‘Not just a Poke’

Managing pain during Vascular Access procedures.

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Disclosure

Amy Baxter

Financial Disclosure: a stipend for travel was provided

Conflict of Interest: Dr. Baxter invented Buzzy and is the CEO of Pain Care Labs, the manufacturer of Buzzy®, VibraCool, VibraCool Pro, DuoTherm, Buzzy Pro, DistrACTION cards, etc.

Giorgio Cozzi

None

Paolo Valerio

None

Needle Pain Know It All

- Rationale for pain relief
- Focus/Fear/ Physiology
- Focus – easy, fast, can be free
  - ACC – Arbiter of Cognitive Conflict
  - Distraction Cards; Tasks; One Voice
- Fear – a bit more
  - Position of Comfort
  - Coping Promoting, Distress Promoting
- Physiology
  - Advanced Gate Control, DNIC, Buzzy
  - Topical Anesthetics Tips & Tricks
  - Other options out in the world…

Objections to Pain Management

- “Little kids don’t actually perceive pain”
- “Its only going to last a second”
- “They won’t remember”
- “When I was their age I didn’t even whimper. Kids today are soft. This will build character!”
- “I’m one and done – first stick every time!”

Medium term effects –
increased response

Heel sticks
- 21 diabetic v. 21 infants no DM
- Frequent heel sticks
- Grimacing, cry duration, VAS

Cleaning 22.2% vs 0% P =.03

Venipunture
- Grimace (81.7% vs 40% P =.01)
- VAS (69% [27.5%] vs 5% [60.5%]; P =.002)
- Crying (40.2% [77%] vs 0% [54.8%]; P =.03)

Taddio A JAMA. 2002 Aug 21;288(7):857-61

Long term – Pain more painful

- 20 LP participants Fent. vs. Placebo
  - Subsequent pain more > if placebo
  - Effect for children <8y p=.04
- Vaccines without pain control
  - Increased pain later injections
  - Increased needle fear, healthcare avoidance

Weisman Arch Pediatr Adolesc Med. 1998;152(2):147-9
McMurtry Clin J Pain 2015 Oct;31(10):S3 Schif, Pillei, Pain 2022

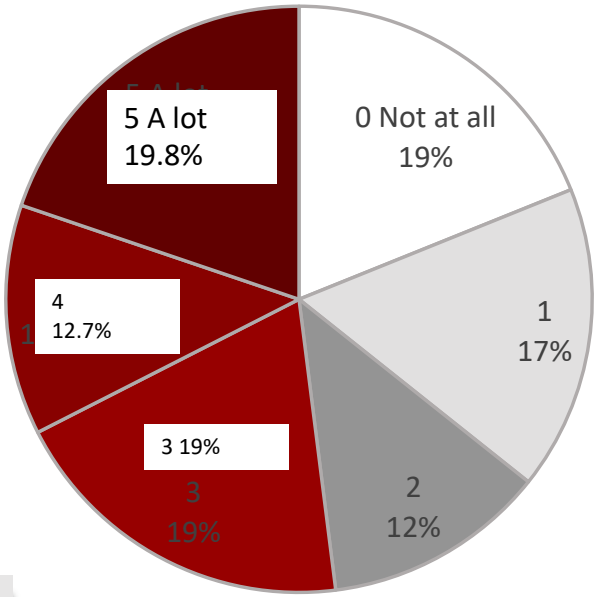
Adult Vaccination: How afraid of needles are you?

…16% said needle fear was a reason they didn't want a vaccine.

23% reported a fear of fainting or looking foolish

28% reported a fear of pain with injection

52% had moderate to severe needle fear



0= Not at all
5 = A lot

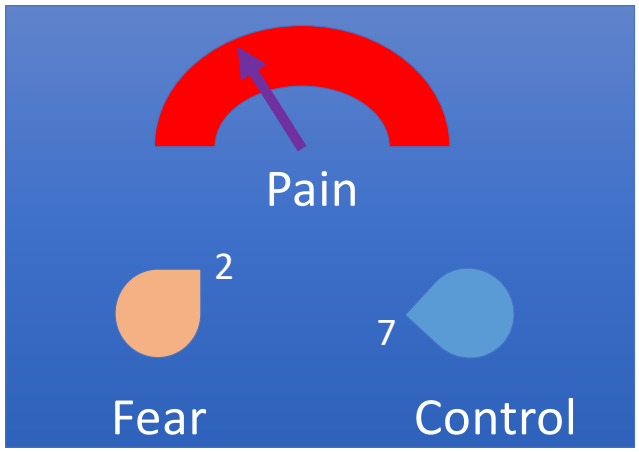
People with severe *vaccine* skepticism were 3x more likely to have severe *needle* fear.
P<.05

