



openEHR & FHIR a vendor perspective

Tomaž Gornik, Founder and CEO, Better
Co-chair, openEHR Foundation
Founding partner, Slovenian ECHA Ecosystem





Agenda

Introduction

Putting Data First

Digital Health Platforms

Openehr & Fhir

Use Cases

Better Ltd



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"We have been **struggling** to make **data follow the patient for 25 years!**

Interoperability is not working!

We need a **fundamentally different approach.**"

- Jordi Piera Jimenez

Director of the Digital Health Strategy Office
at Catalan Health Service





”At the moment most live patient data is **held by the companies** who provide the electronic patient record systems. But **it isn't 'their' data**. And although isn't 'their' data, too often these systems act as a barrier to accessing it. And it means the **data might not be accessible** and can't be properly shared, providing a **barrier to the research – innovation**”

- Matt Hancock

Secretary of State for Health and Social Care

Rewired, March 18th 2021





”I want to explore whether we can remove this **barrier to innovation** and **separate the data layer** from the **application layer** so providers can offer the **application software** and the **data will be stored separately** and securely in the cloud, then we have a **consistent data platform across the NHS.**”

- Matt Hancock

Secretary of State for Health and Social Care

Rewired, March 18th 2021





Why NOW?

“**COVID-19** crisis provides a ‘**burning platform**’ for **accelerating** the **data agenda** in health care.

Health care **data** is exponentially **more powerful** if **connected, combined and shared**”

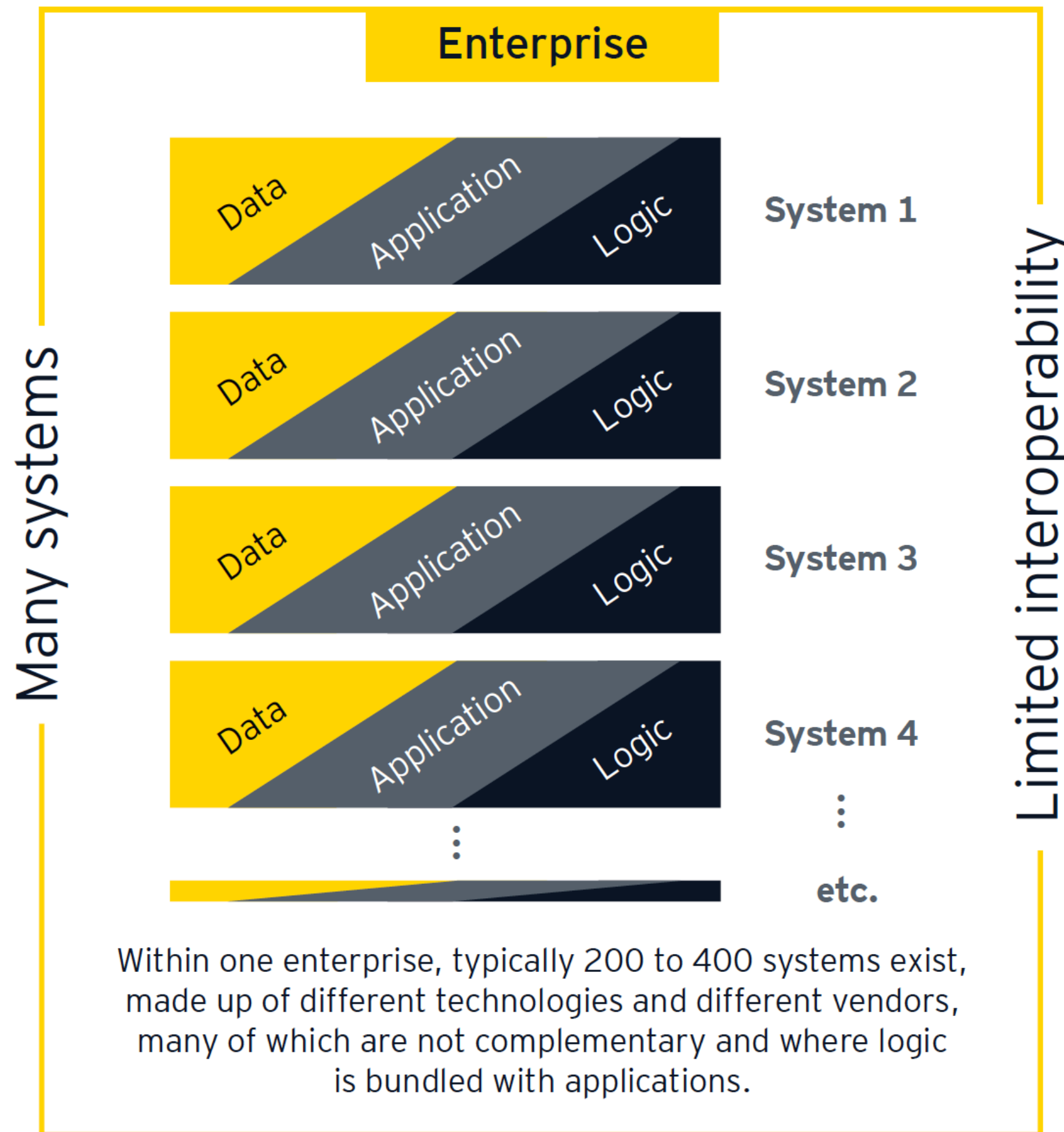


“

Data is for life, not just for one system.
If we consider that as a principle, we will
design and procure systems differently.

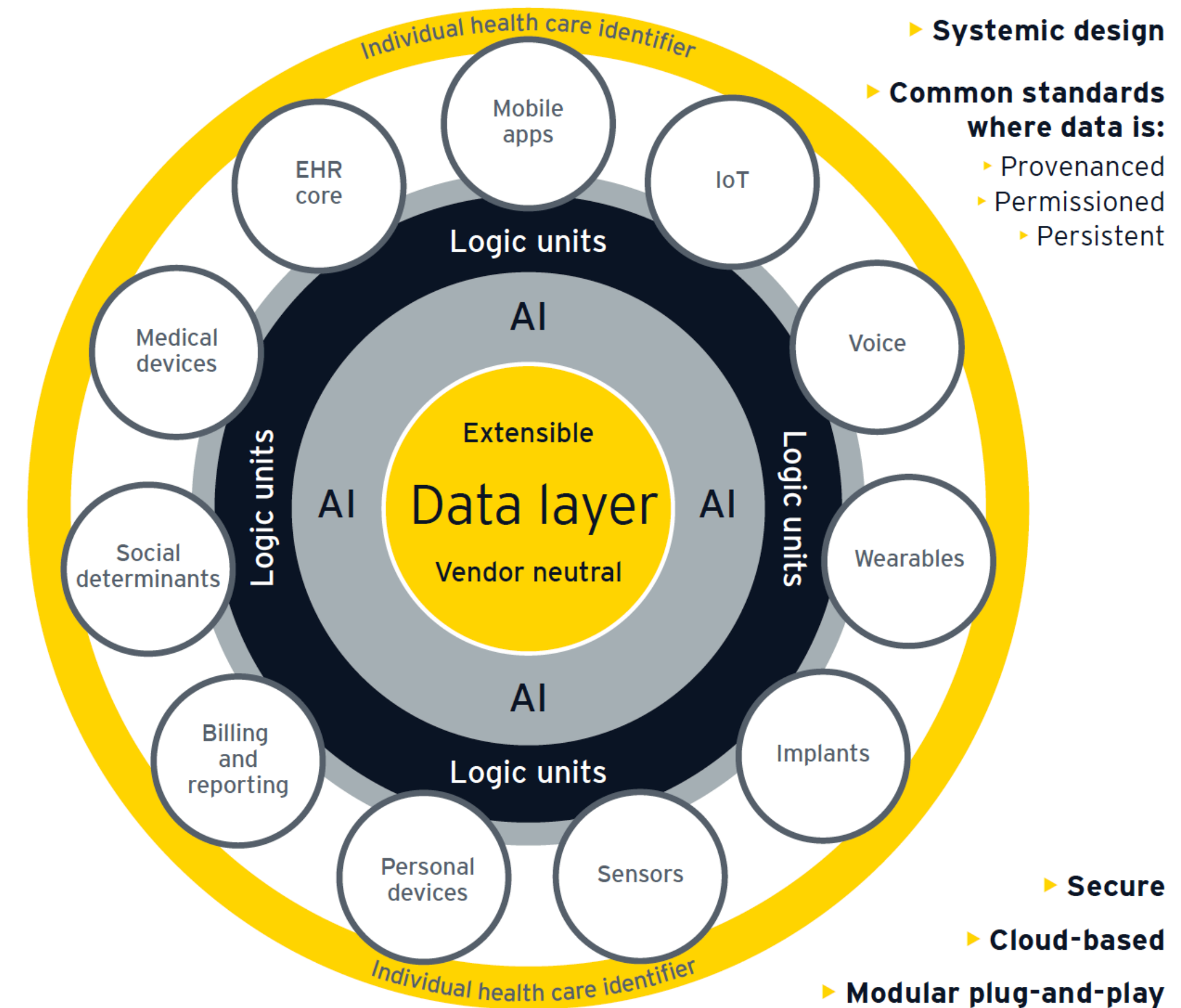
Rachel Dunscombe
CEO NHS Digital Academy

Now

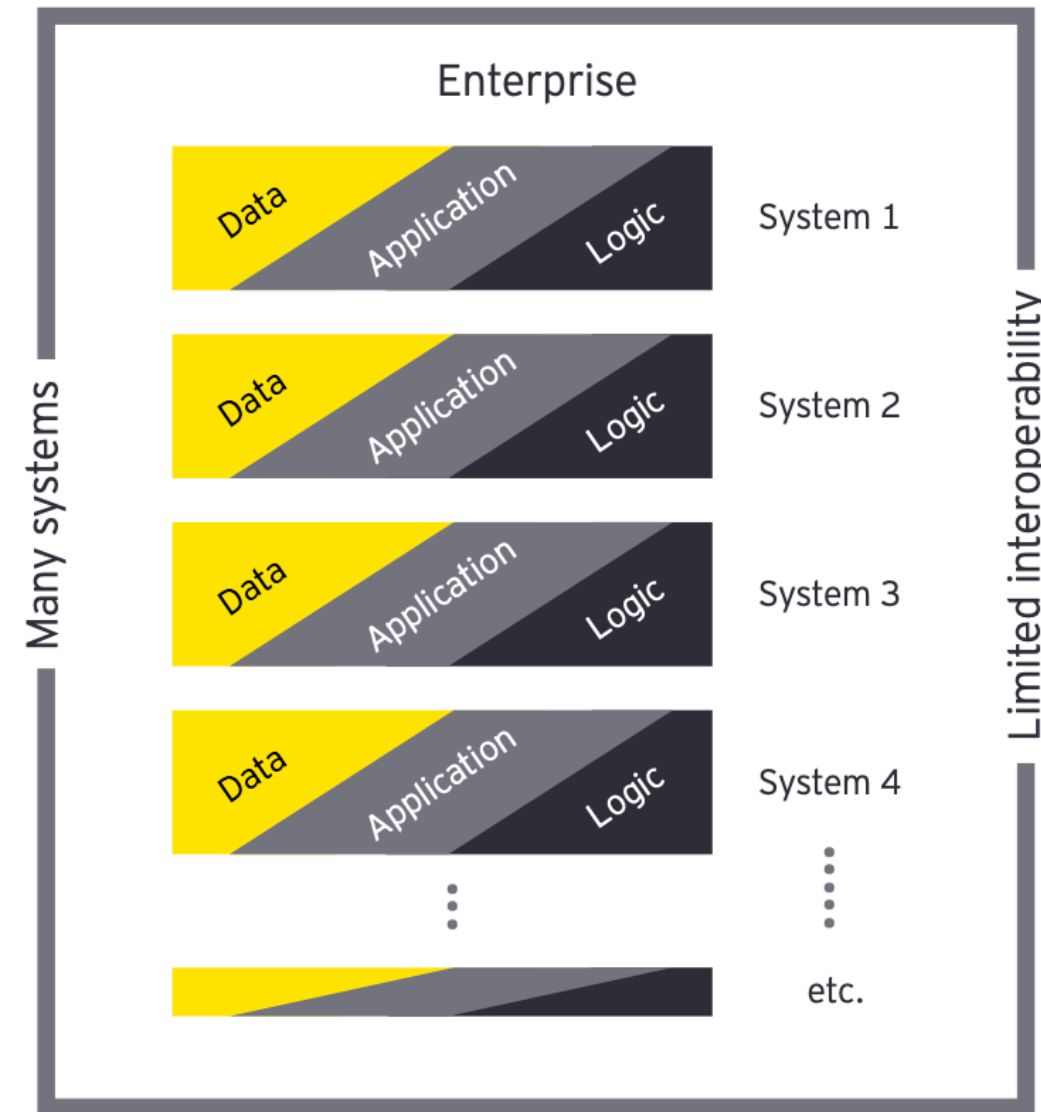


Present: Many systems all with intimately bound data logic and applications

In five years

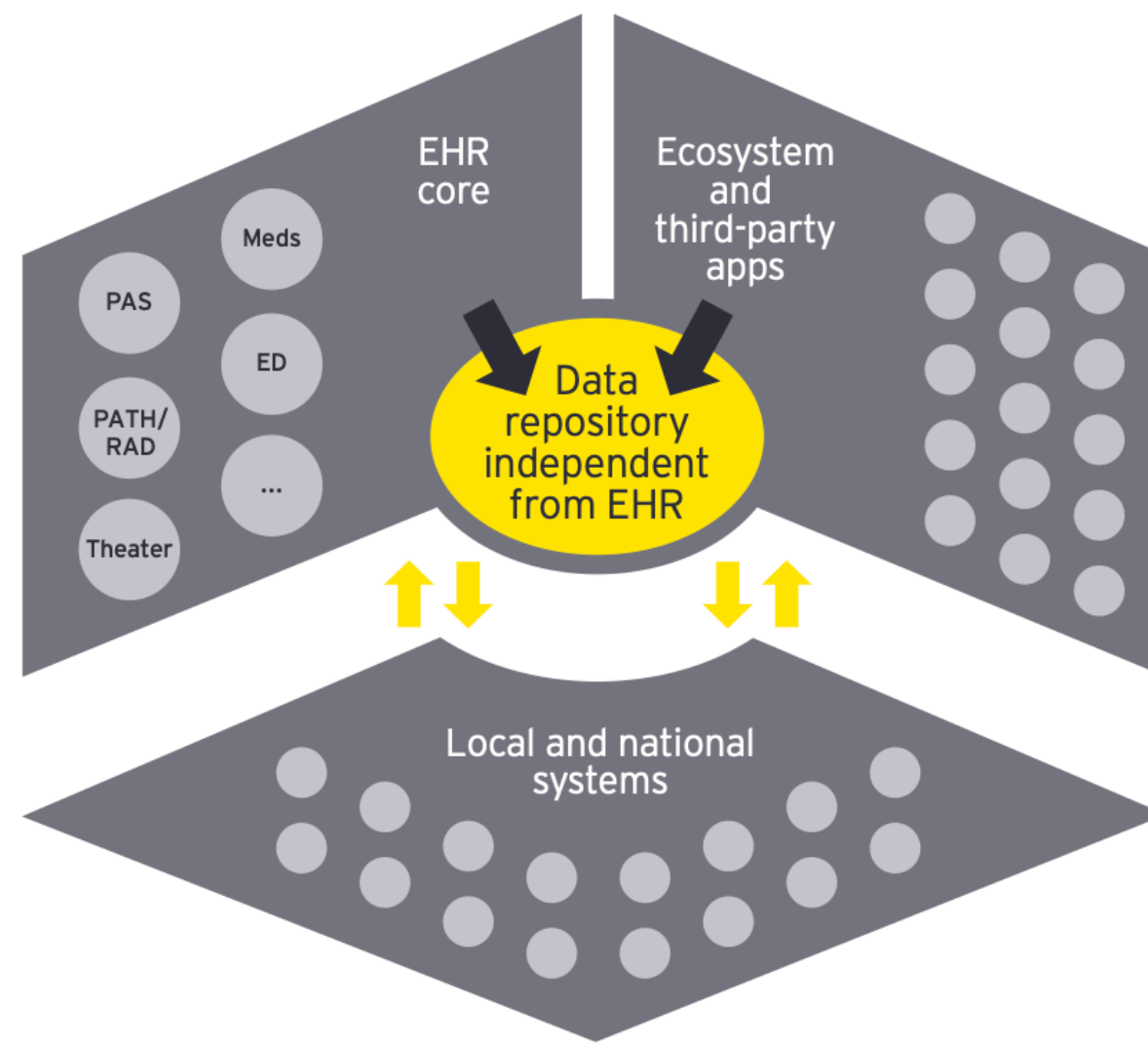


Future: A cohesive technology stack, giving a unified experience for clinicians, professionals and patients; unique data at the center accessed by applications in real time through micro-services



