



Managing Pain

Therapeutically and Safely

2023

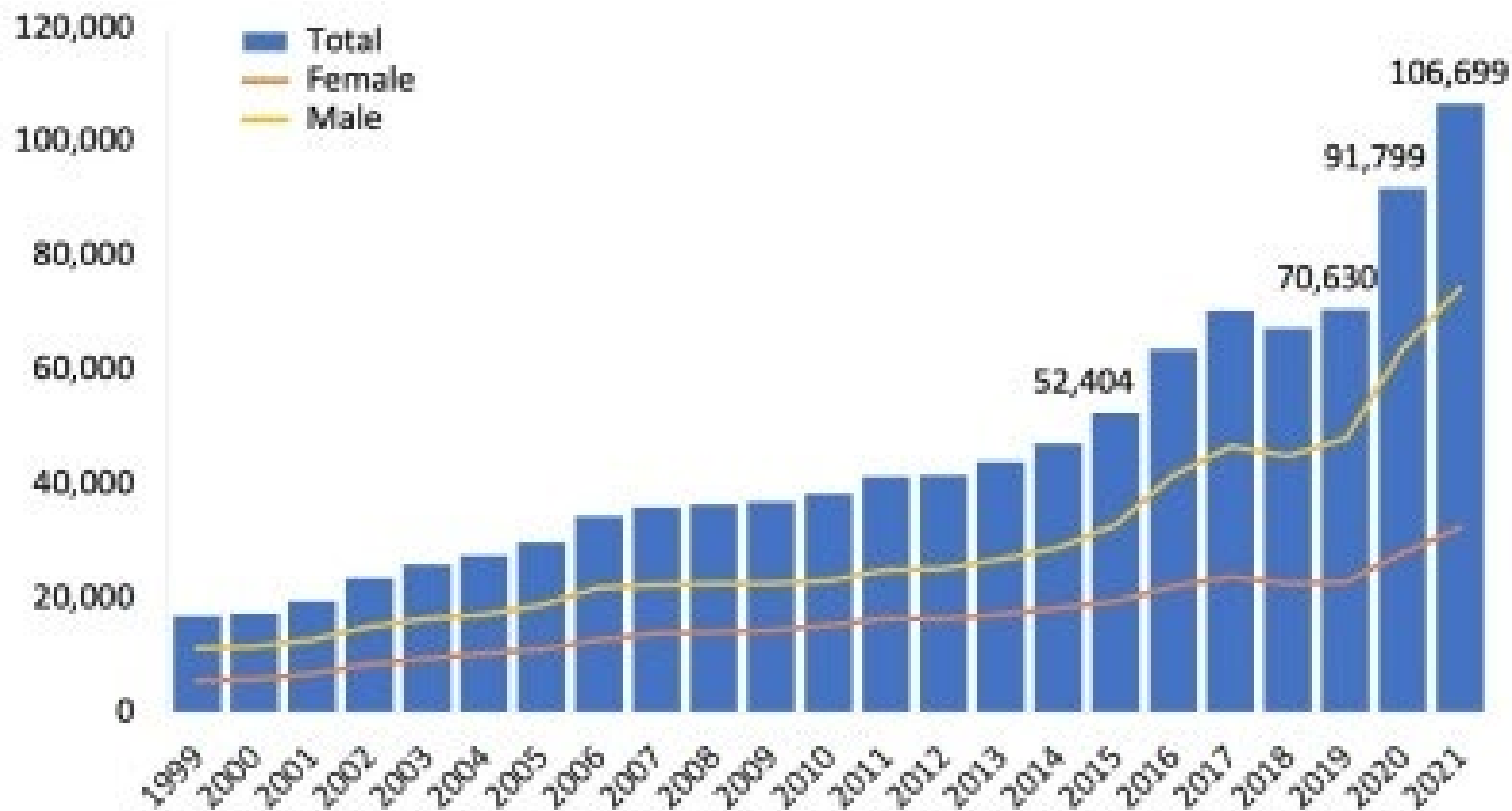
Dana Rizzo RN, BSN, RN-ACM

Objectives

- **Identify and recognize the different types of pain**
- **Verbalize variables and barriers resulting in poor pain management**
- **Identify an indication for the use of the different types of medication in pain management**
- **Demonstrate a comprehensive pain assessment and assessment in non-verbal patient**
- **Understand the pharmacetics of Opioids**
- **Describe Opioid Use Disorder (OUD)**
- **Understand use of opioids in End of Life care**

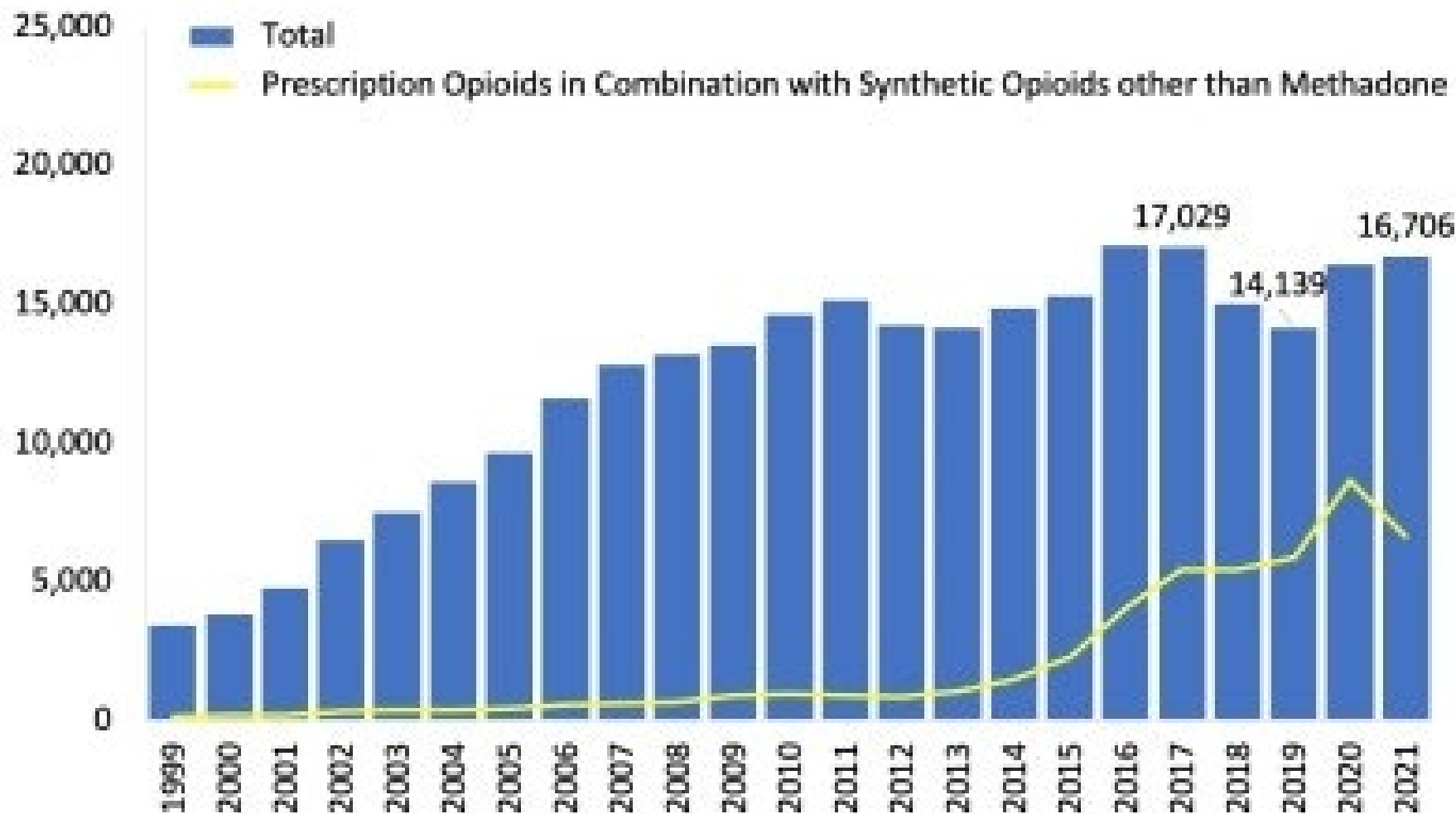
- **Opioid overdose is now the leading cause of death in adults ages 18-45. (2021-2022 75,000 deaths)**
- **The influence of opioid overdose is so great that the drugs have affected American Life expectancy-reducing it.**
- **We now view opioids as the enemy.**
- **Drugs that we trusted to kill pain are now killing us.**
- **We are now fearful of what the drugs may do to us if we take them.**
- **Let's fight the myths about opioids instead of the drugs.**
- **Let's learn how to use opioids wisely.**
- **Financial toll of Opioid addiction in US exceeds \$400 billion per year.**

