Pain Management: Rationale for the BioPsychoSocial Perspective

MI-CCSI

David A. Williams, Ph.D.

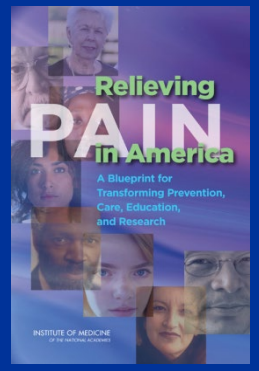
Professor of Anesthesiology, Medicine, Psychiatry and Psychology
Associate Director, Chronic Pain and Fatigue Research Center
Co-Director, Research Development, Michigan Institute for Clinical Health Research (MICHR)
Director, Network-based Research Unit, MICHR
University of Michigan Medical Center
Ann Arbor, Michigan

Disclosures

- Consultant to Community Health Focus Inc.
- Consultant to Swing Therapeutics, Inc.
- Funded for research by NIH

There will be no use of off-label medications in this presentation.

Chronic Pain Numbers



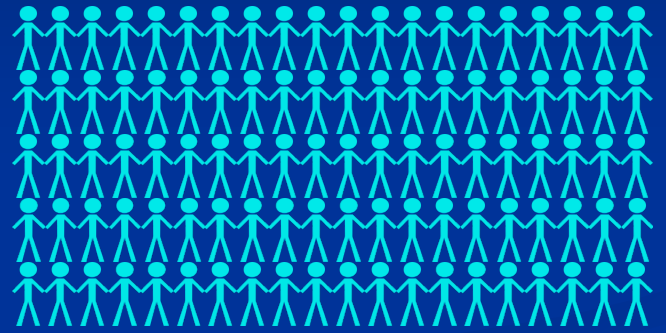
100 Million People
- US

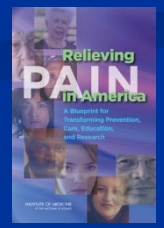
150 Million
- 37 Countries

Eccleston, C., Wells, C. (2017). European Pain Management. Oxford University Press

More people have Chronic Pain than Diabetes, Heart Disease, and Cancer Combined

Chronic Pain	100 Million
Diabetes	29.1 Million
Heart Disease	27.6 Million
Cancer	13.7 Million





= 1 Million individuals

What is Pain?

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

IASP
INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN
CELEBRATING | 1974–2024

What is Pain?

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

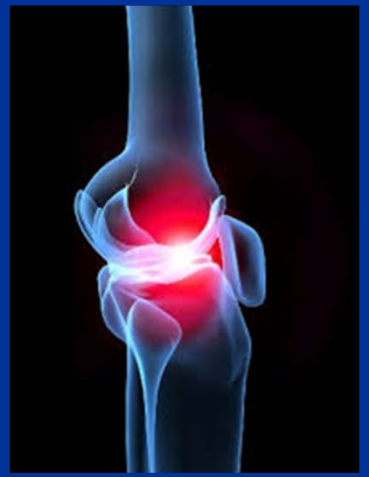
- Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
- Pain and nociception are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
- Through their life experiences, individuals learn the concept of pain.
- A person's report of an experience as pain should be respected.
- Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.
- Verbal description is only one of several behaviors to express pain; inability to communicate does not negate the possibility that a human or a nonhuman animal experiences pain.

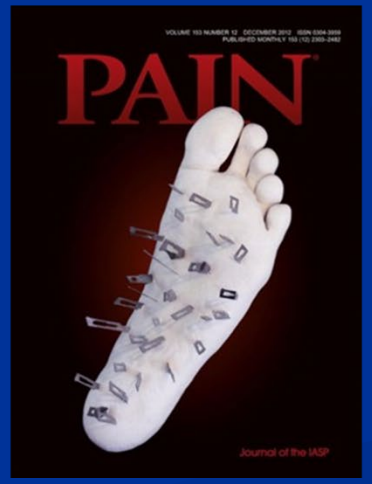
How is Pain Classified?

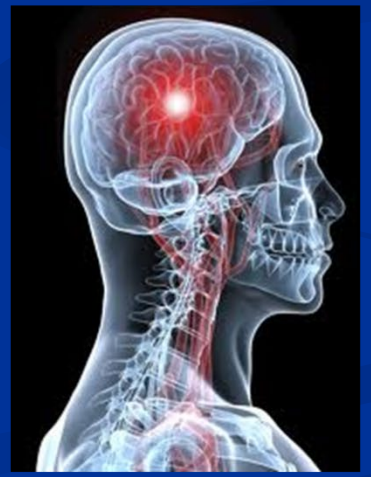
Time	Body Location	Suspected Etiology
Acute Vs Chronic	Head, Neck, Back, Pelvis	Cancer, Rheumatic, etc.

Newest Classification: Pain Mechanisms

Nociceptive Peripheral damage or inflammation	Neuropathic	Central







[1]Woolf CJ. *J Clin Invest*. 2010;120(11):3742-3744. [2]Costigan M, et al. *Annu Rev Neurosci*. 2009;32:1-32. [3]Dickinson BD, et al. *Pain Med*. 2010;11:1635-1653. [4]Williams DA, Clauw DJ. *J Pain*. 2009;10(8):777-791.

Nociceptive Pain

(mechanical, thermal, chemical)

Neuropathic Pain

Peripheral

Central

Post-Stroke

Nociplastic Pain

CNS augmentation of peripheral nociception or CNS generation

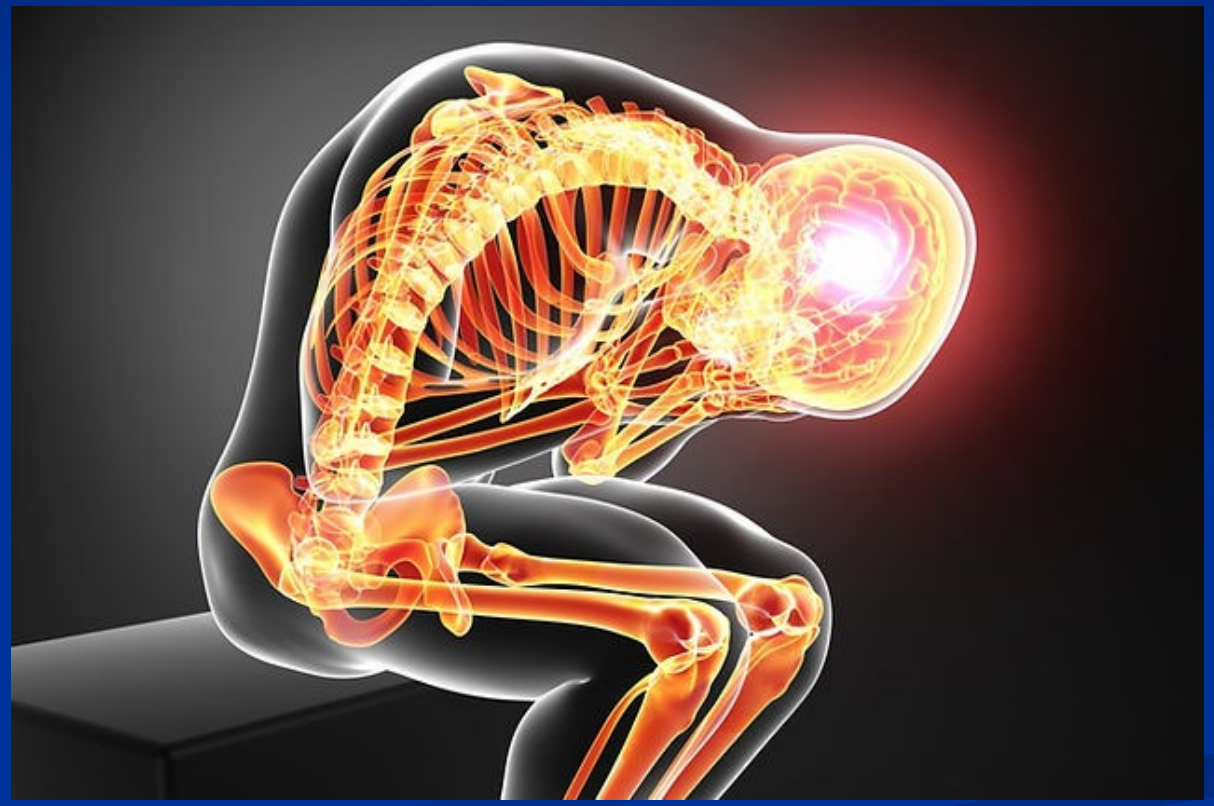
Pain is widespread

- Disproportionate to injury
- Accompanied by CNS-mediated symptoms

Responds to:
CNS acting drugs and Non-pharm treatments

Classic Examples:

- Fibromyalgia
- Chronic overlapping pain conditions (COPCS)



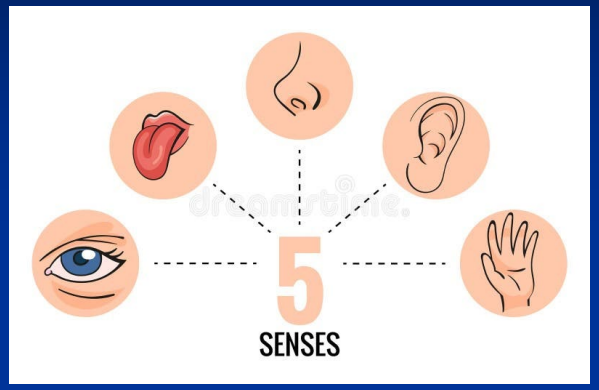
Central (Nociplastic) Chronic Overlapping Pain Conditions

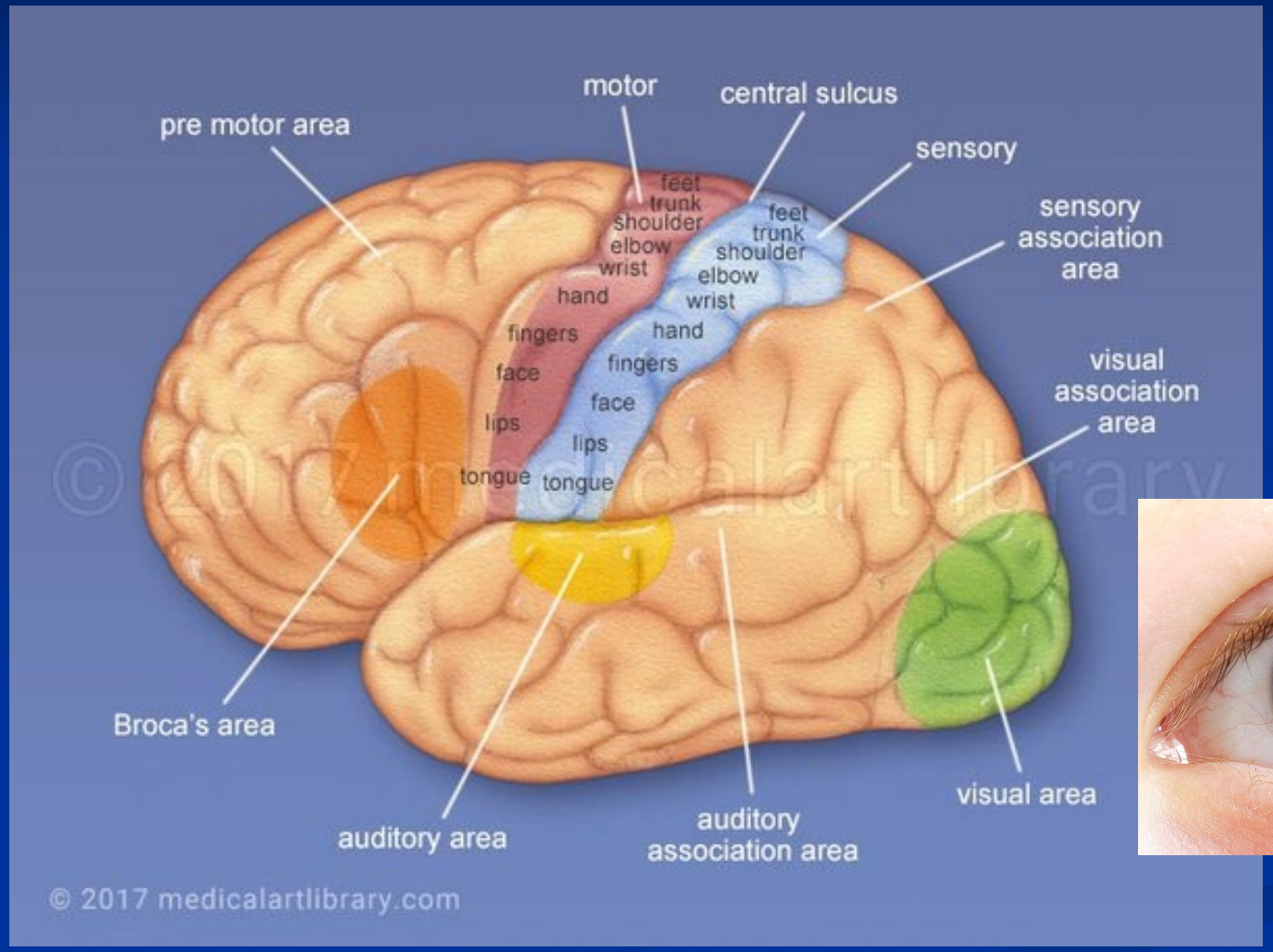
COPCs	US Prevalence
Irritable Bowel Syndrome	44 Million
Temporomandibular Disorder	35 Million
Chronic Low Back Pain	20 Million
Interstitial Cystitis / Bladder Pain Syndrome	8 Million
Migraine Headache	7 Million
Tension Headache	7 Million
Endometriosis	6 Million
Vulvodynia	6 Million
Fibromyalgia	6 Million
Myalgic Encephalopathy / CFS	4 Million

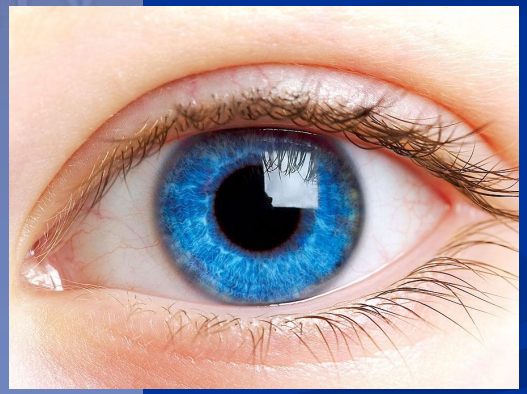
[1]Veasley, C. et al (2015). White paper from the *Chronic Pain Research Alliance*.

