

USE CASE "Hospital of the future"



CHRISTIAN FLYNN

Medical Doctor

Liverpool University

Hospitals Foundation Trust

Clinical Innovation Fellow

Alder Hey Innovation Centre



'Hospital of the Future' Intelligent Health UK

Dr Christian Flynn
Clinical Fellow in Innovation
25 May 2023

Innovation at Alder Hey

8 years of track record – incubator and accelerator

Largest health innovation Centre in UK with **FTE 40+**

Dedicated centre
1000m²

Working with 50+ SME's and 24 Large corporates

A pipeline of **100** innovation challenges

Grants
£13m

Deployed products with spread

Innovation **World firsts**
3D visualisation In the operating theatre, Chat Bots, AI intervention

5 Innovation Labs
UX, AI, Platforms, Health-tech, Immersive

17
Spin-out companies / VC Investors

Industry Investment
£1.5m

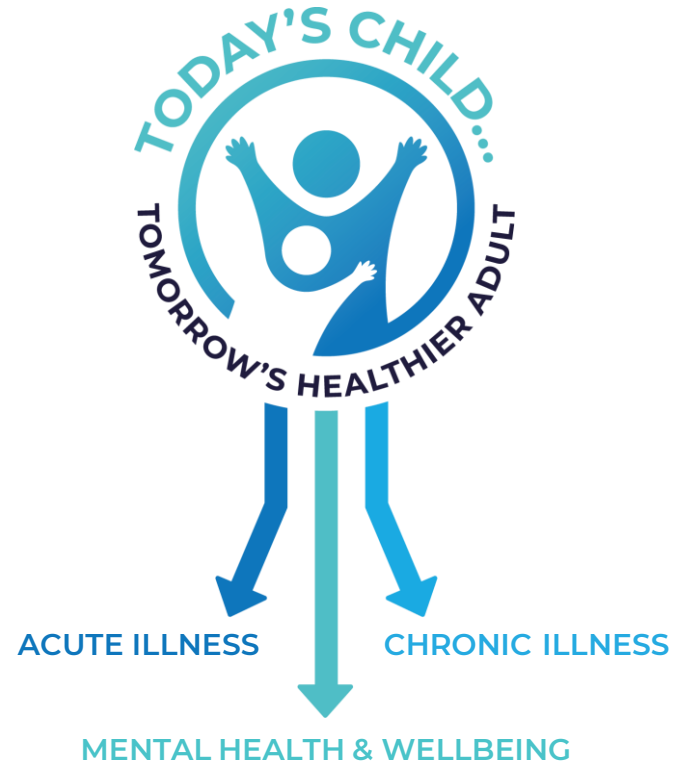


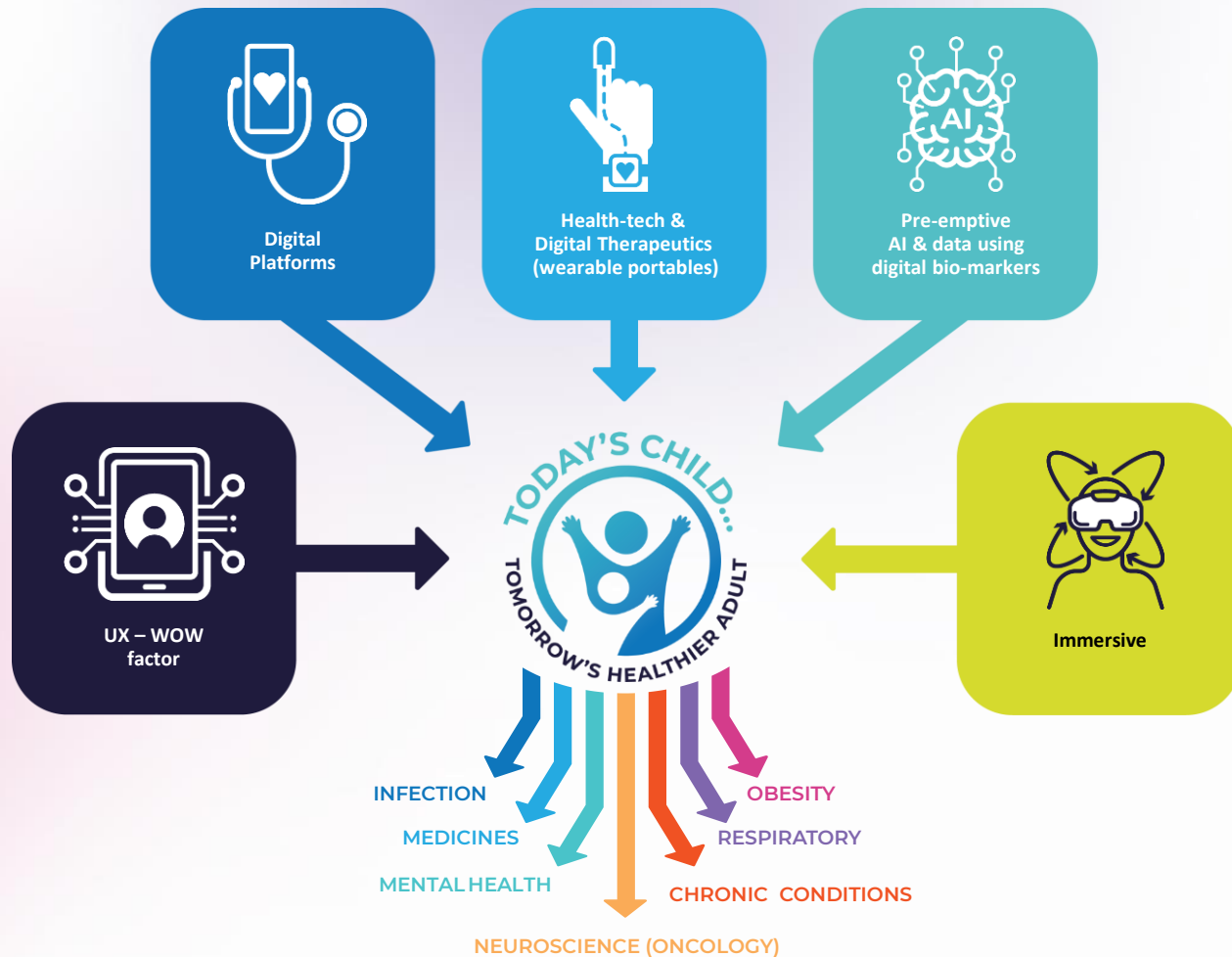
Why innovate?

What happens in childhood lasts a lifetime. Not receiving a fair and healthy start in life endangers a child's future.

Why it's important

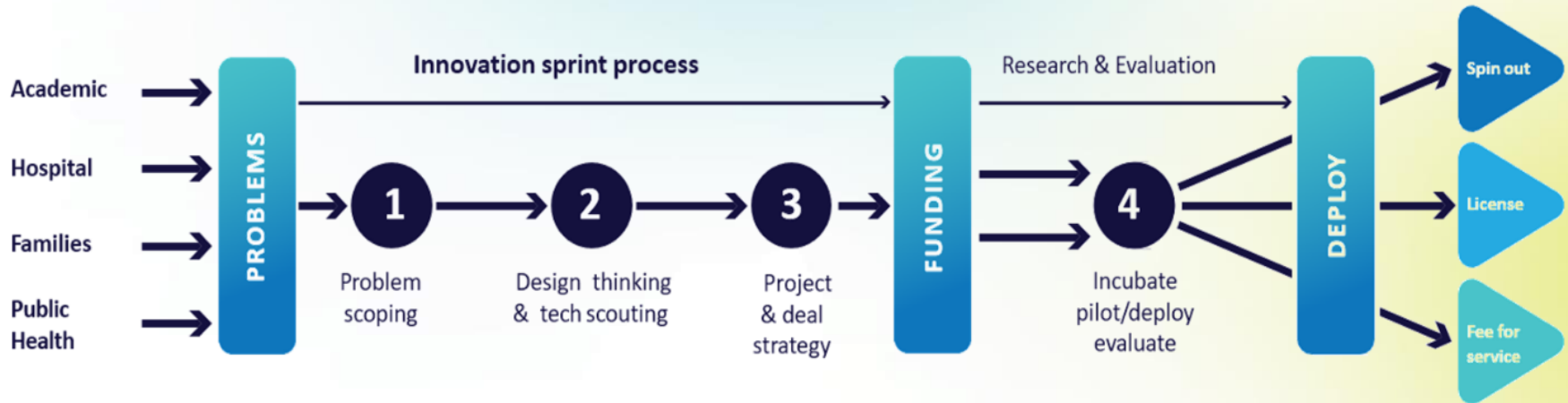
- Children who start behind tend to stay behind
- Early disadvantages impact later life
- Early intervention can significantly improve life chances





