



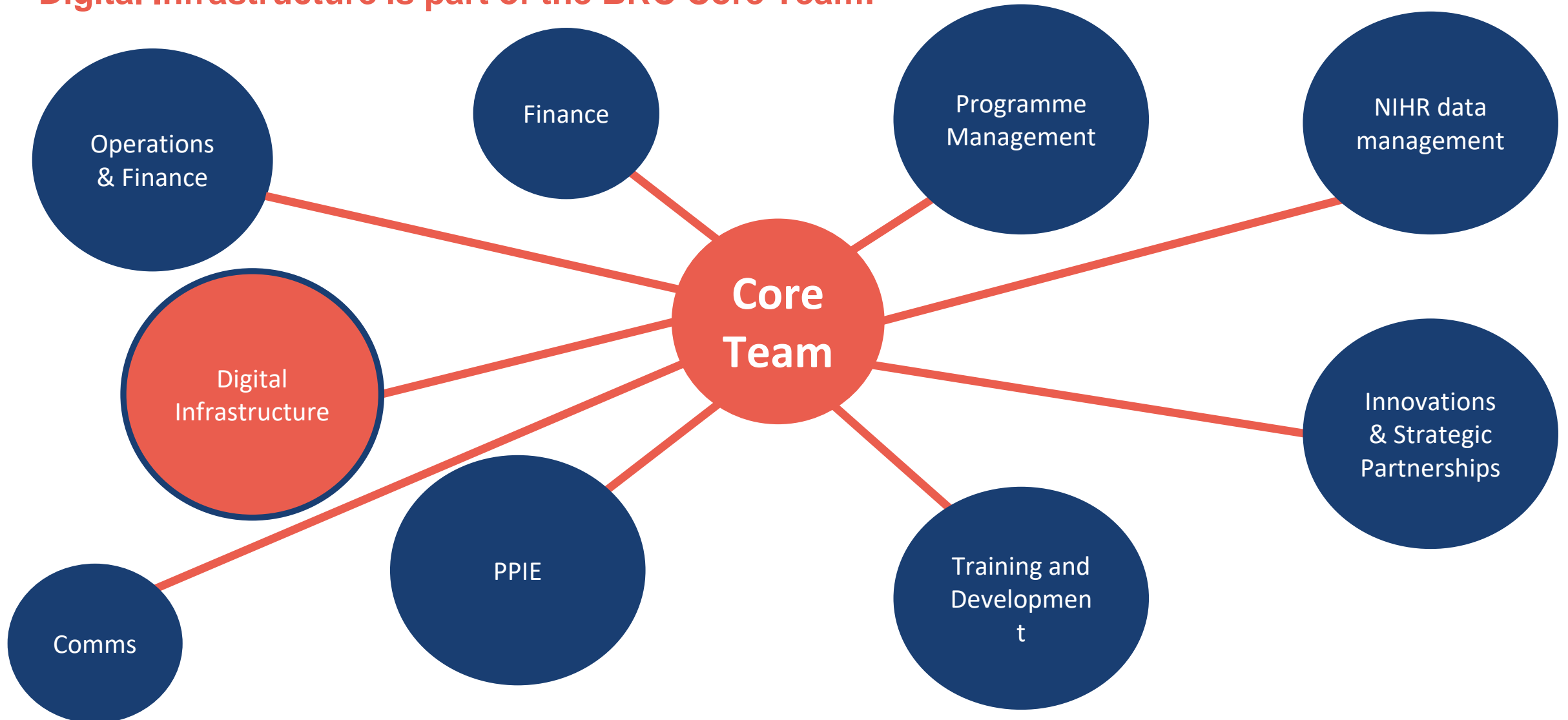
**NIHR** | Manchester Biomedical  
Research Centre

# Digital Infrastructure

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**Digital Infrastructure is part of the BRC Core Team:**