Figure 1. National Drug-Involved Overdose Deaths*, Number Among All Ages, by Gender, 1999-2021



*Includes deaths with underlying causes of unintentional drug poisoning (X40–X44), suicide drug poisoning (X60–X64), homicide drug poisoning (X85), or drug poisoning of undetermined intent (Y10–Y14), as coded in the International Classification of Diseases, 10th Revision. Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999–2021 on CDC WONDER Online Database, released 1/2023.

Figure 4. National Overdose Deaths Involving Prescription Opioids*, Number Among All Ages, 1999-2021



*Among deaths with drug overdose as the underlying cause, the prescription opioid subcategory was determined by the following ICD-10 multiple cause-of-death codes: natural and semi-synthetic opioids (T40.2) or methadone (T40.3). Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple-Cause of Death 1999-2021 on CDC WONDER Online Database, released 1/2023.

All of Society Contributed to the Opioid Epidemic

- **Patients**
- **Lawmakers**
- **Veterinarians**
- **Educational Institutions**
- **Pharmaceutical companies**
- **Regulatory agencies**
- **Dentists**
- **Taxpayers**
- **Law Enforcement**
- **HealthCare Professionals**
- **Mental Health Treatment Specialists**
- **Pharmacists**
- **Insurance Companies**
- **Resource: Holly L. Geyer, M.D.**

Pain Basics

Golden Rule of Pain Management

“Pain is whatever the experiencing person says it is, existing whenever the experiencing person says it does”

In order to be successful we must:

- Be a good listener
- Be a good detective!
- Know ourselves and our bias's
- Always be compassionate

“Pain is subjective in that individuals create their own experiences. This means the way a patient expresses pain may be different than family or professional caregivers.”

IASP (INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN)

Factors Contributing to Pain

- **Culture**
- **Gender**
- **Race**
- **Age**
- **Mental status**
- **Societal acceptance**

So, who has pain, really?

Its harder to see (at times) addiction vs pseudo-addiction

Pain Truths

- **2/3 of pain sufferers have been living with their pain for more than 5 years**
- **1 in 3 describe their pain as the worst it can be**
- **For 1/3 of sufferers, their chronic pain was so severe and debilitating, they felt they couldn't function as normal people and sometimes felt so bad they wanted to die**
- **1/3 of sufferers did not believe people understood how much pain they were in**
- **Patients with pain report:**
 - **Pain affects ability to sleep—56%**
 - **Pain affects mood—51%**
 - **Pain not adequately treated by physician—62%**

(American Pain Foundation)

The Pain Cycle

The Pain Cycle



Pain Responses

- **Perception variability** of objective stimuli-the recognizing and interpreting of sensory stimuli varies from person to person.
 - *For example -The way you feel a stubbed toe is interrupted/felt differently than me when I stub my toe.*
- **Genetic variability of opioid receptors:** A number of clinical observations suggest that patients' genetic disposition or make up influences their response to opioids. For example you may have heard these statement's before:
 - “He seems to have more pain than others”
 - “Pain medications never work on me; I usually take twice the dose”
- Well this may in fact be true as the doses of opioids needed for pain relief vary between individuals due to our differing genetic make up.

Opioid Use Disorder (OUD)

- **OUD is the term used for the complex medical condition that results when someone is addicted to opioids. It is one of the most challenging complications of opioid use.**
- **OUD can affect virtually every aspect of someone's ability to function, including personal health, relationships, work and involvement in the community.**

ACUTE & CHRONIC PAIN

- **Acute Pain** : pain that alerts a person to potential damage or actual tissue damage, *pain that comes on quickly, can be severe, but lasts a relatively short time*
 - Objective signs – tachycardia, hypertension, diaphoresis
- **Chronic Pain**: pain lasting greater than 12 weeks
 - Few objective signs
 - May develop into chronic pain syndrome

