AI in healthcare: overview, examples, implications

Jacqueline Anderson

Project Manager
Research and Innovation

NHS Greater Glasgow and Clyde

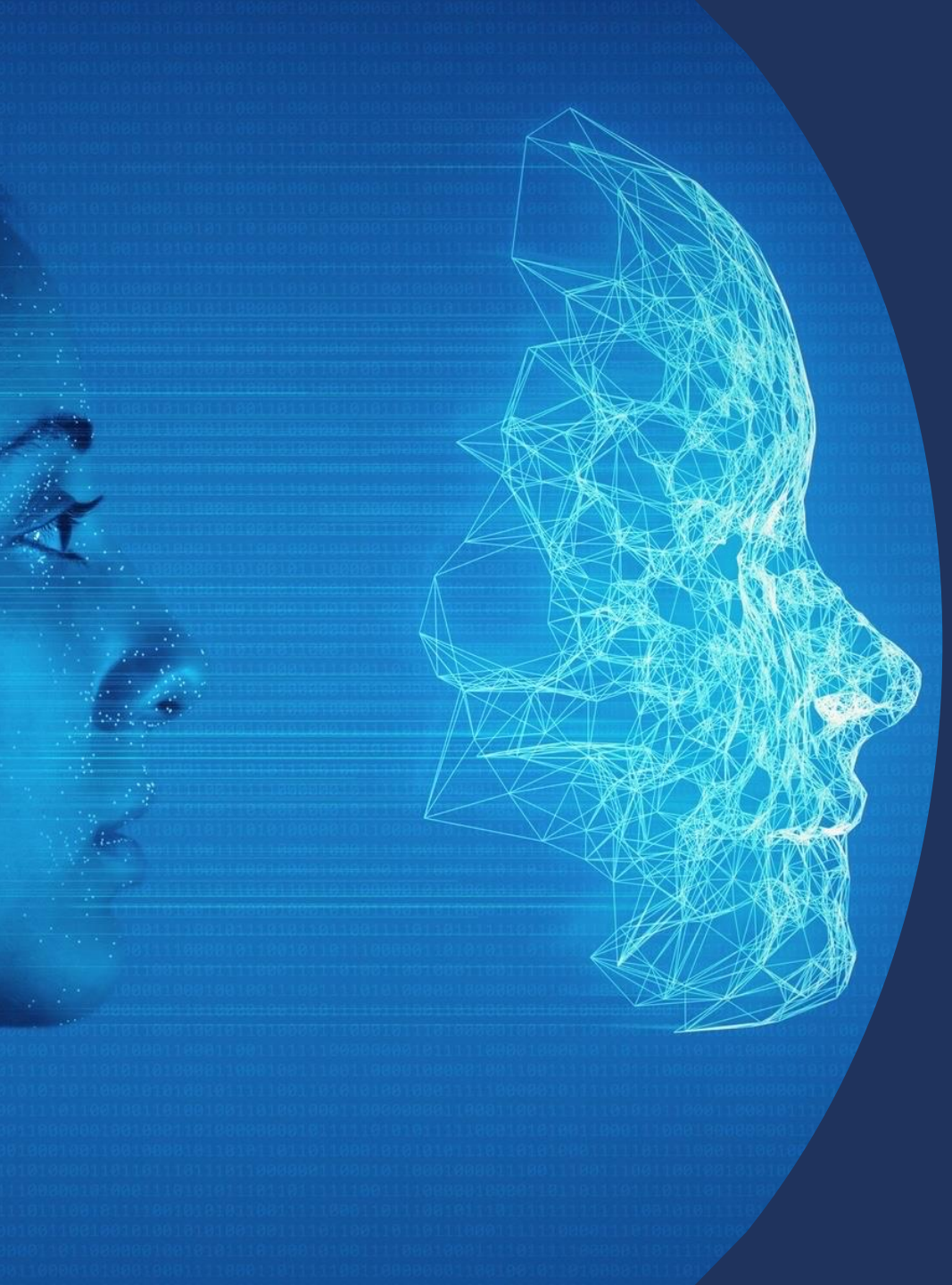
West of Scotland Innovation Hub

Lenus

DYNAMIC AI:

Digital Innovation with Remote Management and Predictive Modelling to Integrate COPD Care with Artificial Intelligence-based Insights:
An Acceptability, Feasibility and Safety Study

- Chronic Obstructive Pulmonary Disorder
- 120 000 people in Scotland
- Preventative, progressive
- Exacerbations
- Frequent hospital admissions



Introduction

- Background and context
- DYNAMIC AI Overview
- Regulatory Framework
- Informed Consent
- Data privacy and Security
- Trial management
- Next steps

What do we mean when we talk about ‘AI’ in healthcare?

Technologies used to allow computers to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition, and language translation

