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Evidence Based Approach to the Treatment of Acute and Post-Operative Pain Using Electrical Stimulation

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Acknowledgements

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AzATA Arizona Athletic Trainers' Association

Disclosures

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- I have no relationships to report that would come into conflict with the delivery of this presentation's content.
- There is not any commercial bias in this presentation.
- There are not any financial disclosures that conflict with the delivery of this information

Overview

- Learning Objectives
- Evidence-Based Practice
- Introduction
  - Poll Everywhere
  - Acute and Post-operative Pain Statistics
  - PICO
- Electrical Stimulation
  - Foundations in Electrical Stimulation
  - Therapeutic application guidelines
  - Evidence behind the practice
  - Treatment guidelines
- Concluding Statements

Learning Objectives

- At the conclusion of the program, participants will be able to:
  - Describe the importance of EBP in therapeutic modalities
  - Select the appropriate type of electrical stimulation for acute pain management.
  - Design evidence based decisions for optimal pain relief using electrical stimulation.
  - Modify treatment parameters to aid in the reduction of pain.

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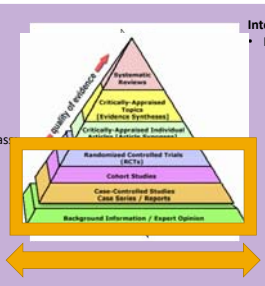
Evidence-Based Practice

Evidence-based vs Practice-based?

External Evidence:
- Information Derived from:
  - Case studies
  - Case series
  - RCT
  - Meta-analysis
  - Reviews
- All studies usually encompass:
  - Epidemiology
  - Etiology
  - Diagnosis
  - Prognosis
  - Treatment
  - Prevention



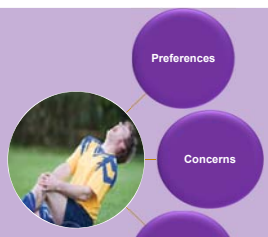
Internal Evidence:
- Information derived from:
  - Clinical experience
  - Foundational classes (anatomy, physiology, etc.)
  - Patient interactions and outcomes
  - Clinical experiences with case patterns or outcomes

Primary role for Clinician's in EBP

Evidence-Based Practice: Defined

Best Available Evidence (outcomes) + Patient's Unique Values & Situations + Clinical Expertise = EBP

Patient Values



Preferences

Concerns

Expectations

Leufer et al. 2009

Perceived Barriers

- Time (76.6%)
- Availability of EBP Mentors (69.6%)
- Access to Resources
- Skills and Attributes

McCarty et al. 2013

- New Modalities/Interventions

Example of Preference and Change

- It takes approximately **17 years** for research to make clinical practice (Leufer et al., 2009)

Beijing 2008 Olympics

Image from https://well.blogs.nytimes.com/2008/08/19/a-quirky-athletic-tape-gets-its-olympic-moment/

Rio 2016 Olympics

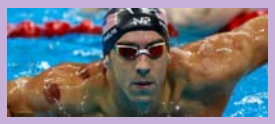


Image from http://newsfeed.careclues.com/blog/rio-olympics-cupping-therapy-michael-phelps/

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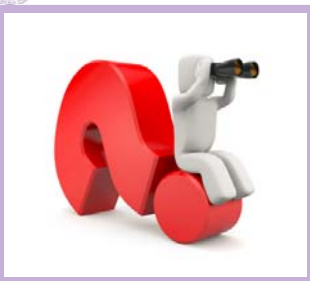
Introduction

Introduction

- Currently, post-operative and acute pain is poorly managed worldwide (Sommer et al., 2010; Boekel et al., 2015)
- Further evidence suggests that less than half of the patients with post-operative pain have adequate pain relief (Chou et al., 2016)
- In sports medicine, there is an inherent risk of injuries that may result in surgical interventions.
- Adequate management of pain is essential for increased patient outcomes and satisfaction (Taylor et al., 2013; Bonnet et al., 2007).

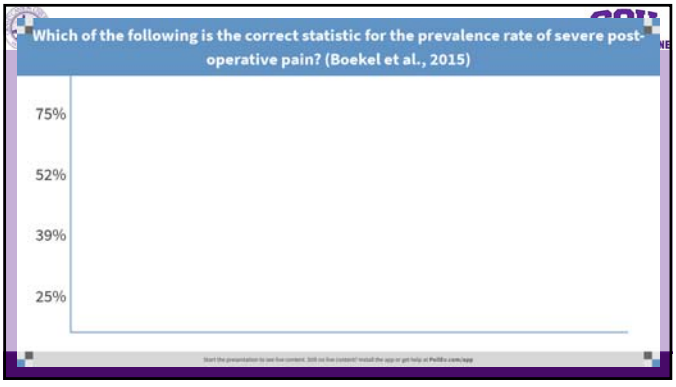
So Lets Look at the Stats!