***Untreated Pain may become chronic pain**

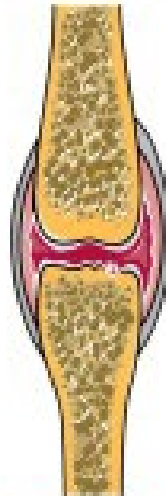
Acute < 3 months

Chronic > 3 months

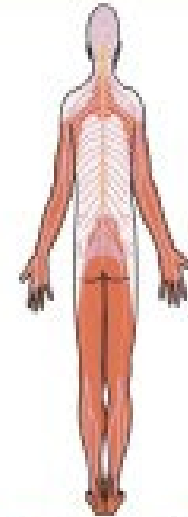
Normal



Inflammatory



Neuropathic



Nociceptive

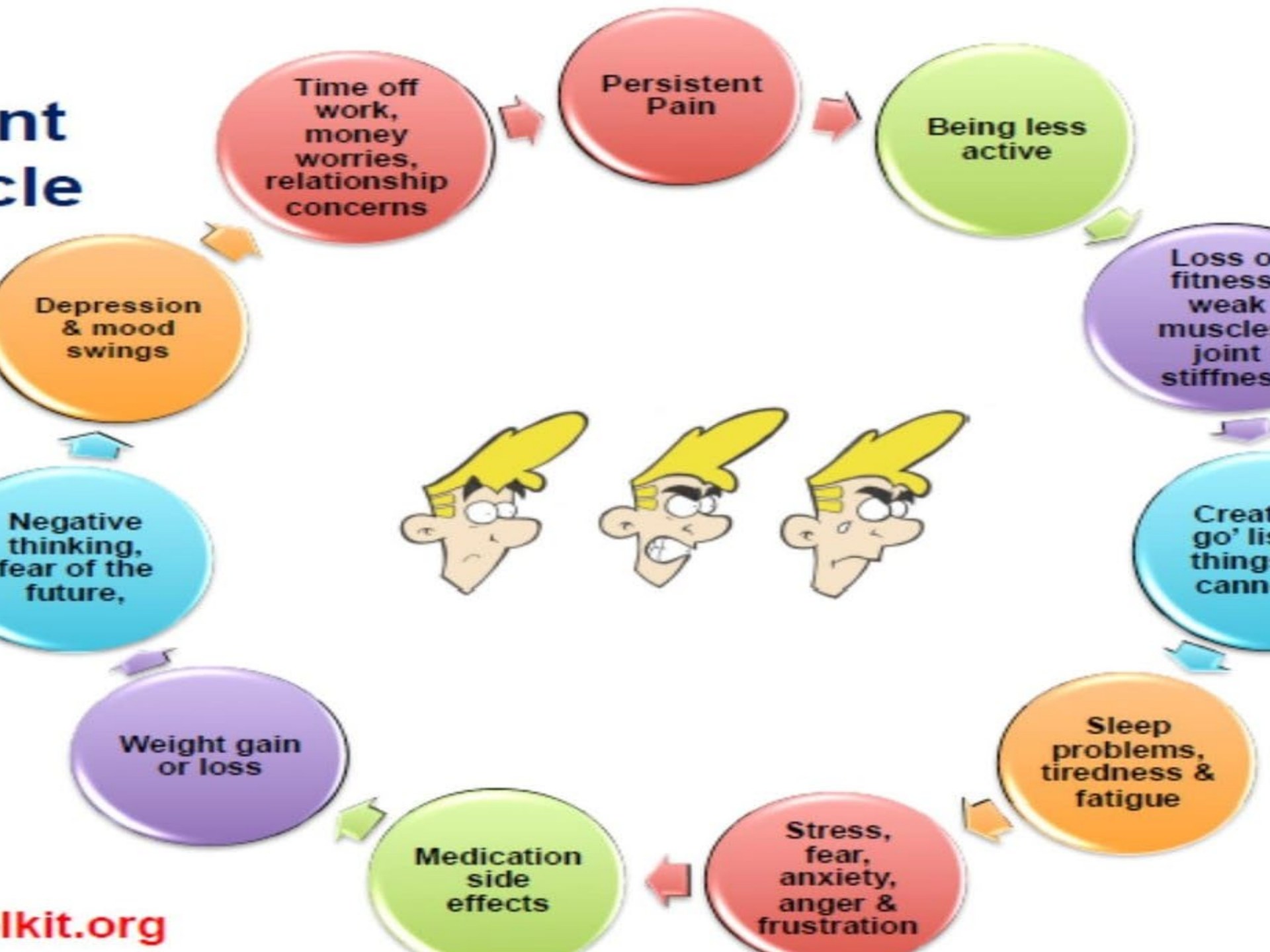
Pathophysiologic

Therefore...**UNTREATED PAIN**

Can result in:

- Sleep disturbance**
- Anxiety possible suicide ideation**
- Decreased socialization**
- Decreased physical conditioning**

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UNTREATED PAIN

- **Untreated or inadequately or poorly treated pain is among the greatest medical problems in our society and can lead to harmful side effects**
- **Untreated or poorly executed pain management plans put people at risk for depression, irritability, fatigue and an overall diminished quality of life.**
- **About 33% of Americans in pain experience sleep loss, which may affect their ability to work, take care of their families, socialize, exercise and participate in activities they enjoy.**
- **Treating pain is an important step in regaining control over quality of life.**

PAIN: WHY SHOULD WE TREAT?

- **Immune system stimulation**
- **Increase feeling of well being**
- **Decrease depression**
- **Increase motor function**
- **Wound healing independent from immune response has been documented**
- **Choice to proceed with physician assisted suicide decreased with control of pain and symptoms**

The Stigma of Pain

Stigmas or bias occur when someone is judged for having a condition that they have, like chronic pain. In other words, stigma and bias are criticisms for having problems like chronic pain. For example, how often have you heard...

- "It must be all in your head."
- "What's wrong with you that you never seem to get better?"
- "I have back pain too but I still go to work... Why can't you?"
- "Are you going to the doctor *again*?"
- "Come on now, it can't be that bad..."

Stigma often presents a barrier to care and is often cited as a challenge for patients, families, caregivers, and providers

Barriers in Pain Management

Clinician barriers:

- **Failure to keep up with advances**
- **Concerns about side effects-the risk vs. the benefit clinicians fear of Opioid respiratory distress and pre mature death**
- **Question validity of complaint**
- **Addiction myth-information**

Barriers in Pain Management

Clinician barriers:

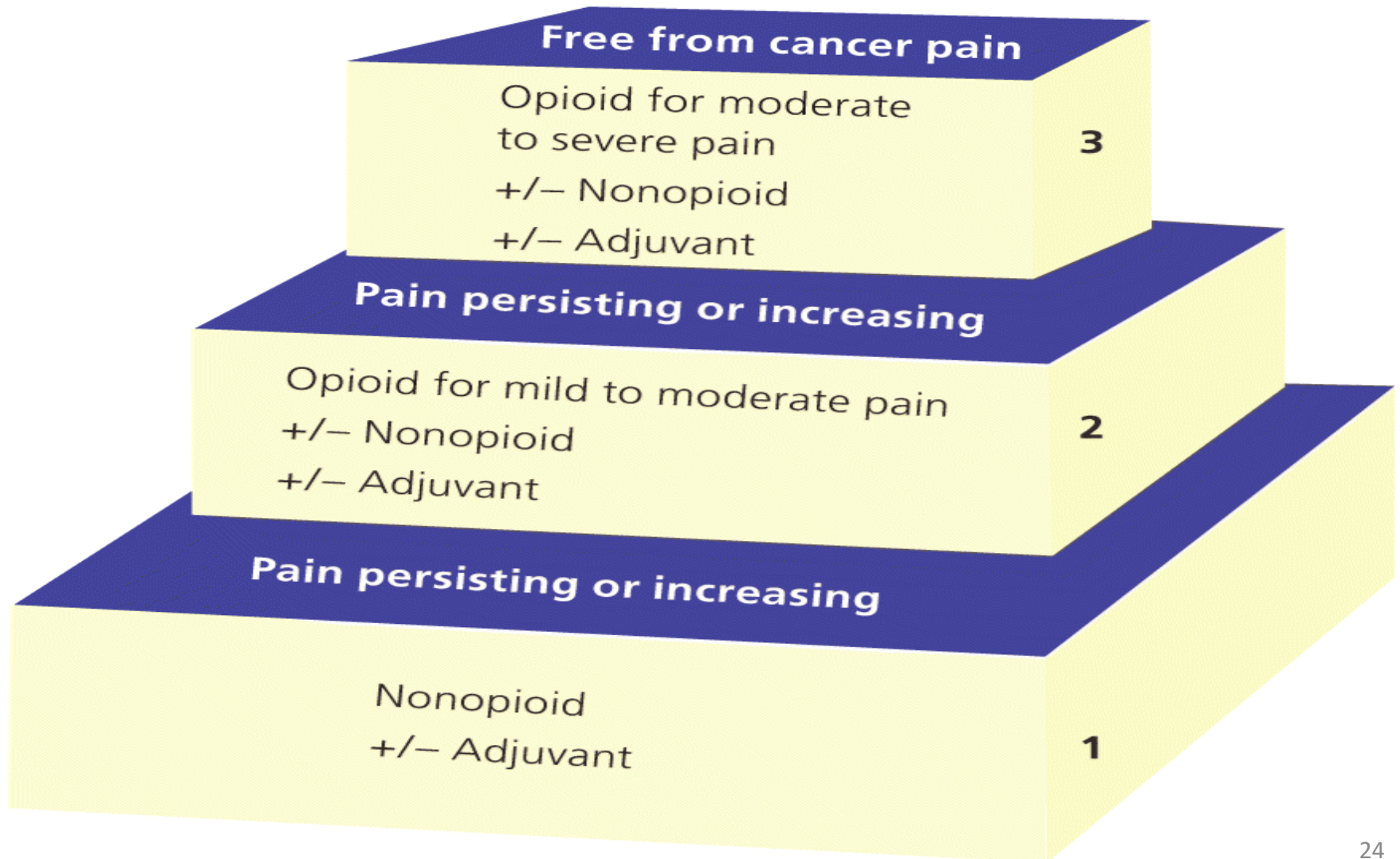
- Does not appreciate pain control as serious issue**
- Inadequate physician education and training**
- Inadequate pain assessment by clinicians**
- Under treatment of specific populations**
- Physicians reluctance to prescribe opioids**

Barriers in Pain Management

Patient Barriers

- **Stigma of taking narcotics (opioids)**
- **Dependency/addiction fears**
- **Poorly controlled side effect(real/imagined)**
- **Reluctance to report pain**
- **Patients fear of Opioid respiratory distress and pre mature death. Morphine=Death**

WHO'S PAIN RELIEF LADDER



Prescribed Opioids

- **MILD ACUTE PAIN**
- **Codeine: swallowed, 4-6 hours LOE, 1/3 as strong as morphine, Uses- Coughs injuries, pain after surgery.**
- **Tramadol: swallowed, 4-6 hours LOE, 1/4 as strong as morphine, Uses- injuries, pain after surgery**
- **LOE: Lenth of Effect**