## Digital Infrastructure Team



**Ruth Norris**  
Head of Digital Strategy



**Alex Frangi**  
Digital Infrastructure  
lead



**George Tilston**  
Research Data  
Engineer



**Richard Williams**  
Research Data Engineer



**Alexander Pate**  
Research Associate



**Narges Azadbakht**  
Data Scientist



**Matt Sperrin**  
Statistician



**Ilina Serafimova**  
Project manager



**Dave Jenkins**  
Statistician



**Le Mai Parkes**  
Research Data Engineer



**Pauline Whelan**  
Digital Health  
Software team



**Kate Wicks**  
Information  
Governance Manager



**George Moulton**  
BRC Capacity  
Building lead



**Thamer Ba Dhafari**  
Research Data Engineer

**We provide support:**



**Access to  
data**



**Software  
Engineering**



**Data  
Science**



**Translation**



**Access to  
data**

**Software  
Engineering**

**Data  
Science**

**Translation**

## Digital Infrastructure – Access to data

- Access to population-based electronic health records (GM Care Record)
- Access to deep phenotypic information from trust EPRs (e.g. images, letters)
- GM Secure Data Environment (GM SDE)
- Health Informatics Collaborative (HIC)
- Implementation of HDR UK & FAIR principles

## Greater Manchester Care Record

Linked electronic health records from 3.1m people, 440 general practices, 10 hospitals, and 9 councils.

**epidemiology and public health**  
e.g. Watkinson vaccine equity

**deep phenotypes through linkage with Trust EPRs**  
e.g. Faivre-Finn Covid19 & cancer

**text mining to unlock text fields**  
e.g. Bakerly & Van der Gast, microbiology reports

**evaluate interventions**  
e.g. Rutter Diabetes MyWay

**prospective cohorts**  
e.g. McDermott pharmacogenetics



## Research Data Engineers

- Skilled team of software engineers with experience of extracting and processing electronic health records
- Provide support for EHR-based studies
  - feasibility
  - study data definition
  - extraction
  - preparation
- All engineers frequently work with the GM Care Record
- We aim to have data engineering support at each of the BRC trusts



**Richard Williams**  
Research Data Engineer



**George Tilston**  
Research Data Engineer



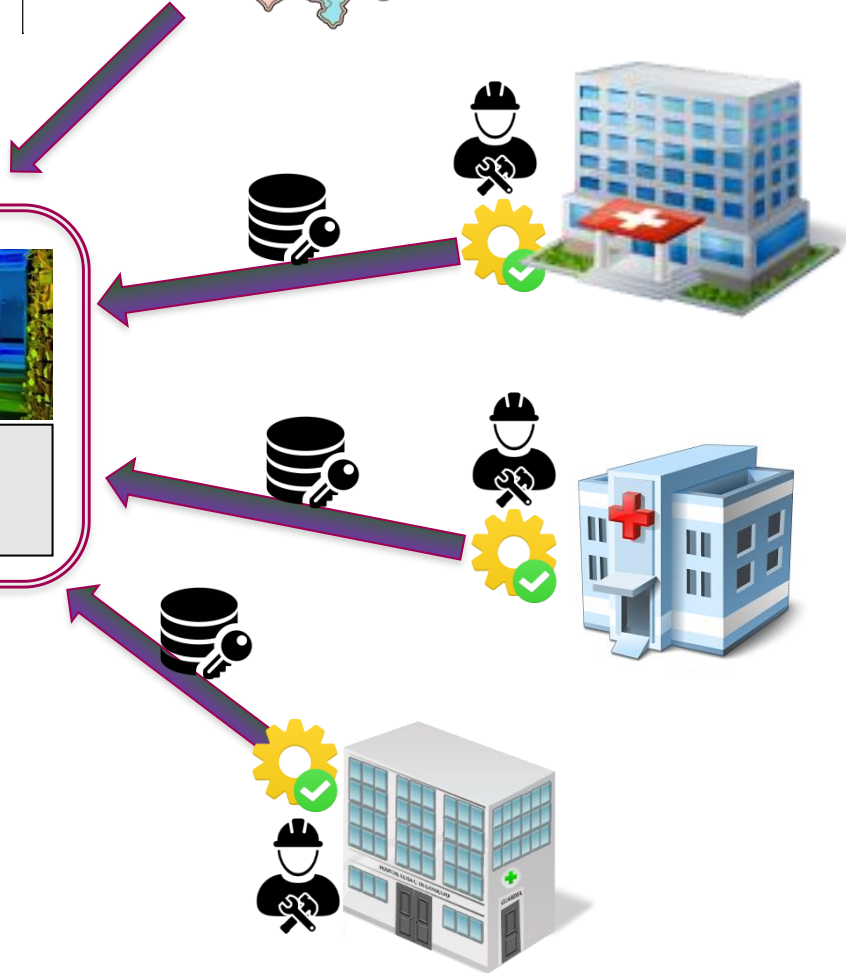
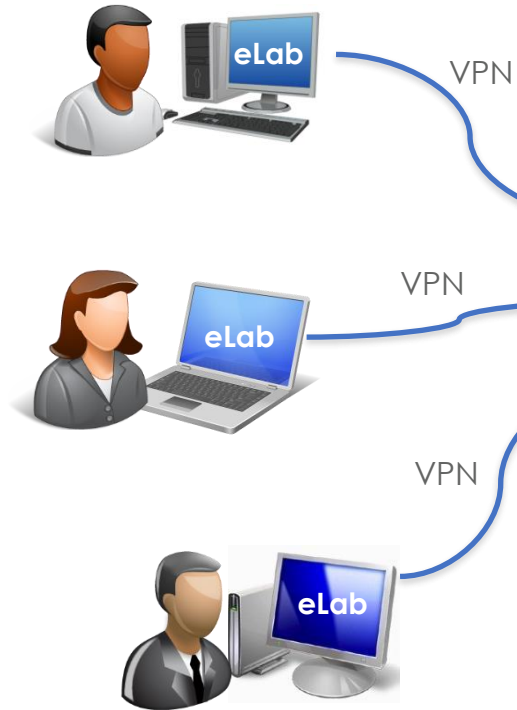
**Le Mai Parkes**  
Research Data Engineer