How Does Pain Happen?

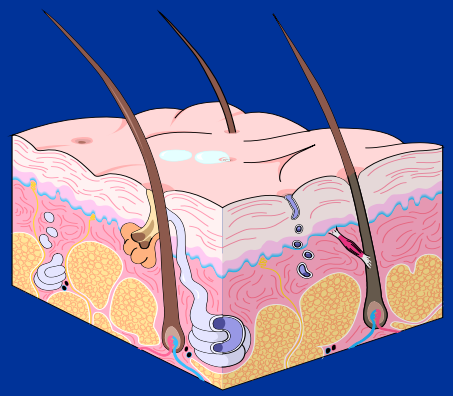
Multi-Stage Sensory Processing

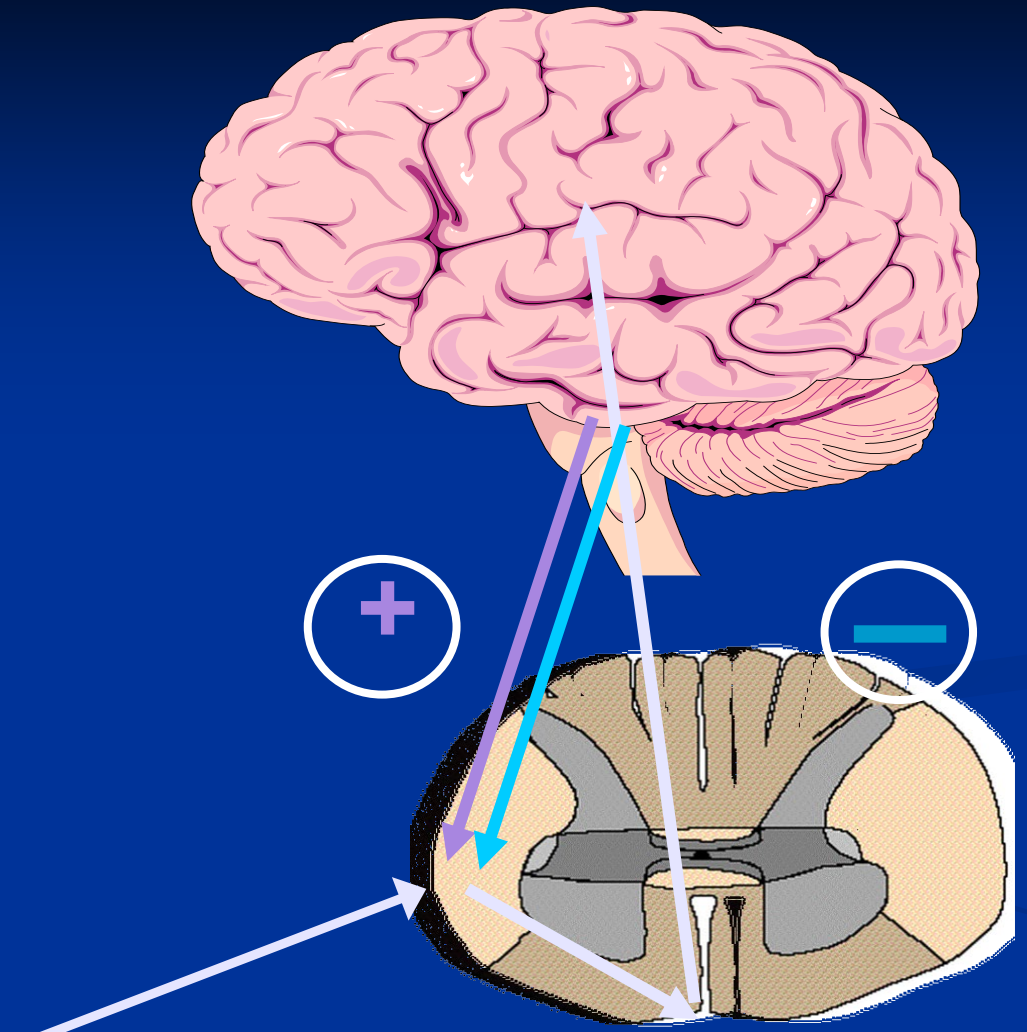






Nociception





CNS Neurotransmitters Influencing Pain

Facilitation

Gabapentinoids, ketamine

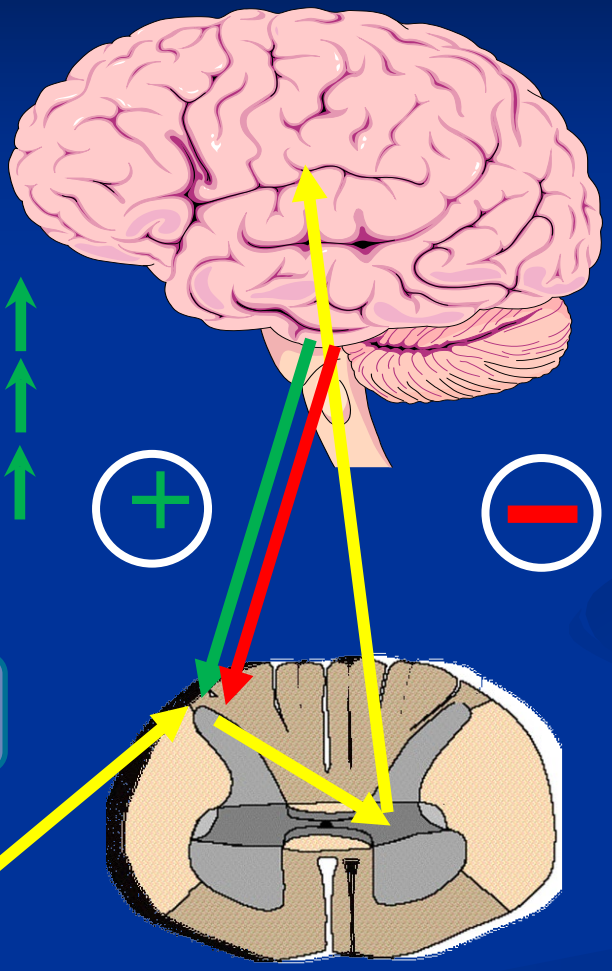
Glutamate and EAA

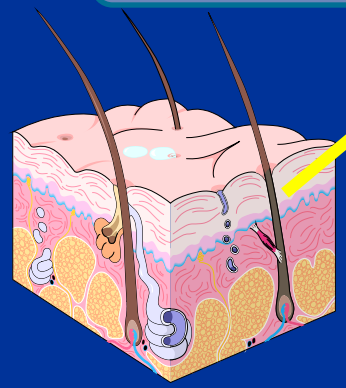
Substance P

Nerve growth factor

Serotonin ($5HT_{2a, 3a}$)

Anti-migraine drugs (–triptans), cyclobenzaprine





Inhibition

Descending anti-nociceptive pathways

Norepinephrine-serotonin ($5HT_{1a,b}$), dopamine

Tricyclics, SNRIs. tramadol

Opioids

Low dose naltrexone

Cannabinoids

No knowledge of endocannabinoid activity but this class of drugs is effective

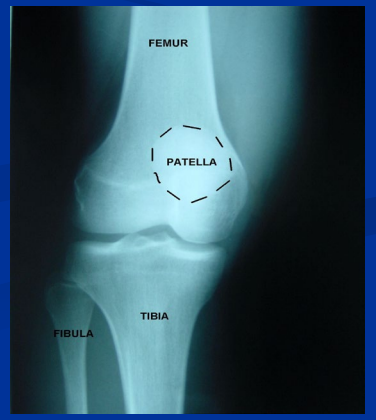
GABA

Gammahydroxybutyrate, moderate alcohol consumption

1. Schmidt-Wilcke T, Clauw DJ. *Nat Rev Rheumatol.* Jul 19 2011.
2. Clauw DJ. JAMA. 2014.

Peripheral Amplifier

Central Amplifier



What Do We Know About the Central Amplifier?

Neurobiological perspective

Brain regions associated with pain processing involve both sensory and affective/cognitive regions

- Sensory / discriminative dimension
  - Somatosensory cortices (S1, S2)
  - Dorsal posterior insula
- Affective / Cognitive dimensions
  - Anterior insula
  - Prefrontal cortex
  - Anterior cingulate cortex
  - Thalamus
  - Amygdala
  - Hippocampus

Goesling, Clauw & Hassett. Curr Psychiatry Rep. 2013;15:421

Neurobiological perspective

Brain regions associated with pain processing involve both sensory and affective/cognitive regions

- Sensory / discriminative dimension
  - Somatosensory cortices (S1, S2)
  - Dorsal posterior insula
- Affective / Cognitive dimensions
  - Anterior insula
  - Prefrontal cortex
  - Anterior cingulate cortex
  - Thalamus
  - Amygdala
  - Hippocampus

Goesling, Clauw & Hassett. Curr Psychiatry Rep. 2013;15:421

Neurobiological perspective

Brain regions associated with pain processing involve both sensory and affective/cognitive regions

- Sensory / discriminative dimension
  - Somatosensory cortices (S1, S2)
  - Dorsal posterior insula
- Affective / Cognitive dimensions
  - Anterior insula
  - Prefrontal cortex
  - Anterior cingulate cortex
  - Thalamus
  - Amygdala
  - Hippocampus

Goesling, Clauw & Hassett. Curr Psychiatry Rep. 2013;15:421

CNS Neurotransmitters Influencing Pain

Facilitation

Gabapentinoids, ketamine

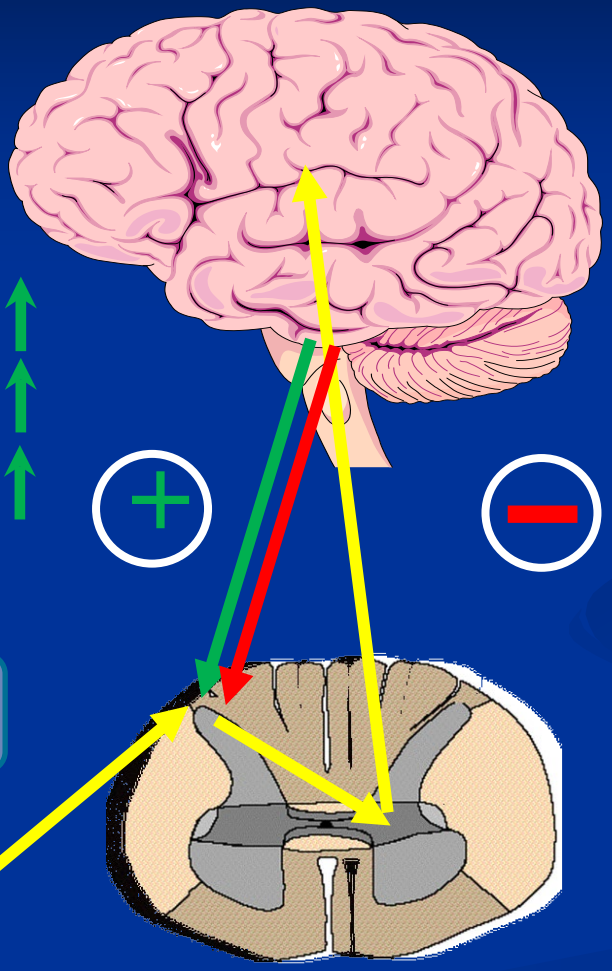
Glutamate and EAA

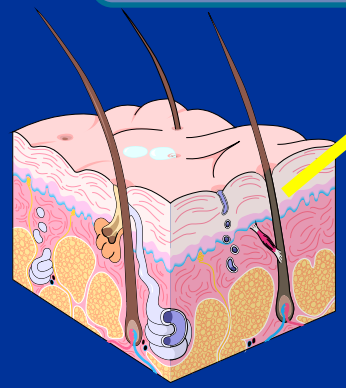
Substance P

Nerve growth factor

Serotonin ($5HT_{2a, 3a}$)

