

Big three Disease Prevention - Conceptual Model

The Big 3: Cancer, Cardiovascular Disease, COPD

Source Data Types – Distributed Variable Flows Impacting Risk Stratification, Interventions & Longitudinal Follow-up

NHS-Number Linked Anonymised Datasets – Heterogeneous Data Formats

(Apply NHS Digital Scalability Model → Secure Hosting)

Molecular & Cellular level



EXTANT DATA FORMATS
NWC Genomic Medicine Centre,
Northern Pathology IC, Leeds

Quantitative Biomarkers



EXTANT DATA FORMATS
LHLP/LLP/LHCH (images, reports,
cardiology, COPD data)

Population Health Level



FHIR Service
Transforms

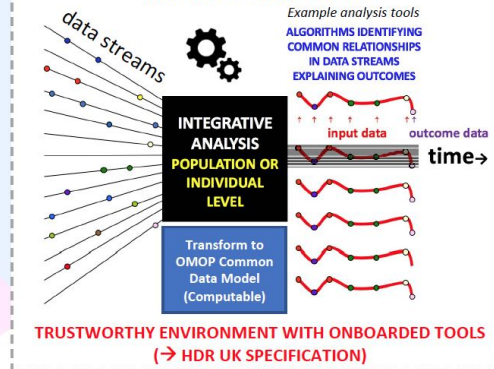
FHIR Service
Transforms

Presymptomatic
Diagnostics/Prognostics

EXTANT DATA SOURCES

LLP – GWAS OncoArray
genetic susceptibility
LLP - Molecular Diagnostics
LLP - UoL Digital Pathology
NWC GMC, NPIC