Prescribed Opioids

- **MODERATE TO SEVERE ACUTE PAIN**
- **Morphine: swallowed , 4-6 hours LOE, -----, uses -injuries, pain after surgery.**
- **Hydromorphone: swallowed , 4-6 hours LOE, 4 times stronger than morphine, uses- injuries, pain after surgery.**
- **Hydrocodone: swallowed, 4-6 hours LOE, same strength as morphine, uses- injuries, pain after surgery.**
- **Oxycodone: Swallowed, 4-6 hours LOE, 1 ½ stronger than morphine, uses-injuries, pain after surgery.**

Prescribed Opioids

CHRONIC PAIN

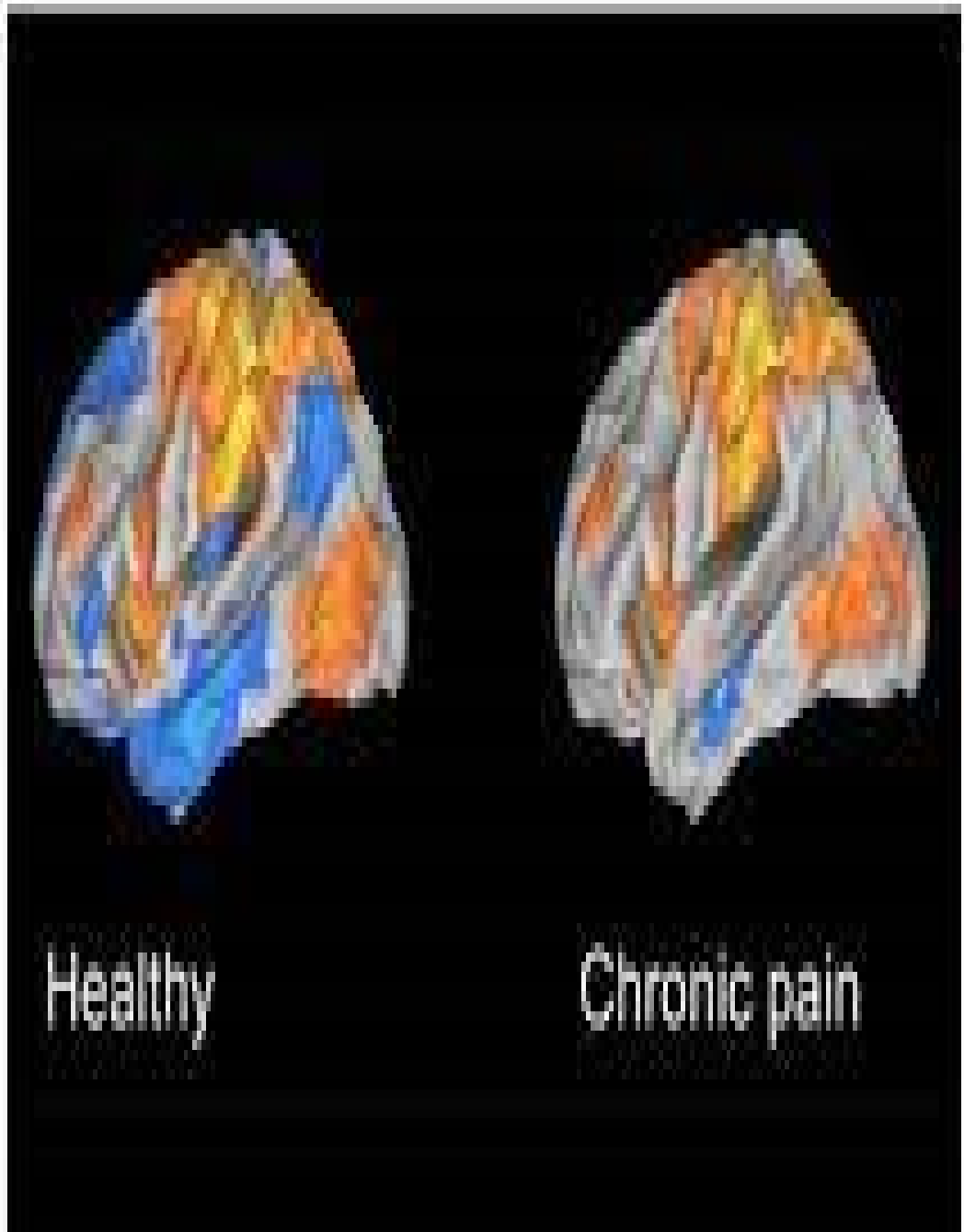
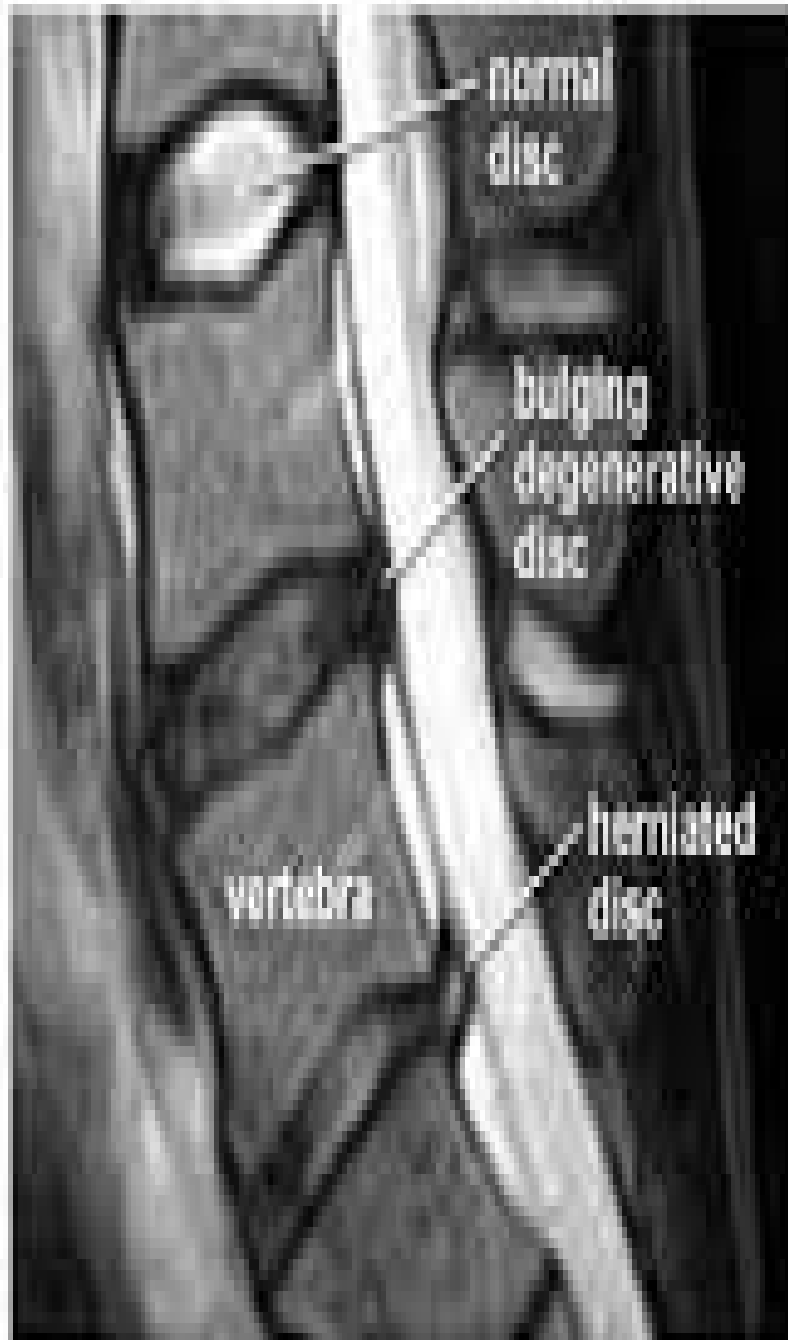
- Buprenorphine: SL or skin patch, LOE depends on route,
- Strength depends on route, Uses-chronic pain, treatment of Opioid use disorder (OUD).
- Methadone: swallowed, LOE Up to 72 hours, 3 times stronger than morphine, uses- chronic pain, cancer pain, treatment of OUD.
- Morphine ER(MS Contin): swallowed, LOE 8-12 hours, -,
- Uses- chronic pain, cancer pain.
- Oxycodone ER(OxyContin): swallowed, LOE 8-12 hours,
- 1 ½ stronger than morphine, uses- chronic pain cancer
- Fentanyl: Patch, LOE up to 72 hours, 50 to 100 times stronger than Morphine, Uses- chronic pain, cancer pain.
- Resource: Holly L. Geyer, M. D.