Anti-migraine drugs (–triptans), cyclobenzaprine





Inhibition

Descending anti-nociceptive pathways

Norepinephrine-serotonin ($5HT_{1a,b}$), dopamine

Tricyclics, SNRIs. tramadol

Opioids

Low dose naltrexone

Cannabinoids

No knowledge of endocannabinoid activity but this class of drugs is effective

GABA

Gammahydroxybutyrate, moderate alcohol consumption

1. Schmidt-Wilcke T, Clauw DJ. *Nat Rev Rheumatol.* Jul 19 2011.
2. Clauw DJ. JAMA. 2014.

Neurotransmitters for Pain Processing

Norepinephrine

Concentration

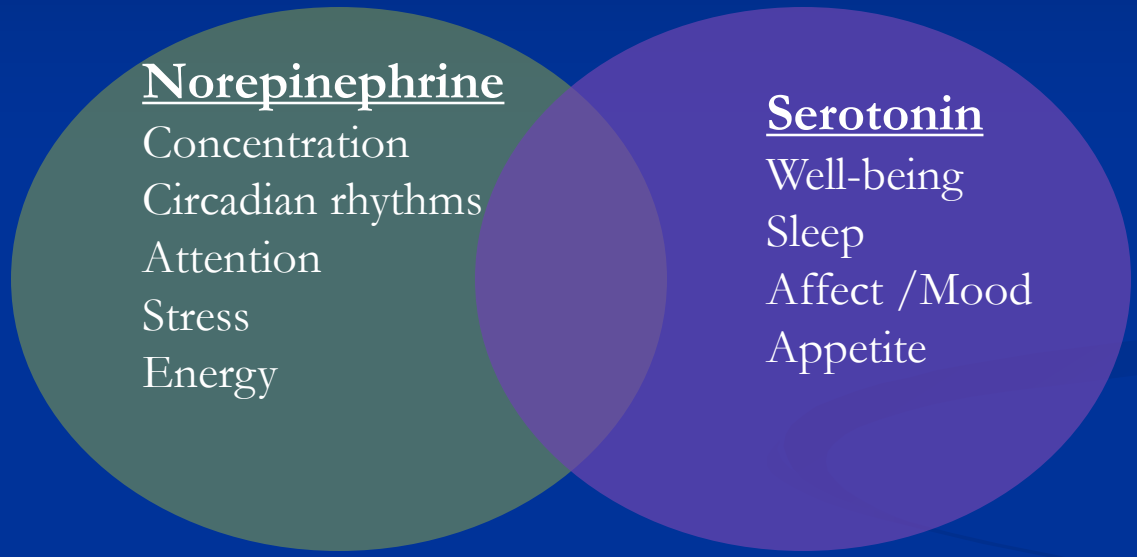
Circadian rhythms

Attention

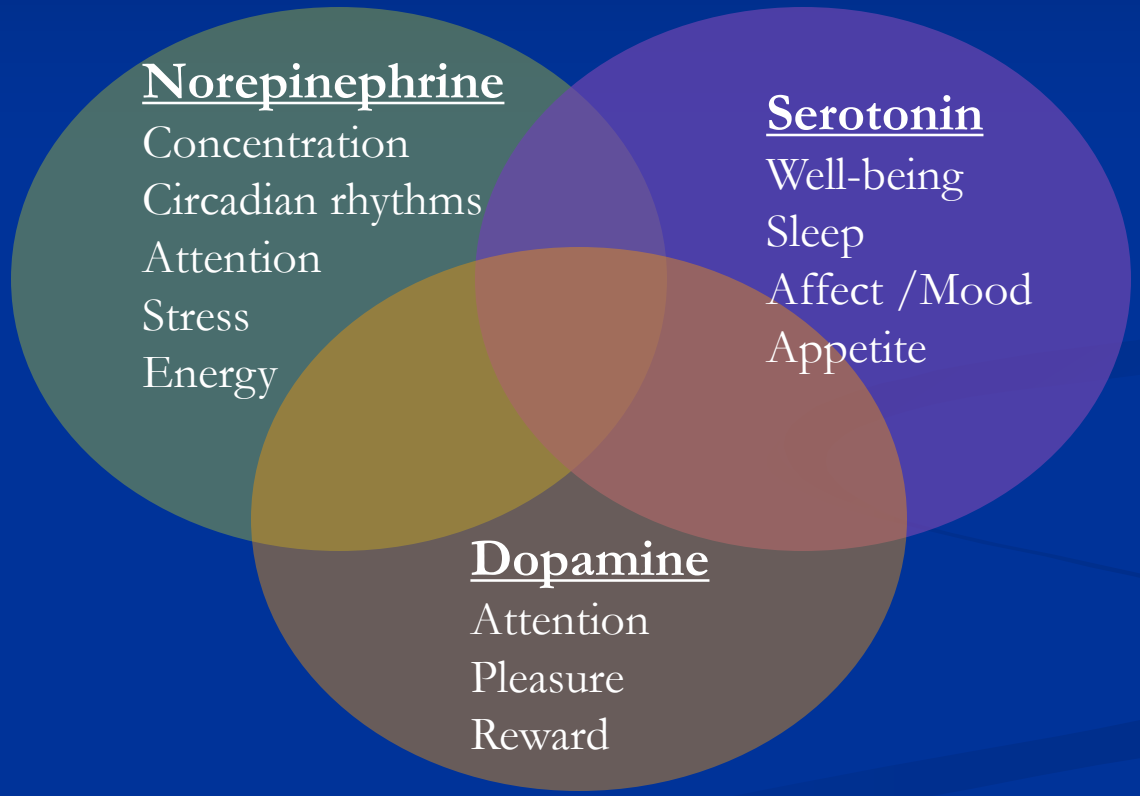
Stress

Energy

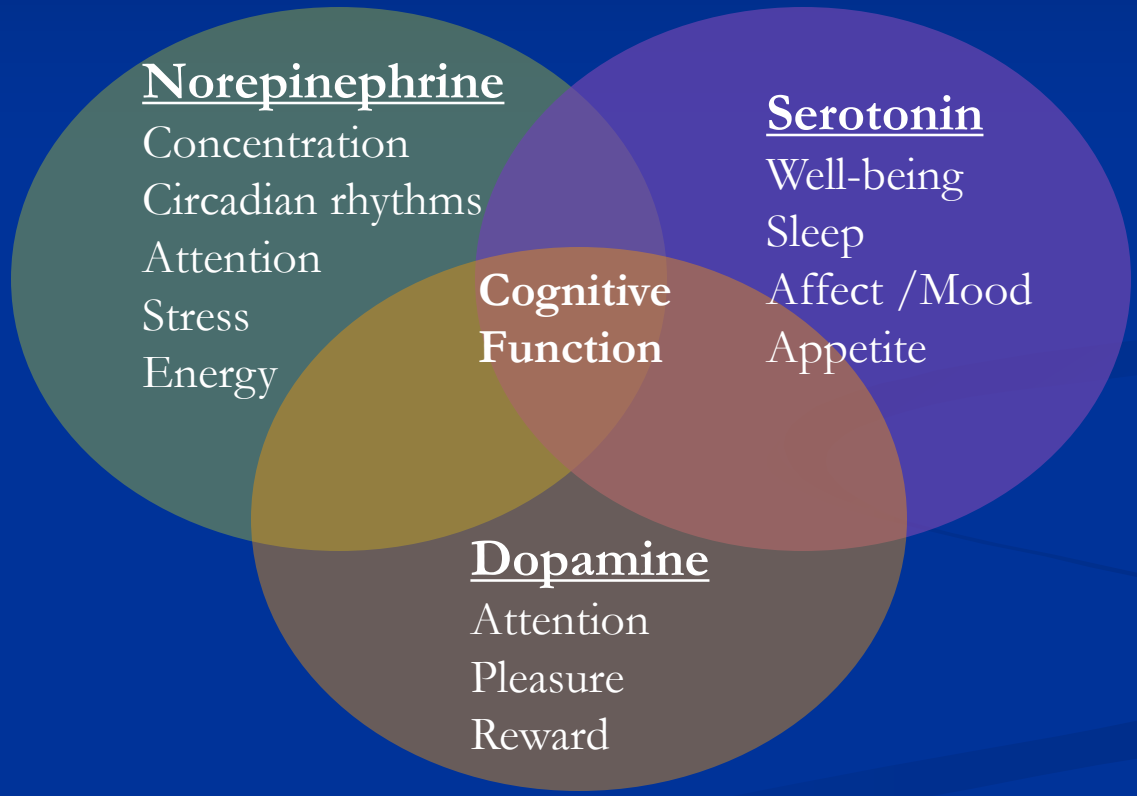
Neurotransmitters for Pain Processing



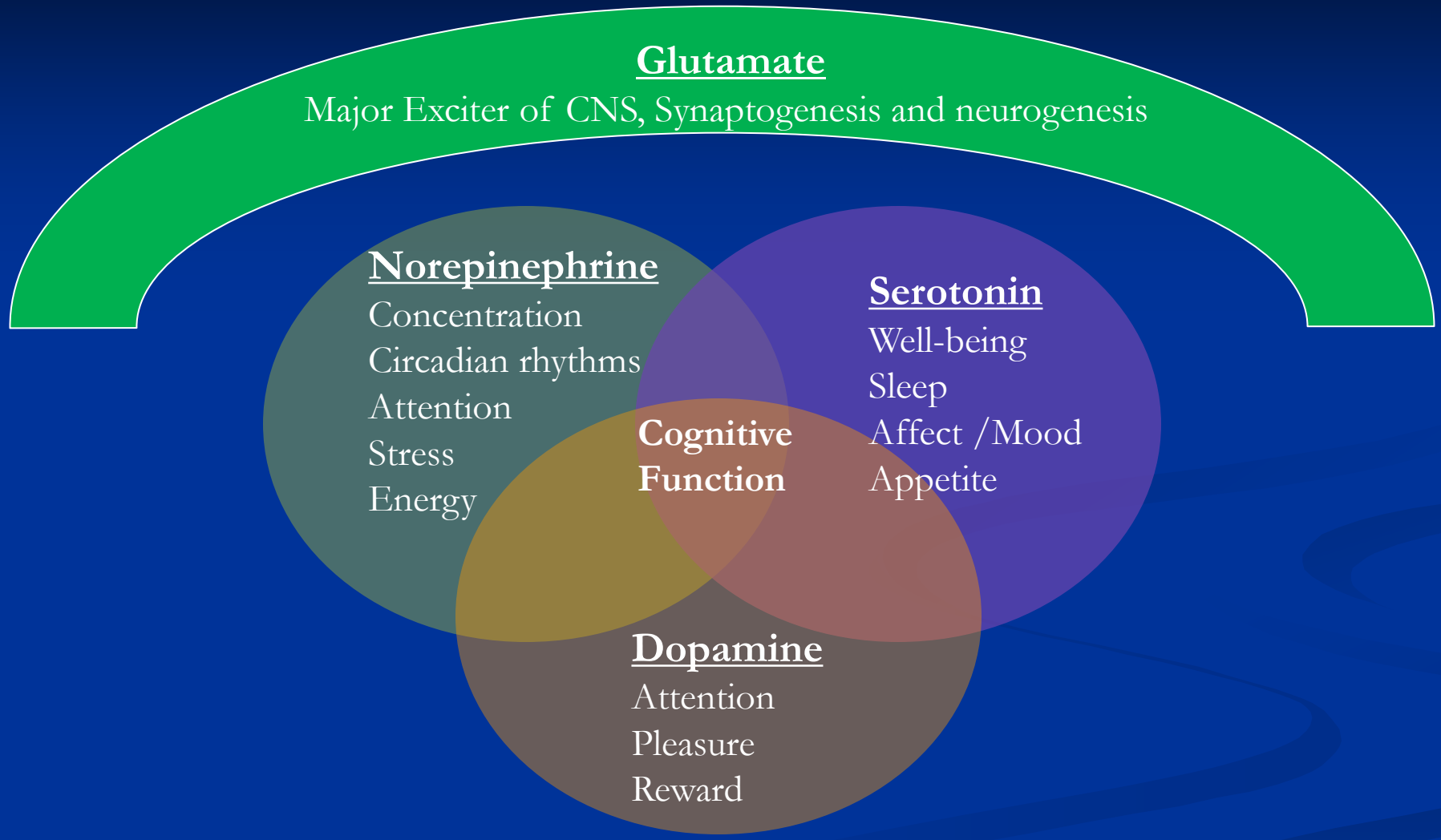
Neurotransmitters for Pain Processing



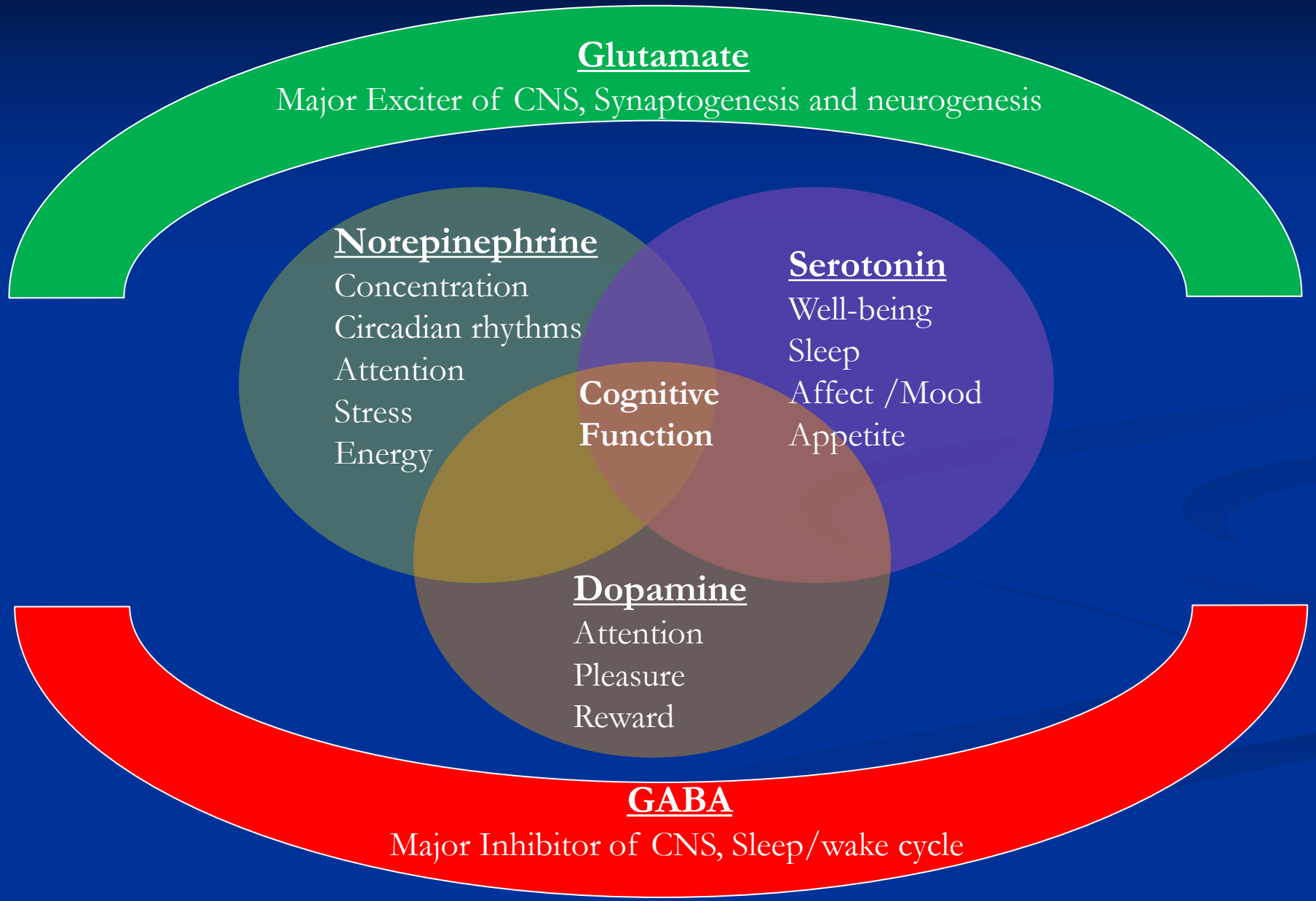
Neurotransmitters for Pain Processing



Neurotransmitters for Pain Processing



Neurotransmitters for Pain Processing



Shared Neurotransmitters Explain

- The complexity of chronic pain presentation

Williams, DA (2018). JABR, 23(2):e12135. Schrepf, A et al., JPain, 2018 (in press).

Shared Neurotransmitters Explain

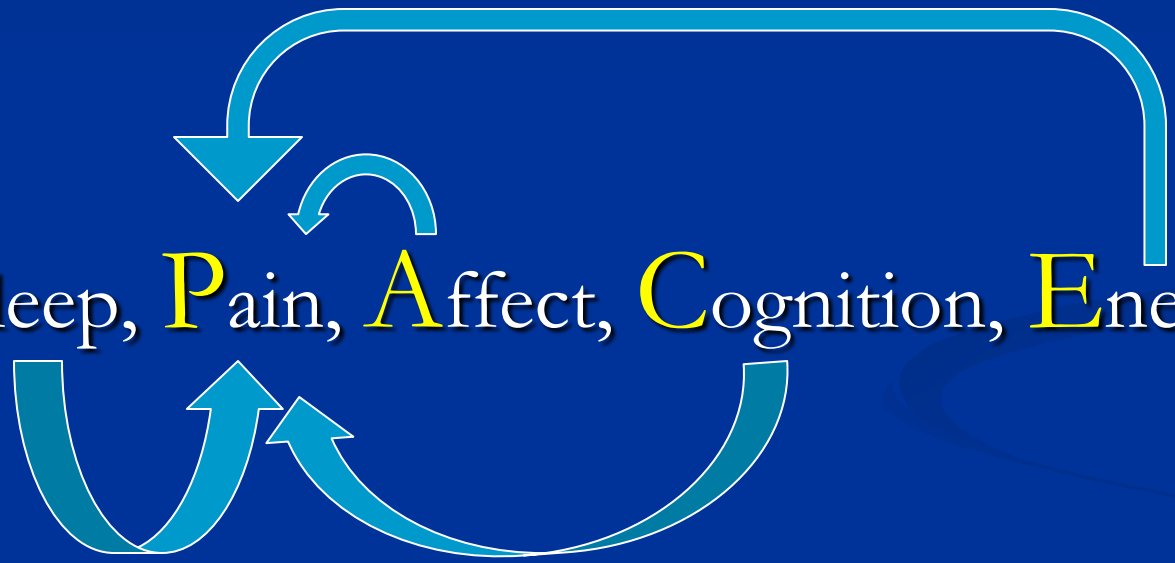
- The complexity of chronic pain presentation

- Sleep, Pain, Affect, Cognition, Energy

Williams, DA (2018). JABR, 23(2):e12135. Schrepf, A et al., JPain, 2018 (in press).

Shared Neurotransmitters Explain

- The complexity of chronic pain presentation



- Sleep, Pain, Affect, Cognition, Energy
- **SPACE** represents new targets for treating pain perception

Williams, DA (2018). JABR, 23(2):e12135. Schrepf, A et al., JPain, 2018 (in press).

So what's a doctor to do?

Most Pain Care Visits occur within Primary Care

Peterson K, et al.. VA ESP Project #09-199; 2017.

Primary Care Physicians Receive Little Training in Pain Management

- 80% of American Medical Schools have no formal pain education
