

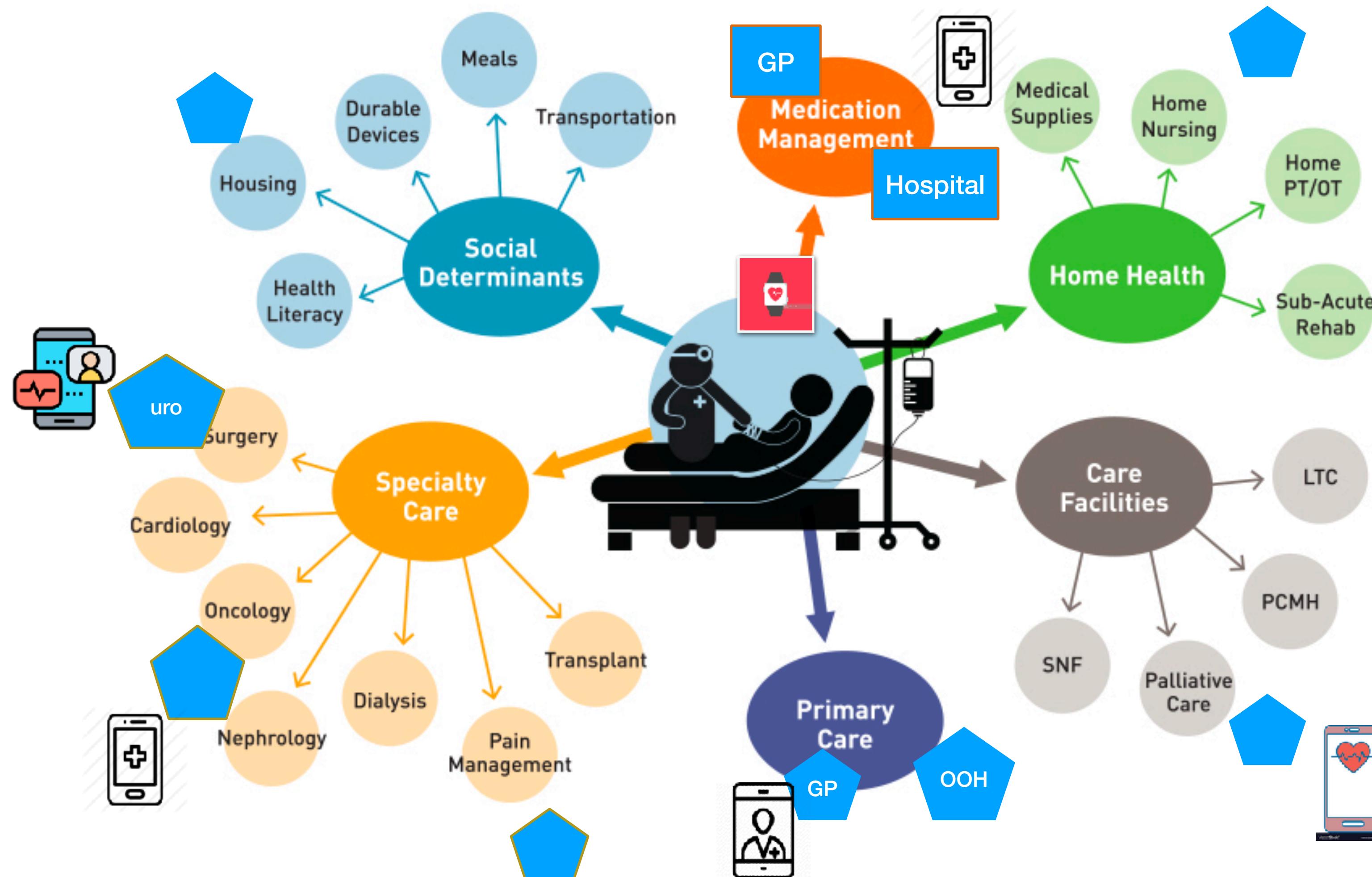
# What is openEHR: Towards a coherent patient-centric digital healthcare ecosystem



**Dr Ian McNicoll**  
**Clinical informatician**  
**Past co-chair openEHR International**

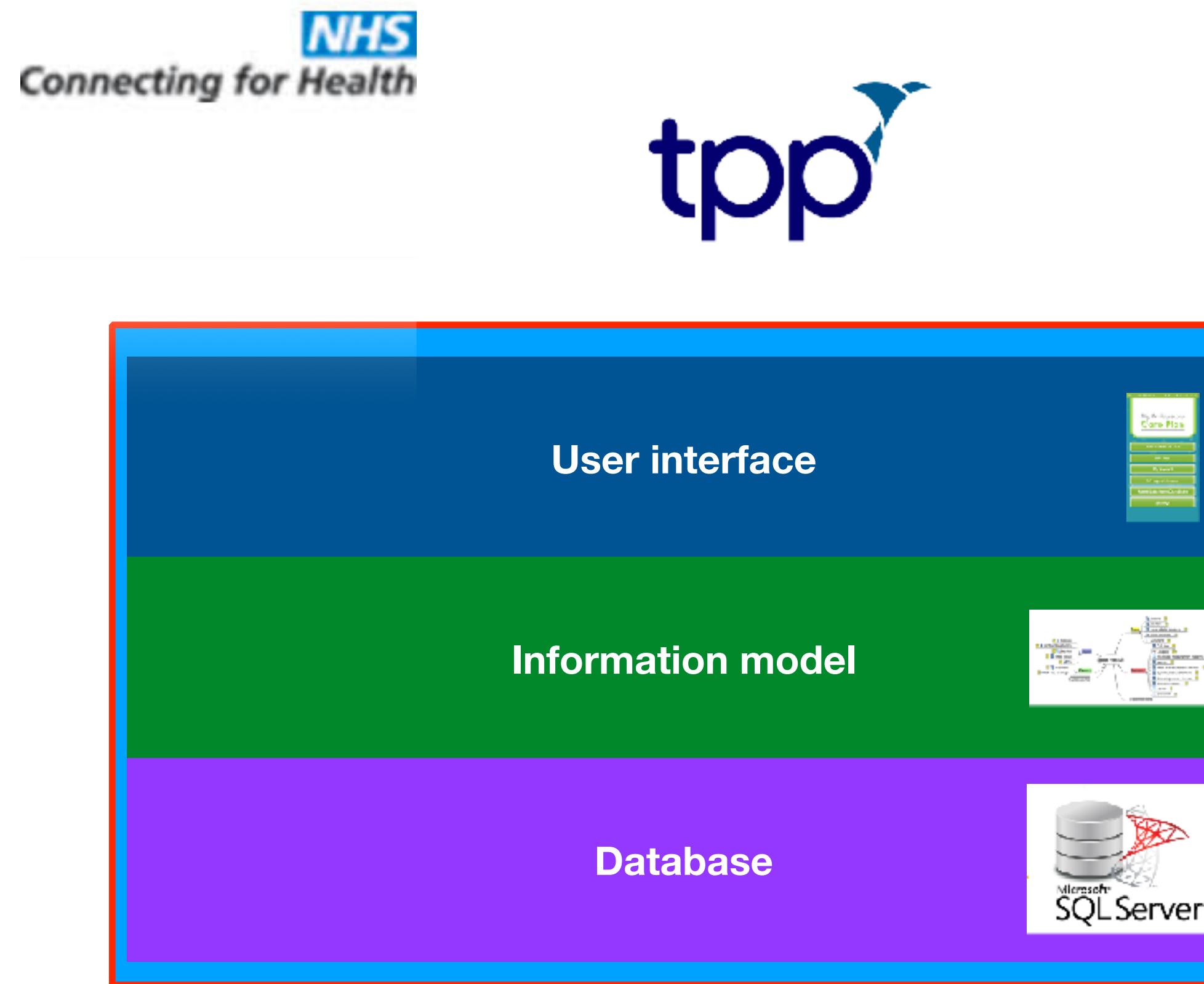
# What do we actually want ? A patient-centred coherent information system?