HL7 UK STANDARD API's



Presymptomatic
Population Stratifiers

EXTANT DATA SOURCES

LLP - ONS, CR, HES
LHLP – EMIS
LHCH - outcome data,
primary care

**Best Practice
Management**

**Preventative
Interventions**

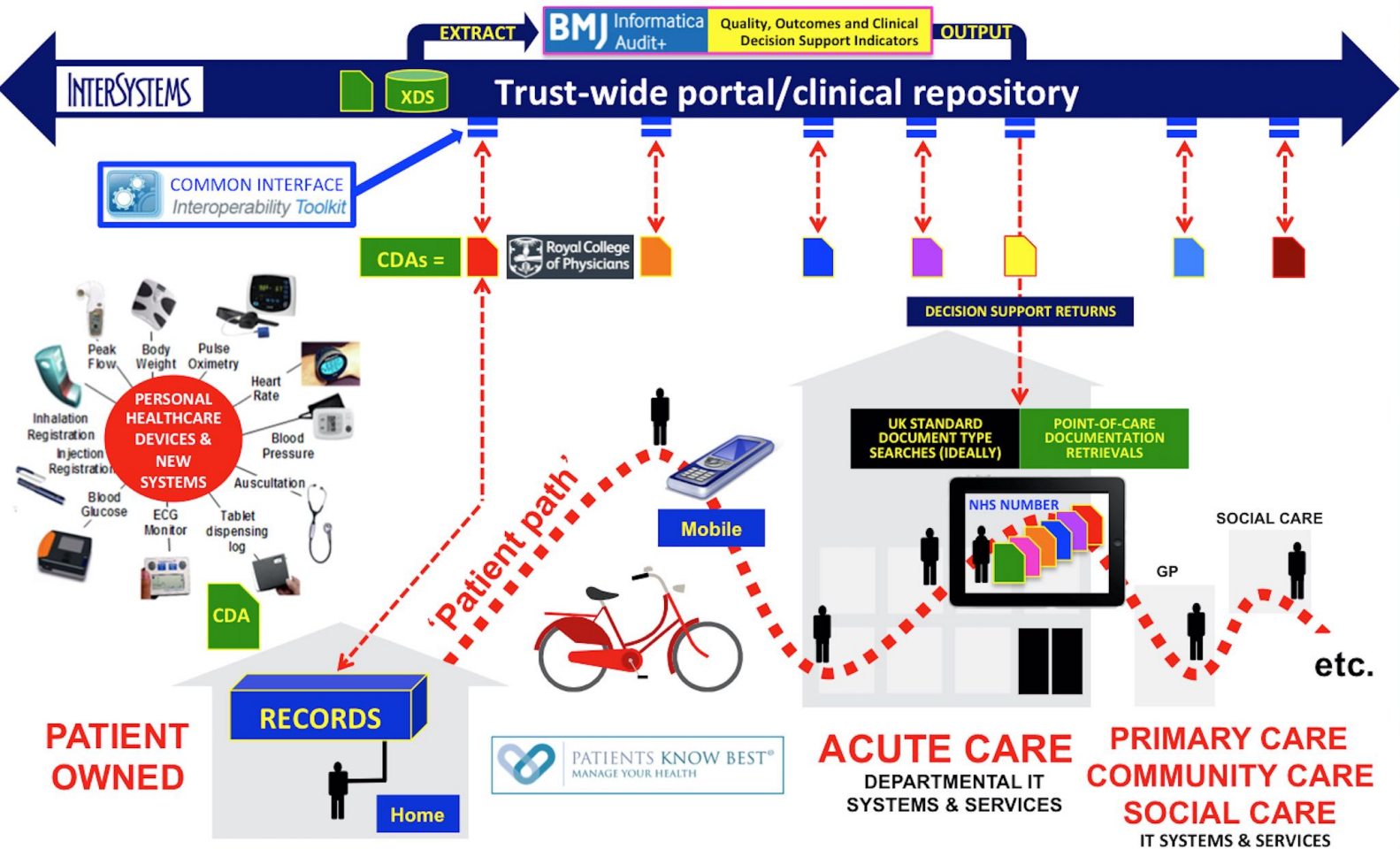


Symbol indicating FHIR/OMOP information services supplying integrative (computable) variables judged relevant to a NWC (→ UK) scale Big 3 prevention system. Determined by NHS and academic experts, they encompass population stratification, disease-intrinsic (molecular/cell/quantitative) biomarkers and population-level relative deprivation variables with central computation prioritising individual entry to screening/pathways.



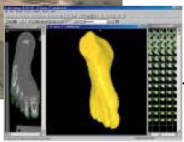
Symbol indicating common integrative analytical toolsets as part of Trustworthy Research Environment (prioritisations, visualisations) using continuous, heterogeneous and multimodal data sets. In due course (beyond scope of exemplar) they will generate outcomes-explanatory algorithms (predictive models) identifying cases progressing to specified outcomes with best preventative interventions.

Paperless Strategy - Conceptual Model



Imaging facilities
MRI Scanner
CT Scanner
PET Scanner

Targeted body metrics



Smart Holograms
Multimodality non-invasive
holographic sensors



Zarlink Semiconductor
External + implantable
RF comms

Healthcare@Home Conceptual Model

Remote retinopathy cameras

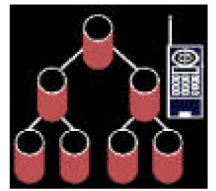


Optometrics

Clinical metabolic analyser



**Institute databases
e.g. genetics**



**Quality self-management
PATIENT FEEDBACK**



**Clinical-management
PRIORITIZATION OF NEED**



PC's, HANDHELDS

IBM
Dedicated Home
Healthcare Server
(monolithic)



Patient's Home
Advanced Services Deployment

QUID
**QUANTITATIVE INDIVIDUALIZED
DIAGNOSTICS MODELLING
ENVIRONMENT**
(multi-enterprise process integrator)
Cardiff University / WeSC



QUIRA
**QUANTITATIVE INDIVIDUALIZED
RISK ANALYSIS APPLICATION**
(proactive population scanning
for pre-symptomatic screening)
Cardiff University / WeSC

