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Better Care Insight Sharing Day

21 October 2021

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Introduction and welcome

Objectives for today

1. Provide an update on HDR UK Quinquennial Review Process
2. Discuss progress, challenges and priority next steps for Better Care projects in the North and South West
3. Ongoing Better Care training activities and how to get involved

Agenda:

Time	Session	Who	Aims
Better Care Insight Sharing			
09.30 (10 min)	**Introduction and welcome**	Simon Ball, Executive Medical Director, University Hospitals Birmingham NHS Foundation Trust	Introduction and overview of day
09.40 (20 min)	**Better Care QQR Update**	Caroline Cake, Chief Executive Officer, HDR UK	• Provide an update on the HDR UK QQR • Highlight inputs required from the Better Care community • Outline any next steps
10:00 (90 min)	**HDR UK North Showcase**	**Chair**: Munir Pirmohamed Andy Clegg: Development of a learning system to optimize anticholinergic medication prescribing for older people living with frailty. Graham King - Learning Care Homes; continuous improvement of structured referrals Tjeerd van Staa: Better prescribing in frail elderly people with polypharmacy. Monica Jones: Data Architecture, Governance and Curation Theme Bridget Young and Joyce Fox Patient and Public Involvement and Engagement Theme	• Provide an overview of ongoing projects led by members of the HDR North Better Care network (frailty and the elderly) • Identify areas of synergy and opportunities for collaboration with the broader community • Identify shared challenges and possible solutions
11.30 (15min)	**BREAK**		

Agenda:

Time	Session	Who	Aims
11.45 (75 min)	**HDR UK Southwest Showcase**	**Chair**: Jonathan Sterne Andrew Dowsey: Prediction models for antimicrobial resistance and severe COVID outcomes Richard Wood: Supporting the renewal of Discharge-to-Assess services in Bristol through patient flow modelling - (IPACS) Ranjeet Bhamber: Subtyping of hospital inpatients by clustering e-observations data Andy Judge: Hospital efficiency and throughput at North Bristol NHS Trust. The impact of the winter flu seasons and COVID-19 on planned elective hip and knee replacement surgery – (Hospital Efficiency)	•Provide an overview of ongoing projects led by members of the HDR Southwest Better Care network •Identify areas of synergy and opportunities for collaboration with the broader community •Identify shared challenges and possible solutions
13.10 (1 hour)	**LUNCH**		
14:00 (30 min)	**CO-CONNECT**	Tom Giles, University of Nottingham	•Standardising COVID antibody data collection across the UK •Configuring an infrastructure which enables trustworthy, fast, de-identified, secure analysis of data sets from across multiple sources •Answering key questions about immunity to COVID-19 and the implications for patient outcomes.
14:30 (45 min)	**HDR UK - Training Update**	Sarah Cadman, Programme Director for Talent and Training, HDR UK Alan Davies, Senior Lecturer in Health Data Sciences, University of Manchester Benjamin Green, Associate Lecturer, University of Manchester	•HDR UK Training – HDR UK Futures •HDR UK Training Catalyst Programme •Training Curriculum •Gaming and simulation to enable Better Care
15:15 (5 min)	**Closing remarks and next steps**	Alice Turnbull, Programme Director, HDR UK Kevin Dunn, HDR UK Programme Manager, HDR UK Midlands	• Wrap up, next steps and close
15:20	**CLOSE**		

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HDR UK Overview for Quinquennium 2

DRAFT

20 October 2021

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HDR UK's mission is to unite the UK's health data to enable discoveries that improve people's lives

Our 20-year vision is for large scale data and advanced analytics to benefit every patient interaction, clinical trial, biomedical discovery and enhance public health.

Draft – not HDR UK policy

What is the HDR UK quinquennial review?

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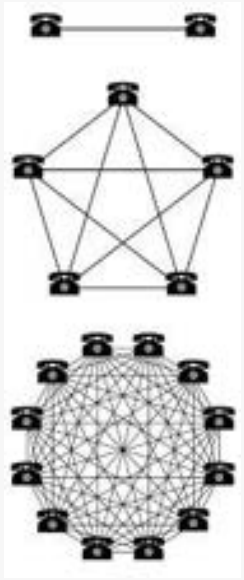
- HDR UK was established in April 2018 by our core funders as the national institute for health data research
- The funders' vision is to create a pre-eminent UK Institute for the next 20-30 years
- The Institute is funded in 5 year periods, “Quinquennium” (QQ)
- We are reviewing HDR UK progress and impact for QQ1 (2018-2023) and preparing a vision and strategy for QQ2 (2023-2028)

British Heart Foundation
UK Research and Innovation
Chief Scientist Office
Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales
wellcome
HSC Public Health Agency
Research and Development
NIHR | National Institute for Health Research
Engineering and Physical Sciences Research Council
Medical Research Council
Economic and Social Research Council

HDR UK's QQ2 principles

1. **Stand on the shoulders of giants –** we'll get further by using and *building on the UK's science and clinical infrastructure and harnessing the UK's unique genomic and health data**

2. **Use, Connectivity & Team Science** - we'll achieve better science through many researchers, using many datasets, to develop many insights that benefit public and patients **



3. **Trust** – we'll demonstrate trustworthiness through transparent and safe use of data and an unwavering focus on patient and public benefit ***

*HMG Life Sciences Vision 2021

** Moore's Law & Metcalfe's Law

*** Caldicott Principles

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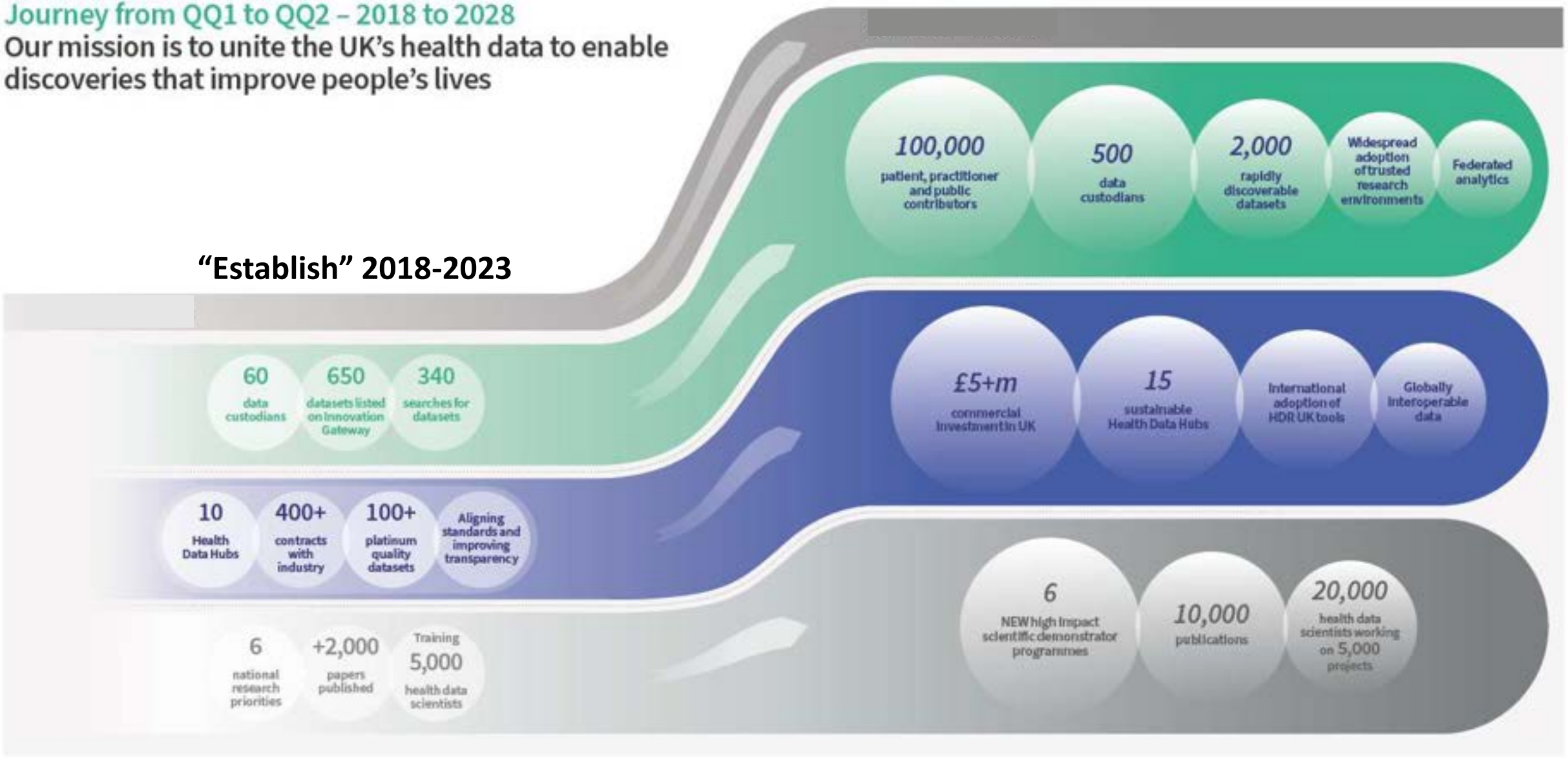
Journey from QQ1 to QQ2 – 2018 to 2028

Our mission is to unite the UK's health data to enable discoveries that improve people's lives



QQ1 has already shown the power of this platform approach, enabling many researchers to safely use large scale data...

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UK data foundations | **Alliance** | **Gateway** | **Expertise** | **Impact**

ZOE COVID Study is the world's largest COVID study, with 4,699,088 contributors

Safely accessible via the SAIL Databank in Swansea, part of the UK Health Data Research Alliance

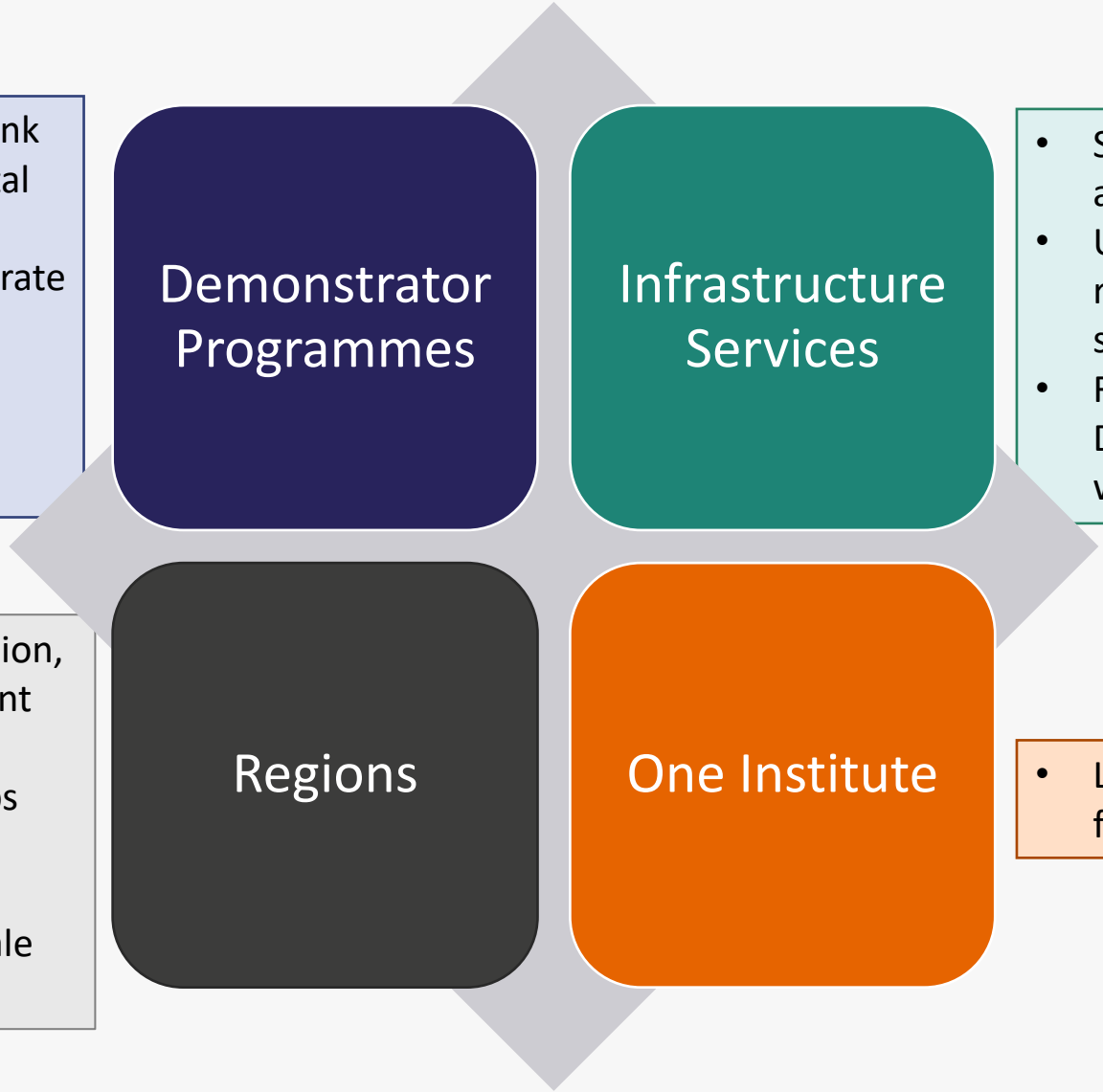
Discoverable via the Gateway, with Platinum Metadata, and over 200 enquiries via the Gateway access request

Supported by data research expertise at the Breathe Health Data Research Hub

Over 70 publications by 20 project teams already available and discoverable via the Gateway

QQ2 Strategy

- UK-wide data foundations which link health, care, genetic, environmental & behaviour data at scale
- Novel research insight to demonstrate how data can 'power-up' and transform health research
- Driving the development of the shared Infrastructure services



- Streamlined, secure, trustworthy access to data to enable research
- User-centred, applicable across research domains and technologies, scalable, and sustainable
- Responding to the needs of the Demonstrator programmes and wider research community

- Local networks enabling participation, knowledge sharing and engagement across the UK
- Drawing on local data, partnerships and communities across the UK.
- Rapid response to identify new funding opportunities for large scale programmes

- Leadership, central communications, finance and operational services

Draft – not HDR UK policy

1. UK-wide Research Demonstrator Programmes:

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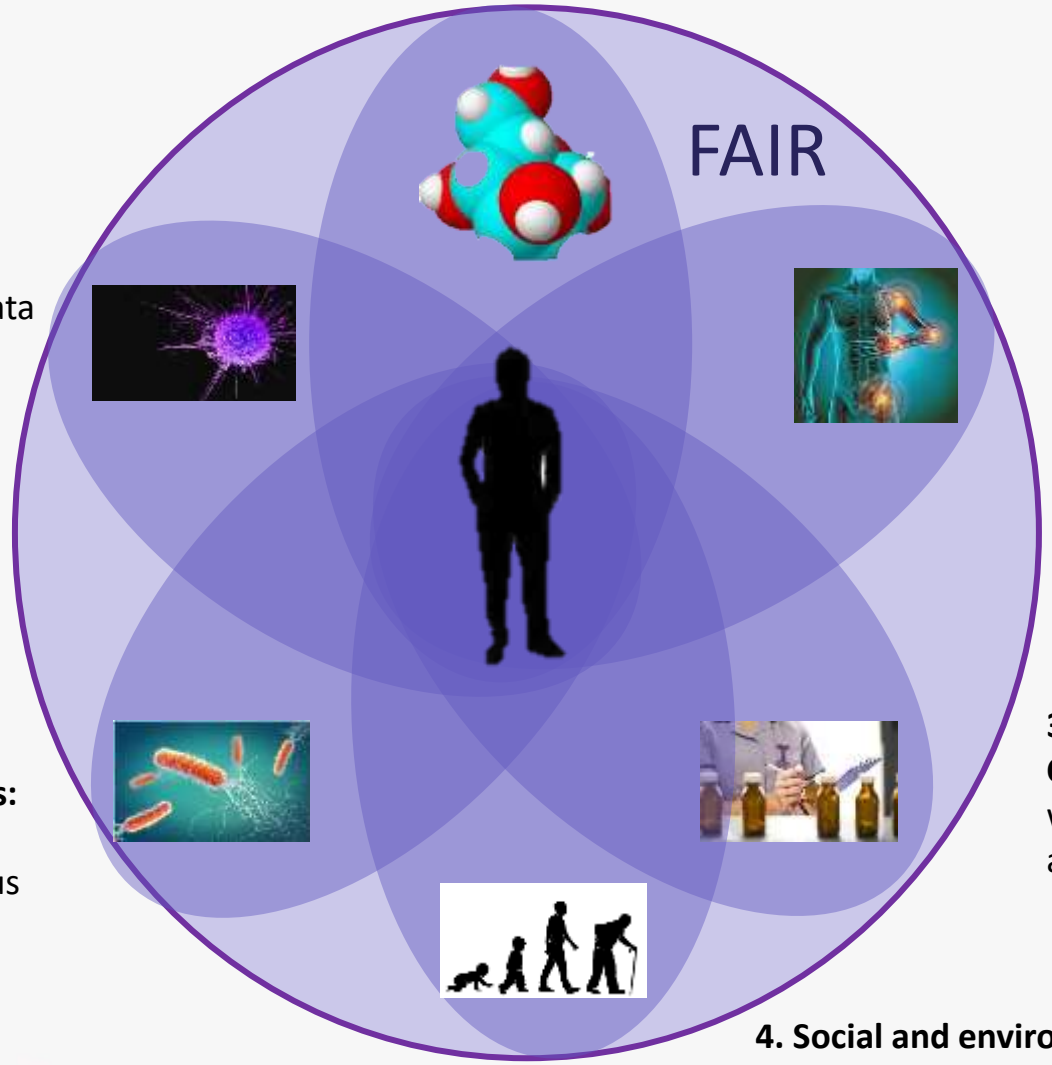
1. Molecules to Electronic Health Records: connecting our genetic data with day-to-day data about our lives to enable discoveries about causes of diseases



2. Immunity and Inflammation: connecting data about inflammation (e.g. respiratory, neurodegeneration) to enable improvements in health

3. Data Driven Innovations Acute & Chronic Care: connecting data about medicines and care we are receiving to enable improvements in care and treatment

4. Social and environmental determinants of health: connecting data on all of us over time with environmental data to enable understanding of childhood health and aging and to enable improvements in health for all of us (we are all represented)

5. Pandemics & outbreaks: connecting data about pathogens to data about us

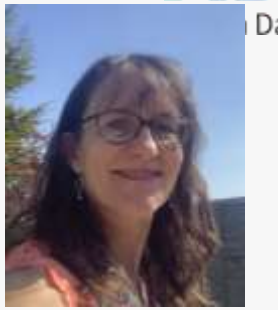
6. Big data for common complex diseases: connecting all of these data to tackle Cancer, CVD, Dementia

IMPACT

HDRUK Data Research UK

1. Demonstrator Programme Convenors

Molecules to EHRs	John Danesh	Sarah Lewington
Inflammation and immunity	Jenny Quint	Aziz Sheikh
Big Data for Common Complex Disease	Cathie Sudlow	Mark Lawler
Data Driven Innovations Acute & Chronic Care	Liz Sapey	Munir Pirmohamed
Pandemics and Outbreaks	Sharon Peacock	Kenny Baillie
Social and Environmental Determinants of Health	Paul Elliot	Ruth Gilbert












2. Research data infrastructure and services

Services to meet researcher needs developed in partnership with the Alliance

Innovation Gateway FAIR DATA
Discovery * Access * Transparency * Analytics

Governance & ethics for access & analysis
- Citizen engagement
- Governance and ethics

Data
- Data Standards & Quality

Capacity & skills
- Talent & Training

Hub and Data Science Network

Enabled by Infrastructure Innovations
Tools for Trials Prognostic Atlas Federation Gateway Development

2. Infrastructure Services Convenors

Public & Patient Involvement & Engagement	Sinduja Manohar	Chris Monk
UK Health Data Research Alliance	David Seymour	Paola Quattroni
• **Data Standards & Quality**	Ben Gordon	Monica Jones
• **Governance & ethics**	Cassie Smith	TBC
Gateway Services	Charles Gibbons	Helen Parkinson
• **Clinical Phenomics**	Harry Hemingway	Emily Jefferson
• **Federated services**	Dave Robertson, Susheel Varma	Carole Goble
Talent & Training	Sarah Cadman	Chris Yau
Tools for clinical trials	Marion Mafham	Matt Sydes
Research hubs and data science centres	Ben Gordon	Kay Snowley

3. Continuing to build our community

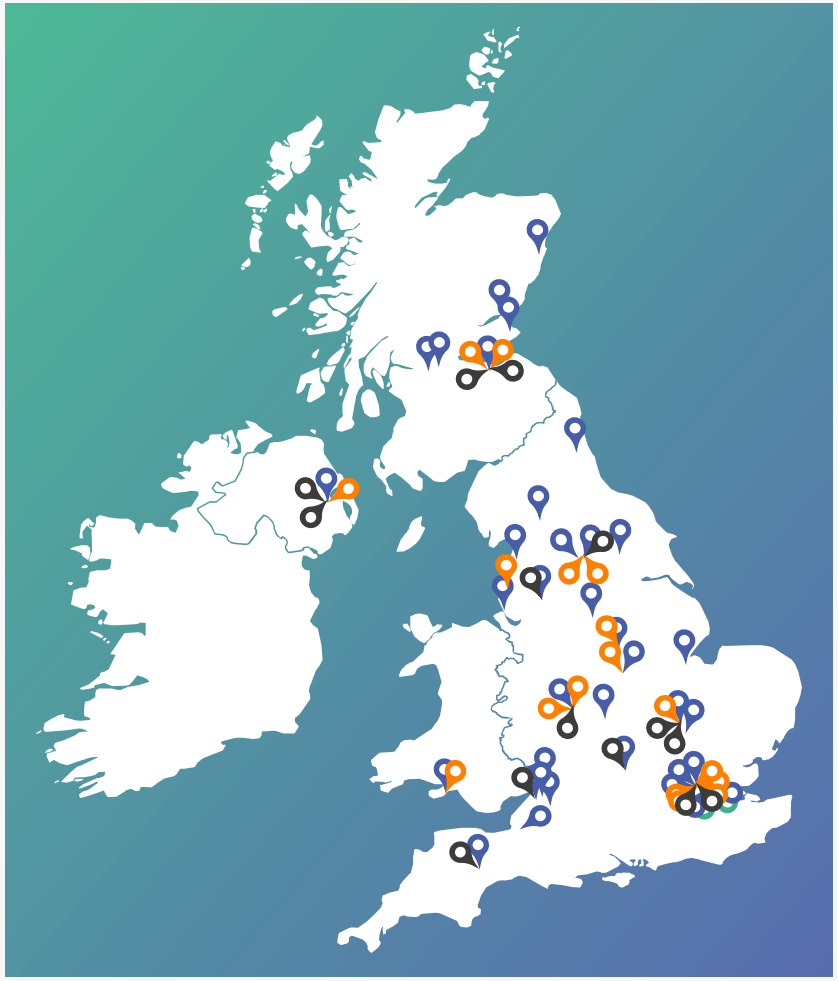
Over the last three years we have created a four-nation UK institute to unite health data - 86 organisations across 32 locations

Wellcome Trust
Great Ormond Street DRIVE Unit

CENTRAL TEAM OFFICES

HDR UK Cambridge
HDR UK London
HDR UK Midlands
HDR UK North
HDR UK Oxford
HDR UK Scotland
HDR UK South-West
HDR UK Wales and Northern Ireland

RESEARCH LOCATIONS



BREATHE
DATA-CAN
Discover-NOW
Gut Reaction
INSIGHT
PIONEER
NHS DigiTrials
BHF Data Science Centre
DATAMIND
Alleviate

HEALTH DATA RESEARCH HUBS

Belfast
Birmingham
Bristol
Cambridge
Edinburgh
Exeter
Leeds
London
Manchester
Oxford

TRAINING LOCATIONS (Masters and PhD)

3. Regional leadership and engagement
Regional network convenors

Cambridge	John Danesh	Angela Wood	
Oxford	Ceclia Lindgren	Eva Morris	
London	Harry Hemingway	Sinead Langan	
Midlands	Alastair Denniston	Fiona Pearce	
Northern England	Munir Pirmohamed	TBC	
South West England	Jonathan Sterne	Rachel Denholm	
Scotland	Emily Jefferson	Dave Robertson	
Wales & Northern Ireland	David Ford	Sinead Brophy	TBC





