



“Vascular Research & Innovation Priorities in the UK should be applied everywhere: they include Wearable Sensors and Telehealth Systems”

Celia Riga

Head of School of Surgery
London Deanery
NHS England

Vascular & Endovascular Surgeon
St Mary's & Charing Cross Hospitals
Institute of Global Health Innovation
Imperial College London






Disclosures


- ✓ UKRI/EPSC Healthcare Technologies Strategic Advisory Board
- ✓ Head NHSE London Surgery, Workforce, Training & Education







Healthcare Demand Inpatient Dependent



- Aging, co-morbid population
- Younger health-conscious population
- Chronic diseases Cardiovascular Diabetes Obesity COPD Cancer Mental Health
- 29% demand surge expected for healthcare workers in the next decade
- Service delivery mode has changed
- Centralization BUT
- Lack of robust outpatient and community resources



UK Healthcare Research Priorities



Community healthcare

- Rapid diagnostics
- Digital Pathology & Radiology
- Telemonitoring, home-based care
- Decentralization – remote & rural
- Budget: 150M over 5 years

Early Detection

- Focus shift from treatment to prevention
- Screening principles
- Right treatment for the right disease stage
- Target treatments to those most likely to benefit
- Budget: Data & Genomics Hubs (£27M), UK Biobank (£100M), Industrial Challenge Strategy Fund (£79M matched by a £160M industry, 5M volunteers)


Efficacy-Effectiveness Gap

- Drug & Treatment variability
- >90% medicines only work in 35-50% of people
- Pharmacogenetics - Drug Resistance
- Compliance
- Budget: £200M over 5 years

Sustainability Resilience Responsiveness


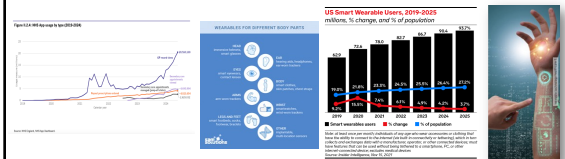
- ⇒ Massive Workforce expansion
- ⇒ AI & Data Science support

2024 Darzi NHS Review



Independent Investigation of the National Health Service in England

- Re-engage staff and re-empower patients
- Lock in the shift of care closer to home
- Simplify and innovate care delivery
- Drive hospital productivity optimise pathways, sustainability
- Tilt towards technology “the workforce urgently needs the benefits of digital systems, use of automation and AI for breakthroughs to create new treatments”

Wearables - Cardiovascular Health

- **Unintended consequences** – health aware, self-Mx
 - 80% of heart failure cases in US
 - 60% of heart failure deaths in US
 - 50% of heart failure hospitalizations in US
 - 25% of heart failure deaths in US
- **Physical activity sensors**
 - CV outcomes/all-cause mortality
 - HRV recovery/recovery/parasympathetic
- **Heart rate & rhythm sensors**
 - CV outcomes/all-cause mortality
 - HRV recovery/recovery/parasympathetic
 - Single-lead ECG recordings
 - AFib detection up to 95% ECG treatment effectiveness for AF
- **BP sensors (Omron/Akita)**
 - Wrist-based cuffs 0.8 ± 12.8 mmHg accuracy
 - Cuffless sensors 0.5 ± 12.7 mmHg accuracy



Wearables - Cardiovascular Health

- Biochemical sensors**
 - Continuous glucose monitoring (CGM) for diabetes
 - Digital pill sensor - medication adherence (88% - 100% accuracy)
- Biomechanical sensors**
 - Cardiac output, stroke volume, heart rate
 - Body composition (fat, muscle, bone mass)
 - Embedded cardiac stress monitoring
- Implants**
 - Pacemaker, ICD
 - AFib detection (resistor PDA)
 - Smart stethoscope

UK Research and Innovation **VEITH SYMPOSIUM**

Cardiovascular Applications

Application	Evidence
Risk assessment	Prospective cohort studies
Physical activity intervention	RCTs
AF & Valve detection	RCTs
HF diagnosis & management	RCTs
Cardiac rehabilitation	RCTs, systematic review, meta-analysis

Home-based cardiac telerehabilitation using wearable sensors is equivalent or better than center-based rehabilitation, can increase access to cardiac rehabilitation and reduce the cost
Maddison, R. et al. Heart 2015, 122-129 2015

Blood Pressure

Digital hypertension management: clinical and cost outcomes of a pilot implementation of the OMRON hypertension management platform

Home and Online Management and Evaluation of Blood Pressure (HOME BP) using a digital randomised in poorly controlled hypertension: randomised controlled trial

➔ **Improvement in BP control**

Vascular Applications

Wearable Sensor Technology Efficacy in Peripheral Vascular Disease (wSTEP)
A Randomized Controlled Trial

Richard Norman, MD, PhD, Richard Krasinski, PhD, Colin Rickard, MD, Louise Allen, MS, Mike P. Jenkins, MS, Richard Gibbs, MD, Nicholas Cheshire, MD, Ana Duru, MD, and Celis Riga, MD, PhD

Wearable Activity Monitors in Home Based Exercise Therapy for Patients with Intermittent Claudication: A Systematic Review

Author	Year	Study	Sample Size	Intervention	Control	Outcome
Chen et al.	2018	Wearable Activity Monitors	100	Wearable Activity Monitor	Standard Care	Increased walking distance
Norman et al.	2021	wSTEP	100	Wearable Activity Monitor	Standard Care	Significant improvement in walking distance

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FUTURE OF SURGERY

Big Data Robotics Genomics Wearables

Accelerated Clinical Translation Hubs/Partnerships

WHICH TECHNOLOGIES WILL MAKE THE GREATEST IMPACT? WHAT DOES THE FUTURE MEAN FOR PATIENTS? HOW WILL THE DELIVERY OF SURGERY CHANGE? THE FUTURE SURGICAL TEAM

FUTURE OF SURGERY

VASCULAR

- Aortic Dissection
- Smart Stents PAD/EVAR/TEVAR
- Sac growth
- Diabetes and foot health
- Stroke
- Intra-operative guidance
- Pre/Re habilitation

WHICH TECHNOLOGIES WILL MAKE THE GREATEST IMPACT? FUTURE SURGICAL TEAM

Conclusions

- Shift from hospital to community care
- Shift from treatment to prevention
- Explosive use of wearables
- Evidence supports the use of wearables in CV health
- Clinical validation mandated: actionable data vs noise → **integration**
- Workforce Transformation – The Future Surgery Team

Remote/digital technologies can reshape care delivery within a robust regulatory framework

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