Conclusion: Survey construction matters

Conclusion: To get people vaccinated, treat needle fear, pain, fainting

Write2Market, Pollfish *4.15.2021 n=600 National US*
XLS available on request

Optimal Pediatric Approach



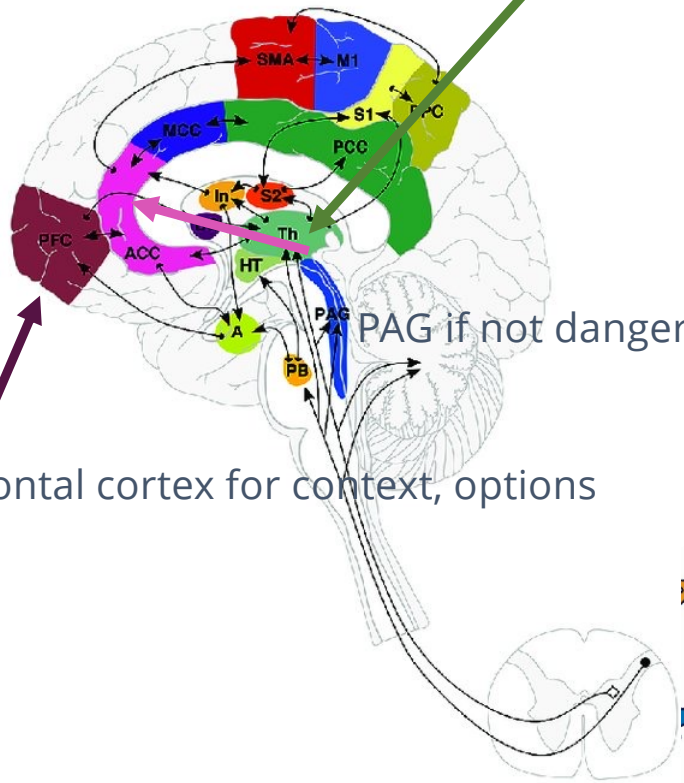
Fear and Focus are the volume knobs for physiologic pain perception

Baxter AL Pediatric Clinics 2013:545

Pain Processing:

It's complicated…

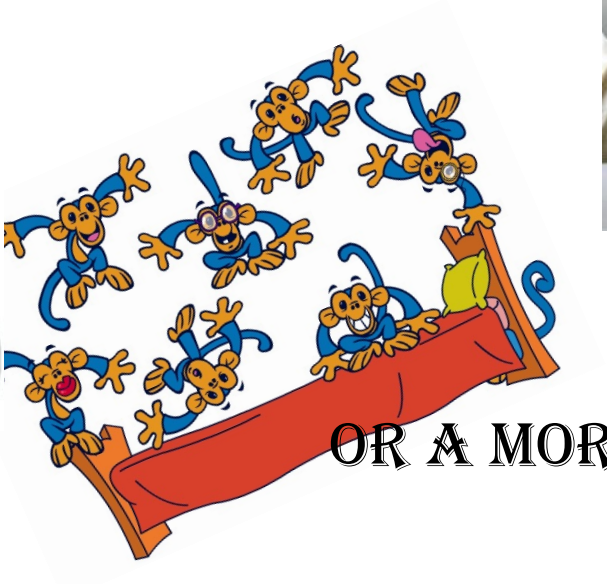
1) To Thalamus
2) To Anterior Cingulate Cortex
("**A**rbitrate **C**ognitive **C**onflict"):
3) To PAG, Hippocampus, FC, Amygdala…
Unless…



FEAR

PAG if not dangerous and needs pain reduction

Frontal cortex for context, options



OR A MORE INTERESTING TASK!

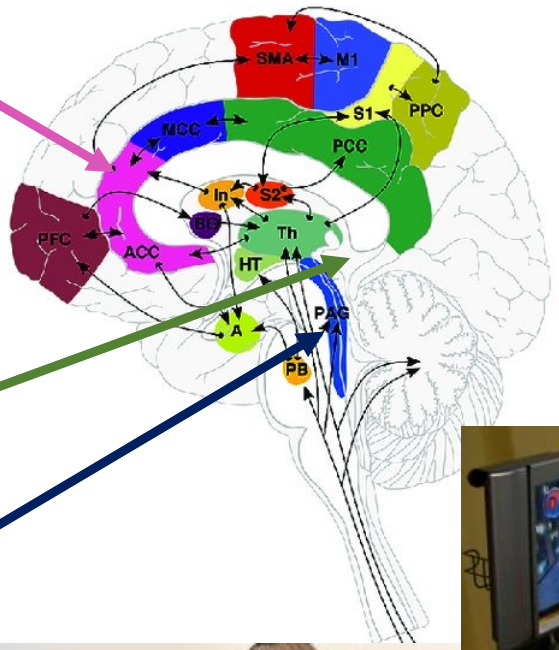
Focus/ Control

Distraction: Virtual Reality, tasks and Anterior cingulate cortex activation can decrease pain 50%

Sorting/counting

"How many x have y?"