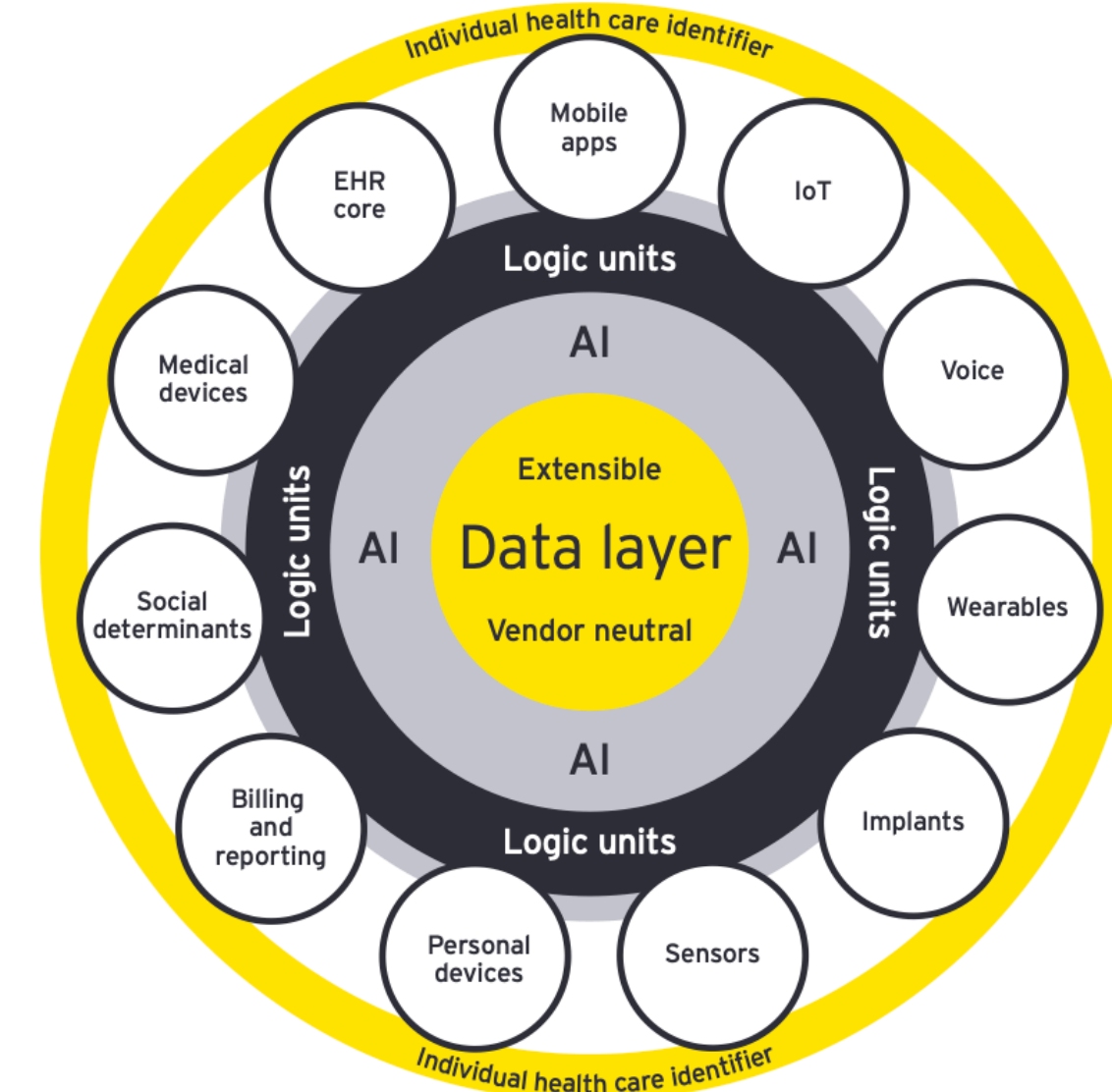
Present-day enterprise systems

Many systems all with intimately bound data logic and applications. Within one enterprise, 200-400 systems can exist made up of several different vendors (many of which are not complementary) and where logic is bundled with the application.



Intermediate-state platform

A more flexible, dynamic infrastructure will be built around existing systems, communicating through modern APIs. In the near term, platform-based systems and legacy EHRs will coexist by maintaining basic functionality in legacy systems while building and innovating in a platform-based environment.

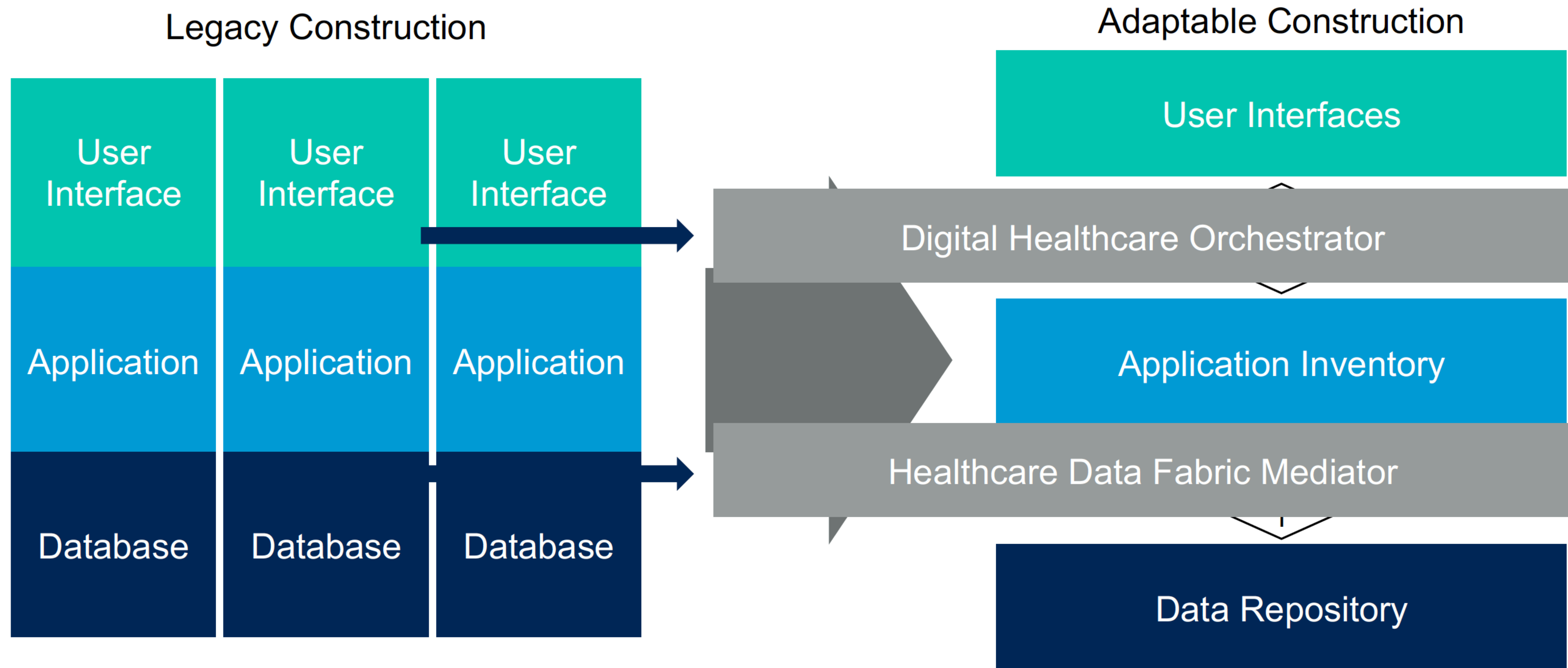


Future-state platform

A cohesive technology stack, giving a unified experience for patients, professionals and consumers; unique data at the center accessed by applications in real time by microsystems.



The Target Architecture Is Clear Enough





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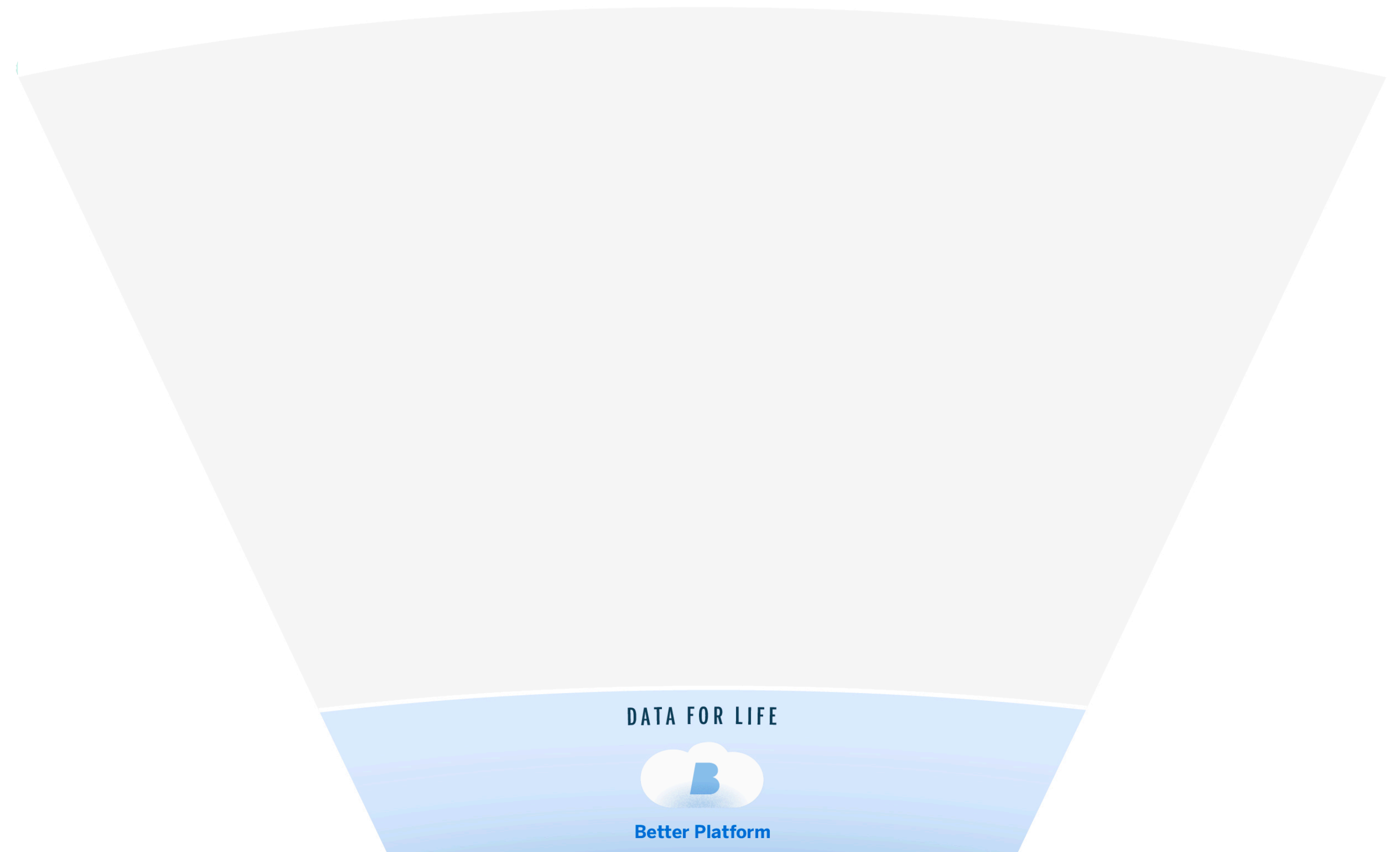
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Better Ltd