PULL

PULL

PULL

PULL

PULL

PUSH

PUSH

PULL

PULL

PULL

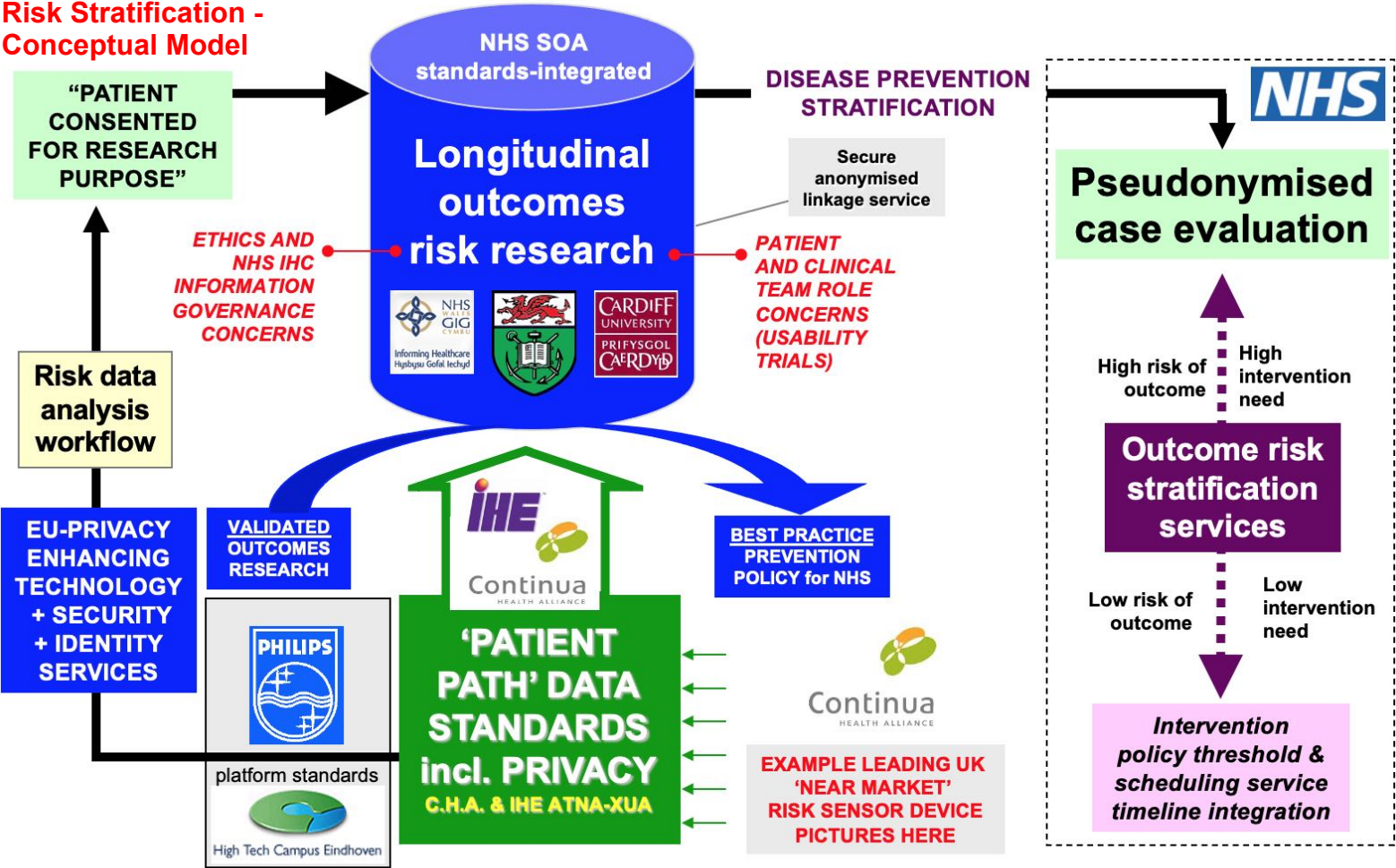