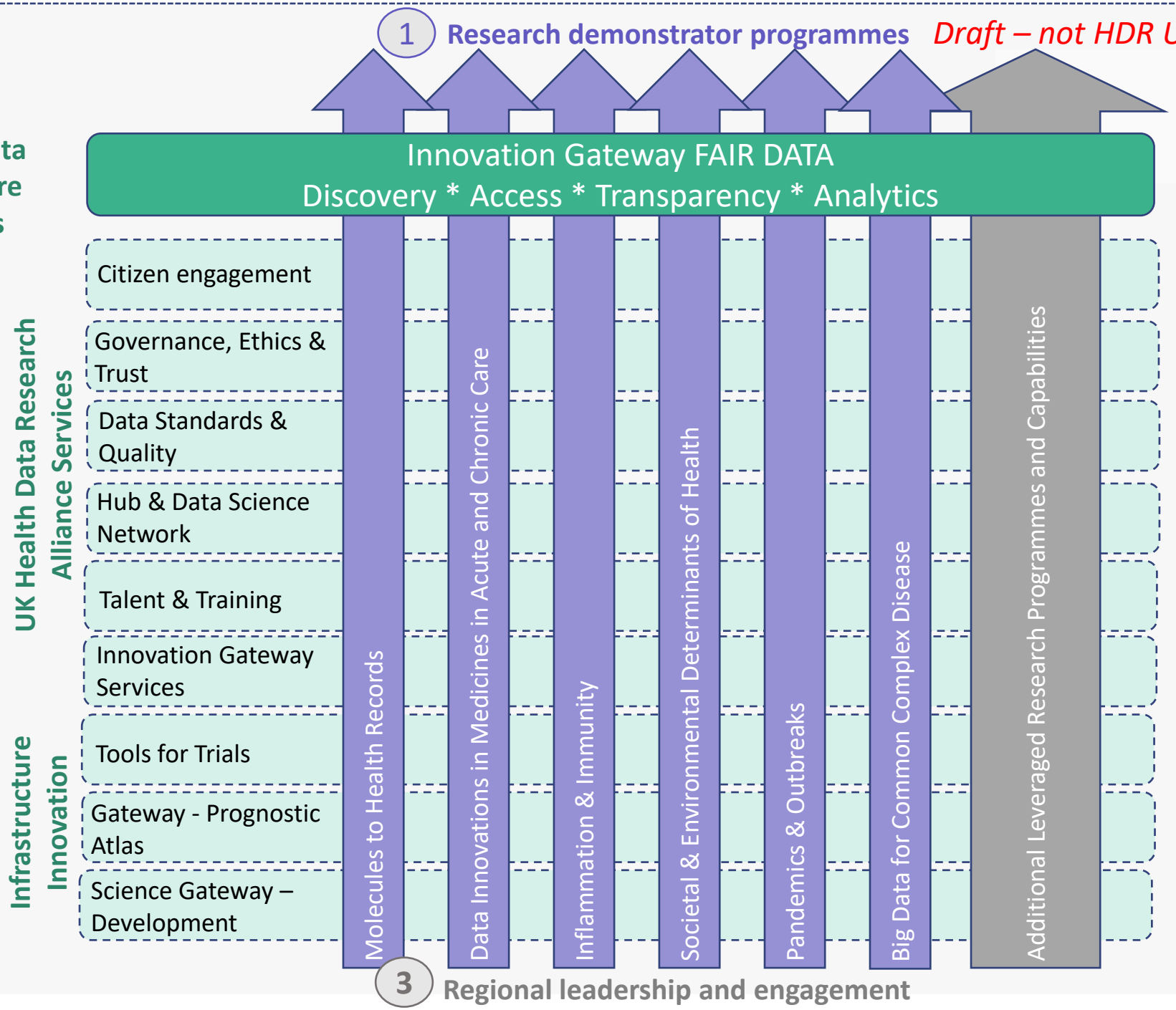









Infrastructure services will enable the core science, and the demonstrator programmes will demonstrate and drive the core infrastructure services



We are developing QQ2 in a collaborative way, engaging and growing our community

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Feb 21 — **Jun 21** — **Sep 21** — **Dec 21** — **Jan 22**

2022
Committee review

Feb 2023
Final funding decision

1 Research Director and Stakeholder reflections and plan development

2a **Community "Blue sky" idea generation**
- Understanding causes of disease
- Clinical Trials
- Better Care
- Public Health
- Applied Analytics
- Phenomics
- Infrastructure & data improvement
- Training

Outputs = QQ1 impact, QQ2 ideas + potential leaders + team

2b **Thematic working sessions across priorities: Frontiers (April)**

2c **Independent panel review of Hubs**

2d **Milestone 2 Gateway Review**

2e **Funder consultation**

Scientific review will review two aspects of each priority area:
i) QQ1 impact
ii) Priority for QQ2, based on alignment to key delivery principles (see next slide)

3 **Scientific review (IAB++)**

4 Decide priorities, agree structure and leadership selection (theme, diversity, geography)

5 **Outline QQR**
- Mission & vision
- QQ1 deliverables
- QQ2 strategy, objectives and outcomes
- Each priority theme proposed strategy
- Organisation
- Financial strategy

6 **IAB & Board review**

7 **Draft QQR report**
- Full written report
- Integrating achievements, external evaluation of impact, and strategy for QQ2
- Commissioned images and graphics

8 **Board review**

9 **Finalised report**
- Finalised report
- Submission

How to get involved

- Connect with the programme leads to identify partnership and collaboration opportunities
- Participate in the Frontiers meetings – 15 November 2021
- Suggest organisations to join the Alliance
- A survey will be distributed soon to hear perspectives directly from Alliance members.
- Keep in touch with progress here: https://www.hdruk.ac.uk/quinquennial-review/

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Questions

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Improving Anticholinergic Medication Prescribing for Older People with Frailty

Andy Clegg

Professor of Geriatric Medicine

Associate Director, HDRUK North

University of Leeds & Bradford Royal Infirmary

a.p.clegg@leeds.ac.uk

@drandyclegg

22/10/2021

The problem

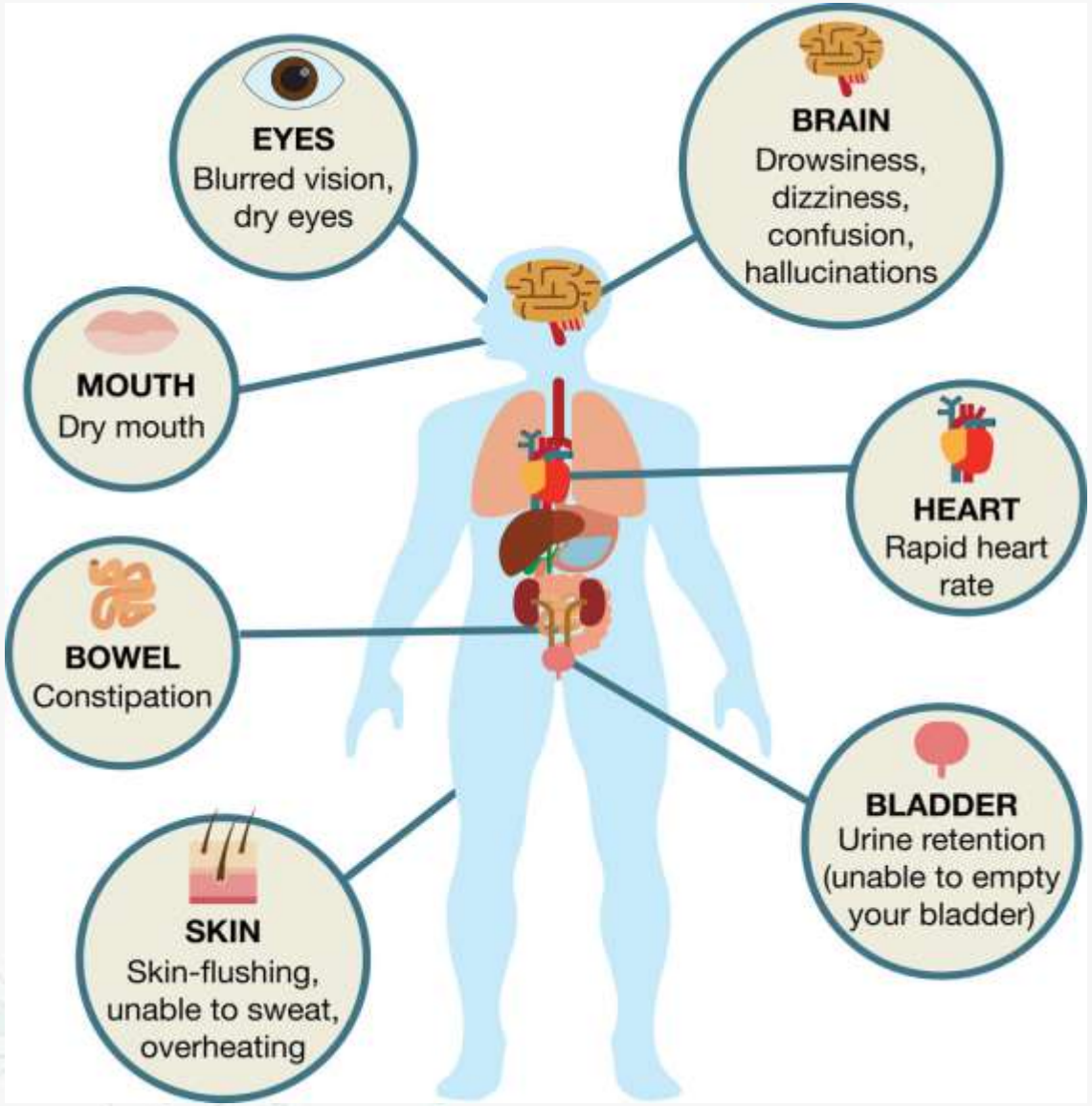
In some cases, anticholinergic effects can be beneficial, and the main mechanisms of action of the medication (e.g. medications for urinary incontinence, or intestinal spasm)

In other cases the effects may be harmful and an unintended side effect of a medication prescribed for another reason

Around 20% of the older population prescribed anticholinergic medication, with growing evidence that they are associated with mental and physical decline in older age

- Delirium (acute confusion)
- Dementia
- Falls
- Loss of physical independence

Anticholinergic side effects



Examples of commonly prescribed medications with anticholinergic side effects

Opioids

Bladder instability medications

Benzodiazepines

Antihistamines

Antidepressants

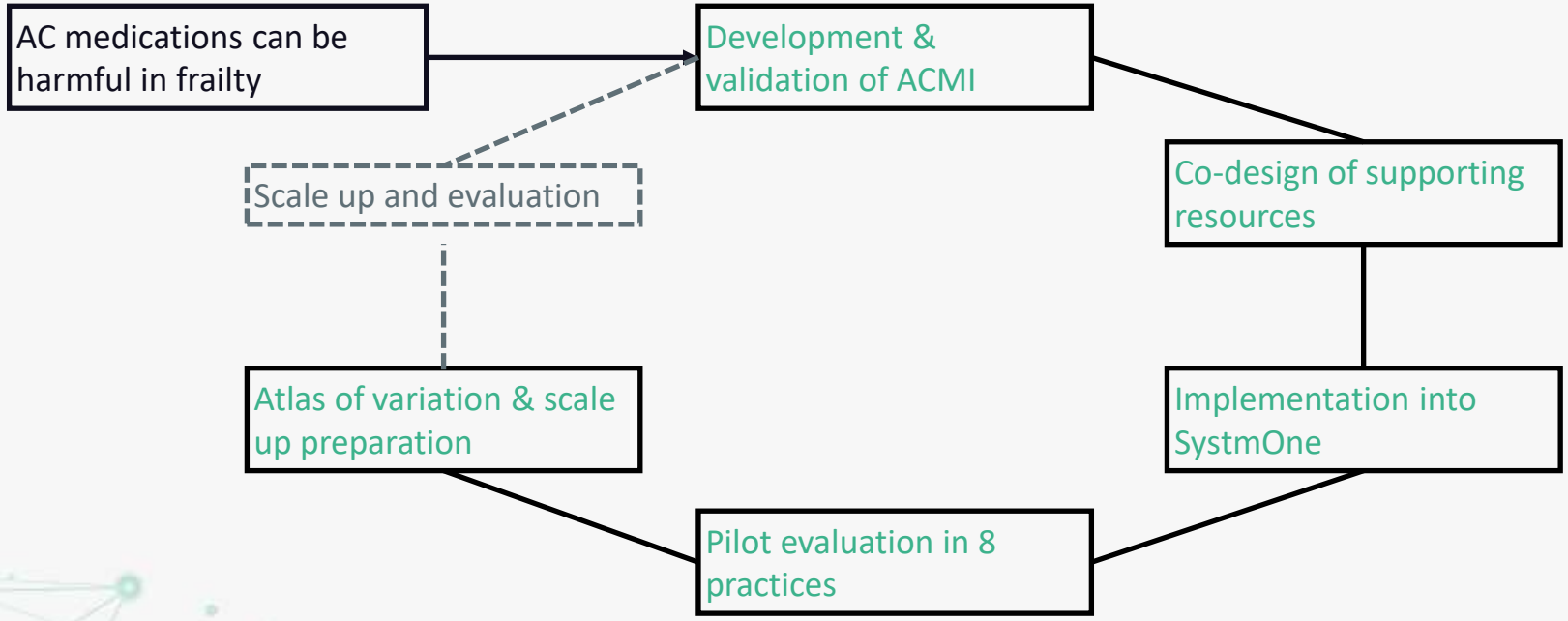
Optimising Anticholinergic Prescribing

We will develop, implement and pilot an Anticholinergic Medication Index (ACMI) and supporting resources to reduce potentially harmful anticholinergic medications for older people with frailty

CONNECTED BRADFORD

SAIL DATABANK

HEALTHY WIRRAL PARTNERS



ACMI internal validation

Data source: Connected Bradford, patients registered 1/1/2019

Study period: Jan-Dec 2019

Analysis: Time dependent Cox model

Outcome: Composite outcome of hospital admissions for delirium/falls

Sample size: 1,822,702

Internal validation: 5-fold cross validation, discrimination statistics, collinearity between meds

Model performance

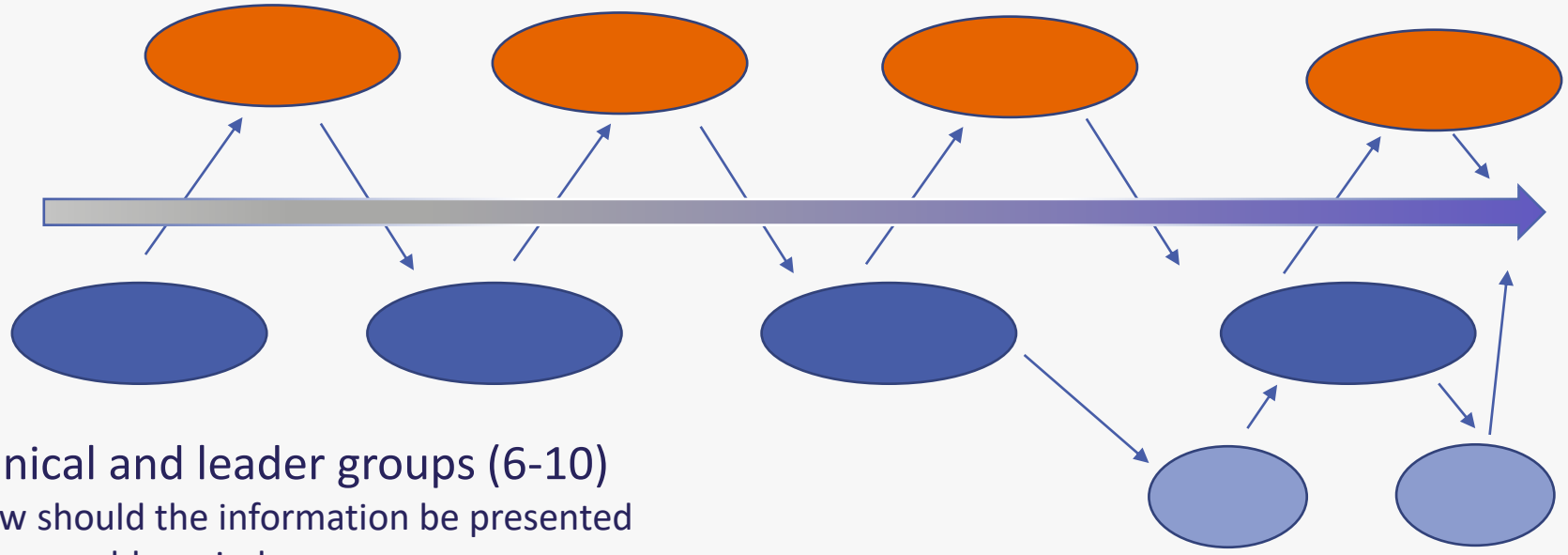
Statistics	Model 1 (ACMI)	Model 2 (ACMI + key predictors)
Concordance	0.64	0.84
Calibration slope	0.94	0.99

Co-design work

Patient groups (7)

How much information to give to patients about score
How to invite patients to attend SMR and to prepare them
Problems with current conversations and follow-up
Encouraging and supporting reductions in medications

Pre-funding



Pilot phase - barriers to implementation (patient and staff), required adaptations of the innovation itself and how the inner and outer context do and don't support use + unintended consequences

Clinical and leader groups (6-10)

How should the information be presented
Who would use index
How would it work as part of SMRs
What support would clinicians need to use it
How to have conversations with patients
Integration within existing IT and other systems

Clinical pharmacists
SystmOne leads
Pre-implementation problem solving

Progress and next steps

Challenges & learning

- COVID19 delays to routine data and co-design of supporting resources, but relatively minor
- Complexity of routine data work with medications, particularly medication doses & frequency
- Primary care pharmacists reallocated to vaccine rollout work, and now booster vaccine rollout
- COVID19-related delay to April 2022 for implementation of Structured Medication Review as a contractual requirement
- Excellent strategic fit, with considerable interest in the work, including from primary and secondary care electronic health record system suppliers

Areas of synergy & opportunities for collaboration with broader community

- Synergy with broader multimorbidity, frailty and polypharmacy research
- Synergy with proposed QQR Medicines in Acute and Chronic Care programme
- Opportunities for collaboration with groups interested in polypharmacy/medicines optimisation research
- Potential for collaboration in Atlas of Variation work, investigating variation in anticholinergic medication prescribing at local/regional/national level
- Opportunities for collaboration in wider scale-up of work, in preparation for definitive evaluation

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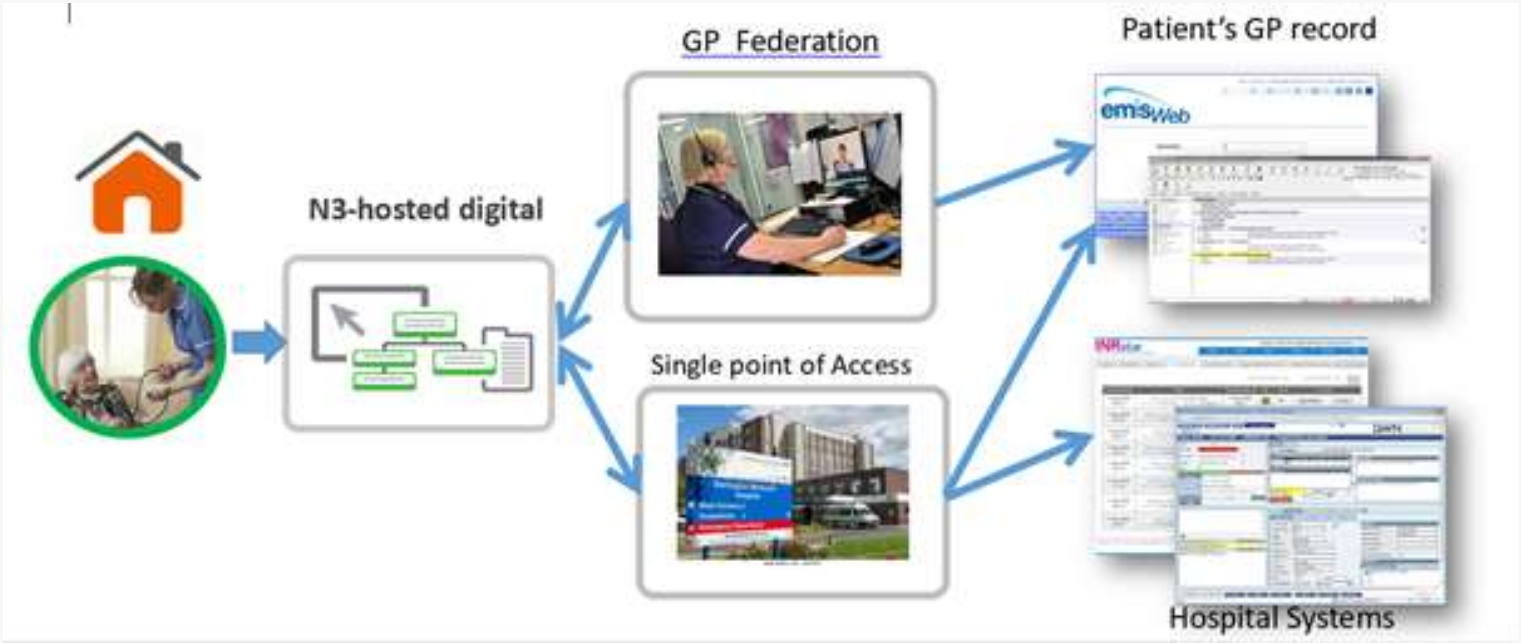
HDRUK North: Digital Care Homes Project

21/04/2021

Learning Care Homes



- App or web portal
- Real time referral from care home to community team
- SBAR & NEWS2
- Pulled into clinical records
- Triage and actioned
- Care home informed

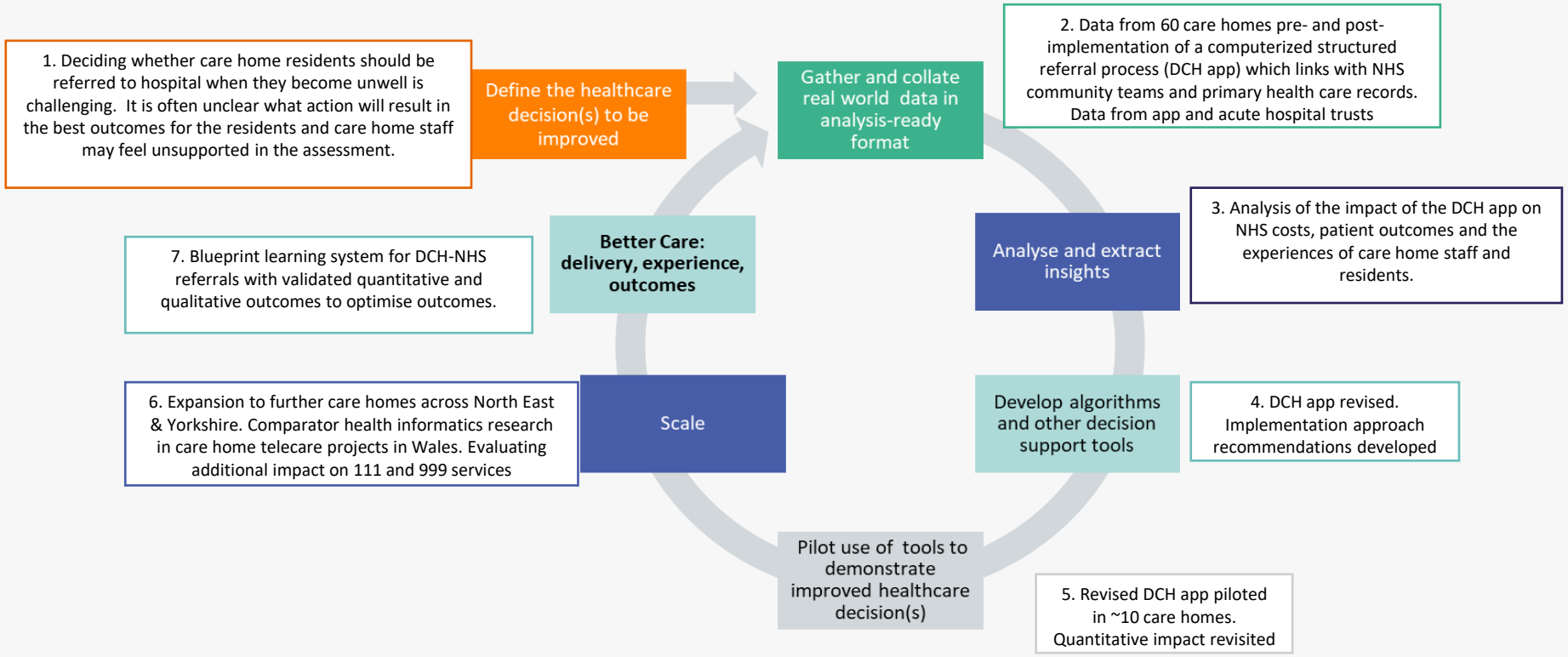
Learning Care Homes

Evaluate the impact of introducing structured digital referrals from care homes to community on clinical outcomes for residents, hospital attendance / admission, health service costs, acceptability & utility to health care workers

Linking data:

- Care Home: Digital App *(SBAR, NEWS2, referral action)*
- Primary Care record
- Emergency Department
- Hospital Admission
- Diagnosis
- Discharge – date, place
- Death
- Covid status

Learning care homes: Better Care Loop



Data Sources

- 10 datasets, consisting of routinely collected, administrative data. Data comes from the County Durham &Darlington NHS Foundation Trust Hospitals, community matrons, data from readings taken inside the care home, COVID-19 testing data and the trust's summary info.
- 441,286 people & 8,125,316 observations in total