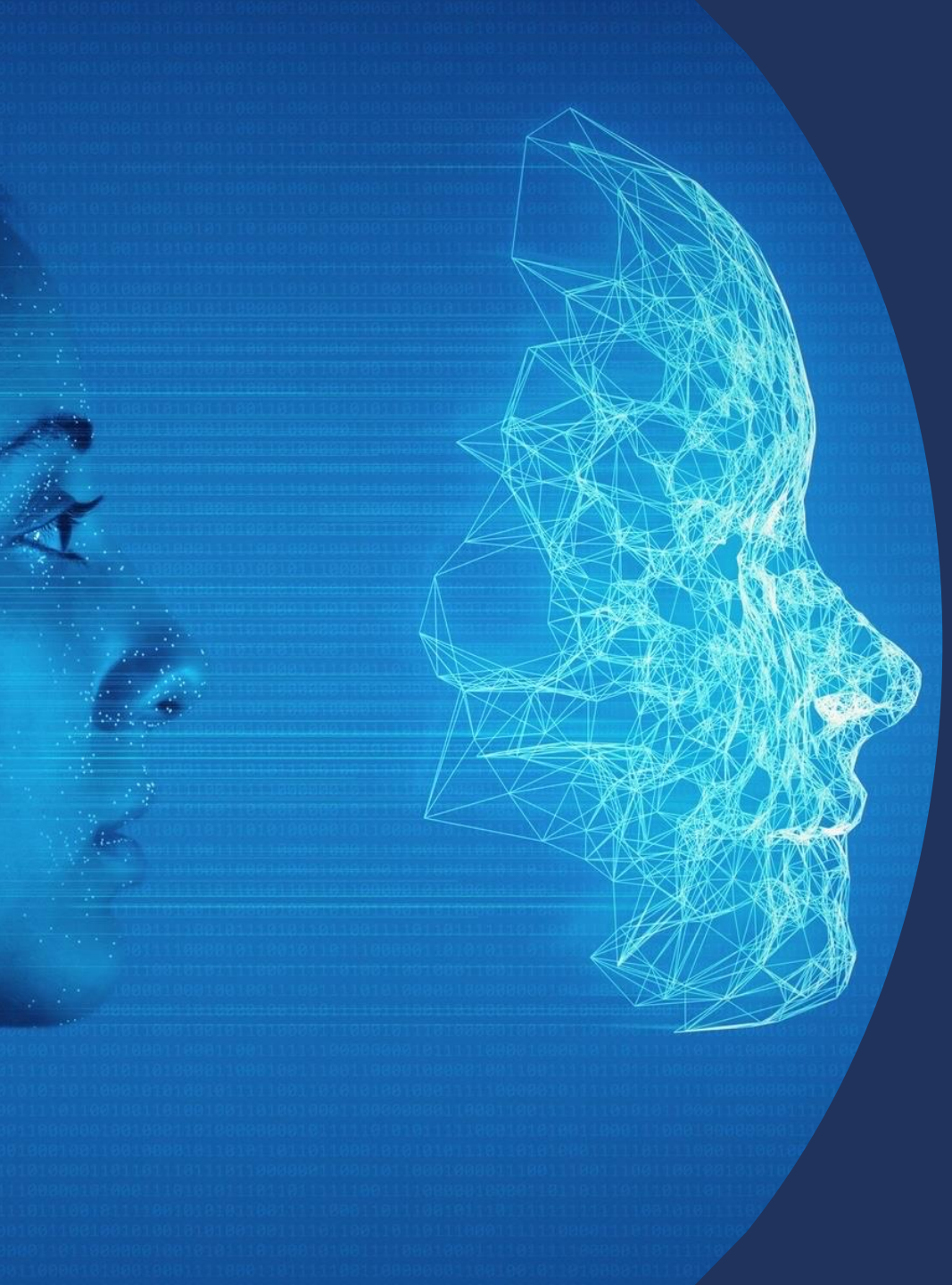
Scotland's AI Strategy

Systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals

High-level Expert Group on AI, European Commission

The use of digital technology to create systems capable of performing tasks commonly thought to require human intelligence.

Office for Artificial Intelligence, UK Government



- Discussion around most accurate definitions
- Machines using statistics to recognise patterns in large amounts of data, including those not perceptible by humans
- Performs repetitive tasks with data, without the need for constant human guidance
- Mostly ‘machine learning’ – digital systems that improve their performance at a particular task over time, through experience
- Supplements rather than supplants

AI is often a **medical device**

- If it's used to treat, diagnose, cure, mitigate, or prevent disease or other conditions – it's normally classified as a medical device
- Just like any other medical device, it needs to be regulated, calibrated, monitored, maintained and controlled

Why use AI?