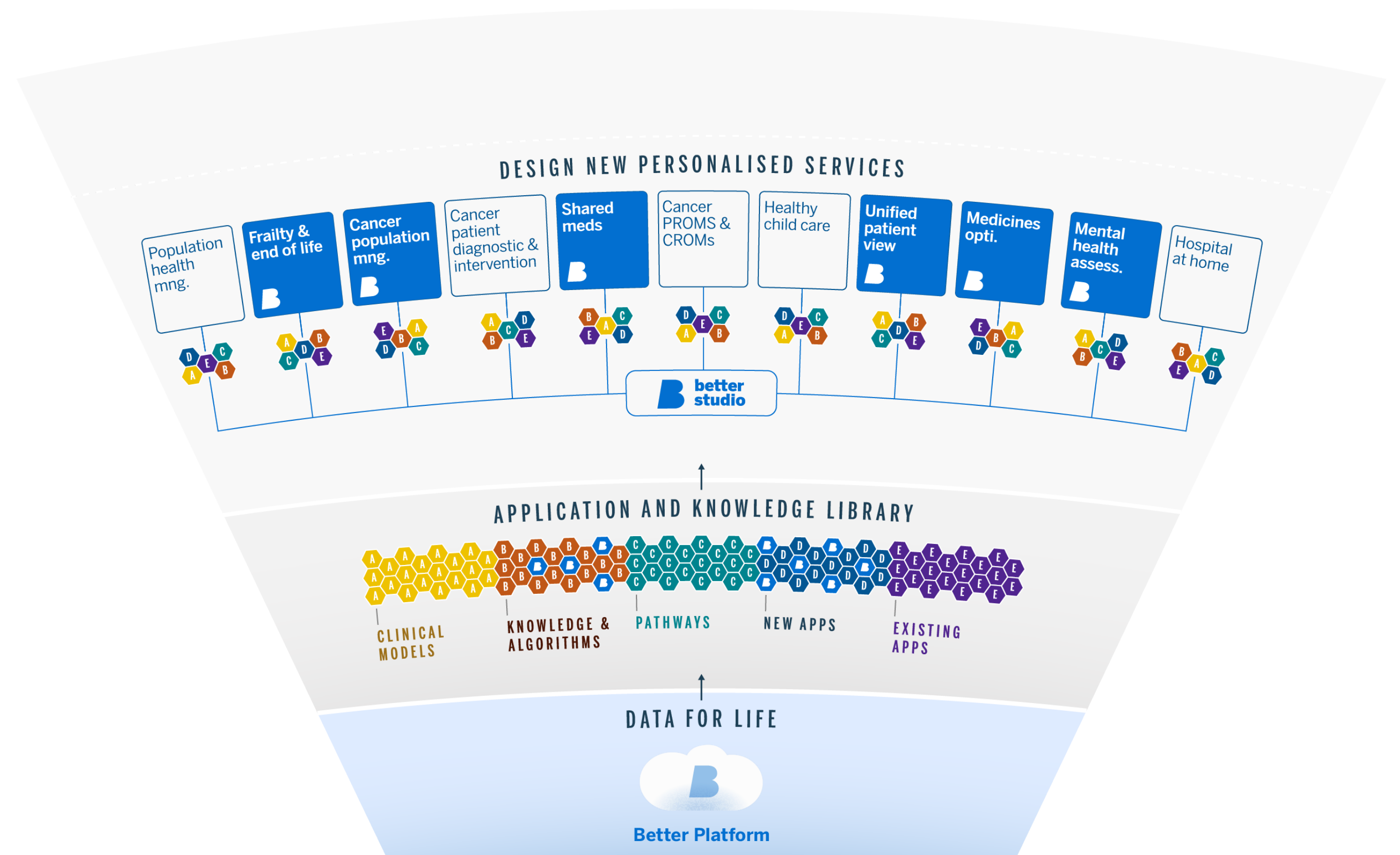
Digital Health Platform

**Vendor-neutral data core
longitudinal care record**



**Fast delivery of applications
low-code tools**

**Vendor-neutral data core
longitudinal care record**



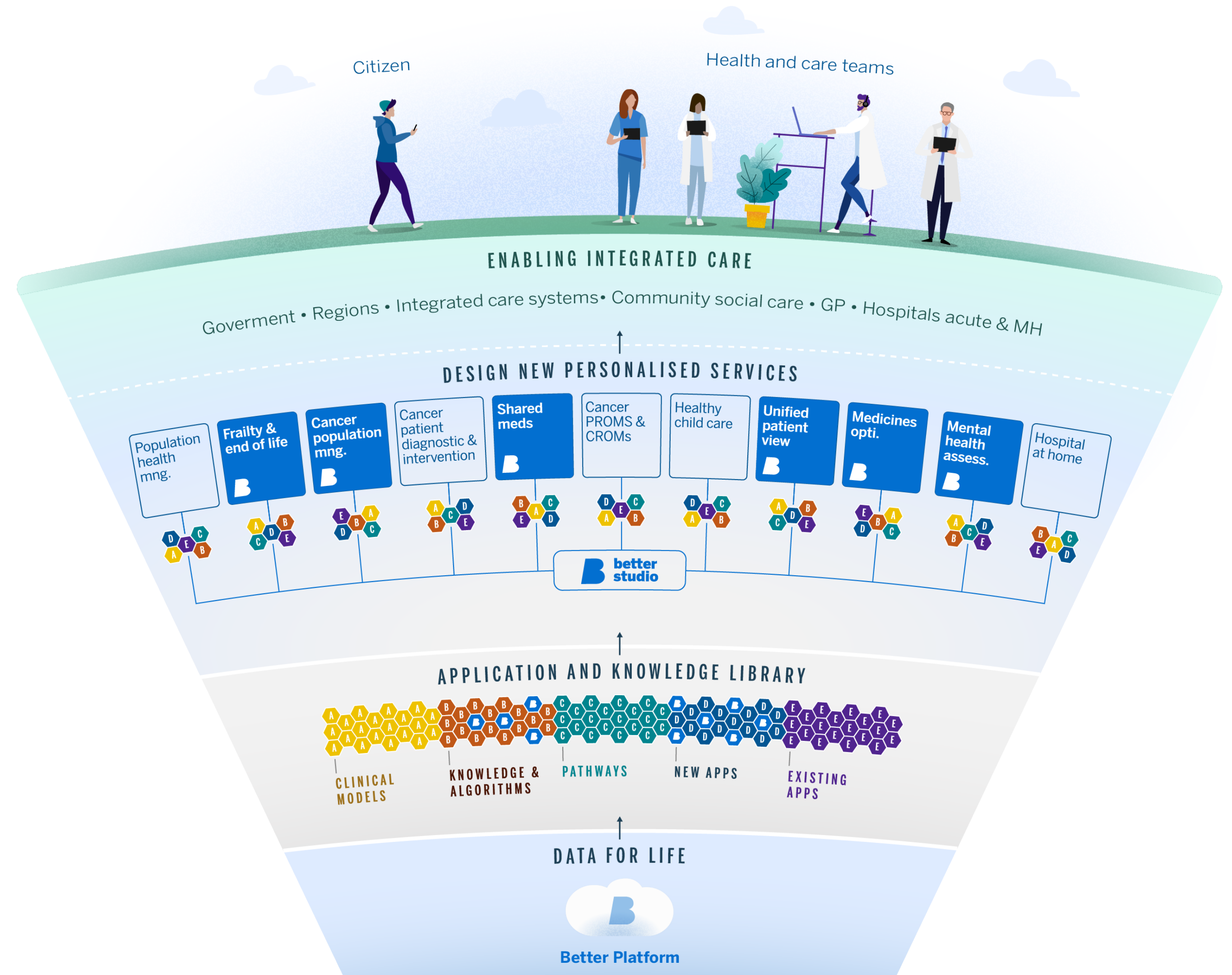


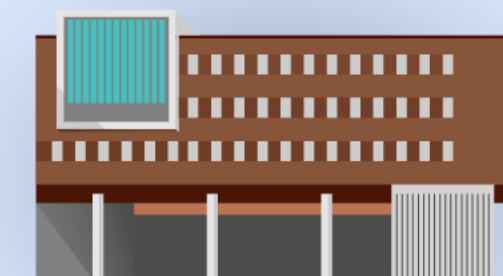
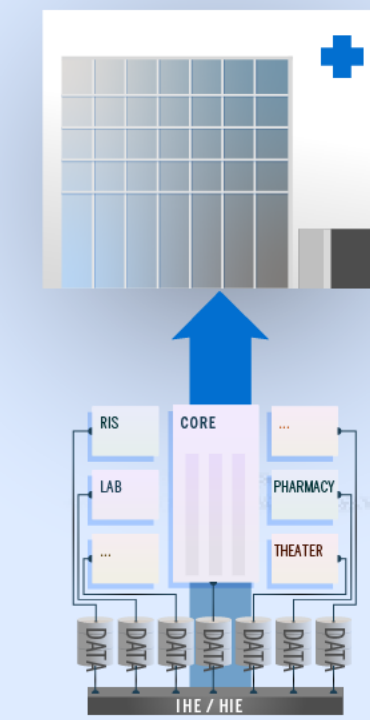
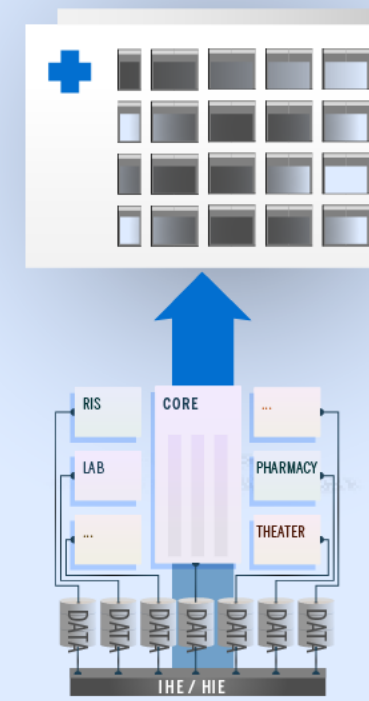
Digital Health Platform

Unified, personalised application experience portal and design system

Fast delivery of applications low-code tools

Vendor-neutral data core longitudinal care record



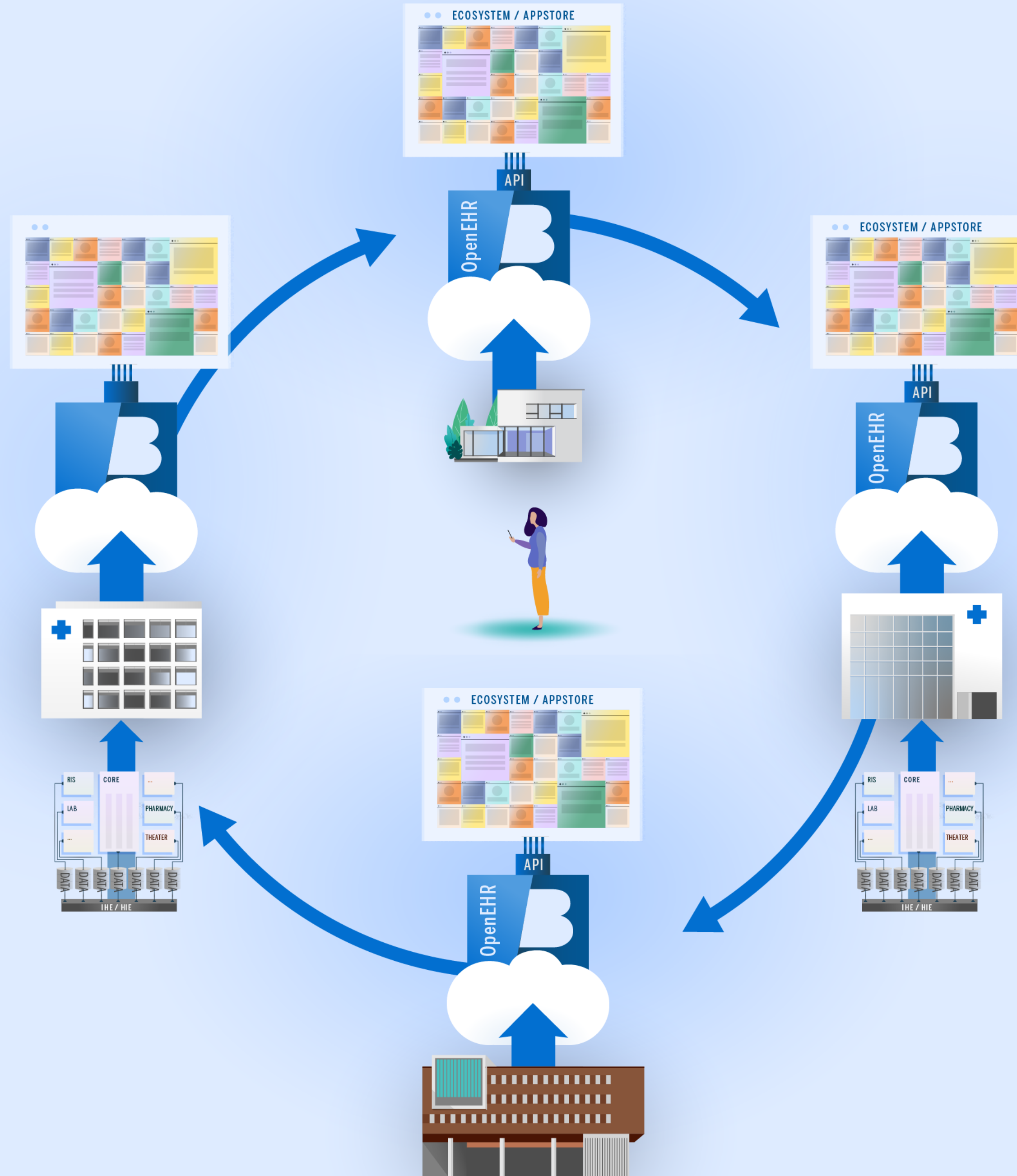






Digital Health Platform

Rich care record built around the patient, not institution:
“one patient, one record”

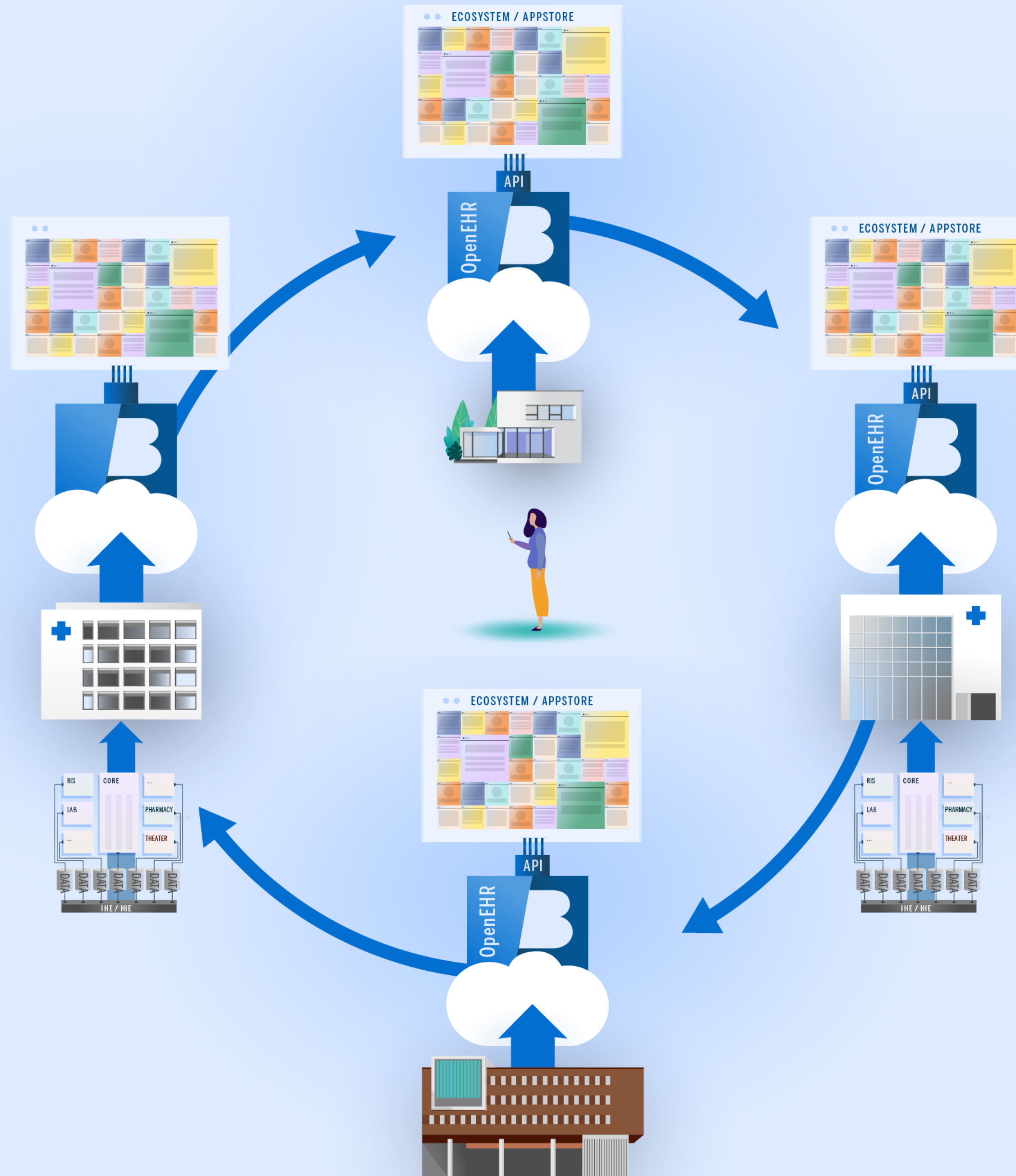




Digital Health Platform

Rich care record built around the patient, not institution:
“one patient, one record”

Governance of data models
Choice of apps, vendors



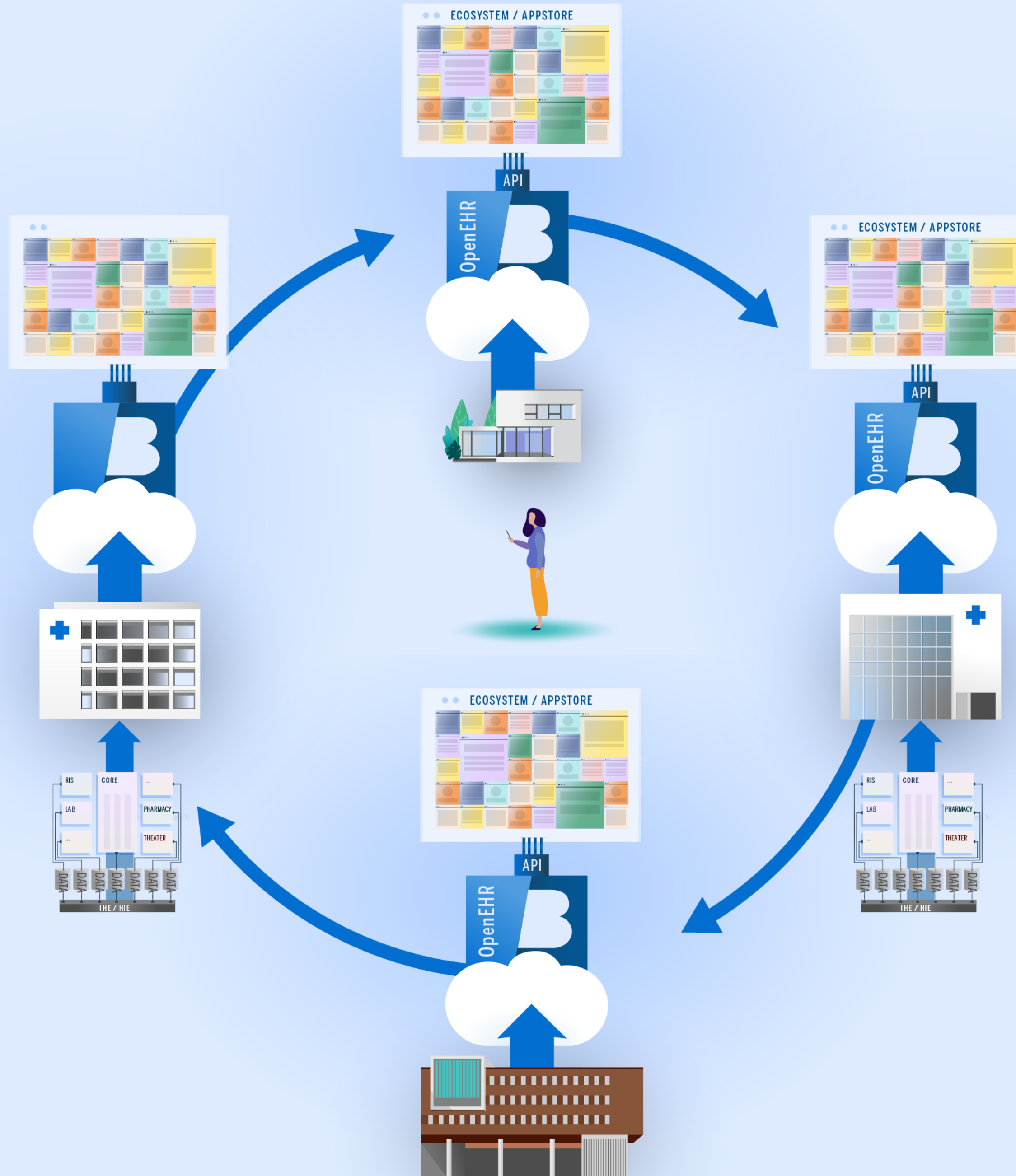


Digital Health Platform

Rich care record built around the patient, not institution:
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Choice of apps, vendors

Ecosystem of apps, built once





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Gartner on open architecture

Gartner believes that truly effective and sustainable **open architectures** will need a capability for **vendor-neutral data persistence**, such as utilizing a common schema or set of **archetypes** and rules for managing **structured** and unstructured data (for example, a VNA, **openEHR** or IHE XDS repository). Providing open **messaging** standards (for example, FHIR, HL7) for data exchange in specific use cases will **only go so far** in meeting the architectural **challenges** of digital **citizen-centric** care delivery.

