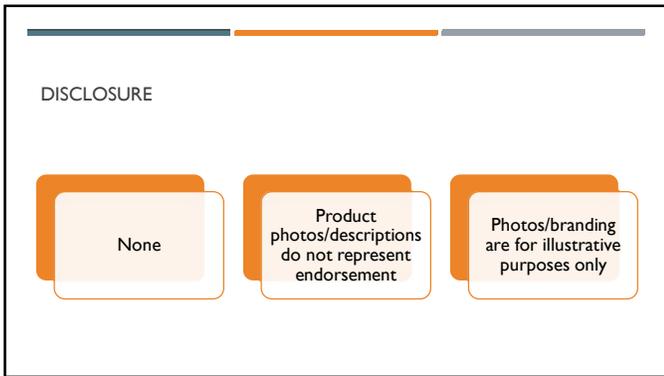
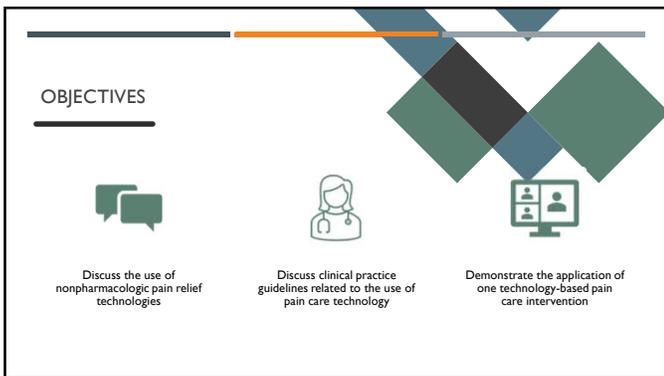




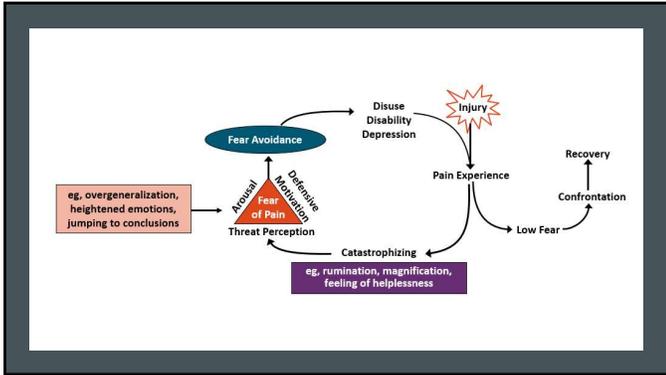
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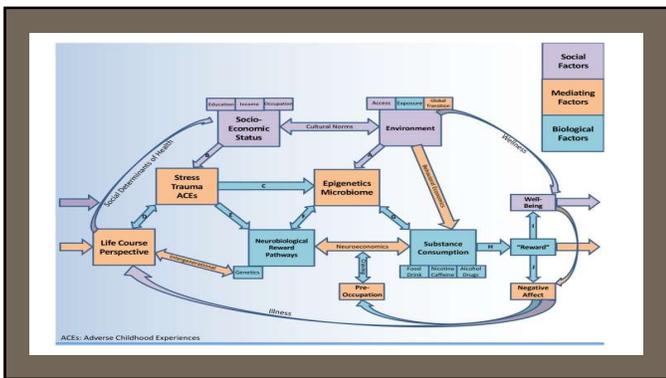
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3



7



8

PAIN

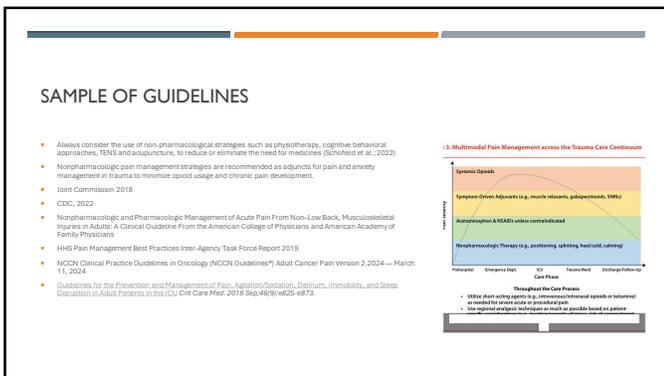
- Complex & best conceptualized in a bio-psycho-social-spiritual framework
- Best outcomes when integrating different management & treatment approaches
- Patient preferences/values are paramount for treatment adherence & effectiveness
- Incorporating patient preferences & values into pain plan facilitates success