The system is overloaded

Outpatients should be seen <12 weeks after referral

Target	Actual
95%	49.6%

Wait <12 weeks from decision to treat, to treatment

Target	Actual
100%	63.9%

Begin treatment within 18 weeks of referral

Target	Actual
90%	72.8%

Wait <62 days from urgent suspicion of cancer referral to treatment

Target	Actual
95%	76.9%

Wait <31 days from decision to treat cancer, to treatment

Target	Actual
95%	96.3%

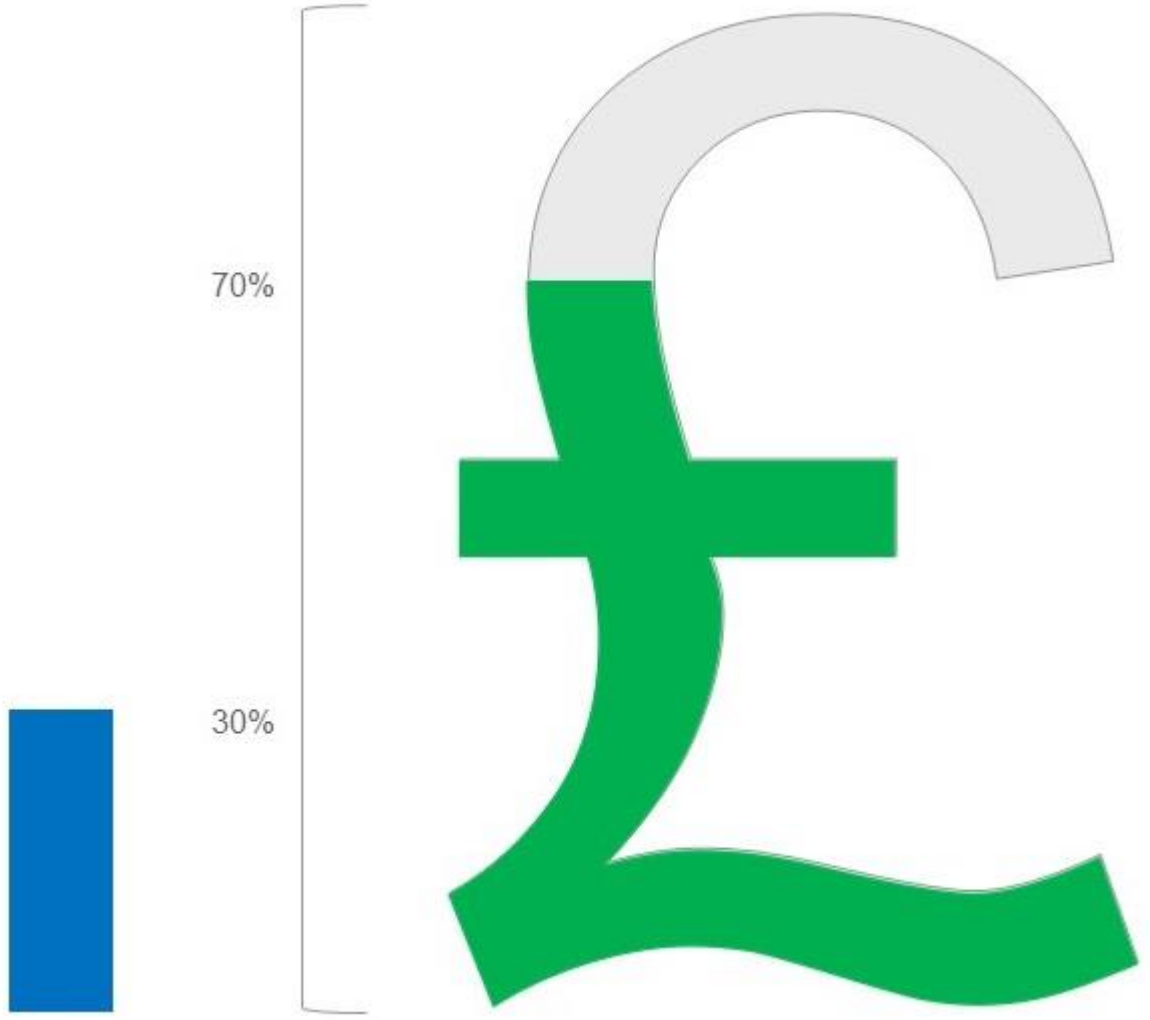
Wait <6 weeks for key diagnostic tests

Target	Actual
100%	49.6%

ED admission, transfer or discharge within 4 hours of reception

Target	Actual
100%	71.3%

Chronic conditions like COPD account for a disproportionate share of healthcare resources and are tied to inequalities



ROLE FOR INNOVATION

Targets are being missed

Financial constraints

Workforce pressures

Demand is increasing

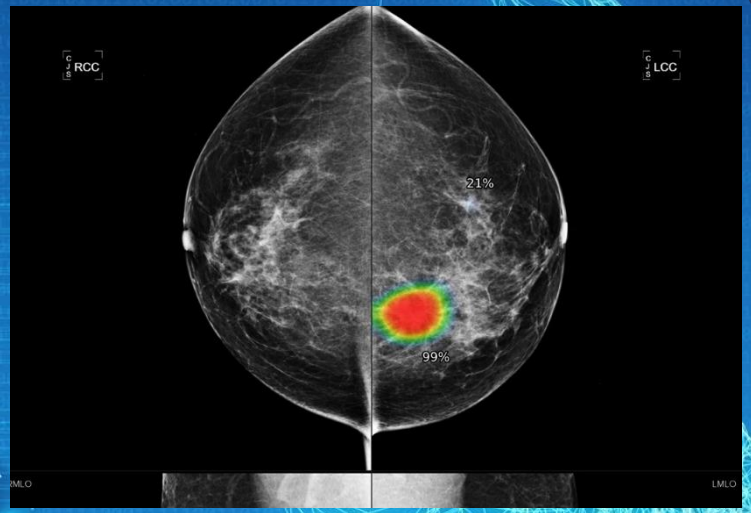
Improved outcomes

Demand will increase by a further 60% by 2040

This demand cannot be met by human resource alone

Where can AI be used?

Some examples ….



- Breast Cancer Screening (Imaging)
- Heart Failure Pathway
- Cancer Diagnosis (Pathology)

OPERA

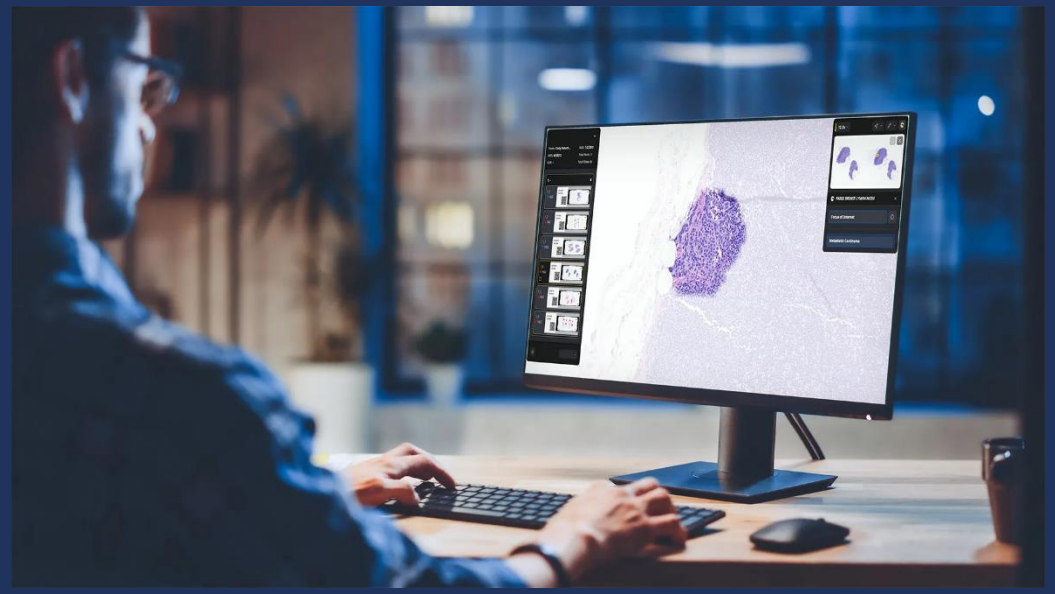
Results from the Optimised Pathway for Early Identification of Heart Failure in the Community (OPERA) project - a collaboration between AstraZeneca UK, NHS Greater Glasgow & Clyde, University of Glasgow, Lenus Health and West of Scotland Innovation teams