Our Process

Innovation? A novel solution that is feasible and adds value



We are **problem solvers!**

AI Landscape

AGI and AI-powered applications will change healthcare

Leading developers



Applications

- Large language model and NLP
- Data analytics and insights
- Automation and decision support

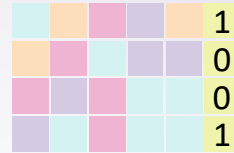
Immediate outputs

- Increase productiveness
- Improve patient outcomes and safety
- Enable personalised medicine
- Education

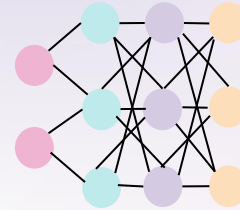
What is AI and Data Science?



Gathering Data



Cleaning



Learning



1 80%

0 20%

Predicting

Leveraging data to create novel insights, bio-markers and approaches to make healthcare more effective and efficient; better experience, diagnosis, treatment and outcomes

Patient safety and data GDPR compliance

Regulation without limiting innovation

Prevent Centralisation

Ensure Equality

Training, recruiting and retaining staff that are AI-capable

Funding AI Research, Development and Integration

AI Use and Patient Choice



Navigating the challenges and limitations of AI

Hospital of the Future

The Three Foundational AI Enhancements for Healthcare

Services

Drastic improvement in efficiency and productiveness for all stakeholders.

Little Hearts at Home

Outcomes

Improve patient outcomes by improving safety, clinical decision support, improve access.

Was Not Brought

Research

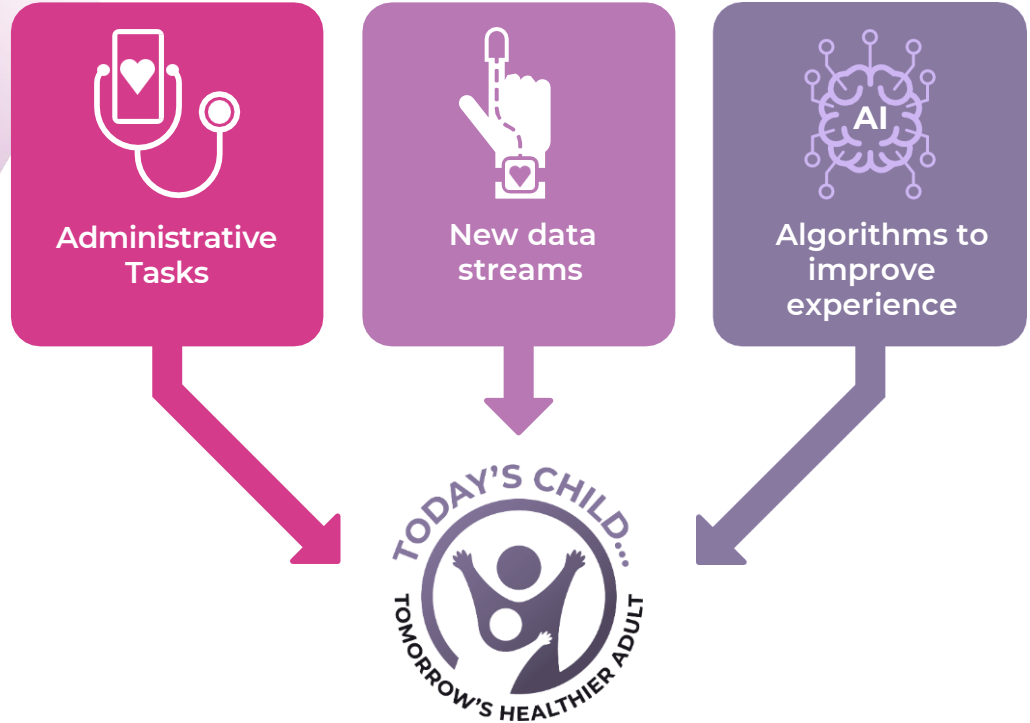
New insights to enable a personalised approach and generation of new drugs and solutions.