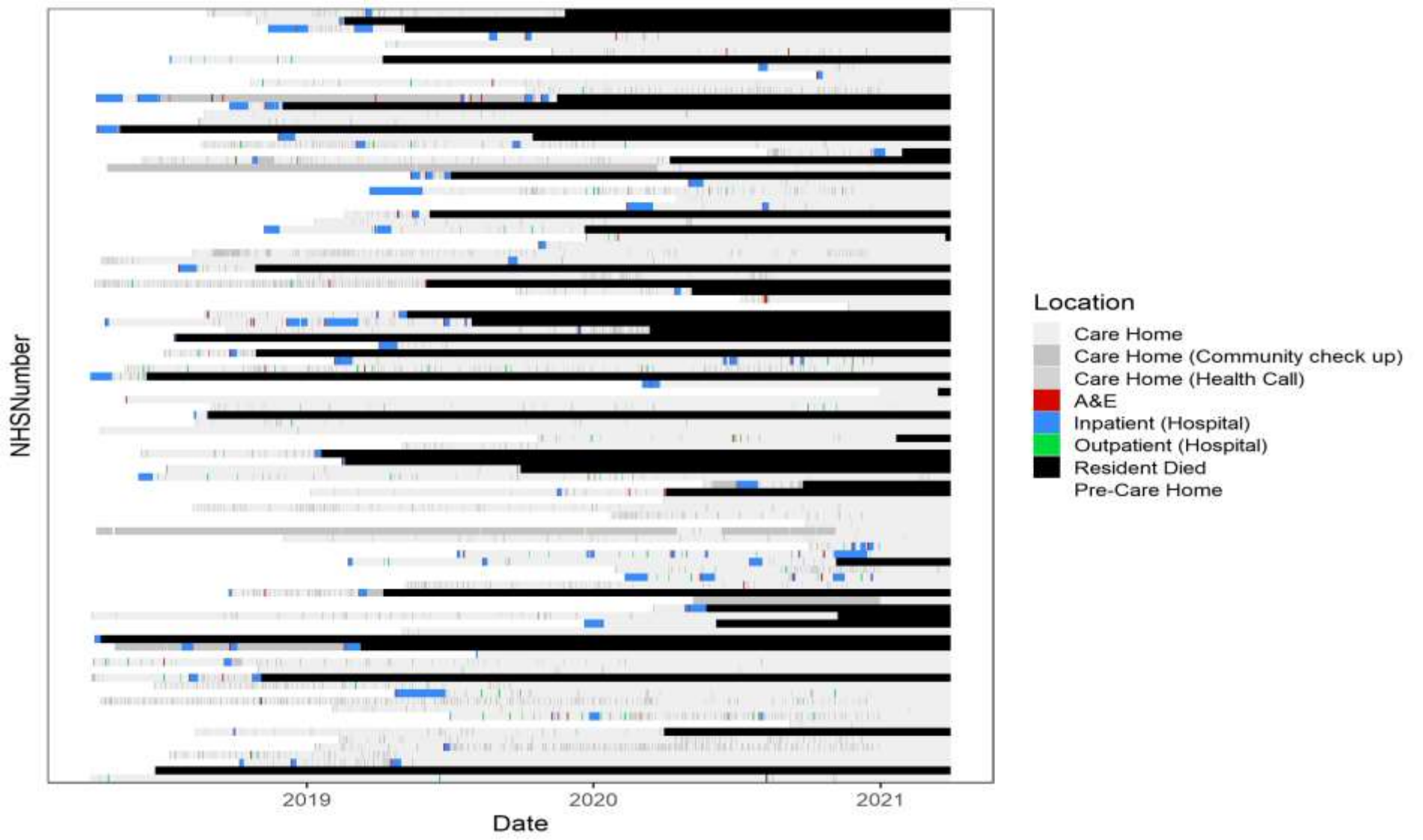
Data Set	Number of Observations	Number of Individuals
A&E	533,165	262,952
Community	2,531,891	52,125
Inpatient	370,020	146,336
Inpatient Observations	2,740,286	91,370
Outpatient	1,412,159	291,183
Ward Episodes	430,127	152,590
Health Call	12,939	3,042
NEWS Read Codes	1,388	592
COVID-19 Testing	91,384	49,760
EWS Discharges	41,110	17,939

Resident information

	True	False
Sex **	Male = 2325	Female = 7022
Had Covid	1,074	10,417
Died within 2 weeks of COVID-19 positive test	251	11,240
Died (within the span of the data set)	4,171	7,320
Diabetes	1,915	9,576
Dementia	1,448	10,043
Wound Care	5,315	6,176

** We do not have age information for 2299 of the residents. This excludes those with unknown ages.*
*** We do not have sex information on 144 of the residents.*

Healthcare interactions of residents



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Improving care delivery:

evaluating acceptability of the *HealthCall* Digital Care Homes app

Recruitment to date

Organisation	Participant	Totals
Local HealthCall Team	Project Manager Clinical Trainers x 2 Administrator	4
Local Authority	Commissioning Manager	1
NHS/Clinical Staff	Team Leader, District Nursing x 3 Community Nurse 1 (and 1 pending) Assistant Community Nurse (pending)	4 (6)
Care Home Staff	Managers x 3 Deputy Managers x 3 Senior Carers x 8 (and 1 pending)	14 (15)
Care Home Residents and Relatives of Residents	Residents x 3 Relatives of Residents 0	3
	Total	26 (29)

Current gaps in recruitment: Care home nurses, GPs, relatives of residents

Care Home Characteristics

Care Home	Participants	Provider	Care provided	Beds
1	Seniors 1 & 2; Resident 1	Chain	Residential	~60
2	Deputy 1; Senior 3	Chain	Residential & nursing	~50
3	Deputy 2 ; Senior 4	Chain	Residential & nursing	~60
4	Manager 1	Independent	Residential	~25
5	Manager 2 ; Deputy 3 ; Senior 5	Chain	Residential	~50
6	Manager 3	Chain	Residential	~70
7	Seniors 6 & 7	Chain	Residential	~75
8	Senior 8; Residents 2 & 3	Independent	Residential	~20
9	Senior 9 (pending)	Chain	Residential & nursing	~40

Recruited from across Co. Durham and Darlington, including both rural and urban areas.

Care Quality Commission rating for all participating care homes is Good.

Initial Findings: *HealthCall* Digital Care Homes App

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A Useful Tool	Relationships & Communication	Challenges to Implementation & Legitimation
Ease of use Improving efficiency Enhancing resident care Legitimising objective and subjective ("soft") signs of health and illness Risk and responsibility at the right level	Rapport and support Appropriacy of training Upskilling through interactions with each other and the technology Evolution of app and its implementation (Feedback loop)	Access (COVID-19) Resident challenges Skill set challenges Cultural challenges Operational/tech challenges
Manager 1: […] *we used to have to ring through to the nurses and it might be engaged. You might have one person to put through and then an hour later somebody else then becomes ill so you need to ring – so it took a lot of time,* ***so we were really excited just for the simplicity of it and I think just the reduction in our time as well.*** Local Authority commissioner: *care home staff are trained how to the observations, trained how to complete the app* […] ***that information goes off to a clinician and they make the judgement***	Clinical Trainer 1: *We give them our mobile numbers, our email addresses* […] ***give them a ring*** […] ***follow that up with regular visits*** […] *if homes are struggling post roll out they'll* ***need a lot more support and we'll pop back in and we'll ring them*** *and sort out issues on the fly type of thing.*	Clinical trainer 2: *Even though it's no different to some of the phones they're using,* ***some are very, very afraid of digital technology*** *so we have to spend time talking around that they can't make a mistake and if they do it doesn't matter because it will be seen by a human.* Administrator: [some] ***would rather just pick up a phone up even though it's gonna take up more of their time*** *so we're still finding that happens in some areas but how we're trying to tackle that*

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Scaling up our project

22/10/2021

Suzanne Mason, Associate Director, HDRUK Northern Partnership

Identifying change in referral practice by care homes during COVID-19 pandemic

Knight, Mason, Caiado, Preston, Hanratty et al

- Care homes in the North East, (residential, nursing etc.)
- Data from 2018 – present: live data feeds

Planned analysis:

- Describe changes with lockdown to flow in/out, referral patterns, ED/admissions, death/place death
- Analyse over time within and between homes
- Interviews with care homes & community teams (selected by type & death rate) – what was done differently, e.g. cohorting, referral practices, testing, workforce, place of death

Impact on ambulance services

- Understanding how HealthCall impacts on ambulance callouts & transfers to hospital
- Led by Newcastle University (Hanratty)
- Collaborating with North East Ambulance Service
- Data will compare HealthCall homes with non-HealthCall homes for 999 & 111 calls, transfers to ED, Non-transports rates

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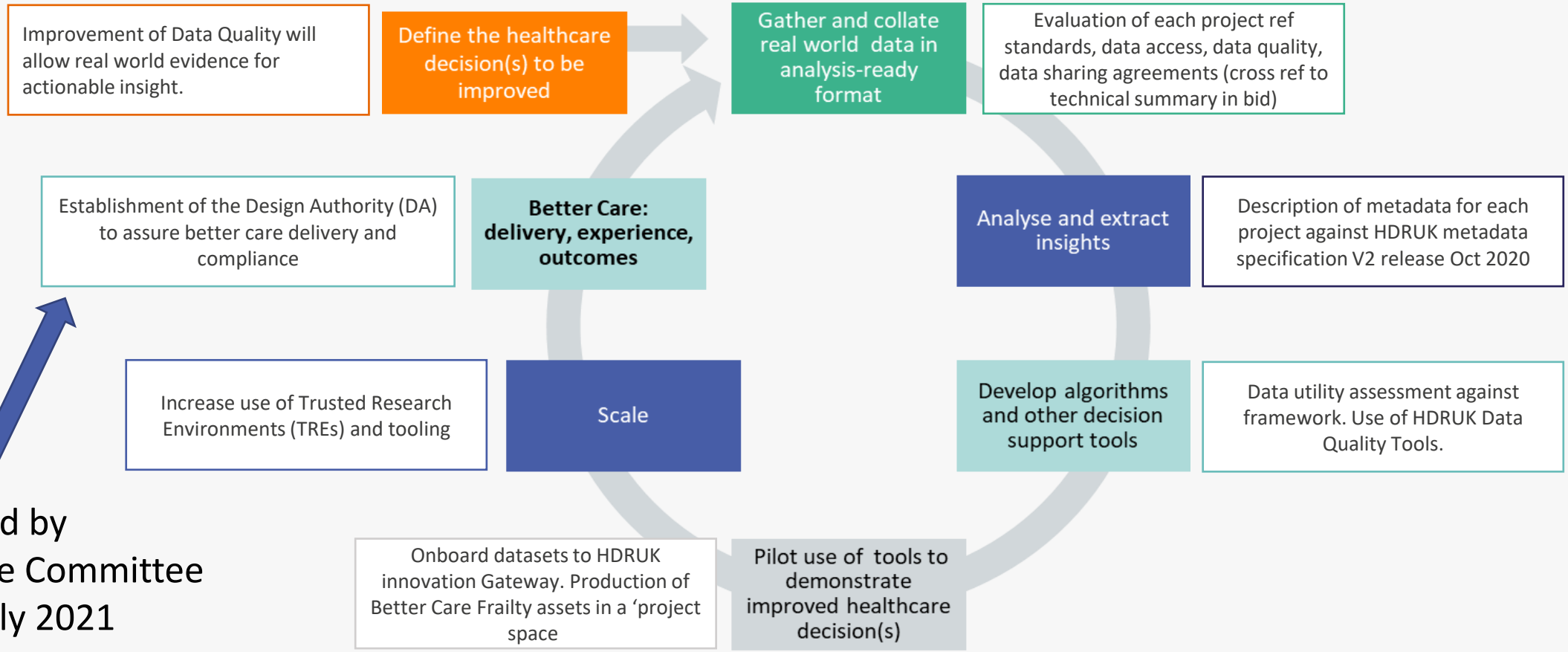
INDUSTRIAL STRATEGY | UK Research and Innovation

Better Care Insight Day 21 Oct 2021

HDRUK North Data Architecture and Governance

Monica Jones
Chief Data Officer – DATA-CAN
Associate Director – HDRUK North

HDRUK North - Data Architecture and Governance

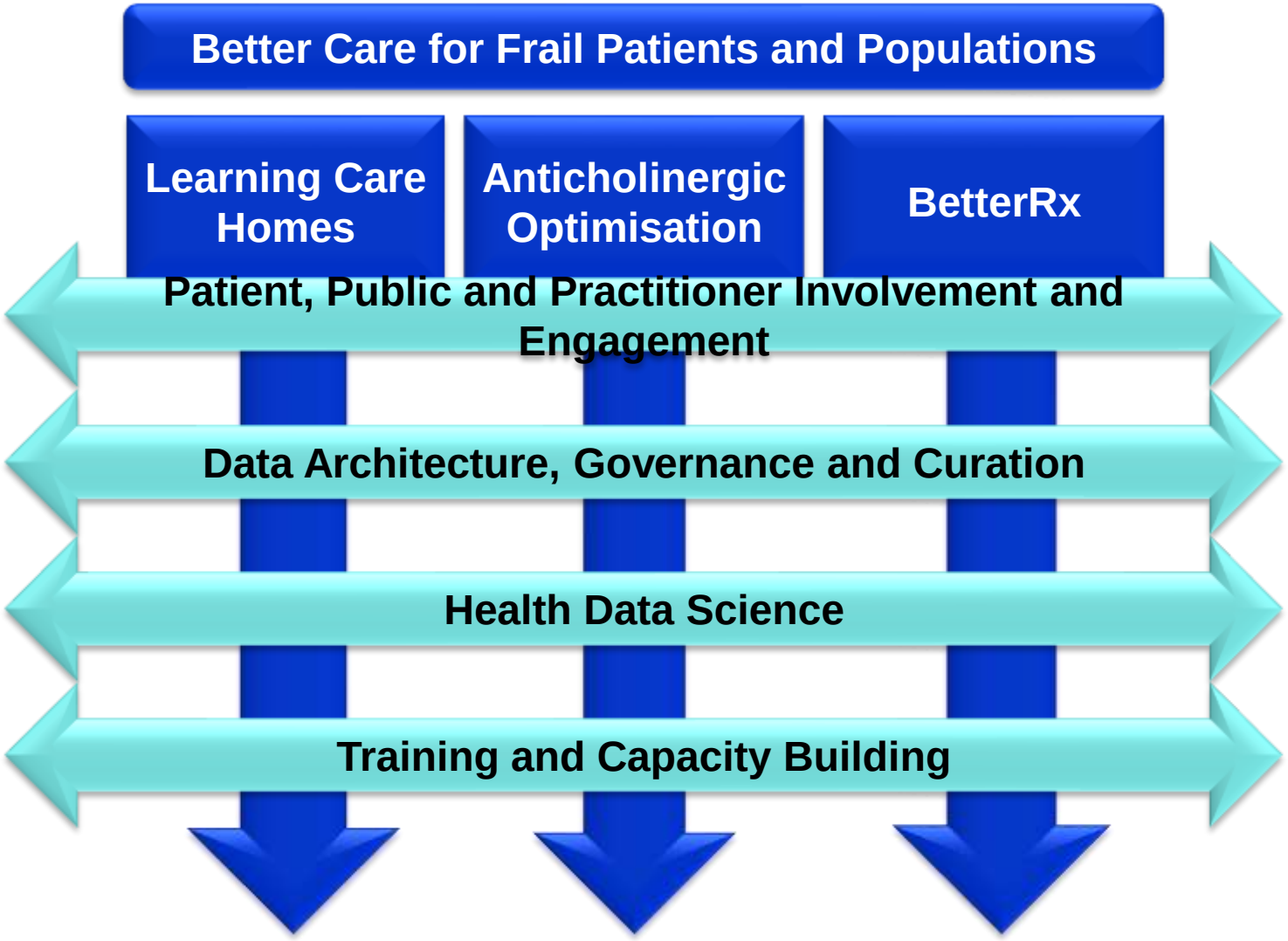


Approved by Executive Committee on 6th July 2021

Scope for the Design Authority will relate to the Cross-cutting themes ensure standardisation of approach

Critical Success Factors:

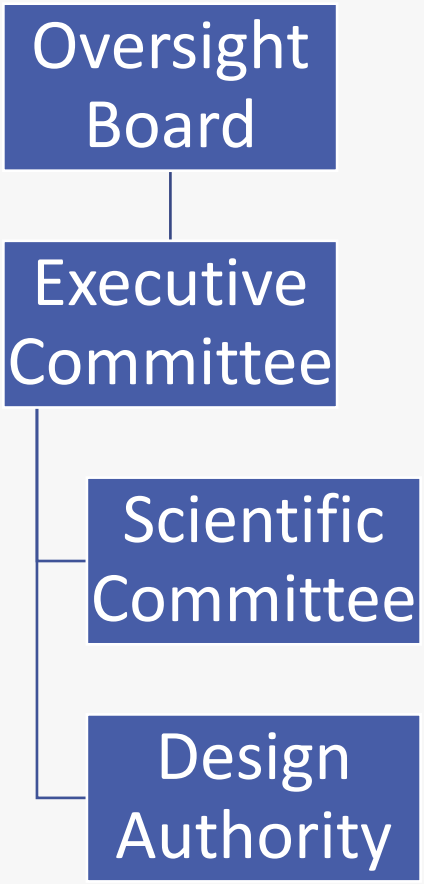
- Improvement of Data Quality
- Increased Membership of HDRUK Alliance
- Increased use of Innovation Gateway and all metadata readily accessible
- Improved access to data for research
- Extended use of Trusted Research Environments (TREs) for scalability and satisfying the 'Five Safes'



HDRUK North Governance Structure

- Design Authority (DA) works alongside the Scientific Committee, both reporting into the Executive Committee

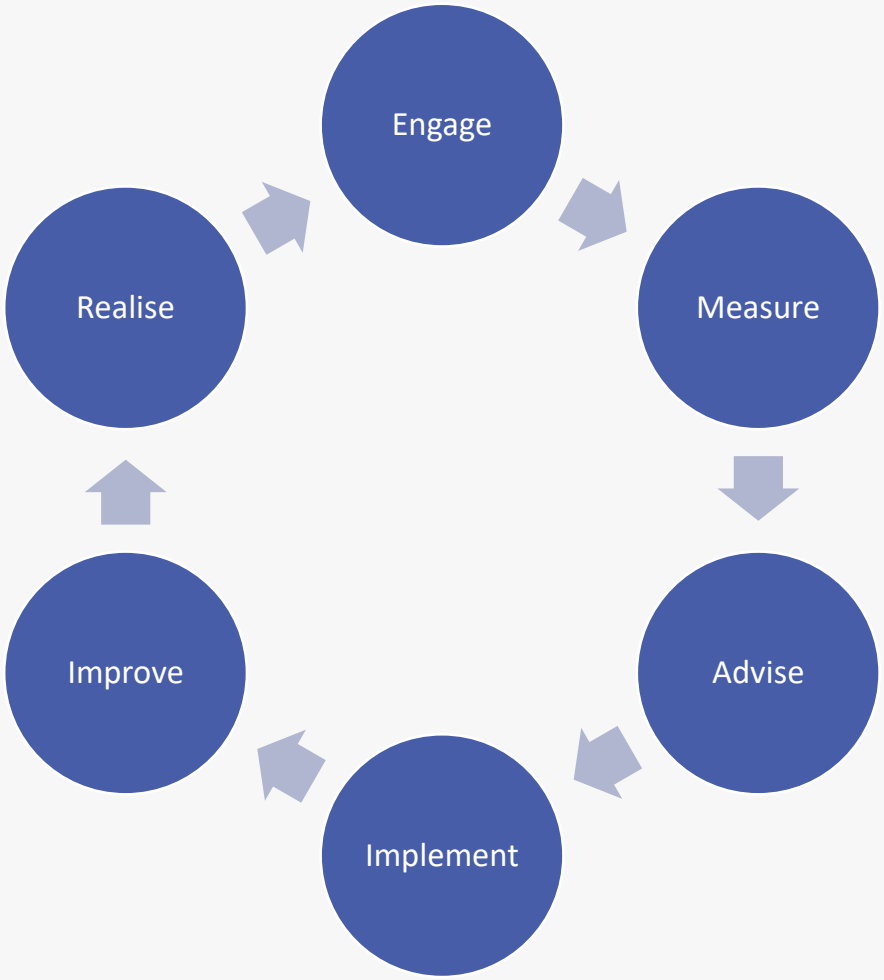
- Purpose of DA – to assure better care delivery and compliance by ensuring technical/data decisions are right, fit for purpose and aligned to the HDRUK North critical success factors



Role of the Design Authority

- Commissioning and approving the development of Architectural Principles, Policies, Strategies and Standards for Data which are clearly aligned to the desired business outcomes of HDRUK North and the Oversight Board;
- Collaborating across the HDRUK North programme of work to ensure a coherent and cohesive Enterprise Architecture, Architectural Principles, Policies, Strategies and Standards are maintained;
- Collaborating with other external Data Strategy and Standards bodies to ensure that system-wide consistency is maintained;
- Establishing a Data Architecture that is appropriate for system-wide adoption;
- Providing strategic oversight for the design and maintenance of a reference data architecture and associated architectural assets;
- Providing leadership for the transformation and standardisation of data architecture;
- Acting as an escalation point for issues of Data and Information policies, strategies and standards.

Design Authority lifecycle

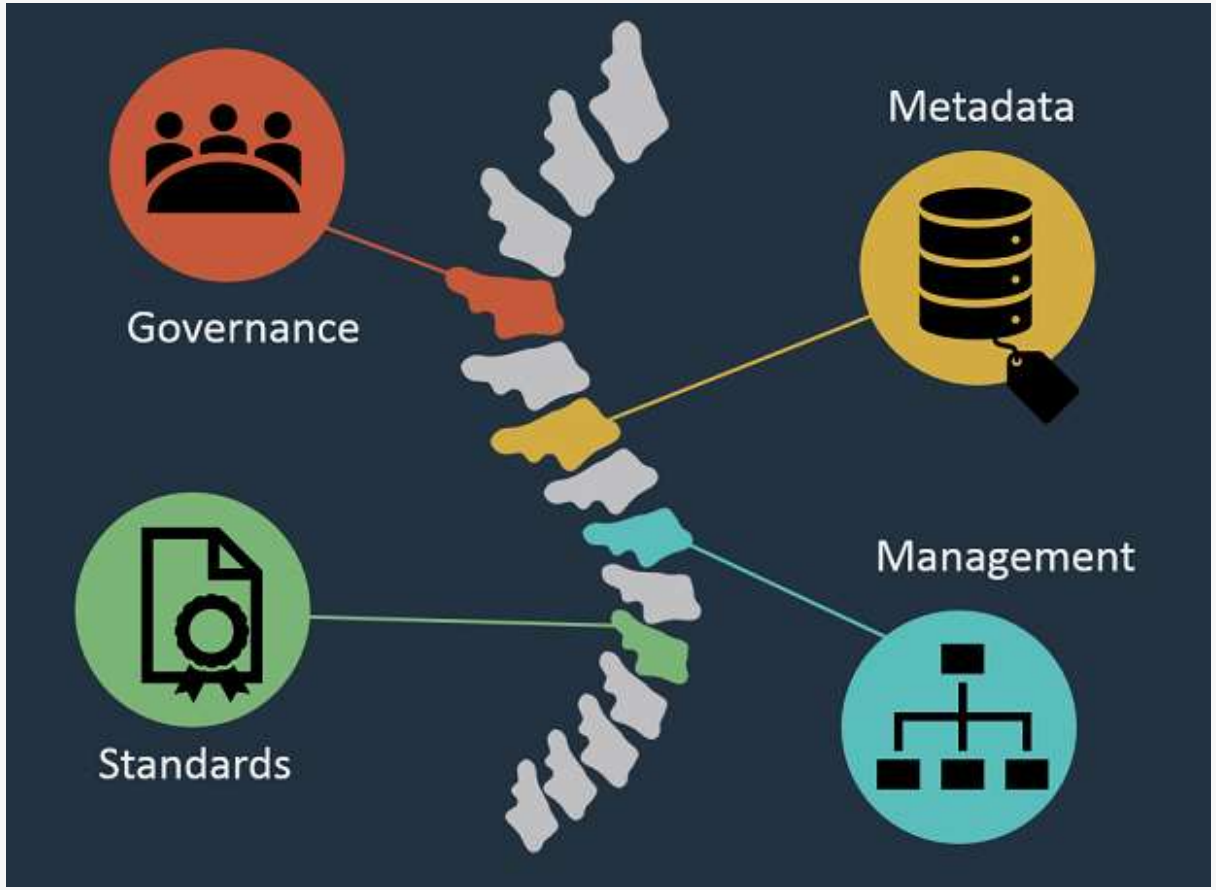


The DA needs to engage with all HDRUK North partners as well as key scientific partners and PPIE community. It can then move through the lifecycle as proposals come forward for datasets and projects

Membership needs to include representatives who have the authority to make decisions on behalf of HDRUK North

Characteristics of good data architecture

- **Collaboration drives the process.** Good data architecture ensures that the benefits being aimed for by a project and the approach to building the TRE are aligned to the shared goals and outcomes. Decision makers define what data will have the highest impact, and data architects build a path to sourcing that data and making it accessible.
- **Make data governance a priority.** Data must be high-quality, of high relevance, and targeted to specific organisational needs. Internal experts will act as data stewards to verify and clean the data. Build a community of stewards who can enhance data quality for all.
- **Adaptability enables agility.** It's best not to be tied to a specific technology or solution. As new technologies come into the market, the architecture should be able to accommodate and adapt to it. Data types can change, and tools and platforms can change. So good data architecture must be adaptable to these inevitable changes.



