Innovations in COPD

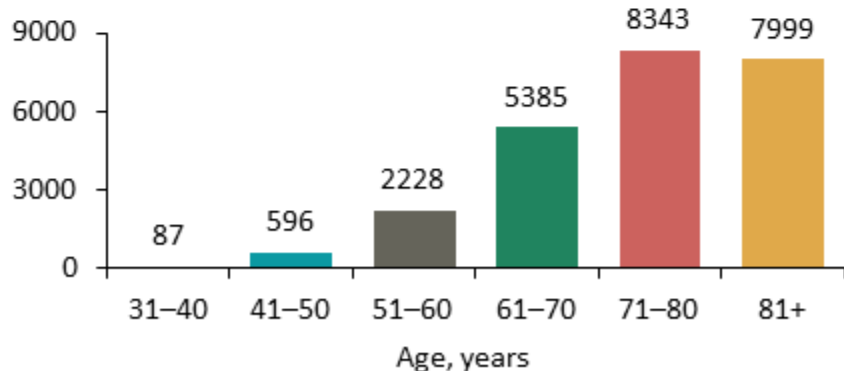Gourab Choudhury

Epidemiology: UK

An estimated **1.2 million people** are living with diagnosed COPD in the UK, meaning an **overall prevalence of 2%**
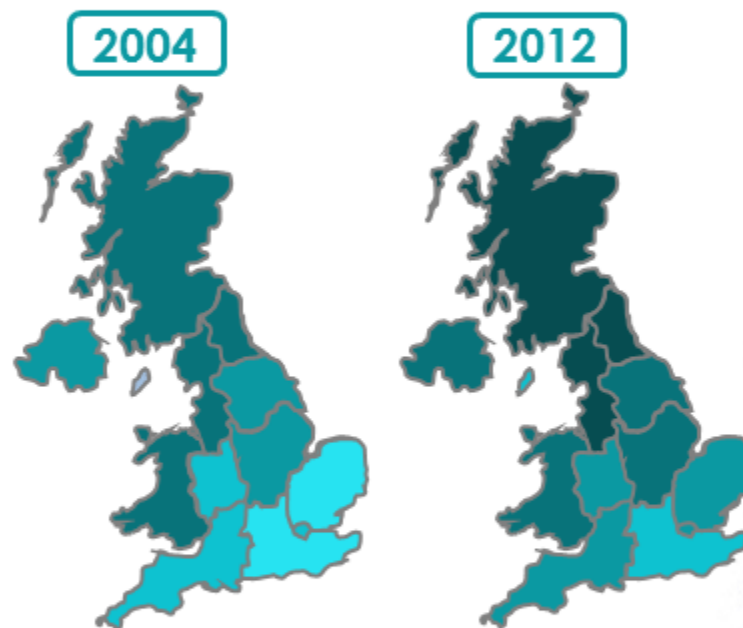

= 100,000 individuals

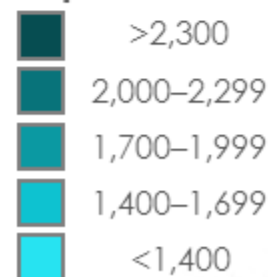COPD is more prevalent in older individuals

Ever diagnosed with COPD per 100,000 population, 2012

Age, years	Value
31–40	87
41–50	596
51–60	2228
61–70	5385
71–80	8343
81+	7999

The prevalence of COPD in the UK is increasing year-on-year

2004   2012

Ever diagnosed per 100,000 population

- >2,300
- 2,000–2,299
- 1,700–1,999
- 1,400–1,699
- <1,400

Socioeconomic impact: UK

Costs the NHS £800 million per annum

£££££££

£ = £100 million

1 million in-patient bed days per annum

24 million working days lost per annum

🕐🕐🕐🕐🕐🕐🕐🕐
🕐🕐🕐🕐🕐🕐🕐🕐
🕐🕐🕐🕐🕐🕐🕐🕐

🕐 = 1 million working days

=

Costing the UK £2.7 billion

£££££££££
£££££££££
£££££££££

£ = £100 million

Department of Health. Facts about COPD 2010
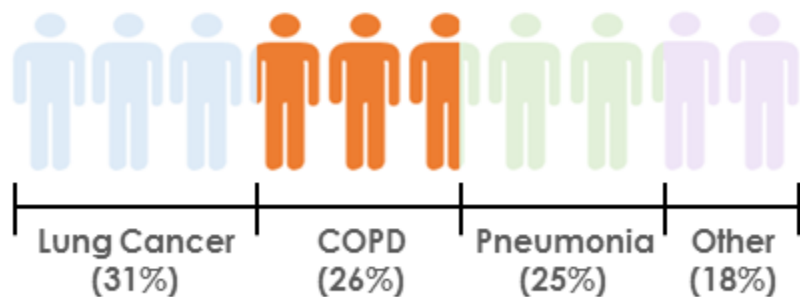
Morbidity / mortality: UK