– **Gartner Group**

Healthcare Provider CIOs Need to Rally Their Enterprise Architects Around Citizen-Centric Care Delivery, 07 February 2017



Digital Health Platform Handbook:

“Good planning will involve a risk assessment of the three standards stacks currently approved at the international level (HL7, openEHR, and IHE)”

Building a Digital Information Infrastructure (Infostructure) for Health, Year: 2020

openEHR & FHIR

openEHR optimized for:

- Storage of data in vendor neutral format
- Clinically designed models following “maximal dataset”
- Semantic querying of data through AQL

*open***EHR**

FHIR optimized for:

- Exchange of information between systems
- Common models following “80/20” rule
- Exposing data through industry adopted API's



Alastair Allen, 2019



Key principles of our approach

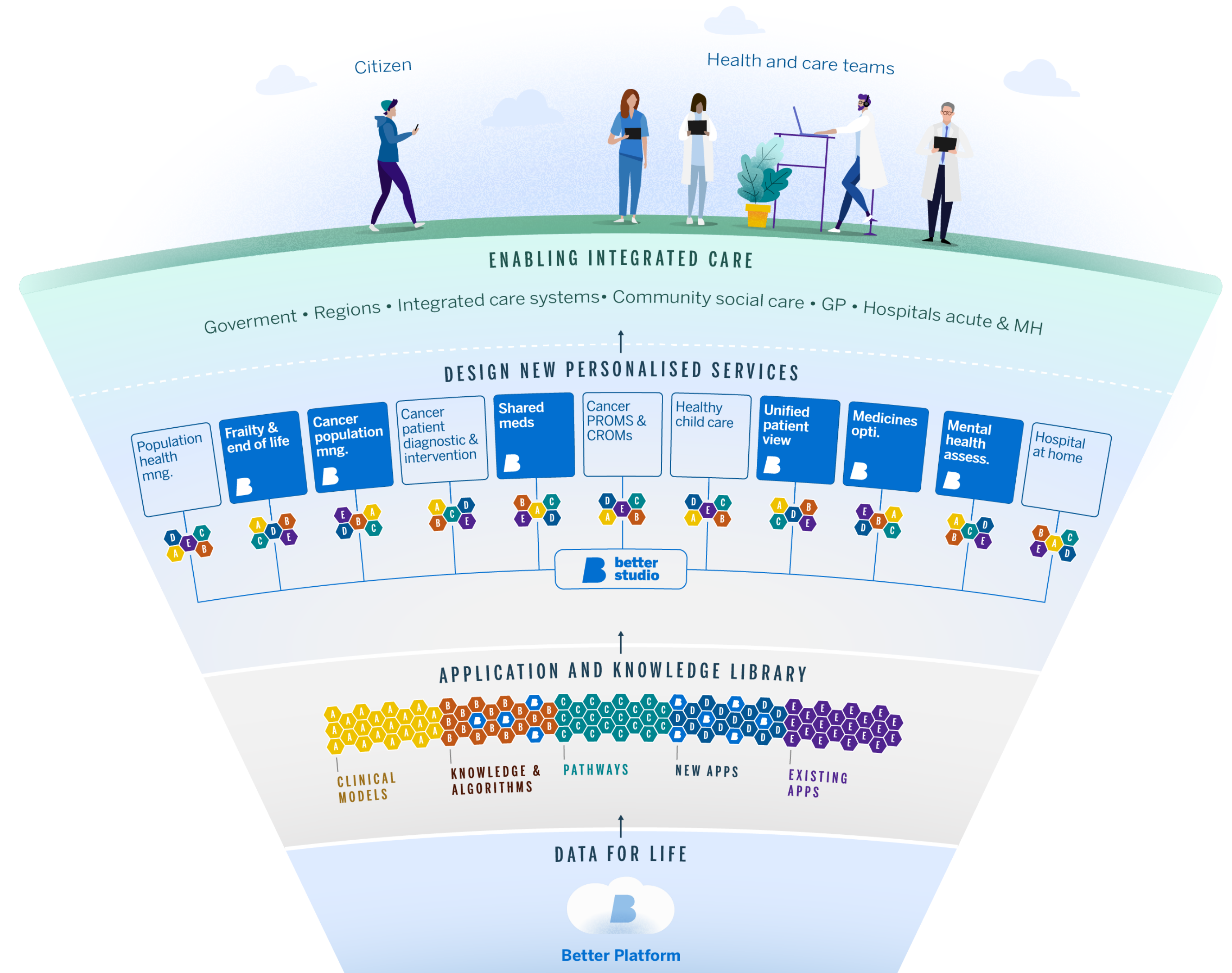
- **Digital health platform** with **open data** and open APIs
- **Modular** and **flexible** architecture
- **Low-code** approach to building and **assembling** an IT portfolio
- User-centered **design**
- Close **collaboration** with **community**



**Unified, personalised
application experience
portal and design system**

**Fast delivery of applications
low-code tools**

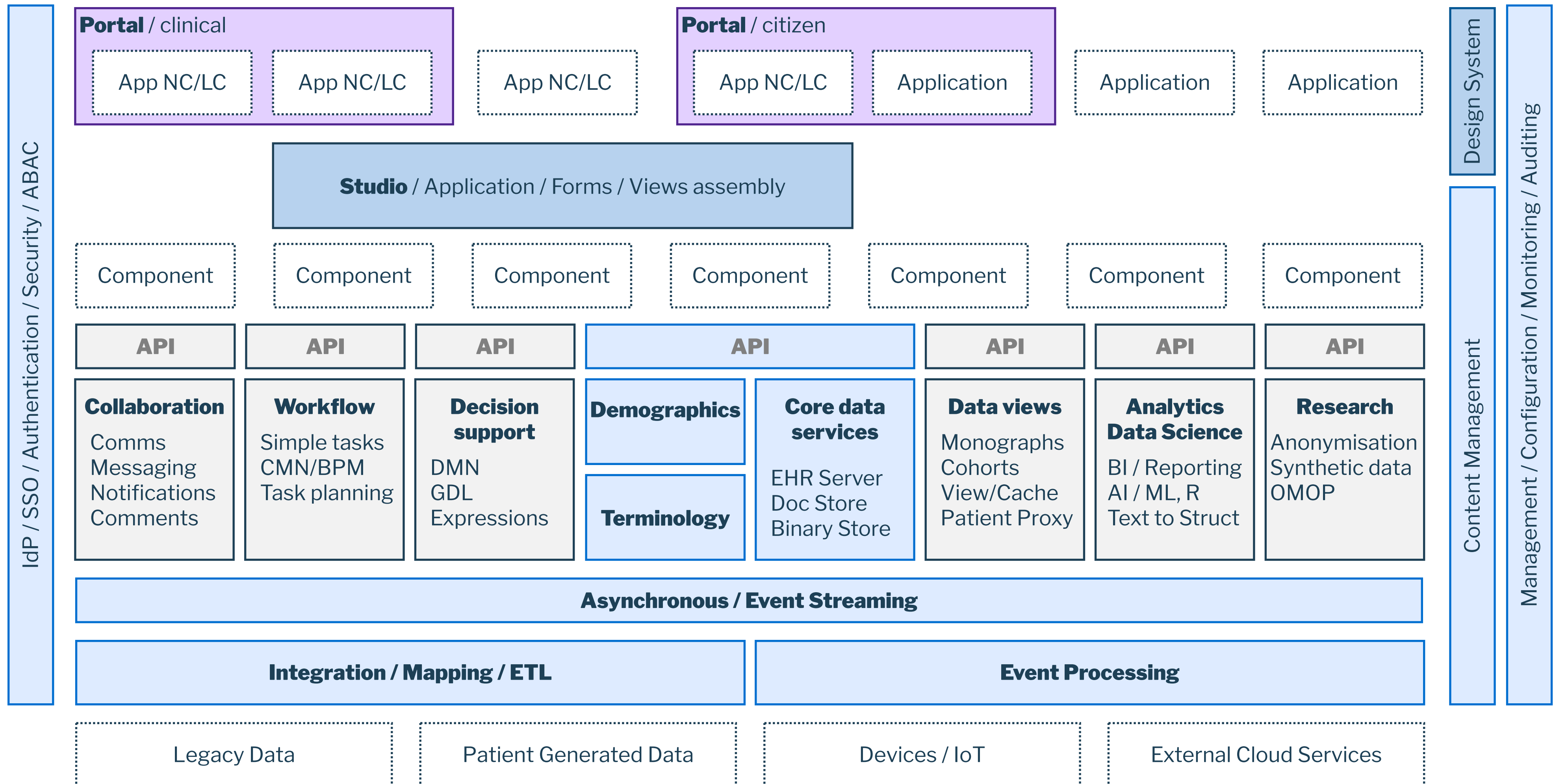
**Vendor-neutral data core
longitudinal care record**



Platform Architecture

Legend

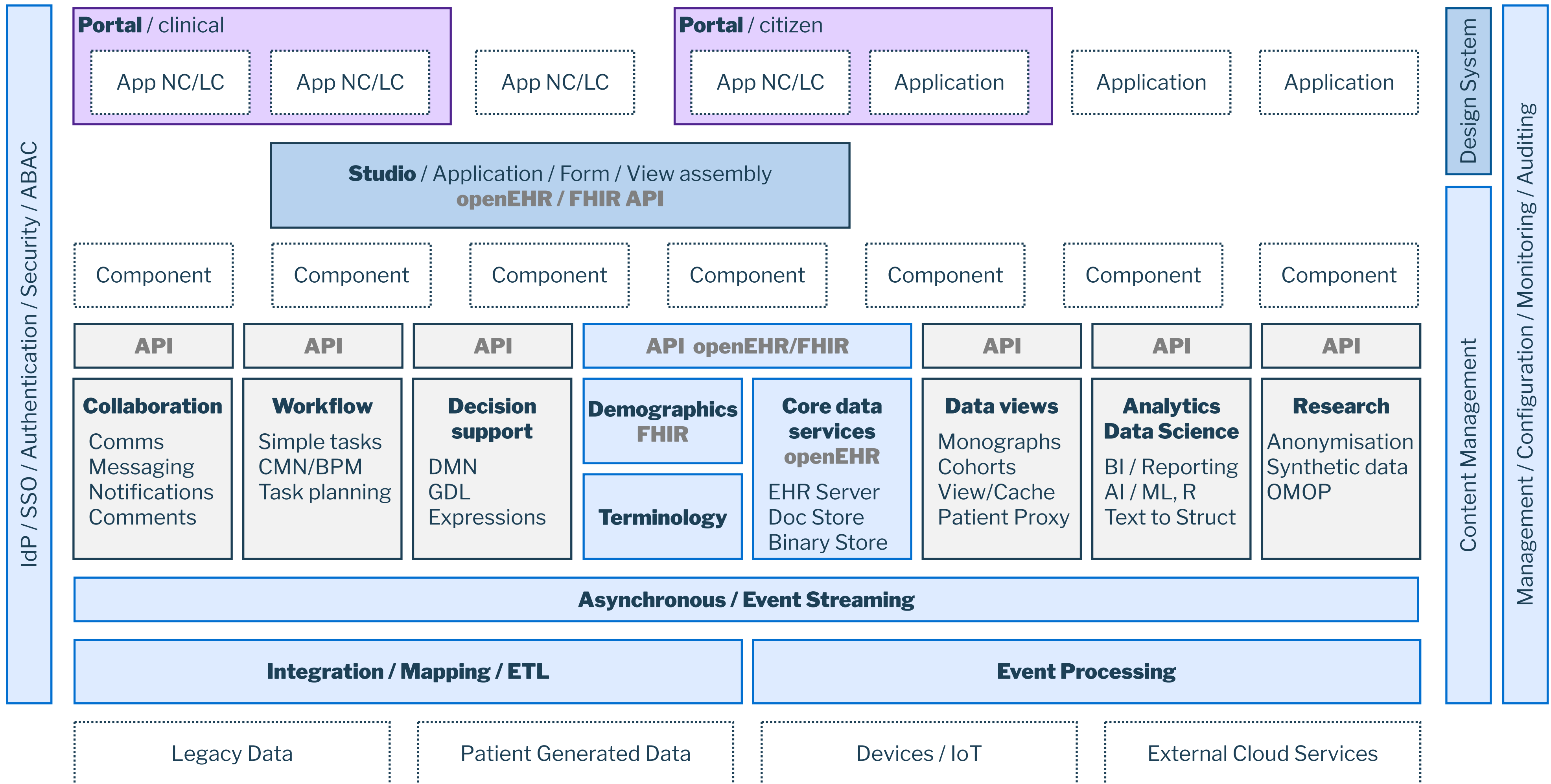
- Better Portal
- Tools
- Core Services
- Extras
- other products