Examples of Integrative Therapies

- **Cognitive behavioral therapy (CBT)**: form of psychotherapy to treat chronic pain.
- **Biofeedback**: A mind-body technique, stems from the theory that anything that can be measured can be changed.
- **Spirituality**: The experience of Transcendence or a connectedness to a greater purpose or power.
- **Yoga**: A mind-body practice, breathing techniques and meditation with poses.
- **Massage Therapy**: Systematic rubbing and manipulation of body parts to reduce muscle tension and stress, treat pain, promote relaxation and create a feeling of general well being.
- **Acupuncture**: Chinese practice inserting needles at points called acupoints. Alleviates pain and nerve tension.
- **Deep Breathing**: relaxes the body by reducing the Sympathetic response and increasing the parasympathetic response.

Types of Chronic Pain

- **Nociceptive pain is one of the two main types of physical chronic pain. The other is called Neuropathic pain.**
- **Nociceptive pain can include damage to skin, muscles, bones, or other tissues.**
- **Nociceptors can also detect chemical and thermal damage.**
 - **Chemical damage is caused by contact with toxic or hazardous chemicals. Exposure to extremely hot or cold temperatures leads to thermal damage.**



NOCICEPTIVE PAIN

- **Injuries that cause nociceptive pain include:**
 - **bruises**
 - **burns**
 - **fractures**
 - **pain caused by overuse or joint damage, such as arthritis or sprains.**

[https://www.healthline.com/health/nociceptive-pain#nociceptive vs neuropathic](https://www.healthline.com/health/nociceptive-pain#nociceptive-vs-neuropathic)

NOCICEPTIVE PAIN TYPES

- **Somatic pain**
 - Somatic pain happens when any of the pain receptors in your tissues, such as muscles, bone, or skin, are activated. This type of pain is often stimulated by movement. It's usually localized. Headaches and cuts are both considered somatic pain.
- **Visceral pain**
 - Visceral pain happens when internal organs, such as involuntary muscles in the heart, are injured or inflamed. This type of pain is usually described as aching. The location may seem vague.

[https://www.healthline.com/health/nociceptive-pain#nociceptive vs neuropathic](https://www.healthline.com/health/nociceptive-pain#nociceptive-vs-neuropathic)

Visceral Pain

- **Visceral pain is often described as generalized aching or squeezing. It is caused by compression in and around the organs, or by stretching of the abdominal cavity.**
- **Sometimes visceral pain may radiate to other areas in the body, making it even harder to pinpoint its exact location.**
 - **For example Some types of pelvic pain and abdominal pain, such as those caused by bladder disorders or irritable bowel syndrome, are considered to be visceral pain disorders.**

VISCERAL PAIN

- **May respond to opioids**
- **Adjunctive medications are often necessary**
 - **Antispasmodics**
 - **Steroids**

Types of Chronic Pain

Primary nociceptive (For example)

- Osteoarthritis
- Visceral pain
- Headache
- Ischemic pain
- Cancer pain
(without nerve injury)
- Back pain
(without nerve injury)

**Injured/irritated
somatic or visceral
structure**

Pain including both nociceptive and neuropathic components

- Chronic back pain
(nerve lesion/dysfunction +
nociceptive activation from
ligaments, joints, muscles,
tendons)
- Cancer pain
(with nerve infiltration)
- CRPS I
(without nerve injury)

**Nociceptive
and neuropathic
components**

Primary neuropathic (For example)

Peripheral

- Back pain
(due to
nerve injury/
dysfunction)
- PHN
- Trigeminal
neuralgia
- HIV
- CRPS II
- Phantom pain

Central

- Post stroke
- Multiple
sclerosis
- Spinal cord
injury

**Injury of
the neural
structure**

Somatic Pain

- **Somatic pain is a type of nociceptive pain that is also referred to as skin pain, tissue pain, or muscle pain**
- **The nerves that detect somatic pain are located in the skin and deep tissues. Two types-**
 - ***superficial somatic pain* -characterized as pricking, sharp, burning, or throbbing pain that happen with everyday injuries and**
 - ***Deep somatic pain* deep somatic pain is usually dull and aching-originates in your joints, bones, tendons, and muscles.**

Somatic Pain

- **May need adjunctive medications in addition to Opioids**
 - **Non-steroidal anti-inflammatory**
 - **antidepressants**
 - **Steroids**

NOCICEPTIVE PAIN SUMMARY

- **Stimulation of NOCICEPTIVE areas in skin, muscle, bone causing pain**
- **Described as “Aching” or “Throbbing pain”**
- **Usually responds to non-opioid or opioid analgesics**
- **May need adjunctive therapy in addition to Opioids**
 - **Non-steroidal anti-inflammatory meds**
 - **antidepressants**
 - **Steroids**
 - **Antispasmodics**
 - **COX-2 inhibitors: Celecoxib need a RX.**
- **Non-pharmacological methods may be effective-massage therapy, physical therapy, heat and ice.**

NEUROPATHIC PAIN

- **Neuropathic pain is often described as a shooting or burning pain.**
- **It can go away on its own but is often chronic. Sometimes it is unrelenting and severe, and sometimes it comes and goes.**
- **It often is the result of nerve damage or a malfunctioning nervous system. (Ectopic firing)**
- **The impact of nerve damage is a change in nerve function both at the site of the injury and areas around it.**
 - **One example of neuropathic pain is called phantom limb syndrome. This rare condition occurs when an arm or a leg has been removed because of illness or injury, but the brain still gets pain messages from the nerves that originally carried impulses from the missing limb. These nerves now misfire and cause pain.**

Pathophysiology of Neuropathic Pain

Peripheral mechanisms

- Membrane hyperexcitability
- Ectopic discharges
- Transcriptional changes

Central mechanisms

Hyperexcitability

Loss of inhibitory controls

Reorganization

Sensitization

- Peripheral
- Central

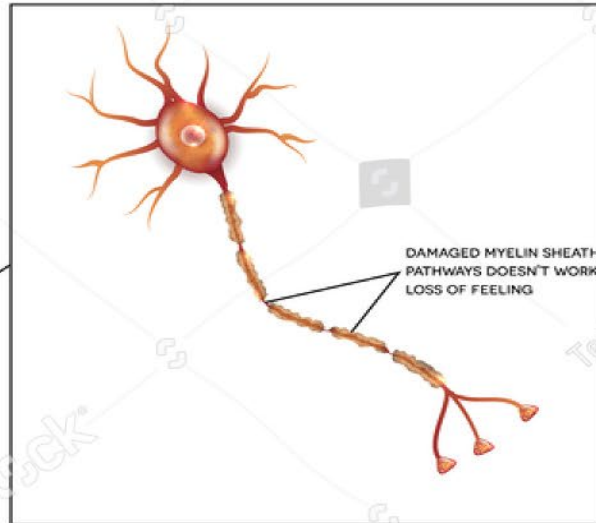
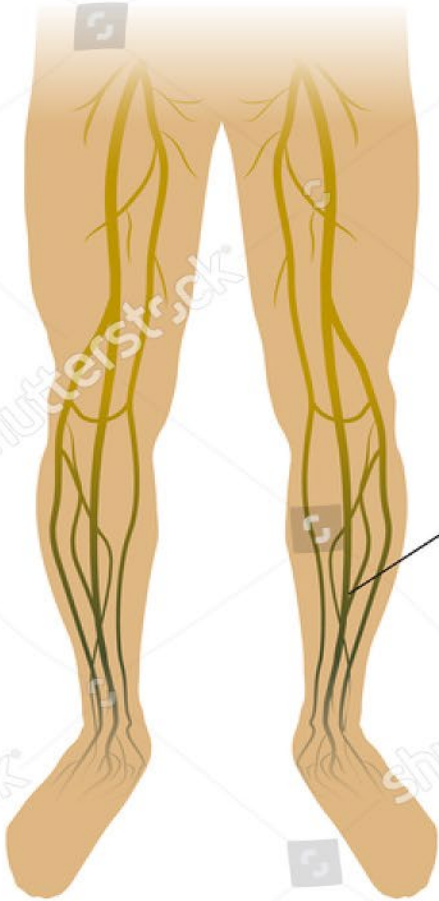
Neuropathic pain