openEHR



# A. Megasuite architecture?

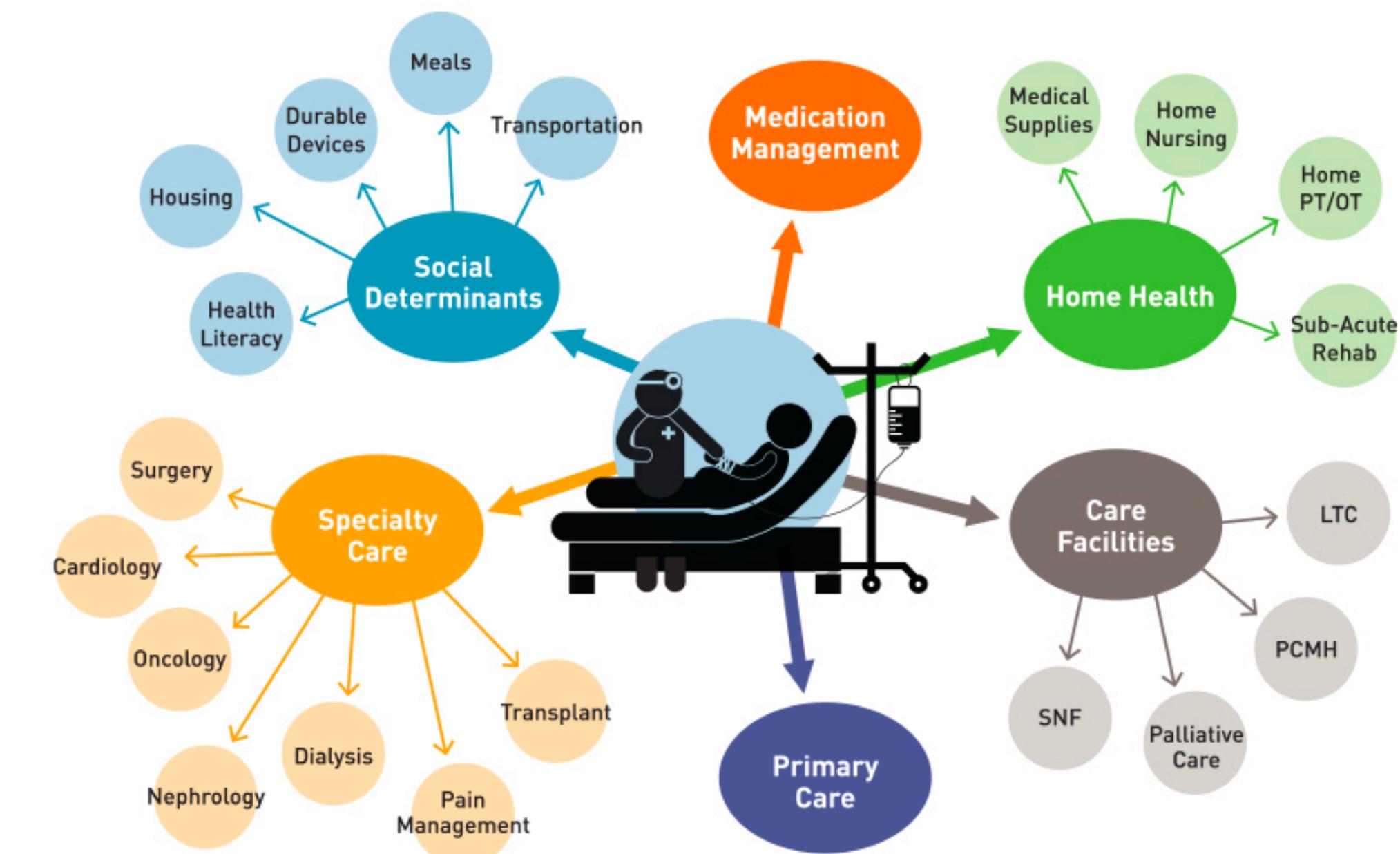
openEHR



**Epic**

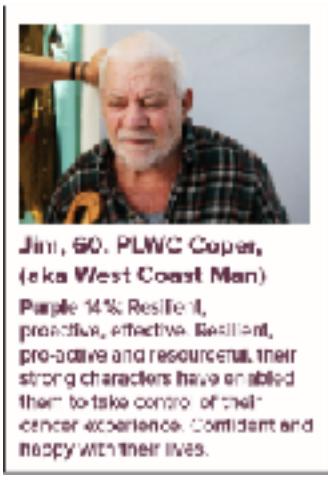
with the patient at the heart

**InterSystems**  
Creative data technology



# Cancer journey

# *open*EHR



**Jim, 60, PLWC Copper,  
(aka West Coast Man)**

Purple 14% Resilient, proactive, effective. Resilient, pro-active and resourceful, their strong characters have enabled them to take control of their cancer experience. Confident and happy with their lives.

MDT Genetic Screen

PW - H. A. W. 400 900 8176 | version 10.10.40.10 | MALPOV.Ludes | on 2024-02-28

MOT MEETING DATE	<input type="text" value="2024-02-28"/>	MOT NAME	<input type="text" value="E.O. 0821 Long"/>	MOT ORGANISATION NAME	<input type="text"/>
MOT LOAD NME	<input type="text"/>	MOT MEETING TIME	<input type="text"/>	MOT IDENTIFIER	<input type="text"/>
REFERRING ORIGIN	<input type="text"/>	SEARCH		DISEASE PRESENTATION	<input type="text" value="New Diagnosis (not defined yet)"/>
<b>CLINICAL HISTORY/REASON FOR DISCUSSION</b> <div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <a href="#">Referral Details</a>  <a href="#">Previous Treatment/Referrals</a>  <a href="#">Keyworker Details</a>  <a href="#">MDT Records</a>  <a href="#">Previous Staging</a>  <a href="#">Patient Summary View</a>  <a href="#">Reporting</a> </div> <div style="flex: 1;"> <a href="#">Add Patient Summary</a>  <a href="#">GOF Treatment Referral Data</a> </div> </div> <p>This patient was referred to the GP following a GOF clinical alarm, communicated at the left upper lobe CT scan location. Our U&amp;L notes and analysis evidence that this transmission has shown significant cell loss.</p>					
<p>Primary Diagnosis</p> <p>Site code (ICD9)</p> <p>ICD9CDR</p> <p>Management Date (month)</p> <p>Grade of Disease</p> <p>(in degrees)</p> <p>Date of Diagnosis</p> <p>Book of Diagnosis</p> <p>Pathologist name</p> <p>Date First Seen (Clinical Availability)</p> <p>Reproductive Consultant (Cancer Specialist)</p> <p>Pathology Grade</p> <p>(in degrees)</p> <p>Stage Date</p> <p>Age at Birth</p> <p>Age at Treatment</p> <p>Path Type</p> <p>Stage Type</p> <p>ICD9-ICD10</p> <p>Treatment</p> <p>Neoadjuvant</p> <p>Adjuvant</p> <p>Hormonal</p> <p>Other</p> <p>Stage Crossing</p> <p>Metastatic Type</p> <p>Local/Metastatic</p> <p>Hematogenous (if applicable)</p> <p>Comorbidities</p> <p>SEARCH</p> <p>ACE 32 Score</p> <p>Other Cancer</p> <p>Site of Other Cancer</p> <p>HDM DISCUSSION</p>					

MY CLINICAL OUTCOMES

Patient details: Mrs Dawn Taylor

This patient has missing registration information that needs to be completed before validation.

VIEWING LEFT HIP REPLACEMENT

OVERVIEW CONFIRM UPDATE REVIEW

CONTACT US

Sub-specialty Hospital / clin Treatment / p Detail / impl Pre/post oper Gender Age

General

Name: Mrs Dawn Taylor

Email: dawn.taylor@my-clinical-outcomes.com

Date of birth / Age: 10-Jun-1943 / 75

Clinic / Consultant: Dr Terry Smith

Problem area: Left hip

Latest condition detail

Treatment date / Time since treatment: 09-Dec-2010

Procedure: Total hip replacement

Note

OXFORD HIP SCORE

ASSESSMENT DATE

Score: 31

Assessment date: 09-Dec-2010

Score: 37

Assessment date: 09-Dec-2011

Score: 38

Assessment date: 09-Dec-2012

Score: 38

Assessment date: 09-Dec-2013

Score: 38

Assessment date: 09-Dec-2014

Score: 37

Assessment date: 09-Dec-2015

Score: 36

Assessment date: 09-Dec-2016

Score: 37

Assessment date: 09-Dec-2017

Score: 24

Assessment date: 09-Dec-2018

REVIEW

UPDATES

BY SMITH

1 2 3 More Less

Recent scores

Date	Score
09-Dec-2010	31
09-Dec-2011	37
09-Dec-2012	38
09-Dec-2013	38
09-Dec-2014	37
09-Dec-2015	36
09-Dec-2016	37
09-Dec-2017	24
09-Dec-2018	24

# Treatment Summary

Please take this document with you to your GP practice appointment where your diagnosis and cancer care will be reviewed with you.

Please complete this form using BLOCK CAPITALS and black ink.