Poll Everywhere

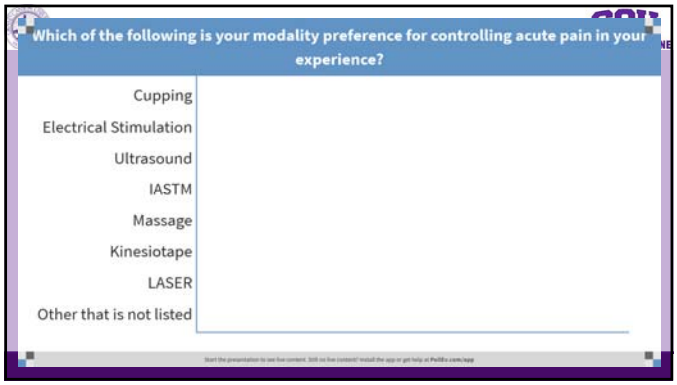


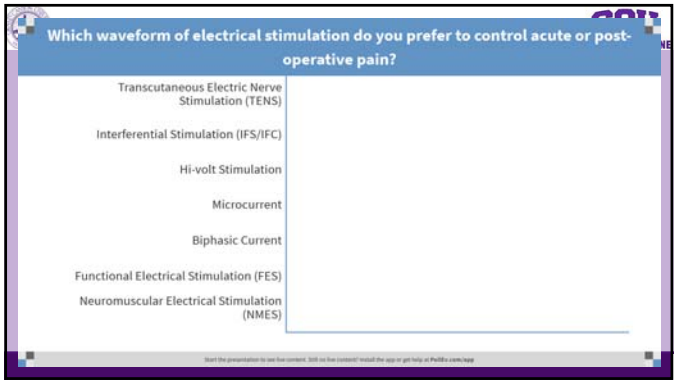
PollEv.com/bwarn646

https://www.polleverywhere.com/




Approximately, how many Americans are suffering from acute or chronic pain? (Volkow et al., 2016)
25%
30%
35%
40%


Which of the following is your modality preference for controlling acute pain in your experience?
Cupping
Electrical Stimulation
Ultrasound
IASTM
Massage
Kinesiotape
LASER
Other that is not listed


Which waveform of electrical stimulation do you prefer to control acute or post-operative pain?
Transcutaneous Electric Nerve Stimulation (TENS)
Interferential Stimulation (IFS/IFC)
Hi-volt Stimulation
Microcurrent
Biphasic Current
Functional Electrical Stimulation (FES)
Neuromuscular Electrical Stimulation (NMES)

PICO Question

- In subjects suffering from acute and post-operative pain (P) does the use of electrical stimulation during the recovery process (I) reduce the amount of pain and disability experienced (O) compared to conventional treatments (C)?
  - P – Subjects with acute and/or post-operative pain
  - I – Electrical stimulation
  - C – Reduction of pain
  - O – Conventional therapies

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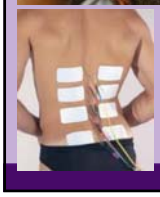
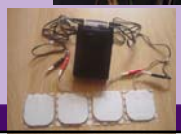
Electrical Stimulation

Current Problems with Electrical Stimulation

- Consistency
  - Too many parameters
  - Inconsistent selection in the evidence
    - (Feger et al., 2015; Johnson et al., 2015; Chou et al., 2016; Chou et al., 2017)
- Poor evaluation of outcomes
  - Patient rated outcomes measures
  - Adjuvants to electrical stimulation
    - (Feger et al., 2015; Qaseem et al., 2017))
- Catch-all treatment for every athlete

What are we trying to accomplish?




Therapeutic Application Guidelines

- Recognize Problem
- Prioritize the Proble
- Goal Se
- Rev st Evidence
- reatment Planning
- Re-evaluate

Be Intentional

- Primary uses for electrical stimulation:
  - Pain control
  - Edema reduction
  - Reduce spasm
  - Reduce muscle atrophy
  - Neuromuscular re-education
  - Wound healing

Electrical Stimulation in a "nut shell"

- Electrical stimulation is an effective modality for stimulating sensory, motor, and pain nerves and, given the proper parameters
  - The nerve stimulated influences the pain relief (Claydon et al., 2011).

