Harnessing Interoperability and Data Sharing in Health Plans

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Koray Atalag, MD, PhD, FAIDH

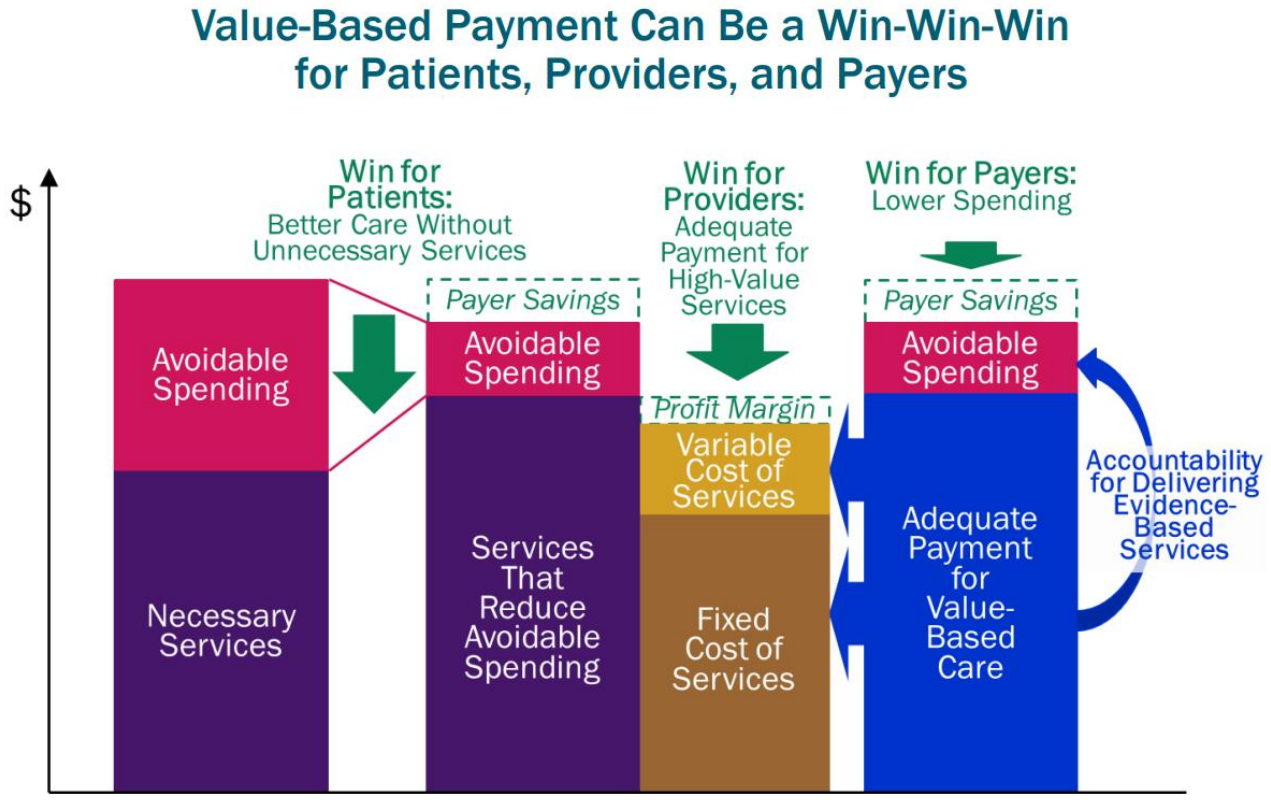
Senior Consultant

koray@galata-digital.biz

Agenda

- The big picture
- Laying the foundations
- What’s possible
- What’s already happening
- Case study

Can we Optimise the Whole Health System?



VBHC – It's all about Data

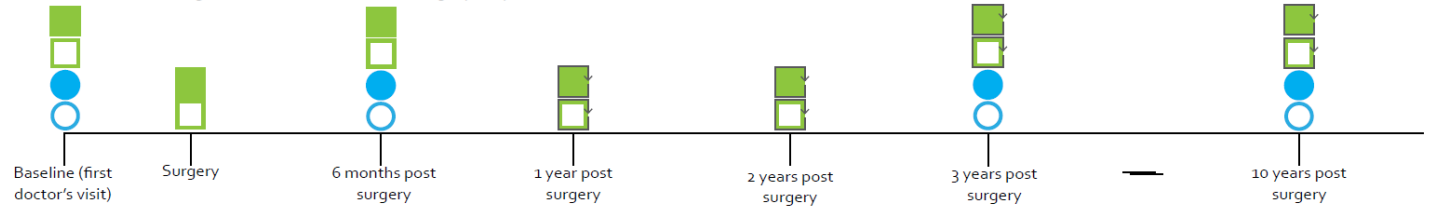
Casemix & Treatment Data
Clinical Reported Outcome Measures (CROMs)
+
Patient Reported Outcome Measures (PROMs)
Patient Reported Experience Measures (PREMs)