Patient's name:	John Smith	GP contact details:	Dr Jones
Date of birth:	10.10.10	Record number:	
Address:	3 Park Road	Hospital trust:	
	Doncaster DN4 0EF		

Your patient has had the following diagnosis and treatment for cancer and received a summary and ongoing management plan as outlined below. They have/have not received a copy of this summary. (Delete as applicable)

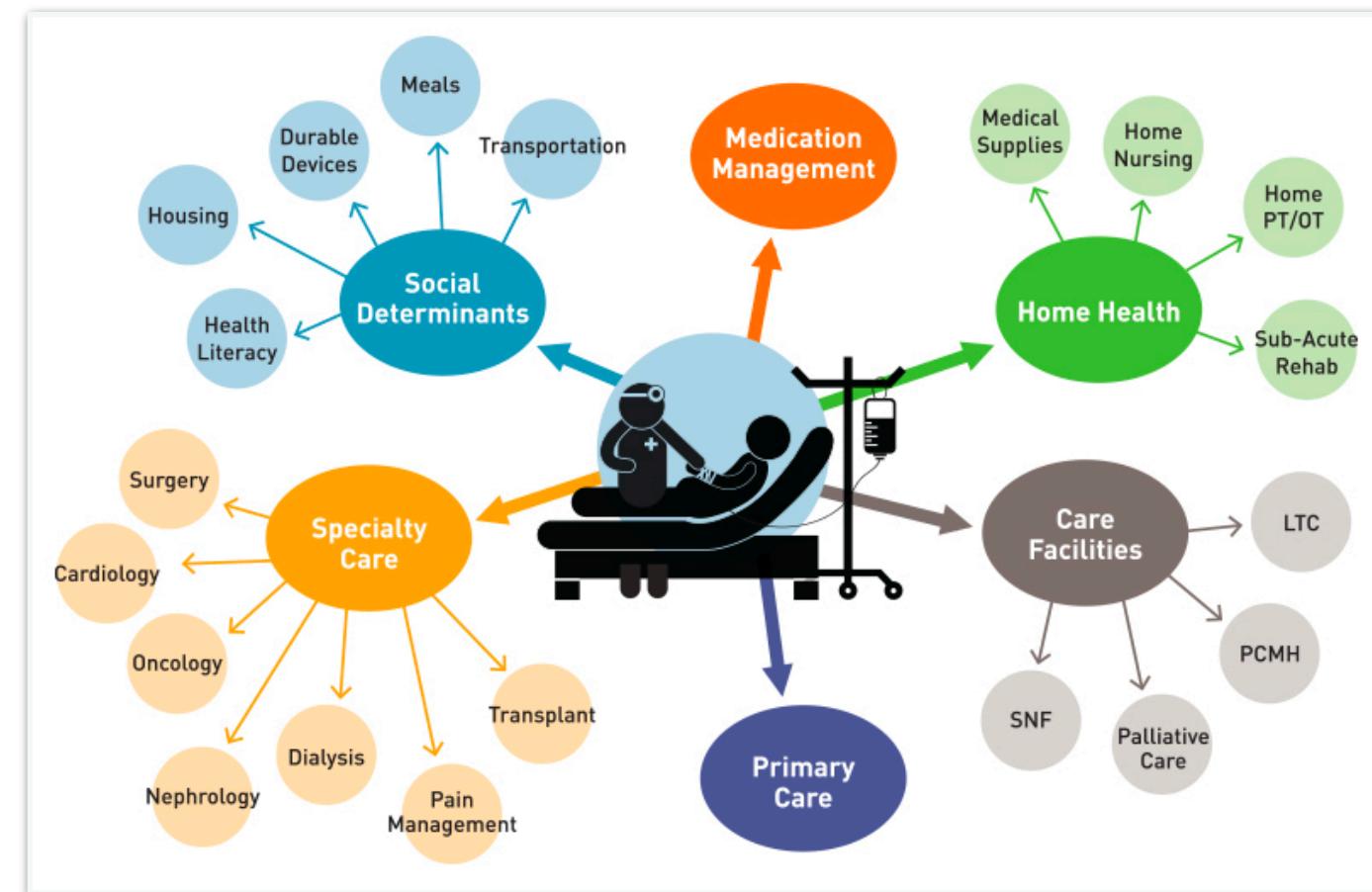
<b>Diagnosis:</b> Colorectal cancer	<b>Date of diagnosis:</b> 10.02.10	<b>Stage/grade:</b> Dukes: T2
<b>Summary of treatment and relevant dates:</b> Surgery – Resection (March 10) and reversal of stoma (Sept 10) Radiotherapy – May–June 2010 Possible treatment toxicities and/or late effects: Diarrhoea following pelvic radiotherapy		<b>Treatment aim:</b> Curative
<b>Possible treatment toxicities and/or late effects:</b> Surgery – Resection (March 10) and reversal of stoma (Sept 10) Radiotherapy – May–June 2010 Possible treatment toxicities and/or late effects: Diarrhoea following pelvic radiotherapy		<b>Advise entry onto primary care palliative/supportive care register:</b> No <b>DS 1500 application completed:</b> No <b>Prescription charge exemption agreed:</b> Yes
<b>Alert symptoms that require referral back to specialist team:</b> Diarrhoea for more than two weeks not relieved by loperamide/codeine Blood or mucus per rectum Further change in bowel function Abdominal pain that persists for longer than four weeks and does not respond to simple analgesia		<b>Contacts for referrals or queries:</b> In hours: 01234 567890 (CNS team) Out of hours: 01234 567894 (oncology ward)
<b>Secondary care ongoing management plan: (tests, appointments etc)</b> Next GP Review – Jan 2011 CEA next due in Jan 2011 then annually until 2015 CT scan (abdomen and chest) next due Sept 2011 Colonoscopy repeat next due Sept 2015		<b>Other service referrals made:</b> (delete or add) Dietician Benefits/Advice Service
<b>Recommended GP actions in addition to GP Cancer Care Review:</b> Please review dose of XXXXX in two months if symptoms of XXXXX resolved reduce to 4mg daily		
<b>Summary of information given to the patient about their cancer and future prognosis:</b> John Smith and his wife have been informed that the cancer in his colon was non-invasive and that he has received surgery and radiotherapy with curative intent. He is aware however that it may recur in the future and we have briefly discussed the further treatment available should this be required. He is fully aware of the symptoms of recurrence and what to do should any occur.	<b>Additional information including issues relating to lifestyle and support needs:</b> I have advised him to quit smoking and referred to smoking cessation clinic. He is keen to join local colorectal support group and plans to attend next session in November.	

**Completing Clinician:** Charles Goodenough

**Signature:**

**Date:** 30.10.10

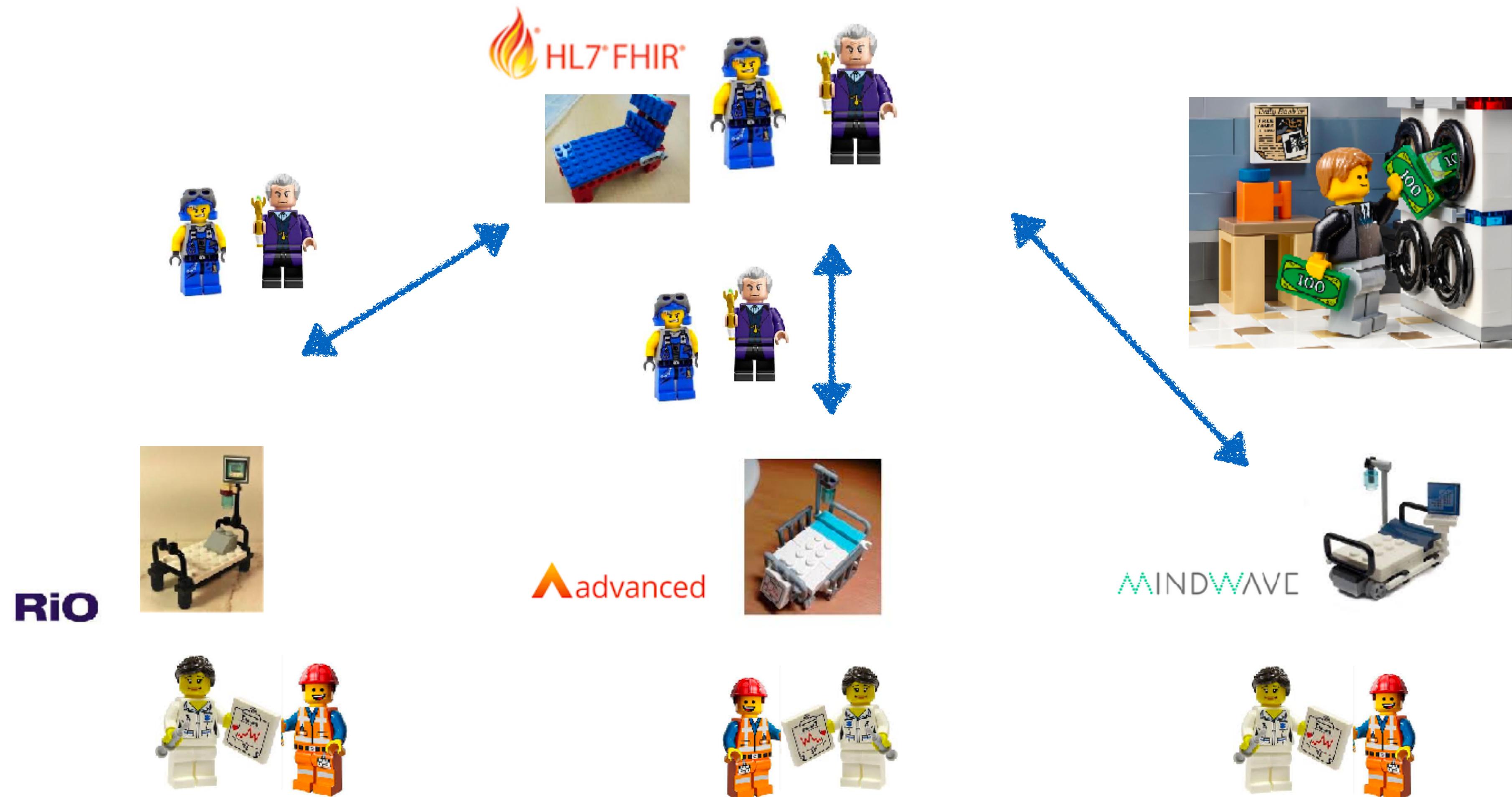
You can order Treatment Summary triplicate pack through [macmillan.org.uk](http://macmillan.org.uk)