Treat2TargetX

Alder Hey Anywhere Platform

Services

Leveraging digital platforms for enhanced efficiency and productivity





Problem

High risk congenital heart disease patients are treated in the **community** by 28 regional teams across North West, North Wales and IOM.

Clinicians at Alder Hey lack access to information for these patients and are only aware of patient deterioration when nurses contact the clinical team at Alder Hey for advice.

High interstage mortality (25-30%) between stages of open-heart surgeries.

Multiple needs including: airway, nutrition, neurodevelopment and Infection

Regular hospital visits.

Solution

Web-based platform for community nurses to record patient observations.

Patients are monitored with set clinical parameters according to individualised condition set by medical guideline and evidence

Alder Hey clinical team are alerted if patients breach their set parameters in a Community Nurse visit.

Dashboard displaying patient information to enable tracking of improvements and deteriorations.

Regional figures are monitored live.



Impact

Care delivered at home.

Improves patient centred care, patient experience & quality of life.

Real-time data allows clinicians in Alder Hey to closely monitor these very complex specialised patients with an automatic alert system .

Facilitates a **SAFE** early discharge post admission.

Improves preventative & pro-active coordination in patient care

Reduces emergent situations and hospital re-admissions for intervention.

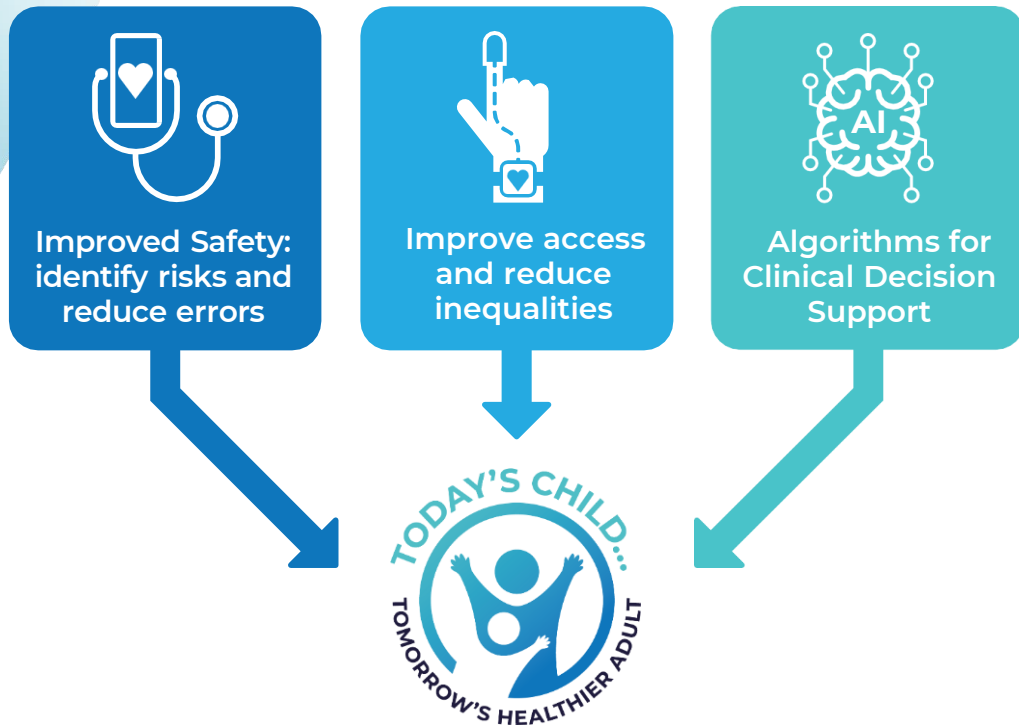


"This project is very meaningful to us, as it is at the core of what we are trying to achieve, enabling little babies to spend more time with their families and get treatment they need, closer to home."

Claire Liddy - Director of Innovation

Outcomes

Optimising patient
outcomes through AI



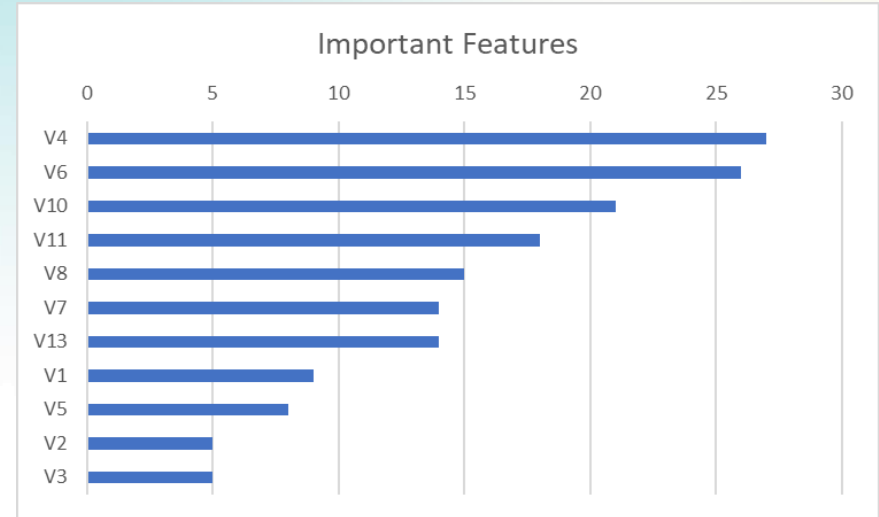
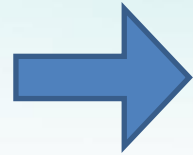
Outcomes: Was Not Brought – Reducing healthcare inequalities

- **7 million appointments not attended (2021-2022)**
 - Large cost
 - Delays in treatment
 - Increase waiting



Missed Appointments – Identification

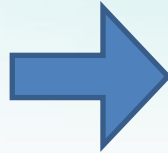
V1	V2	V3	V4	Missed Appointment?
a	13	L3	1	Y
a	11	L4	2	N
a	2	L1	8	N
b	9	L11	4	Y
a	11	L21	6	N
b	3	L1	4	Y
b	13	L1	7	N
b	5	L3	3	N
a	15	L4	6	N
b	5	L7	2	N
b	16	L7	8	Y
a	8	L8	3	N
a	2	L8	10	N
a	3	L6	9	N



Algorithm

Missed Appointments – Prediction

V1	V2	V3	V4	Missed Appointment?
b	7	L7	1	?
a	8	L8	4	?
b	5	L11	3	?
b	6	L12	7	?
b	12	L6	5	?
a	15	L7	6	?
b	6	L5	9	?
b	9	L4	10	?
a	10	L12	7	?
a	1	L6	2	?