29,776 COPD deaths in 2012

15,245 Male | **14,531 Female**

**Equivalent to
1 death in every 20 in the UK**

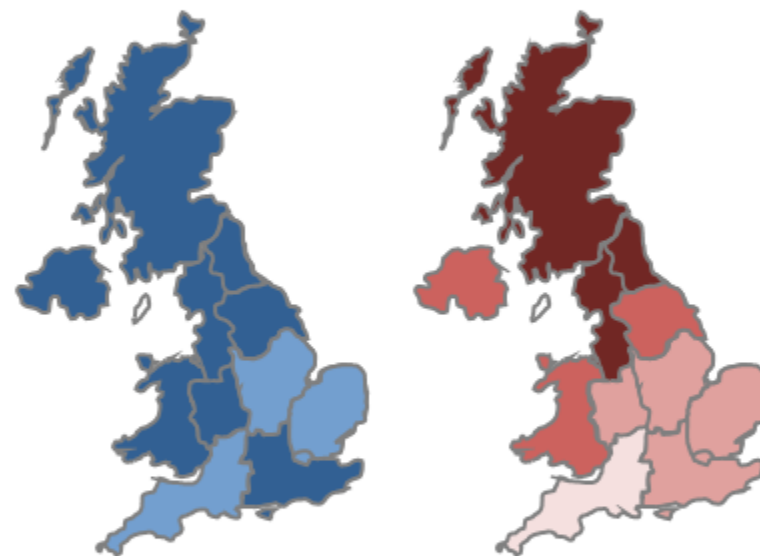## COPD is the second largest contributor to respiratory mortality

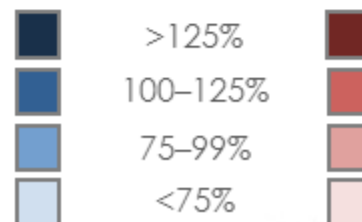Lung Cancer (31%) | COPD (26%) | Pneumonia (25%) | Other (18%)

Mortality rates are higher than the national average in the North of the UK

Male | **Female**

Regional/national COPD age-standardised mortality ratio, 2008–2012

>125%	
100–125%	
75–99%	
<75%	

Background

- Over the next 10 years the proportion of over 75s in Scotland's population; who are the highest users of NHS services – will continue to rise.

- There will be a continuing shift in the pattern of disease towards long-term conditions, particularly with growing numbers of older people with multiple conditions and complex needs such as COPD or dementia.