<b>RoSPECT</b>	Recommended Summary Plan for Emergency Care and Treatment
<b>1. This plan belongs to:</b>	
Preferred name	
Date completed	

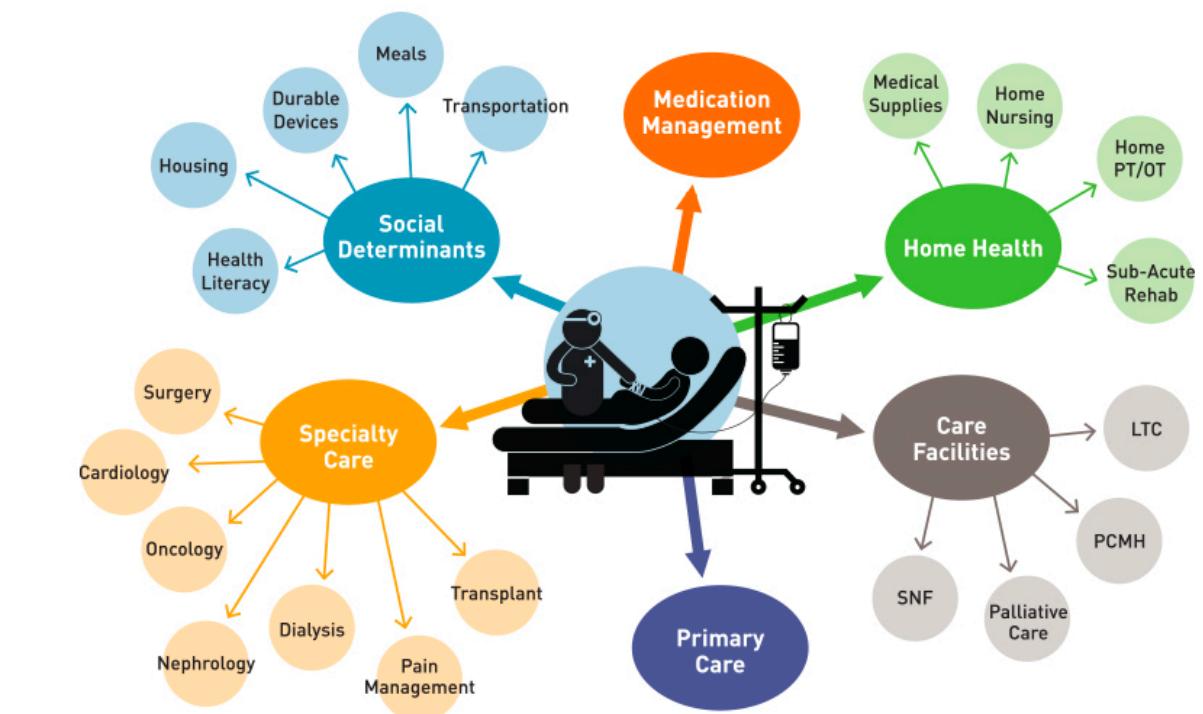
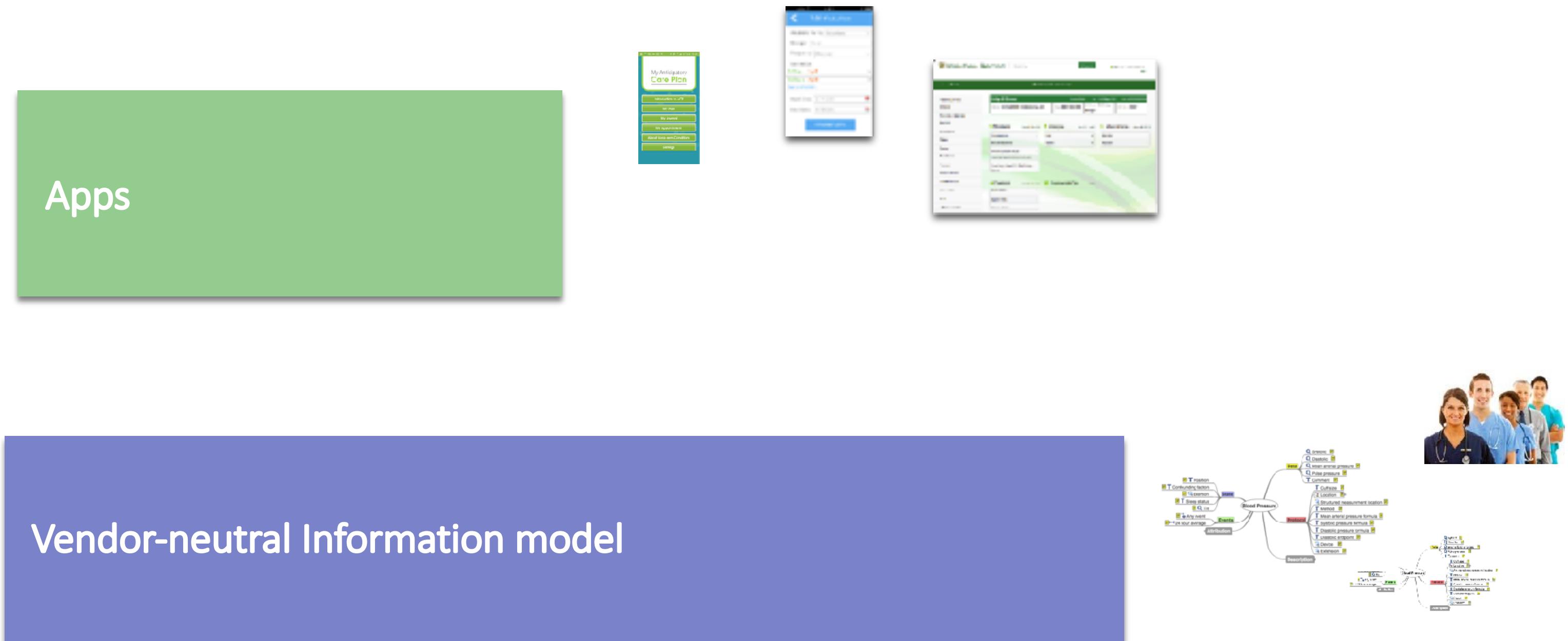
# B. Best of Breed - ‘interoperability’