ICHOM

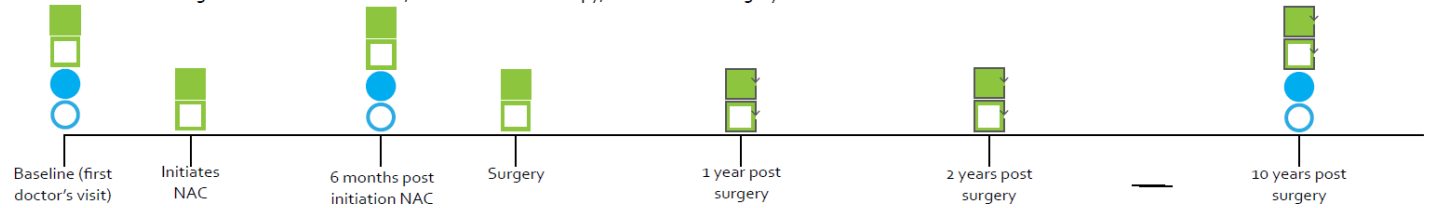
46 Sets address ~60% of global disease burden

$$\text{VALUE} = \frac{\text{Outcomes}}{\text{Cost}}$$

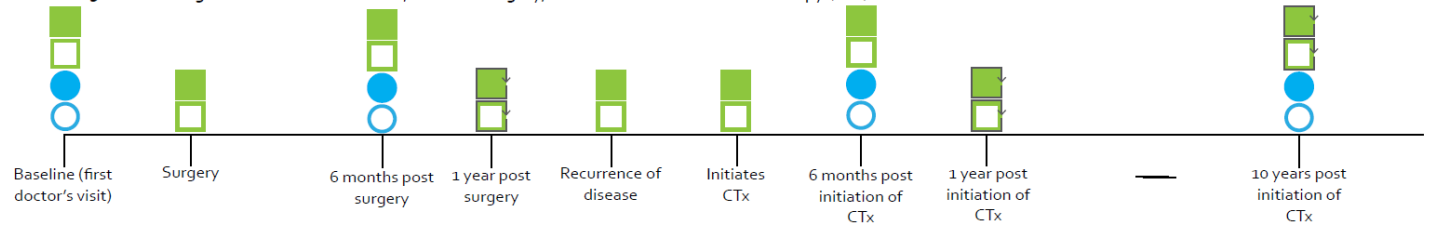
EXAMPLE 1: Patient diagnosed with breast cancer, surgery only



EXAMPLE 2: Patient diagnosed with breast cancer, receives chemotherapy, then receives surgery



EXAMPLE 3: Patient diagnosed with breast cancer, receives surgery, recurs and receives chemotherapy (CTx)



The following questionnairs should be administered at the indicated time points:

- Patient-Reported Outcome Measures
- Patient-Reported Case-Mix Variables
- Clinical-Reported Outcome Measures
- Clinical-Reported Case-Mix Variables
- Tracked Ongoing Annually for Life

Annual follow-up reassessed from date of surgery so that it will run parallel with annual outpatient visit.

^ Distinction for long-term follow-up:
- Local disease
  Up to 10 years follow-up
- Metastatic disease
  Annually for life