Agency: Options, simplicity and comfort change the meaning of pain, and impact the brain's architecture to reduce pain perception.



Motion: Disrupts conduction from ACC to hippocampus leading to long-term fear of pain

A.C.T.: Focus on pain increases it; focus on valued activity and movement reduce pain

TALKAESTHESIA

Faisal R Ali, et al BMJ 2016;354:i3033

ENGAGEMENT

Language to avoid	Language to use
You will be fine; There is nothing to worry about (Reassurance)	What did you do in school today? (Distraction)
This is going to hurt/this won't hurt (Vague; negative focus)	It might feel like a pinch (Sensory information)
The nurse is going to take some blood (Vague information)	First, the nurse will clean your arm and you will feel the cold alcohol pad. Next (Sensory and procedural information)
You are acting like a baby (Criticism)	Let's get your mind off of it; Tell me about that film (Distraction)
It will feel like a bee sting (Negative focus)	Tell me how it feels (Information)
The procedure will last as long as (Negative focus)	The procedure will be shorter than.. something familiar to the child (Procedural information; positive focus).
The medicine will burn (Negative focus)	Some children say they feel a warm feeling (Sensory information; positive focus)
Tell me when you are ready (Too much control)	When I count to three, blow the feeling away from your body (Coaching to cope, distraction, limited control)
I am sorry (Apologising)	You are being very brave (Praise; encouragement)
Don't cry (Negative focus)	That was hard; I am proud of you (Praise)
It is over (Negative focus)	You did a great job doing the deep breathing, and holding still.. (Labelled praise)

Cohen, Pediatrics, 2014

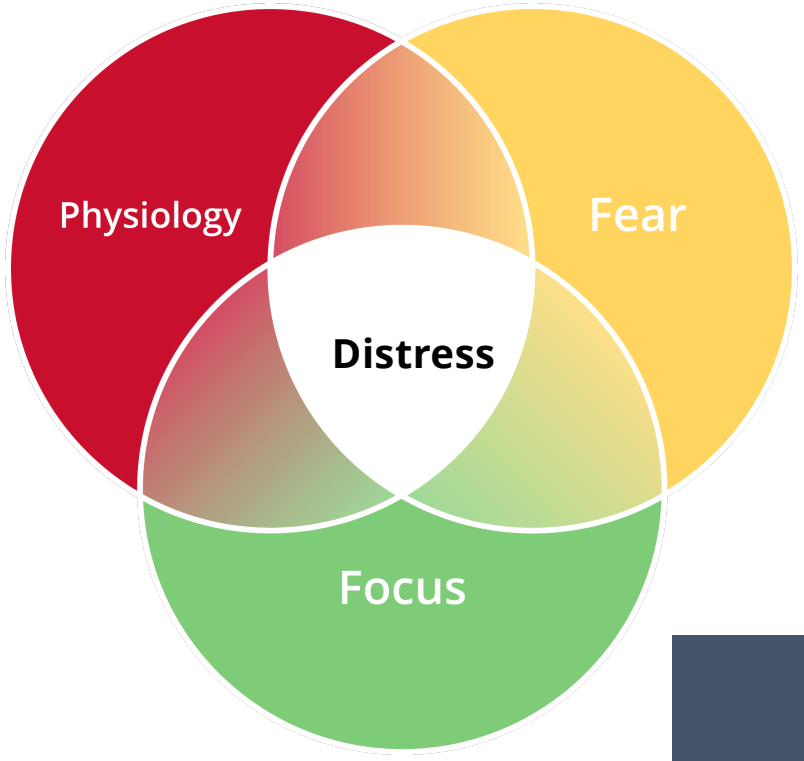
Cues: Comfort Positions

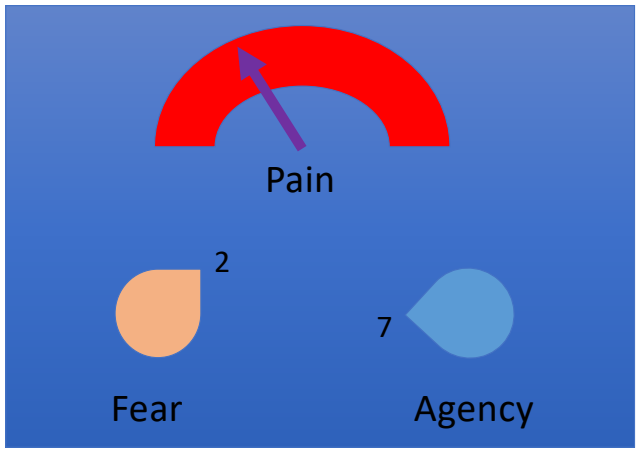
- 74% IV attempts require extra staff
- Position of comfort gives parents a job
- Parents' stress improved
- Benefit: Happier parents