PERIPHERAL NEUROPATHY

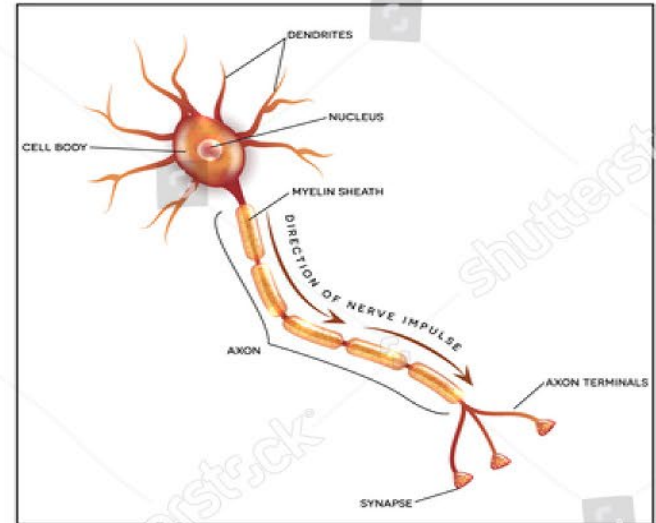
- **Peripheral Neuropathy symptoms can range from numbness or tingling, to pricking sensations (paresthesia), or muscle weakness.**
- **Severe symptoms may include burning pain (especially at night), muscle wasting, paralysis, or organ or gland dysfunction. Damage to nerves that supply internal organs may impair digestion, sweating, sexual function, and urination.**
- **In the most extreme cases, breathing may become difficult, or organ failure may occur.**

PERIPHERAL NEUROPATHY

NERVE DAMAGE

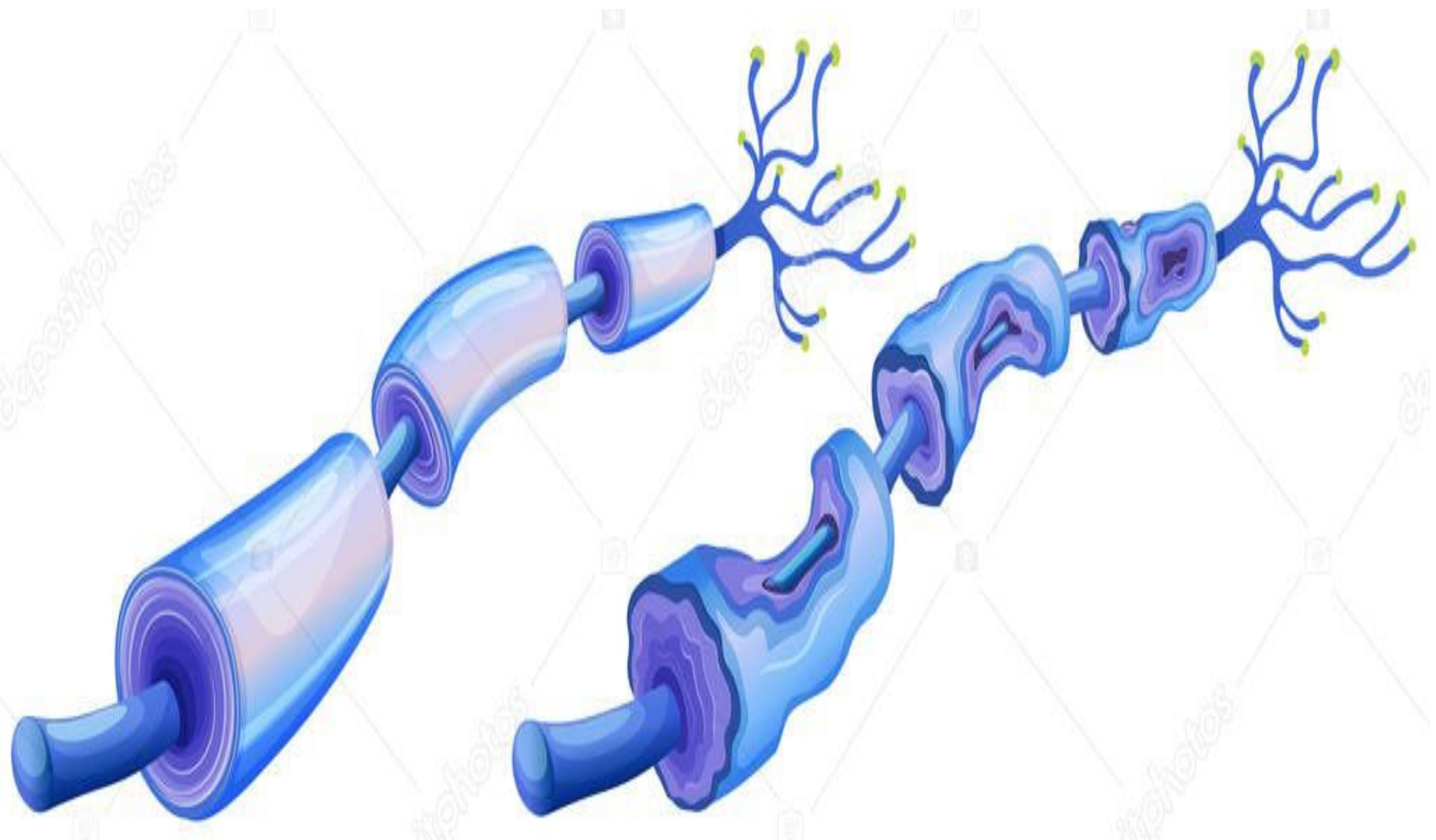


UNHEALTHY NERVE CELL



HEALTHY NERVE CELL

Peripheral Neuropathy



CENTRAL NEUROPATHY

- **This disorder can occur in people who have experienced strokes, multiple sclerosis, Parkinson's disease, brain tumors, limb amputations, brain injuries, or spinal cord injuries. It may develop months or years after injury or damage to the CNS.**
- **It is characterized by a mixture of pain sensations, the most prominent being a constant burning. The steady burning sensation is sometimes increased by light touch.**
- **This type of pain also increases in the presence of temperature changes, most often cold temperatures.**
 - **People may describe loss of sensation which can occur most prominently in the distant parts of the body, such as the hands and feet.**

Neuropathic Pain

- **Pain medications often provide little or no relief for neuropathic pain.**
- **However, some antidepressants and anticonvulsants can be useful in treating neuropathic pain.**
 - **Adjunctive therapy-**
 - **Tri-cyclic antidepressants and/or anticonvulsants**

EFFECTIVE PAIN MANAGEMENT-

Assessment of Pain

- **Effective pain management can generally be accomplished by paying attention to the following steps:**
 - **Good comprehensive assessment and regular screening to ensure that the patient's pain is recognized early.**
 - **Proper characterization of the pain to identify and understand underlying pathophysiology, which could significantly influence treatment options.**
 - **Is the pain acute or chronic?**

Pain Assessment continued...

- Is it somatic, visceral, neuropathic, or mixed?
- Is there an incidental component?
- Is there breakthrough pain?
- Determining whether the pain requires pharmacologic and/or other modalities of treatment. Pain is often multifactorial in nature, so factors that may modulate pain expression, such as psychological distress and substance use, should be assessed.
- What is the impact of pain on the patient?
- Is the benefit of treatment likely going to outweigh the risks?