ICHOM

Breast Cancer Set: Defining full Patient Journeys

ICHOM has Over A Decade of Impact

46+ Sets of Patient-Centered Outcome Measures

Measures for **~60%** of disease burden

> 1,200 global consortium of clinical and patient co-creators

SNOMED International

HL7 FHIR

LOINC from Regenstrief

> 500 implementation settings in **46** countries

> 30,000 member global Value-based Healthcare network

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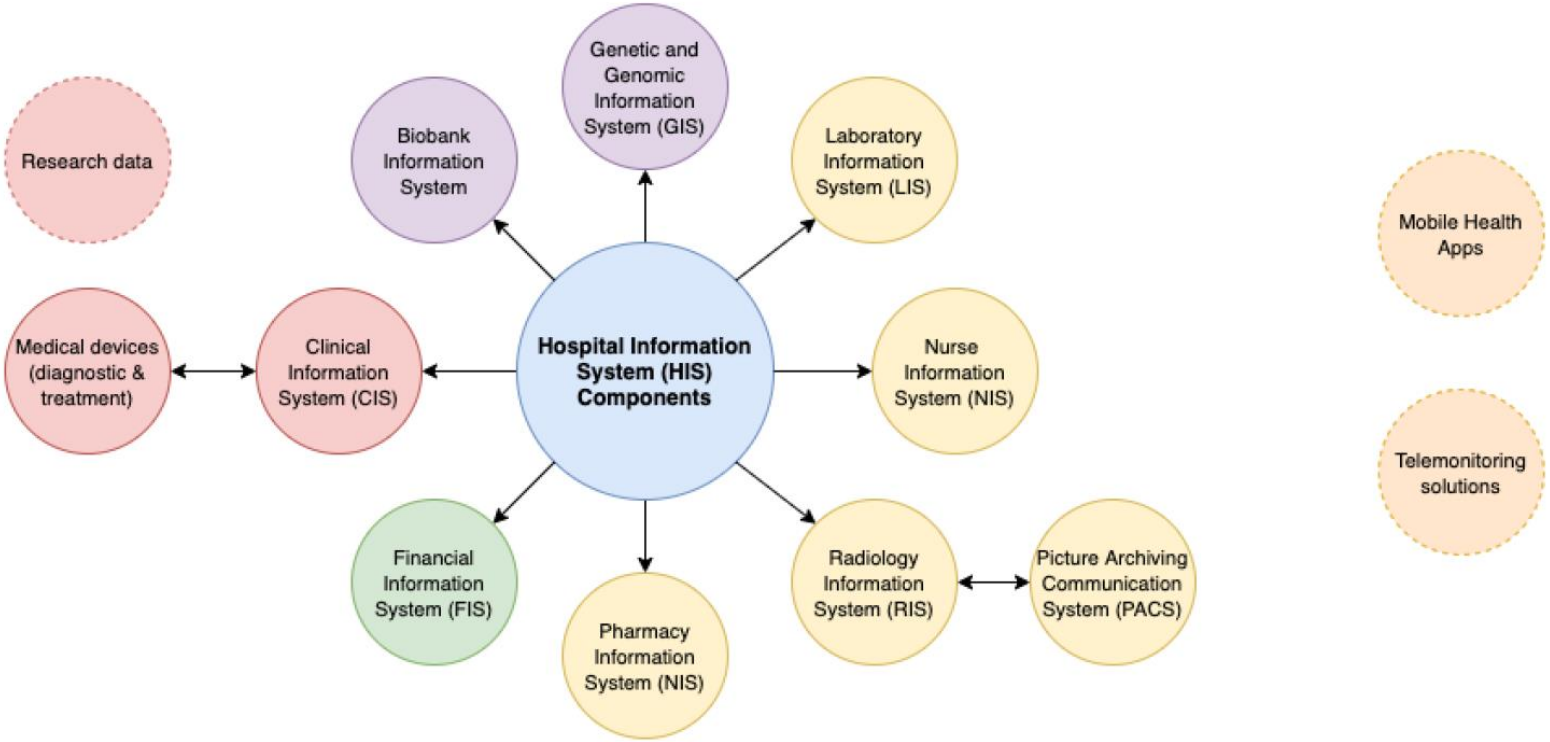
Where's Key Healthcare Data?

Healthcare data is (still) siloed and locked in non-interoperable EMRs



Source: Digital Health Strategy for Catalonia 2018-2022 (Jordi Piera-Jiménez, 2018).

Health Information Exchange (HIE)

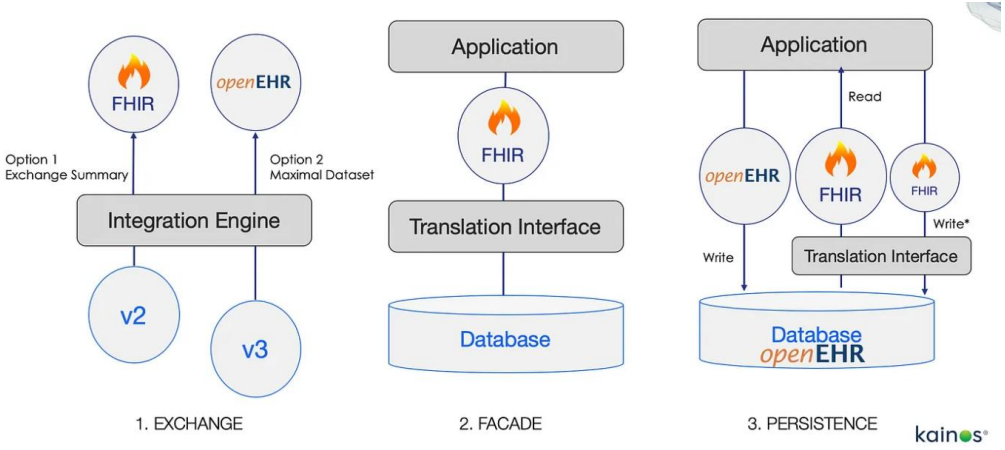
Store and share interoperable clinical, admin, financial data