- We therefore need to visualise the NHS that will best meet the needs of the future in a way that is sustainable, and then make the changes necessary to turn the vision into reality.
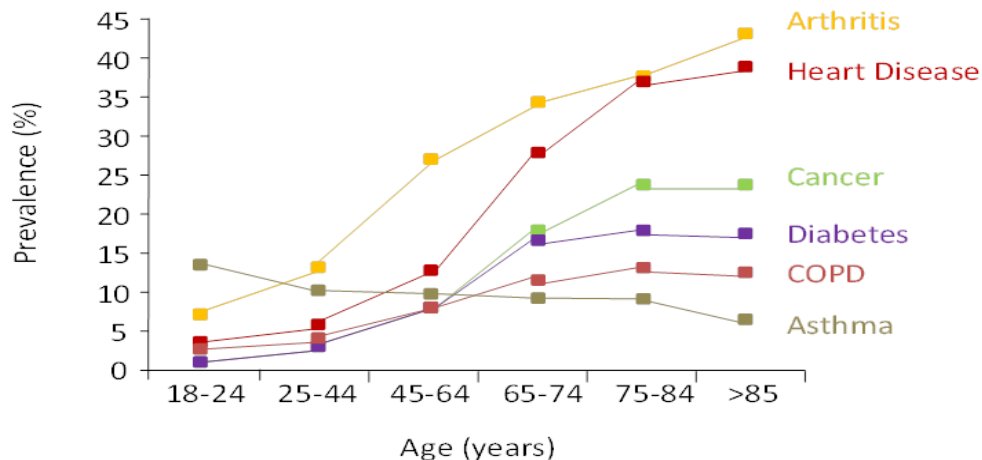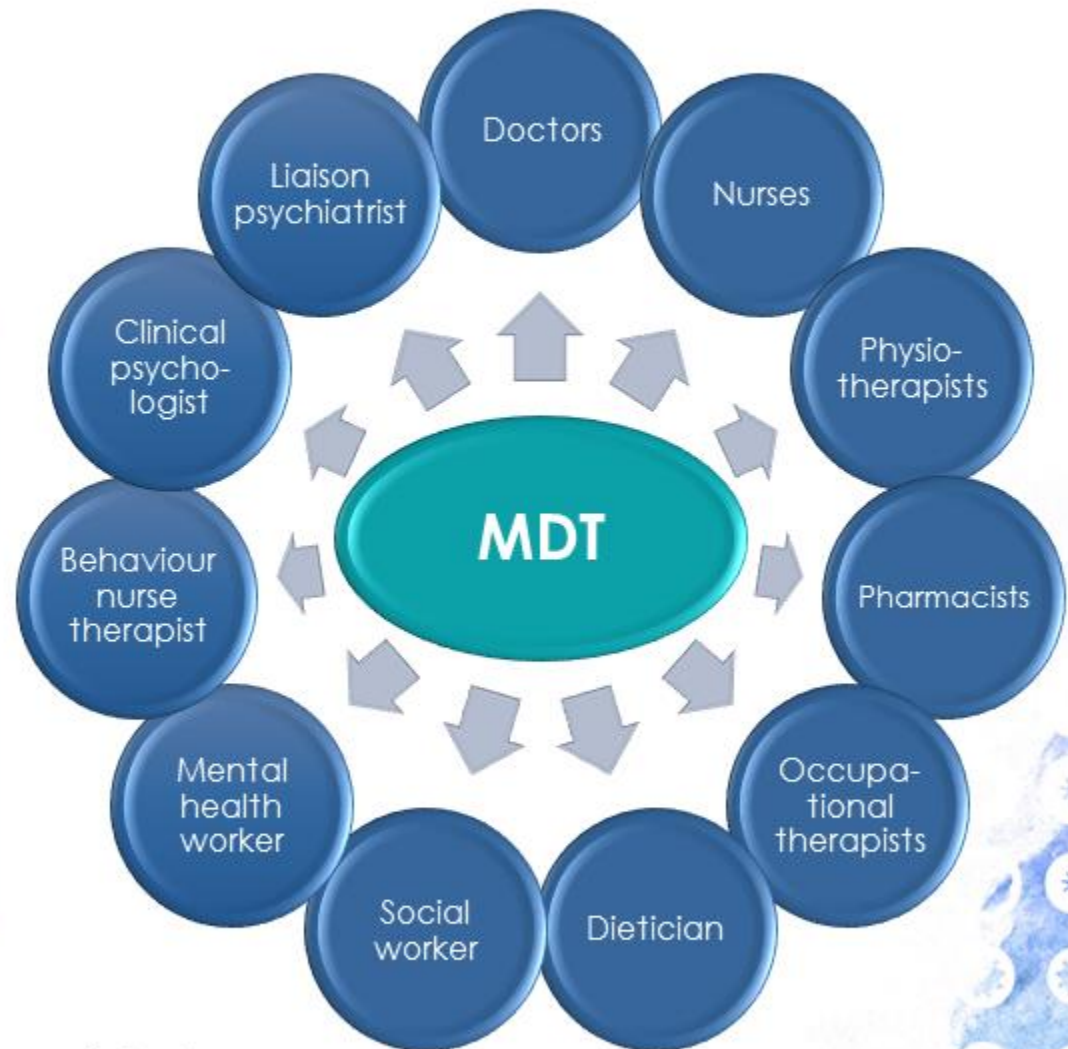
Multidisciplinary management

- COPD care should be delivered by an MDT
- MDT activities include:
  - assessing patients
  - care and treatment of patients
  - advising patients on self-management strategies
  - identifying and monitoring patients at high risk of exacerbations and undertaking activities which aim to avoid emergency admissions
  - advising patients on exercise
  - education of patients/HCPs

MDT

Doctors · Nurses · Physio-therapists · Pharmacists · Occupa-tional therapists · Dietician · Social worker · Mental health worker · Behaviour nurse therapist · Clinical psycho-logist · Liaison psychiatrist

SG High Impact Changes
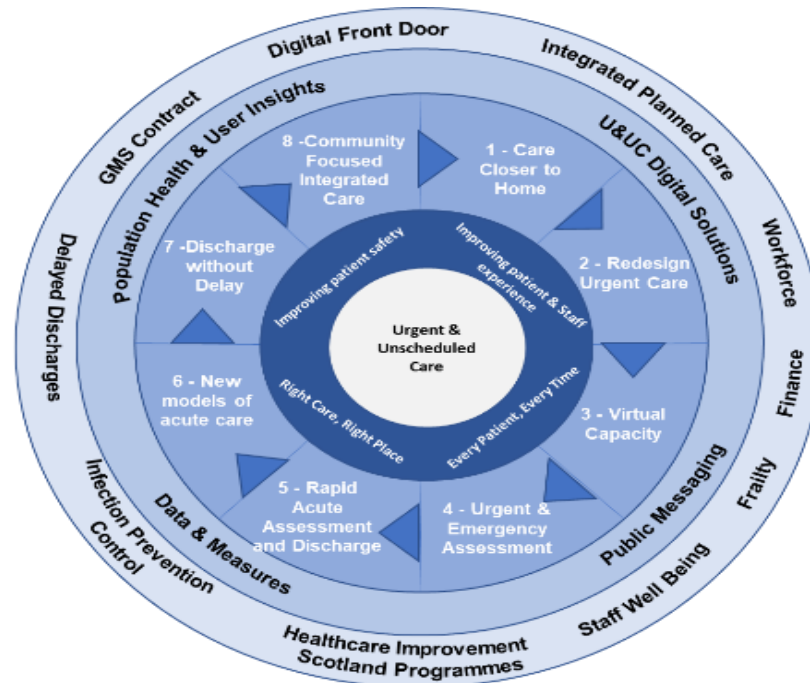
Outcomes
High Impact Changes
Underpinning principles
Influencers and enablers