PULL

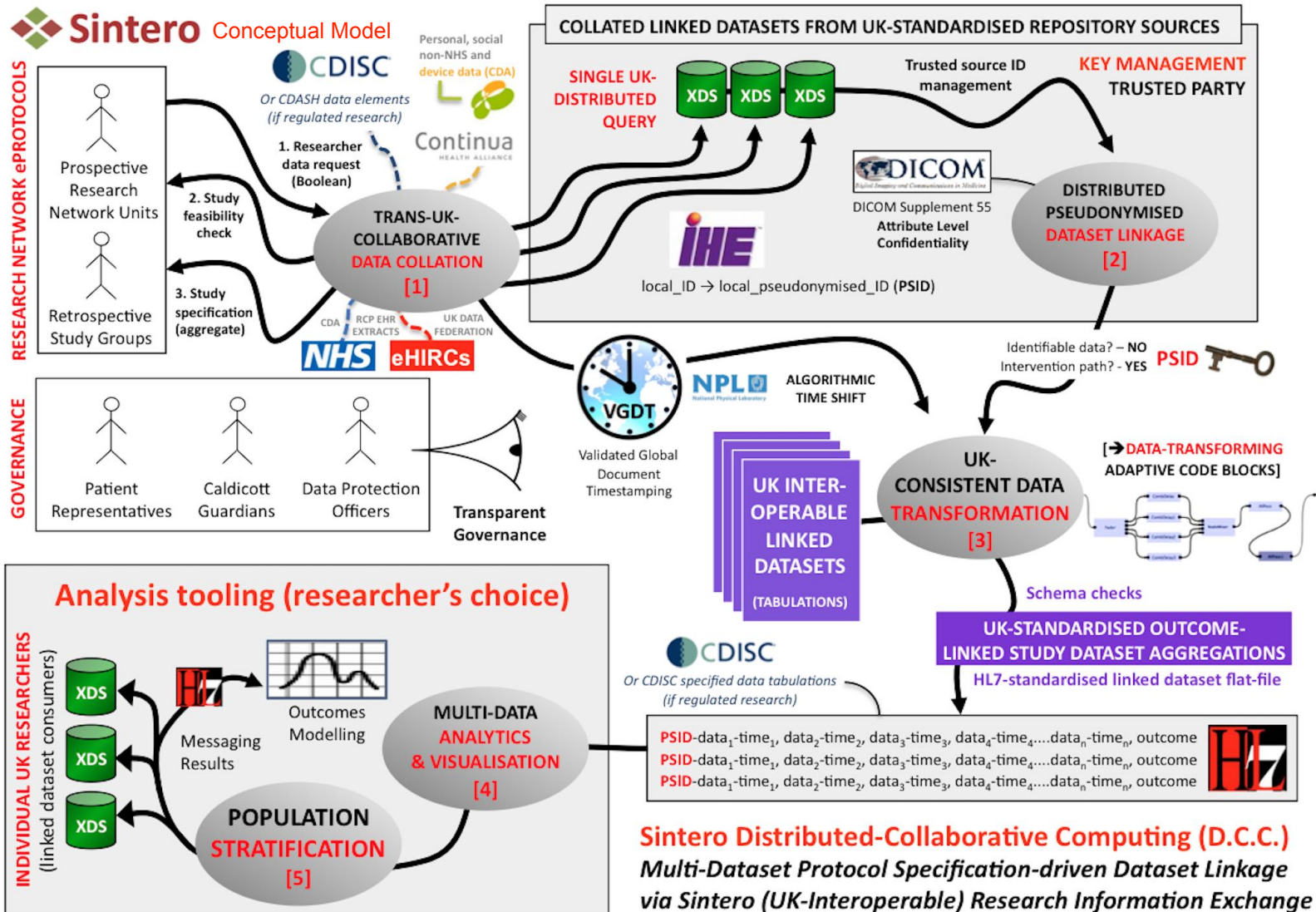
PULL

PUSH (FILTERED)