## GM Secure Data Environment (GM SDE)



BRC researchers



NHS trusts

## Health Informatics Collaborative (HIC)

- Partnership of 34 NHS trusts to facilitate the sharing and reuse of clinical data for research (including MFT, NCA, and The Christie; currently onboarding Blackpool)
- Data sharing framework agreement for contributing NHS trusts
- Organised in clinical themes: **cardiovascular**; **critical care**; renal disease; **viral hepatitis**; cancer: ovarian, breast, **colorectal**, lung, and prostate; **covid-19**; infectious diseases; **hearing health**; musculoskeletal; myeloma; transfusion dependent anaemias; diabetes
- Coordinating Centre (led by Oxford BRC) support is winding down over Q1 2023.
- **Manchester BRC Digital Infrastructure team** assists with: information governance; data extraction and transfer; and (sometimes) data analysis

## Exemplar HIC Research Study

The NIHR HIC requires a collaborating site to contribute data to a theme before they can submit a research proposal to use the combined data. Now that MFT has contributed data to the COVID-19/Cardiovascular theme, we can submit research proposals.

Dr Stuart Grant is leading a study which aims to **predict one-year mortality in patients admitted to hospital with acute coronary syndrome (ACS)**, and develop a clinical prediction model.

The dataset, hosted at Imperial College Healthcare Trust, includes patients from five collaborating hospitals hosting NIHR Biomedical Research Centres (not including Manchester) who had a troponin test ordered between 2010 and 2017.

The analysis has mostly been completed, and a manuscript is being drafted.