Pain Reduction Strategy	Parameters	Nerves
Gate Mechanism (Ascending Pathways)	Frequency: High Frequency (60-100 Hz) Phase Duration: Approx. 75 usec (60-100 usec)	A-Beta Fibers (Sensory)
Central Biasing (Descending Pathways)	Frequency: High Frequency (100 Hz) Phase Duration: Approx. 1000 usec	C-Fibers (Noxious, Intense Stimulation)
Endorphogenic Inhibition (Descending Mechanism)	Frequency: Low Frequency (Usually <10 Hz) Phase Duration: Approx. 200-400 usec	Motor Fibers (A-delta and A-Alpha)

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Evidence Behind the Practice

Feger et al. 2015

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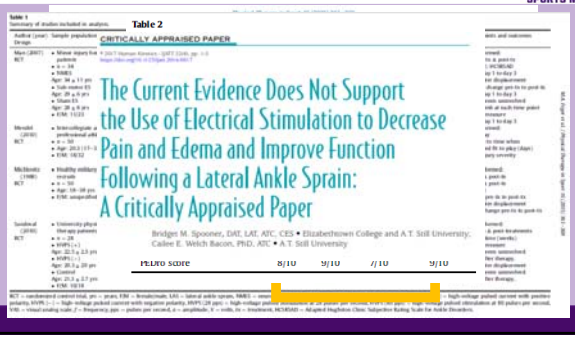

Table 2

CRITICALLY APPRAISED PAPER

The Current Evidence Does Not Support the Use of Electrical Stimulation to Decrease Pain and Edema and Improve Function Following a Lateral Ankle Sprain: A Critically Appraised Paper

Bridget M. Spooner, DAT, LAT, ATC, CES • Elizabethtown College and A.T. Still University; Cailee E. Welch Bacon, PhD, ATC • A.T. Still University

PEDro score 8/10 9/10 7/10 9/10

Johnson et al. 2015

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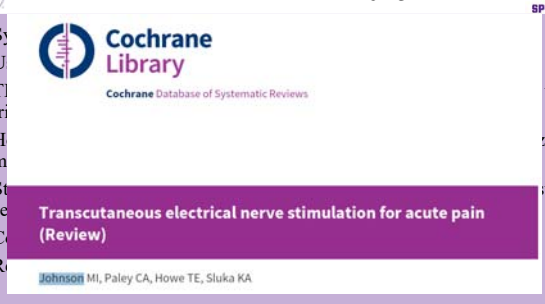

Cochrane Library

Cochrane Database of Systematic Reviews

Transcutaneous electrical nerve stimulation for acute pain (Review)

Johnson MI, Paley CA, Howe TE, Sluka KA

The Journal of Pain, Vol 17, No 2 (February), 2016: pp 131-157
Available online at www.jpain.org and www.sciencedirect.com

American Pain Society — RESEARCH EDUCATION TREATMENT ADVOCACY — PUBLISHED BY ELSEVIER

Guidelines on the Management of Postoperative Pain

- A
  - S
  - u
    - o NSAIDs
    - o cognitive modali
    - o Physical Modali
- These recommen… owever, the authors ultimately … and other adjuvant physical … ain management
- The strongest rec… ids and other prescription drugs

Use of Physical Modalities

Recommendations 7 and 8

- The panel recommends that clinicians consider transcutaneous electrical nerve stimulation (TENS) as an adjunct to other postoperative pain treatments (weak recommendation, moderate-quality evidence).
- The panel can neither recommend nor discourage acupuncture, massage, or cold therapy as adjuncts to other postoperative pain treatments (insufficient evidence).

Qaseem et al. 2017

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CLINICAL GUIDELINE

ACP American College of Physicians® Leading Internal Medicine, Improving Lives

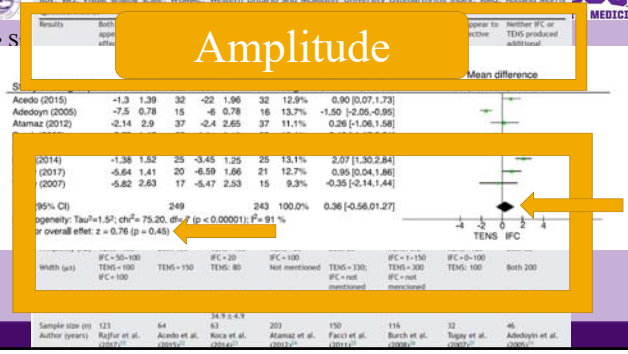
Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians

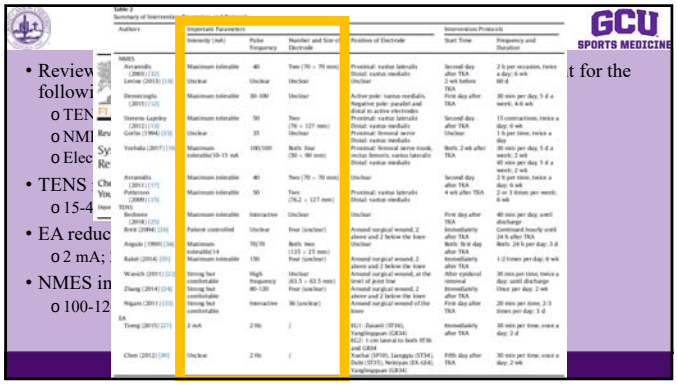
Amir Qaseem, MD, PhD, MHA; Timothy J. Wilt, MD, MPH; Robert M. McLean, MD; and Mary Ann Forciea, MD; for the Clinical Guidelines Committee of the American College of Physicians*

- Why?
  - o Mixed samples, poor measurements of patient outcomes, lack of connection of pain control.

Table 1 Studies characteristics. *Abbreviations*: TENS, transcutaneous electrical stimulation; IFC, interferential current ther-apy; VAS, visual analog scale; WOMAC, Western Ontario and McMaster University Osteoarthritis Index; RMQ, Rolland Morris

Amplitude





- Review
  - TEN
  - NMI
  - Elec
- TENS
  - 15-4
- EA reduc
  - 2 mA;
- NMES in
  - 100-12

t for the

Other Notable References

- Li and Song, 2017
  - Concluded that the use of TENS post-operatively in TKA reduced opioid use.
  - This meta-analysis only pooled **5 RCTs** but suggested the potential for use.
- Unterrainer et al., 2010
  - RCT for patients undergoing spinal surgery
  - Used TENS preincisional and postoperatively.
  - **Reduced the need for postoperative opioids**
  - Used 100 Hz and 2 Hz with a strong sensory stimulus
- Simpson et al., 2014
  - High frequency (100 Hz), low intensity (2 mA)
  - Demonstrated significant reduction of pain and anxiety pre-hospital care
  - Concluded that TENS is a viable option for pre-hospital analgesia (EMTs)

Evidence-based Parameters

- TENS
  - High frequency, low intensity works best for acute and post-operative pain
    - (Clayton et al., 2011; Yue et al., 2018; Almeida et al., 2018; Samuel & Maiya, 2015)
  - 15-40 mA; 70-150 Hz
- IFC
  - High frequency and sub-motor
    - (Almeida et al., 2018; Fuentes et al., 2010; Zeng et al., 2015; Samuel & Maiya, 2015)
  - 80-150 Hz (most studies use 100 Hz)
- HVPS
  - High frequency and sub-motor
    - (Feger et al., 2015; Draper et al., 2012)
  - Pulse duration under 200 usec, High frequency (120 Hz), and sub-motor

Evidence-based Parameters

- Its all about the intensity!
  - Clinicians should use an intensity 90% of a visible motor contraction.
    - You can attain this by turning up the stimulation until the twitch is seen and reduce it 10% of the amplitude.
  - Should be a strong, but comfortable, stimulation level absent of a motor contraction.

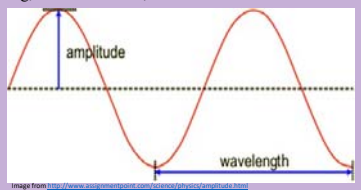


Image from http://www.assignmentpoint.com/science/physics/amplitude.html

Concluding Statements

- Electrical stimulation has some great potential benefits
  - However, it has a plethora of conflicting data and parameters
- Use your knowledge to better yourself in the clinic on most up-to-date evidence
  - Electrical stimulation has a decent amount of evidence out there and available but thoroughly appraise evidence due to poor construction and bias
- Parameters are important for nerve stimulation
  - ALL effects are secondary to a nervous system response (except DC)
  - What tissue are you stimulating?
  - What are you trying to accomplish?
- We need more higher quality and consistent evidence to substantiate the use and be able to make better more informed clinical decisions!

Acknowledgements

Arizona Athletic Trainers' Association

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