Platform Architecture



Legend

- Better Portal
- Tools
- Core Services
- Extras
- other products

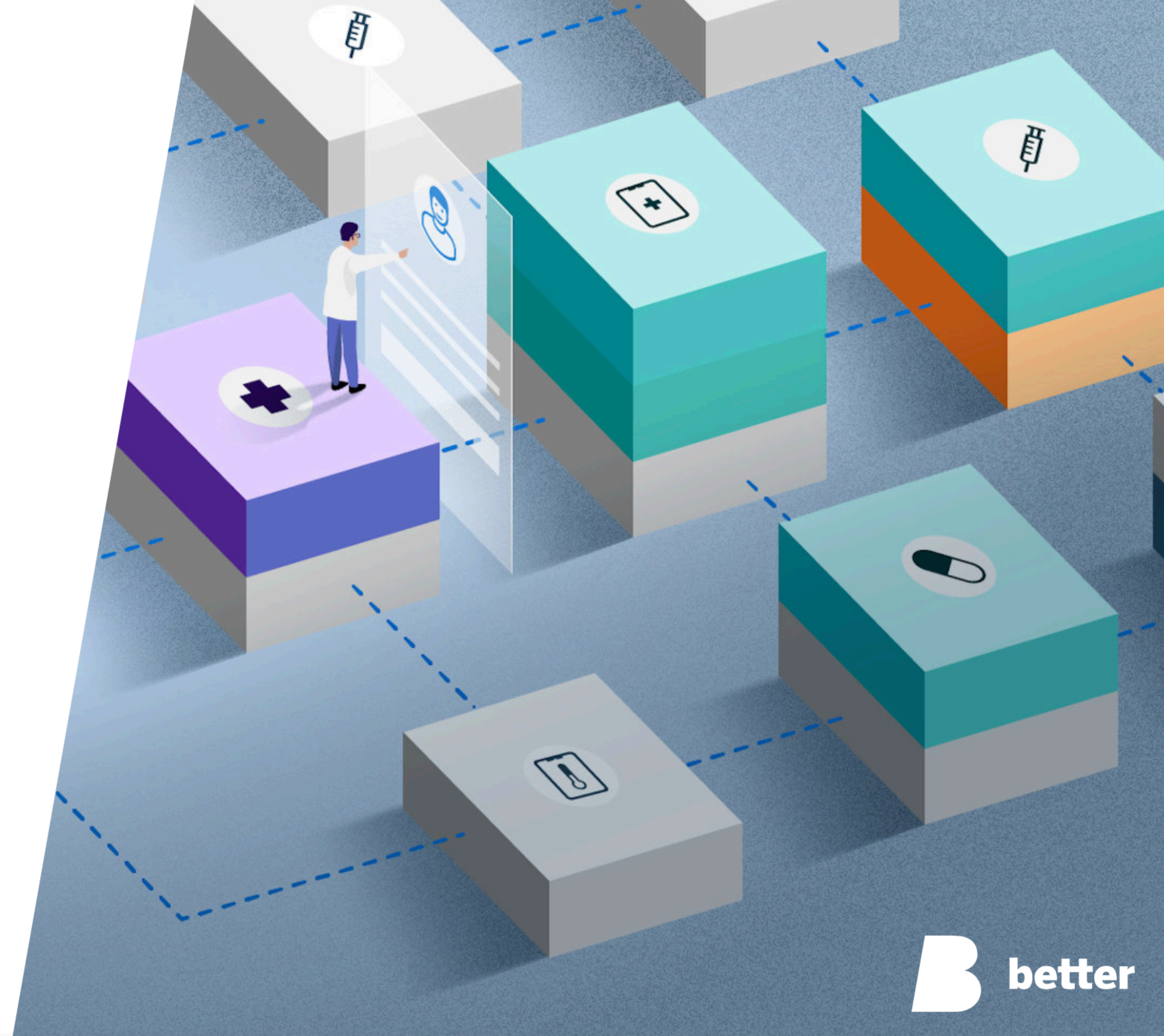


openEHR

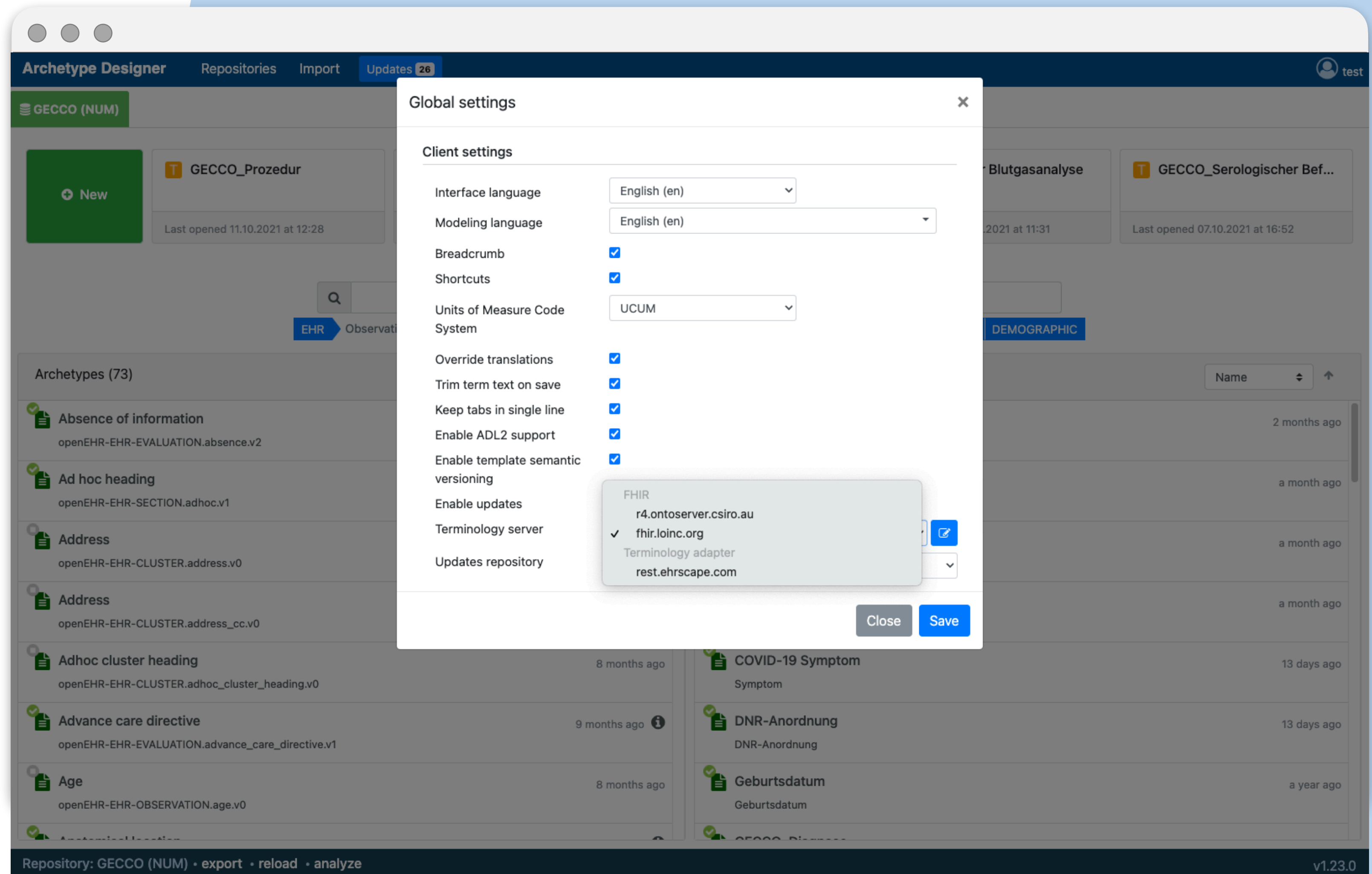
Archetype Designer

 Username
 Password

Log In



Archetype Designer supports FHIR Terminology Server including browsing & referencing FHIR CodeSystems & ValueSets for coded concepts in openEHR models





Archetype Designer
supports FHIR
Terminology Server
including browsing &
referencing FHIR
CodeSystems &
ValueSets for coded
concepts in openEHR
models

Add binding for terminology ✕

Terminology
Browse terminology server ▾

Name
Medicines Review Type

Uri
terminology://fhir.hl7.org/ValueSet/\$expand?url=https://healthterminologies.gov.au/fhir/ValueSet/medi

Value Sets [Code systems](#)

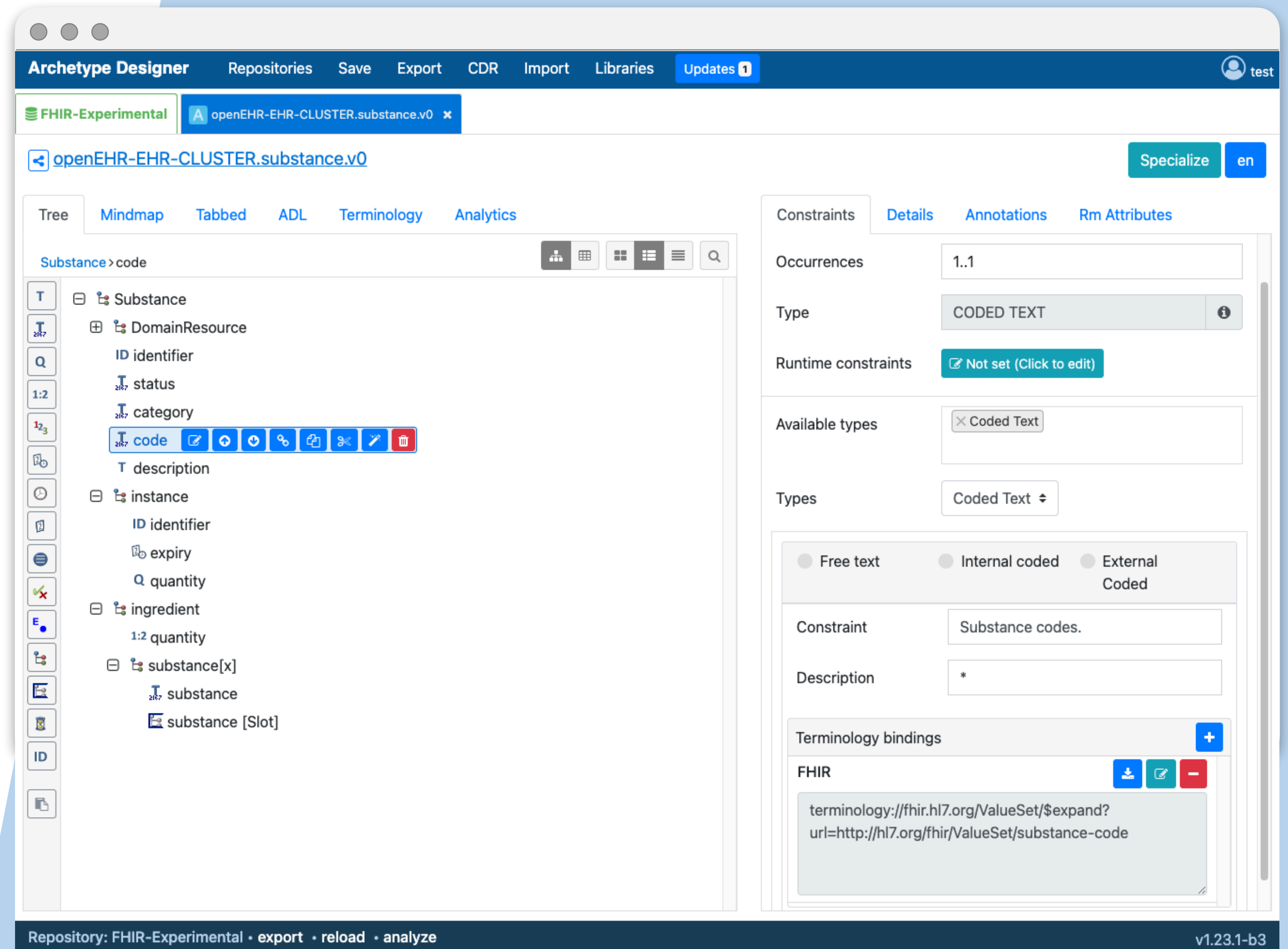
draft active

- Medicines Review Type
- V3 Value SetActClassProcedure
- v2 Duration Categories
- domicileCode
- SubscriptionStatus

Medicines Review Type	
1348931000168107	Home medicines review
1348961000168104	Community pharmacy medicines review
1348951000168101	Hospital medicines review
1348921000168109	General practice medicines review

Cancel Add

Archetype Designer supports FHIR Terminology Server including browsing & referencing FHIR CodeSystems & ValueSets for coded concepts in openEHR models





Easily build models,
queries and smart forms

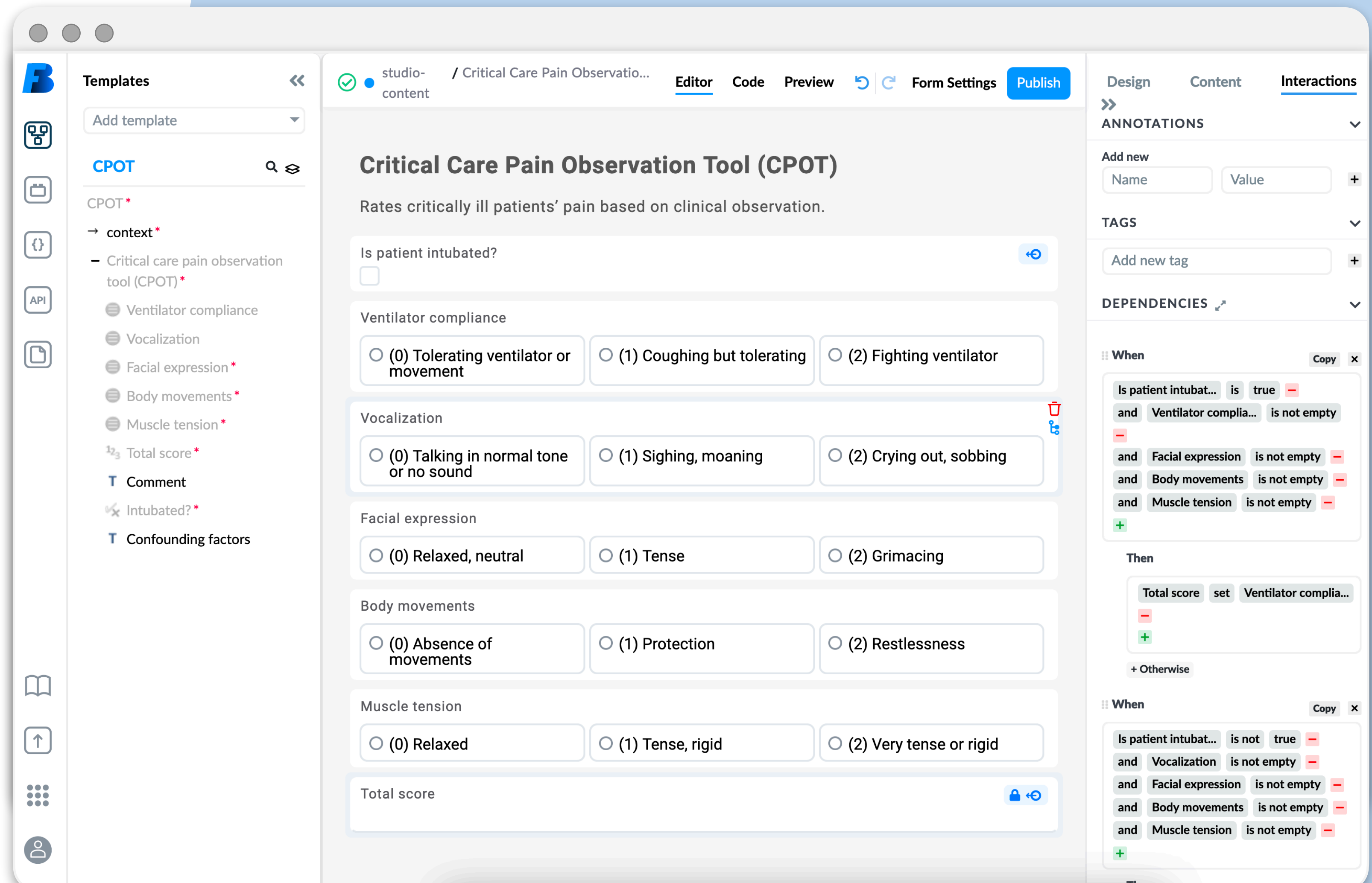
Data entry and display

Widgets for advanced
display

Incorporate external
data through APIs

Web and mobile

Preloaded with rich set
of assessment and
scales forms





Easily build models,
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Preview: Critical Care Pain Observation Tool (CPOT) [Validate] [Restore data] [Save composition]

Critical Care Pain Observation Tool (CPOT)

Rates critically ill patients' pain based on clinical observation.

Is patient intubated?