Access to  
data

Software  
Engineering

Data  
Science

Translation



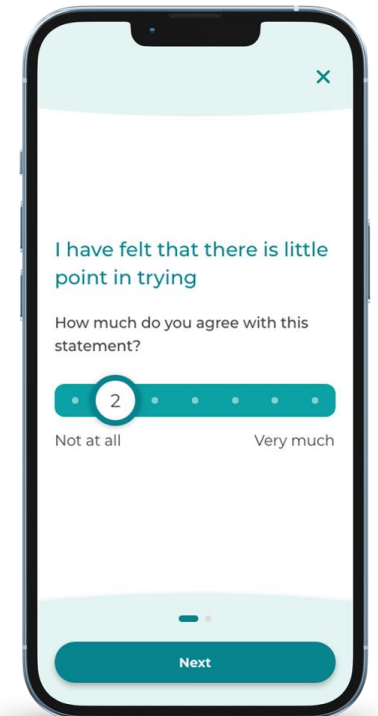
**Pauline Whelan**

## Digital Health Software team

- Team of specialist digital health software engineers and UI/UX designers
- User Research with patients and clinicians
- Co-design of digital health software - from idea to high fidelity interactive prototypes
- Integration with wearables/hearables for passive data sensing
- Defining technical feasibility (e.g integration with Electronic Health Records)
- Embedding behaviour change tools (e.g. to support adherence) in patient-facing apps
- Developing research dashboards to visualise and analyse complex datasets
- Navigating the regulatory landscape for software as a medical device (SaMD)
- Attention to digital accessibility

## Digital Health Software - CONNECT

- PI: Prof Sandra Bucci, University of Manchester
- Wellcome Trust Funded
- Aim to develop a relapse prediction algorithm for people with serious mental illness (SMI)
- Remote digital data collection system
  - Active symptom monitoring via smartphone questionnaire
  - Passive sensing through wearables and smartphone
- 1100 participants enrolled for 12 months across 6 NHS Trusts
- Builds on previous SMI smartphone research at UoM



Access to  
data

Software  
Engineering

**Data  
Science**

Translation



## Access to data science capacity

- Experienced team of data scientists / statisticians
- Can assist with analysis of complex datasets (e.g. electronic health records, wearable sensor data)
- Focus on methods for clinical outcome prediction



**Dave Jenkins**  
Statistician



**Narges Azadbakht**  
Data Scientist



**Matt Sperrin**  
Statistician

## Clinical Prediction Modelling support

- Support with development, validation and impact assessment of clinical prediction models in healthcare:
  - Study feasibility, design and planning.
  - Adherence to methodological and reporting standards.
  - Training.
  - LIMITED support for direct assistance with data analysis.
- Particular interest in ‘non-standard’ studies where methodological innovation is required.
- Contact Ilina to find out more.



**Dave Jenkins**  
Statistician



**Narges Azadbakht**  
Data Scientist



**Matt Sperrin**  
Statistician

## Prediction modelling example- Application of multi-state modelling in multi-morbidity using UK Biobank data

Increasing number of people are becoming affected by multi-morbidity.

Development of tools that support clinical decision-making in this complex area is needed.

Advanced analytical methods can help model the multi-morbidity trajectories of these patients.

In this study we will explore the use of multi-state model for multi-morbidity risk prediction within population of patients affected by different metabolic conditions (type 2 diabetes, cardiovascular disease and chronic kidney disease).

We aim to:

- demonstrate how to develop a multi-state model in the context of multi-morbidity using the UK Biobank data.
- identify and potentially address the methodological challenges in fitting multi-state models in a large electronic health record (EHR) database for the prediction of multi-morbidity.

Data- UK Biobank data and linked EHR data (for example, GP data)

Access to  
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Software  
Engineering