2 weeks
Waiting time reduced from 12 months to 2 weeks for a population of 1.2 million

2 minutes
Echo analysis times reduced from 25 to 2 minutes by operationalising AI tools

30 %
Referrals diverted by enabling active clinical referral triage (ACRT)

150 %
Increase in diagnostic efficiency based on patients diagnosed in a 4hr clinic



Demand forecasting

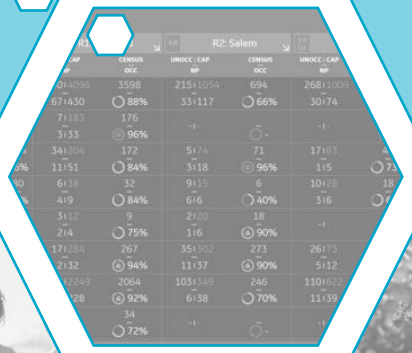
Screening

Population health and prevention

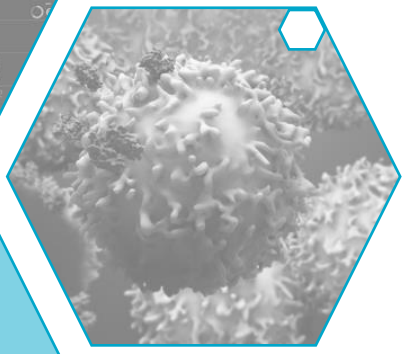
Diagnosis

Operational planning, scheduling and prioritisation

Quality, information, security and safety management



Therapeutic



Diagnostics

Prediction and prognosis

Considerations for healthcare organisations

Challenges

- Public awareness and concerns
- Safety
- How to realise benefits
- Relevant regulations
- Change management
- Performance
- Strategy and policy development
- Transparency and explainability

DYNAMIC AI

COPD Digital Transformation

Patient App

Daily symptom diary and patient reported outcomes (PROs)