- Those that do, report 5 or fewer hours
  - Emphasis of education is often cellular and subcellular rather than interpersonal or social in nature
- Only 34% of physicians reported feeling comfortable treating chronic pain
  - Only 1% found it a satisfying practice

Loeser, JD & Schatman, ME (2017). Chronic pain management in medical education: a disastrous omission. Postgraduate Medicine, 129 (3): 332-335.

How good is our black bag for treating chronic pain?

Treatment	Impact on Chronic Pain
Long term opioids	32% reduction
Pain drugs generally (across classes)	30% - 40% get 40% - 50% relief
Spinal fusion	75% still have pain
Repair herniated disk	70% still have pain
Repeat Surgery	66% still have pain
Spinal cord stimulators	61% still in pain after 4 yrs. average pain relief 18% across studies

Turk, D. C. (2002). *Clin.J Pain, 18*(6), 355-365; Backonja MM et al. *Curr Pain Headache Rep* 2006;10:34-38

Are Invasive Procedures Effective for Chronic Pain? A Systematic Review

Wayne B. Jonas, MD,* Cindy Crawford,† Luana Colloca, MD, PhD,‡ Levente Kriston, PhD,§ Klaus Linde, MD, PhD,¶ Bruce Moseley, MD,‖ and Karin Meissner‖,**

Conclusions. There is little evidence for the specific efficacy beyond sham for invasive procedures in chronic pain

Pain Medicine, 20(7), 2019, 1281–1293
doi: 10.1093/pm/pny154
Advance Access Publication Date: 10 September 2018
Review Article

OXFORD

Pain Medicine Versus Pain Management: Ethical Dilemmas Created by Contemporary Medicine and Business

John D. Loeser, MD† and Alex Cahana, MD, PhD*†*

Biomedical Model
Interventional
Pain Medicine

- Procedure Driven
- Focus on curing/fixing

Patient is passive recipient

Biopsychosocial model
Interdisciplinary
Pain Management

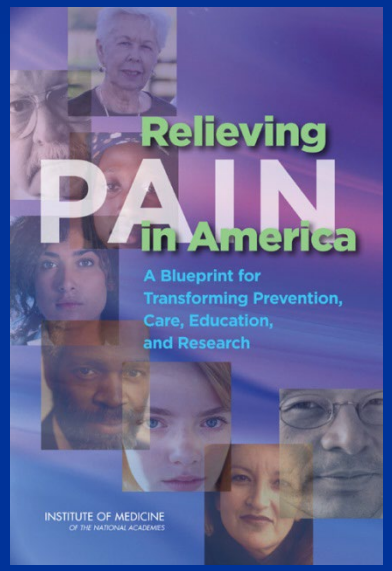
- Focus on multidisciplinary teams
- Focus on pain management

Patient is active participant

Loeser, J & Cahana, A. (2013). Clinical Journal of Pain, 29 (4): 311-316.