Data Architecture Principles

- **Data is a shared asset.** A modern data architecture needs to eliminate organisational data silos and give all stakeholders a complete view of the research environment.
- **Users require adequate access to data.** Beyond breaking down silos, modern data architectures need to provide interfaces that make it easy for users to consume data using tools fit for their jobs.
- **Security is essential.** Modern data architectures must be designed for security and they must support data policies and access controls directly on the raw data.
- **Common vocabularies ensure common understanding.** Shared data assets, such as product catalogues, fiscal calendar dimensions, and KPI definitions, require a common vocabulary to help avoid disputes during analysis.
- **Data should be curated.** Invest in core functions that perform data curation (modelling important relationships, cleansing raw data, and curating key dimensions and measures).
- **Data flows should be optimized for agility.** Reduce the number of times data must be moved to reduce cost, increase data freshness, and optimize enterprise agility.

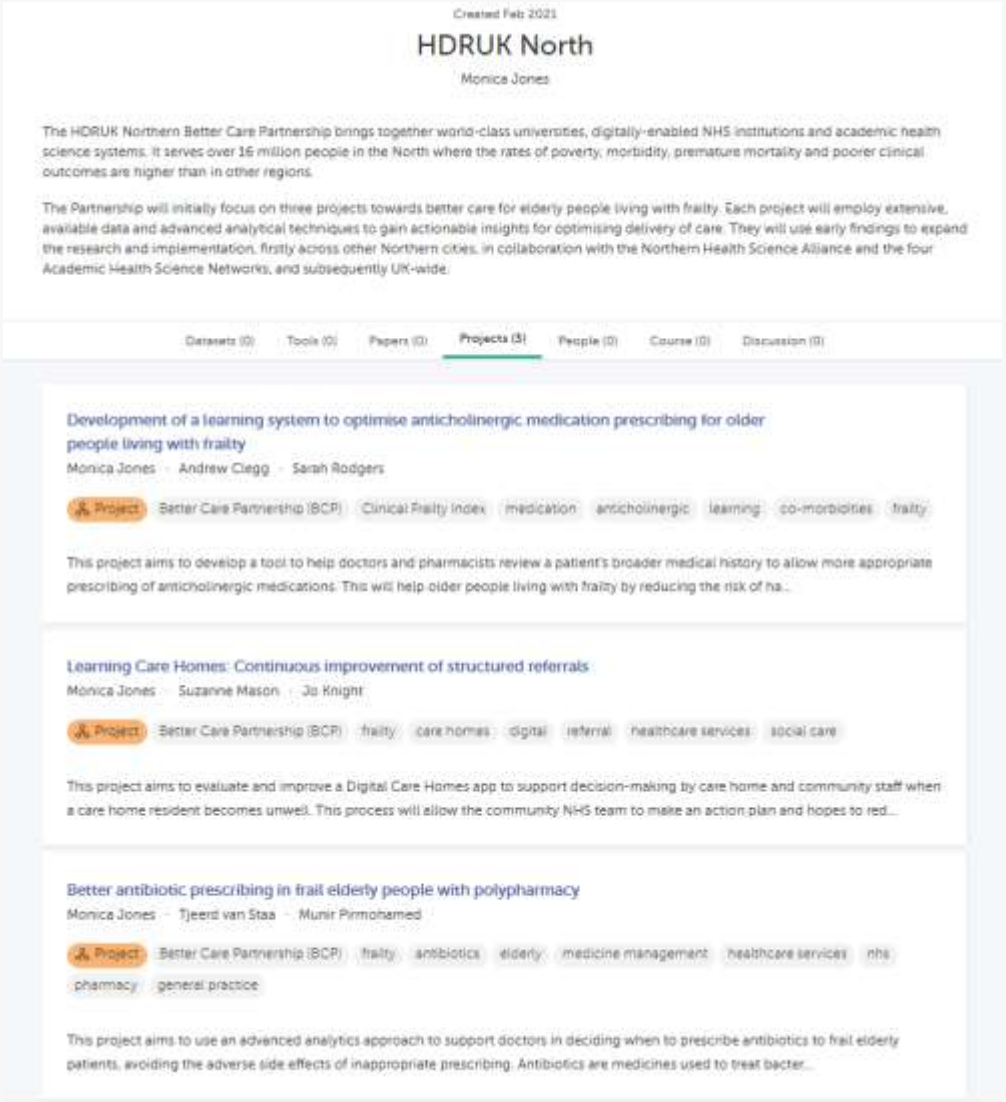
HDRUK North Gateway Collection

Onboard datasets to HDRUK innovation Gateway. Production of Better Care Frailty assets as a Collection

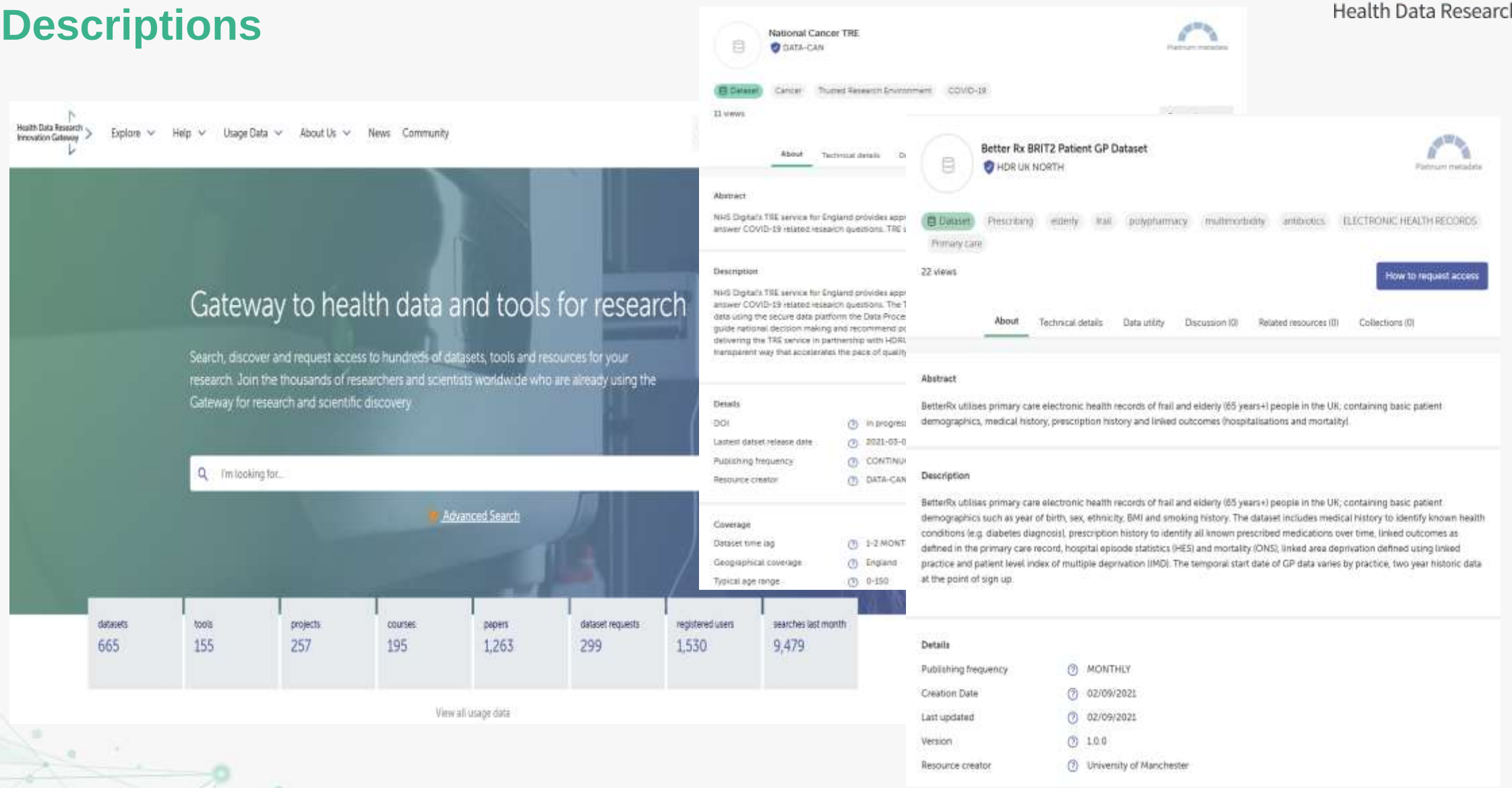
Description of metadata for each project against HDRUK metadata specification V2

- Care Homes
- ACMI
- Better Rx

Data utility assessment against framework. Use of HDRUK Data Quality Tools



Health Data Research Innovation Gateway – Metadata Descriptions



What is a TRE?

A TRE is a **Trusted Research Environment.** Also known as 'Data Safe Havens', TREs are highly secure computing environments that provide remote access to health data for approved researchers to use in research that can save and improve lives.

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Why are they **important?**

TREs make research safer. Making data available through a TRE means that people can be **confident** that their personal health data is accessed **securely** and their **privacy protected.**

TREs help make **research efficient**, **collaborative** and **cost effective**, providing rich data that enables **deep insights** which will go on to improve healthcare and **save lives.**

TREs provide approved researchers with a **single location** to access valuable datasets. The data and analytical tools are all in **one place**, a bit like a **secure reference library.**

Learn more about TREs and discover examples of how TREs are being used to enable life-saving health research.

Learn more about **TREs** →

How is my data **safeguarded?**

Health data should always be kept safe and secure, and used responsibly to ensure privacy. Heath Data Research UK ensures these high standards are met by promoting the use of the 'Five Safes' model across all TREs.

Safe People
Only trained and specifically accredited researchers can access the data

Safe Projects
Data is only used for ethical, approved research with the potential for clear public benefit

Safe Settings
Access to data is only possible using secure technology systems – the data never leaves the TRE

Safe Data
Researchers only use data that have been de-identifed to protect privacy

Safe Outputs
All research outputs are checked to ensure they cannot be used to identify subjects

Open, Federated and Interoperable

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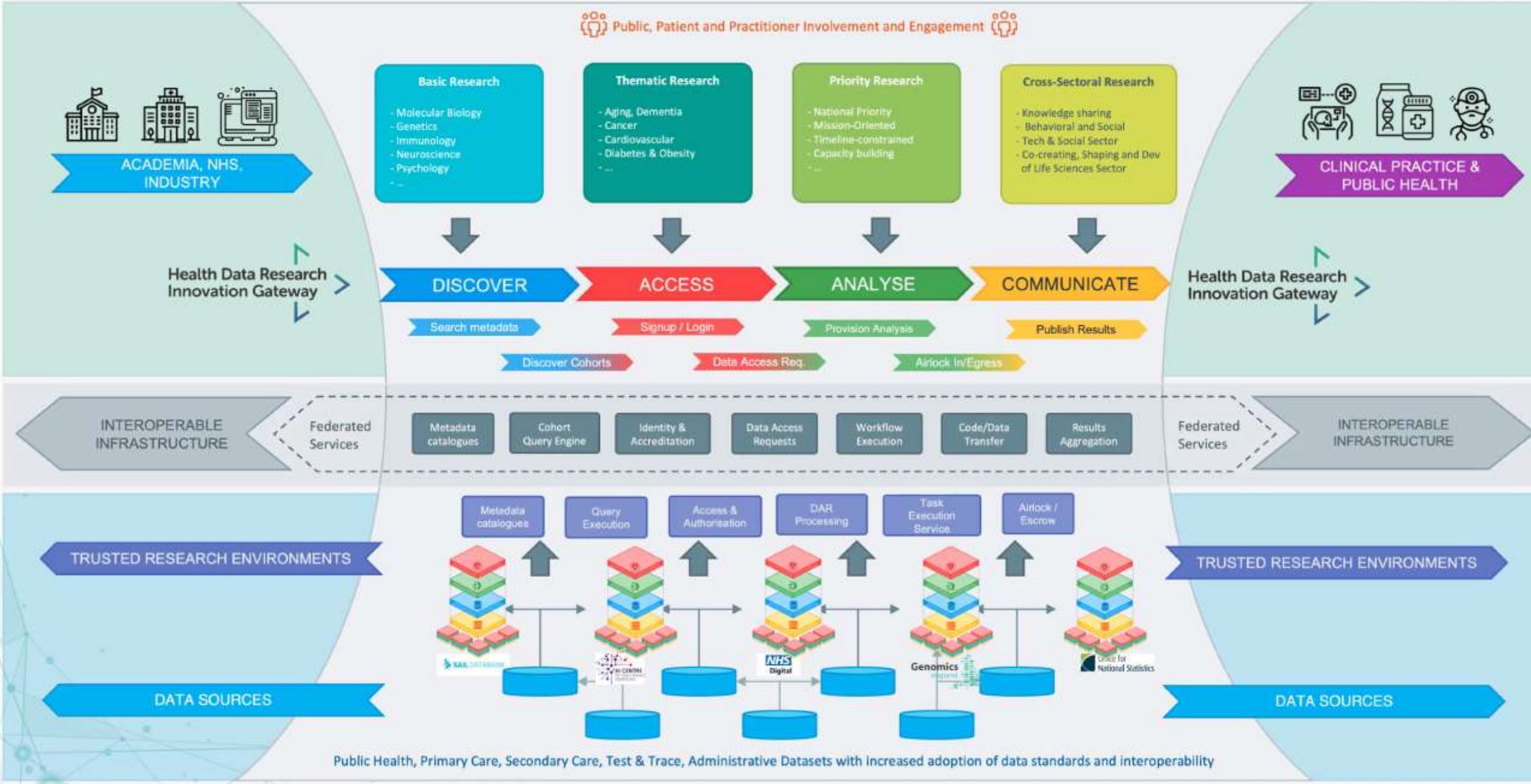

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INDUSTRIAL STRATEGY | UK Research and Innovation

Any Questions ? … now or later

HDRUK North - HDRUKNorth@liv.ac.uk

Cross Cutting Theme: Patient and Public Involvement and Engagement

- Academic leads - Caroline Sanders (Manchester) and Bridget Young (Liverpool)
- Joyce Fox - Chair of Core Patient and Public Advisory Group
- Patient and public involvement on governance committees and key groups
- Each project has tailored PPPIE plans
- Working together to co-develop strategy and planning to co-create outputs: animations, easy to read materials and PPI partners co-presenting at conferences

Underpinned by

1. Continuous evaluation
2. Training and support
3. Capacity building
4. Increasing Digital literacy
5. Good Communication

PPIE Update

Progress

- Ongoing PPI contributions to governance committees and project meetings; PPI meetings for the 3 projects
- PPI in new groups – 1) Implementation 2) Clinical 3) Design Authority groups
- Development of Better Care North PPIE strategy

Challenges

- Achieving ambitious and well supported PPIE work within budget and resource constraints
- Programme integration in addition to tailored work for projects
- Maximising links with wider partnerships across the north for added value

Mitigations and solutions

- Input from project investigators and research staff to supporting PPIE
- PPI Chair for Core Patient and Public Advisory group is highly beneficial
- Work collaboratively with other HDR Programmes and ARCs/AHSNs on overarching themes and activities

PPIE Strategy

Structure

1. Background to programme
2. The North - regional difficulties and where improvement is needed
3. Focus on frailty – can be a result of health and other inequalities
4. Recognise rich cultural diversity and resilience of northern communities
5. The research and PPIE
6. Values and vision
7. What we want to achieve and how we'll do it
8. Governance

Involvement

Engagement

PPIE Strategy

Structure

Involvement

- Diversity and inclusion
- Working collaboratively – “public contributors are critical friends”
- Supporting best practice
- Training and capacity building
  - Researchers – show what good PPI can do. Sharing personal experiences of healthcare system to connect researchers with patients as people not just ‘data’
  - MSc project
  - Buddy-system

Engagement

PPIE Strategy

Structure

Involvement

Engagement

- Engage with residents in care homes/supported housing to let their voices be heard?
- Gateway for reaching communities outside the current PPI partners – those not being heard?
- Create resources to show daily experiences of the public and patients – remind healthcare researchers/leaders of day-to-day problems with healthcare and the impacts on the care people receive

- How to future-proof?

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COFFEE BREAK

The next session will start at 11:45am

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Supporting the renewal of Discharge-to-Assess services in Bristol through patient flow modelling

(the IPACS project)

IPACS project team

NHS Bristol, North Somerset and South Gloucestershire CCG

Dr Richard Wood

Dr Paul Forte

University of Bath

Dr Zehra Onen Dumlu

Prof Christos Vasilakis

University of Exeter

Dr Alison Harper

Prof Martin Pitt

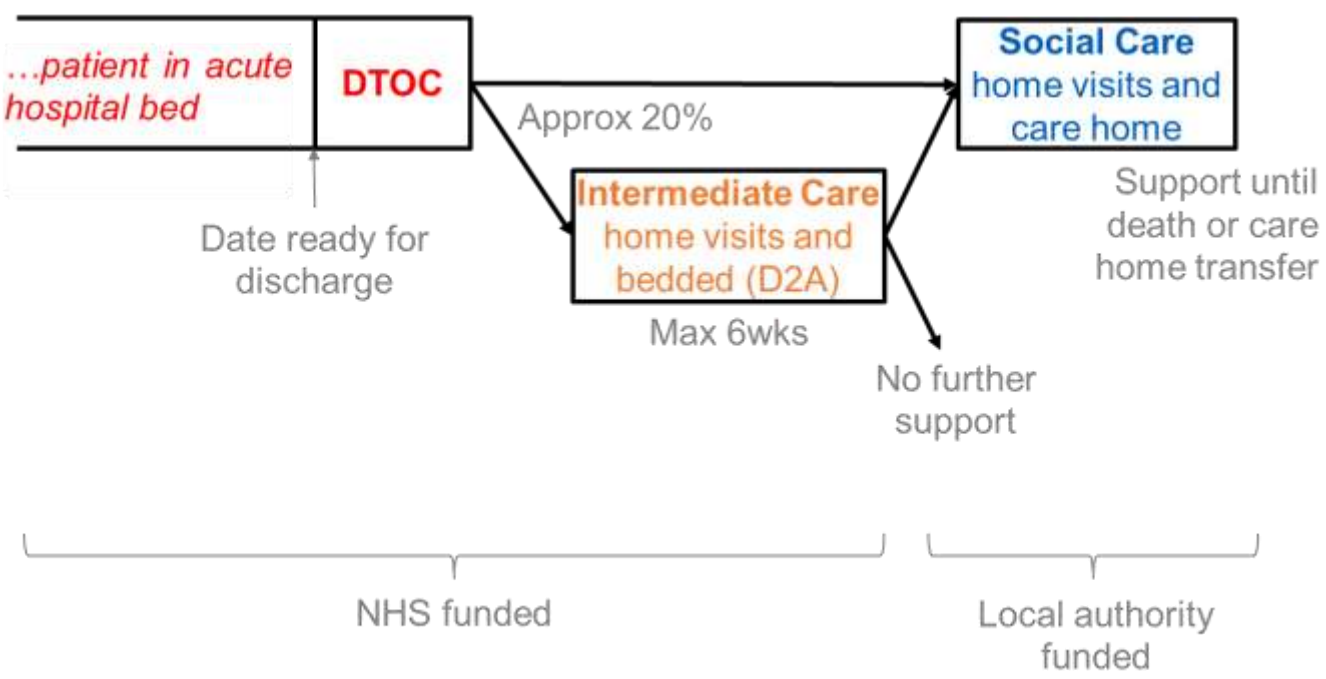
IPACS

Improving **P**atient flow between **A**cute, **C**ommunity and **S**ocial care

- Started June 2021 (currently about halfway through).
- **Background**: very little evidence to support managers on the optimal capacity allocation for the complex discharge pathway.
- **Aim**: to develop a reusable computer simulation model for calculating the optimal capacity requirements for the pathway.

Healthier Together
Improving health and care in Bristol, North Somerset and South Gloucestershire
NHS Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group
NHS North Bristol NHS Trust
NHS University Hospitals Bristol NHS Foundation Trust
NHS South, Central and West Commissioning Support Unit
West of England Academic Health Science Network
Bristol City Council
University of Bristol
University of Exeter
University of Bath
NIHR | Bristol Biomedical Research Centre
Applied Research Collaboration West
Applied Research Collaboration South West Peninsula
PenCHORD

Complex discharge pathway



There are often blockages on the pathway.

500,000 days lost per year.

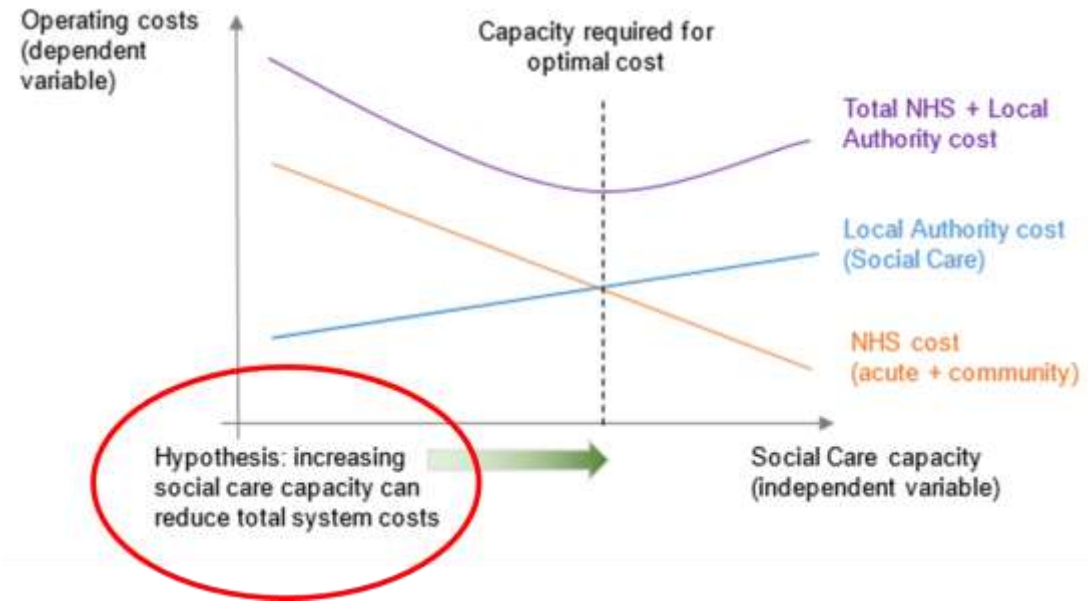
Costing almost £1b (England).

IPACS approach

- Model patient flow along the pathway.
- Investigate ‘what if’ scenarios to best reallocate available resources (beds, home visits).
- Reduce blockages: improve patient outcomes and experience.
- Reduce blockages: reduce costs of keeping patients in hospital.