Asynchronous messaging direct to clinical team

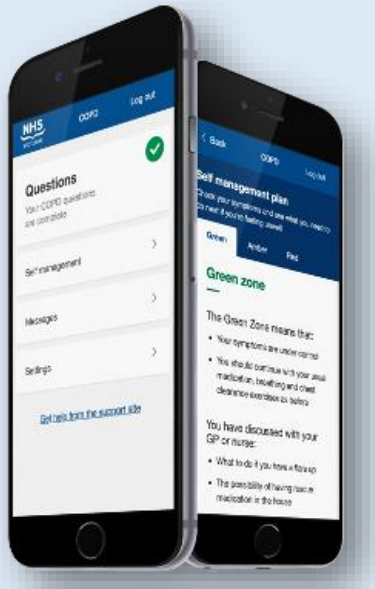
Self-management information

Clinician Dashboard

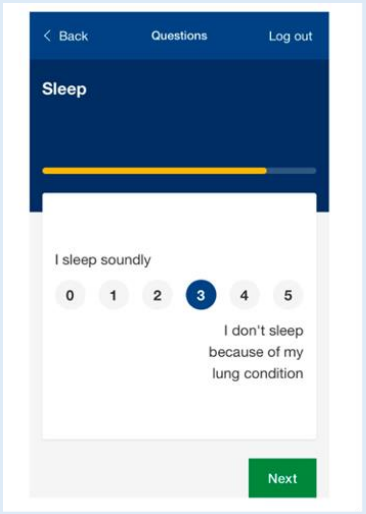
PRO and connected device data

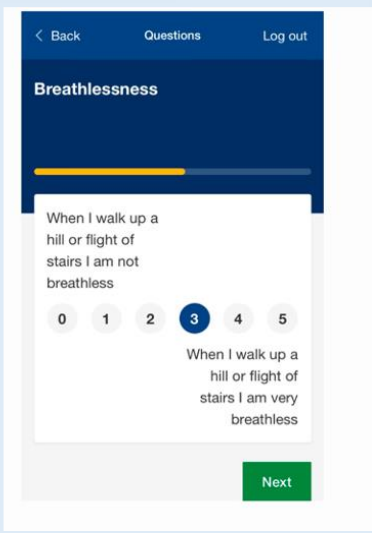
Clinical data

PDF export to electronic health records application

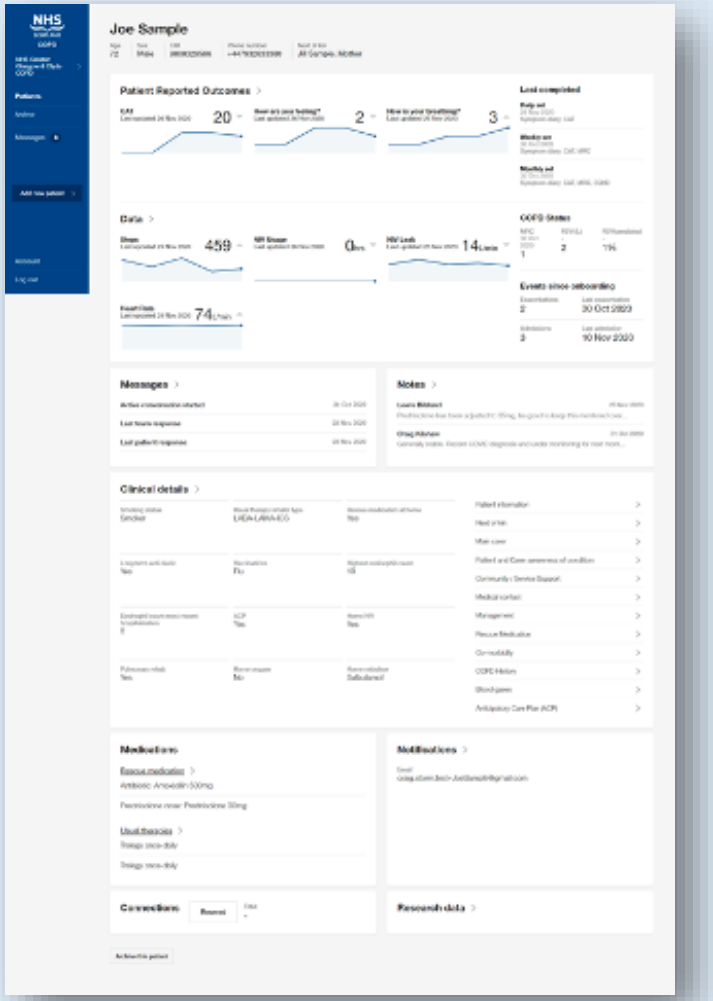


Patient web application – self management information





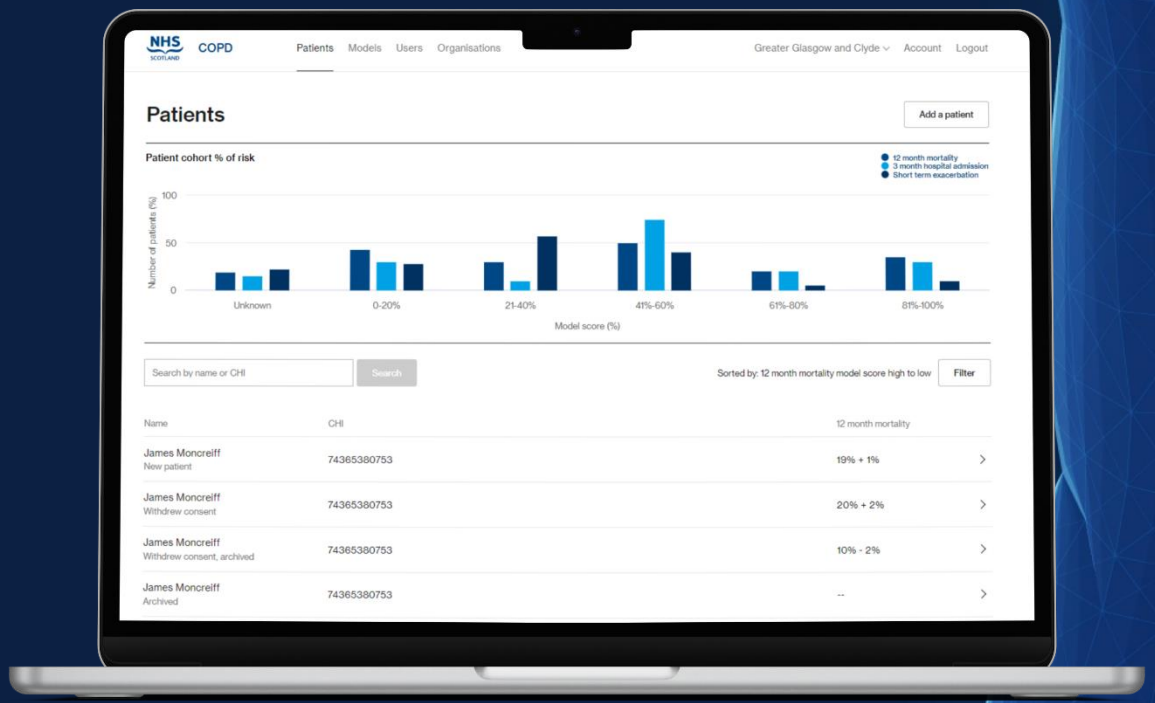
Patient web application – symptom diary questions



Clinician Dashboard – clinical information available during patient-clinician interaction

What is DYNAMIC AI?