Reducing Fear: Comfort Positions

Affection
Secure
Distracted
Visual Control

Optimal Pediatric Approach





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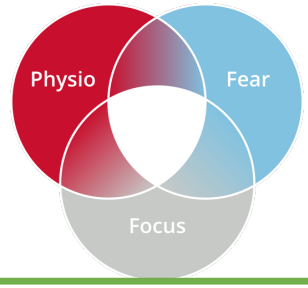
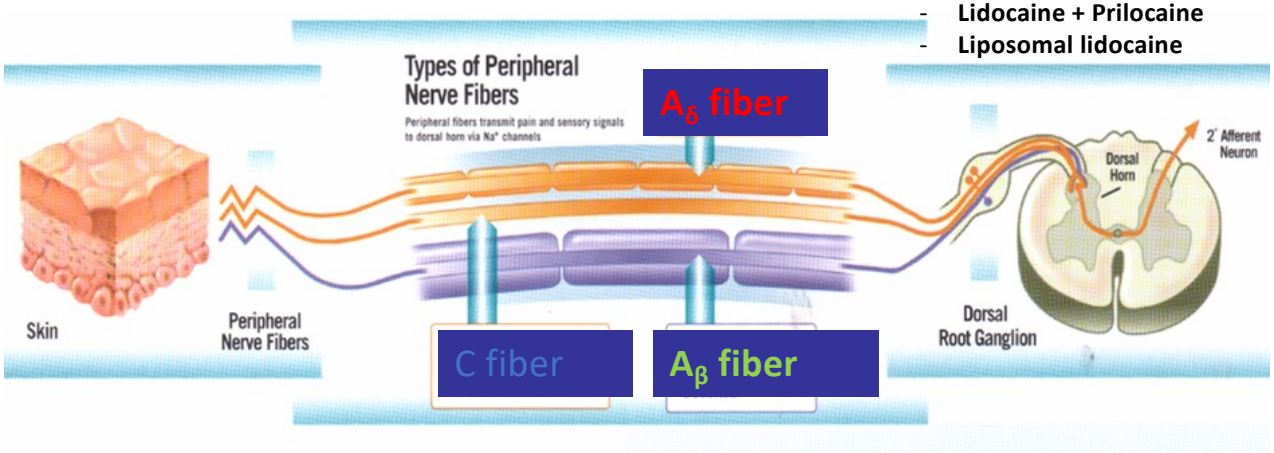
How Pain Transmission Works



Na+ channel blocking
- **Lidocaine + Prilocaine**
- **Liposomal lidocaine**



- A $_{\delta}$ fibers transmit **fast pain**
- C Fibers slow pressure and cold
- A $_{\beta}$ fibers are huge and fast,

IV Access Pain Relief

From Slowest to Fastest

- Eutectic Mixtrue Local Anesth. (60 minutes)
  - Mixture 2.5% prilocaine
    2.5% lidocaine
- Amethocaine (30 minutes)
  - 5% tetracaine
- Liposomal Lidocaine (20 minutes)
  - Liposomal formulation of 4% lidocaine
- Tetracaine patch (20 minutes)
  - 7% lido 7% tetracaine
- Jet lidocaine (2 minutes)/Lidocaine Bleb
- Cold and/or Vibration (1 minute)

Cochrane Database Syst Rev. 2006 Jul 19;(3):CD004236.
EMLA and amethocaine Lander Wetman et al