Platform	Scale & Coverage	Data Types
(UAE) Malaffi	All licensed facilities in Abu Dhabi; ~2,600 orgs; 1B+ transactions; 7m+ population	Labs, imaging, vitals, prescriptions, problems, allergies, appointments
(SG) Synapxe	100% of public hospitals, polyclinics, and gov. pharmacies; all clusters	Clinician notes, meds, labs, imaging, allergies, discharge summaries
(USA) SHIN-NY	Entire state coverage via 8 RHIOs; 100% hospitals; 200+ providers connected	Labs, diagnoses, immunizations, care team info, encounter summaries
(KSA) NPHIES	90%+ national coverage targeted; 600+ hospitals; 4,000+ health centers	Claims, eligibility, prescriptions, diagnostics, encounters, referrals
(SP) hc Catalonia HC3	Covers 100% public hospitals, primary care, pharmacy; 2500+ connected orgs	Shared clinical history, meds, reports, imaging, discharge, -omics, **PROMs**
(NL) Dutch RHIOs	Regional exchanges; hundreds of hospitals and labs across provinces	Diagnostic images, lab results, EHR summaries, referrals

Interoperability at Its Best (Standards Convergence)

Ease and accuracy with which systems can exchange and understand data without humans

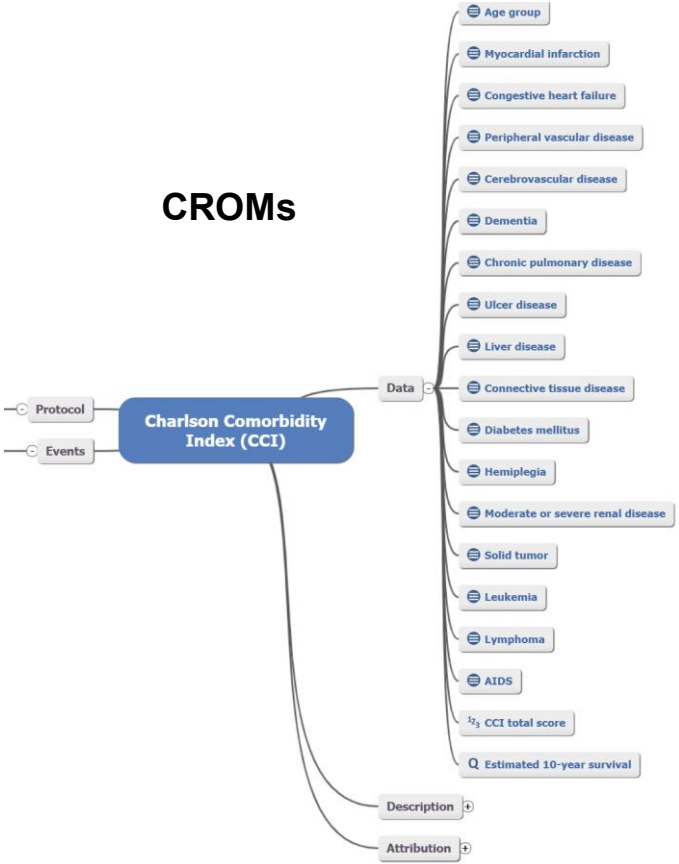
- openEHR ➔ for defining the entire lifelong EHR
- FHIR ➔ for exchange of healthcare data
- SNOMED ➔ covers entire biomedical & healthcare concepts & relationships
- Other terminology and classifications: ICD, LOINC, ATC, RxNorm, CPT