The current four strands of Respiratory Ambulatory Services thus being given special focus are:

Community Respiratory Teams (CRT)
Virtual home Monitoring and Supported Self-Management
Early Supported Discharge (ESD)
Hot Clinics

User experience of digital

Figure 13. UK smartphone penetration since 2012 (%)

Question. Which, if any, of the following devices do you own or have ready access to?
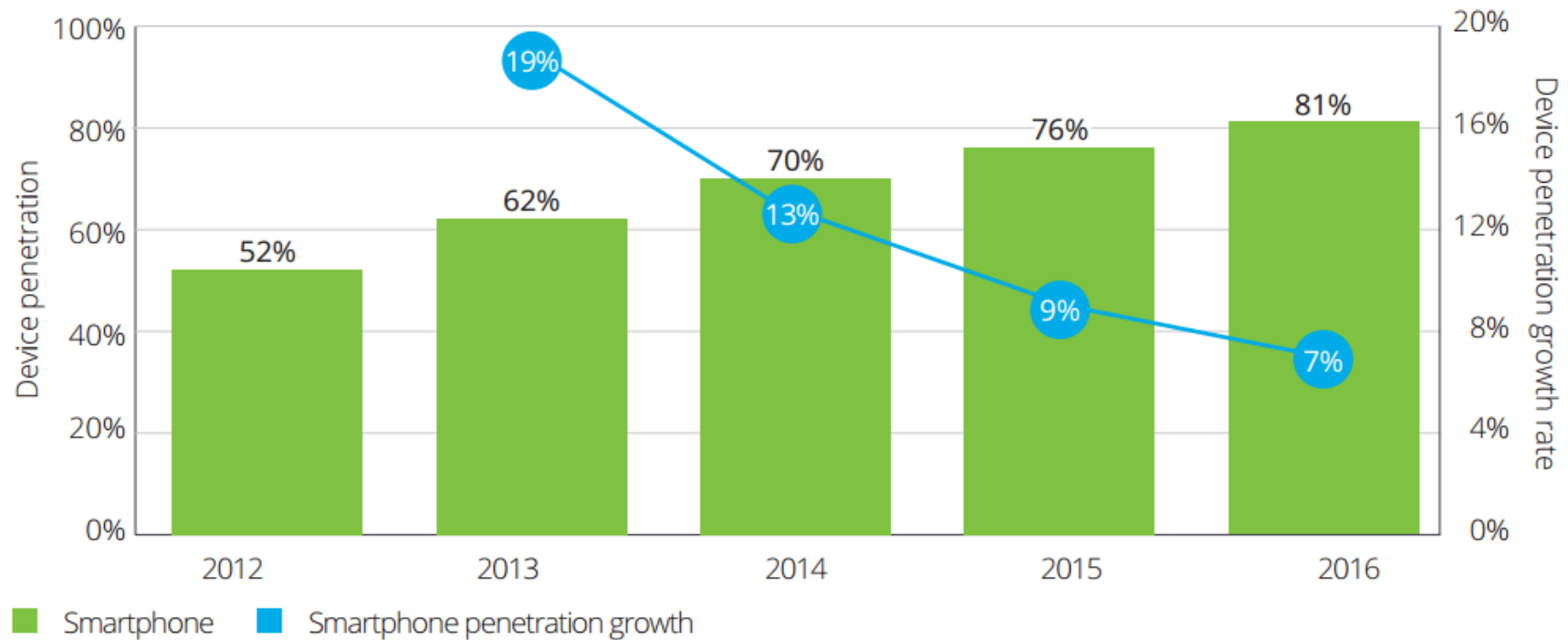
Note: Growth rate is calculated as year-on-year growth

Weighted base (2012/2013/2014/2015/2016): All respondents (2,060/4,020/4,000/4,000/4,003)

Source: UK edition, Deloitte Global Mobile Consumer Survey, May–Jun 2012, May 2013, May 2014, May–Jun 2015, May–Jun 2016

