Can Wearable Technology Advance Care?

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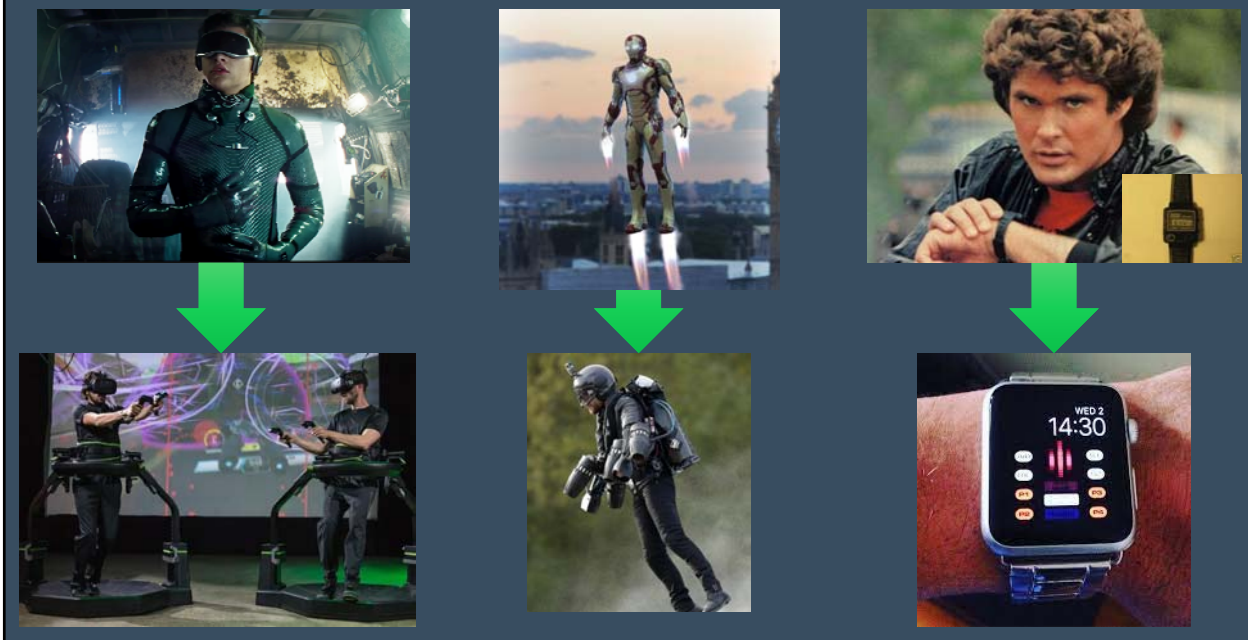
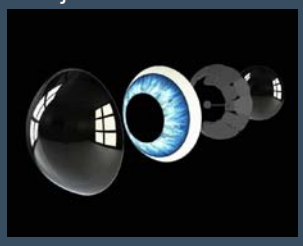


Can it advance care?

Mojo contact lenses



Oura Ring

Welt Smart Belt Pro

What does it do?

- Biosensors that measure physiologic metrics
  - Point of care technology (POCT) that monitors physical signals: HR, glucose, BP, etc…
- Determines health status or can detect acute changes in condition
- Enabled by technological advancements and identification of biomarkers.
- Rapid growth in development over the last decade

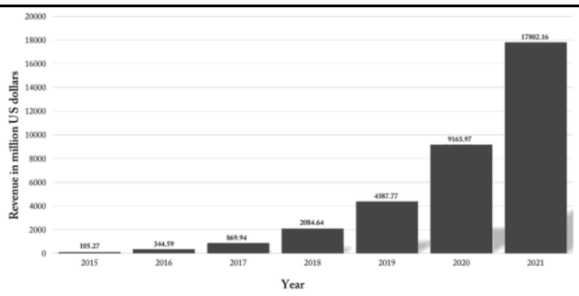


Figure 1.1
Projected size of the global market for wearable devices in the health-care sector from 2015 to 2021 [2].

