Continuum of Care from Wearables to Non-Invasive Neuromodulation

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Continuum of Care from Wearables to Non-Invasive Neuromodulation Workshop

- A lack of comprehensive and rigorous approach
- Non-invasive and invasive neuromodulation technologies are often siloed
- Evolving regulatory environment especially with wearables
- Need to encourage neuromodulation technologies to leverage wearables
- Attention to the design of wearables to specifically support neuromodulation
Continuum of Care from Wearables to Non-Invasive Neuromodulation

Non-Invasive Neuromodulation
- TMS
- tDCS
- nVNS
- TENS
- Ultrasound
- Light

Invasive Neuromodulation
- DBS
- SCS
- VNS
- FES

Biomarkers (MOA, patient selection, stimulation tuning)
- MRI, EEE, MEG
- Physio (EKG, Motion, Galvanic Skin Response, Respiration...)

Wearables and Apps
- Sensors
- Connectivity
- Surveys
Outcomes

Little data, but high quality
- Regimented surveys collected by experts
- Rigorous calibrated biomarkers
- Uniform data collection, forced response, conventional statistics
- Fixed neuromodulation dose

Lots of data, but mixed quality
- Online surveys, elective, self assessments
- Adaptive questionnaires
- Continuous, noisy data collection
- Adaptive neuromodulation dose

“Not one missing data cell”

“FitBit in the dryer”
Is this even regulated?

Medical device

Not a medical device (but used in research/treatment decisions)

Source: Wired

Medical device

Not a medical device (but used for medication)

Source: Sue Carlson

Medical device

Not a medical device (yet an accessory to one)
What is Wearable?
- (Not) Implanted?
- Anything at home?
- Used during daily activities?
- At the coffee shop?
- Hands-free?
- Shown at CES?

What is a Medical Wearable?
- For “medical” purpose.
- Under medical supervision?
- Regulatory approved?

“Wearable technology is where it’s at right now.”
A wearable?
A medical device?
Publications per year