Data  
Science

**Translation**

CHRISTABEL  
PANKHURST  
INSTITUTE

FOR HEALTH TECHNOLOGY  
RESEARCH AND INNOVATION



# CHRISTABEL PANKHURST INSTITUTE

FOR HEALTH TECHNOLOGY  
RESEARCH AND INNOVATION

Claudia  
Lindner



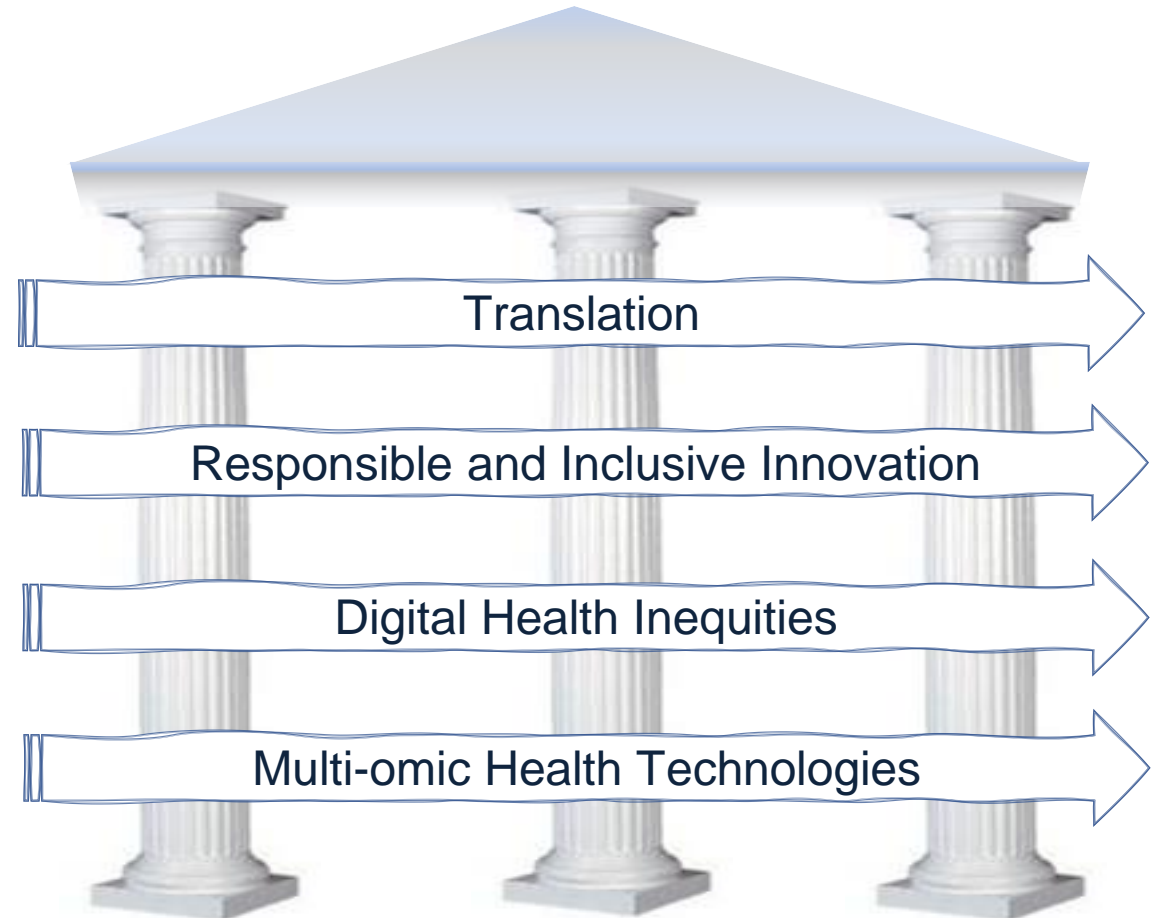
Robert  
Meckin



Sabine van  
der Veer



Juhi Gupta



Translation

Responsible and Inclusive Innovation

Digital Health Inequities