*open*EHR



# C. open Platform - vendor-neutral

# *open*EHR



# *open*EHR

# Technology-neutral datastore (CDR)



 CaboLabs



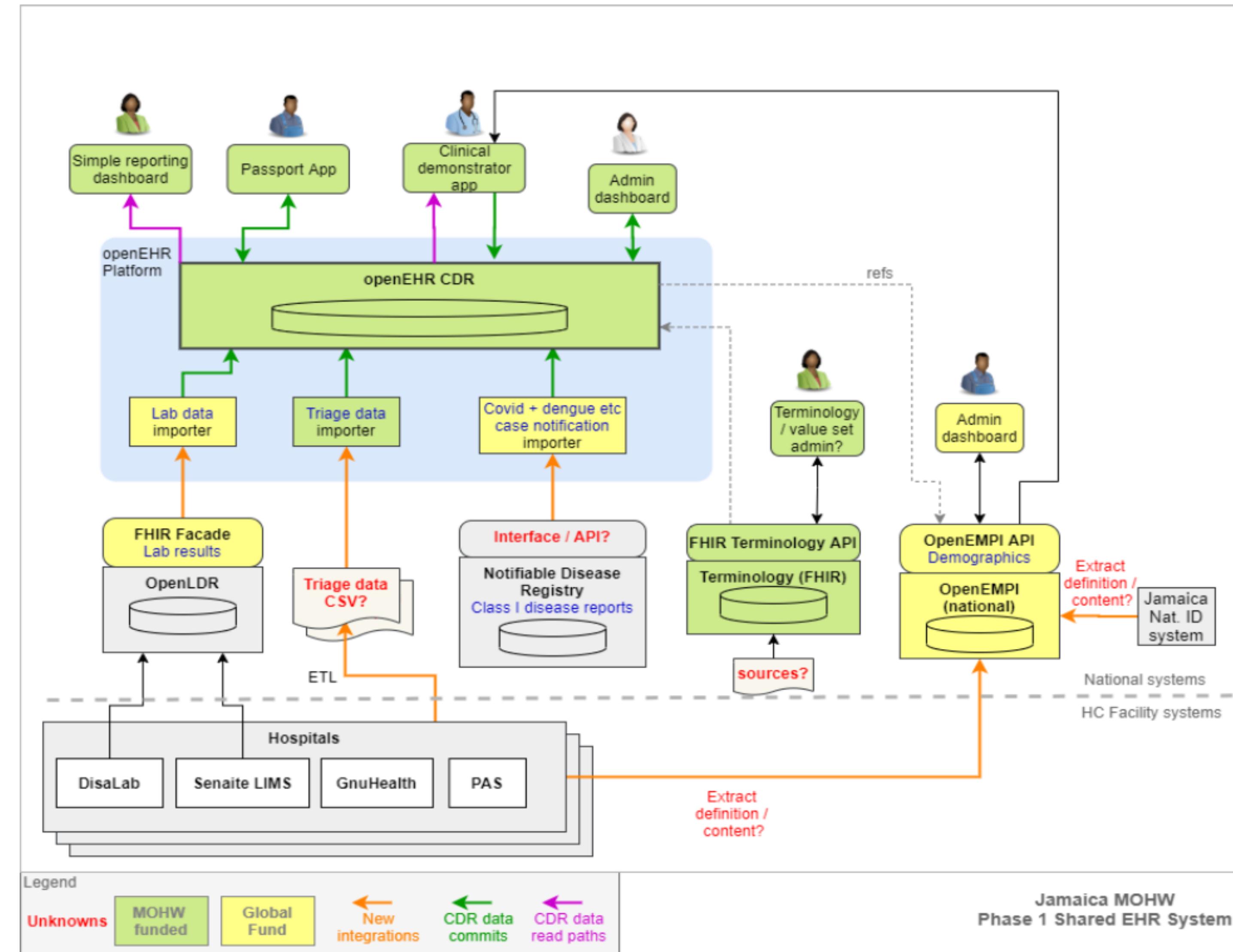
# OpenEHR Capacity Project Overview

The primary function of this consultancy is to plan, design, build capacity and implement the required components of the information architecture of the national eHealth (Digital Health) Architecture for the health sector.

The emphasis is on data design and specifications using OpenEHR clinical modelling, related resources and tools with an open platform approach.

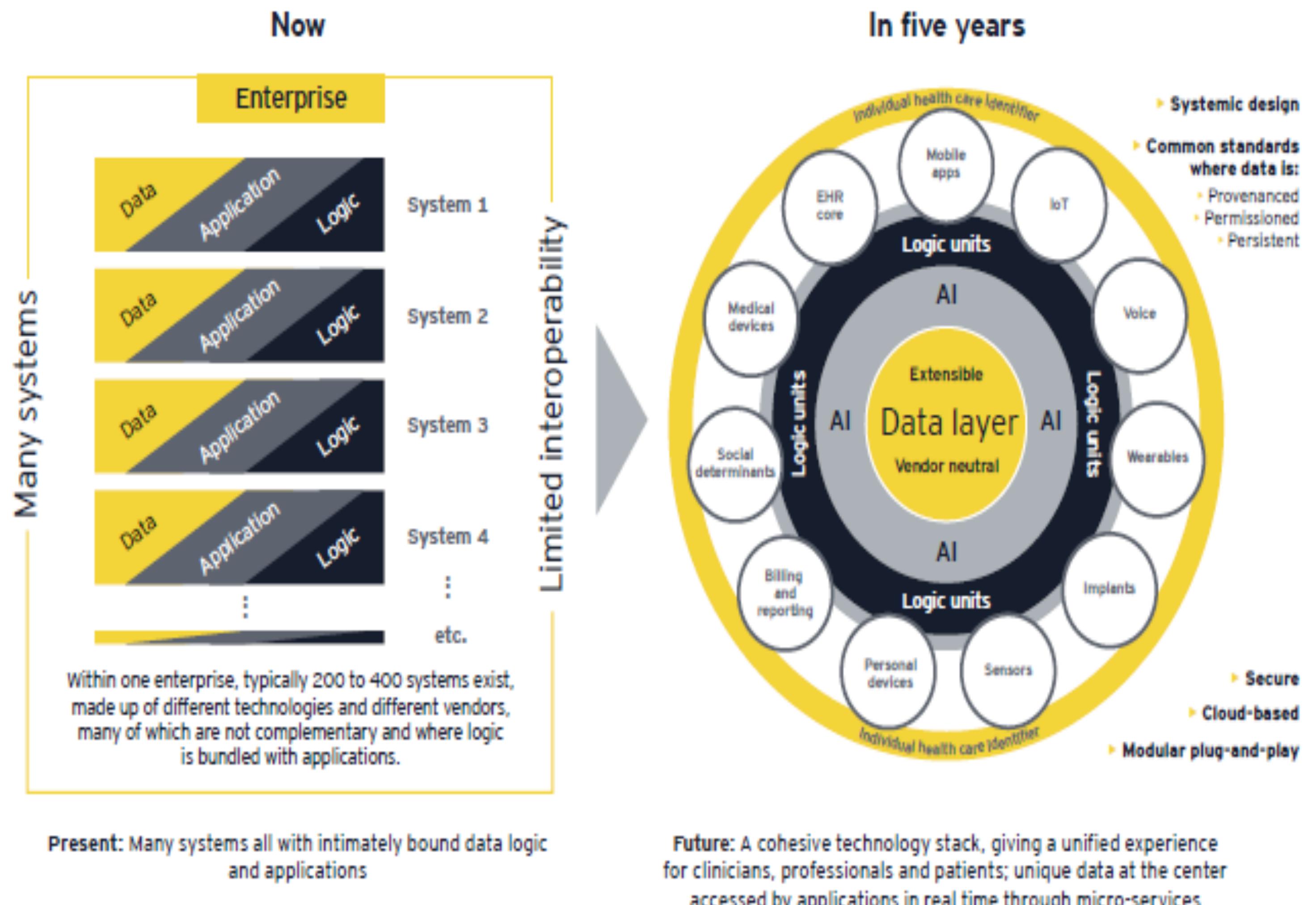
OpenEHR and its resources will enable the vision of the Ministry of Health and Wellness for (semantic) interoperability across various eHealth applications in the public and ultimately the private health sector.

OpenEHR enables the use of an open platform and provides a large repository of pre-defined data elements ready for use including for queries, reporting, analytics and research. The consultant is collaborating with the eHealth Architecture consultant contracted through the Global Fund Project.



## What are the benefits of using OpenEHR?

- ✓ An OpenEHR platform solution may be put in a single hospital as any traditional EHR is, but can also be across a city, region or whole country such as Jamaica ... providing continuity of care. *It's joined up*
- ✓ It puts the patient at the centre of everything. *It's safe*
- ✓ A big problem with EHRs is 'vendor lock-in'. It becomes too expensive to change even though the system is not up to the job. OpenEHR avoids this. *It gives flexibility*
- ✓ The separation of data models from the technical layers allows the platform to be built and deployed independently, removing one of the major sources of cost at a stroke. *It's cheaper*
- ✓ It also allows the people who know their own data and workflows, to be in the driving seat when specifying Hospital Information. *It's built by clinicians for clinicians*
- ✓ Technical advances of OpenEHR lead naturally to a plug-and-play platform economy, in which any developer can produce a component, as long as it conforms to open standards. *It's easy to use*
- ✓ This puts the customer back in charge of their own system environment, while enabling incremental procurement of new components. *It gives you back control*



# openEHR clinical modelling

*open*EHR

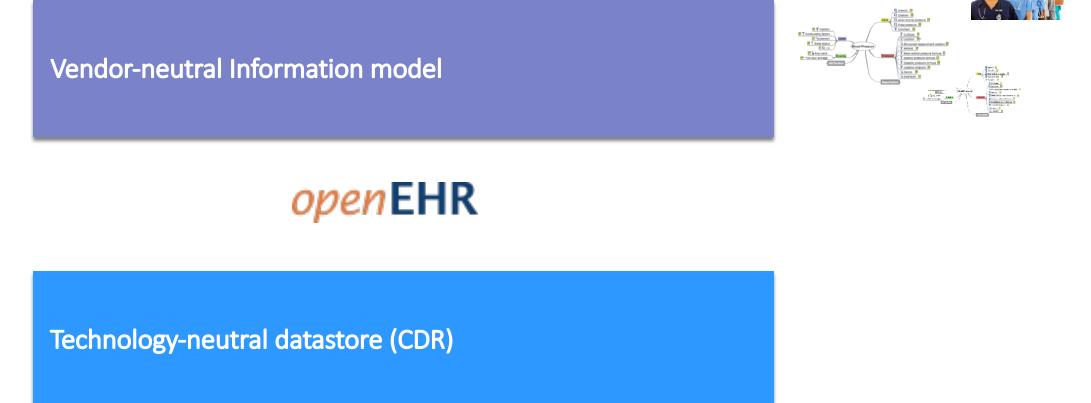
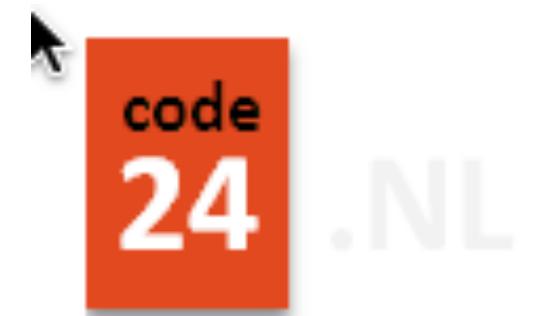
# CDR - Clinical data repository