Recommendations in Multiple Federal Documents

Self-Management, Evidence-Based, Patient-Centric, Multi-Modal Pain Care



National Pain Strategy

A Comprehensive Population Health-Level Strategy for Pain

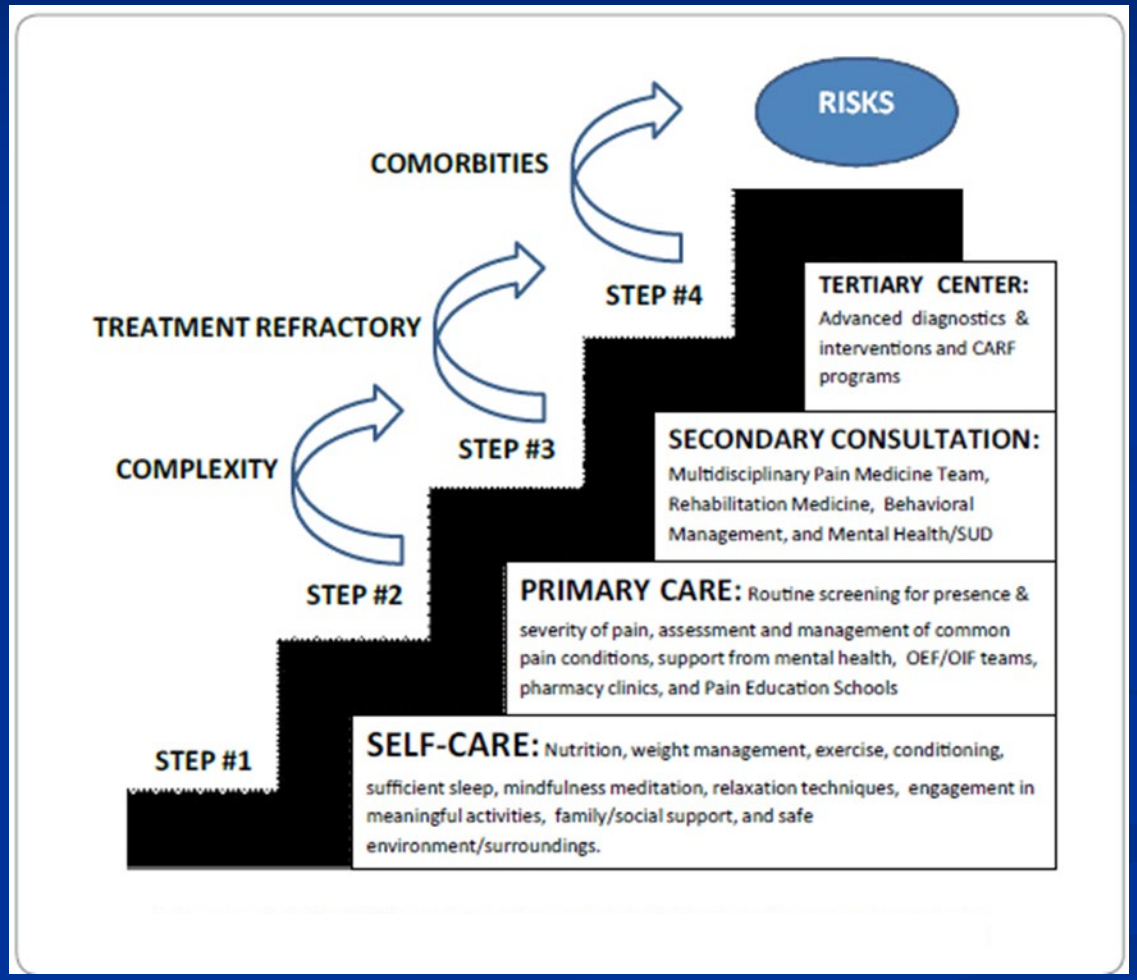
Healthy People 2030

EFFECTIVELY AND RESPONSIBLY MANAGE CHRONIC PAIN

GUIDELINE FOR PRESCRIBING OPIOIDS FOR CHRONIC PAIN

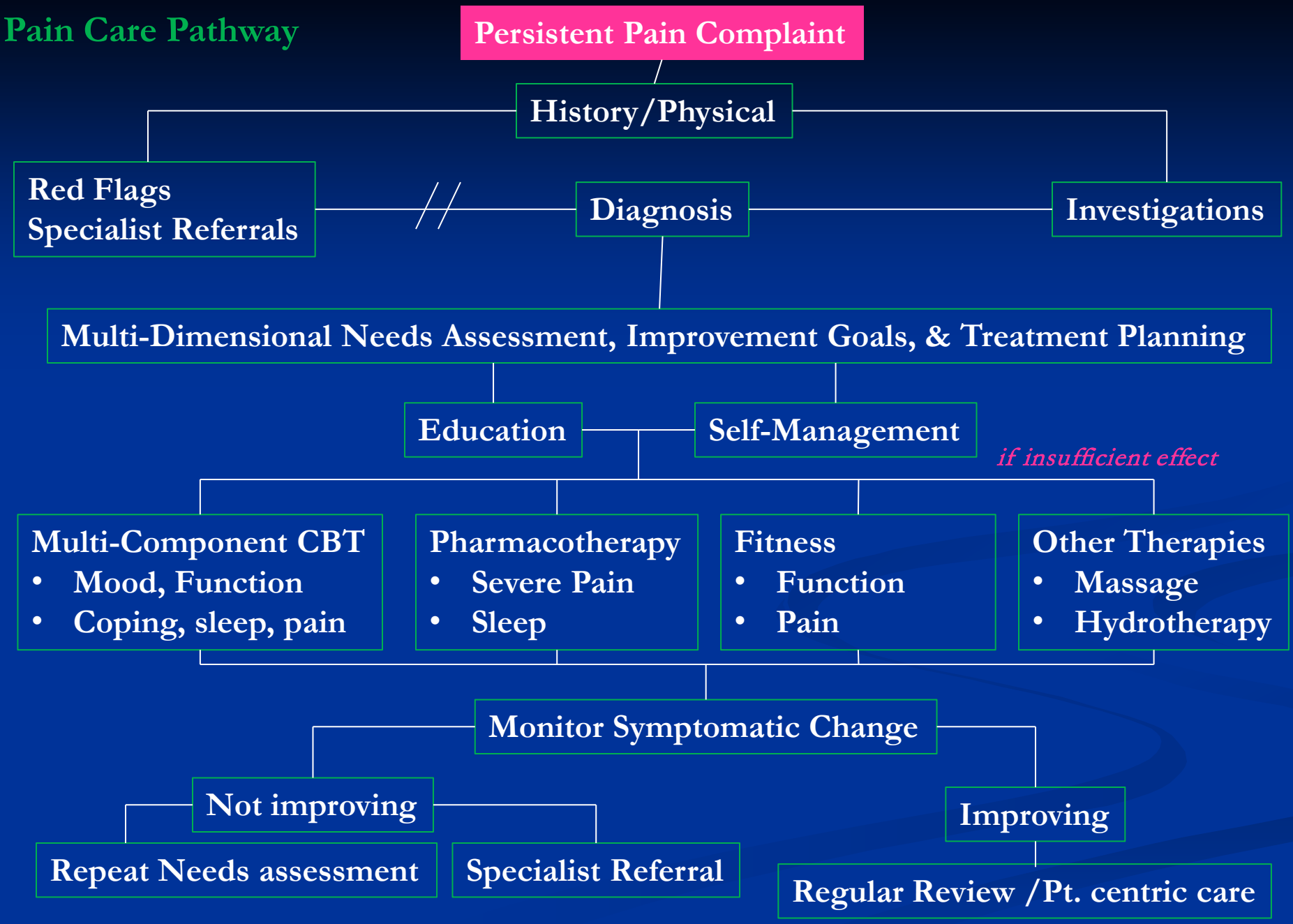
www.cdc.gov

VA's Stepped Care Model of Pain Management



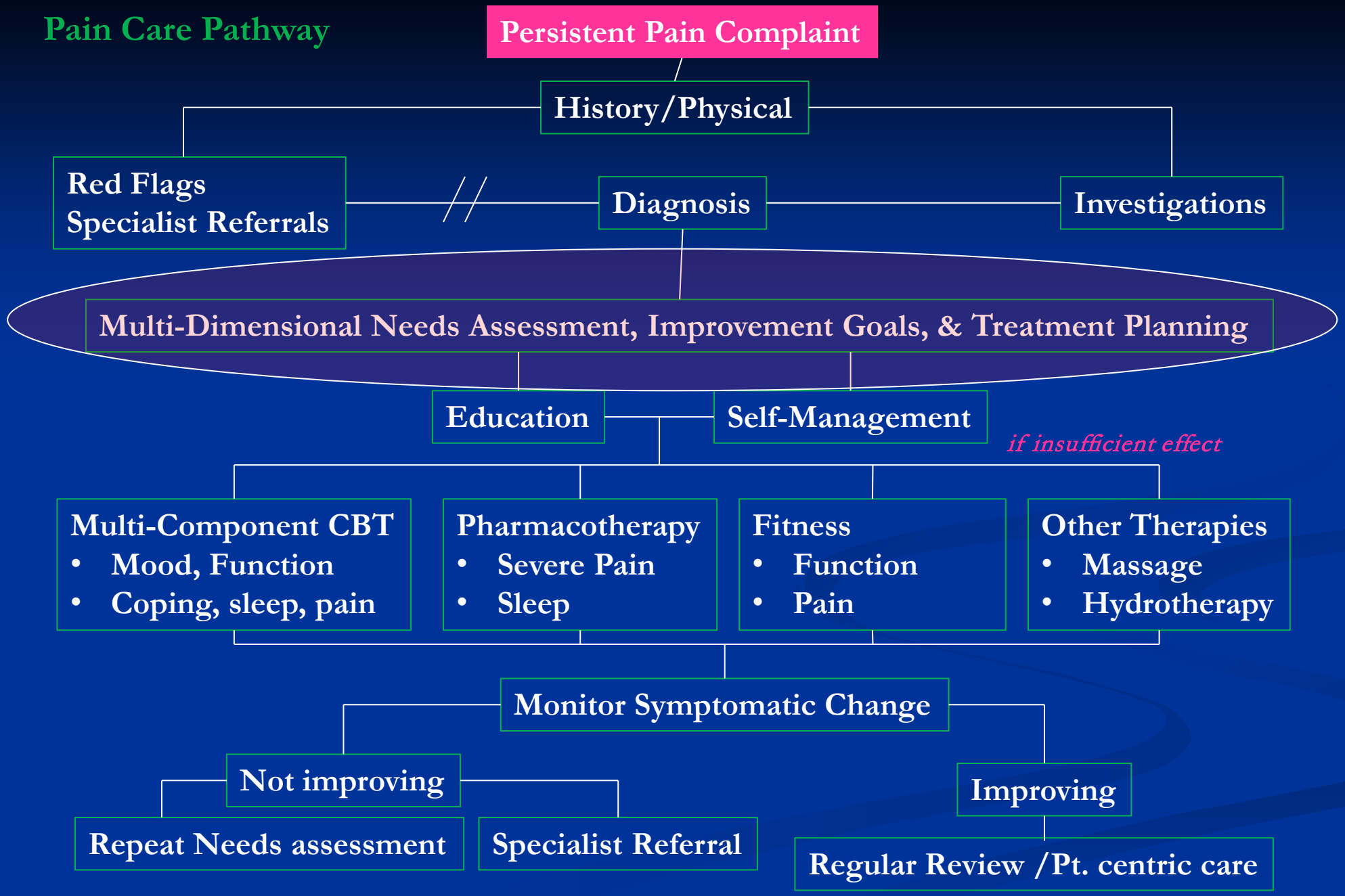
Kerns et al (2011). Transl Behav Med, 1:635-643. Coslo & Swaroop. (2016). J Pain Mgt & Med., 2:2

Pain Care Pathway



Adapted from Macfarlane et al. Ann Rheum Dis, 2017;76:318-328; Lee, et al., BJA 2014; 112:16-24; Peterson et al, VA ESP Project #09-199, 2017

Pain Care Pathway



Adapted from Macfarlane et al. Ann Rheum Dis, 2017;76:318-328; Lee, et al., BJA 2014; 112:16-24; Peterson et al, VA ESP Project #09-199, 2017

How Do you Assess Pain?

- Intensity
- Multi-focal (widespread)

Intensity

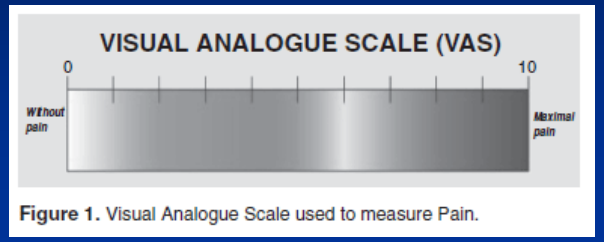
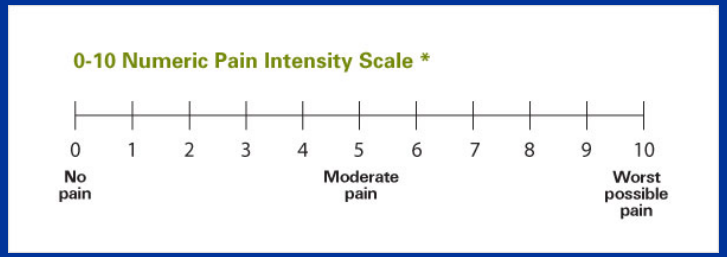


Figure 1. Visual Analogue Scale used to measure Pain.



Verbal Rating Scale: Discomfort Rating

0- **Pain or Discomfort - none**

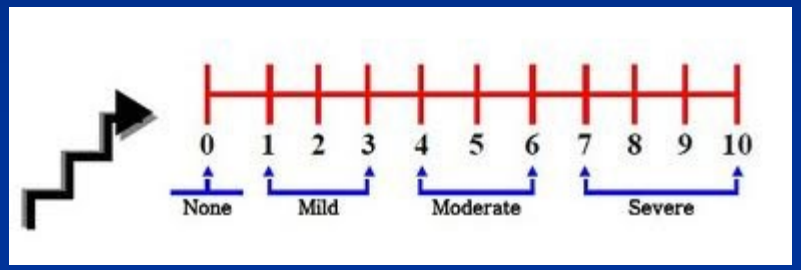
1- **Pain or Discomfort - I am aware of it, I think about it**

2- **Pain or Discomfort - I am aware of it, I think about it but I can ignore it at times.**

3- **Pain or Discomfort - I can't ignore it, but I can do my usual activities.**

4- **Pain or Discomfort - It is difficult for me to concentrate; I can only do easy activities.**

5- **Pain or Discomfort - Such that I cant do anything.**

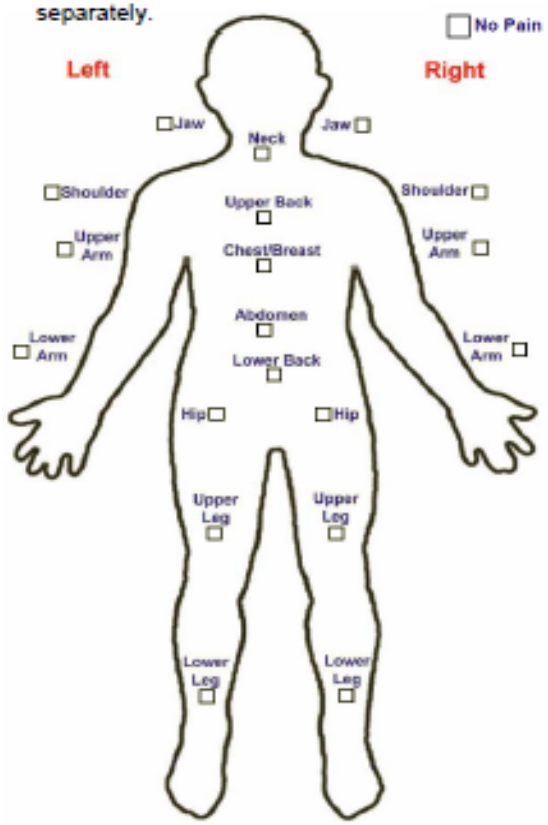


Jensen MP, Karoly P. Self-report scales and procedures for assessing pain in adults. In: Turk DC, Melzack R, eds. Handbook of Pain Assessment. New York, NY: the Guilford Press; 2011:19-44.

2010/11/16 ACR criteria for FM

Fibromyalgia Symptoms (Modified ACR 2010 Fibromyalgia Diagnostic Criteria)

1. Please indicate below if you have had pain or tenderness over the past 7 days in each of the areas listed below. Check the boxes in the diagram below for each area in which you have had pain or tenderness. Be sure to mark right and left sides separately.



2. Using the following scale, indicate for each item your severity over the past week by checking the appropriate box.

No problem
Slight or mild problems: generally mild or intermittent
Moderate: considerable problems; often present and/or at a moderate level
Severe: continuous, life-disturbing problems

	No problem	Slight or mild	Moderate	Severe
a. Fatigue	☐	☐	☐	☐
b. Trouble thinking or remembering	☐	☐	☐	☐
c. Waking up tired (unrefreshed)	☐	☐	☐	☐

3. During the past 6 months have you had any of the following symptoms?

	No	Yes
a. Pain or cramps in lower abdomen	☐	☐
b. Depression	☐	☐
c. Headache	☐	☐

4. Have the symptoms in questions 2-3 and pain been present at a similar level for at least 3 months? **No** ☐ **Yes** ☐

5. Do you have a disorder that would otherwise explain the pain? **No** ☐ **Yes** ☐

1. Wolfe et. al. *Arthritis Rheum.* Jun 15 2009;61(6):715-716. 2. Wolfe et. al.
2. *J Rheumatol.* Feb 1 2011. 3. Clauw DJ. JAMA, 2014.

Chronic Overlapping Pain Conditions

American Pain Society
RESEARCH
EDUCATION
TREATMENT
ADVOCACY

PUBLISHED BY ELSEVIER

The Journal of Pain, Vol 17, No 9 (September), Suppl. 2, 2016: pp T93-T107
Available online at www.jpain.org and www.sciencedirect.com

Overlapping Chronic Pain Conditions: Implications for Diagnosis and Classification

CrossMark

William Maixner,*,† Roger B. Fillingim,‡ David A. Williams,§ Shad B. Smith,*,† and Gary D. Slade*,¶,‖

*Center for Pain Research and Innovation, ¶Department of Dental Ecology, ‖Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.
†Center for Translational Pain Medicine, Department of Anesthesiology, Duke University, Durham, North Carolina.
‡Pain Research and Intervention Center of Excellence, University of Florida, Gainesville, Florida.
§Chronic Pain and Fatigue Research Center, Department of Anesthesiology, University of Michigan, Ann Arbor, Michigan.