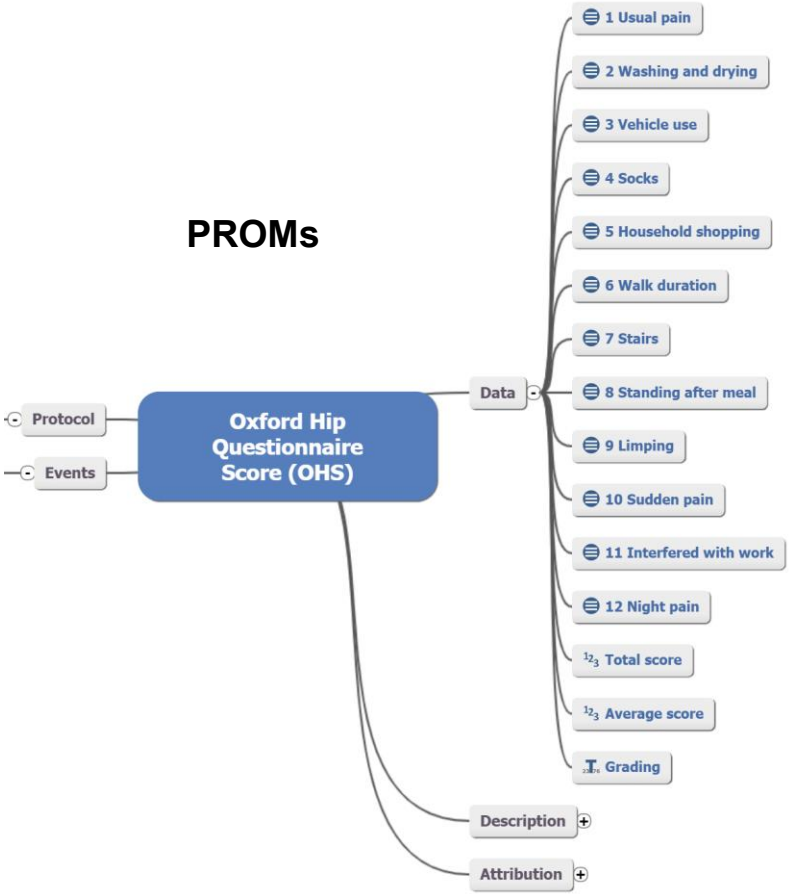
Structure & Semantics of EHR

openEHR

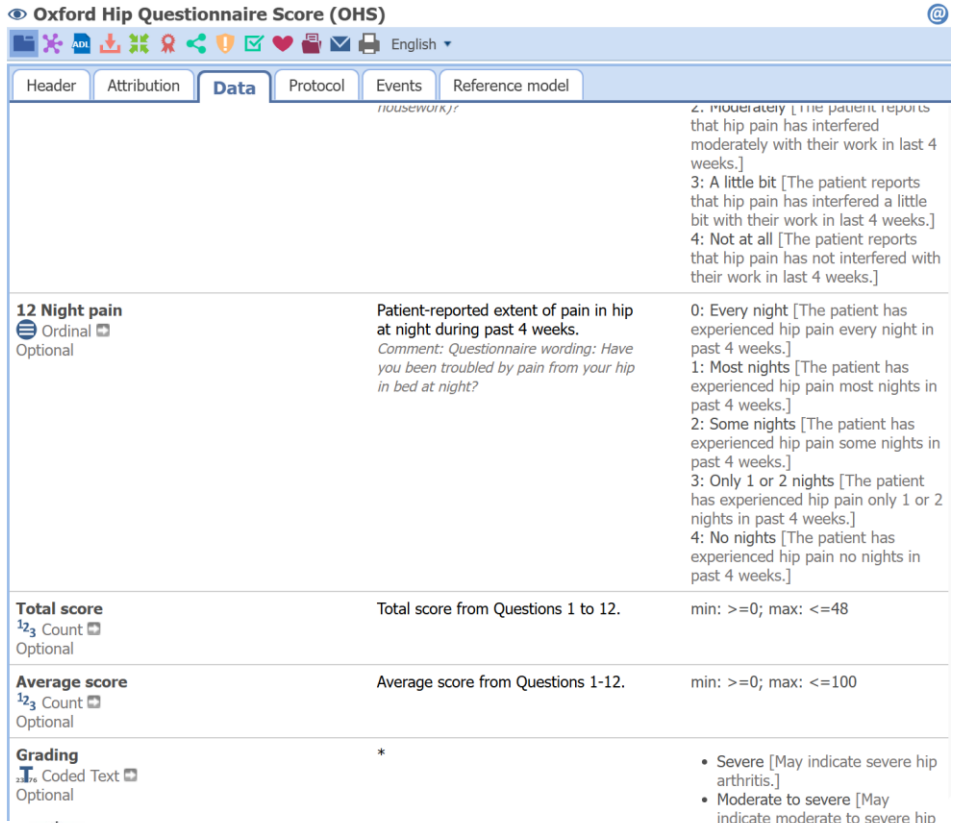
CROMs



PROMs



openEHR https://ckm.openehr.org

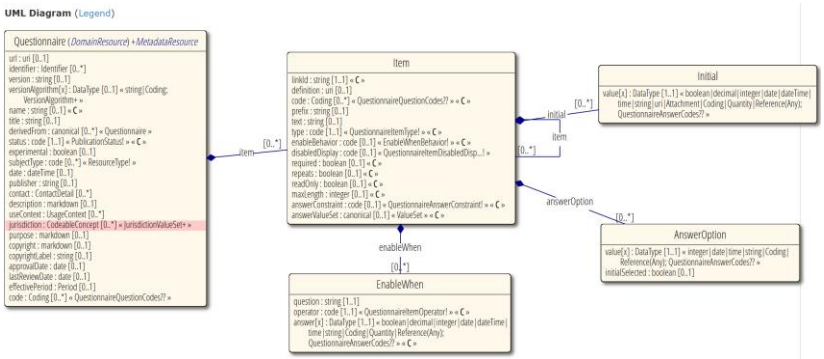



```
OBSERVATION[at0000] matches {    -- Oxford Hip Questionnaire Score (OHS)
    data matches {
        HISTORY[at0001] matches {    -- Event Series
            events cardinality matches {1..*; unordered} matches {
                POINT_EVENT[at0002] occurrences matches {0..1} matches {    -- Point in time
                    data matches {
                        ITEM_TREE[at0003] matches {    -- Tree
                            items cardinality matches {0..*; unordered} matches {
                                ELEMENT[at0008] occurrences matches {0..1} matches {    -- 1 Usual pain
                                    value matches {
                                        0|[local::at0109],
                                        1|[local::at0009],
                                        2|[local::at0010],
                                        3|[local::at0011],
                                        4|[local::at0012]
                                    }
                                }
                                ELEMENT[at0014] occurrences matches {0..1} matches {    -- 2 Washing and drying
                                    value matches {
                                        0|[local::at0019],
                                        1|[local::at0015],
                                        2|[local::at0018],
                                        3|[local::at0017],
                                        4|[local::at0016]
                                    }
                                }
                                ELEMENT[at0020] occurrences matches {0..1} matches {    -- 3 Vehicle use
                                    value matches {
                                        0|[local::at0021],
                                        1|[local::at0022],
                                        2|[local::at0023],
                                        3|[local::at0024],
                                        4|[local::at0025]
```