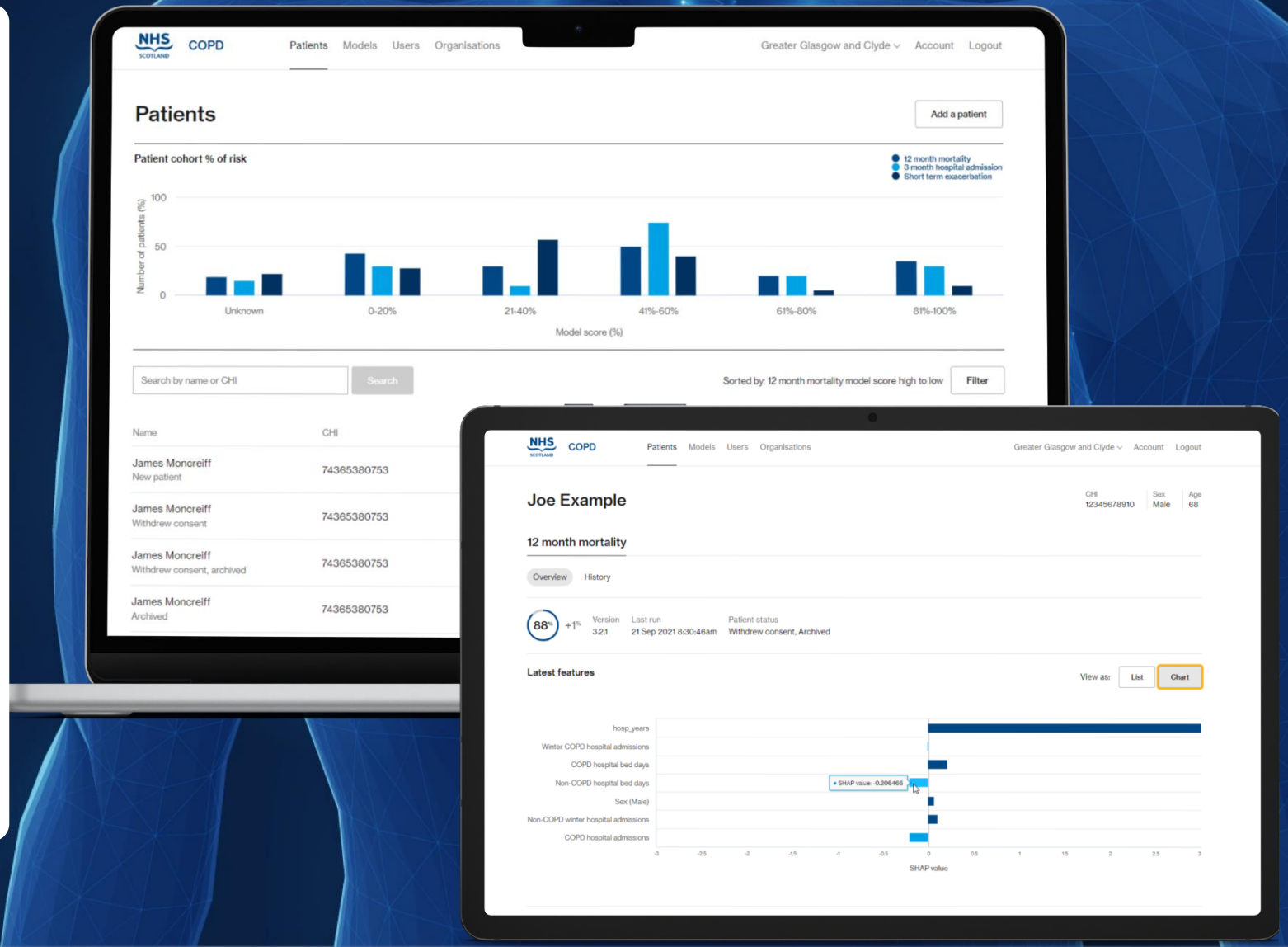
Medicines & Healthcare products Regulatory Agency



- MHRA Regulated Clinical Trial
- Medical Device (non- CE/CA mark)
- AI Insights Application
- Machine learning predictive models
  - 12 Month Mortality
  - 3 month re-admission
- Determine feasibility, acceptability and safety

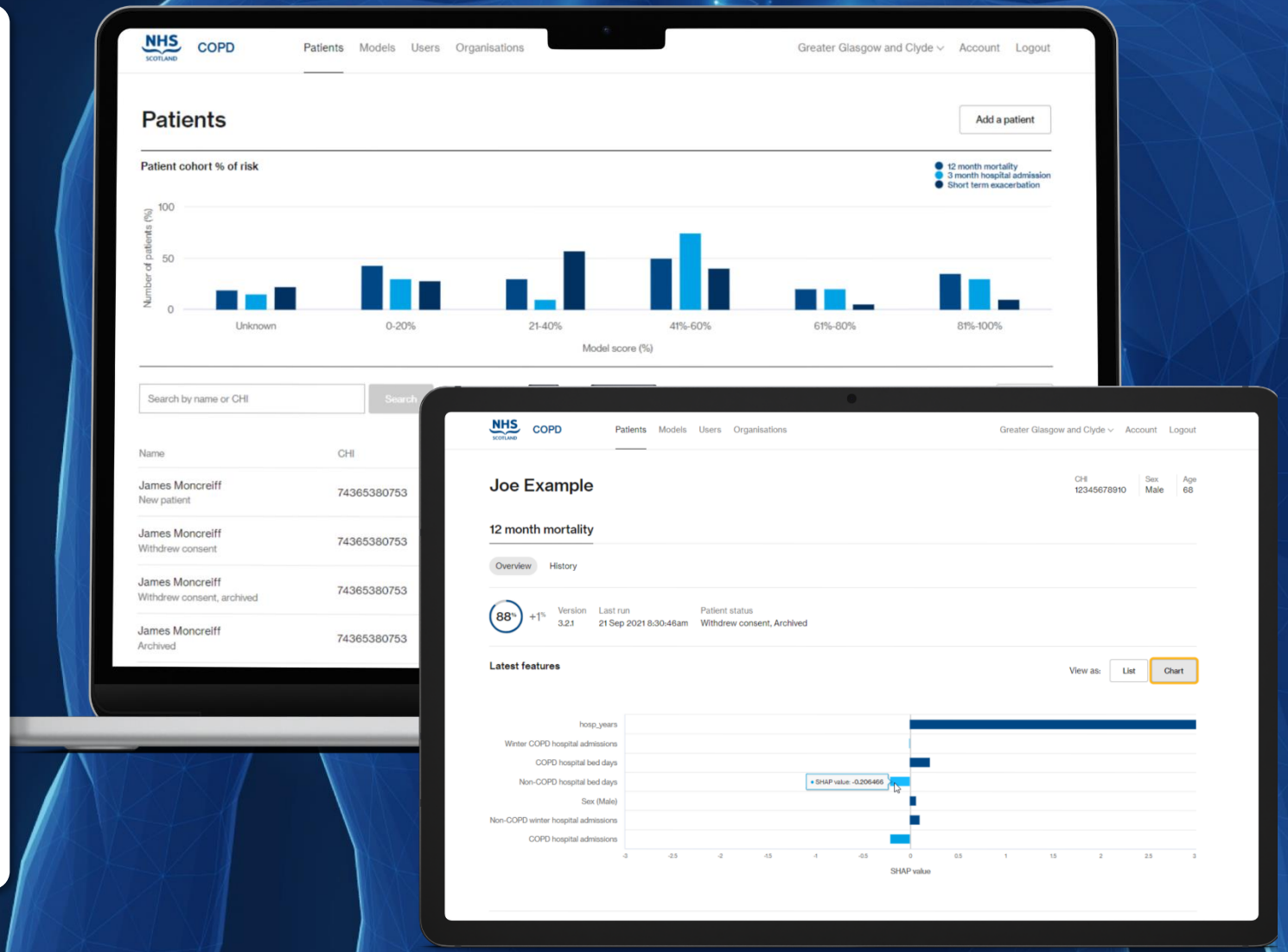
What is DYNAMIC AI?