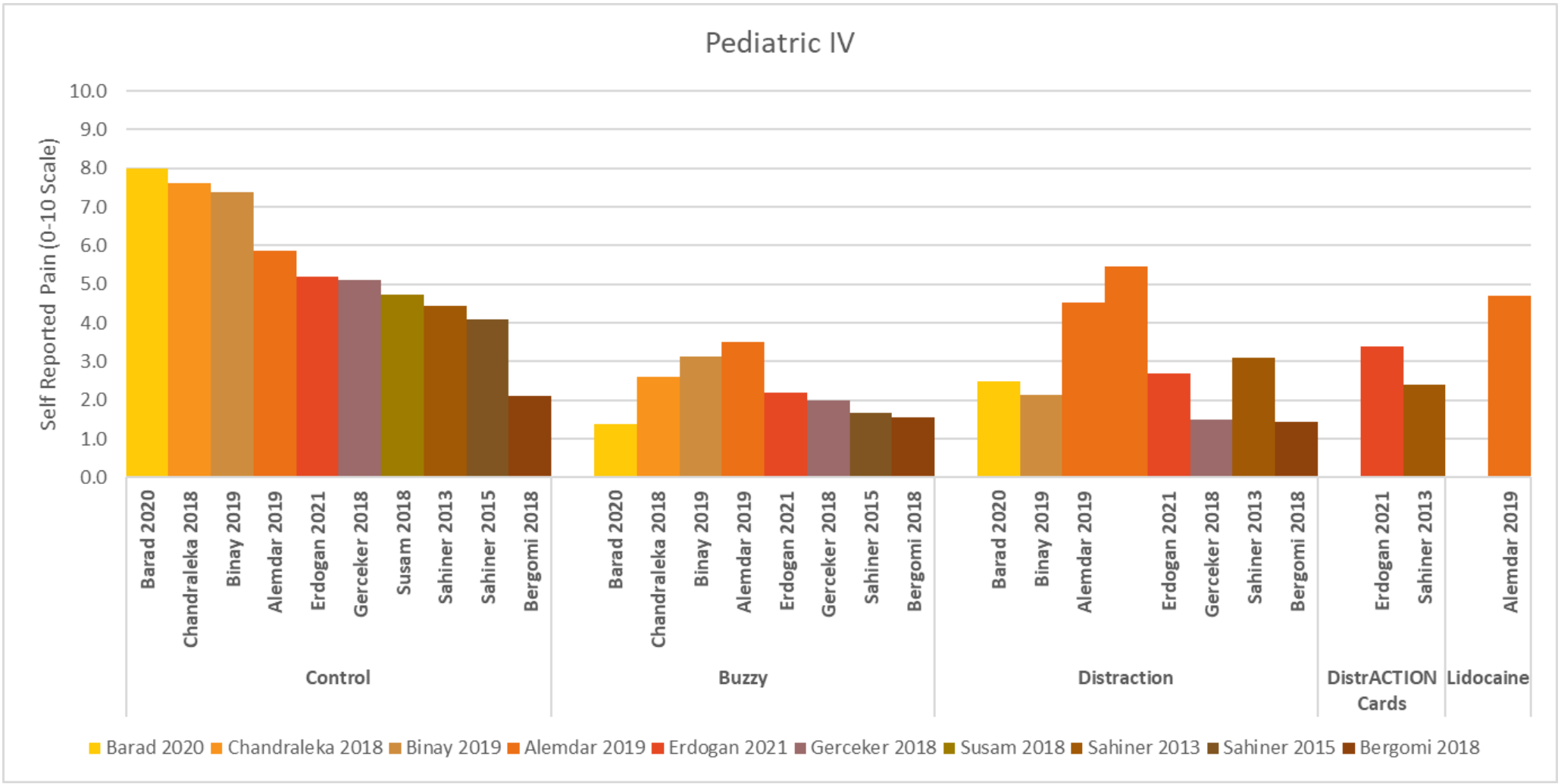
What Helps Most? Physiologic Interventions

Pain Reliever	**Prep Time**	**Duration after use**	**RCTs IV +sig -sig**	***Weighted Mean v. Control* 0-10 scale***	**RCTs IM**	***Weighted Mean v. Control* 0-10 scale***	**Head 2 Head with cold/ vibration**
Ice + Vibration "B-C fiber"	1 min	I min	31++++++++++ ++++++++++++ +++++++ *2- -*	*-3.20*	27+++++++++ ++++++++++ +++++++ 1-**	-2.63	
Lidocaine/Prilocaine	60 min	2 hours	20++++++++++ +++++++++ *1-*	*-1.16*	5+++++ 3- - -		0.5/10 lower CV**
Liposomal Lidocaine 4%	20 min	10-20 min	9+++++++++ *2- -*		0!!		= for IV - Potts - Whelan
Cold Spray	1 min	30 sec		n/a	1+ 2- -	+1.86	
Plastic w/ Prongs	1 min	0 sec	0	n/a	+1 3- - -		2 favor C/V 1 = (insulin)

***Did not use ice packs

Ballard A et al. Clin J Pain. 2019 June;35(6):532-543 (N= 1138, **pain -1.11**; 95% [CI]: -1.52 to -0.70; P<0.0001) , **anxiety -1.37**; 95% CI: -1.77 to -0.96; P<0.00001)

Lee VY, et al Hum Vaccin Immunother. 2018;14(11):2737-2747 "**coolant and vibration together… most consistent effects in reducing self-reported pain, fear or distress.**"



Thrasher A, Baxter AL. 2022 Work in progress Not yet peer reviewed

What is Cold/vibration?

High Frequency Mechanical Stimulation + Ice

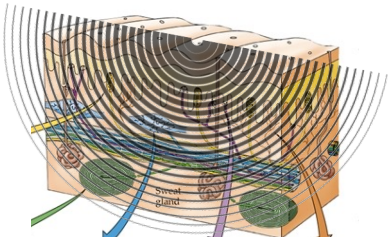
ACC: "Yeah, it's ok. PAG, reduce pain sensitivity!"