V1	V2	V3	V4	Risk of Not Being Brought to Appointment
b	7	L7	1	12%
a	8	L8	4	97%
b	5	L11	3	78%
b	6	L12	7	2%
b	12	L6	5	3%
a	15	L7	6	56%
b	6	L5	9	32%
b	9	L4	10	20%
a	10	L12	7	43%
a	1	L6	2	87%

Algorithm

Missed Appointments – Intervention



Your child has an appointment at Alder Hey on 3rd January. Reply CONFIRM



Outcomes

Optimising patient
outcomes through AI

1

Child/ young person is brought
to their appointment

2

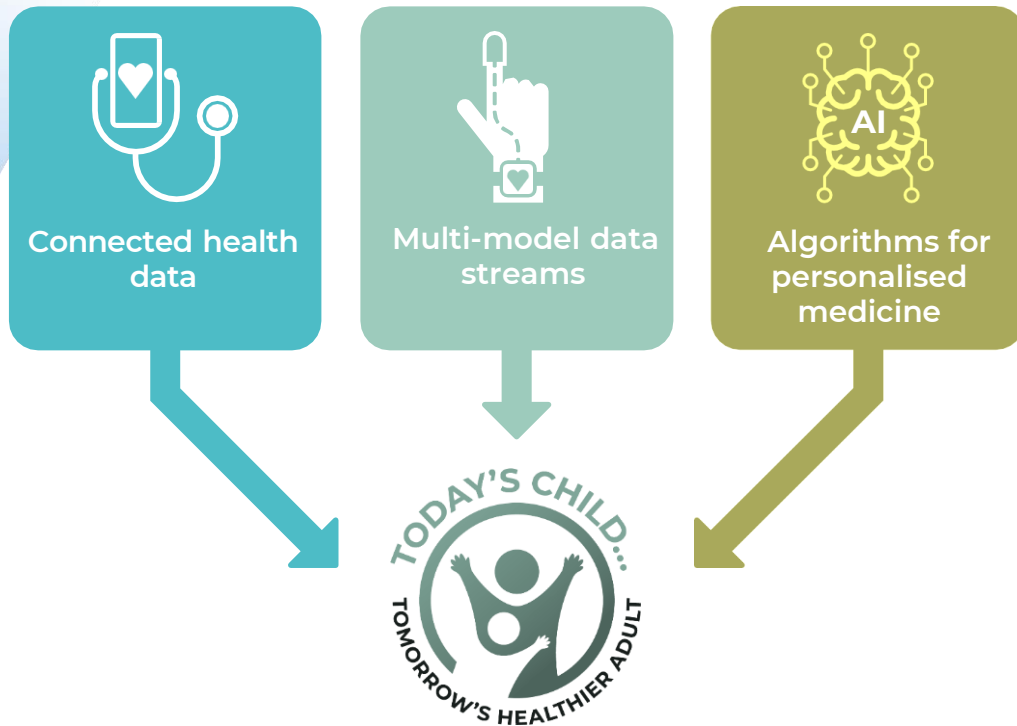
The appointment is rescheduled and
so this empty appointment can be
used by someone else

3

Potential to save the hospital money as less
appointments are wasted

Research

Discover new insights



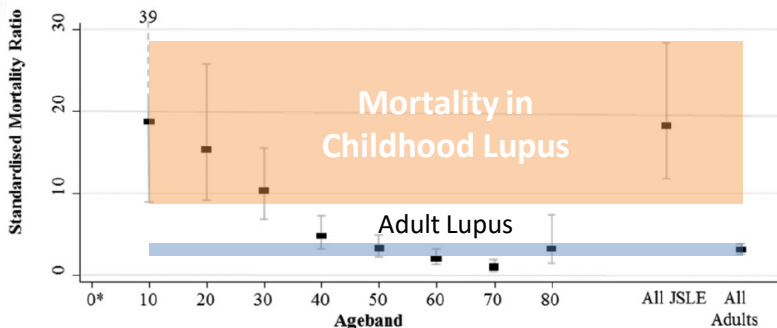
Urgent Need to Improve cSLE Outcomes

Children are more likely to die from cSLE

Compared to adult SLE patients, cSLE patients have:

- Higher disease activity
- Greater medication (steroid) burden
- More severe organ manifestations
- Earlier damage: 21% by 1 year in the UK

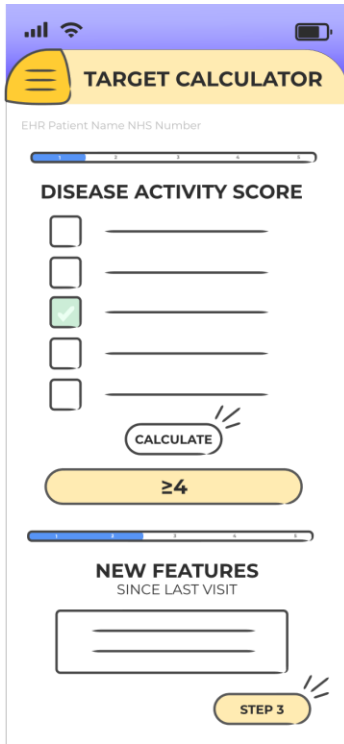
Therapeutic advances are slow



Failure to achieve Lupus Low Disease Activity State (LLDAS):

- organ damage
- more steroid use
- poorer HRQOL
- mortality

Research: Treat2TargetX – data-driven treatment targets



TARGET CALCULATOR

EHR Patient Name NHS Number

DISEASE ACTIVITY SCORE

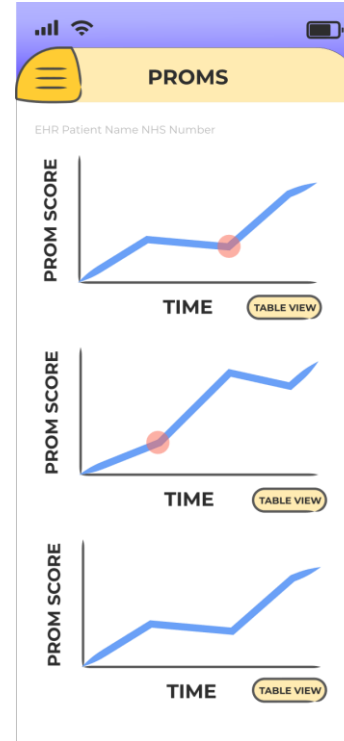
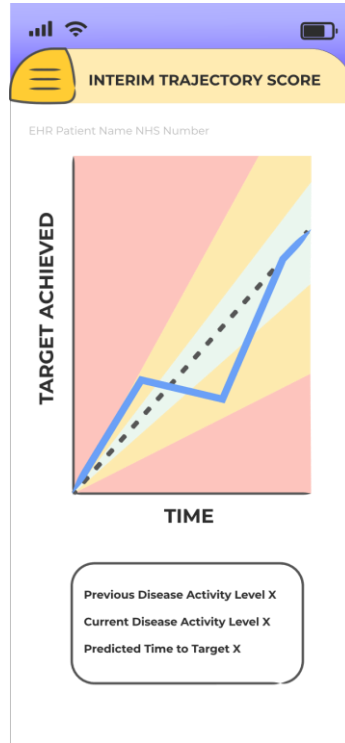
-
-
-
-
-