- Risk based stratification
- Clinical MDT Discussion
- Actionable Insights
- Decision Support
- Informed direction of resource



Planning and set up

- MHRA Clinical Trial Application
- Ethical Approval
- Document preparation
- Research Protocol
- Investigators Brochure
- Patient-facing documentation
- Patient-Public Engagement



Regulatory Framework

- **MHRA Regulated Trial**
  - Medical Device Regulations 2002
  - Clinical Trial Application- ‘Notice of No Objection’
    - Trial document set
    - Technical documentation
- **Experience**
  - Clinical trials using AI are relatively new
  - Feedback from MHRA during application process
  - Dialogue between researchers and regulators ongoing

MHRA Medical Device Regulation

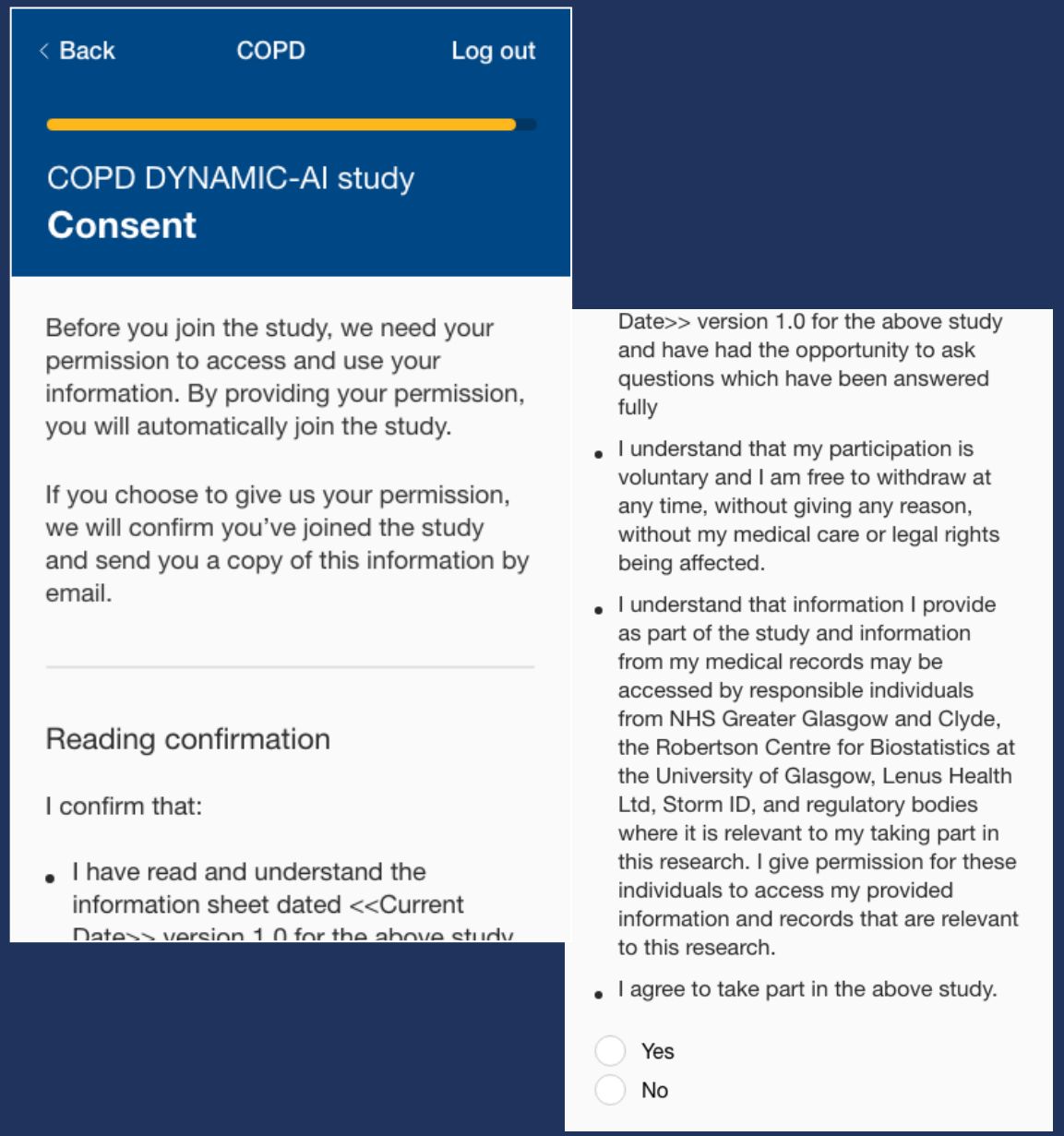
MHRA Software AI Guidelines 2023

Informed Consent

Digital Consent Process

Requirement of Good Clinical Practice

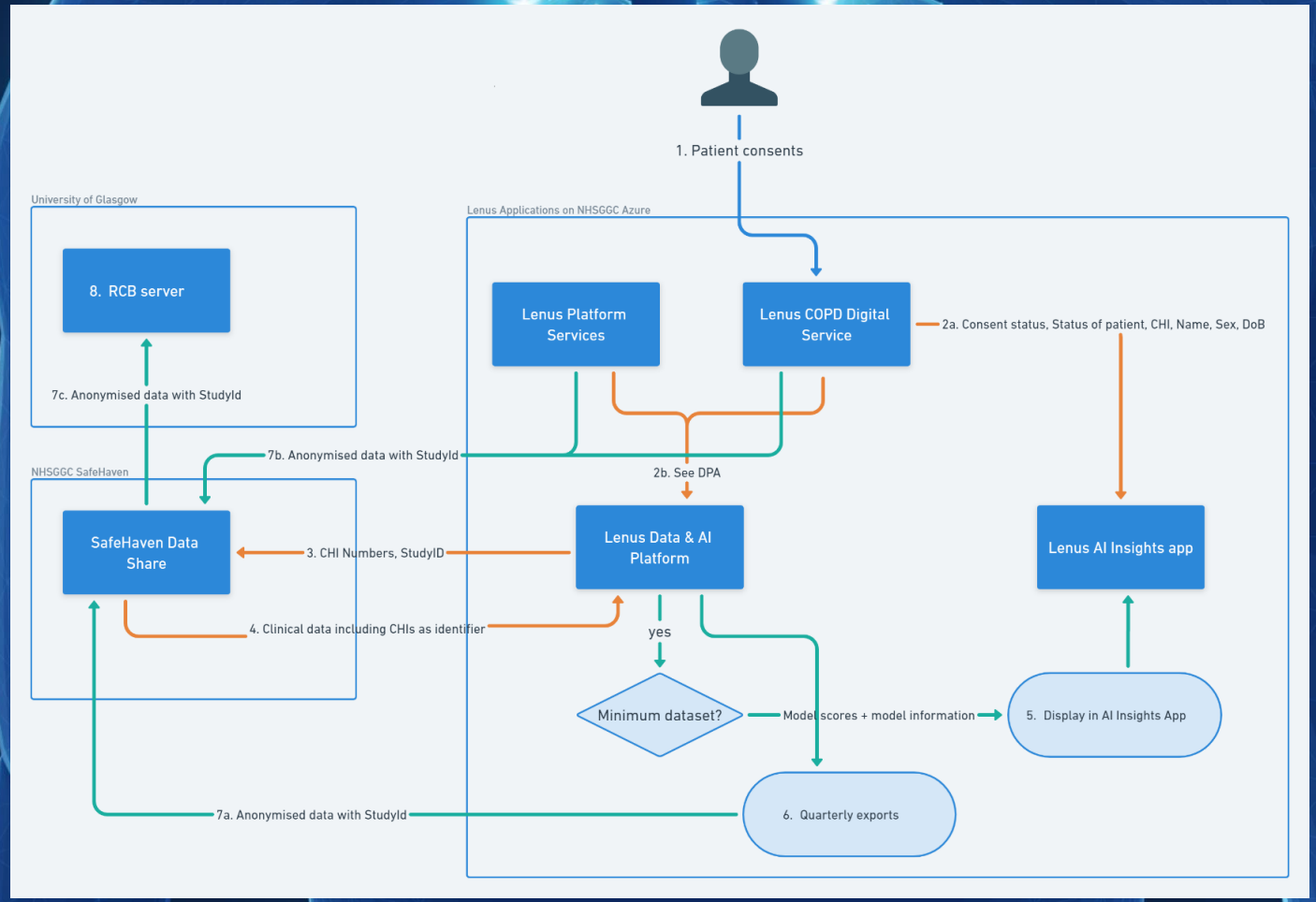
AI brings additional responsibility to explain clearly



Data Privacy and security

How data is used in DYNAMIC AI

- Model training
- Model Inferencing
- Research datasets
- Production data from Lenus COPD (Digital Service)



Data Protection Regulations

- AI falls under existing regulations
- UK GDPR and Data Protection Act
- Health board is data controller
- Internal Information Governance
- Data Protection Impact Assessment
- Data Processing Agreements for data processing and transfers
- Next steps

Trial management

Trial Management

- Sponsor Governance
  - Compliance, Safety reporting, monitoring
- Trial Management Group
  - Independent Oversight
  - Executive function
- Model Approval Process

What next for AI in healthcare?

Challenges

- Public awareness and concerns
- Safety
- How to realise benefits
- Relevant regulations
- Change management
- Performance
- Strategy and policy development
- Transparency and explainability

Making the transition

- Innovation
- Evidence
- Change Management
- Service Evaluation
- Trust
- Post-Implementation Surveillance