Whole Health: It Starts With Me

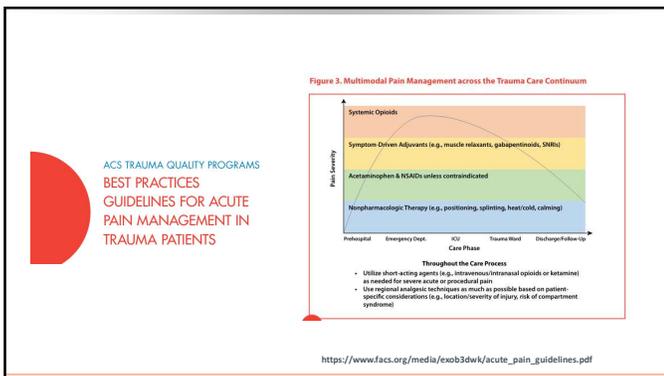
9



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NURSE DRIVEN TECHNOLOGIES

- Transcutaneous Electrical Nerve Stimulator (TENS)
- Transcutaneous Auricular neurostimulation (TAN)
- Biofeedback devices
- Virtual Reality
- other

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TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS)



- Non-pharmacological intervention
- Acute & chronic pain
- Safe, inexpensive, over-the-counter
- Pulsed alternating current through skin electrodes
- Parameters
 - pulse frequency & pulse intensity are adjustable & linked to efficacy

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MECHANISMS OF ANALGESIC EFFECTS



- Activates inhibitory mechanisms ↓ central excitability in CNS
- Activates large afferent fibers in periphery that send input to CNS
- Activates descending inhibitory systems ↓ hyperalgesia
- Brain responses measured w/EEG show ↓ cortical activity with LF & HF TENS
- ↓ activity primary somatosensory (S1) & motor (M1) cortices occurred w/both frequencies
- Reduced connectivity between SI/M1 & prefrontal cortex found only w/LF TENS
- FMRI - HF TENS ↓ activity in pons and connectivity between the pons and S1
- LF TENS ↑ functional connectivity in medulla

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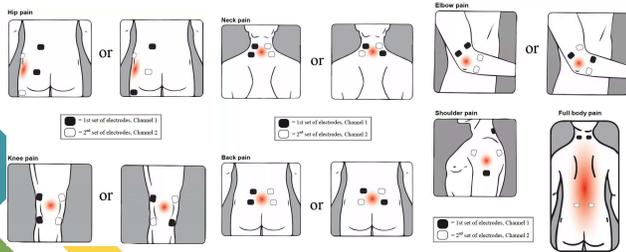
CONTRAINDICATIONS

-  A cardiac pacemaker or defibrillator
-  Spinal cord stimulator
-  Any implanted metallic or electronic device
-  Disrupted skin integrity
-  Cancer???

NOT CONTRAINDICATED

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HOW TO USE A TENS UNIT



Legend:
 ● = 1st set of electrodes, Channel 1
 ○ = 2nd set of electrodes, Channel 2

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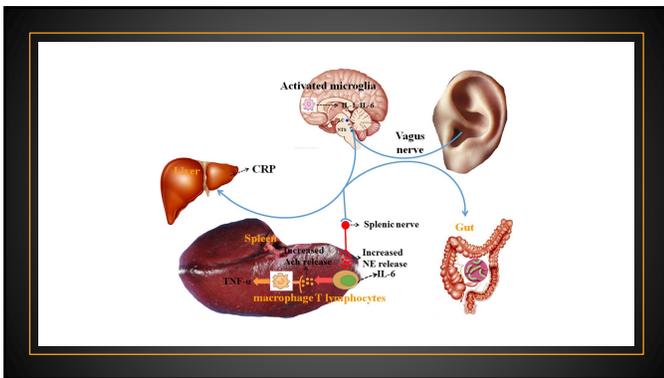
NURSING CONSIDERATIONS

- Assess**
 - Mental capacity
 - Skin integrity
 - Sensation
 - Safety
 - Other reason for pain
- In-patient P&P/guideline**
- Patient education**
- Over-the-counter**
- FSA/HSA reimbursable**

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CLINICAL APPLICATIONS

Opioid withdrawal

Pain

Anxiety

Depression

Headache

September 2023

Sidebar 7: Treatment Options for Cluster Headache[®]

Treatment	
V	Non-invasive vagus nerve stimulation ••
T	Galcanezumab •
V	Verapamil •
M	Sumatriptan subcutaneous ••
M	Zolmitriptan nasal spray ••
O	Oxygen therapy ••