- **Term defined by the National Institutes of Health ~ 2013**
- **Conditions likely to co-exist sharing neurobiological underpinnings**
- **Conditions predominantly (or solely) affecting women**
- **Any number and combination of conditions is possible**
- **Several conditions can develop at once or gradually over years**

COPCs[1]	US Prevalence
Irritable Bowel Syndrome	44 Million
Temporomandibular Disorder	35 Million
Chronic Low Back Pain	20 Million
Interstitial Cystitis / BPS; chronic prostatitis	8 Million
Migraine Headache	7 Million
Tension Headache	7 Million
Endometriosis (Painful)	6 Million
Vulvodynia	6 Million
Fibromyalgia	6 Million
Myalgic Encephalopathy / CFS	4 Million

[1]Veasley, C. et al (2015). White paper from the *Chronic Pain Research Alliance*.

	FM	IBS	TMD	UCPPS	ENDO	VVD	cLBP	cTTH	MI	CFS
FM										
IBS	10.18									
TMD	5.64	3.70								
UCPPS	9.91	9.10	4.75							
ENDO	4.06	5.05	1.87	18.62						
VVD	3.14	3.97	1.85	24.99	15.56					
cLBP	5.29	2.29	1.24	2.34	2.30	1.20				
cTTH	2.43	1.58	2.64	1.94	1.25	N/A	3.36			
MI	5.27	3.30	6.13	3.29	3.21	1.63	1.99	4.27		
CFS	6.07	2.90	1.48	2.78	1.86	1.19	1.75	1.82	2.67	
diab neurop	2.60	1.66	N/A	0.86	N/A	N/A	2.08	0.51	1.06	1.18
COPD	3.14	1.78	0.89	1.05	0.54	0.50	1.92	0.71	1.11	1.29
chronic viral hepatitis	2.20	1.48	0.56	1.19	N/A	N/A	1.22	0.56	0.68	1.01

Odds ratio =

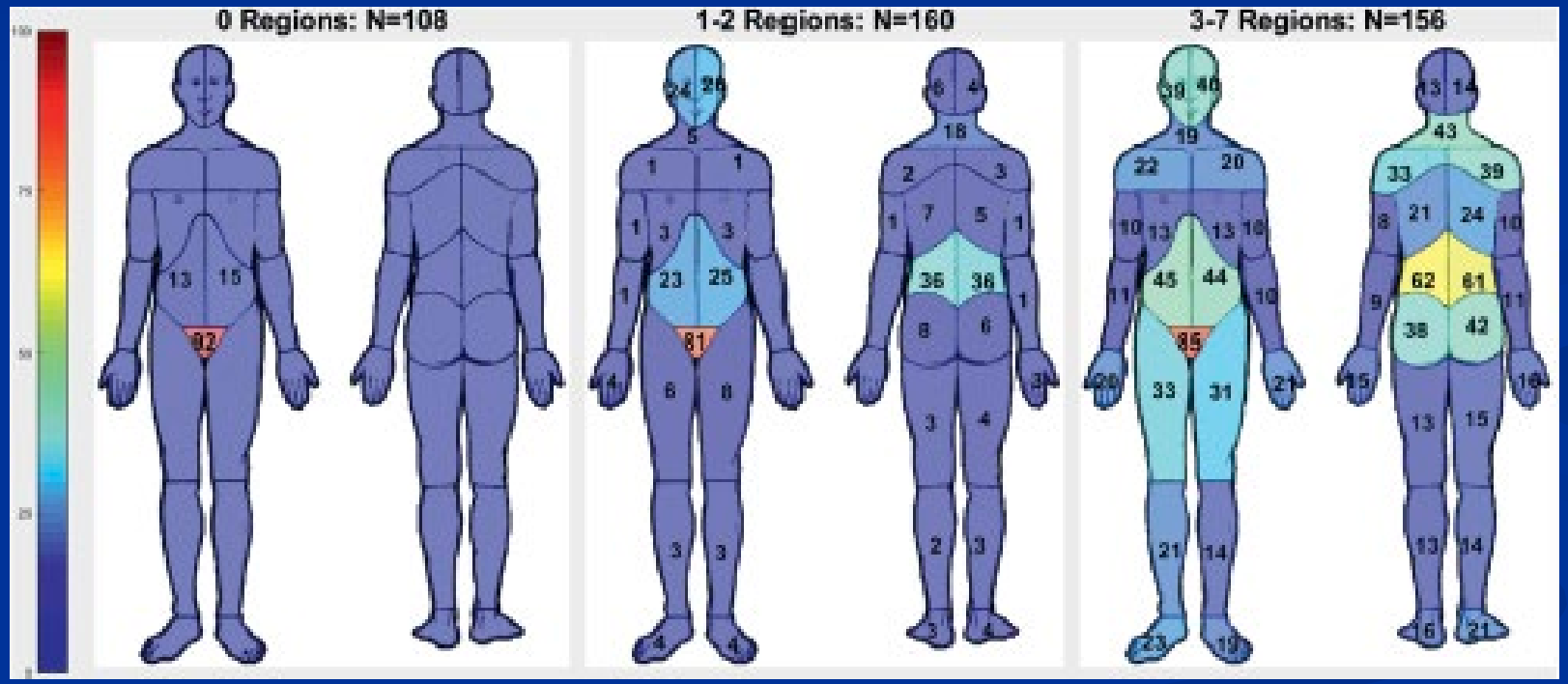
5+

3-5

1-3

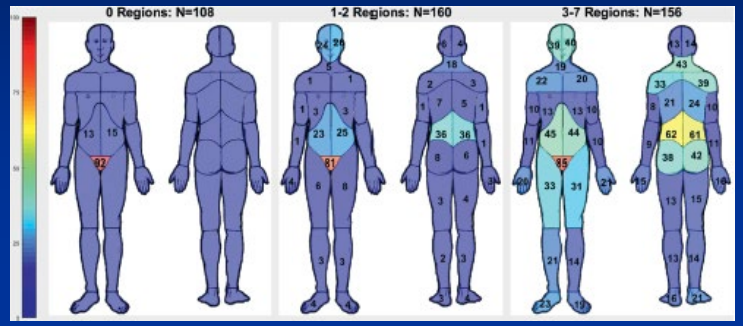
Can you have just 1 COPC and still have it be a COPC?

Pain Distribution in IC (MAPP)



Lai, HH, Jemielita, T, Sutcliffe, S., Bradley CS, Naliboff, B, Williams, DA et al,. J. Urology. (2017), 198(3): 622-631.

Similar Pattern in other COPCs



Condition	Index only	1-2 regions + index	>= 3 + index
IC (n=424)	25%	38%	37%
C. Migraine (n=1601)	29%	26%	45%
Mixed COPCs (n=9169)	25%	75%	

Lai, HH, Jemielita, T, Sutcliffe, S., Bradley CS, Naliboff, B, Williams, DA et al,. J. Urology. (2017), 198(3): 622-631.
Barad, MJ et al. Headache. (2021), 61(6): 872-881.
Quinlan, T A et al. Health Services Research. (2021), 56:1233-1244.

Chronic Overlapping Pain Conditions Screener (COPC-S)

USASP
US ASSOCIATION FOR THE STUDY OF PAIN

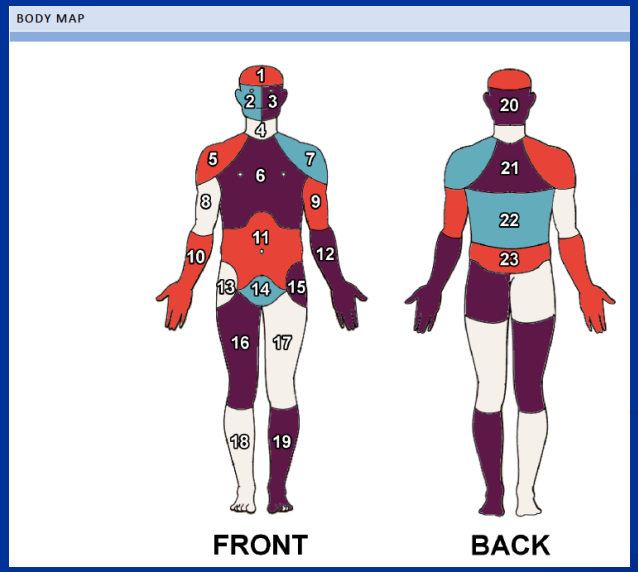
PUBLISHED BY
ELSEVIER

The Journal of Pain, Vol 25, No. 1 (January), 2024: pp 265–272
Available online at www.jpain.org and www.sciencedirect.com

The Chronic Overlapping Pain Condition Screener

Andrew Schrepf,* William Maixner,† Roger Fillingim,‡ Christin Veasley,§ Richard Ohrbach,¶ Shad Smith,† and David A. Williams*

https://copcscreener.com

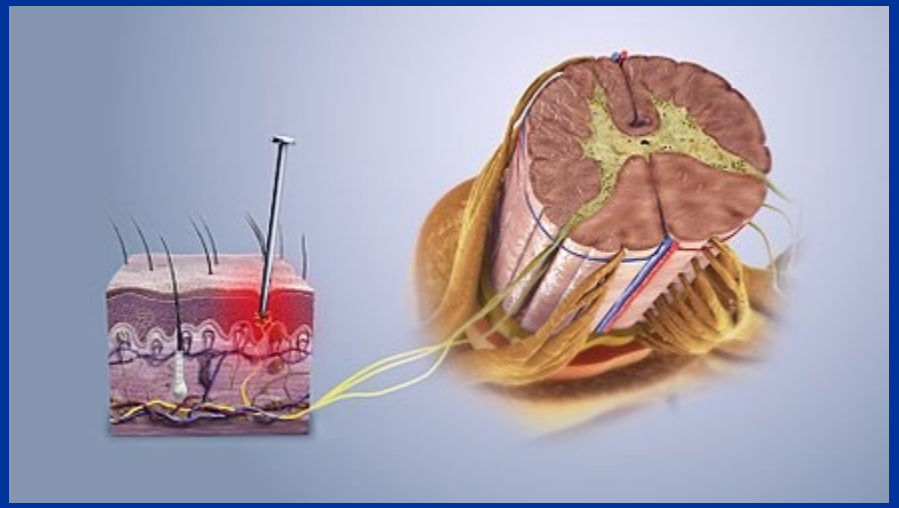


Report	
Condition	Class
FM	Y/N
IBS	Y/N
TMD	Y/N
MI	Y/N
TTH	Y/N
IC/CP	Y/N
cLBP	Y/N
ME/CFS	Y/N
ENDO-pain	Y/N
VVD	Y/N
Total	x/10

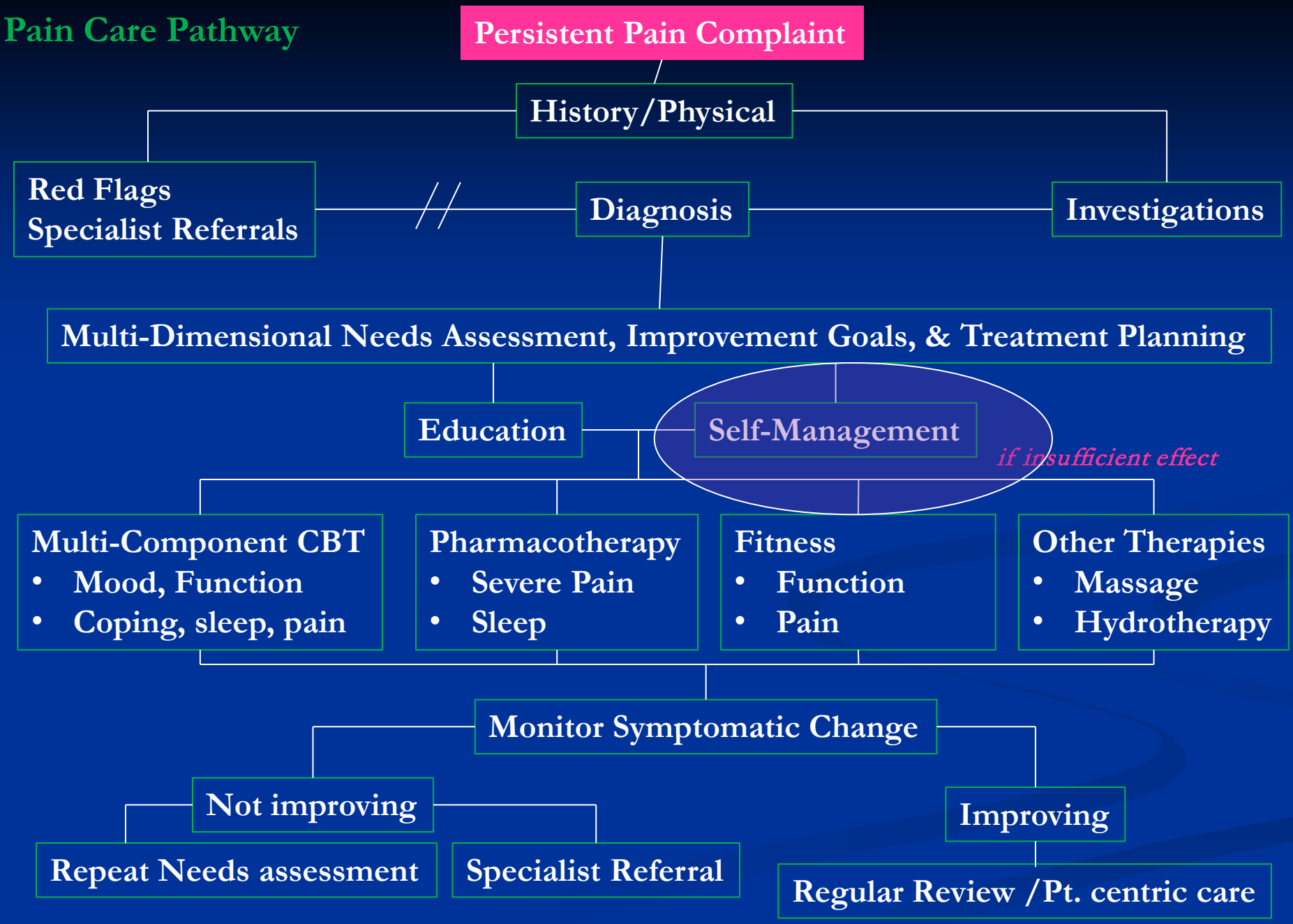
Schrepf A, Williams DA, Maixner W. Chronic Overlapping Pain Conditions Screener - The REDCap Version: Users Guide, Version 11.0. Ann Arbor, MI: University of Michigan; 2022.