Not a zero-sum game

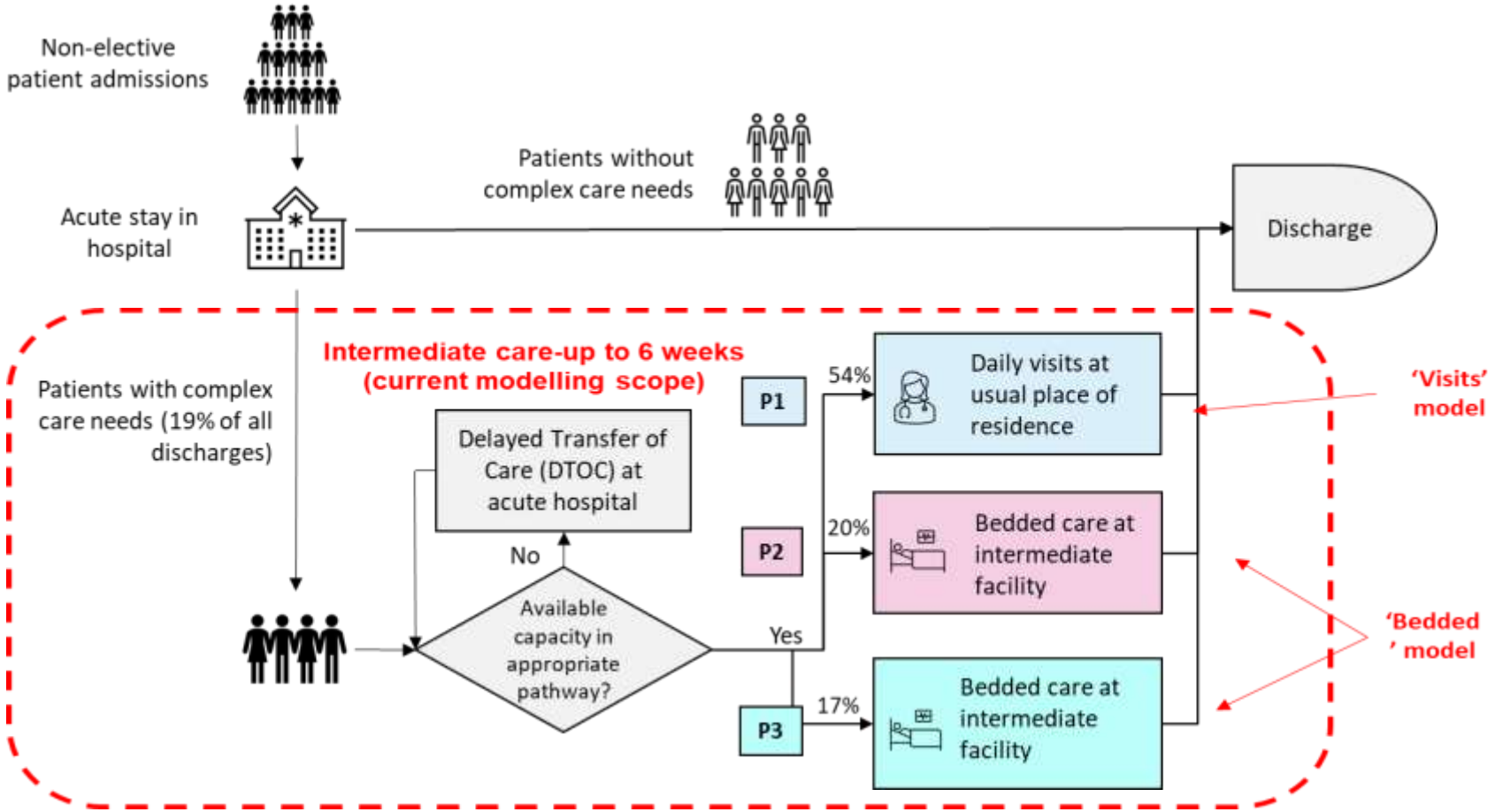
- Additional downstream costs can be more than offset by reductions in costly acute discharge delays.



BNSSG D2A Business Case

- **B**ristol, **N**orth **S**omerset, **S**outh **G**loucs (1 million popn).
- Business Case: renew D2A services for next 18 months.
- Question for IPACS: how much capacity is required?

BNSSG D2A patient pathway



Stochastic simulation

- For patient pathway modelling, health services (*still*) typically rely on simple spreadsheet approaches using average arrival rates and length of stay (LOS).
- Planning by averages can lead to substantial under-estimation of capacity.
- Stochastic models provide reliable results by capturing realistic variability.
- We are developing a purpose-built, easy-to-use and open-source simulation tool coded in R.

IPACS models

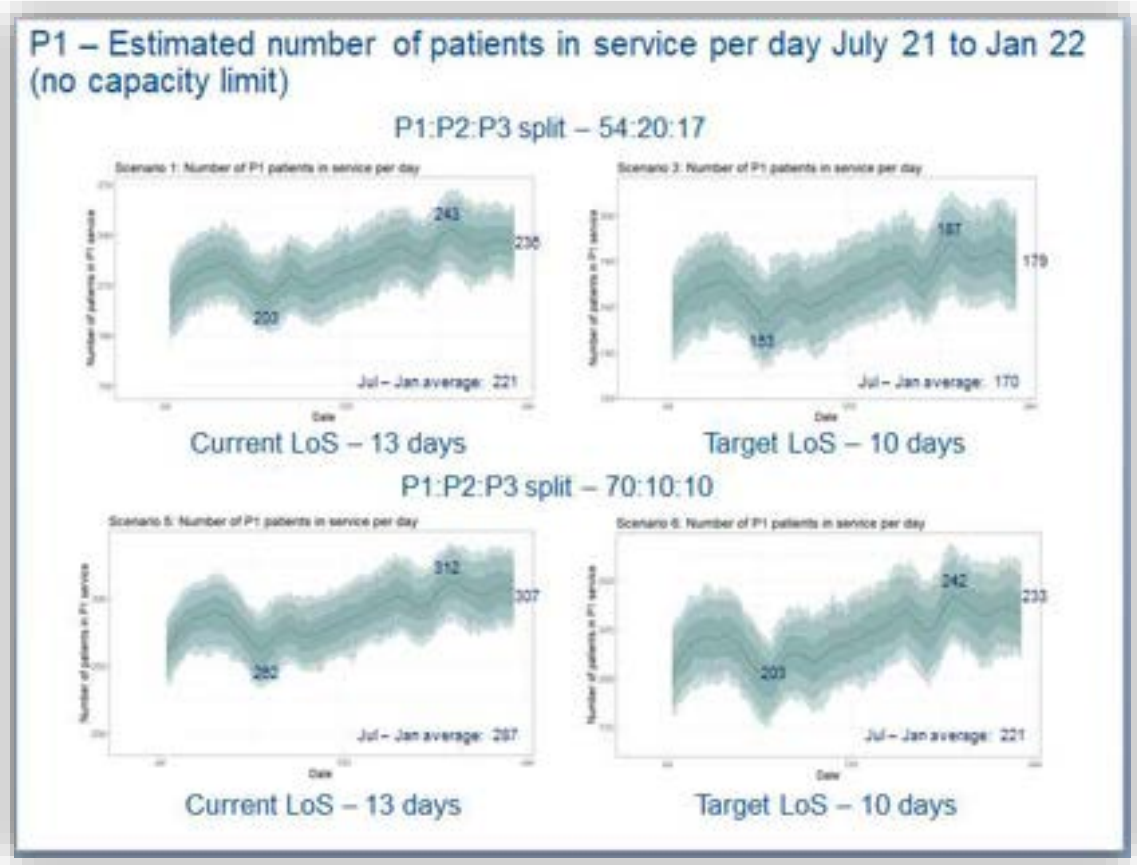
Bedded care model

- Care is provided in community or care home beds.
- LOS is variable and approximated by a parametric distribution.
- Each admitted patient consumes one service channel (bed) from admission to discharge.
- There are a fixed number of service channels (beds).

Visits-based care model

- Care is provided at the patient's own home through daily visits.
- LOS is variable and approximated by a parametric distribution.
- Each patient consumes a different (reducing) number of daily home visits over their LOS.
- Capacity (max daily home visits) cannot be exceeded by demanded home visits for patients in the service.

Business Case results (example: D2A P1)



The modelling has been used to understand the effect of different LOS and discharge rates.

Uncertainty has also been captured through confidence bands.

Next step: deciding cost-optimal capacity (over acute discharge delay cost and D2A service provision cost).

Outcomes

Impacts

- IPACS model outputs form a central part of the Business Case.
- Business Case almost finalised, prior to submission to exec board.
- First time stochastic modelling outputs have been used in a Business Case of this type in our system.
- Good foundation for the project to build on.

Challenges

- Managers are not familiar with:
  - "Stochastic"
  - "Dynamical models"
  - "Computer simulation"
- Used to Excel / spreadsheet based approaches, using averages (thus prone to substantial inaccuracy).
- More work required to get managers, clinicians, and analysts more familiar with stochastic models and outputs.

Next steps

- Extend coverage to social care
- Use feedback to further refine the model, including PPIE
- Work with neighbouring systems to trial/use the model
- Configure user interface through R Shiny
- Scale to other systems nationally

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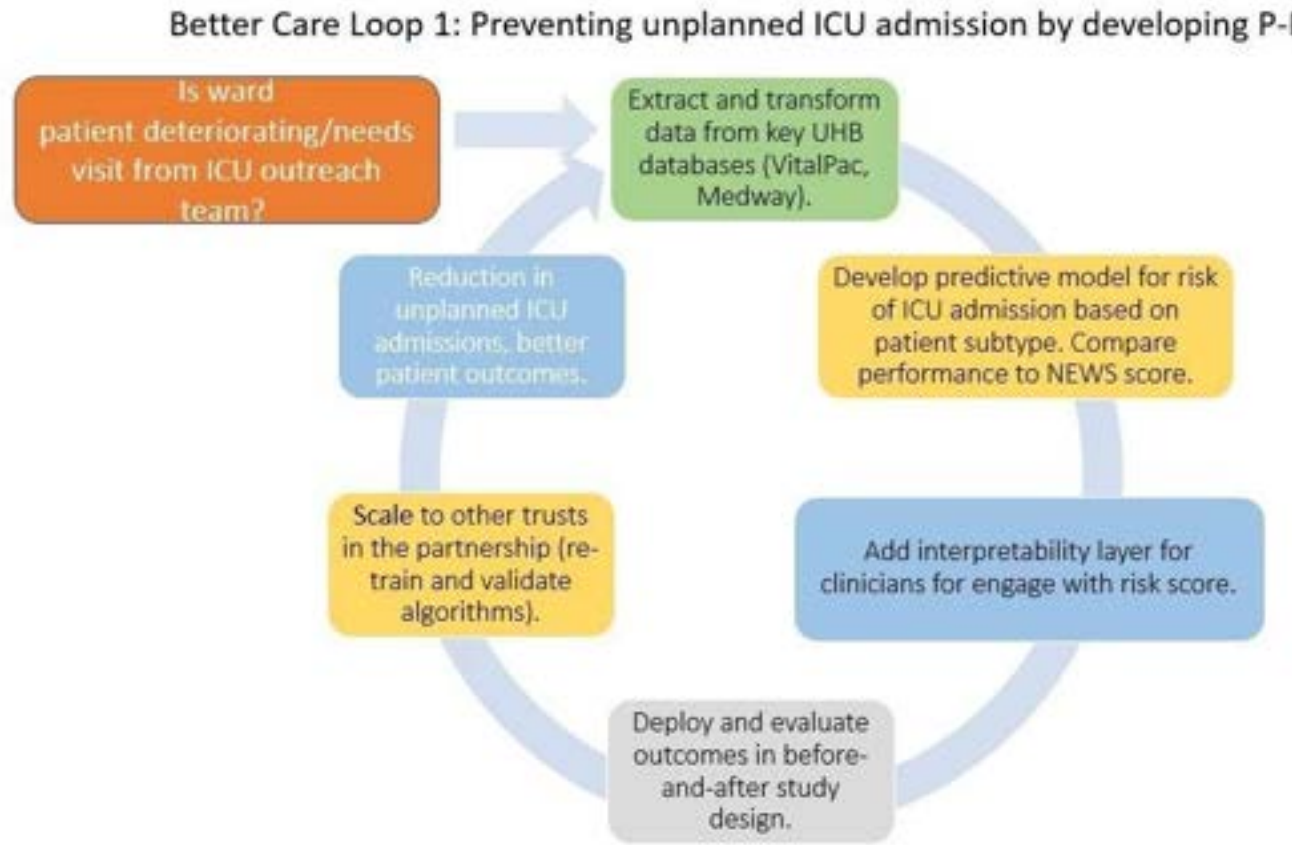
ICU – Personalised National Early Warning Score (PNEWS)

Better Care Loop



NEWS Scoring System

NEWS based on a aggregate scoring system.
Six physiological measurements.

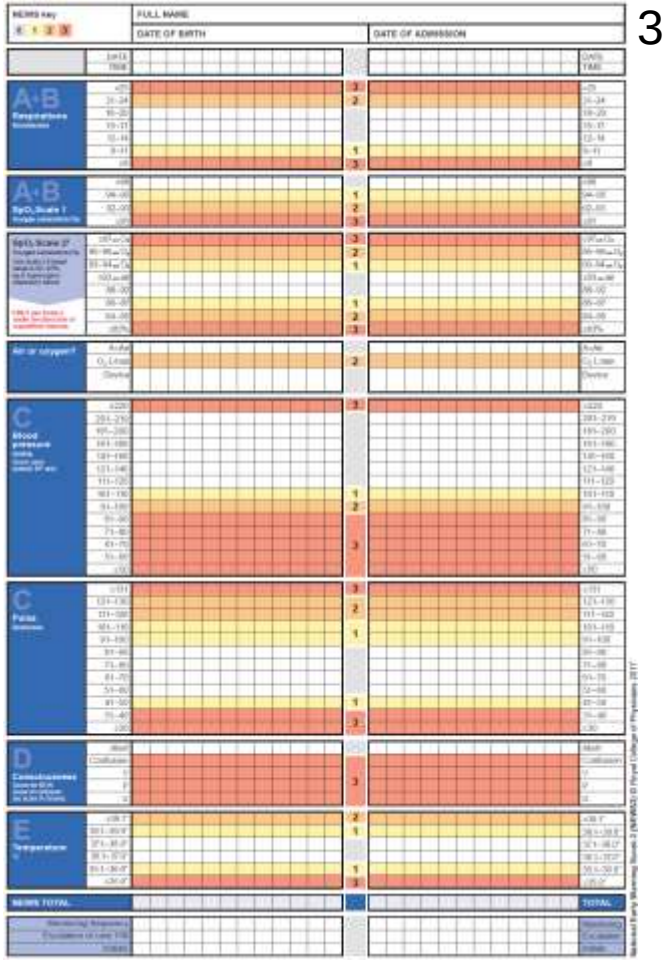
- Respiration Rate.
- Oxygen Saturation – SATS.
- Systolic Blood Pressure.
- Pulse Rate.
- Level of Consciousness[1], new Confusion[2] score.
- Temperature.

NEWS Scoring – Paper/chart based

1

Physiological parameter	Score 3	2	1	0	1	2	3
Respiration rate (per minute)	≤8		9–11	12–20		21–24	≥25
SpO_2 Scale 1 (%)	≤91	92–93	94–95	≥96			
SpO_2 Scale 2 (%)	≤83	84–85	86–87	88–92 ≥93 on air	93–94 on oxygen	95–96 on oxygen	≥97 on oxygen
Air or oxygen?		Oxygen		Air			
Systolic blood pressure (mmHg)	≤90	91–100	101–110	111–219			≥220
Pulse (per minute)	≤40		41–50	51–90	91–110	111–130	≥131
Consciousness				Alert			CVPU
Temperature (°C)	≤35.0		35.1–36.0	36.1–38.0	38.1–39.0	≥39.1	

2



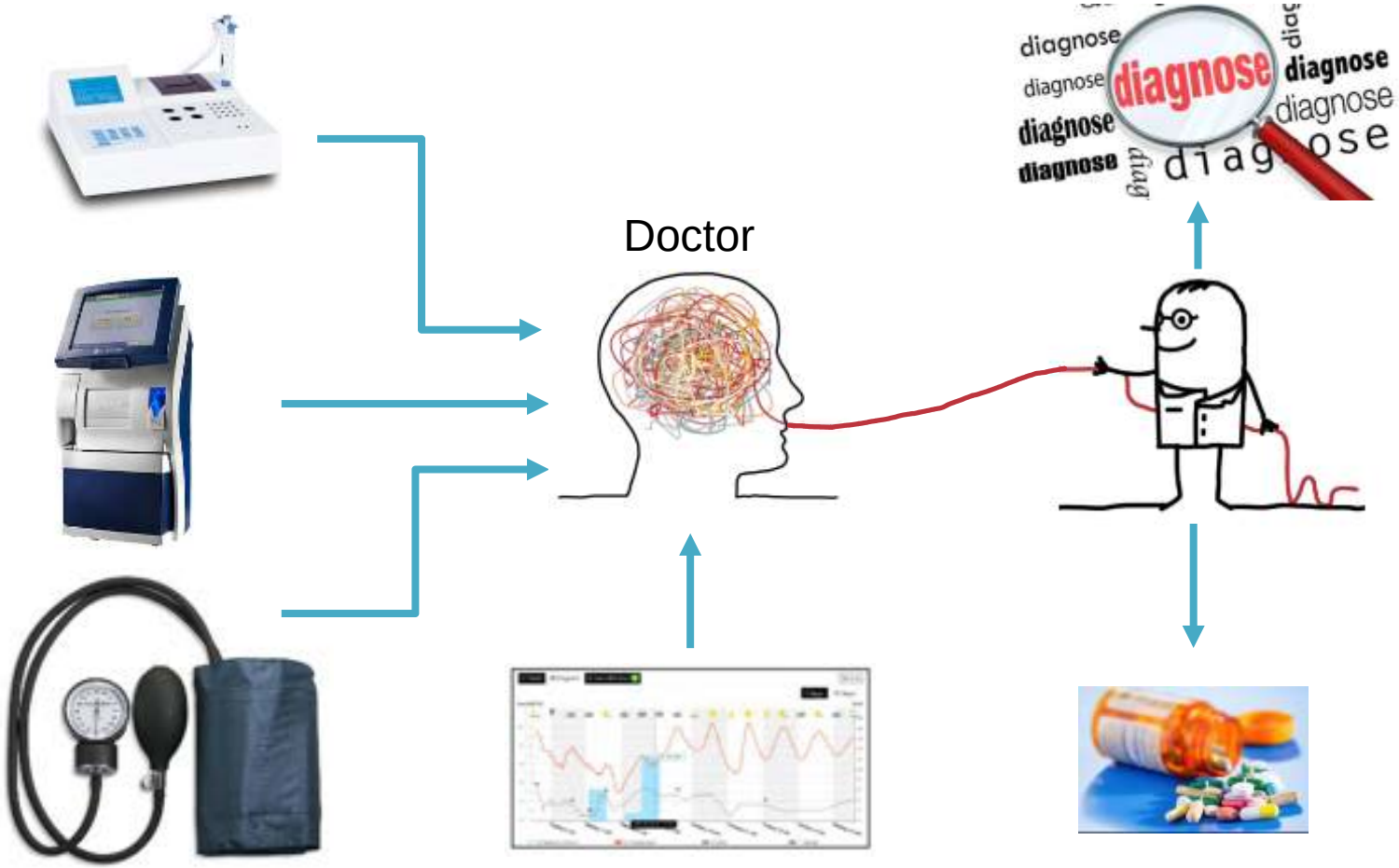
3

NEW score	Frequency of monitoring	Clinical response
0	Minimum 12 hourly	• Continue routine NEWS monitoring
Total 1–4	Minimum 4–6 hourly	• Inform registered nurse, who must assess the patient • Registered nurse decides whether increased frequency of monitoring and/or escalation of care is required
3 in single parameter	Minimum 1 hourly	• Registered nurse to inform medical team caring for the patient, who will review and decide whether escalation of care is necessary
Total 5 or more Urgent response threshold	Minimum 1 hourly	• Registered nurse to immediately inform the medical team caring for the patient • Registered nurse to request urgent assessment by a clinician or team with core competencies in the care of acutely ill patients • Provide clinical care in an environment with monitoring facilities
Total 7 or more Emergency response threshold	Continuous monitoring of vital signs	• Registered nurse to immediately inform the medical team caring for the patient – this should be at least at specialist registrar level • Emergency assessment by a team with critical care competencies, including practitioner(s) with advanced airway management skills • Consider transfer of care to a level 2 or 3 clinical care facility, ie higher-dependency unit or ICU • Clinical care in an environment with monitoring facilities

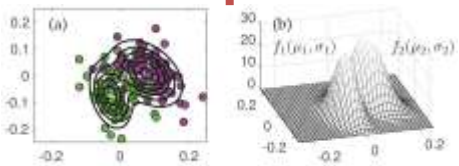
Paper based recording.

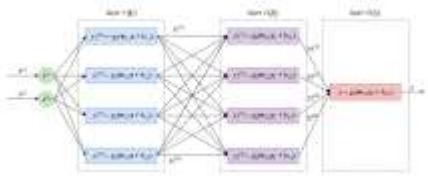
1. Each physiological measurement is given a score.
2. All measurements are recorded and totalled.
3. Based on the final Score for that time point a Clinical response is then taken.

Classical Medicine



Future of Medicine

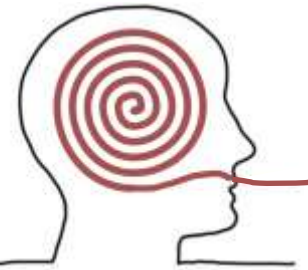


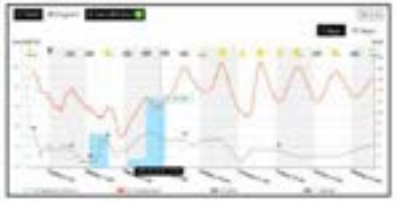


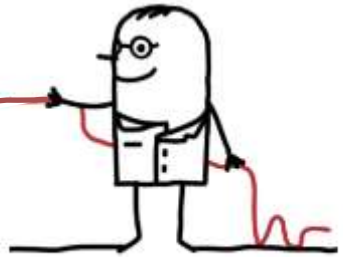
Database

Supercomputer

Doctor







Vitals Data

- Database with electronically recorded physiological measurements.
- Measurements are taken periodically from the start of admission of a patient.
- More than 180 different physiological measurements can be recorded for a patient in the Vitals Database.
- Only a few measurements are taken at a high temporal density.
- Rich set of hospital data
  - Level of care on wards
  - Diagnosis codes
  - Investigation results
  - Outcome information
- This data set is mainly from data outside of the ICU.
- Aim: Use machine learning with this rich dataset and develop a new Personalised NEWS scoring system.

Data Overview

- Currently using only a subset of the data.
- 70,452 Patients
- 34,126,407 records.
- Data from 2017 to 2020
- NEWS analysis:
  - 44,657 Patients
  - 1,211,747 records (NEWS variables)
- New Systemwide Data:
  - 300,000+ patients
  - Patients and data across multiple domains:
    - NHS trusts.
    - ICU within the NHS.
    - GP surgeries.
    - Social care.
    - Patient outcome information.