*open*EHR

- Smart datastore which natively stores, retrieves, queries openEHR data via a standard API



- All data completely available
- AQL - Vendor-neutral querying
- **'No-code' deployment of new clinical content definitions**



# openEHR API

openEHR

The screenshot shows the openEHR REST API documentation page. It features a sidebar with navigation links for different API resources:

- Composition (EHR API - Composition Resource v1.0)
- Contribution (EHR API - Contribution Resource (WIP v1.0.1))
- Directory (EHR API - Directory Resource (v1.0))
- EHR (EHR API - EHR Resource (v1.0))
- EHR\_STATUS (EHR API - EHR\_STATUS Resource (WIP v1.0.1))
- Query (Query API - Query Resource (WIP v1.0.1))
- Stored Query (Definitions API - Stored Query Resource (WIP v1.0.1))
- Template (Definitions API - Template Resource (WIP v1.0))

The screenshot shows the Postman application interface. A collection named "Apperla C4H: openEHR REST APIs" is selected. The "Body" tab displays a JSON response for a blood pressure measurement:

```
24  },
25  },
26  },
27  },
28  },
29  },
30  },
31  },
32  },
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35  },
36  },
37  },
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47  },
48  },
49  },
50  },
51  },
52  },
53  },
54  },
55  },
56  },
57  },
58  },
59  },
60  }
```

The response includes fields such as "blood\_pressure", "uid", "other\_participation", "systolic", "magnitude", "unit", "diastolic", "magnitude", "unit", and "time".

# AQL - Archetype Query Language

openEHR

cdr.code4health.org/studio/aql-builder

34

5.11.2020 @ 13:23 + :

< NCD-Generic Patient Encounter.v0

Search...

Patient Encounter

→ context

- Generic

- Vital Signs

- Heart Rate

- Heart rate reading

Q Heart rate

- Blood pressure

- Blood pressure reading

Q Systolic

Q Diastolic

T Position

T Location of measurement

T Method

- Body temperature

- Body temperature reading

Q Temperature

- Oxygen saturation

- SPO2 reading

1:2 SpO<sub>2</sub>

- Inspired oxygen

Q Flow rate

✓ On room air

T Method of oxygen delivery

- Anthropometrics

- Height/Length

- Height/length measurement

1 SELECT c/uid/value as compositionId,  
2 c/name/value as compositionName,  
3 p/Systolic as systolic,  
4 p/Diastolic as diastolic,  
5 a/Weight as weight,  
6 f/Body\_mass\_index as bmi,  
7 r/Analyte\_result as glucose\_result  
8 FROM EHR e  
9 CONTAINS COMPOSITION c  
10 CONTAINS (OBSERVATION m#Blood\_glucose or OBSERVATION p#Blood\_pressure or OBSERVATION a#Body\_weight or OBSERVATION f#Body\_mass\_index or CLUSTER r#Laboratory\_analyte\_result)  
11 WHERE e/ehr\_id/value = {{ehrId}}  
12 OFFSET 0 LIMIT 10

Num. of results: 10

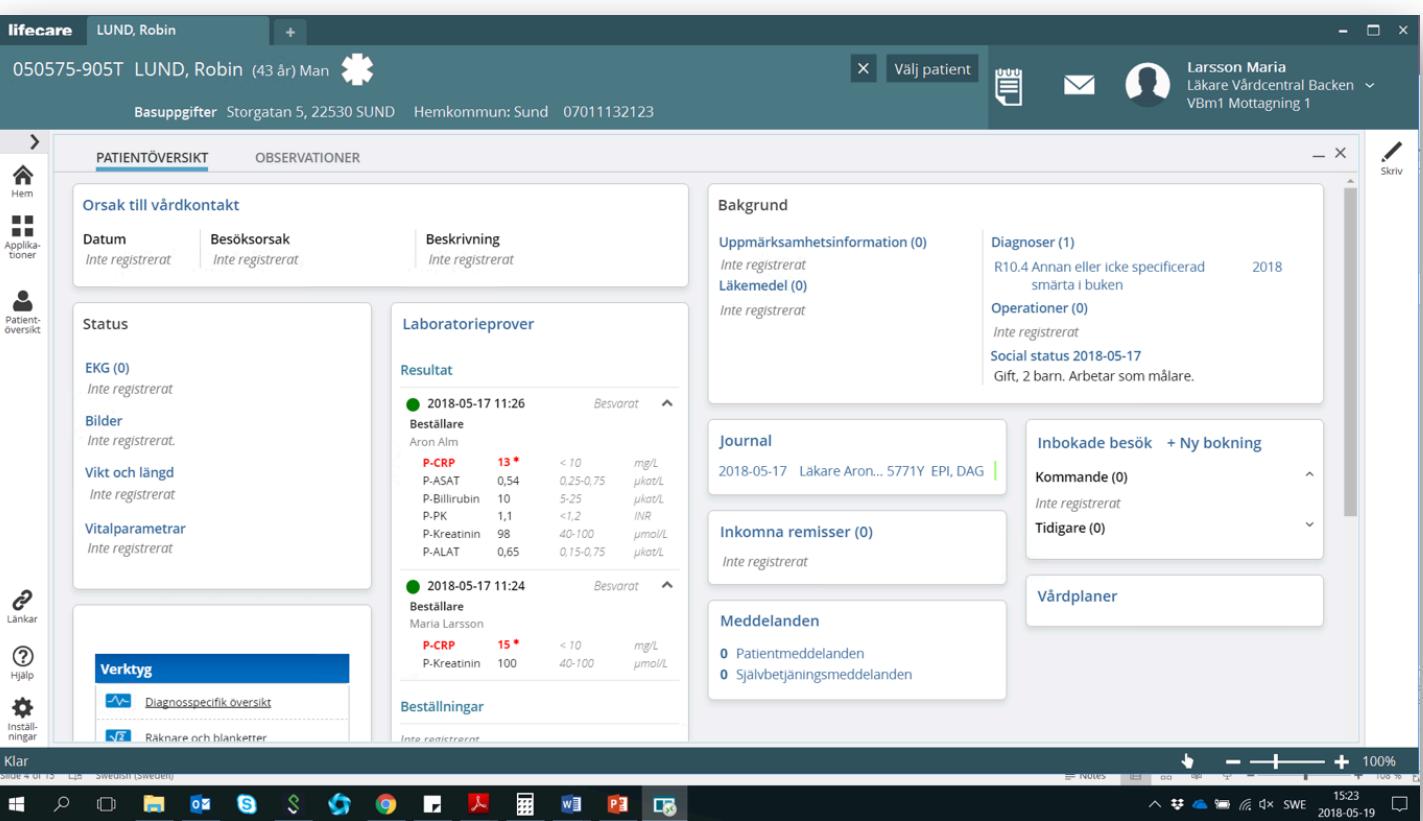
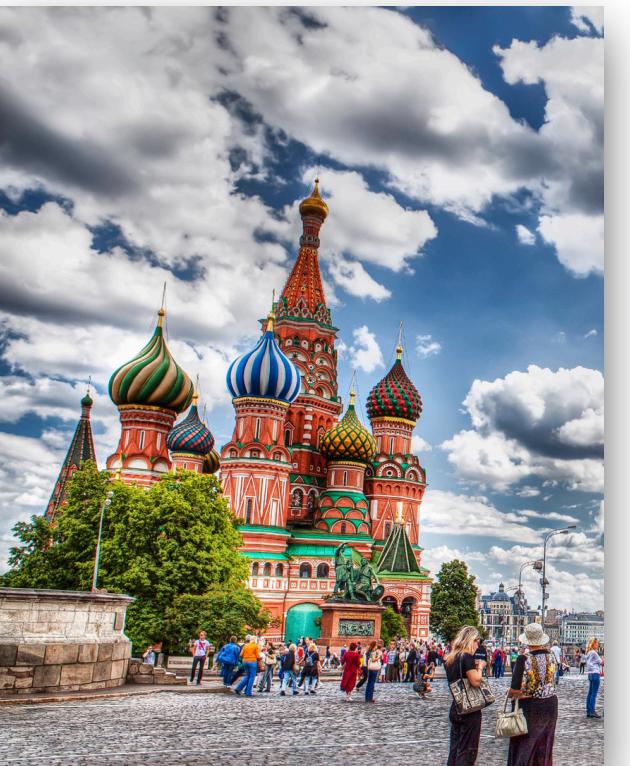
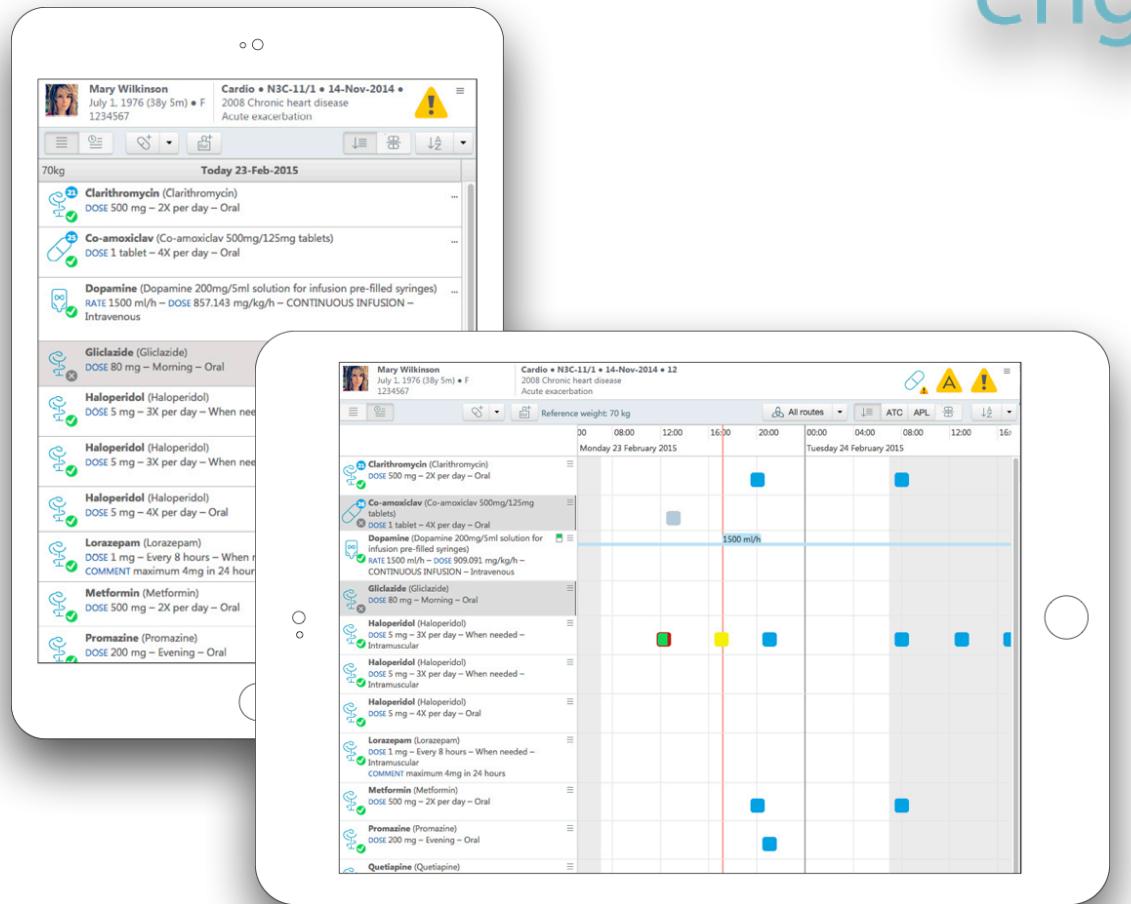
Export Expand table Compact Detailed Raw