Thinking Differently about Chronic Pain

- Treating a perception requires different techniques than fixing damaged tissues



Pain Care Pathway



Adapted from Macfarlane et al. Ann Rheum Dis, 2017;76:318-328; Lee, et al., BJA 2014; 112:16-24; Peterson et al, VA ESP Project #09-199, 2017

How to ERASE S.P.A.C.E.

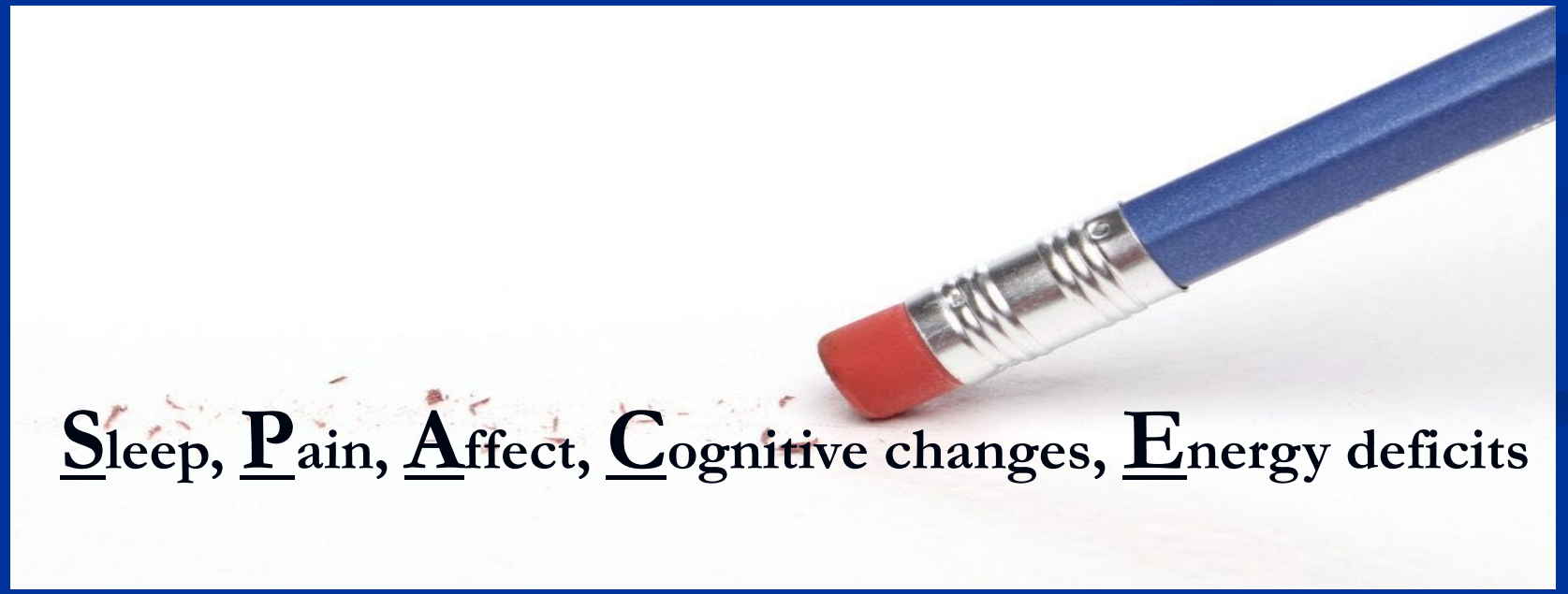
Emotions

Reflections

Actions

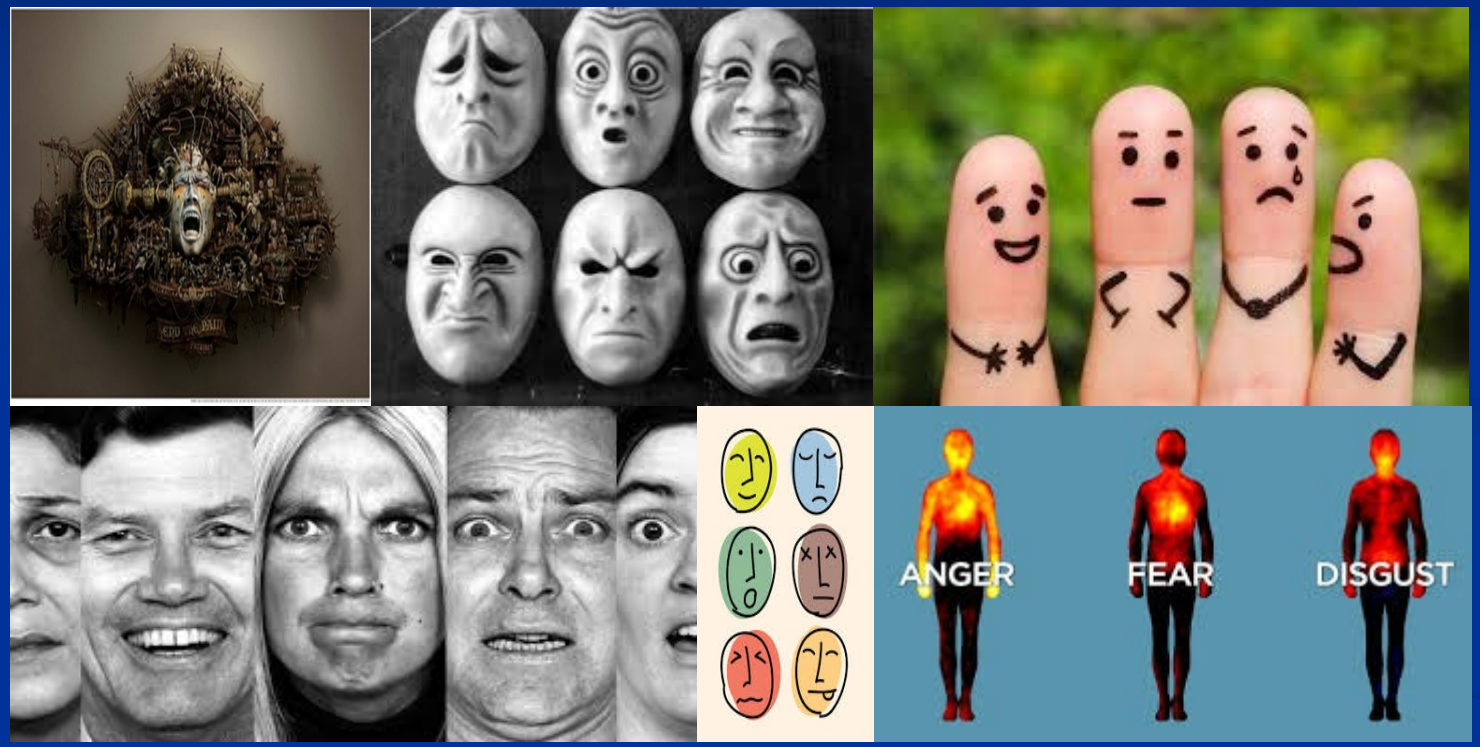
Sleep

Environment



ERASE

Emotions



Altering pain perception through Emotions

Patients do not need to be mentally ill to have chronic pain

Approaches to Resolve Negative Affect Influencing Chronic Pain

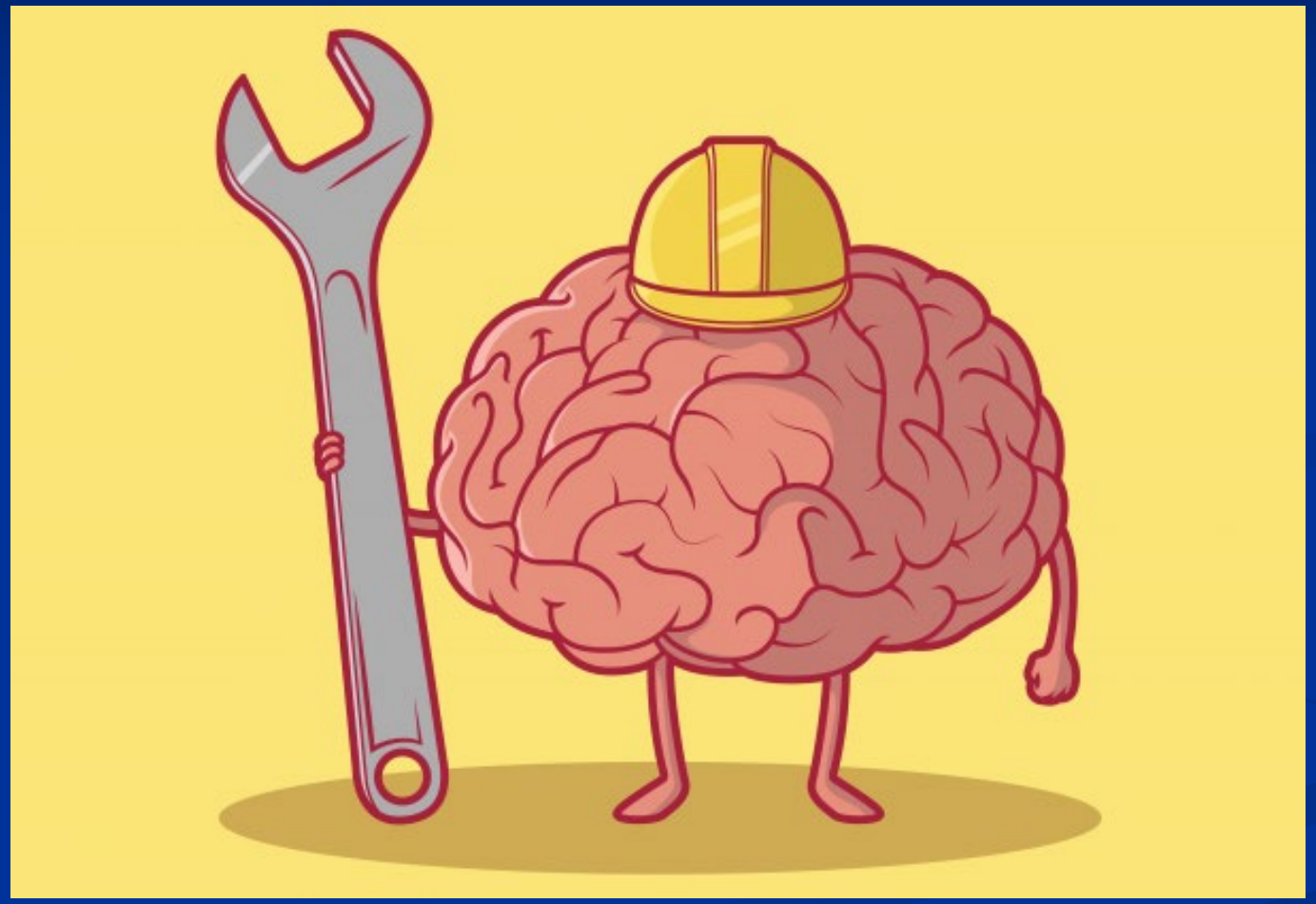
Emotional Awareness and Expression Therapy (EAET)