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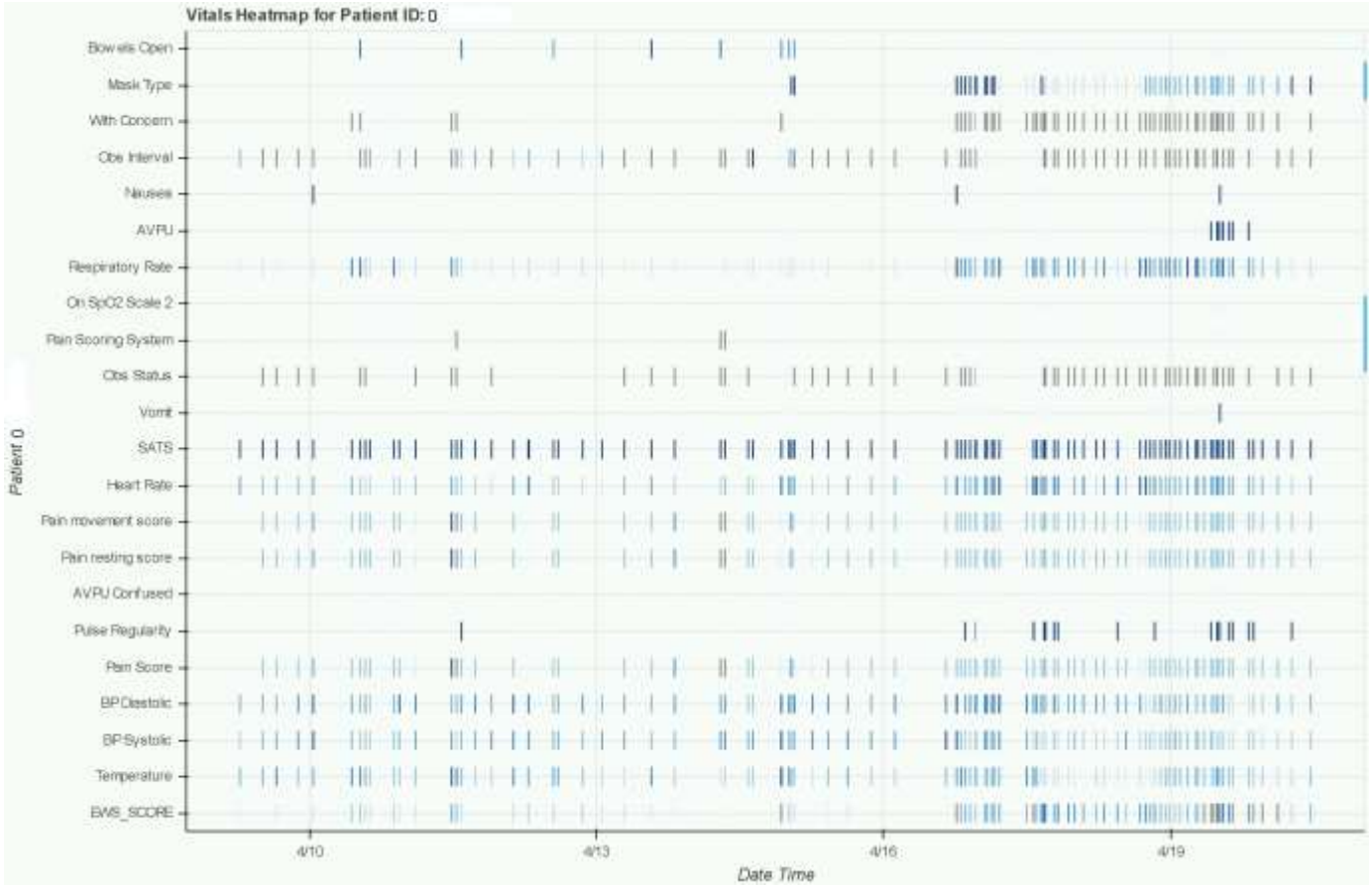
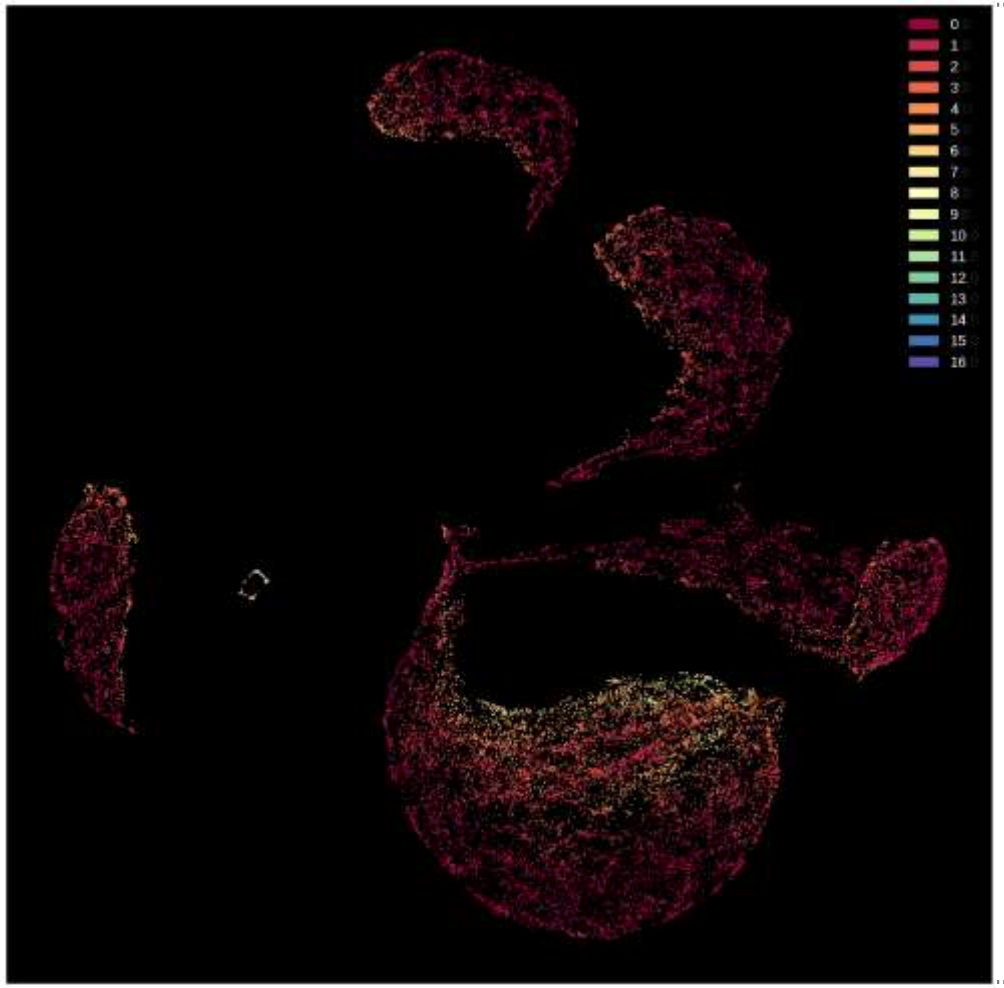


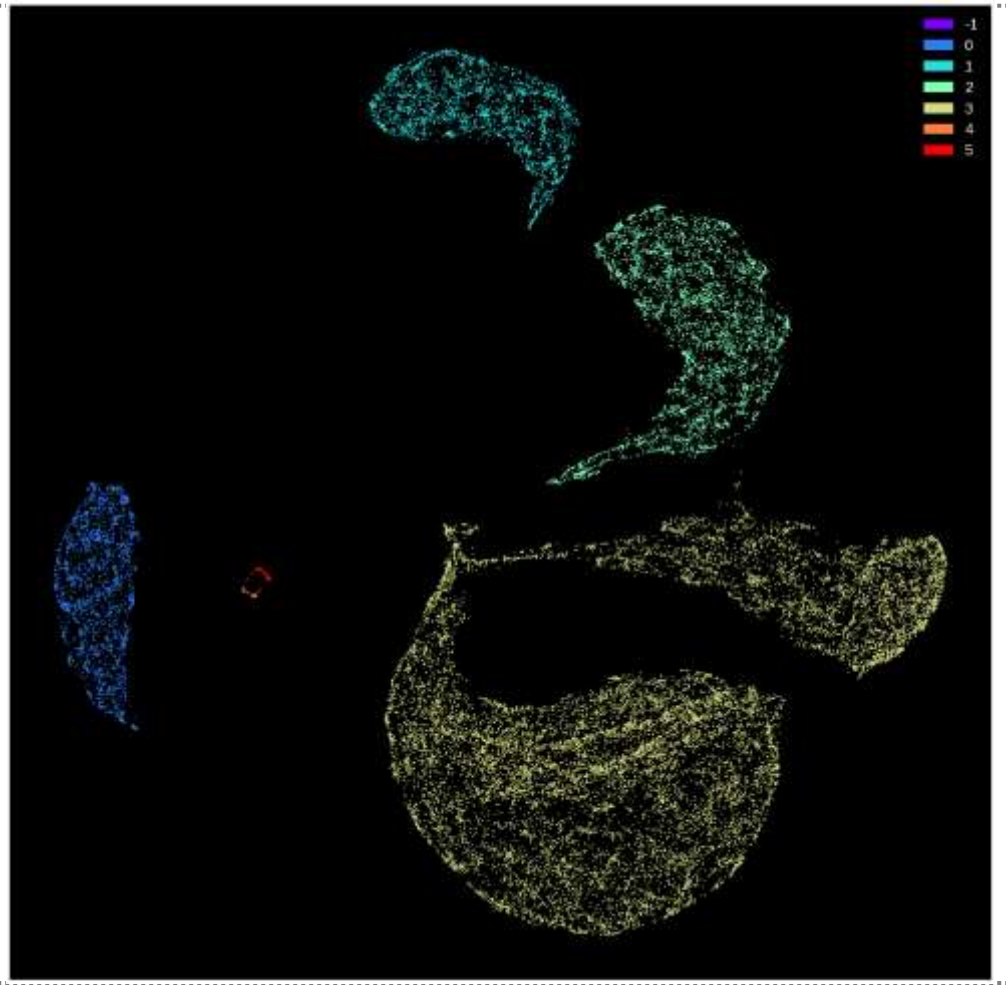
Unsupervised Clustering - UMAP of NEWS Data

- Project high dimensionally (6D in case of NEWS) data into a 2D embedding space.
- Clustering of patients data.
- Idea to separated data into different regions where data are explained with commonalities.

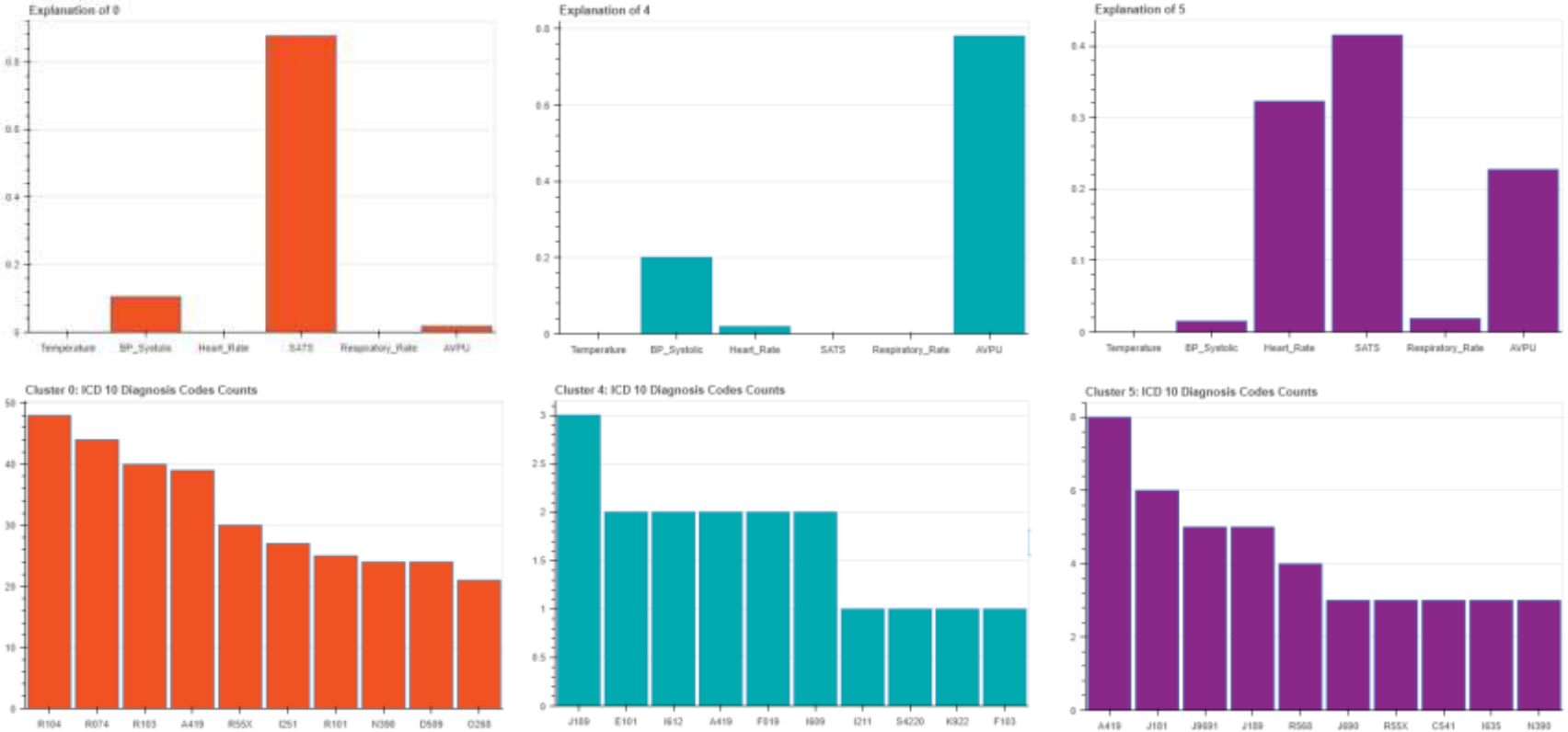


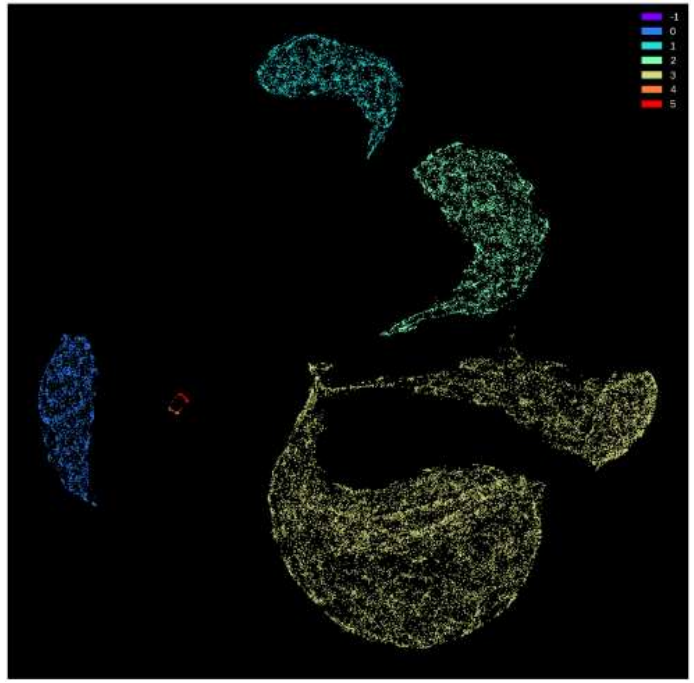
Clustering of Patients

- Hierarchical density-based clustering algorithm.
  - HDBSCAN
  - DBSCAN
- Find regions of similar structure.



Cluster Explanations





- Clustering regions explanations
  - Data is clustered into different regions Impacted by the different variables influence.
  - Which set of variables are dominating the clustering of the data in that region.
- Diagnosis Codes – Histogram of most dominate diagnosis of each cluster region.

Cluster Data Characteristics

Cluster ID	0	1	2	3	4	5
NEWS Score	1.07 (1.42)	0.91 (1.26)	0.84 (1.21)	1.67 (1.94)	**6.81 (3.06)**	5.23 (2.55)
Temperature	36.82 (0.58)	36.81 (0.56)	36.80 (0.54)	**36.87 (0.58)**	36.74 (0.97)	36.75 (0.89)
BP_Systolic	125.42 (21.35)	126.68 (21.39)	127.88 (20.20)	128.80 (22.61)	106.44 (18.79)	**146.00 (11.93)**
Heart_Rate	78.23 (17.00)	77.78 (16.37)	78.19 (16.08)	80.45 (16.77)	**83.23 (18.93)**	77.38 (20.45)
SATS	**100.00 (0.02)**	99.00 (0.00)	98.00 (0.04)	95.40 (2.03)	95.01 (3.86)	99.77 (0.44)
Respiratory_Rate	16.69 (2.47)	16.54 (2.20)	16.67 (2.26)	17.26 (2.89)	17.98 (5.16)	**18.69 (5.38)**
AVPU	0.00 (0.04)	0.00 (0.02)	0.00 (0.04)	0.00 (0.02)	**1.00 (0.00)**	**1.00 (0.00)**
Count	2152	2536	4019	15324	100	13
Mortality	0.0213755	0.0185331	0.0141826	0.0341295	0.32	0.230769
ICD10 (most frequent)	R104	I251	I251	I251	J189	A419

Conclusions - Next stage

- Link outcome data to patients within the clustering model.
- Explore the inclusion of more features into the model beyond the current six (NEWS).
- Be able associate clinical features to each cluster.
- Characterise each cluster based on patient information.
- Build a prediction model based on clustering information:
  1. Whole dataset.
  2. Clustering level.
  3. Individual patient level.
- Create a better predictive score identify patients at risk of deterioration.
- Systemwide Dataset.

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Hospital efficiency and throughput at North Bristol NHS Trust. The impact of the winter flu seasons and COVID-19 on planned elective hip and knee replacement surgery – (Hospital Efficiency)

Andy Judge

Bristol Community Health
Avon and Wiltshire Mental Health Partnership NHS Trust
Weston Area Health NHS Trust
Sirona care & health
UWE Bristol
North Somerset Council
South Gloucestershire Council
NSCP
Bristol Health Partners
Healthier Together
Improving health and care in Bristol, North Somerset and South Gloucestershire
Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group
North Bristol NHS Trust
University Hospitals Bristol NHS Foundation Trust
South, Central and West Commissioning Support Unit
West of England Academic Health Science Network
Bristol City Council
University of Bristol
University of Exeter
University of Bath
NIHR | Bristol Biomedical Research Centre
Applied Research Collaboration West
Applied Research Collaboration South West Peninsula
PenCHORD

Improving hospital efficiency by forecasting demand for hospital beds

- **University of Bristol**: Ashley Blom, Andy Judge, Theresa Redaniel, Emily Eyles, Tim Jones, Marion Prat, Chris Penfold, Rebecca Wilson, Ruta Margelyte, Mike Bell
- **PenCHORD University of Exeter**: Martin Pitt, Alison Harper
- **North Bristol NHS Trust**: Tim Keen, Andrew Elliot
- **Partnership** with **North Bristol NHS Trust** Directors and Chief Executives; **University of Bristol** and **NIHR ARC West** clinicians, academics and data scientists; and **PenCHORD University of Exeter** expertise in operational research and patient pathway modelling

Problem and Opportunity

- NHS acute hospital trusts face challenges in planning hospital bed capacity
- Increasing demand from emergency admissions has placed unprecedented pressure on acute hospitals, limiting their capacity to undertake routine elective procedures
- Care computer systems contain live information relating to patients, staffing, theatres and beds
- These data can be used for:
  - forecasting emergency admissions;
  - forecasting demand for beds and theatres;
  - efficient scheduling of elective surgery.

Cancellation of elective surgery…winter 2017…then in 2020

NEWS

Home | UK | World | Business | Politics | Tech | Science | Health | Family

Health

Hospitals to cancel ops to cope with winter surge

By Nick Triggle
Health correspondent

21 December 2017 Share

Hospitals across England have been told to cancel non-emergency operations in the new year to prepare for a post-Christmas surge in patients.

Guardian — Search jobs Dating Sign in Search UK edition

The Guardian

ion Sport Culture Lifestyle More

'Unlike anything seen in peacetime': NHS prepares for surge in Covid-19 cases

Hospitals cancel non-urgent operations in unprecedented shutdown of normal activity

Coronavirus - latest updates
See all our coronavirus coverage

▲ There are growing fears that doctors and nurses who treat Covid-19 patients will be putting themselves at risk. Photograph: Neil Hall/EPA

Hospitals are trebling the size of their intensive care units and preparing to replace A&E doctors with other specialists as the NHS braces itself for a surge in patients whose life is at risk from the coronavirus.

Millions of patients will have their care delayed as hospitals cancel non-urgent operations, including some surgery for people with heart and lung conditions.

Hernia repairs, cataract removals and hip and knee replacements will be among the many procedures affected. Around 700,000 people a month in England have a planned procedure. Single rooms freed up will be used as isolation facilities for Covid-19 cases.

Approach

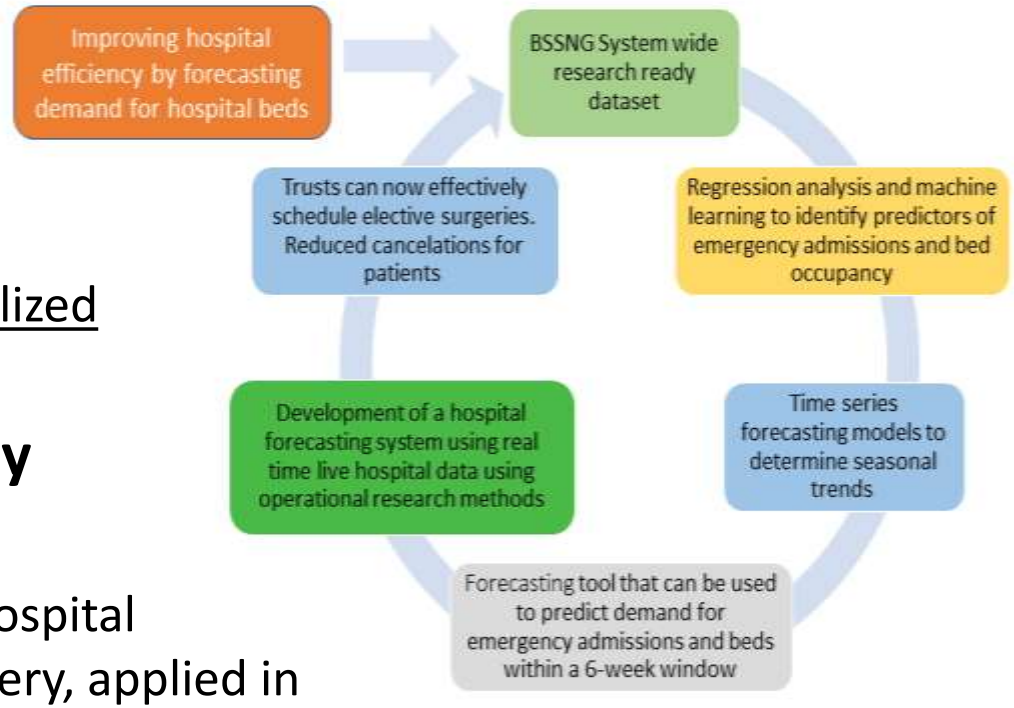
- Link direct operational data feeds from North Bristol Trust with primary care data available through the BNSSG Systemwide dataset.
- Develop, validate and implement models that can forecast non-elective emergency admissions.
- Use operational research methods to plan elective surgery through optimizing hospital bed capacity.

Better Care Loops

Loop 1: forecasting and predictive analytics

Prognostic models identify patient, hospital staffing and facilities data that predict emergency admission, bed occupancy and discharge delays.

Methods: Time series forecasting, penalized regression, machine learning.



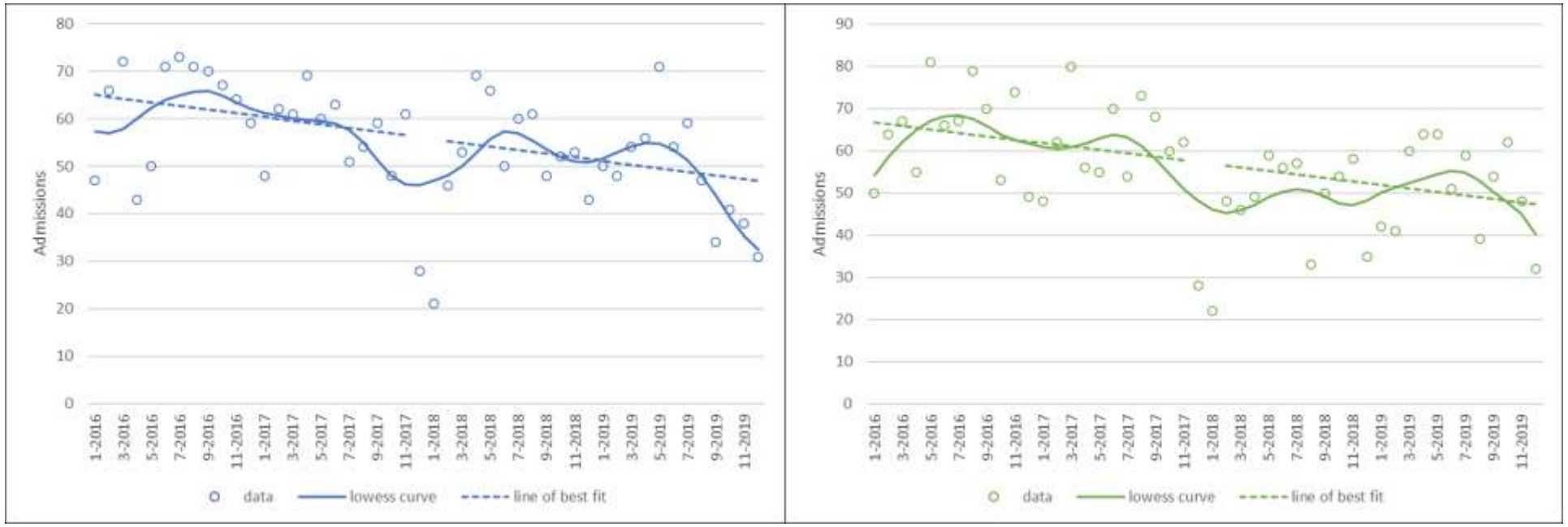
Loop 2: real-time elective surgery scheduling

Use operations research to develop a hospital forecasting system to plan elective surgery, applied in real time to live NHS hospital data. Methods: discrete event simulation and system dynamics

2017/18 Winter flu natural experiment

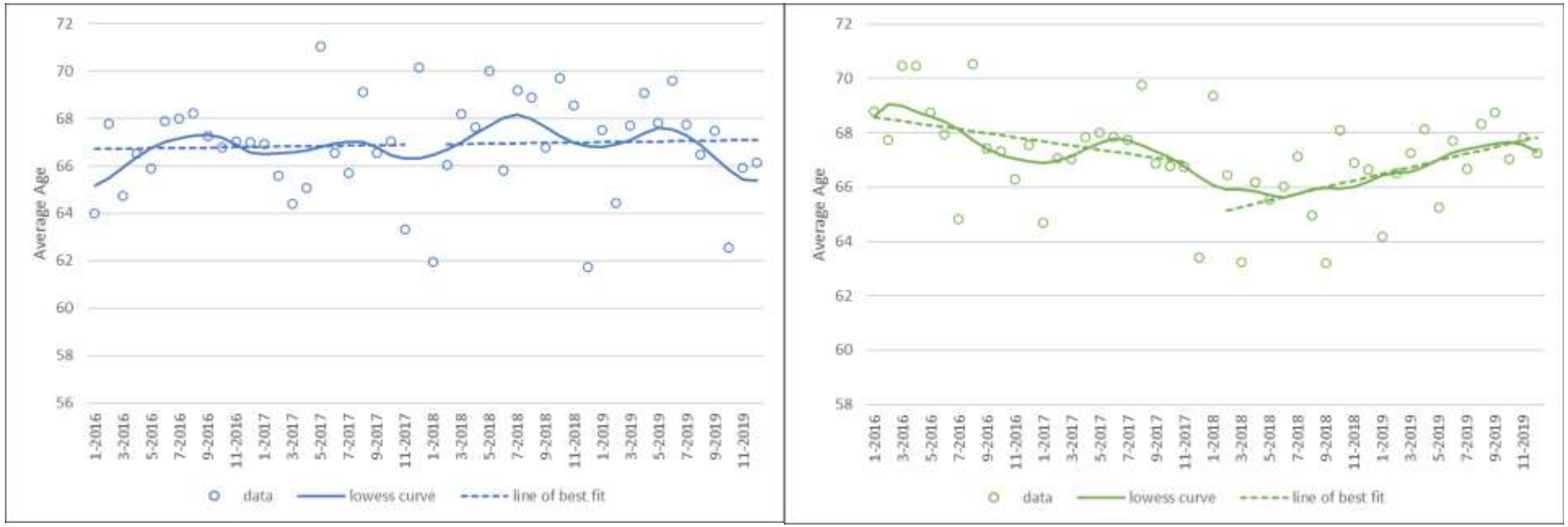
- Advice from NHS England's emergency pressures panel to postpone planned surgery for patients during Winter 2017/18
- We can learn about scheduling of hospital activity during this period and following the restart of elective surgery in February 2018
- Elective hip and knee replacements
  - common elective surgery
- Trends in elective hip/knee replacement surgery at NBT before/after Winter 2017/18
  - Admissions
  - Ratios of emergency/elective, public/private, bed occupancy
  - By gender, age, deprivation, comorbidities