CALCULATE

≥4



NEW FEATURES
SINCE LAST VISIT

STEP 3



CLINICAL DECISION SUPPORT

EHR Patient Name NHS Number

-  _____
-  _____
-  _____
-  _____
-  _____

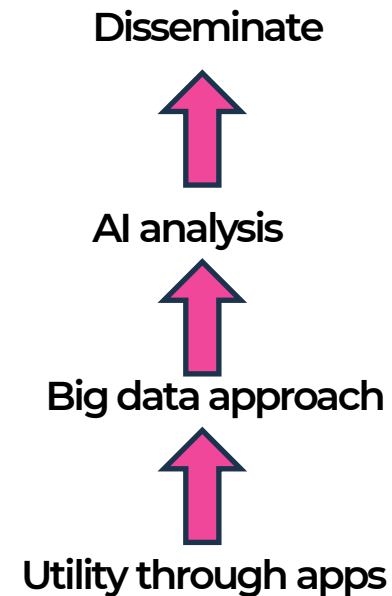
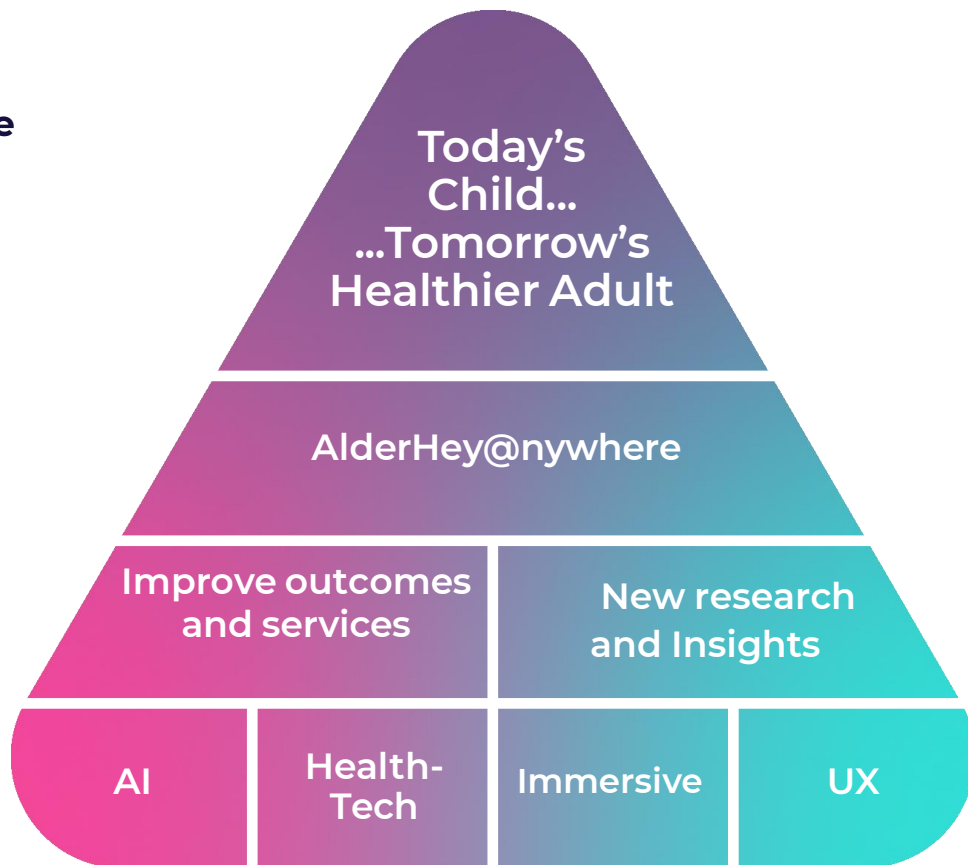
Trained by
research data
and new
outcomes



The Future with AI

Alder Hey @nywhere

- Interoperable
- Versatile
- Collate Health Data



Anywhere – Connected Health Data

In Hospital Monitoring



Hospital Monitoring at Home




Consumer Health Monitoring



Anywhere Engine

- Data Interoperability
- Data Processing
- Data Storage
- Data Lake
- APIs (FHIR, HL7, Custom)
- Embedded AI






Hospital Systems – Electronic Health Records



Anywhere Portal



Visual health data for patient and clinicians *plus* single point of access for services, appointments, resources, patient diary, care plans, results

Secondary Data Usage



Prediction and Prevention Models





Thank you

For further details please contact:
christianflynn@doctors.org.uk



Alder Hey Children's
NHS Foundation Trust



INTELLIGENT HEALTH UK 2023

Breaking down the barriers
between tech and healthcare