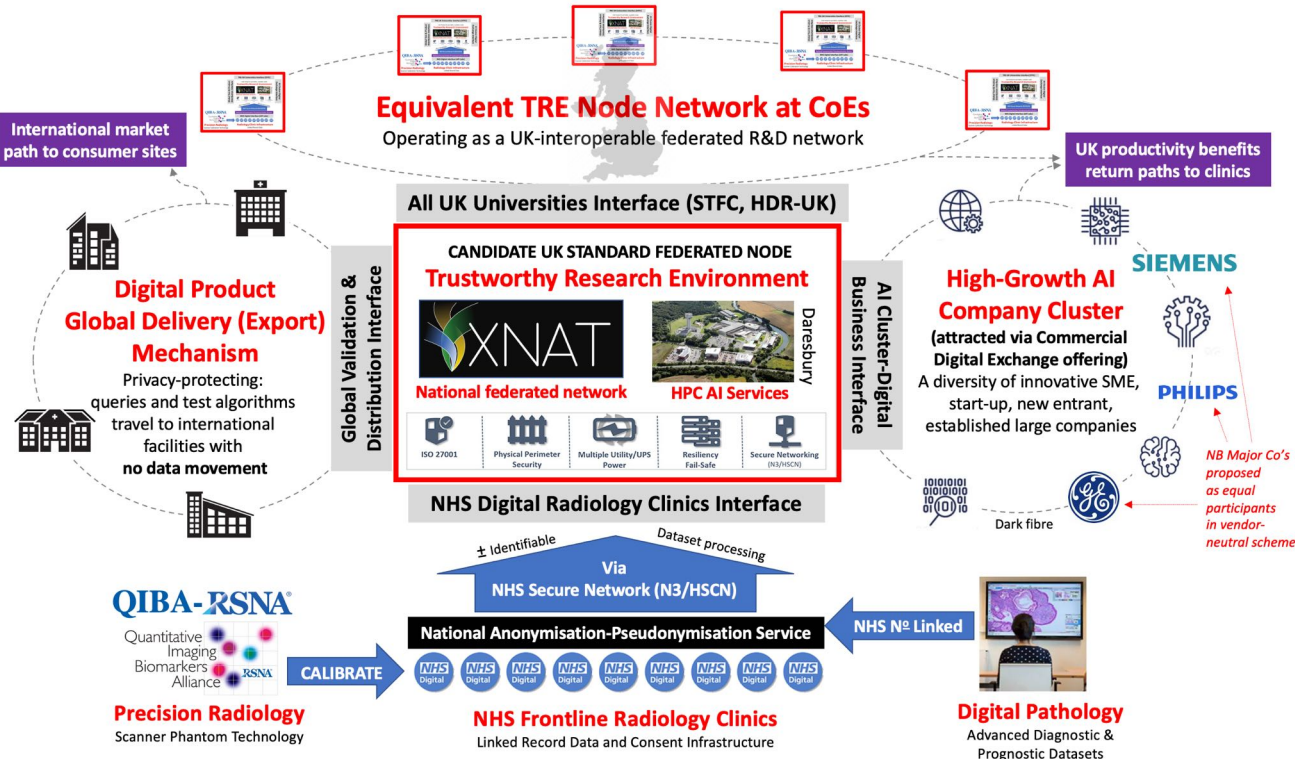
UNOBTRUSIVE
LOCATION

Risk Stratification - Conceptual Model





Vendor-Neutral TRE - Conceptual Model



PROMS - CONCEPTUAL MODEL

Surgery - arrival
(PAERS kiosk)



Admin
(enable/disable)



Invoke
HowRU

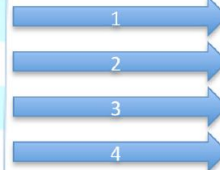
+ audit
+ error logs

Patient status data entry
(Abies HowRU)



Data capture into messages
(4 answers per patient)

Data Items
(standardised)



**EMIS
Open HR
XML
messages**

+ testing
+ accreditation

**General Practice
Patient Electronic
Record System
(EMIS)**

Transfer

Consent form (staff participation) ❖ consent form (patient participation) ❖ patient and staff experience questionnaires/semi-structured interviews ❖ focus groups ❖ observational study/ethnography ❖ field notes ❖ effects of HowRU on consultation

