Wearable Technologies And Telemonitoring
For Vascular Diseases: How To Keep Vascular Patients Out Of Hospitals

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Disclosures
✔ I do not have any potential conflict

Wearable Technologies & Remote monitoring

- Unprecedented increase in use
- 77 million wearable devices in 2017 US
- Market set to reach $150 billion by 2027

FDA Approves First Finger Prick-Free Device for Diabetics

Abbott’s Eroa-approved wearable glucose monitor is different than anything on the market.

The Freestyle Libre Flash is a small circular wearable sensor worn on the back of the upper arm that sampling glucose from the interstitial fluid every 10 minutes via a sensor that penetrates into the skin. The sensor is waterproof and can be worn for up to 15 days. Wearing a Libre-like sensor over the sensor transmits a current glucose reading, as a flash reading, and the direction of glucose trend.

Use of a Wearable Defibrillator in Terminating Tachyarrhythmias in Patients at High Risk for Sudden Death:

"The wearable defibrillator is a promising new technology that has the potential to improve outcomes for patients with high-risk atrial fibrillation who are not candidates for current ablation or surgical therapy."

FDA approves pill with embedded sensor to monitor compliance

"The pill contains a miniaturized sensor that can track the pill’s journey through the digestive system and communicate adherence data to a smartphone app."

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Applications
Improving care, reducing net spending
Chronic diseases: Cardiovascular, Diabetes, Obesity, COPD, Cancer
- Personalization
- Teleconsultation, teleconferencing
- Early diagnosis
- Remote patient monitoring
- Image guidance
- Pre & Rehabilitation
- Medication adherence
- Information Registry
- Education
- Veterans Health Administration
  >2000 staff trained, >13,000 patients, >32 conditions
- Whole System Demonstrator (DoH) NHS
  World’s largest telehealth RCT, 3336 patients
Mortality, hospital admissions, bed days, cost

Peripheral Arterial Disease – The Challenge
“Eat clean, keep lean”

Initial Visit 3 months 6 months
“Stop smoking, keep walking”

Wearable Sensor Technology Efficacy in Peripheral Vascular Disease (wSTEP)
A Randomized Controlled Trial
Pedro Narvaez, MD, 1, Richard Koeserrich, PhD, 1 Colin Richard, MD, 1 Leonard Allen, MD, 1
Mike F. Buxton, MD, 2 Richard Grims, MD, 2 Nicholas Chhabd, MD, 2 Andy Dyer, MD, 2 and Celina Riga, MD, 2

INCLUSION EXCLUSION
Calf claudication
Confirmed SFA disease on imaging
>500m MWD
Poor mobility due to unrelated factors
Excluded: n=52
- Did not meet inclusion criteria (n=20)
- DNA > 2 (n=11)
- Declined (n=21)
Allocated to NFB group n=20
- Unrelated ill health n=1
- Family bereavement n=2
- Revascularisation (angioplasty) n=1
Withdrawal n=4
- Death, stroke (n=1)
- Other (n=3)

Allocated to control group n=17
- Unrelated ill health n=3
- Lost to f/u n=1
- Revascularisation (surgery) n=1
Withdrawal n=5
- Death (n=2)
- Other (n=3)

F/U 3 (n=19)
6 (n=18), 12 (n=16)
F/U 3/6 (n=9)
6/12 (n=13), 12/12 (n=9)
Wearable Sensor Technology Efficacy in Peripheral Vascular Disease (wSTEP)

Block Randomization

Standardized clinical pathway for ALL patients:
- Routine information on maintaining physical activity
- Best medical therapy
- Advised to attend SEP
- Same number of clinic visits

For NFB patients:
- Daily targets programmed into NFB
- Asked to wear NFB every day for 1 year
- Feedback given regarding exercise habit at each f/u

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Maximum walking distance
Claudication distance

VascuQol Score

Summary

Wearable activity tracker technology IC

- Supplement/alternative to SEPs
- Management of IC in the community
- Motivation/empowers patients

Considerable benefit using a potentially resource-sparing, population-based strategy with a sustainable impact

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Wearables & mHealth

BUT...

- Clinical data
- Regulatory
- Confidentiality
- Ethics

Artificial intelligence