Vocalization

(0) Talking in normal tone or no sound (1) Sighing, moaning (2) Crying out, sobbing

Facial expression

(0) Relaxed, neutral (1) Tense (2) Grimacing

Body movements

(0) Absence of movements (1) Protection (2) Restlessness

Muscle tension

(0) Relaxed (1) Tense, rigid (2) Very tense or rigid

Total score
5

Configuration

DISPLAY PROPERTIES

Desktop Tablet Mobile

w 768 px h 1024 px

DISPLAY PARAMETERS

Language
en

Date format
dd/MM/yyyy

Date placeholder

CONTEXT PARAMETERS

Dropdown presentation min. items

- Validation disabled
- Display validation messages on touched
- Iso zulu time
- Disable form script
- Show numeric range placeholder
- Enable auto sizing textareas
- Readonly
- Disable script run on init
- Presentation mode
- Show all pages at once



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queries and smart forms

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The screenshot displays the Better Studio interface for configuring a form. The main window is titled "Malnutrition Universal Screening Tool - webinar final". The left sidebar shows the "External APIs" section with an "API Connector" configuration for an "FHIR Server". The central area shows the form configuration for the "Malnutrition Universal Screening Tool (MUST)", which identifies patients who are malnourished or at risk of malnutrition. The form includes input fields for "Weight", "Height/Length", and "Weight (3 to 6 months)", each with a unit selector (kg or cm). A "Score:" field is set to "{{score}}", and a "High risk" section provides treatment instructions. A table shows "Date measured" (2021-10-11) and "Weight" (undefined). The right sidebar shows the "WIDGET CONFIGURATION" for the "GENERIC_EXTERNAL_WIDGET", including "WIDGET VALUE MAPPING" with a dropdown menu for "resourceType" and other fields.



Easily build models,
queries and smart forms

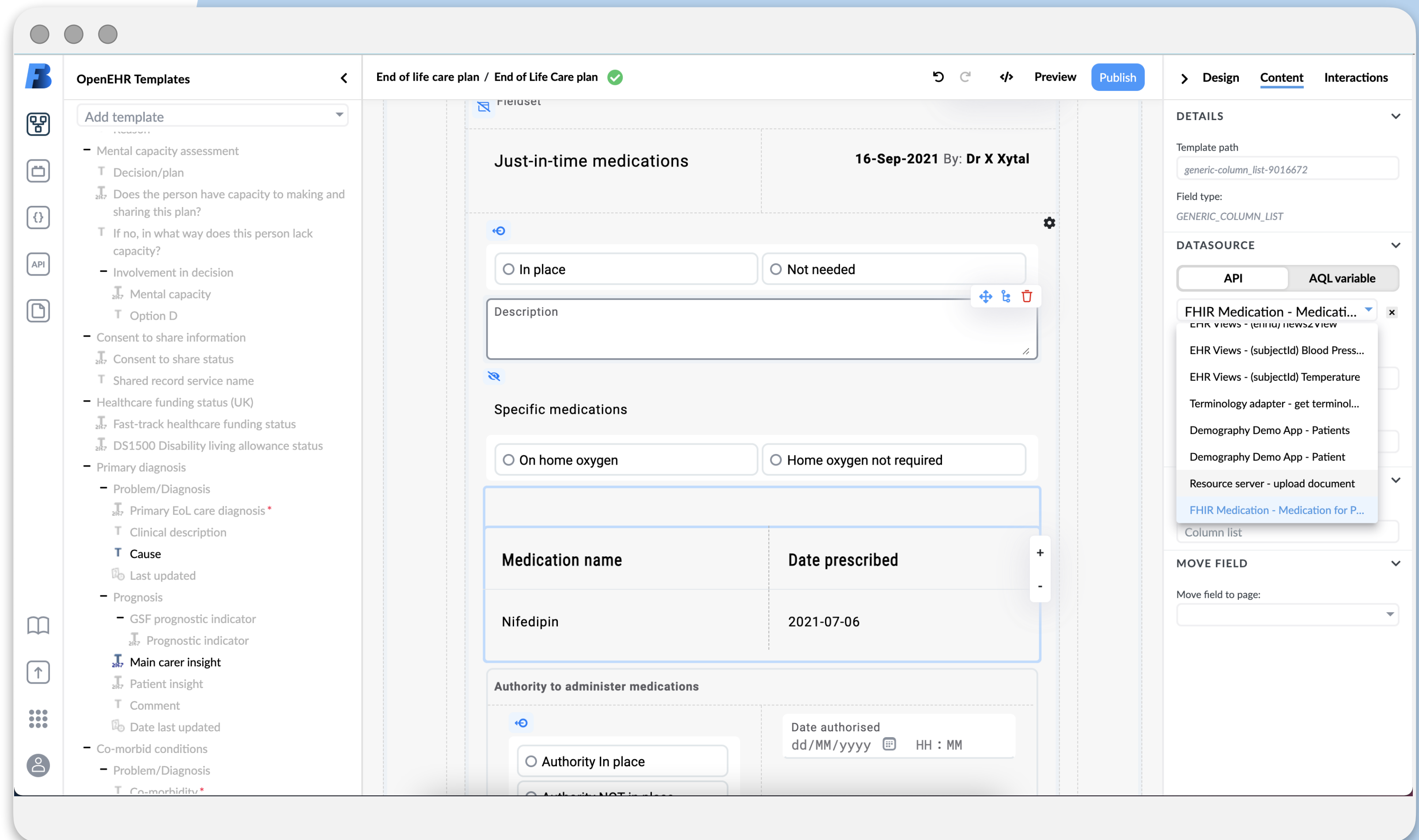
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Ward List

Patient Summary view

Timeline view

User management

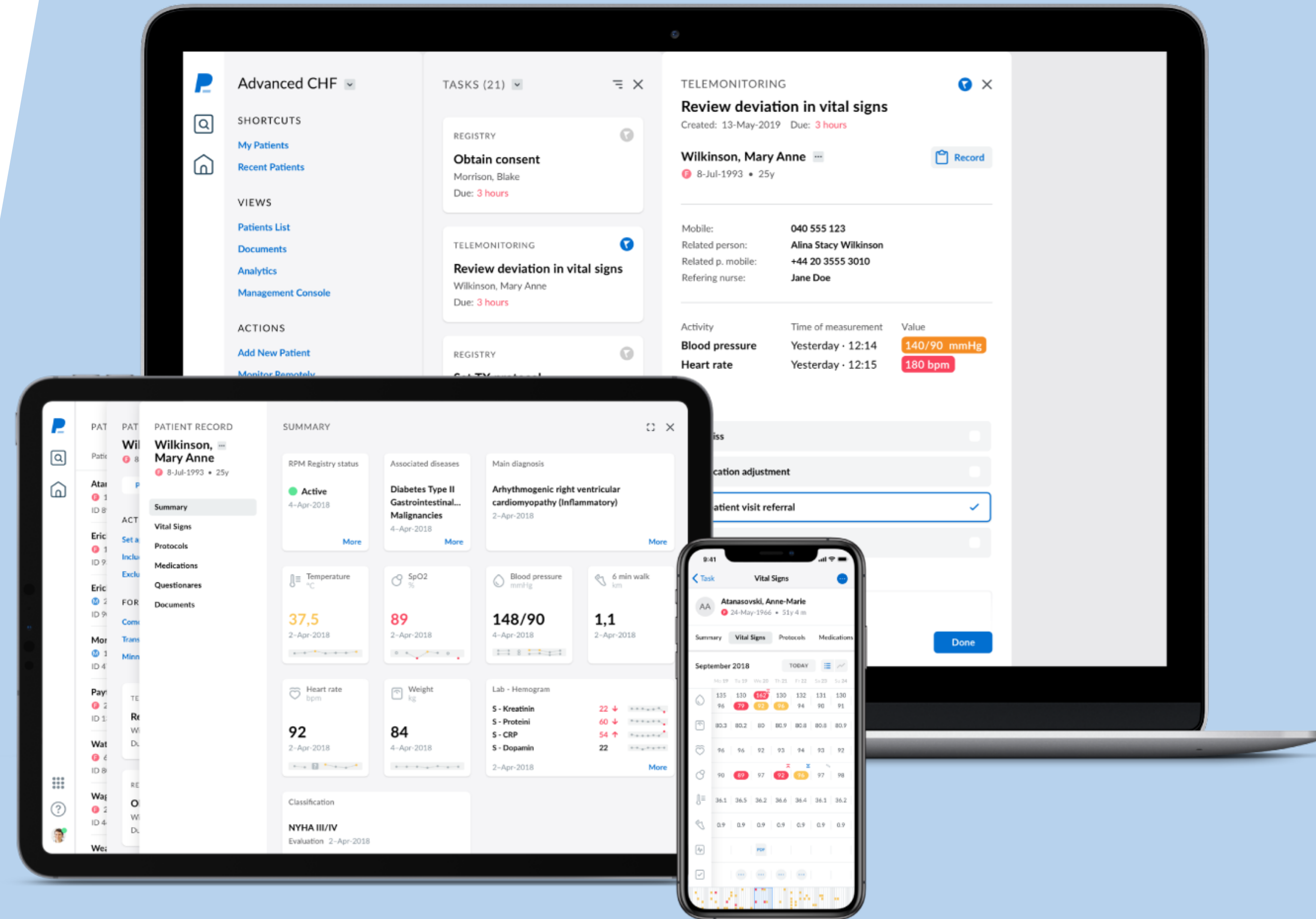
Prebuilt set of commonly used assessments and scores

Web based and responsive design

ADT Integrations



reddot award 2019 winner





Manage multiple patients safely and seamlessly

A holistic approach for treating patients with multiple chronic conditions

Early identification of deterioration (i.e Antimicrobial stewardship)

Always have all patient data readily available

Improved communication and collaboration

Reduced ADRs and completely prevented never events

OVERVIEW
Geriatric ward

Search Filters

Name	Location	Allergies	Flags	NEWS 2	Vitals	Assessments	Tasks	High risk medications
Mary Acker 8-Jul-1943 · 78y 6m HIC 893107581	Eliot Room 6 Bed 3	Known allergies	High risk	8 High	RR 26 H SpO2 89 L Temp 38.6 H	Waterlow Medium VTE Low	Replace IV catheter Today Collect blood Due 2h ago	Cefazolin 3 days
Mark Barlow 16-Apr-1954 · 66y 8m HIC 936342247	Eliot Room 8 Bed 1	Known allergies Amoxicilin Likely Funnel web spider venom antiserum Confirmed	Likely faller Suspected dementia Low sodium diet	4 Medium	RR 18 SpO2 89 L BP 105/56 L HR 72 AVPU Alert Temp 37.2	Waterlow Low VTE Medium NYHA III/C MUST Low Wells DVT High	Turn off Flowtron Today Encourage hydration Due 1h Call relatives regarding EoL Due 1h	Clozapine 3 days
James Clayton 12-Nov-1950 · 71y 2m HIC 130580933	Eliot Room 6 Bed 5	No allergy info	High risk	2 Low	RR 12 HR 89 Temp 37.5	Waterlow Low VTE Low		Fondaparinux
Jennifer Denver 23-Jul-1931 · 92y 8m HIC 289743638	Eliot Room 12 Bed 1	No known allergies	High risk	2 Low	RR 14 HR 92 Temp 37.0	Frailty High Waterlow High	Turn around Today Chart IV fluids intake Due 2h	
Robert Jones 3-Oct-1938 · 83y 4m HIC 101010101	Eliot Room 7 Bed 3	No known allergies	High risk	2 Low	RR 13 HR 72 Temp 38.5 H	Waterlow Low VTE Medium	Collect sample for MRSA recheck Due 1h	Bactrim 14 days
Olivia Langley 12-Nov-1952 · 69y 4m HIC 101010101	Eliot Room 2 Bed 3	Known allergies	High risk	4 Medium	RR 16 HR 88 Temp 36.8	VTE High MUST Low	Apply TED stockings Due 1h	LMWH

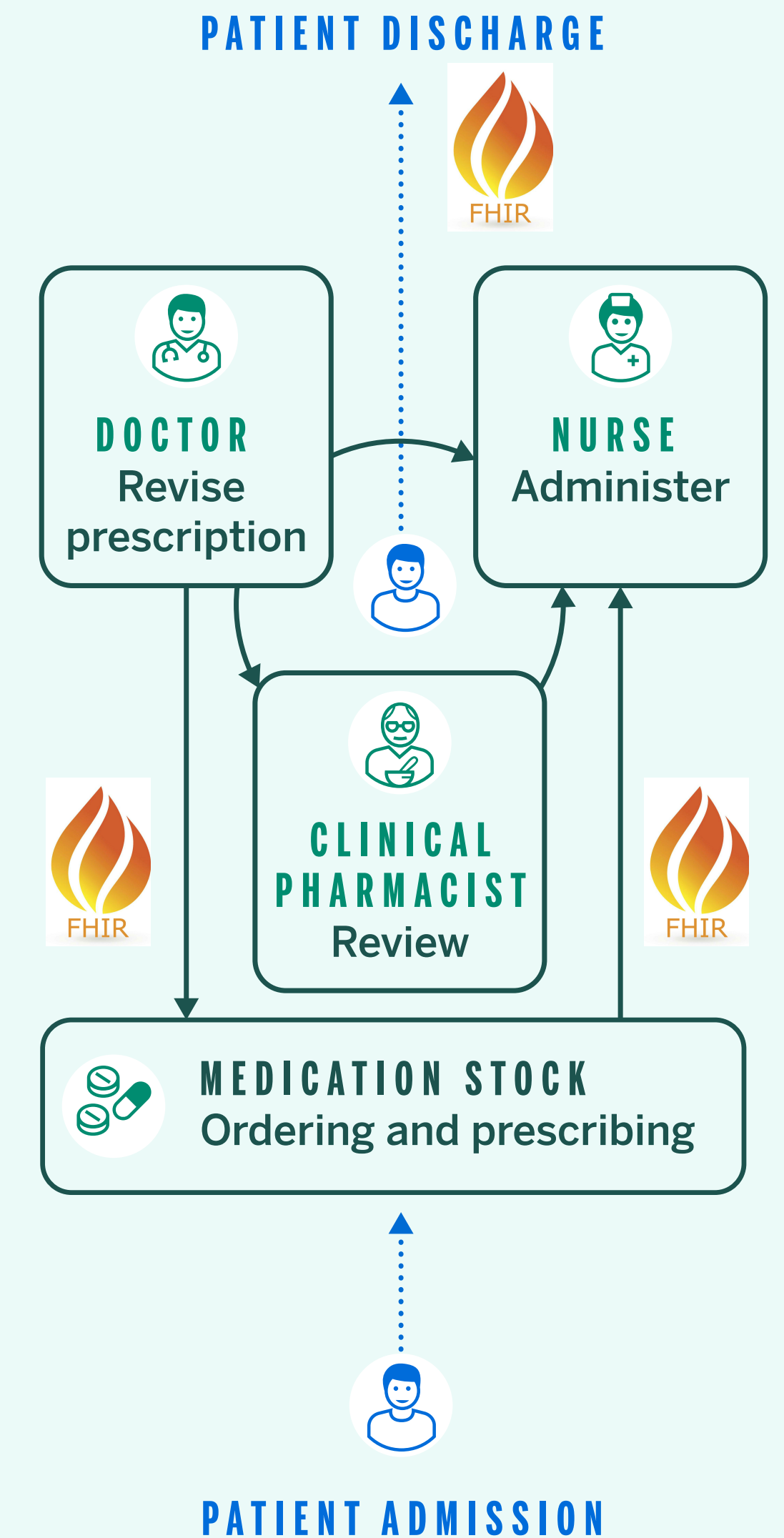


Ready-to-use, flexible, and scalable application for **electronic medication management** in any hospital department

- ✔ State-of-the-art **future-proof** application for end-to-end medication management
- ✔ Helps **reduce medication errors** and missed doses
- ✔ **Gain efficiency** in medication-related workflows with reduced time spent

Medication management based on an open platform

- ✔ intuitive and easy-to-use by clinical staff
- ✔ closed-loop medication management
- ✔ CE-marked dose calculator
- ✔ BI reporting
- ✔ successfully deployed in 10 NHS Trusts