COPD Innovation in Lothian

- Early and better identification of COPD is a key objective
- Focus then needs to be on
- Monitoring of high-risk patients: e.g. Dynamic Scot
- Identifying at risk patients and prevent them from becoming high-risk (DataLoch and Lenus)
- Digital integration between Primary and Secondary Care is key to achieve this: NHS Lothian innovation work
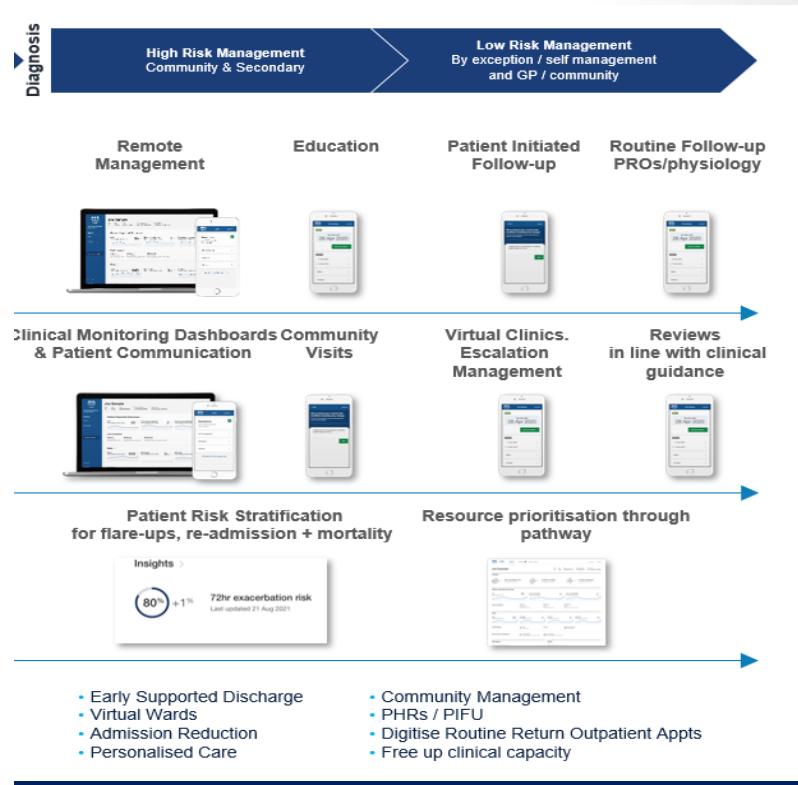
Enablers

- Scottish Government Ambulatory Interface Group
- Centre for Sustainable Delivery
- Accelerating integration with 3rd Sector : CHSS and BLF are key partners
- Building collaborations with industry – Astra Zeneca

BSc Student work
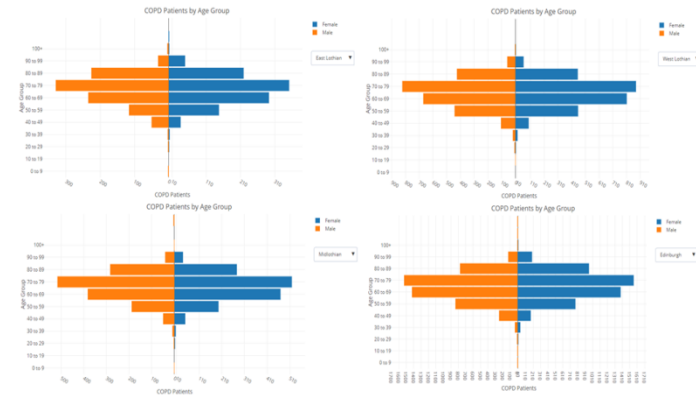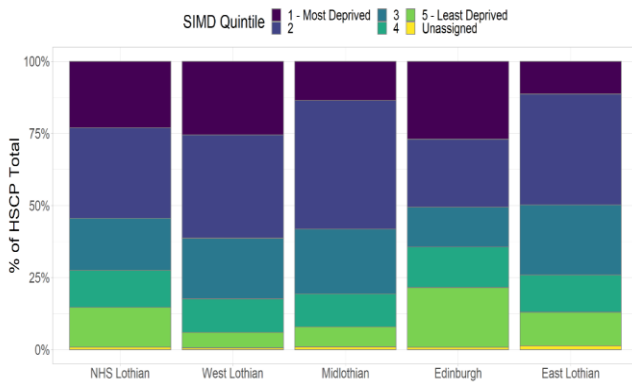
Challenge for running the service	West Lothian	East Lothian	Edinburgh	Midlothian
Staffing, budget and recruitment				
Social Deprivation				
Frailty				
Complex/multi-morbid patients				
Out of Hours Issues				
Remote monitoring				
Capacity and demand				

(green = minimal/not a challenge,
yellow = somewhat of a challenge and
red = major challenge to running of the service)