Admissions for elective hip and knee replacements



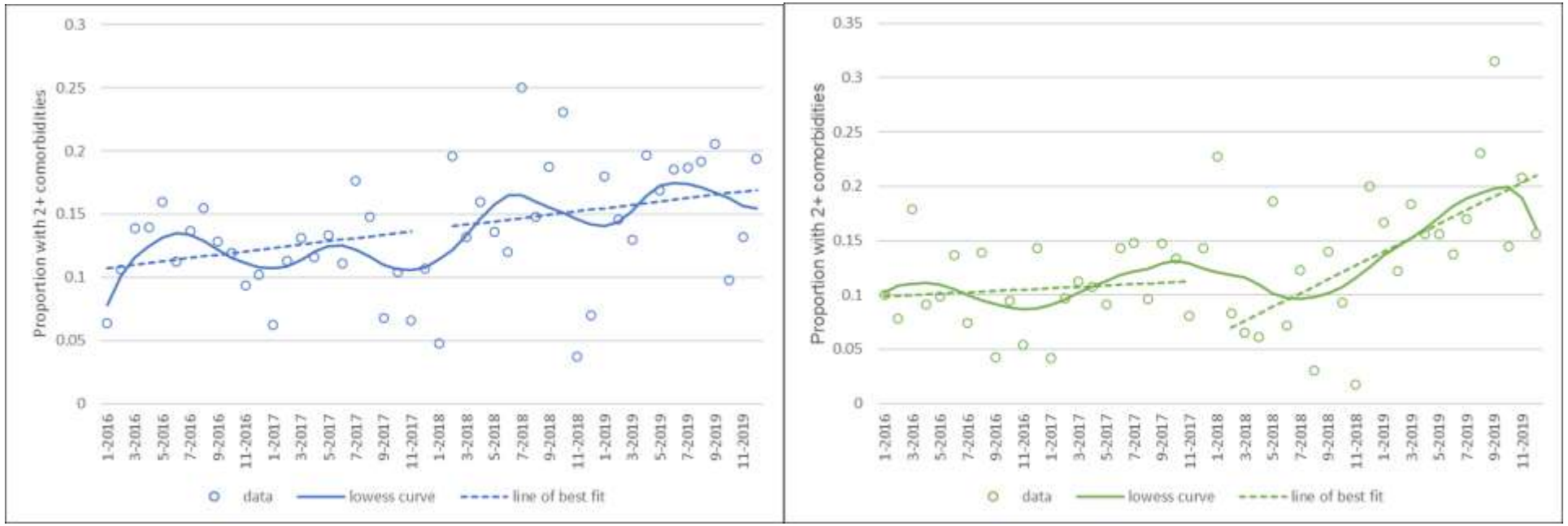
- Numbers have declined from 63 hip replacements per month and 65 knee replacements per month in 2016 to 49 hip replacements and 51 knee replacements per month in 2019.
- Hip and knee operations are seasonal, with 10 fewer hip replacements and 13 fewer knee replacements per month during Winter compared to Summer.

Admissions for elective hip and knee replacements (age)



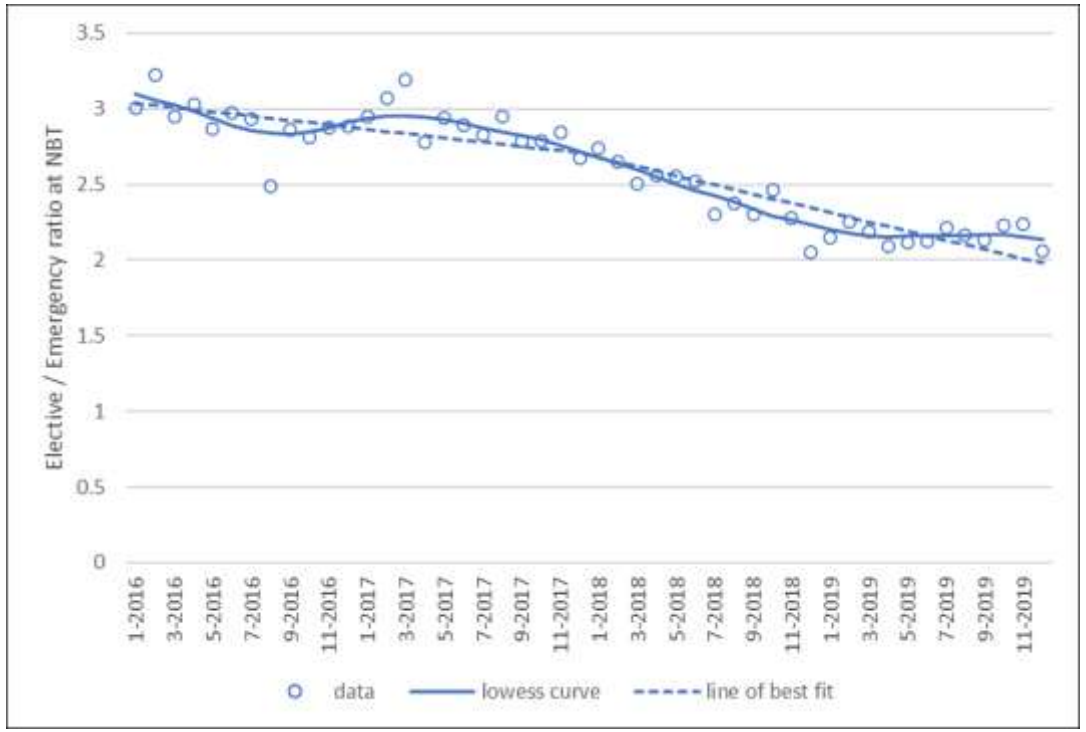
- Evidence of seasonality for hip admissions, where the mean age of patients was 66 (SD: 14.5) in December compared to 68 (SD: 13.1) in July, showing that older patients were more likely to be operated on in the summer months.
- Change in trend of age for knee replacements after Winter 2017; beforehand there had been a slight decline in average age and this started to increase after Winter 2017.

Admissions for elective hip and knee replacements (co-morbidity)



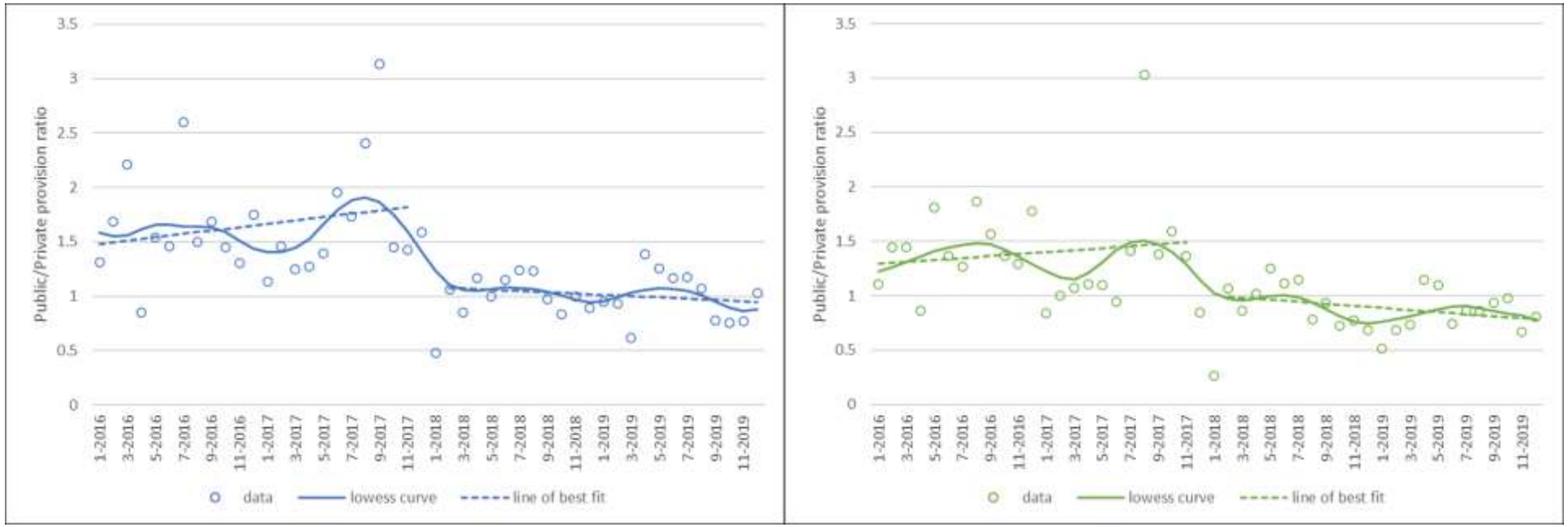
- Seasonality in the complexity of people having hip replacements, with 12% (95% CI: 9%-15%) of people having 2+ comorbidities in Winter and 16% (95% CI: 13%-19%) in the Summer
- The average number of Charlson co-morbidities a patient had at the time of hip and knee replacement surgery increased after winter 2017, with a continuing upwards trajectory.

Ratio of elective admissions to emergency admissions at NBT (not just for hip/knee electives)



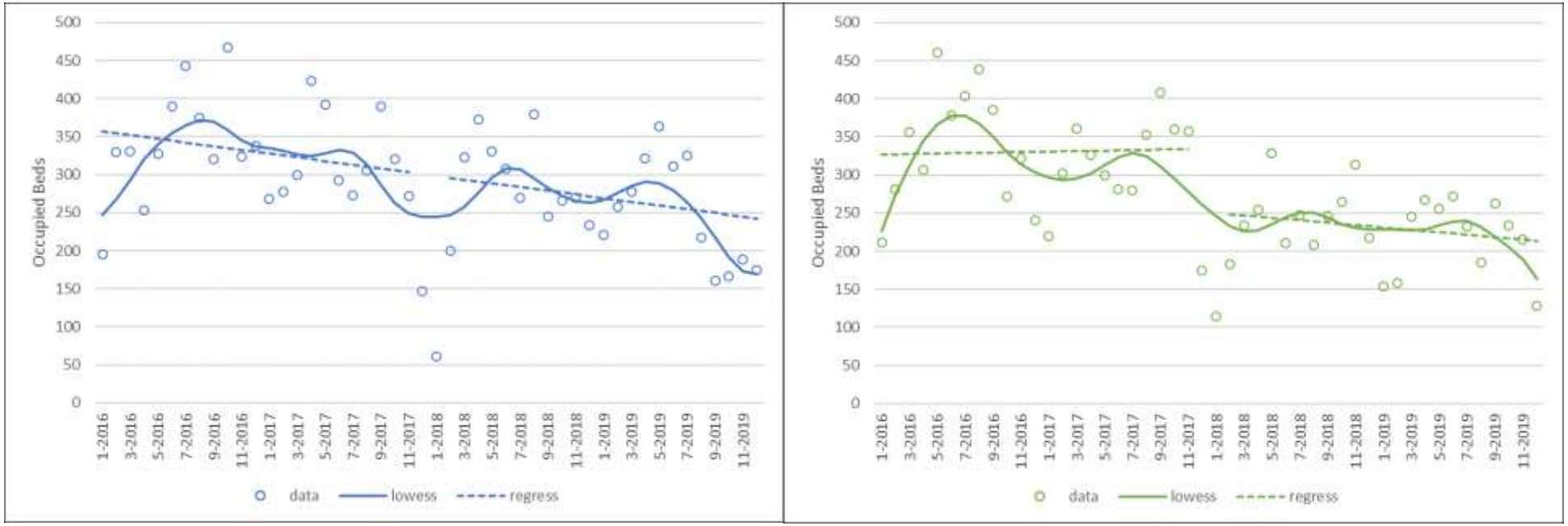
- Ongoing downward trend in ratio of elective to emergency admissions at NBT, from an average of 2.9 (SD: 0.17) electives for every emergency in 2016 to 2.2 (SD: 0.06) in 2019.
- No indication of seasonality, but did start to decrease more rapidly after Winter 2017

Ratio of public to private provision of hip/knee elective surgery at NBT



- Ratio of public to private provision higher in Summer compared to Winter for hip surgery (1.56 (SD: 0.52) vs 1.19 (SD: 0.38)) and for knee surgery (1.28 (SD: 0.64) vs 0.92 (SD: 0.41)).
- There is a step change reduction in public provision compared to private provision after Winter 2017 for both types of surgery

Bed Occupancy hip/knee elective surgery at NBT



- Very seasonal, with higher occupancy in the Summer months (324 beds for hips and 291 beds for knees on average) compared to the Winter months (225 beds for hips and 199 beds for knees on average).
- In both cases bed occupancy has reduced over time, with a gradual reduction for hip surgery and a step change downwards for knee surgery after Winter 2017.

Predicting elective hip and knee activity

- Predict measures of hospital throughput:
  - Length of stay
  - **Length of stay greater than 7-days**
  - **Discharged when medically fit**
  - Occupied bed days
  - Cancellations
- Potential predictors
  - Patient characteristics – age, gender, IMD, BMI, comorbidities etc.
  - Hospital admission factors – admissions method, date + time (incl day of week, season), hospital activity (elective:emergency, bed occupancy) etc.

Orthopaedic Pathway Mapping

What-if scenarios

1. What-if we had current capacity, aka status quo?

   Identify where the current delays are in the pathway

2. What-if we had extra bed capacity (+1, +2, +5…infinite beds)?

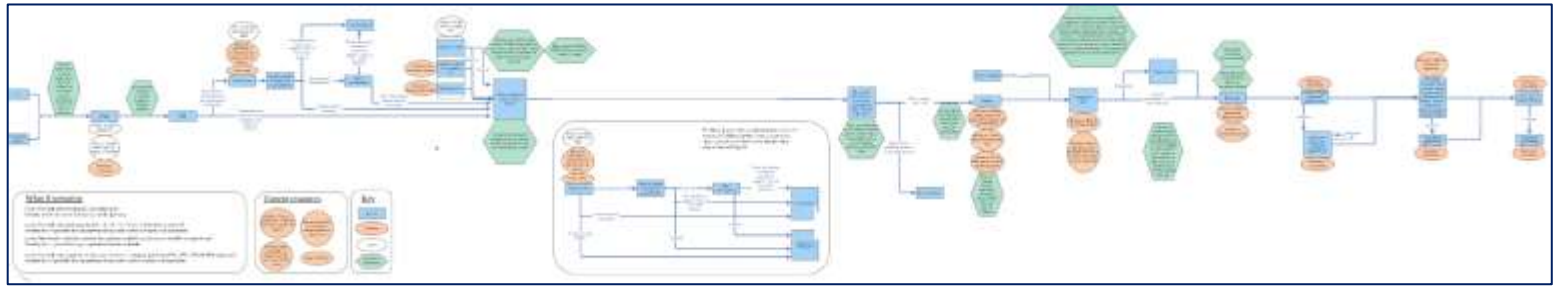
   Impact on delays and number of cancelled operations

3. What-if the theatre schedule matched the pathway availability (so operations never cancelled)?

   Impact of an optimised theatre schedule

4. What-if we had extra capacity for day case elective hip surgery (+5%, +10% etc)?

   Impact on pathway delays and number of cancelled operations



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Thank you

Any questions?

Bristol Community Health
Avon and Wiltshire Mental Health Partnership NHS Trust
Weston Area Health NHS Trust
Sirona care & health
UWE Bristol
North Somerset Council
South Gloucestershire Council
NSCP
Bristol Health Partners
Healthier Together
Improving health and care in Bristol, North Somerset and South Gloucestershire
Bristol, North Somerset and South Gloucestershire Clinical Commissioning Group
North Bristol NHS Trust
University Hospitals Bristol NHS Foundation Trust
South, Central and West Commissioning Support Unit
West of England Academic Health Science Network
Bristol City Council
University of Bristol
University of Exeter
University of Bath
NIHR | Bristol Biomedical Research Centre
Applied Research Collaboration West
Applied Research Collaboration South West Peninsula
PenCHORD

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LUNCH

The next session will start at 2pm

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Curating the UK COVID-19 diagnostics data for research and innovation

22/10/2021

Gordon Milligan, Programme Lead

Esmond Urwin, Standards Lead

Vision

To transform the UK's COVID-19 response by making COVID-19 related datasets Findable, Accessible, Interoperable and Reusable (FAIR) and providing expert data engineering, enabled by HDR UK, to support and catalyse their responsible use in research and innovation.

Objectives

The project will provide four new capabilities

1) A single platform for discoverability and feasibility analyses to understand if the required data and/or populations exist to answer given questions;
2) The ability of researchers to perform meta-analysis and synthesis over multiple UK cohorts;
3) The ability to link COVID cohorts to multi-dimensional health and non-health related datasets to support research at pace across the four nation;
4) Further development of the robust UK health data infrastructure to enable long-term impact for health data science beyond COVID-19

Outcomes

Discovery of data:

- Creation of a single searchable library of datasets that will be accessible through the Gateway
- Ability to search for data cohorts or patients for recruitment to clinical trials from across both repurposed cohorts and targeted COVID-19 cohorts, HDR UK BREATHE Hub cohorts
- Provision of advanced HDR Discovery tooling (with BC Platforms) that enables record-level query builder integrated within the Gateway.
- An automated application to the data source for data access or collaboration.
- Ongoing identification, curation and deposition of effectively anonymised COVID-19 rich datasets into the Gateway
- Identifying which data fields (within these datasets) require further curation to address COVID-19 priorities

Analysis of data:

- Automated federated-aggregate level queries initiated through the HDR UK Gateway enhanced with the BC Platforms functionality. The data remains in situ and data sources are in control of the queries which are run on their data and by who.
- Automated extraction of project specific, individual level, pseudonymised datasets from different data sources, transferred and hosted in a TRE of researcher choice

Outcomes

Data harmonisation and standardisation:

- Serology data capture standardisation tools across the UK, filling potential gaps.
- Transformation of linked data into OMOP format.
- Identity management to ensure the same pseudo-id for individuals in different cohorts.

Linkage to augment data sources:

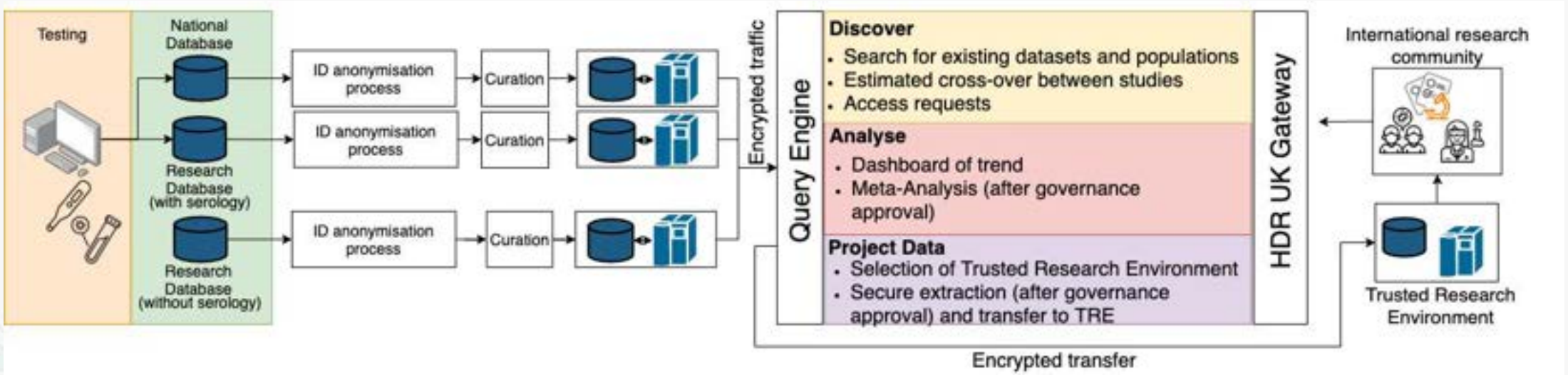
- Linkage to longitudinal routinely collected data streamlined for new COVID-19 cohorts, BREATHE and ATLAS cohorts. We will enable linkage to PCR, genomic data (COG-UK) and other multi-dimensional datasets.

Exemplar public health and research questions:

- Durability of antibody protection, antibody response and the medium and long-term outcomes on health.

Building on existing capabilities

1) BREATHE Hub and SAIL infrastructure, containing 17 respiratory cohorts
2) ATLAS federated search (ALSPAC, Generation Scotland, NIHR BioResource, Nottingham BREATHE, TWINS UK)
3) Only 15% of budget spent on accelerating and enhancing existing infrastructure
4) National safe havens infrastructure across the four nations
5) UKCRC Tissue Directory, experience in linking 200 biobanks across the country



Standardising COVID antibody data collection across the UK

- Over 5 different vendors of serology testing assays
- Many different Laboratory Information Management Systems (LIMS) capturing data
- The reporting of “positive/negative” test results rather than the number of antibodies per volume, sample signal to cut-off signal ratio, assay type and neutralisation titre will compromise the UK’s research effort.
- COVID-19 is a new disease with a rapid testing program delivered within a clinical setting without the prior research and calibration. For example, different assay vendors are using different volumes of antibodies to classify a result as either positive or negative. We do not currently know where that line should be drawn.

CO-CONNECT Standards Work Package Aims & Objectives

- Develop a minimum data standard for COVID serology data.
- Support the capture of standardised, granular serology data from across the UK.
- Support clinical decision making and research informing public health decision.

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Advancing the UK's
health data science skills

Training@HDR UK

Academic Programmes

HDR UK-Turing Wellcome PhD Programme in Health Data Science

Our PhD programme aims to develop future leaders in health data science. Its underlying philosophy is that health data science requires a combination of expertise spanning three fundamental areas: statistical, computational and health sciences.

Masters Programmes

Our Masters programmes, delivered in partnership with 6 leading universities across the UK, are designed to provide the best possible foundation for a career in health data science.

Other Programmes

Apprenticeships – AI Apprenticeship Academy for Health (in partnership with Cambridge Spark)

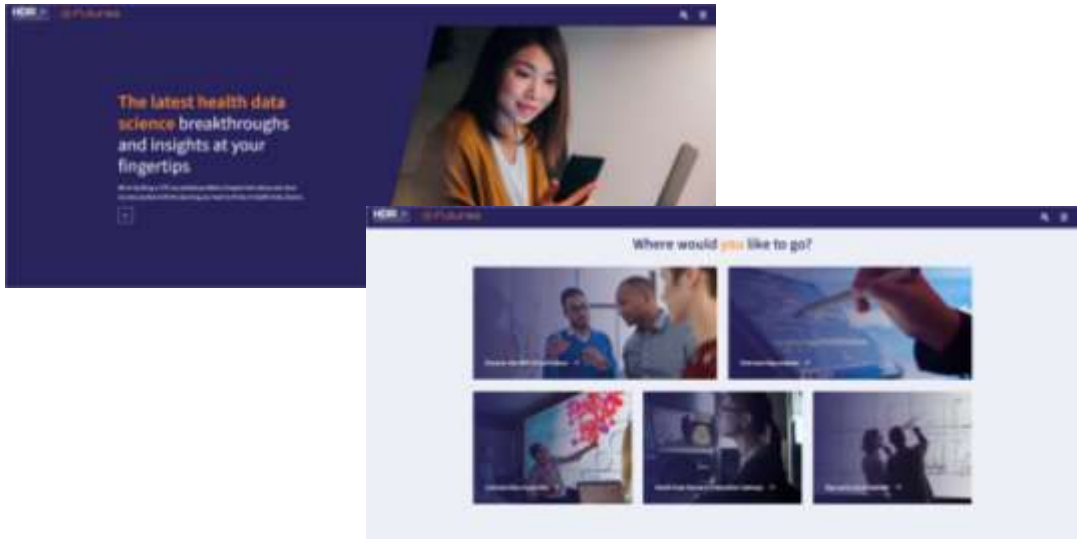
Our Cambridge Spark apprenticeships offer expert-led, MSc equivalent 15-month apprenticeships that will bring major benefits to employers and employees alike. It is part of our drive to ensure that anyone with the ambition, talent and drive can have a career in health data science – no matter what your background or where in the UK you live.