Multi-omic Health Technologies

Digital

Materials

AI



Alex  
Frangi

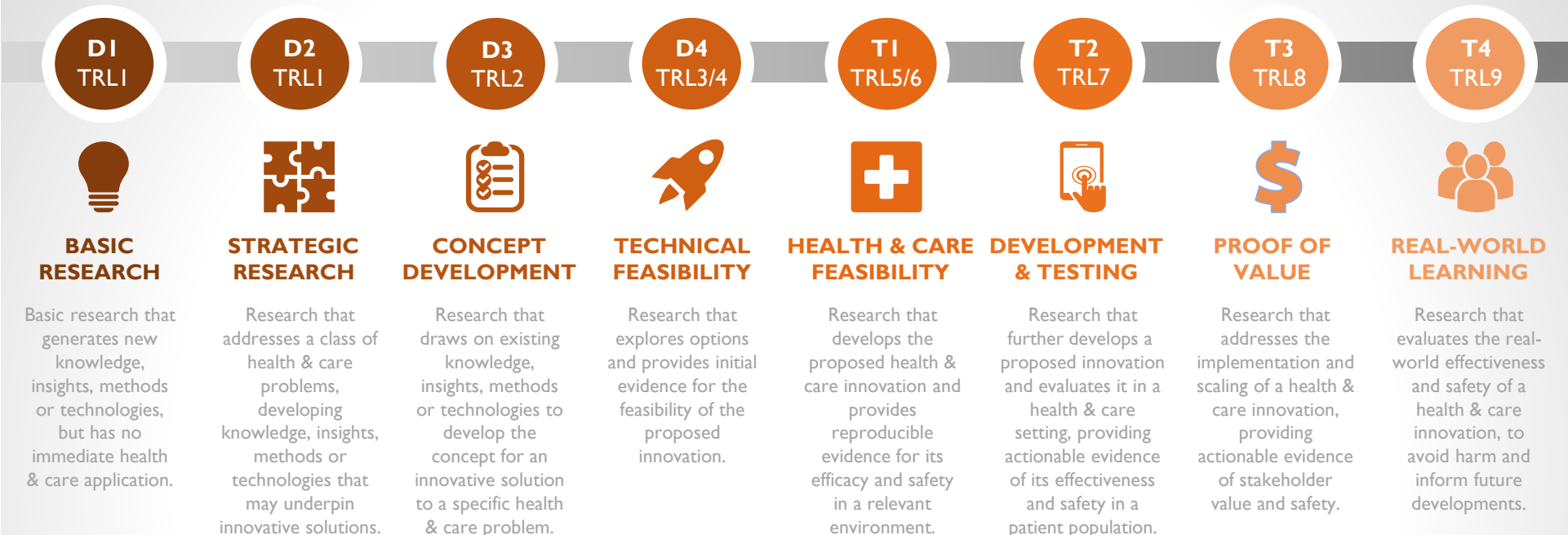


Julie  
Gough



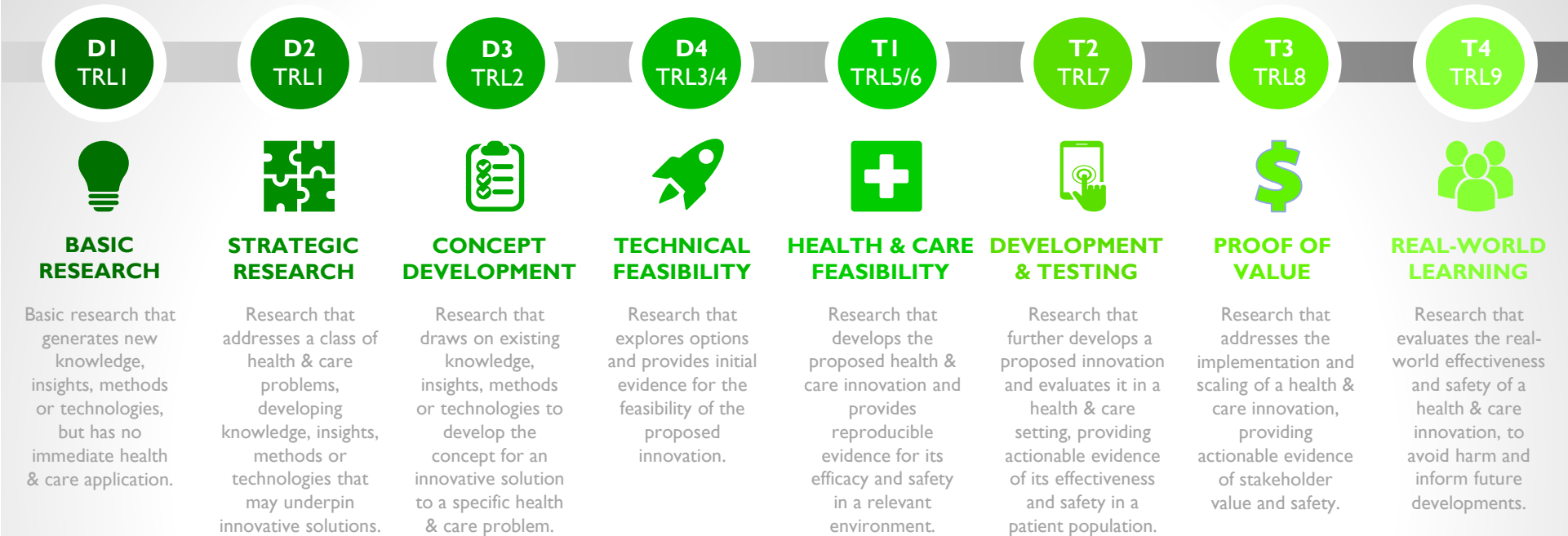
Samuel  
Kaski

# TRANSLATIONAL ROADMAP MEDICAL DEVICE (INVASIVE)



# TRANSLATIONAL ROADMAP

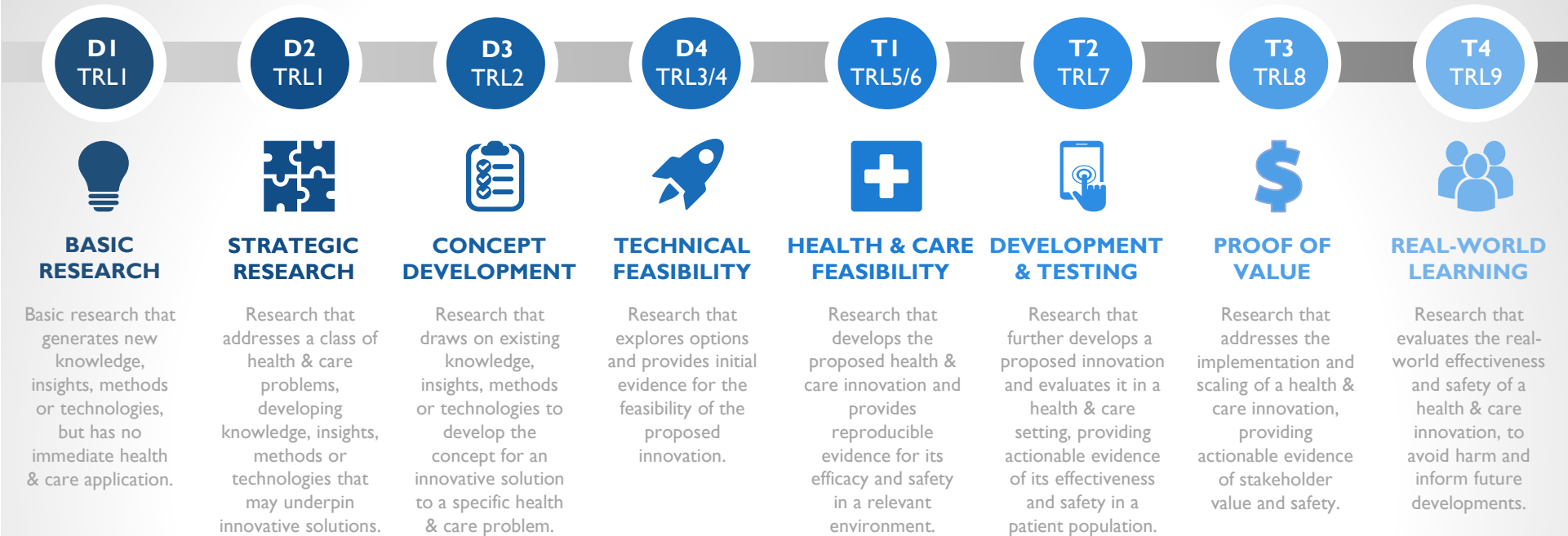
## MEDICAL DEVICE (NON-INVASIVE)





# TRANSLATIONAL ROADMAP

## SOFTWARE AS MEDICAL DEVICE



## Contact us:



**Alex Frangi**

Digital Infrastructure lead

[alejandro.frangi@manchester.ac.uk](mailto:alejandro.frangi@manchester.ac.uk)



**Ruth Norris**

Head of Digital Strategy

[ruth.norris@manchester.ac.uk](mailto:ruth.norris@manchester.ac.uk)



**Ilina Serafimova**

Project manager

[ilina.serafimova@manchester.ac.uk](mailto:ilina.serafimova@manchester.ac.uk)