Balancing Measures

The number of admissions and occupied bed days for 0 and 1 day length of stay has reduced between 2019, 2021 and 2022
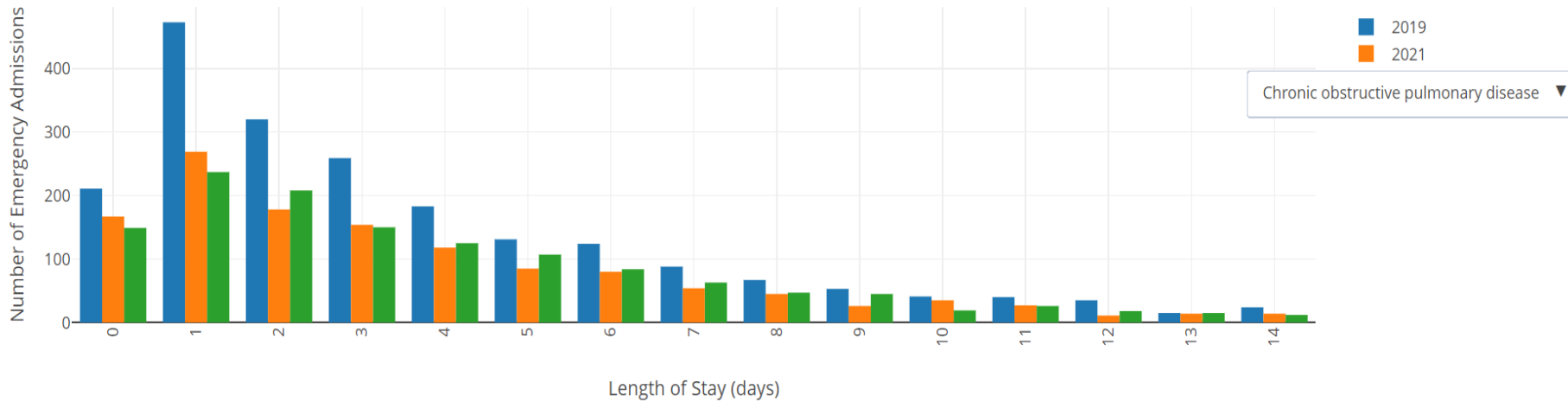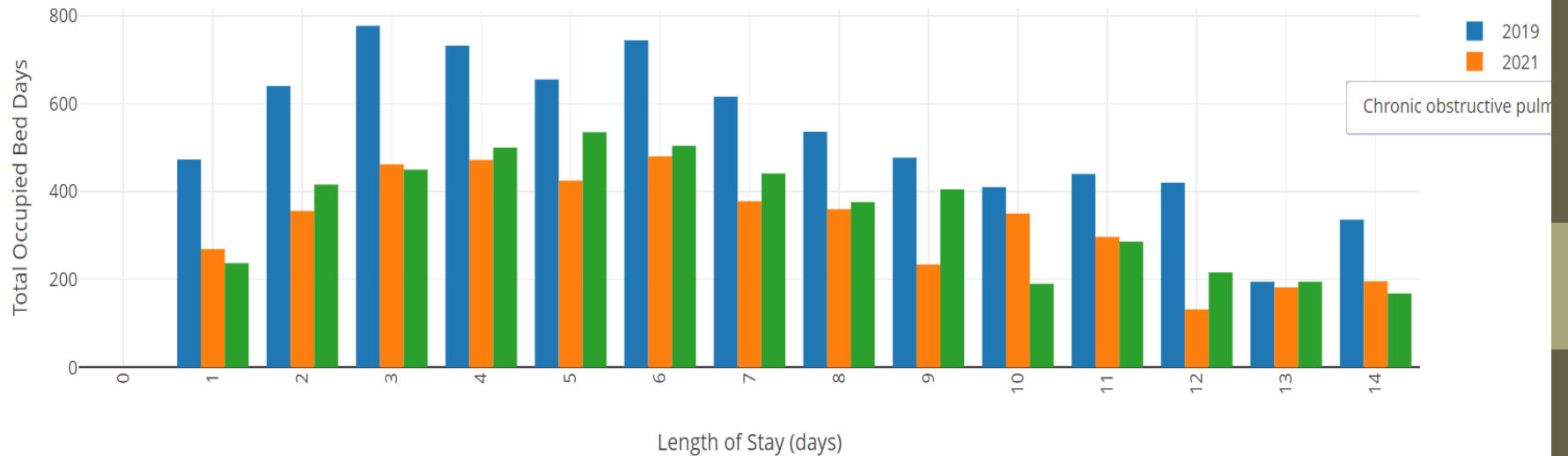
Phase one Lothian COPD Innovation Work:

- **Sample Size**: approximately 50 thousand patients between 2014 and 2023.

- **12-month mortality prediction:** This model is a binary classification model which predicts all-cause 12-month mortality in COPD patients. The model outputs a prediction for deceased or alive in the following 12-months together with both global and local explainability, and the underlying data used to make the prediction.