Exchange of Healthcare Data

HL7 FHIR

Questionnaire model (for PROMs, PREMs, CROMs and more)



NIH National Library of Medicine
Lister Hill National Center for Biomedical Communications

LHC FHIR Tools
Tools, widgets, and services for applications using the HL7® FHIR® standard

Home | LHC-Forms Demo | Form Builder | Clinical Table Search Service | SDC Questionnaire App

LHC-Forms is a widget that renders input forms, based on definition files (FHIR® Questionnaires), for web-based applications. This page provides a demo with some sample forms. For information on including the widget in your own website, see the developer documentation.

Genetic Forms

Featured Forms

- Personal Health Record
- US Surgeon General family health portrait
- Mental RFC assessment form
- Heart ultrasound (echocardiogram)
- Weight & height tracking panel
- Vital signs panel
- U.S. standard certificate of death - 2003 revision
- Patient-Reported Outcomes with LASIK Symptoms and Satisfaction (PROWL-SS)

LOINC Panels with

Load From File | Save To File | Show Form Data As ... | Show repetition numbers | Show indentation
Show tree lines

Patient-Reported Outcomes with LASIK Symptoms and Satisfaction (PROWL-SS)

Center	Type a value
Protocol	Type a value
Participant ID	Type a value
1. In general, how satisfied or dissatisfied are you with your present vision?	Select one

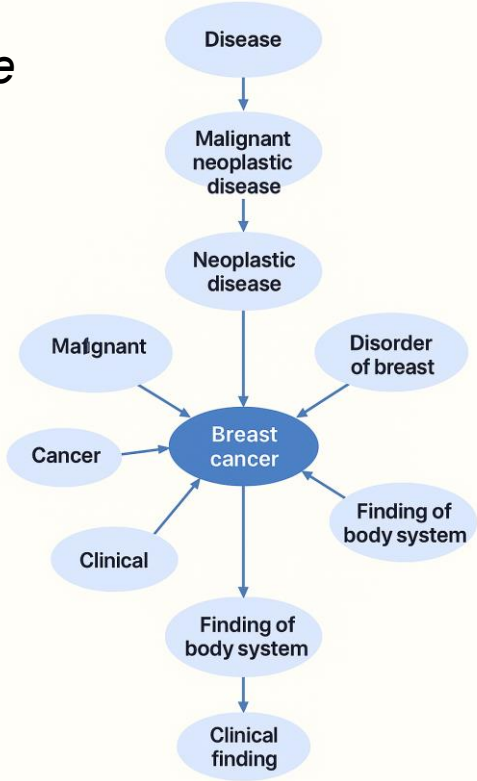
The next few questions are about double images, which some people call ghost or shadow images. By double images, we mean seeing a distorted or blurry visual image, such as the images shown below. These images may not represent exactly what you see and your symptoms may be more or less severe than what is shown.