Care plans

ICHOM - PROMs

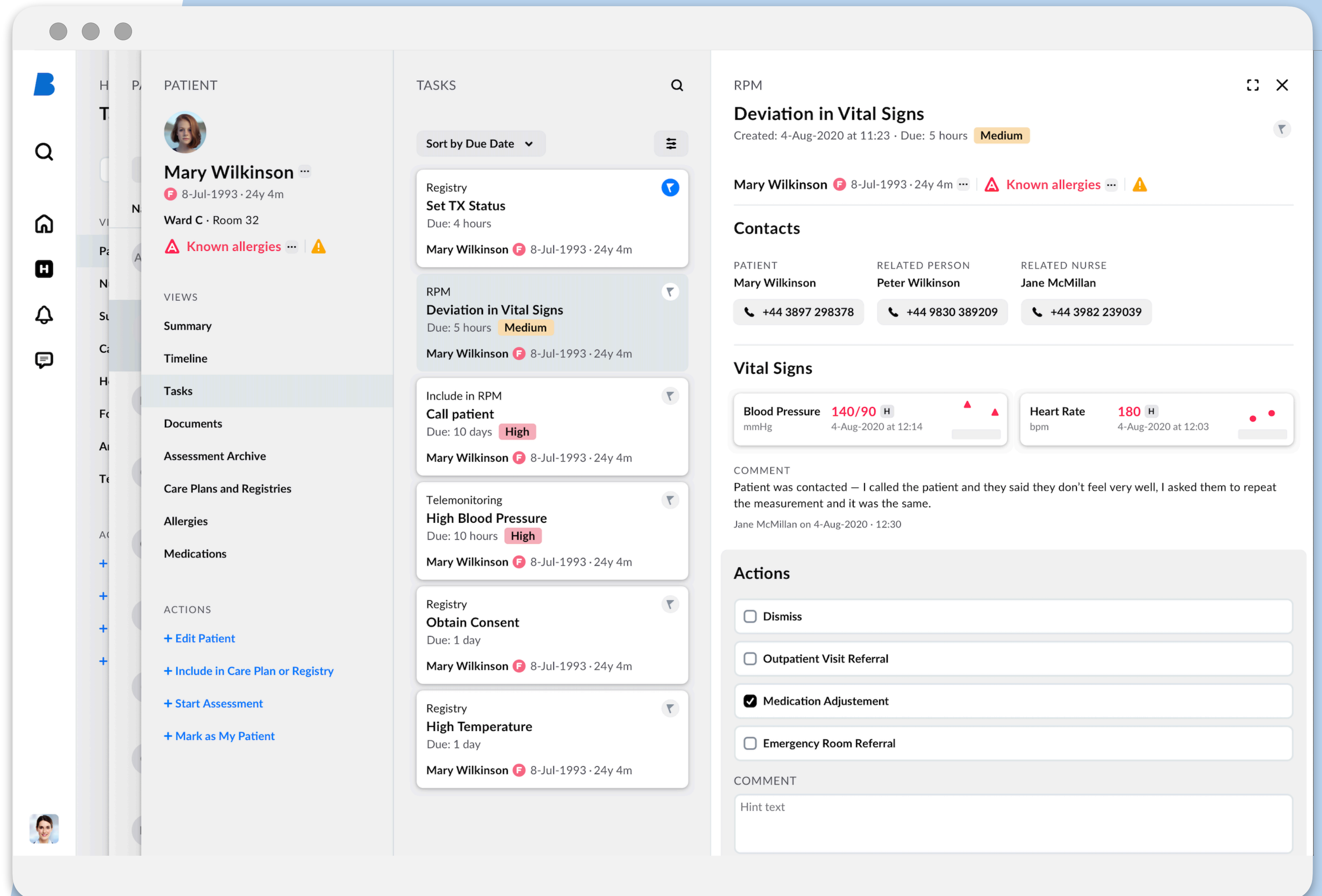
Create new registries (no-code)

Create care plans (no-code)

Add tasks and reminders

Assign patients to case-specific care-plan (groups and sub-groups)

Fully customisable and easily extendable



The screenshot displays a patient care plan for Mary Wilkinson. The interface is divided into several sections:

- PATIENT:** Mary Wilkinson, 8-Jul-1993 · 24y 4m, Ward C · Room 32. Includes a "Known allergies" warning.
- VIEWS:** Summary, Timeline, Tasks (selected), Documents, Assessment Archive, Care Plans and Registries, Allergies, Medications.
- ACTIONS:** + Edit Patient, + Include in Care Plan or Registry, + Start Assessment, + Mark as My Patient.
- TASKS:** A list of tasks with due dates and priority levels:
 - Registry: Set TX Status (Due: 4 hours, Medium)
 - RPM: Deviation in Vital Signs (Due: 5 hours, Medium)
 - Include in RPM: Call patient (Due: 10 days, High)
 - Telemonitoring: High Blood Pressure (Due: 10 hours, High)
 - Registry: Obtain Consent (Due: 1 day)
 - Registry: High Temperature (Due: 1 day)
- RPM Deviation in Vital Signs:** Created: 4-Aug-2020 at 11:23 · Due: 5 hours (Medium). Includes patient info, known allergies, and contacts.
 - Contacts:** Mary Wilkinson (Patient), Peter Wilkinson (Related Person), Jane McMillan (Related Nurse). Phone numbers: +44 3897 298378, +44 9830 389209, +44 3982 239039.
 - Vital Signs:** Blood Pressure 140/90 mmHg (High), Heart Rate 180 bpm (High).
 - COMMENT:** Patient was contacted – I called the patient and they said they don't feel very well, I asked them to repeat the measurement and it was the same. Jane McMillan on 4-Aug-2020 · 12:30.
 - Actions:** Dismiss, Outpatient Visit Referral, Medication Adjustment, Emergency Room Referral.
 - COMMENT:** Hint text



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CENTRALISED REGISTRY OF PATIENT DATA(CRPD) Ministry of Health Slovenia

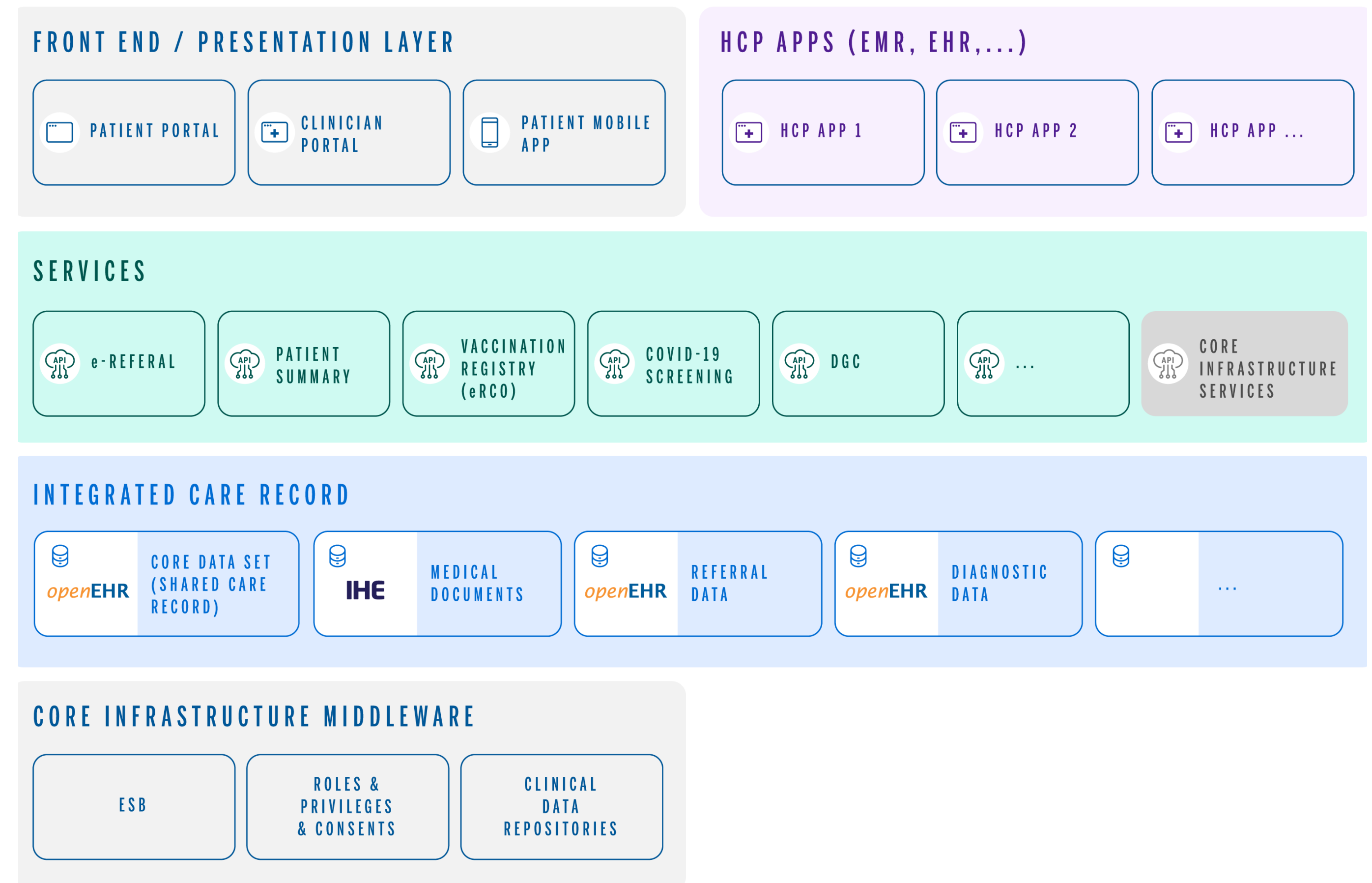
National environment based on a digital health platform (DHP) providing robust and scalable foundation for exchanging and sharing electronic health records and supporting central applications for 2 million citizens



Centralised Registry of Patient Data (CRPD)

Core part of the Slovenian national eHealth project with an important mission to improve the quality of health services with effective electronic solutions. It is a crucial component of the national information infrastructure that enables integration of various information systems.

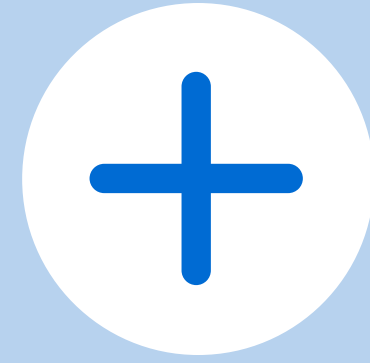
- Data stored around the patient on a **vendor-neutral** clinical data repository providing **longitudinal patient record**
- Integrated care records (ICR) serves as a **single source of “truth”** for the lifetime of the patient.
- Infrastructure for **digital services** based on shared care records





SCOPE

- Medical documentation (discharge summary, clinical notes)
- Structured core data set: **diagnoses, allergies, vaccinations, surgical procedures, dispensed medications, diagnostics data (Lab, Imaging),...**
- Referral data, Consent document, Access policy data, other relevant information



BENEFITS

- **Innovations and rapid development** on fit for purpose services and apps (like Covid-19 SMS notification service in 14 days)
- **Engaging patients** in the care process providing them access to their medical records
- Providing **relevant information** for all stakeholders involved in a patient care process and **improve decision support**
- **Population health monitoring** and epidemiological monitoring
- Data available for **research and secondary use**



USAGE

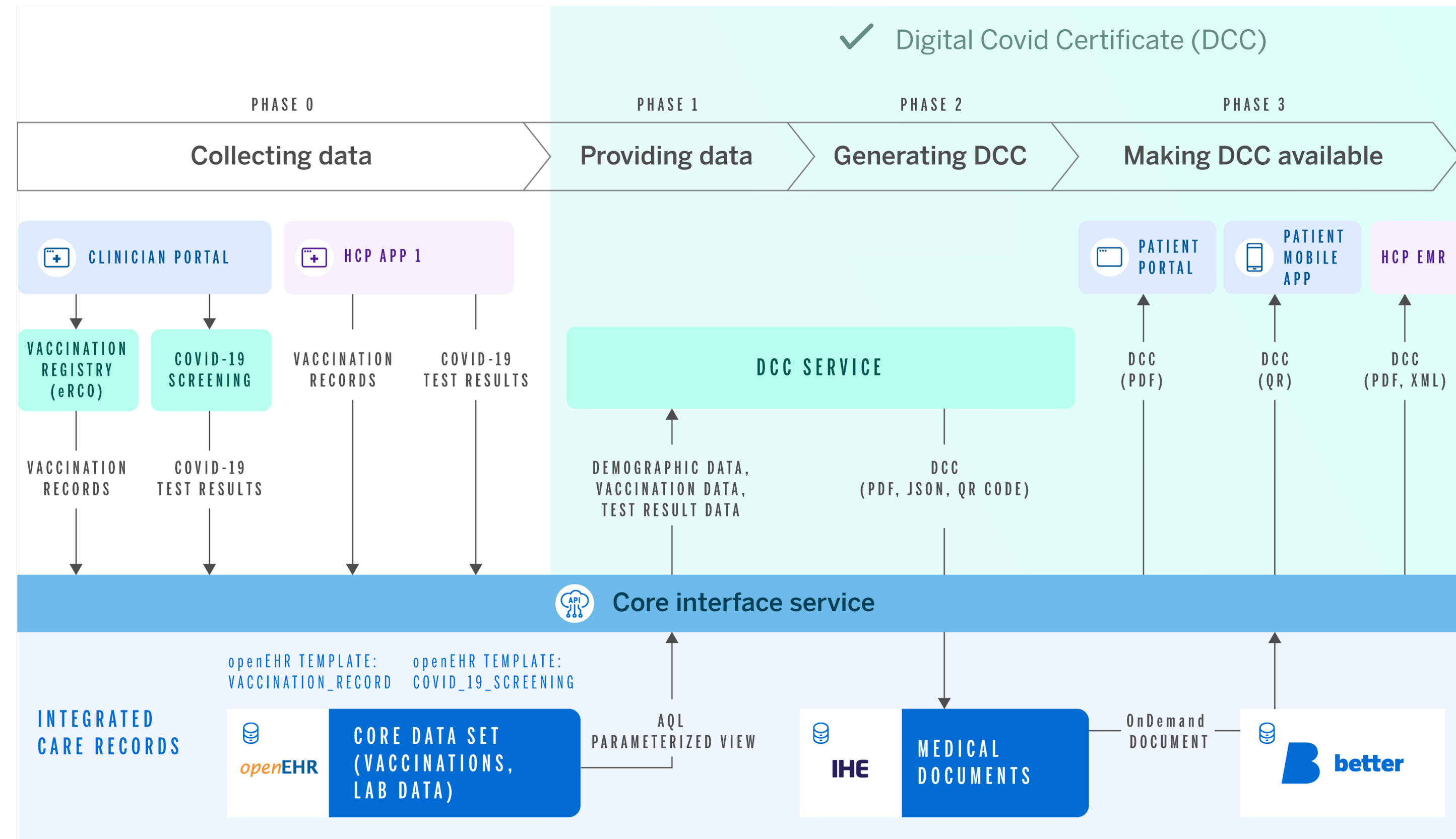
- In total **120M** documents: 85M structured, 35M unstructured
- Data available for more than **2M** individuals (UniqueID) covering over 95% of population
- **1.2M** Vaccination records, **3.2M** Covid-19 test results (PCR + rapid), **900k PCR** reports

Centralised Registry of Patient Data (CRPD) Digital Covid-19 Certificate

Using integrated care record data with already collected data for Vaccinations and test results (Antigen, PCR)

Configure AQL parametrised view for DGC service in 1 hour

- CRPD provides standardised APIs for retrieving relevant data for generating DCC (demographic data, vaccination data, test result data)
- DCC service generates DCC according to defined specifications (structured and digitally signed)
- DCC is available as onDemand document including QR code





UNIVERSITY HOSPITALS BIRMINGHAM & WEST MIDLANDS CANCER ALLIANCE

Cancer intervention & diagnostics



Queen Elizabeth Hospital Birmingham
Part of University Hospitals Birmingham
NHS Foundation Trust