- **3-month readmission prediction:** This model is a binary classification model which predicts 3-month readmission in COPD patients (respiratory and all-cause). The model outputs a prediction for readmission or no readmission in the following 3-months together with both global and local explainability, and the underlying data used to make the prediction.

- **COPD cohort risk stratification:** This model is an unsupervised learning model that groups patients into k clusters as a means of risk stratification. These clusters are updated with new incoming data and validated by looking at admission, prescription and mortality rates in the 12-months following model training.

Integrated Digitally Enabled regional care & support for COPD

Sustainable → Patient-centred

A digitally enabled regional COPD care programme

Collaborative — Effective

Clinically efficient
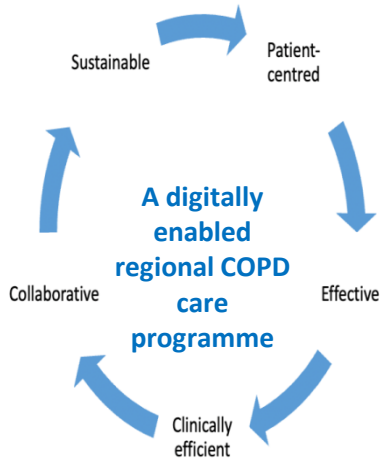
DATA SOURCES AND FEEDS	Patient Reported	Primary Care	Prescribing MI	COPD Specific Data sets
	Third Sector	Secondary Care	Social Care	

DATA PROCESSING & PRESENTATION	INTEGRATED REGIONAL COPD DASHBOARD (**PROJECT 1**)			
	Data Processing & AI	Real time patient phenotyping & stratification	Tracking of disease progression	Presentation to clinical teams & stakeholders
	Event & Outcome measurement tracking			

Stakeholders & collaborators

DDI Data-Driven Innovation

THE UNIVERSITY OF EDINBURGH

AstraZeneca

Chest Heart & Stroke Scotland

NHS

MORE EFFECTIVE, EFFICIENT, COLLABORATIVE, & SUSTAINABLE NHS/SOCIAL CARE (PROJECT 2)

1. Phenotyping and stratification of status and risk for adverse events (e.g. hospital admissions, frequent exacerbations).
2. Dashboard-enabled clinician prompts and prioritisation enabling more effective communication between relevant Primary and Secondary care.
3. AI-enabled:
   • medication review
   • prescribing optimisation
   • prompting for evidence-based interventions (smoking cessation, pulmonary rehabilitation etc)

4. AI driven identification of patients for integrated intensive home monitoring

PATIENT-CENTRED MANAGEMENT

Digitally-enabled self management pathway (PROJECT 3)

Integration of care with CHSS 'No Life Half Lived' Programme & support service (discharge to assess and further enhance patient education) (PROJECT 4)

This content is

We aim to transform COPD service provision in the region from a reactive, high cost approach to one focused on prevention, anticipation and co-management with the objective of reducing COPD hospitalisations by 30%.

The project uses linked, routine health data and aims to use machine learning/AI approaches to:

Automate patient identification, describe incidence, characterise stage and severity, and report regional distribution and trends in COPD over time.

Understand healthcare utilisation by this population including Emergency Department (ED) attendances, hospitalisations and occupied bed days, readmissions and outpatient activity.

Develop risk models to automate identification of patients at risk of hospitalisation and/or high resource use utilising rich data including social determinants of health.

Automate patient flagging for evidence based interventions an pathways.

Ongoing work is developing a regional data-driven dashboard of COPD patients, with automated characterisation and a suite of digital tools to support care coordination of patients across healthcare settings

The project team will train and validate machine learning models for adverse outcomes with modifiable interventions. The project build on an established collaboration between the Usher Institute, DataLoch, NHS Lothian, and Lenus Health, who have entered an agreement with NHS Lothian to develop live clinical dashboards to target better care to COPD

Reducing mortality and morbidity from respiratory disease is one of the seven UK Life Science 'grand challenges'