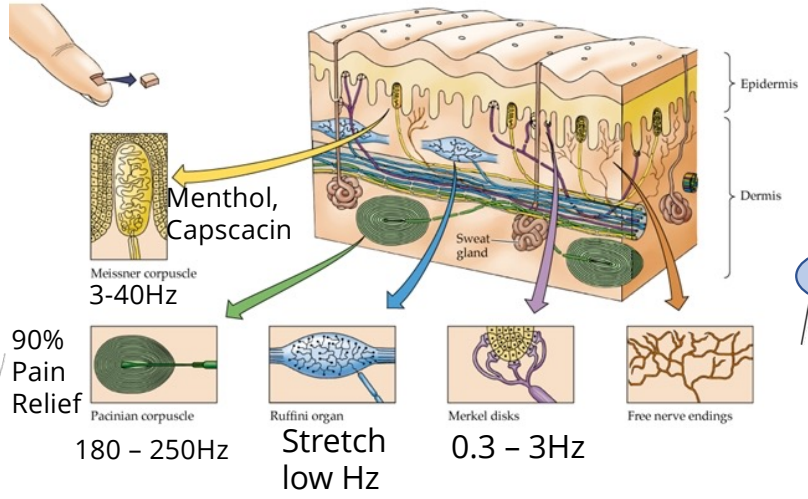
Thalamus: "Hey! There's an obnoxious cold sensation!"

Mechanoreceptor Pain Control

Mechanical Touch Stimulation

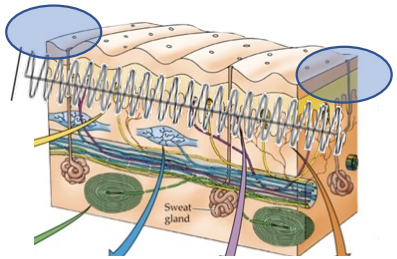
M-Stim





Transcutaneous Electrical Stimulation

E-Stim



Pacinian corpuscles (180-250Hz) are responsible for 90% of Gate Control Pain Reduction. (Hollins M, 2017)

200Hz vibration penetrates and activates Pacinian receptors.

Vibration impulse spreads in a wave through mechano-transduction, increasing tissue growth & stretching Ruffini endings.

97-100% of patients tolerate the amplitude & sensation.

Safe with pacemakers, can use with ice or heat.

Typically tuned to Meissner or 80-150Hz – too slow for Pacinian.

Contracts, not stretches, muscle fibers

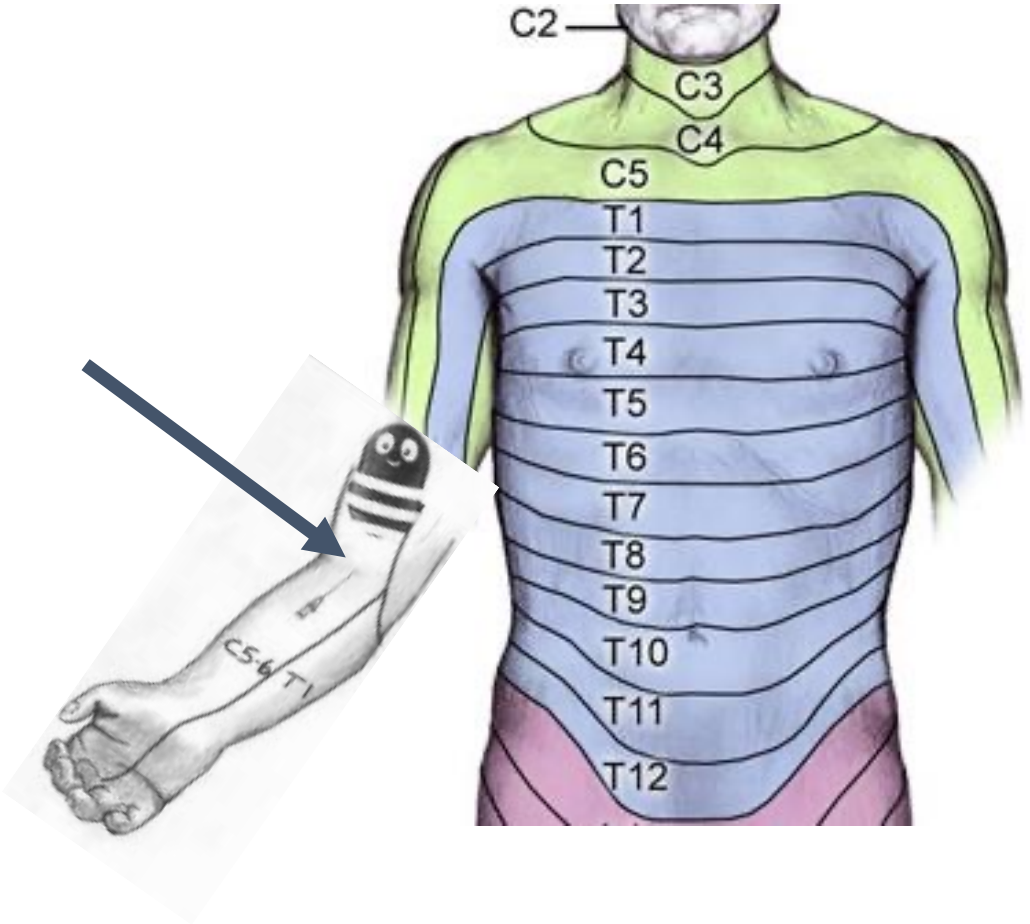
Current is superficial, doesn't reach deep Pacinians