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ADVERSE EVENTS

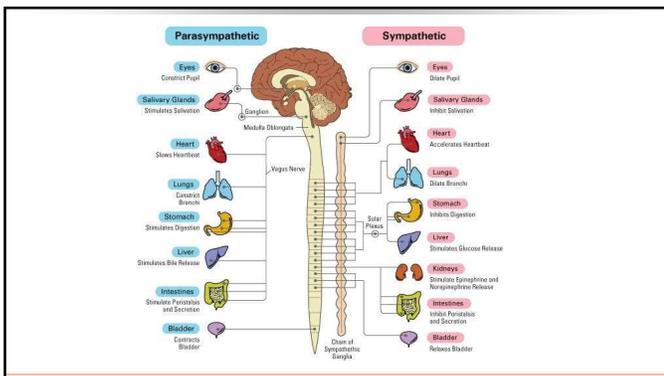
- Vestibular neuronitis
- Arrythmia
- Dizziness
- Depression
- Seizure
- Basal cell carcinoma

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BIOFEEDBACK
THE ULTIMATE IN SELF-CARE TECHNOLOGY

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HEART RATE VARIABILITY (HRV)

- Heart rate variability (HRV) analysis is a widely accepted tool for the noninvasive assessment of autonomic nervous system (ANS)

25 seconds of heart beat data

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Change in SBP vs. Average Slow Breathing Time per Week (minutes)

Greater reductions with greater use

The randomized controlled study [6] that also demonstrated FDA clearance for use without a prescription (OTC) demonstrated that slow breathing was the "active component" and a "noise response." Using RESPiRATE for only 45 minutes a week of slow breathing delivers significant blood pressure reductions. Using RESPiRATE more yields an even larger reduction.

Benefits beyond blood pressure

Beyond the 20 clinical studies in hypertension, independent researchers around the world have published more than 30 additional clinical studies demonstrating the various cardiopulmonary and neurological benefits of RESPiRATE. Please note that RESPiRATE has been cleared for marketing only for lowering blood pressure and stress.

Hypertension (250k Users)	20 studies
Heart Failure	9 studies
PTSD/Anxiety	8 studies
COPD & Pulmonary Hypertension	4 studies
Sympathetic Overactivity	5 studies
Vascular Resistance & Stiffness	3 studies
Improving Sleep	2 studies

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NEUROFEEDBACK

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NEUROFEEDBACK (NF)

Non-invasive treatment targeting brain activity

Type of biofeedback providing real-time information to patients about their brain activity

Allowing them to learn how to directly change this activity in ways that may lead to improved health and comfort.

Measures brain activity via EEG or functional Magnetic Resonance Imaging (fMRI)



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HOME-BASED NEUROFEEDBACK

- EEG approach accessible & less expensive
- Electrodes placed on scalp to measure amplitude/oscillatory activity in different frequency bandwidths
- Raw electrical signal represents collective activity of millions of neurons in the cortex
- Signal analyzed & aspects of electrical brain activity fed back to patient



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Biofeedback/Neurofeedback

- Sympathetic and Parasympathetic activation
- Rest & Digest
- You don't know what you don't know
- Does NOT measure or confirm pain
- Tool to support self-efficacy

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Virtual Reality

FDA U.S. FOOD & DRUG ADMINISTRATION

Home / News & Events / FDA Approves / Press Announcements / FDA Authorizes Marketing of Virtual Reality System for Chronic Pain Reduction

FDA NEWS RELEASE

FDA Authorizes Marketing of Virtual Reality System for Chronic Pain Reduction



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Mechanism of Action of Virtual Reality

- Complex interplay of brain cortices, neuronal chemistry w/ cognitive, emotion, and attentional process
- Gate Control Theory**
 - Attention to pain modifies suffering
 - Distractions may reduce suffering
- Theory of Multiple resources**
 - Various cognitive & perceptual processes needed to perform a task.
 - This theory supports the use of VR technology as a method of pain relief, which is based on integrating multimodal (visual, auditory, tactile, and olfactory) sensory distractions.
- Neurobiological mechanisms: intercortical modulation**
- Signaling pathways of pain matrix**
 - attention, emotion, memory & senses (eg. touch, auditory, and visual)
- Practice makes perfect**
 - Move without pain in a virtual world

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Artificial Intelligence



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PMCID: PMC10322534
 PMID: 37418623

Artificial Intelligence for Automatic Pain Assessment: Research Methods and Perspectives

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OTHER TECH

- Web-based / App based pain coping skills
- Telemedicine
- TeleHEALTH

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