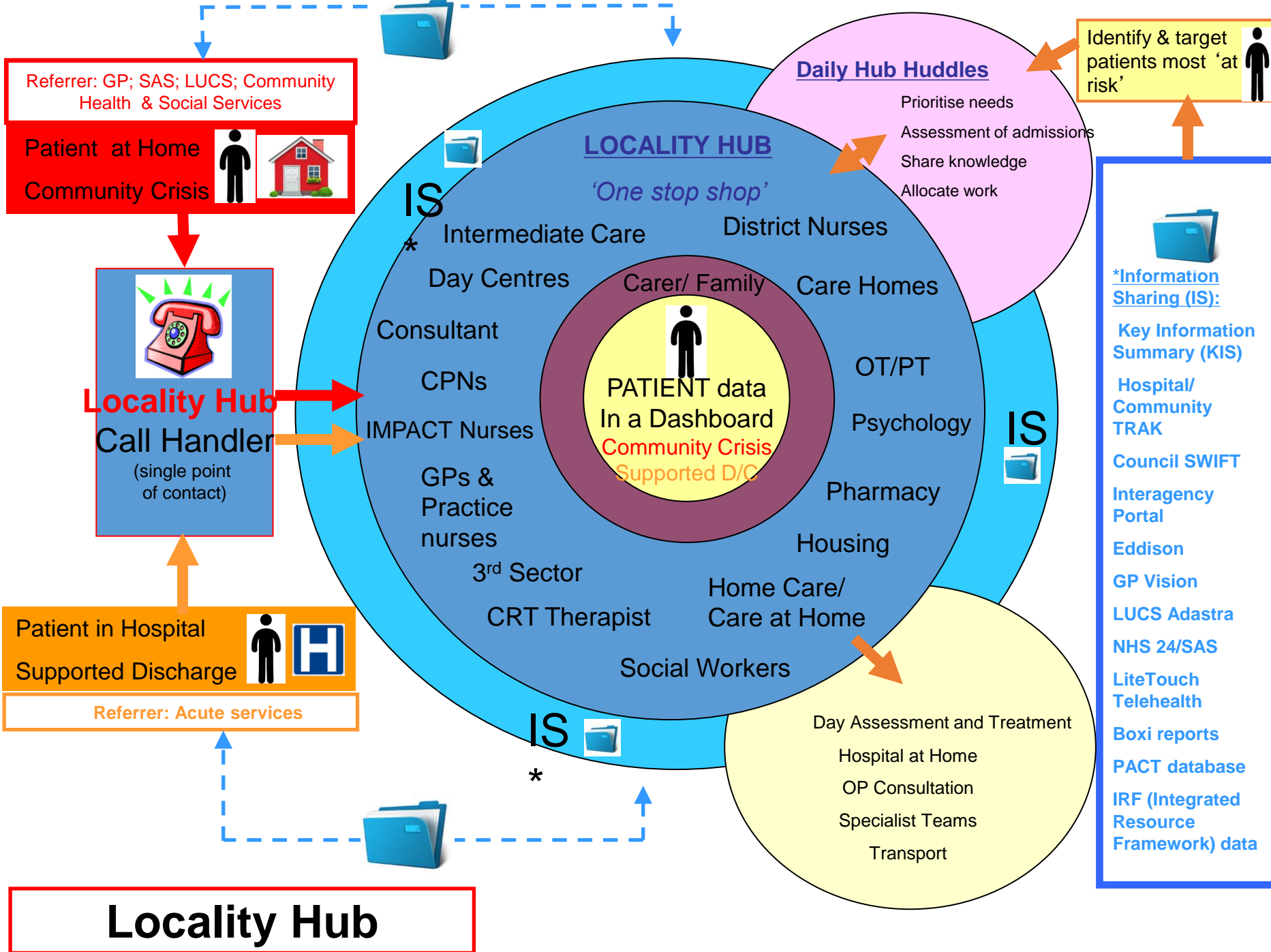@DataCapitalEd

@Data-drivenInnovation Initiative

DDI Podcast

Funded by

THE UNIVERSITY of EDINBURGH

DDI Data-Driven Innovation

Referrer: GP; SAS; LUCS; Community Health & Social Services

Patient at Home
Community Crisis

Locality Hub
Call Handler
(single point of contact)

Patient in Hospital
Supported Discharge

Referrer: Acute services

Locality Hub

LOCALITY HUB
'One stop shop'

IS
*

Intermediate Care
Day Centres
Consultant
CPNs
IMPACT Nurses
GPs & Practice nurses
3rd Sector
CRT Therapist
Social Workers

Carer/ Family

PATIENT data
In a Dashboard
Community Crisis
Supported D/C

District Nurses
Care Homes
OT/PT
Psychology
Pharmacy
Housing
Home Care/ Care at Home

IS

IS
*

Daily Hub Huddles
Prioritise needs
Assessment of admissions
Share knowledge
Allocate work

Identify & target patients most 'at risk'

Day Assessment and Treatment
Hospital at Home
OP Consultation
Specialist Teams
Transport

*Information Sharing (IS):
 Key Information Summary (KIS)
 Hospital/ Community TRAK
 Council SWIFT
 Interagency Portal
 Eddison
 GP Vision
 LUCS Adastra
 NHS 24/SAS
 LiteTouch Telehealth
 Boxi reports
 PACT database
 IRF (Integrated Resource Framework) data

Acknowledgements

Professor Timothy Walsh

Claire Yerramasu

Reuben Burns

Edinburgh CRT service

Midlothian CRT service

RNS service, ERI

Samantha Smith, Ryan Orr (HISES)

Lenus and Dataloch Teams

Scottish Gov