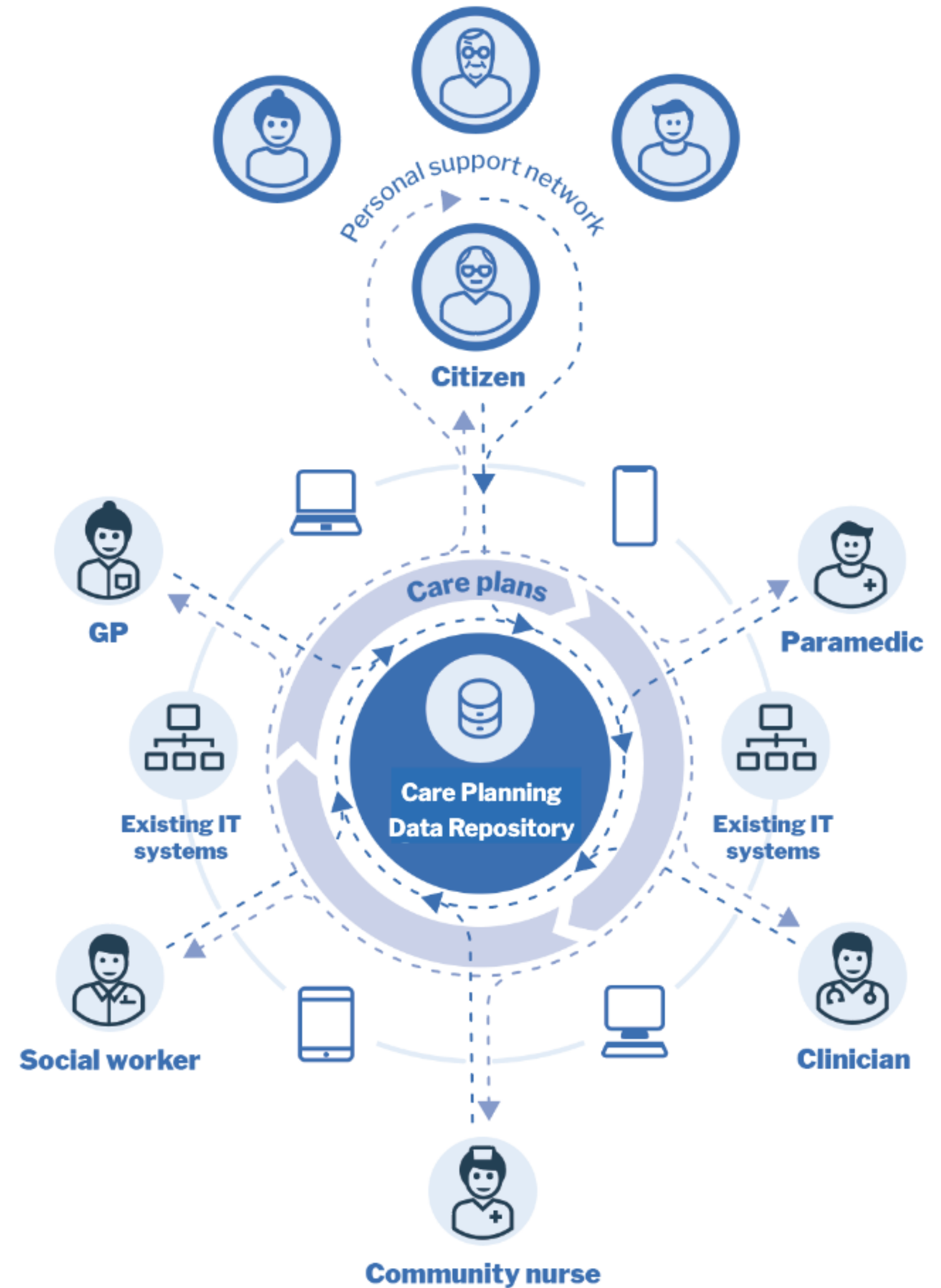
better

SUFFOLK & NORTH EAST ESSEX Integrated Care System

Better Platform
Care Planning
End-of-Life



CAN DO
HEALTH & CARE





PATIENTS KNOW BEST[®]
MANAGE YOUR HEALTH



Advance Directive
PDF - Doc Ref
FHIR
FHIR
Contacts (REST)
PDF - Document Reference
FHIR

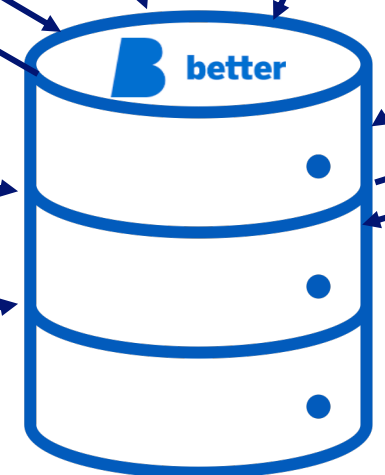
Encounter info
HL7 CDA
FHIR

EoL Care Plan: FHIR bundle
FHIR

PDF - Document Reference
FHIR



Created NEW: Frailty Care Plan
including open APIs
(in 3 hours)



Clinical data
repository

Interopen Hackathon Summary



Care Plans

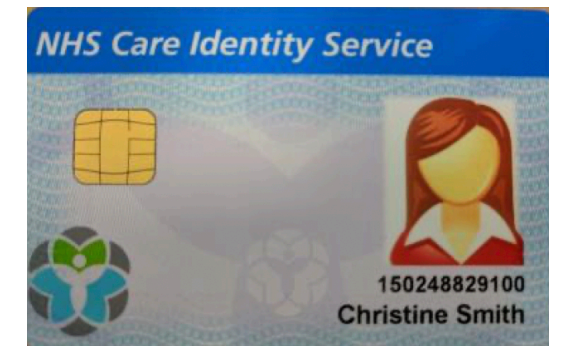


Desktop browser:
embedded care plan launch

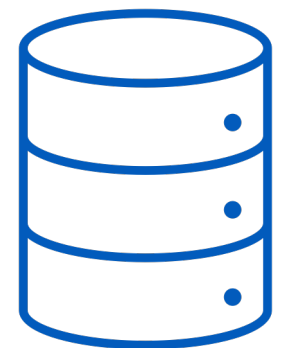


GP or Community system

FHIR IM1



NHS Smartcard
authenticated log in



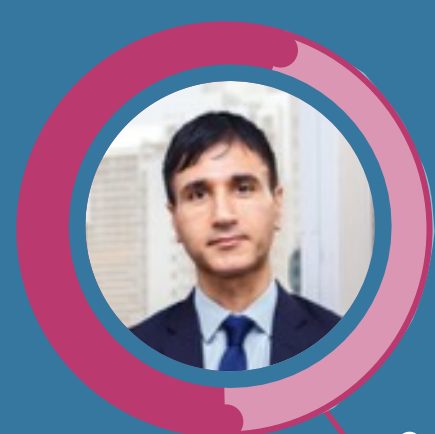
Care Identity
Server



Care planning must support patients, carers, healthcare professionals and system leaders



“ I want to ensure my patient's wishes are met when the time arises ”



“ I don't want to have to repeat the same information over and over again ”



One London Dynamic integrated care planning service



“ I don't have access to the information I need ”

Worries and fears

- I'm overwhelmed already, how is it going to help me and my patients
- We don't need a new system
- Bringing the current patients across: they will call the surgery or call me
- Need it all in one place this isn't just another system





SOMERSET ICS consolidated medication record

Regional medicines platform enables the creation of the **ICS patient medication record** away from individual provider silos.





OXFORD HEALTH NHS FOUNDATION TRUST

BetterMeds
Better Portal
Better Platform





THE CHRISTIE NHS FOUNDATION TRUST

Manchester, UK

Better Platform for:

- Clinical forms
- PROMs
- Core EHR
- Research



30+ NHS Trusts and organisations across all 4 nations use openEHR





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Better Ltd



30 years

in healthcare IT



140 employees

Slovenia, UK, Germany



1000+

Healthcare providers



22+ million

Patient Records



**120+ Customers
in 16 markets**



15 Partners

SIs, Resellers, OEM



WHY

Better improves health and care for all by **simplifying** the work of health and care teams and **accelerating** digital transformation underpinned by **data for life**

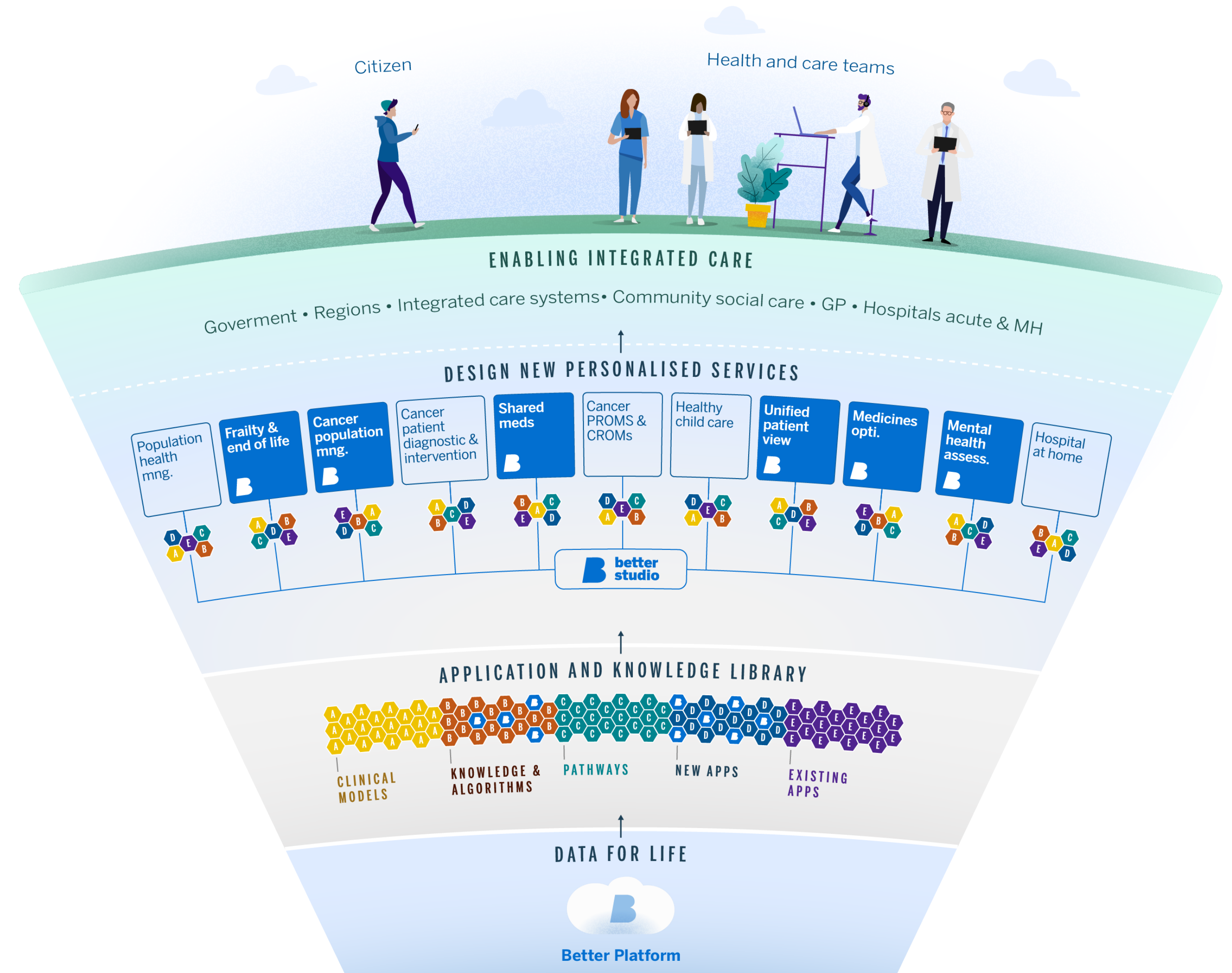


Digital Health Platform

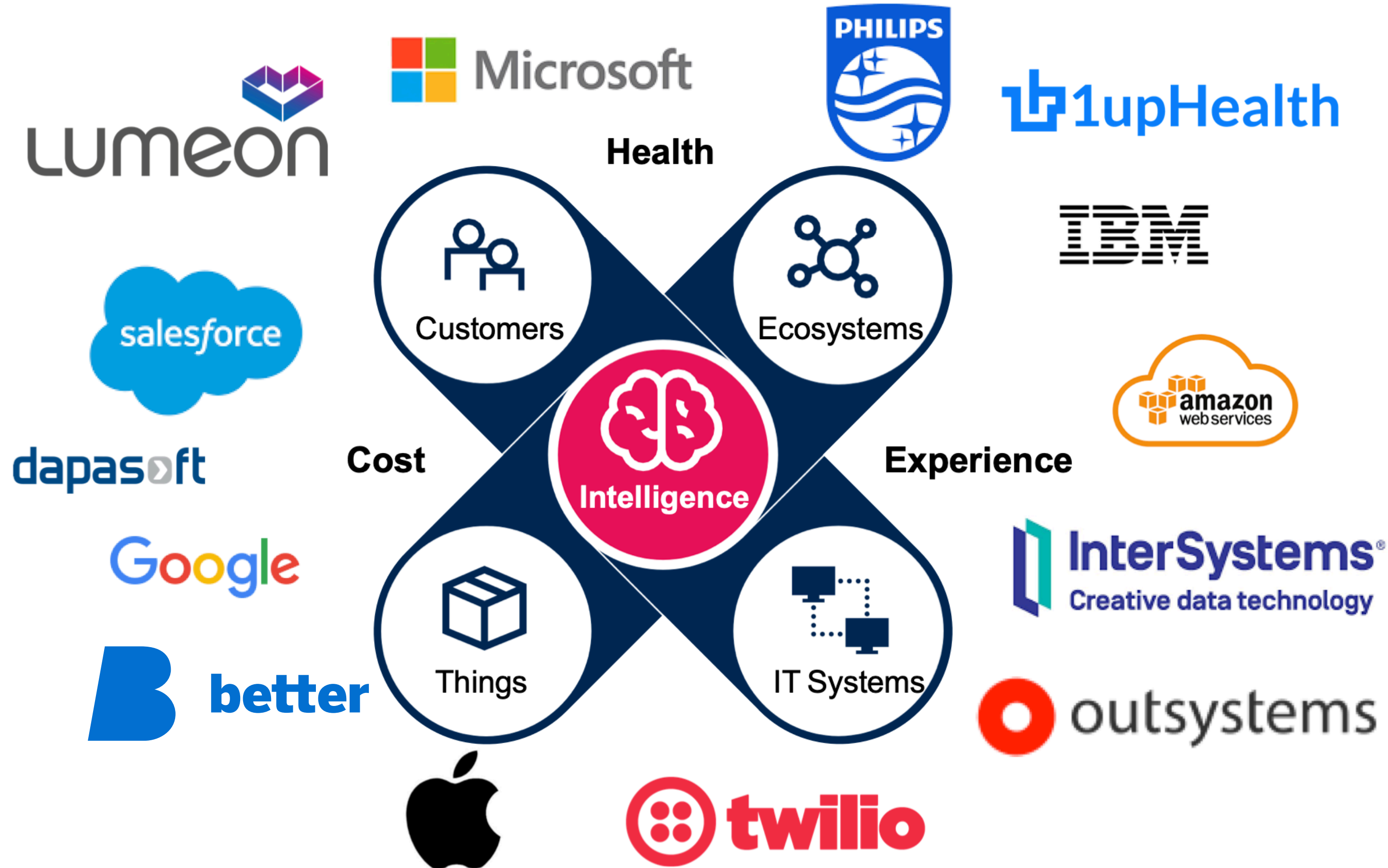
Unified, personalised application experience portal and design system

Fast delivery of applications low-code tools

Vendor-neutral data core longitudinal care record



A New Era of Capability Has Rapidly Evolved



Gartner®

Select Partners



B better

- **Monolithic and uneconomical EHRs** are **impeding** digital transformation by **blocking data use**
- **End-to-end disease management** will require **many apps** and applications working with the **same data**
- **Digital Health Platforms** offer **personalised UX**, **low-code** tools and a **vendor neutral data layer**
- **openEHR** is now widely used by the **most advanced** health systems for **data persistence**
- **FHIR** is widely used for **data integration** and **access** through standard interfaces
- We need to make **use of both!**





Thank You!



Better data, Better care

www.better.care