**Completion rates
Data consistency
Typical variation
Validity checks**

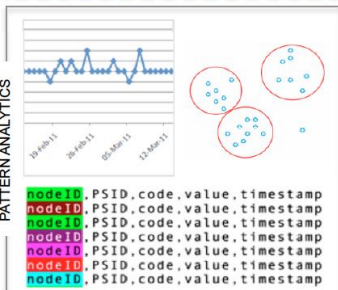
UCL - multi-level case study

**Anonymised or linked-pseudonymised studies
(UCL and Cardiff University)**

Cardiff University – longitudinal / inference / clustering

CLINICAL SETTING

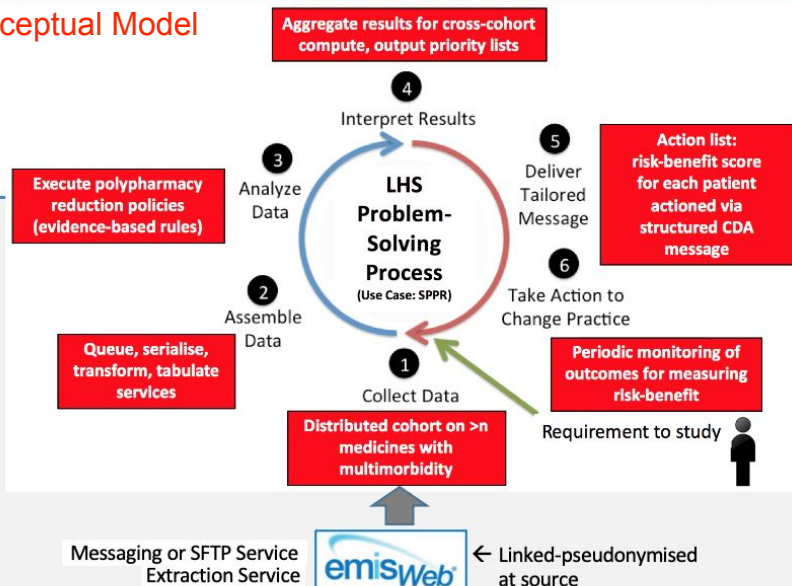
PATTERN ANALYTICS



LHP Personalised Medicine Research Centres (Selected)



Cross-Trust Research Conceptual Model



innovate here re messaging design aka GMR

INBOUND MESSAGING DESIGNER (Messaging Service)

RESOLUTION (Messaging Service) DISCOVERY (Cloud Data Store)