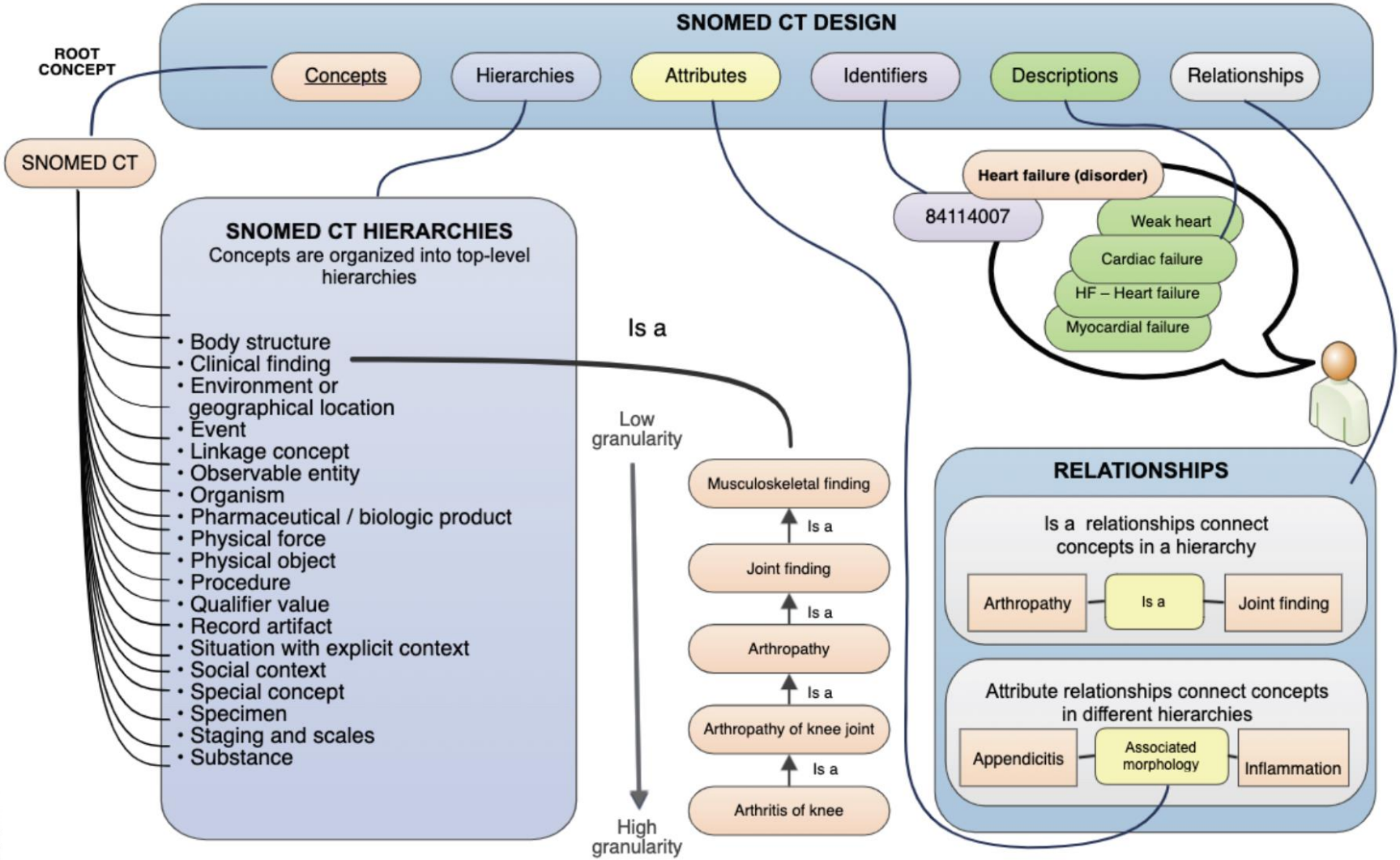
No double image → Severe double image

Explicit Semantics: SNOMED CT

Standardized terminology enabling consistent, computable health data

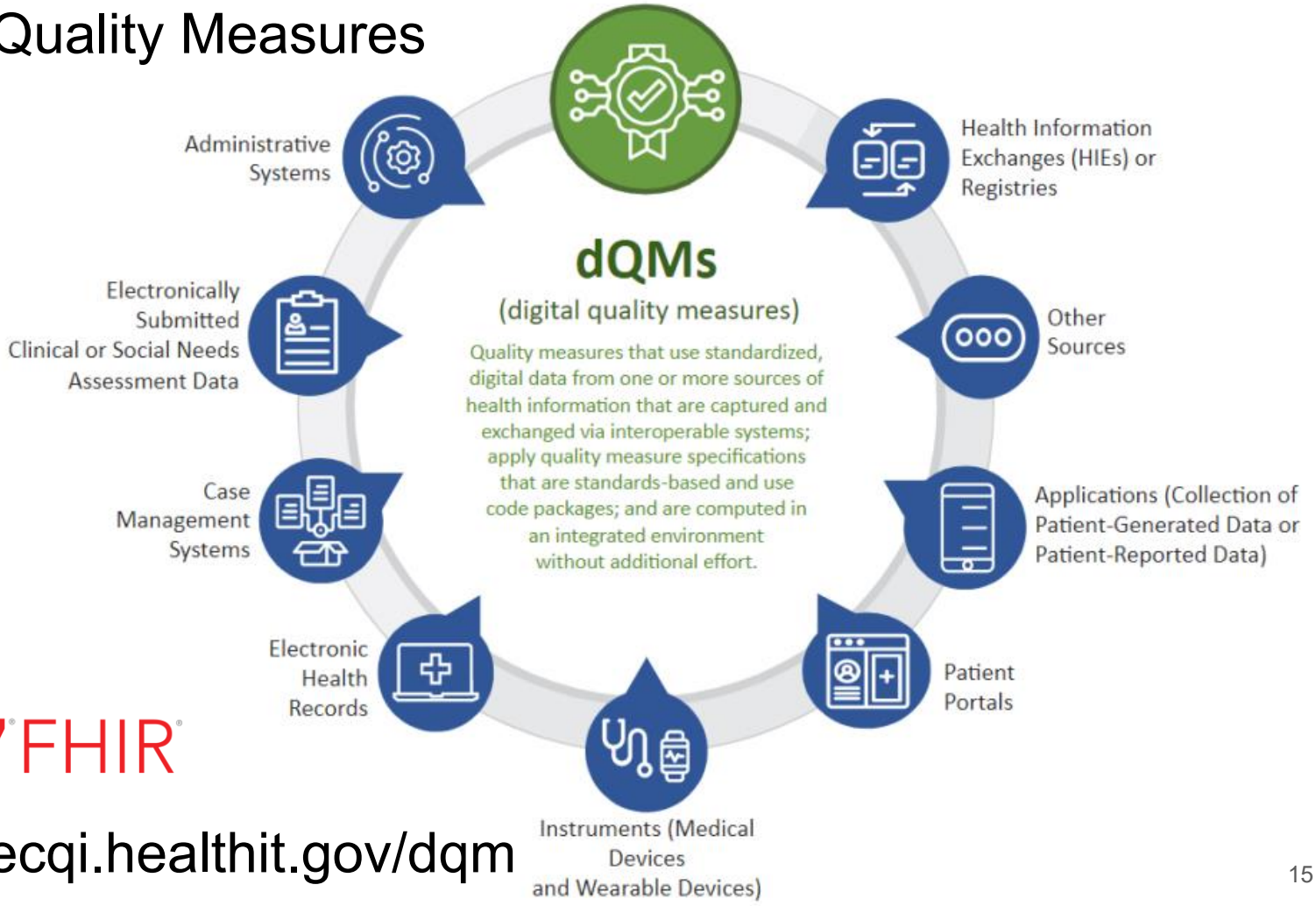
🌎 **Global Use**	Adopted in **80+ countries**
📦 **Concepts**	**360K+ concepts** and **1.2M+ terms**
🔗 **Relationships**	**1.6M+ relationships** for computable semantics
🧬 **Structure**	**Multiaxial** – part of multiple trees
💻 **Interoperability**	Powers **decision support, analytics & data exchange**




SNOMED CT DESIGN
ROOT CONCEPT
SNOMED CT
Concepts
Hierarchies
Attributes
Identifiers
Descriptions
Relationships
SNOMED CT HIERARCHIES
Concepts are organized into top-level hierarchies
• Body structure
• Clinical finding
• Environment or geographical location
• Event
• Linkage concept
• Observable entity
• Organism
• Pharmaceutical / biologic product
• Physical force
• Physical object
• Procedure
• Qualifier value