Pleasant Activity Scheduling

Traditional Psychotherapy

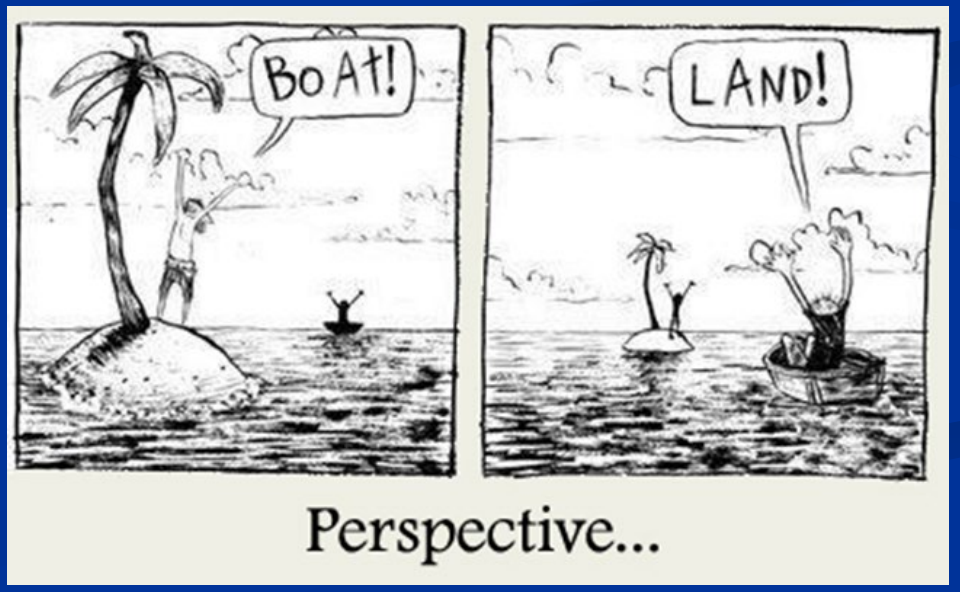
ERASE

Reflections



Using Cognition to alter pain perceptions

Reframing



The Relaxation Response

Visual Imagery

Meditation

Biofeedback

ERASE

Actions

Using Behavior to alter pain perceptions and provide a foundation of wellness

Exercise

- Multiple reviews and meta-analyses, and professional society guidelines recommend exercise and physical activity for the treatment of chronic pain and fatigue
- Increase Fitness
- Increase Function

Hassett & Williams. Best Pract Res Clin Rheumatol 2011;25:299-309

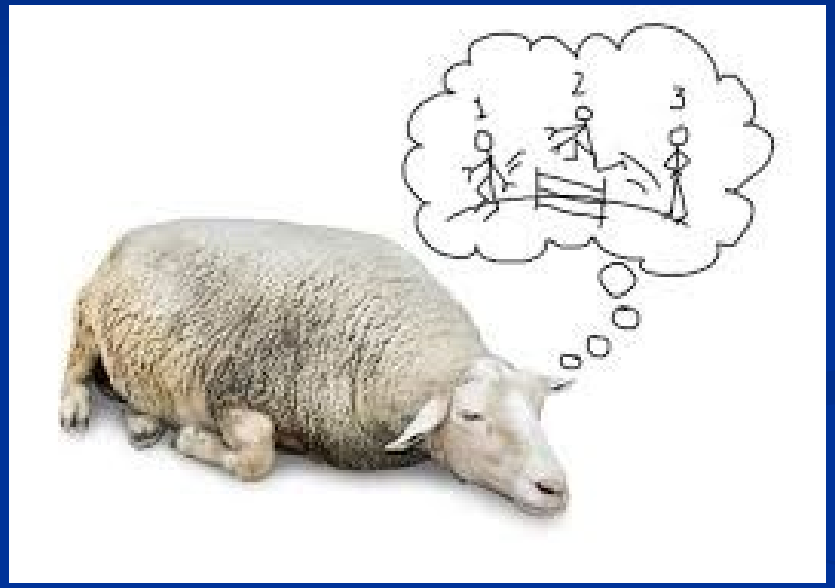
Lifestyle Physical Activity

Pacing for Energy Efficiency

Problem Solving / Goal Setting

ERASE

Sleep



Altering Pain via Sleep

Behavioral and Sleep Hygiene Skills

Timing
Regular bed time/wake time

Sleep Behavior
Get in bed only when sleepy
Use bed for sleep
Get up after 15' if no sleep

Thermal Tips
Decline in core temp signals sleep
Exercise, warm bath before bed

Environment
Steady room temperature
Keep room dark

Ingestion
Decrease nicotine
Decrease Caffeine
Alcohol interferes with sleep
Light snack is recommended

Mental Control
Effort will not produce sleep
Avoid mental stimulation
Seek mental quiescence

Edinger, JD et al. *Arch Intern Med.* 2005;161(21):2527-2535
Morin, CM et al. Am J Psychiatry. 1994;151:1172-1180.

ERASE

Environment

Using the Environment to alter pain perceptions and provide a foundation of wellness

Social Challenges

Dr. -Patient

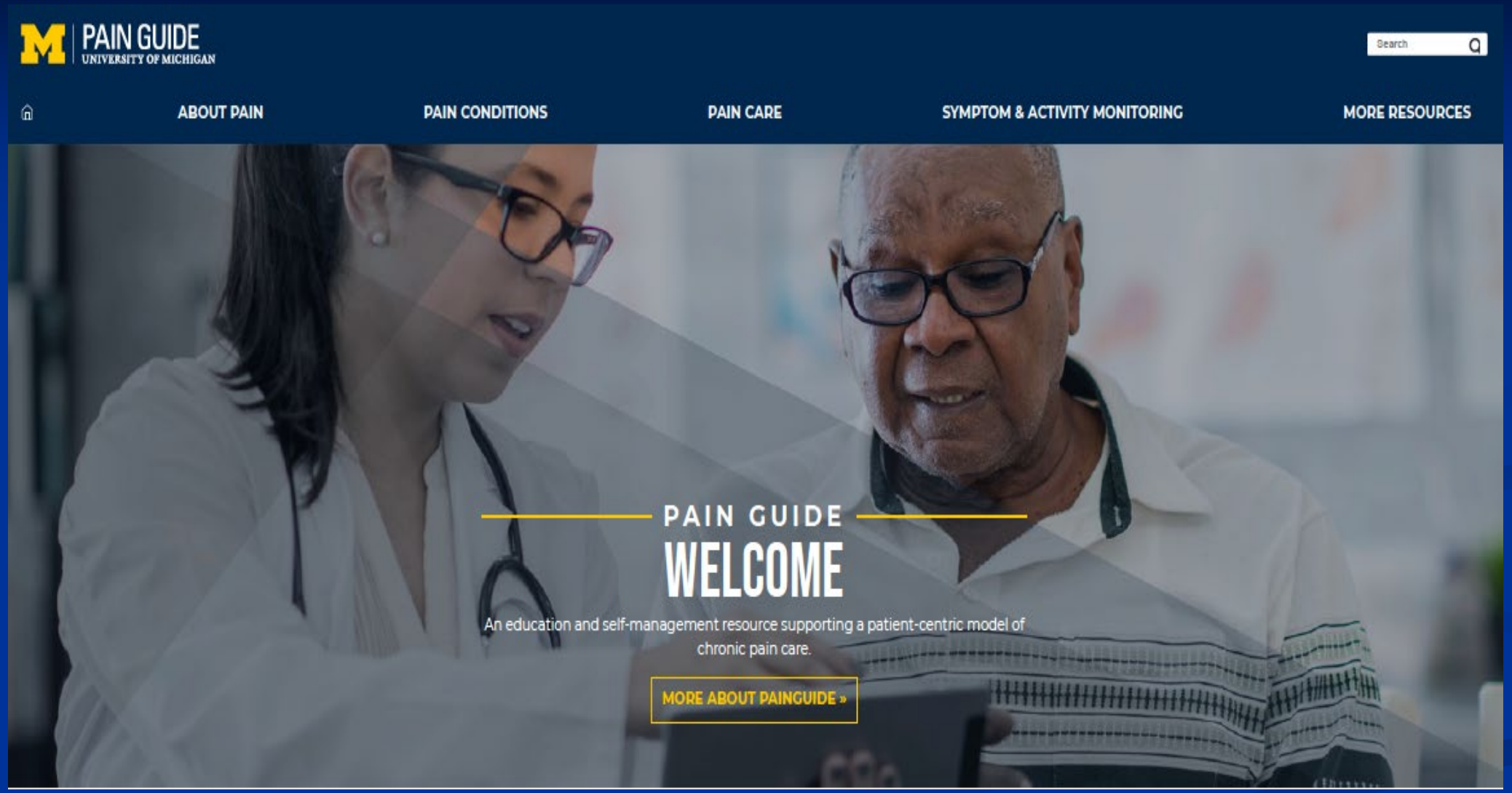
Friends

Family

Employer and co-workers

Physical Challenges

Web-based self-management



http://PainGuide.com

Self Care

Exercise

Exercise, when done safely, can benefit you physically and mentally. It helps prevent deconditioning of muscles which is often associated with more pain. Studies find that exercise is one of the most beneficial approaches to managing pain.

Learn more >

Pacing

People with pain often "over do" resulting in pain flare ups. Pacing can allow activities to get accomplished safely, without flare-ups, and in a manner that conserves energy (i.e., with less fatigue).

Learn more >

Nutrition & supplements

Eating a healthy diet has many benefits for everyone; however there may be some specific benefits for pain sufferers. The examination of pain and diet is an emerging literature.

Read nutrition & supplements tips >

Relaxation

Teaching the body to relax can both diminish muscle tension and decrease stress. To work properly, regular practice is needed so that the body learns a rhythm of relaxation and can relax on your command. Less tension and less stress can lead to decreased pain intensity.

Learn more >

Reframing

What we think influences how we feel and how much pain we experience. Sometimes negative thoughts become automatic and make us feel worse. Learning to reframe our thinking in realistic terms that challenge negative automatic thinking can help diminish pain intensity.

Learn more >

Managing Emotions

Emotions are integral to the production of pain. You cannot have pain without emotions. Thus anything we can do to alter the emotional content of one's brain will influence pain. Better management of stress can influence pain as well as engaging in pleasant activities. The pleasant activities will help diminish pain intensity.

Learn more >

Communication skills

Conflictual social relationships with family, friends, doctors, and employers can make pain worse. Alternatively, these same relationships can be used constructively to make pain better. Communication skills can help make social relationship work in your favor.

Learn more >

Sleep

Pain and Sleep are closely related such that poor sleep can make pain worse. These are a number of behavioral sleep strategies that can be used to get a more refreshing night's sleep.

Learn more >

Acupressure

Like acupuncture, which uses needles, acupressure is an ancient treatment that uses the pressure of one's own finger on the skin so as to help re-balance the flow of energy through the body as a means of reducing symptoms such as pain.

Learn more >

Sprituality

The belief in something "bigger," "more powerful," or "more knowledgeable" than oneself has been key to many individuals being able to successfully deal with pain. Spirituality may refer to a specific religious belief or it can be any belief that provides a source of strength and comfort to the individual with pain.

Learn more >

Ergonomics/Posture

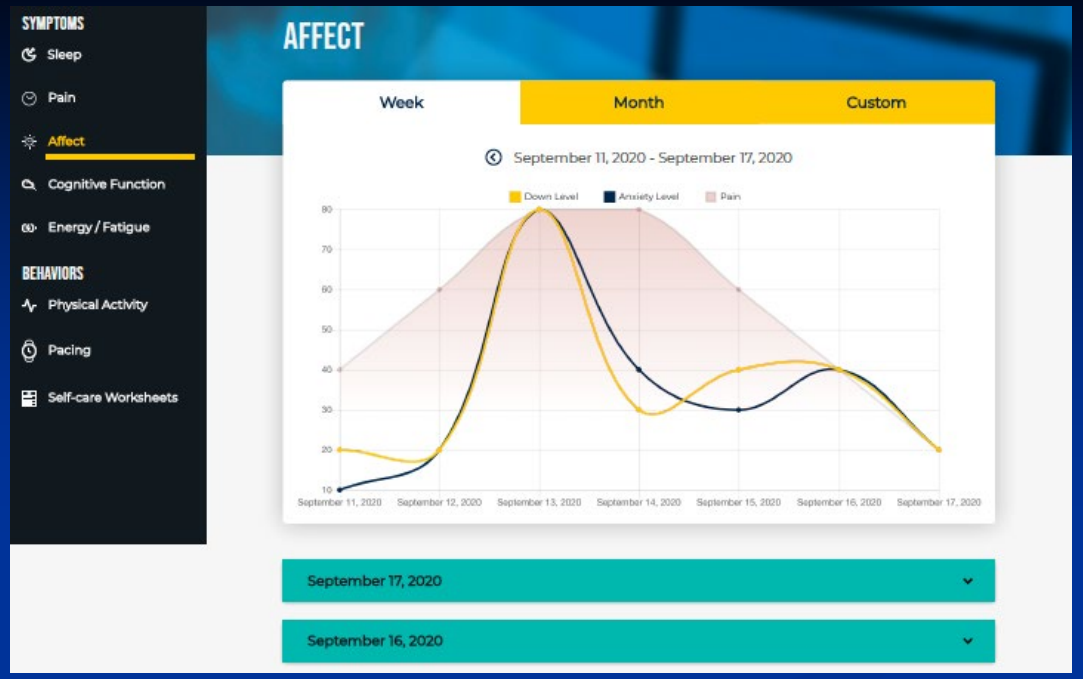
How you sit, stand, transition and lift can either make pain worse or allow you to function even with pain. This section offers help in optimizing how you interact with your environment in ways that don't exacerbate pain.

Learn more >

Resilience

We often focus on fixing what is broken but we can't lose sight of our personal strengths that help us get through challenging times. Finding our sources of resilience can be a valuable tool for reducing pain and living a quality-filled life.

Learn more >



PAIN CARE

- Self Care
- Professional Care
  - Medications
  - Therapies
  - Devices
  - Procedures

Bottom Line

- 1. Pain is not located in a body part. It is a perception and needs to be treated as a perception.
- 2. Taking time to just listen to the patient's story is a necessary part of pain treatment. You will be treating the affective and social components of pain.
- 3. If you recommend self-management (exercise, relaxation, sleep hygiene etc.), ask about it with the same enthusiasm and regularity that you ask about drugs. Patients learn what you think is <u>really</u> important by what you ask about.