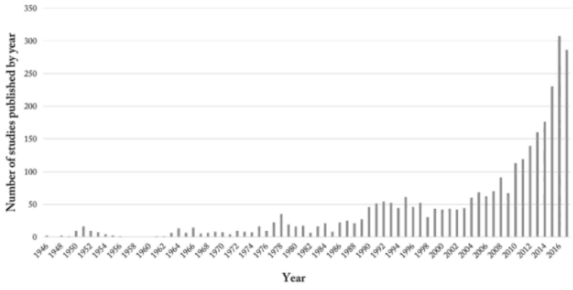
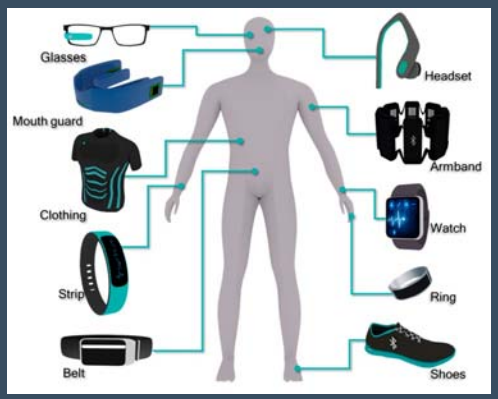


Figure 1.2
Number of studies resulted from a PubMed search with "wearable technology AND (health care OR medicine)" as the keyword [3].

*Wearable Technology in Medicine and Healthcare – Melisa Junata and Raymond Kai Yu Tong

Intended Outcomes

- Promotes **personalized** care
- Facilitate real-time monitoring of acute and chronic conditions
- Reduce the cost of care
- Improve access to care
- Promote engagement and self management



Wearable Technology in Stroke

- Stroke detection
- Stroke rehab
  - Robotics and exoskeletons
  - AR/VR
- Stroke Prevention
  - Holter/event monitors --- Cardionet or Zio patch
  - Activity trackers

VIPS Stroke Detection

Cerebrotech

- Developed by **Cerebrotech Medical Systems**
- Volumetric Impedance Phase Shift Spectroscopy (VIPS)
  - Sends low energy radio waves through the brain and detects changes consistent with stroke.
- VITAL study: VIPS device can differential severe stroke from minor stroke with sensitivity of 93% and specificity of 92%
- Currently marketed to Paramedics to assist in diagnosing severe stroke in the field to help triage to stroke centers

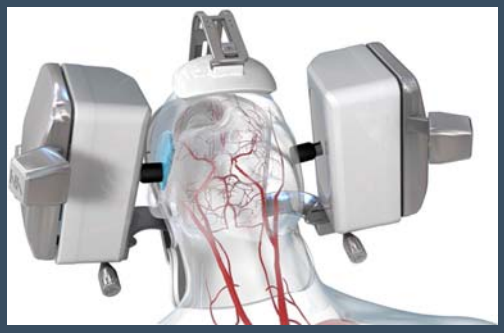
Microwave Stroke Detection

- StrokeFinder device by Hunter Medical Research Institute
- Utilizes microwave technology
- Consists of a helmet antenna system, microwave unit, and computer
- Uses proprietary AI to differentiate ischemia from bleed
- Ongoing trials to study accuracy of StrokeFinder in Australia and abroad

Ultrasound Stroke Detection

Lucid Robotic System by Neural Analytics

- Made up of
  - Lucid M1 Ultrasound System
  - NeuralBot rotobotic ultrasound positioner
- TCD system to monitor CBF and AI to interpret the US and optimize placement of ultrasound probe
- Scan completed in less than 5 minutes.
- Studies ongoing



Sonas Device

- Battery powered TCD device
- Detects vessel occlusions due to stroke

EEG Stroke Detection

Alphastroke (Forest Devices)

- Portable EEG and AI device used to detect asymmetry between 2 hemispheres of the brain
- Monitoring lasts 1 minute
- Studies suggested device could differentiate ischemic from hemorrhagic and could potentially detect LVO

BrainScope

- EEG based
- Uses proprietary algorithm to detect ischemic stroke, hemorrhagic stroke, and stroke mimics.
- Correctly identified strokes when CTH was negative 80% of the time.
- Studies limited by small sample size.

Stroke Detection

- Walsh et al looked at 10 different non-invasive wearable devices utilizing 7 different types
  - Accelerometers
  - EEG
  - Microwaves
  - Near-infrared
  - Radiofrequency
  - Transcranial Doppler
  - Volumetric impedance phase shift spectroscopy (VIPS)
- Noninvasive external brain monitoring have the potential to differentiate:
  - stroke from non-stroke
  - ischemic from hemorrhagic
  - LVO from non-LVO strokes.

Non-invasive sensor technology for prehospital stroke diagnosis: Current status and future directions. Int J Stroke. 2019; 14(6):592-602 (ISSN: 1747-4949)

Artificial Intelligence

- Machine learning and decision support must quickly and accurately interpret data
- Devices can be used in the prehospital space by technicians rather than specialists
- Machine learning may add years to development before Biosensors are marketable making them EXPENSIVE pursuits.

Conclusions

- Wearable technology CAN advance stroke care
- Must balance cost of technology with potential outcomes
- Well designed devices may improve outcomes, improve access, and reduce economic burden of stroke
- Scope of wearable technology in stroke is broad and promotes individualized care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