#	compositionId	compositionName	systolic	magnitude	units	precision	d
1	7b20dc2b-6494-467d-8986-469367f7c75b::4cce5a07-be4d-4318-a94f-3b8401853a20::1	Passport observations	169	mm[Hg]	0	69	
2	3484653f-c211-464b-bace-83ff626d0b6b::4cce5a07-be4d-4318-a94f-3b8401853a20::1	Passport observations	169	mm[Hg]	0	69	
3	aaa1da4b-ea92-4933-ac25-66f84bcd717c::4cce5a07-be4d-4318-a94f-3b8401853a20::1	Passport observations					
4	ae04cf64-4d76-4742-9c44-3ff2b8a2e9fd::4cce5a07-be4d-4318-a94f-3b8401853a20::1	NCD - first visit	110	mm[Hg]		76	
5	ae04cf64-4d76-4742-9c44-3ff2b8a2e9fd::4cce5a07-be4d-4318-a94f-3b8401853a20::1	NCD - first visit	99	mm[Hg]		80	
6	ae04cf64-4d76-4742-9c44-3ff2b8a2e9fd::4cce5a07-be4d-4318-a94f-3b8401853a20::1	NCD - first visit	123	mm[Hg]		55	
7	ae04cf64-4d76-4742-9c44-3ff2b8a2e9fd::4cce5a07-be4d-4318-a94f-3b8401853a20::1	NCD - first visit	155	mm[Hg]		66	
8	7ff115e4-dcd1-4315-a3bb-70b5e8a59134::4cce5a07-be4d-4318-a94f-3b8401853a20::1	JMOHW - Passport observations.v0	120	mm[Hg]	0	88	
9	687d40df-57d1-4d29-ab41-88396f810de0::4cce5a07-be4d-4318-a94f-3b8401853a20::1	Passport observations	124	mm[Hg]	0	88	
10	159c3aab-8bb6-45dd-a452-cbf3e4ac1fe8::4cce5a07-be4d-4318-a94f-3b8401853a20::1	Passport observations	124	mm[Hg]	0	90	

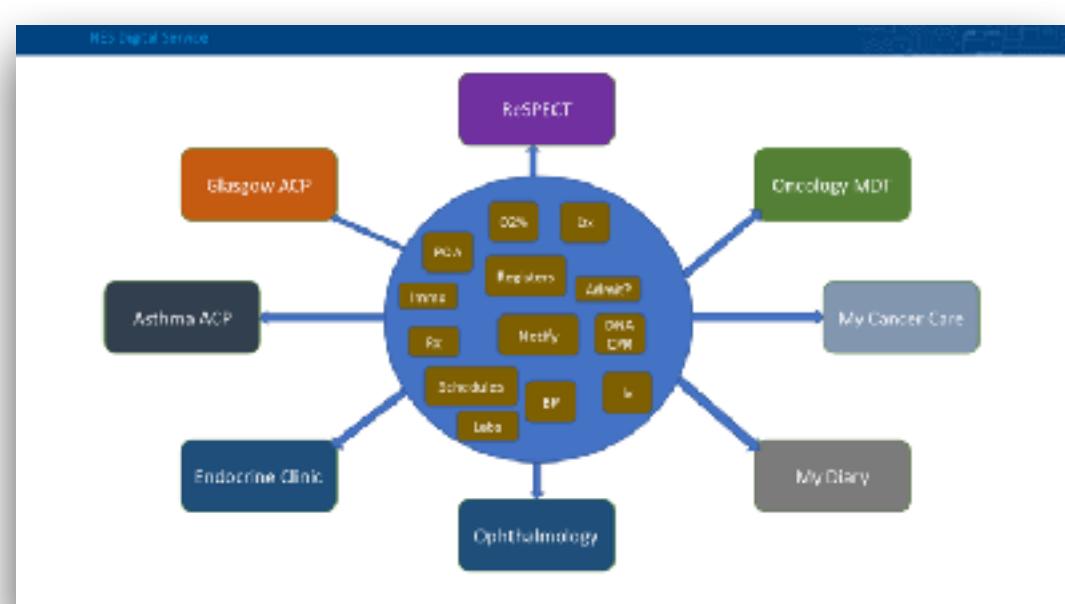
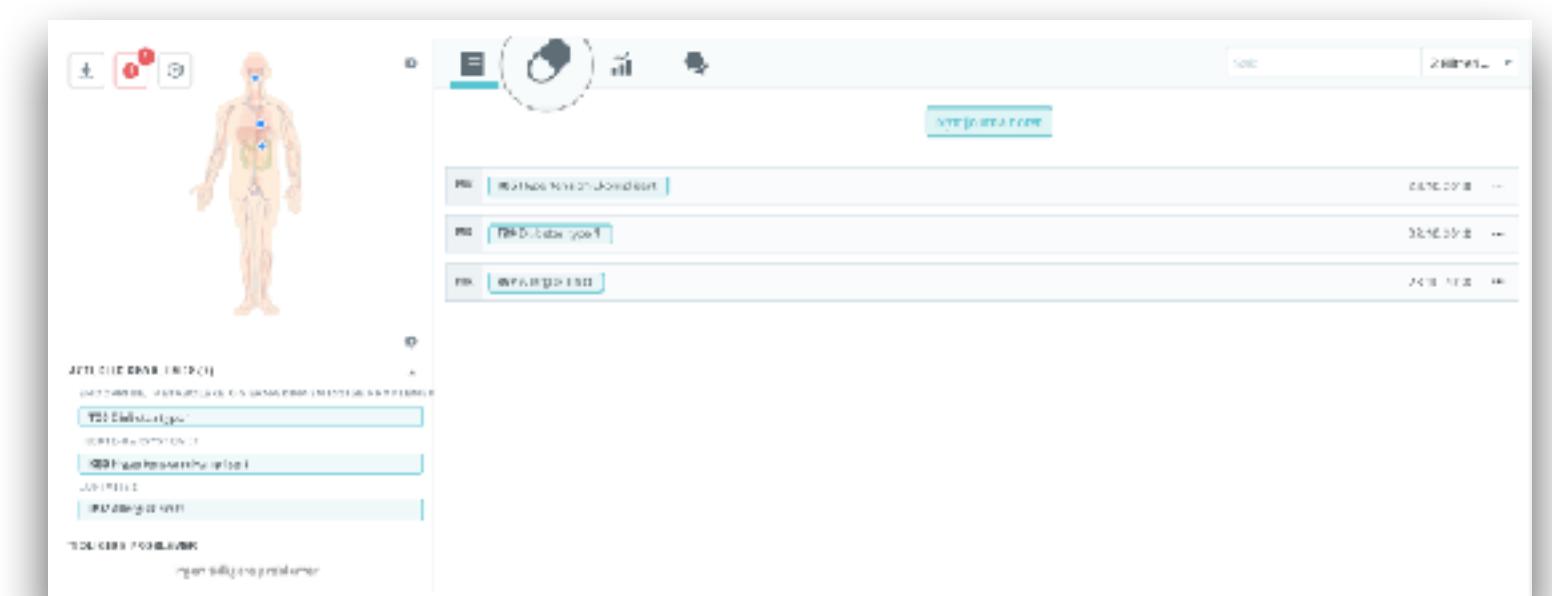
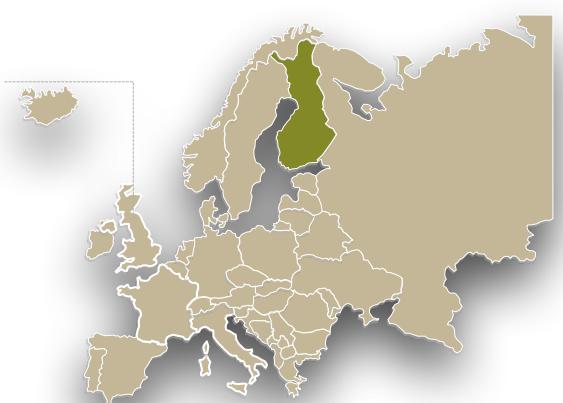
# openEHR applications - at scale