50% of patients tolerate the amplitude.

Do not use with pacemakers or ice.

2021 Nobel Prize: pressure and temperature modify pain transmission & perception

Nerve signals are transmitted in bands called dermatomes – Device must go “Between the pain and the brain” to interrupt the signal



Eutectic Mixture Local Anesthetics Beyond the Basics

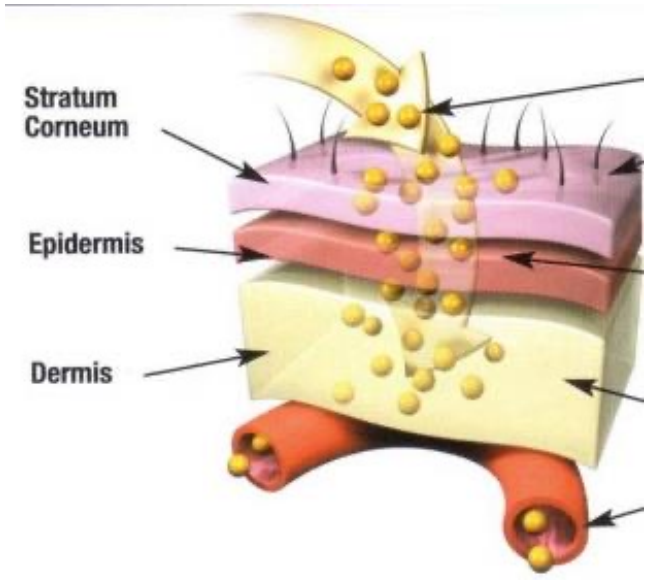
- 25mg/g lido, 25mg/g prilo
- 60 minutes occluded
- Depth up to 0.5cm
  - Buckley 1993 Drugs 46:126
- Vasoconstricts first 1.5 hours
  - Bjerring 1989 Br J Anesth 63:655
  - Baxter PEC 2009
- Caucasian>Black
  - 70% v. 40% at 1 hour
  - 90% v. 80% at 90 min

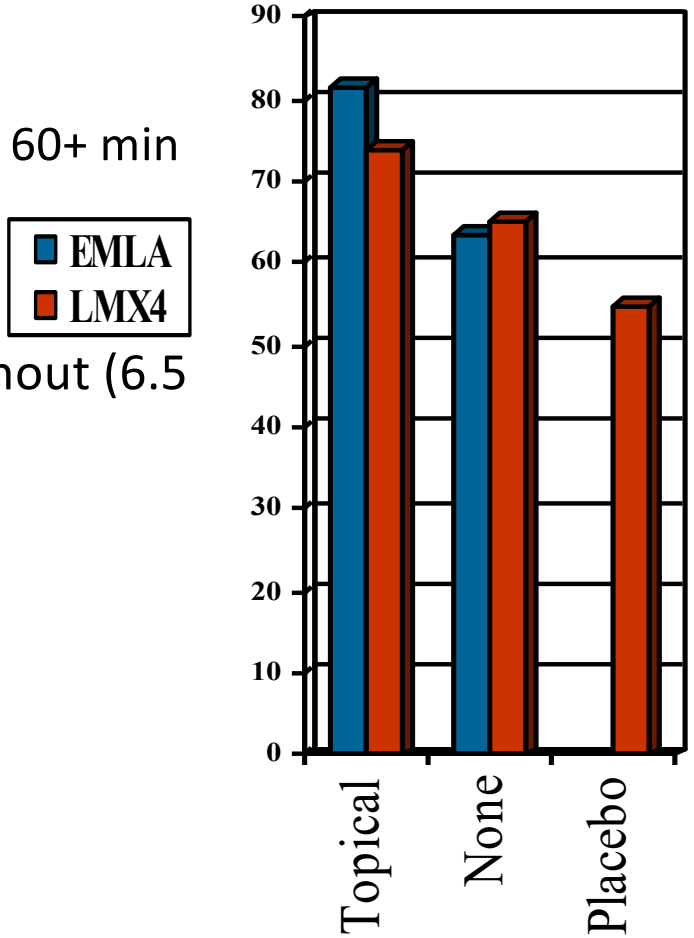
Vale 2003 Rev Bras Anesth 53:258
Hellgren 1989 Br J Clin Pharm 28:205
Hymes, Spraker 1996 Reg Anesh Pain 11(1)

Liposomal IV Time and Success

- Eutectic Mixture success
  - No reduction in success when on 60+ min
- LMX-4
  - 51/69 (74%) vs. 40/73 (55%)

  Faster with pain relief than without (6.5 vs. 8.5 minutes)





Pain from *Occlusive Dressing*?….