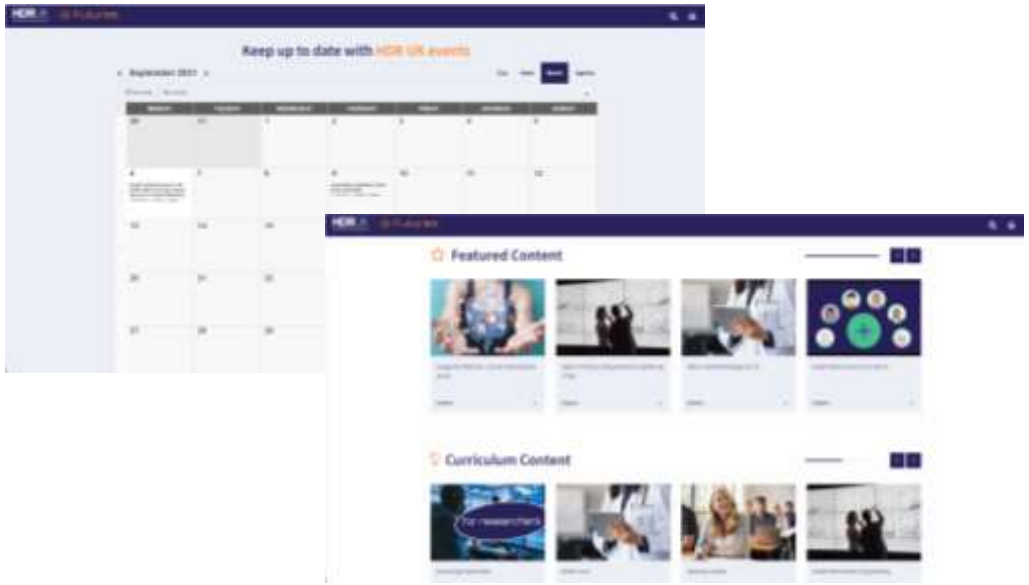
Health Data Science Academic School

HDR UK runs an annual academic school targeted at PhD students, early-mid career researchers, and technology specialists working in health data science across academia, the NHS and industry, equip them with the necessary skills to respond to the very latest challenges in health data science.

HDR UK Futures

Futures, our brand-new and completely **free** Virtual Learning Environment, hosts our growing catalogue of online learning content and now has 1,400 registered users.





Example 1 – Phenomics Research Learning Pathway

1	An Introduction to Phenomics Research
2	How to Validate Phenotypes
3	How to use the HDR UK Phenotype library
4	Meeting the Public Demand for Risk Information
5	Informatics Consult
6	How to generate a Phenotype from diverse health data Part I, 2 and 3
7	Text for Decision Making
8	How should patients inform the definition and use of phenotypes?
9	Computable guidelines
10	The Clinical Informatics Consultation: Concept and Requirements
11	How to incorporate information from mobiles and wearables in phenotypes?

Dr Amitava Banerjee

Example 2 – Health Information Engineering Learning Pathway

1	Core Web Technology: HTML
2	Core Web Technology - CSS
3	Core Web Technology - Java Script
4	Modern Databases: RDBMS with SQL
5	Modern Databases: MongoDB
6	Modern Databases: Neo4j
7	Unit Testing: Software Product Testing
8	Using Jupyter eBooks
9	The Scrum Framework
10	Agile in Practice
11	The Power of Reflection

Dr Alan Davies

For Clinicians (more to follow)

1	Why is health data research critical to you? - Alastair Denniston
2	Better Care and the Learning Health System - Alastair Denniston
3	Components of the Better Care Loop - Alastair Denniston
4	Data in Ophthalmology - Alastair Denniston
5	Code Free Deep Learning for Clinicians - Ciara Byrne and Pearse Keane
6	An Introduction to Machine Learning for Clinicians x 12 videos - Susan Krueger and Hatim Abdulhussein
7	?
8	?

Alastair Denniston

The Events Calendar

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
27 Gut Reaction, the Health Data Research Hub for IBD - SME workshop 14:00 BST - Online / Virtual	28 Diversity in Data - National Inclusion Week Community Event 14:30 BST - Online / Virtual	29	30	1	2	3
4	5	6	7	8	9	10
11	12 HDR UK Applied Analytics 2021 seminar series 15:00 BST - Online / Virtual	13 Data and Connectivity Programme - Information for the Public 12:00 BST - Online / Virtual	14 Innovation Gateway Open Door and Q&A 14:00 BST - Online / Virtual	15	16	17
18	19	20 NHSX PhD Data Science Internship Scheme Launch 13:00 BST - Online / Virtual	21 Better Care Insight Sharing Day 09:30 BST - Online / Virtual	22	23	24
25	26	27	28 HDR UK Applied Analytics 2021 seminar series 14:00 BST - Online / Virtual	29	30	31

We also offer Bootcamps and Short Courses…

Health Information Engineering Workshop – December 2021

The workshop aims to simulate a real-world Agile software project, using a modern technology stack, where participants will work together and will gain hands-on experience.

Part One

The first part includes an introduction to programming and databases, with self-directed learning using Jupyter notebooks. Participants work at their own pace to arrive at the same starting point for the main workshop.

Part Two

In the second part, participants will work in a small Agile team using the Scrum framework methodology. Teams will be tasked with adding features to a web-based prescribing dashboard. This allows participants time between the first 2 days and the final day to carry out a longer cycle (Sprint) of work culminating in a Sprint review.

Jupyter Notebooks

Participants will use a set of interactive Jupyter notebooks that allow self-directed learning.

These notebooks introduce:

- Programming with Python
- Databases with SQLite
- Web technologies (HTML, CSS and JavaScript)

The notebooks contain explanatory material about the related topics with embedded code that can be run and altered. They also contain tasks where participants can check the accuracy of their work.

How we could collaborate

06

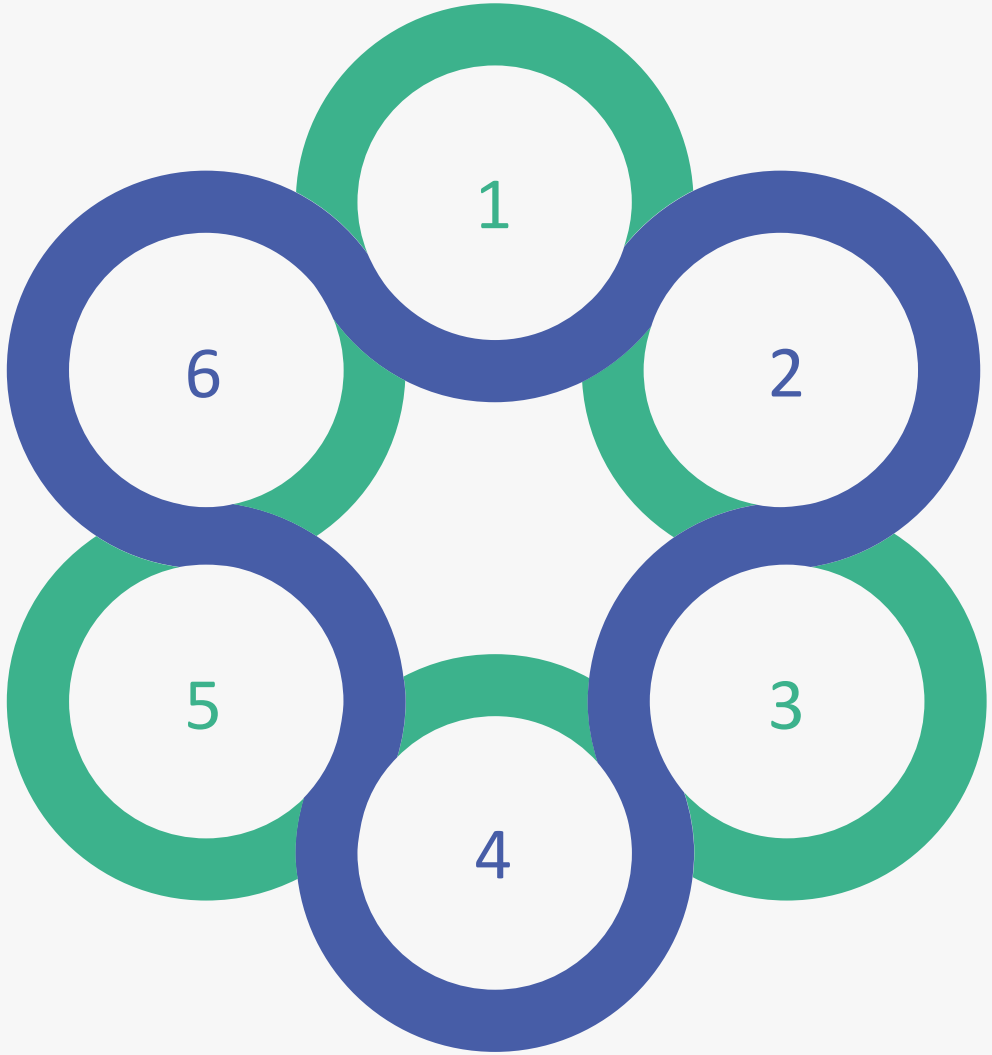
Sign up to HDR UK Futures and access our training courses (https://hdruklearning.csod.com)

05

Is there a training event that you would like us to deliver?

04

We can promote your events on social media, the website and our learning platform



01

Can you help us shape a learning path for clinicians or help us create a new learning path?

02

Do you have a suggested topic for a bite-size video that meets a need?

03

Can you deliver a relevant bite-sized video or do you know somebody that can?

Questions

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Health Data Research UK

Thank you

Find out more:
www.hdruk.ac.uk
@HDR_UK
@HDRUKlearning

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Health Data Research UK

Better Care Insight Day

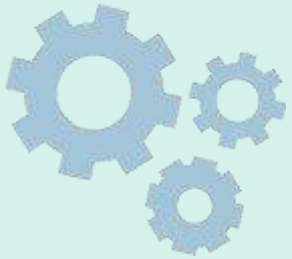
Curriculum Development (Health Information Engineering)

22/10/2021 | Dr. Alan Davies (Senior Lecturer Health Data Science, Manchester University, UK)

Computable knowledge

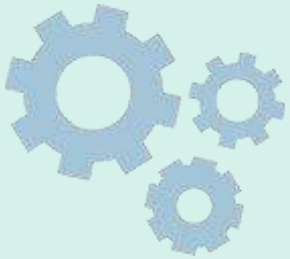
- Data alone holds no value unless we can derive insight from it
- This knowledge can then be acted on to improve systems and services (to add value)
- For knowledge to be computable it must exist in a form that enables computational processing and analysis

Digital transformation maturity models



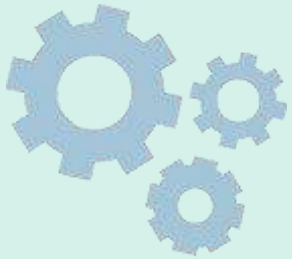
Model 1

Extension of EHR capabilities to drive digital engagement



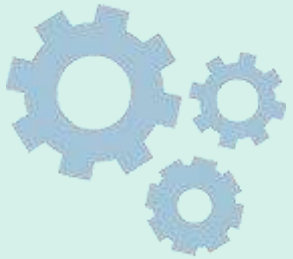
Model 2

Initiatives focusing on virtualisation of care (e.g. telehealth, remote monitoring, …)



Model 3

Stand alone digital initiatives driven by internal demand (case-by-case)

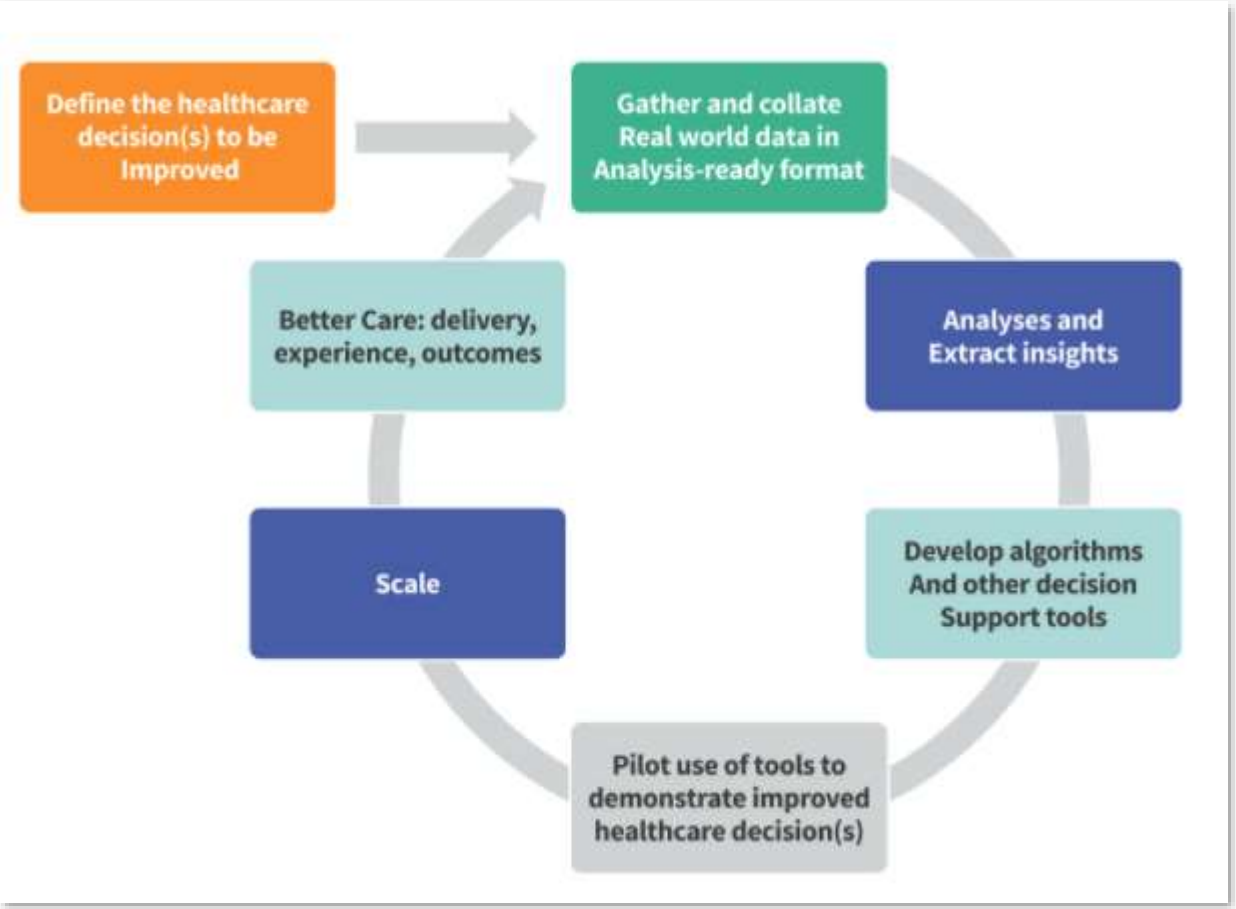


Model 4

Long term strategies (enterprise digital transformation for patients, carers and administrative functions)

Adapted from: Marx, E., Padmanabhan, P (2021) *Healthcare Digital Transformation*. Oxon: CRS Press

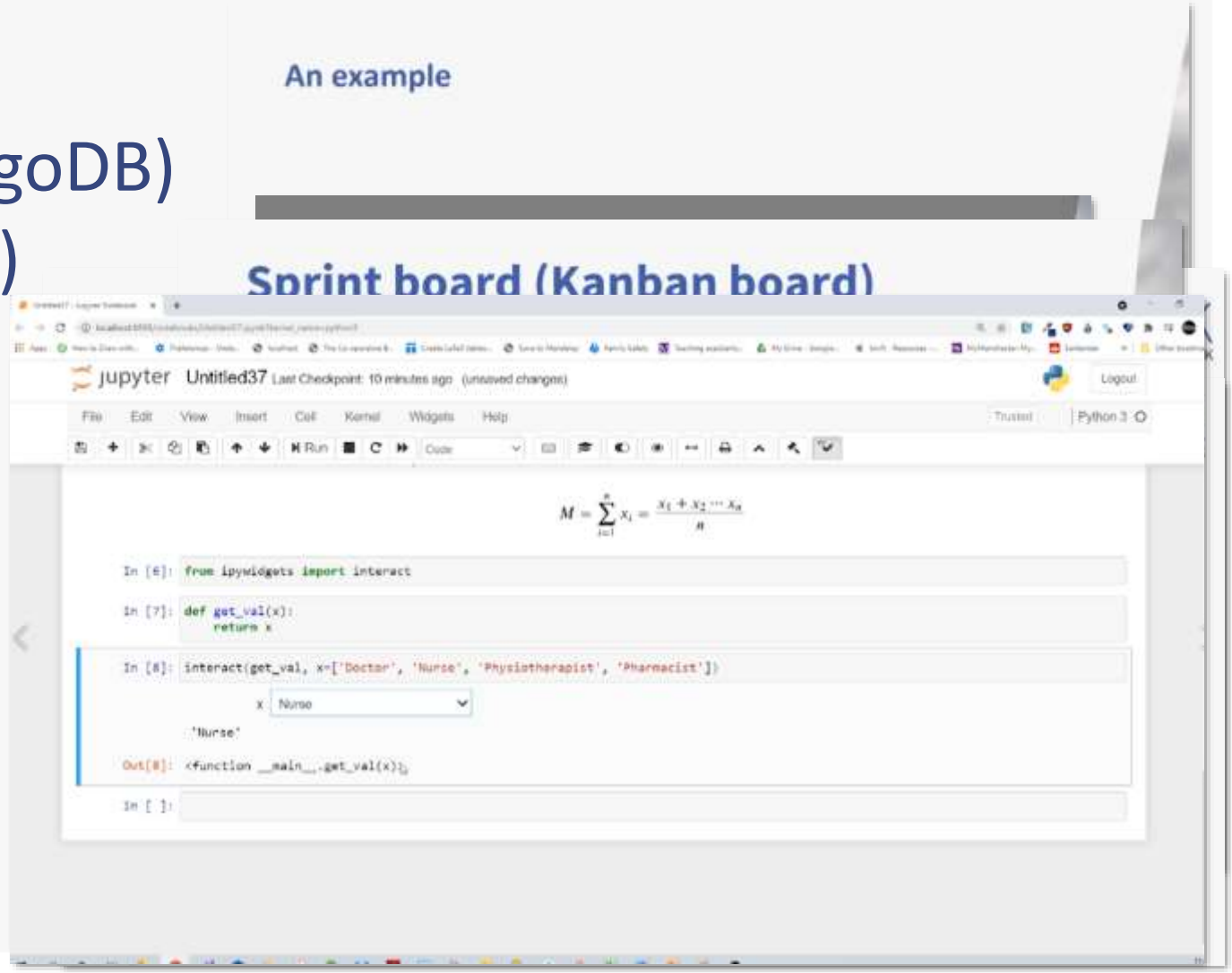
The Better Care loop



Source: https://www.hdruk.ac.uk/science/better-care/

Health Information Engineering

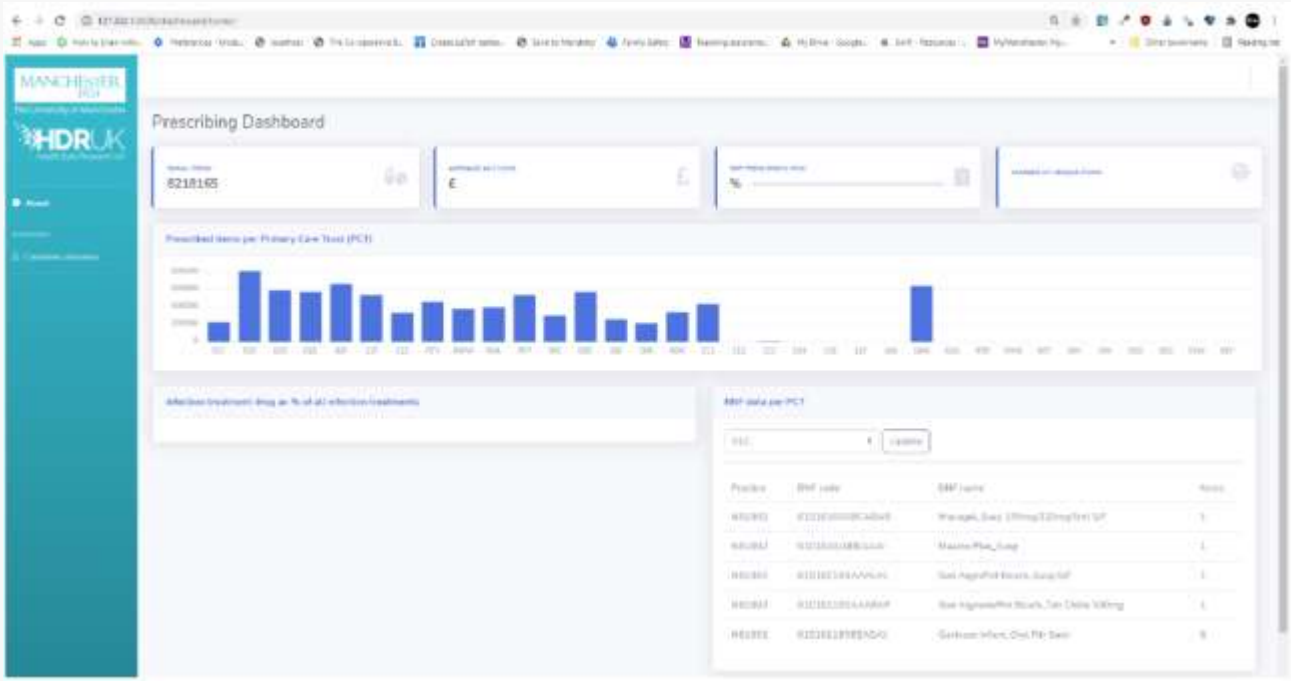
- Database systems
  - RDBMS – SQL
  - NoSQL Document (MongoDB)
  - Graph databases (Neo4j)
- Software testing
- Web technologies
  - HTML
  - CSS
  - JavaScript
  - Jupyter notebooks
- Agile methodology



Health Information Engineering Workshop

- For analysts and data professionals
- Simulates a real world software project
- Extracting data from a database -> processing data to derive insights -> presenting to the end user

Health Information Engineering Workshop



Future work

- Develop curriculum to cover aspects of the Better Care Loop (theoretical and technical skills)
- Leverage lessons learnt from catalyst projects and incorporation of case studies
- Development of a game to practice and experience concepts of the loop

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Game States

A Sightseeing Ramble Around Play Technology

22/10/2021

Benjamin Green (Games Lead, Centre for Health Informatic, Manchester University, UK)

Overview

Games *are* good!

Let’s park that for now…

What are game

Contextualisation and description

Modes and technologies

Some options that are out there, including features and pitfalls

Games as technology

Games are not new, they've been a pastime for thousands of years

They're a knowledge sharing technology as well as an entertainment

Narrative (1D).

"What happened after…"

Maps, graphs or illustrations (2D).

"where can I find X…"

Sculptures or time series maps/graphs (3D).

"How does that change…"

Games (4D).

"What if we do Y…"

A heuristic

A game is a *thing* whose shape changes over time in a constrained way, such that players get a **payoff** from predicting its shape as a consequence of their or others' actions

Physical, Digital or Simulation

Terms related fidelity and presentation

Higher fidelity tends to require greater effort and expense

Physical games can simply require a pen and paper; perhaps using bespoke equipment

- Low fidelity
- Highly flexible
- Sometime less intuitive

Digital games tend to encode some of the constraints and procedure of the game as a fixed, rigid system.

- Less flexible, but extremely robust
- Allows bookkeeping heavy tasks – physics, AI, data processing
- Expensive to produce
- Time consuming

Physical, Digital or Simulation (continued)

Simulations can be either digital, physical or a blend of both

Their design objective is presenting key factors completely and accurately

They are for practice, assessment or *prediction

- High fidelity
- Highly Inflexible
- Often require players to have specialist training or knowledge
- Usually very expensive
- Require a lot of research

*predictive capability requires interpretation

Some game classes

PUZZLES *(such as ESCAPE ROOMS)*
WARGAMES
MEGAGAMES
BOARD GAMES
LIVE GAMES
ROLEPLAY GAMES (RPGs)
VIDEOGAMES

Questions?

Closing remarks and next steps

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THANK YOU

Next steps

Meeting follow up

01

- Meeting slides and summary report – circulated to all attendees
- Let us know feedback for next time

Events

02

- **15 November 2021:** QQR Frontiers meeting
- **23 November 2021 :** Gateway Workshop for Researchers
- For more events see the HDR UK website: Events - HDR UK

Stay in touch

03

- Join the Better Care slack channel (contact **alice.turnbull@hdruk.ac.uk**)
- Visit the **Better Care webpage**
- Visit the **Gateway**
- Sign up to the **HDR UK mailing list**
- Follow us on LinkedIn and Twitter @HDR_UK

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THANK YOU