Scalable message queuing and load balancing



ANY LHP SYSTEM STRUCTURED OR UNSTRUCTURED DATA

The Royal Liverpool and Broadgreen

Liverpool Heart and Chest

The Walton Centre

The Clatterbridge Cancer Centre

Primary Care Practices

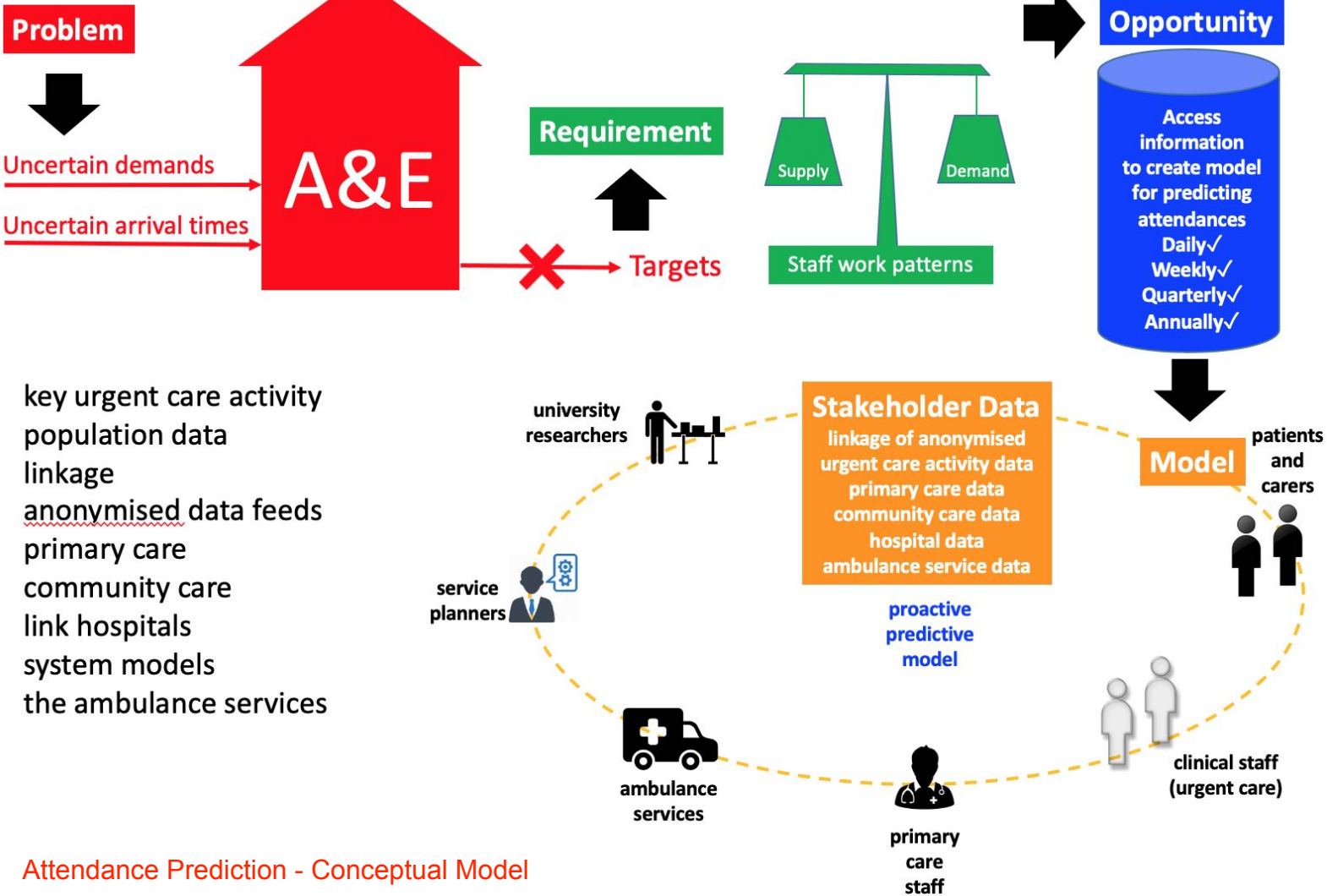
Liverpool Women's

Mersey Care

Alder Hey Children's

Aintree University Hospital

LHP Front-line Data Source Systems (Heterogeneous)



HL7 Genetic Testing Report - Conceptual Model

UK Genetic Test Facilities, Companies and/or Specialists

NHS Knowledge
Assimilation
via GTR Cycle

WP6.
REFINED CLINICAL DECISION
SUPPORT ALGORITHMS

WP2. CLINICAL
MANAGEMENT
RETURNS

Test result
+ decision
support

GENETIC
TESTING
REPORT
(GTR)

WORLD
STANDARD
FORMAT



CLASSIFIERS

INFOGRAPHICS

LONGITUDINAL
ANALYSIS
(TIME-BASED OUTCOMES)

UK Academic/Industry/NHS Research Networks (JANET-N3)

CSV fact table, relational database, RDF store,
clusters to suit analysis or usage of complex data

WP5.
PATTERNING
& SENSEMAKING
APPLICATIONS

Advanced Security
& Patient Privacy;
Trusted User
Network; IHE,
QED Frameworks

Programmatic
Data Extracts

WP1. TEST
REQUESTS

WORLD STANDARD FORMAT
Patient Consents



Individual's
Point-of-Care
in UK NHS

Uses GTR decision support section

WP3.
DISSEMINATE
READABLE GTR

IHE XDS
(Vendor
Neutral)

WP4. EHR EXTRACT
& AGGREGATE

Patient Consent
is Referenced

Semantic
Warehouse
KEEPS RICH DATA IN
STANDARD FORMS

VENDOR-NEUTRAL
HL7 STANDARDS