- "Interestingly, many of the children who rated overall procedure pain as high described the pain as being associated with removal of the occlusive dressing and not with the IV insertion."

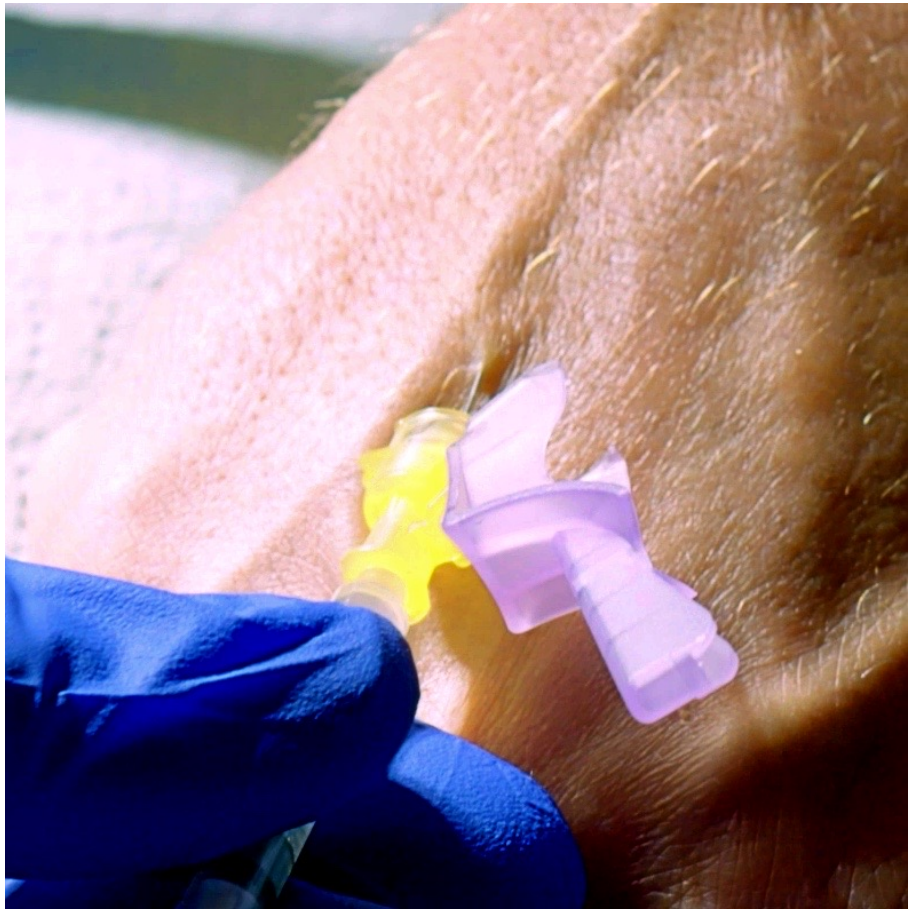
Luhman Pediatrics 2004 113(3):e217

Tetracaine/Lidocaine

- Works in 20 minutes, 3 years youngest
- 68% kids 0 pain
- Vasodilate – 100%
- Don’t chew - toxic
- Pretty hot
- $40
- Stiff

Buffered Lidocaine and 30G needle

- Buffered Lidocaine versus Liposomal Lidocaine.
- Tiny bleb over vein
- N=69 age 4-17
- No difference
  - Nurses satisfaction
  - Pain scores kids
  - Pain scores parents



Luhmann, Pediatrics Vol. 113 No. 3 March 2004

Vapocoolant Systematic Review

"Vapocoolants were ineffective in children and adults when compared to placebo, and effective in adults only when compared to no treatment. The magnitude of effect was low and was offset by increased pain from application. They cannot be recommended for routine use in children or adults."

Hogan ME J Emerg Med. 2014 Dec;47(6):736-49

Stations

1. Comfort position/distraction
2. Buzzy: ice wings vs. no ice wings. IV insertion (optional) or sharps
3. Buffered lido vs. non-buffered lido. 30 G needles. IV insertion (optional)
4. EMLA removal Tegaderm vs. Clingfilm