PAIN ASSESSMENT

“OPQRSTU”

<https://nurseslabs.com/wp-content/uploads/2015/09/NHA-011-PainAssessmentOPQRSTUV.png>

- **O: Onset**
 - When did it begin? How long does it last (duration)? How often does it occur (time)? What were you doing when the pain started?
- **P: Provoking or Palliating Factors**
 - What brings it on? What makes it better? What makes it worse?
- **Q: Quality**
 - What does it feel like? Can you describe it (throbbing, stabbing, dull, etc.)?
- **R: Region & Radiation**
 - Does your pain radiate? Where does it spread? Point to where it hurts the most. Where does your pain go from there?
- **S: Severity**
 - What is the intensity of the symptom (pain scale 1-10, visual scales) Right now? At worst? Are there any other symptoms that accompany the pain?
- **T: Time & Treatment**
 - When did the symptoms first begin? What medications are you currently taking for this? How effective are these? Side Effects?
- **U: Understanding & Impact**
 - What do you believe is causing this? How is this affecting your ADLs, you and/or your family? Do you have any other concerns?

QUESTIONS to ASK PATIENTS

Acronym OLD CARTS:

- **O**nset
- **L**ocation
- **D**uration
- **C**haracter
- **A**lleviating/Aggravating
- **R**adiation
- **T**emporal Factors
- **S**everity

PAIN ASESMENT TOOLS







- 0-10 pain intensely scale
- Simple Descriptive scale
- Visual analog scale
- Faces Rating Scale (children)
- PAIN-AD (nonverbal dementia)
- Patient/caregiver entries

UNIVERSAL PAIN ASSESSMENT

Universal pain assessment tool

This pain assessment tool is intended to help patient care providers assess pain according to individual patient needs. Explain and use 0–10 scale for patient self-assessment. Use the faces or behavioral observations to interpret expressed pain when patient cannot communicate his/her pain intensity.



	0	1	2	3	4	5	6	7	8	9	10
Verbal descriptor scale	No pain		Mild pain		Moderate pain		Moderate pain		Severe pain		Worst pain possible
Wong-Baker facial grimace scale	 Alert smiling	 No humor serious flat	 Furrowed brow pursed lips breath holding	 Wrinkled nose raised upper lips rapid breathing	 Slow blink open mouth	 Eyes closed moaning crying					
Activity tolerance scale	No pain	Can be ignored	Interferes with tasks	Interferes with concentration	Interferes with basic needs	Bedrest required					

How do you assess pain in a non-verbal patient ?

- **Facial action (at rest and with repositioning)**
- **Body movement and with repositioning**
- **Vocalizations (groan with repositioning)**
- **Increased heart rate**
- **Respiratory rate**
- **Blood pressure**
- **Decreased heart rate with oxygen desaturation**

NON-VERBAL PAIN SCALE

TABLE 2

PAIN ASSESSMENT IN ADVANCED DEMENTIA (PAINAD) SCALE

Items	Score = 0	Score = 1	Score = 2	Score
Breathing (independent of vocalization)	Normal	<ul style="list-style-type: none"> Occasional labored breathing Short period of hyperventilation 	<ul style="list-style-type: none"> Noisy labored breathing Long period of hyperventilation Cheyne-Stokes respirations 	
Negative vocalization	None	<ul style="list-style-type: none"> Occasional moan or groan Low level of speech with a negative or disapproving quality 	<ul style="list-style-type: none"> Repeated troubled calling out Loud moaning or groaning Crying 	
Facial expression	Smiling or inexpressive	<ul style="list-style-type: none"> Sad Frightened Frown 	<ul style="list-style-type: none"> Facial grimacing 	
Body language	Relaxed	<ul style="list-style-type: none"> Tense Distressed pacing Fidgeting 	<ul style="list-style-type: none"> Rigid Fists clenched Knees pulled up Pulling or pushing away Striking out 	
Consolability	No need to console	<ul style="list-style-type: none"> Distracted or reassured by voice or touch 	<ul style="list-style-type: none"> Unable to console, distract, or reassure 	
Total				

Note. Total scores range from 0 to 10 (based on a scale of 0 to 2 for each of five items), with a higher score indicating more behaviors indicating pain (0 = no observable pain to 10 = highest observable pain).

Adapted from Warden, V., Hurley, A.C., & Volicer, L. (2003). Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale. *Journal of the American Medical Directors Association*, 4, 9-15.

Morphine at end-of-life

- **Pain management**
- **Eases breathing even with lower respirations**
- **The fear of Morphine**
- **Explaining “Double effect”**

Opioids at the End of Life

Common Opioids utilized in end of life care:

- **Codeine- tablet, liquid**
- **Hydrocodone – tablet, liquid**
- **Morphine ER(MS Contin)- tablet, liquid, IV, SQ, IM**
- **Oxycodone (OxyContin)–tablet, liquid**
- **Hydromorphone- Dilaudid**
- **Methadone-tablet**
- **Fentanyl – Patch**

