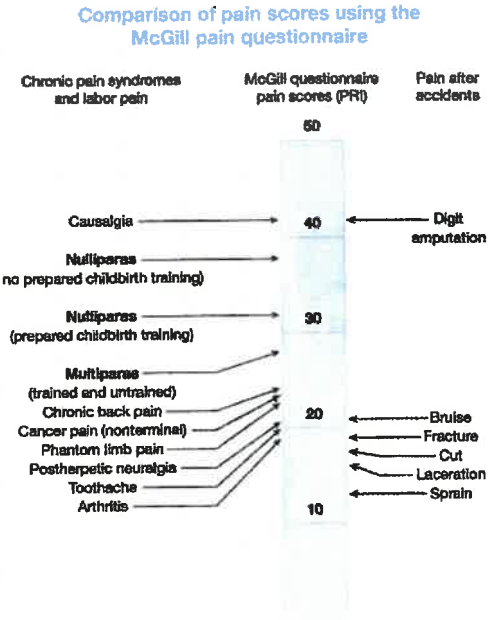

Other methods of pain evaluation :

- Brief pain inventory.
- Sensory and reactive dimension.
  - 7 items : General activity, mood, walking ability, normal work, relationship with other people, sleep, enjoyment of life.
- West haven yale multidimensional pain inventory (Whympi).
  - 52 items and 3 parts.
- Neuropathic pain : LANSS, NPQ, DN4, ID, pain detect.

Other important histories of pain :

- Mode of onset/ location : Sudden severe headache (SAH).
- Duration/ chronicity : Migraine → unilateral, 4 hours to 72 hours; cluster headaches → max 8 minutes, every year same time.
- Aggravating and relieving factors : Sitting cross legged, piriformis, SI joint.
- Character of pain : Cluster, PHN, phantom limb pain.
- Timing : Inflammatory pain more in morning, plantar fascitis.
- Posture : Sitting to standing posture, facet arthropathy, bending forward (PIVD).
- Past history : H/o rash in post herpetic neuralgia.
- Family history : Fibromyalgia, rheumatoid arthritis.
- Personal history : Sleep (OSA), bowel bladder problems, pregnancy, IBD.
- Drug history/ treatment : Chemotherapy, Vit-B12 deficiency, Vit-D deficiency, addictions, surgery.

Flags

00:26:18 ----- Active space -----

Red flags :

- Suspecting tumor.
- Pain after trauma : SAH.
- Infection : Fever, rigor.
- Loss of bladder and bowel control.
- Motor deficit and progressive sensory deficit → Patient should be referred to the spine surgeon.

Yellow flags :

- Greater risk of progression to psychological distress and disability relating to pain (Anxiety depression personality disorder).
- Tools available :
  a. PHQ-9.
  b. Becks depression inventory.
  c. Hamilton depression scale.
  d. Zung self rating depression score.
  e. Hospital anxiety and depression scale(HADS).
  f. Pain catastrophizing scale (PCS).
  g. The tampa scale of kinesophobia.

Patient health questionnaire (PHQ-9)

NAME: _____ DATE: _____

Over the last 2 weeks, how often have you been bothered by any of the following problems? (use "✓" to indicate your answer)	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself–or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
	add columns	+	+	+
(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card).	TOTAL:			
10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	Not difficult at all Somewhat difficult Very difficult Extremely difficult			

PHQ-9 score	Depression severity	Proposed treatment actions
0-4	None-minimal	None
5-9	Mild	Watchful waiting; repeat PHQ-9 at follow-up
10-14	Moderate	Treatment plan, considering counseling, follow-up and/or pharmacotherapy
15-19	Moderately Severe	Active treatment with pharmacotherapy and/or psychotherapy
20-27	Severe	Immediate initiation of pharmacotherapy and, if severe impairment or poor response to therapy, expedited referral to a mental health specialist for psychotherapy and/or collaborative management

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GENERAL EXAMINATION IN CHRONIC PAIN

General examination 00:01:00

Overview :

- Built and nutrition.
- Signs of distress.
- Gait and posture.
- Mental state.
- Facial appearance.
- State of clothing.
- Vitals.
- Head to toe.
- Tender points.

Built & nutrition :

Thin built patients :

- Mental disorder.
- Anorexia.

Heavy or obese patients :

- Hypothyroidism.
- Eating disorder.

Signs of distress :

- Ask patient whether feeling agitated, irritated, withdrawn, not feeling self, self harm.
- Wincing, sweating, breathing labored, holding chest, guarding etc.

Facial appearances :

- Moon face : Cushings face, steroids long-term like arthropathies.
- Mask like face : Parkinsonism.
- Periorbital edema, puffy eyelids : Kidney disorder.
- Anxious face.
- Depressed face : Flat, apathy, poor eye contact, not interested.
- Myxedema face : Hypothyroidism, hair loss outer third eyebrows, dull puffy face.

Gait and posture :

Posture :

- Leaning forward, stooped posture : Lumbar canal stenosis.
- Cant stand or sit : PIVD.
- Not able to sit : Coccygodynia, piriformis, pudendal.