openEHR

Genomics  
england

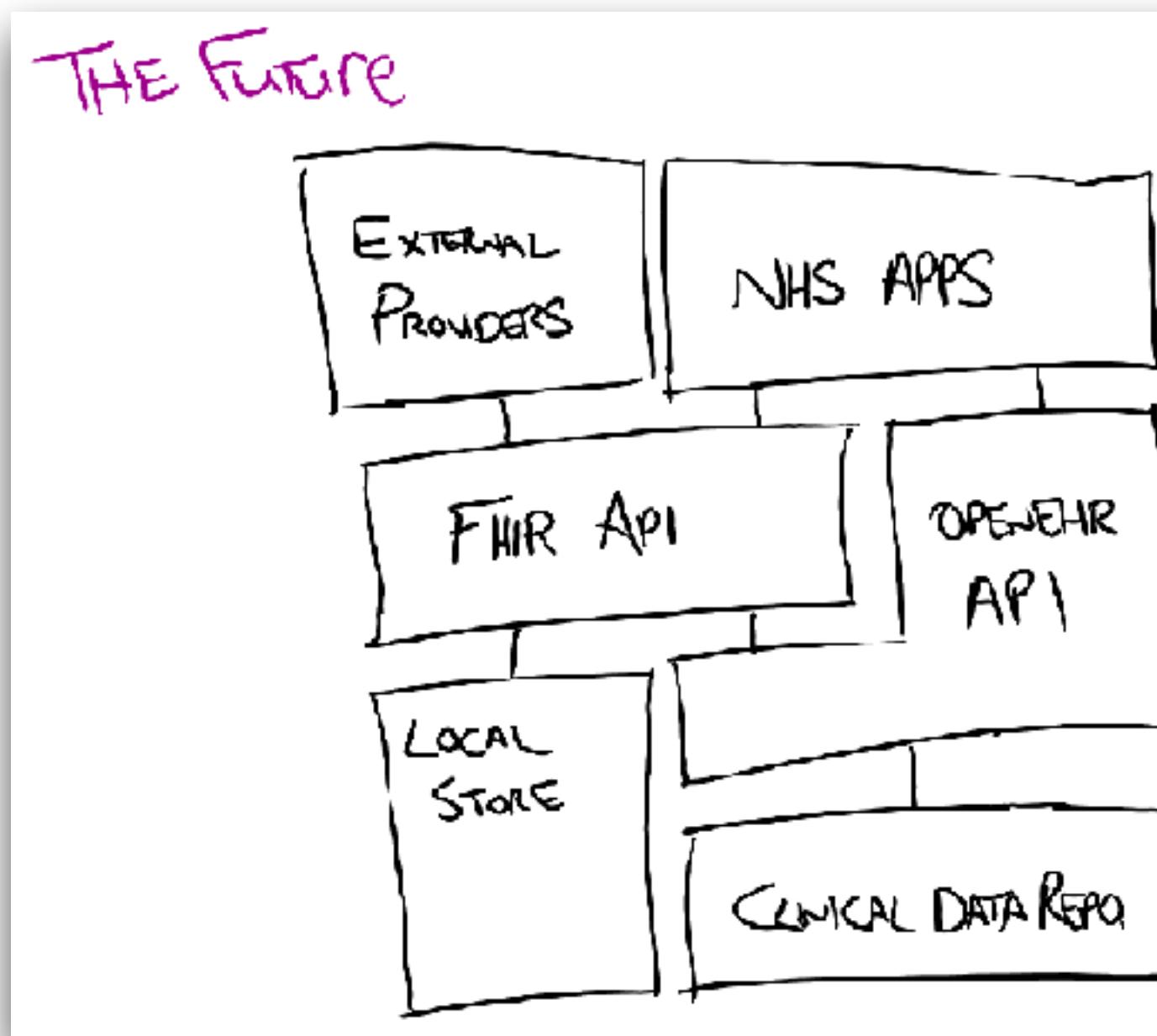


una



# openEHR + FHIR?

**openEHR**



**INTEROPen**

**FHIR® and openEHR**

[https://www.interopen.org/wp-content/uploads/2019/03/INTEROPen-openEHR-and-FHIR\\_March2019.pdf](https://www.interopen.org/wp-content/uploads/2019/03/INTEROPen-openEHR-and-FHIR_March2019.pdf)

Name	Flags	Card.	Type	Description & Constraints
AllergyIntolerance	I		DomainResource	Allergy or Intolerance (generally: Risk of a reaction to a substance or other stimulus) + AllergyIntolerance.clinicalStatus SHALL be one of the following values + AllergyIntolerance.clinicalStatus SHALL NOT be one of the following values Elements defined in Ancestors: id, meta, implicitRules, extension, type, value, status, category, criticality, code, patient, onset[x], recorder, asserter, lastOccurrence, note, reaction, substance, manifestation
Identifier	S	0..*	Identifier	External ids for this item
clinicalStatus	?! Σ I	0..1	code	active   inactive   resolved
verificationStatus	?! Σ I	1..1	code	AllergyIntoleranceClinicalStatus (Required) unconfirmed   confirmed   refuted   entered
type	S	0..1	code	AllergyIntoleranceVerificationStatus (Required) allergy   intolerance - Underlying mechanism
category	S	0..*	code	AllergyIntoleranceType (Required) food   medication   environment   biologic
criticality	S	0..1	code	AllergyIntoleranceCategory (Required) low   high   unable-to-assess
code	S	0..1	CodeableConcept	AllergyIntoleranceCriticality (Required) Code that identifies the allergy or intolerance
patient	S	1..1	Reference(Patient)	AllergyIntolerance Substance/Product, Condition Who the sensitivity is for
onset[x]		0..1		When allergy or intolerance was identified
onsetDateTime			dateTime	
onsetAge			Age	
onsetPeriod			Period	
onsetRange			Range	
onsetString			string	
assertedDate		0..1	dateTime	
recorder		0..1	Reference(Practitioner   Patient)	
asserter	S	0..1	Reference(Patient   RelatedPerson   Practitioner)	
lastOccurrence		0..1	dateTime	
note		0..*	Annotation	
reaction		0..*	BackboneElement	
substance		0..1	CodeableConcept	
manifestation		1..*	CodeableConcept	

**Adverse reaction risk (Latest revision / latest published)**

**Protocol**

**Attribution**

**Data**

**Reaction event**

**Last updated**

**Extension**

**URI Supporting clinical record information**

**Reaction reported?**

**Report summary**

**Substance**

**Criticality**

**Category**

**Onset of last reaction**

**Reaction mechanism**

**Comment**

**Specific substance**

**Certainty**

**Manifestation**

**Reaction description**

**Onset of reaction**

**Duration of reaction**

**Severity of reaction**

**Reaction details**

**Initial exposure**

**Duration of exposure**

**Acute of exposure**

**Exposure description**

**Exposure details**

**Clinical management: description**

**Clinical management: details**

# openEHR International : [openehr.org](http://openehr.org)

*open*EHR