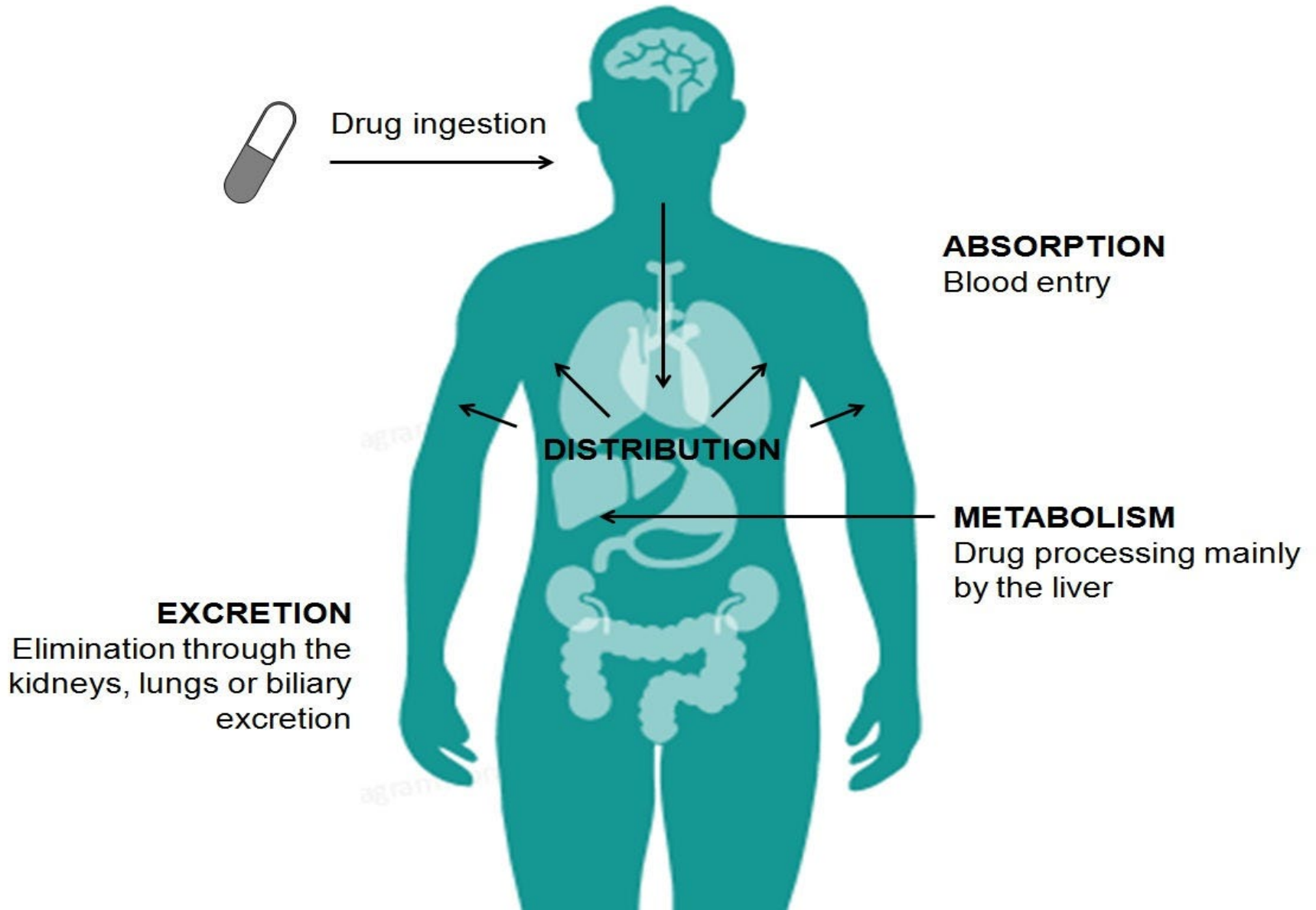
OPIOID DISTRIBUTION and ELIMINATION

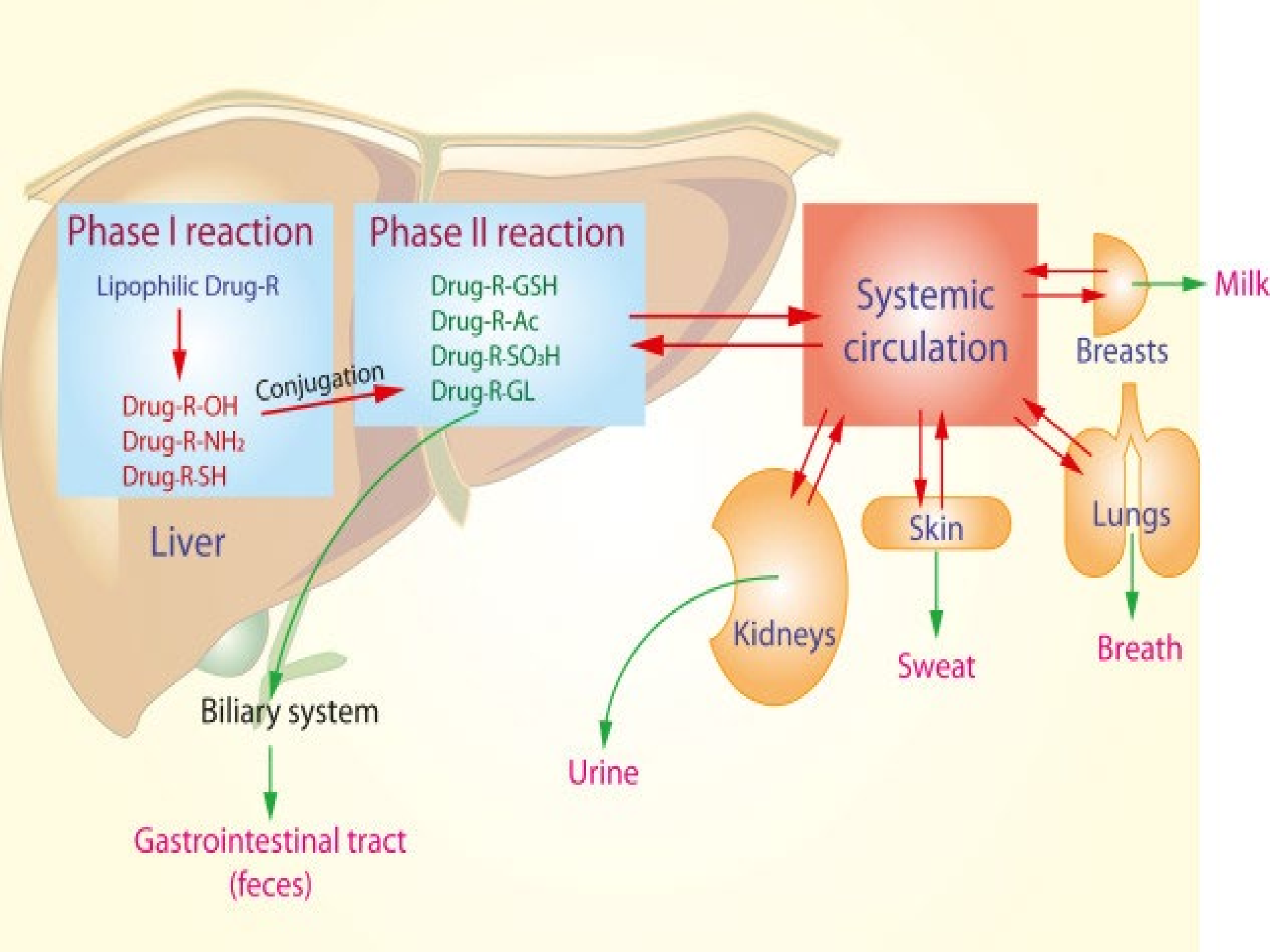
- **Two ways Opioids are distributed**
 - **Hydrophilic -compounds distribute in the circulating system.**
 - **Lipophilic- compounds adsorbed in fatty tissues and have a secondary distribution from this deposition**
- **Elimination of opioids occurs in the liver and Kidneys.**
 - **Therefore, in patients with renal or hepatic dysfunction these pharmaceuticals can be altered. So if we don't consider this in these types of patients when providing pain relief we could be causing potentially preventable adverse effects such as respiratory depression, hypotension, or central nervous system (CNS) toxicity.**

OPIOID PHARMAKINETICS

- **Opioid Receptors located throughout the body – peripheral, GI, pulmonary, central nervous system, immune system**
- **Pharmacokinetics to consider in Opioids use –**
 - **Absorption-the process whereby a drug moves from the muscle, digestive tract, or other site of entry into the body toward the circulatory system.**
 - **Distribution-pattern of distribution of drug molecules by various tissues after the chemical enters the circulatory system**
 - **Metabolism- is the process by which the body breaks down and converts medication into active chemical substances.**
 - **Elimination- the point at which it is completely eliminated form the body. In rare cases, some drugs irreversibly accumulate in body tissue.¹**

Four Stages of Pharmacogenetics





SIMPLE RECOMMENDATIONS

- 1. Oral administration of analgesics be first if possible.**
- 2. Analgesics should be given at regular intervals.**
- 3. Analgesics should be prescribed according to intensity as evaluated by a scale of intensity of pain.**
- 4. Dosing of pain medication should be adapted to the individual**
- 5. Analgesics should be prescribed with a constant concern for detail.**

ALTERNATIVES TO ORAL OPIOIDS

- **Other routes of administration: sublingual, buccal, rectal, vaginal**
- **Transdermal-opioid patches**
- **Parenteral- IV infusions or SC injections**
- **Epidural or spinal analgesics**

Interventional Procedures

- **Joint injection:** Treats joint pain and inflammation .
- **Radiofrequency ablation:** Heated probe or special needle used to deaden, or ablate, nerve endings to painful body areas or structures. Spine pain, joints, painful tumors.
- **Cryoablation:** probe or special needle is used to freeze or deaden nerve endings to painful body areas or structures(tumors).
- **Prolotherapy:** Medication is injected around damaged ligaments and tissues to induce healing. Tennis elbow, sacroiliac ligament.
- **Platelet-rich plasma injection (PRP):** Experimental injections of person's own platelets given into a painful joint Degenerative knee arthritis.
- **Stem Cell injection:** Experimental, uses person's own stem cells and injecting them into joint. (Degenerative Knee osteoarthritis.)

Interventional Procedures

- **Spinal Cord and Peripheral nerve-stimulation (SCS, PNS, TENS):** Medical device consisting of wire lead and generator(battery). Can be surgically implanted near a nerve or spinal cord. Others can be placed on skin. They electrically block or modulate pain signals. Used for severe spinal pain or limb pain.
- **Drug Pump or Intrathecal Drug Delivery System:** Medical device with a flexible tube connected to a small drug pump. Device is surgically implanted to deliver potent pain medications directly to spinal cord. Cancer related pain treatment.

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Thank you-Questions?