• Record artifact
• Situation with explicit context
• Social context
• Special concept
• Specimen
• Staging and scales
• Substance
Is a
Low granularity
High granularity
Musculoskeletal finding
Is a
Joint finding
Is a
Arthropathy
Is a
Arthropathy of knee joint
Is a
Arthritis of knee
Heart failure (disorder)
84114007
Weak heart
Cardiac failure
HF – Heart failure
Myocardial failure
RELATIONSHIPS
Is a relationships connect concepts in a hierarchy
Arthropathy
Is a
Joint finding
Attribute relationships connect concepts in different hierarchies
Appendicitis
Associated morphology
Inflammation

CMS digital Quality Measures

dQMs



HL7 FHIR

https://ecqi.healthit.gov/dqm

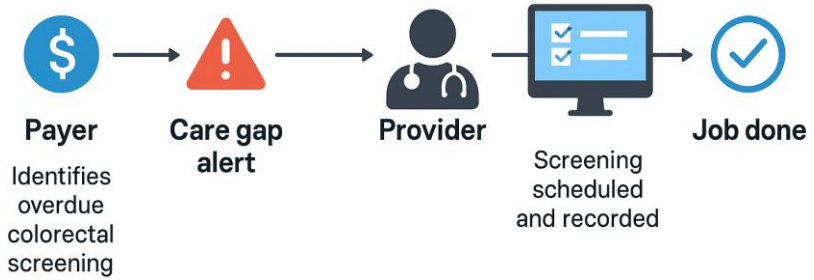
Let’s do something cool: Care Gaps

- dQMs are expressed using FHIR electronic Clinical Quality Measure (CQM)
- Care Gaps engine (in several solutions) uses FHIR data and automatically detects missing or inappropriate healthcare services

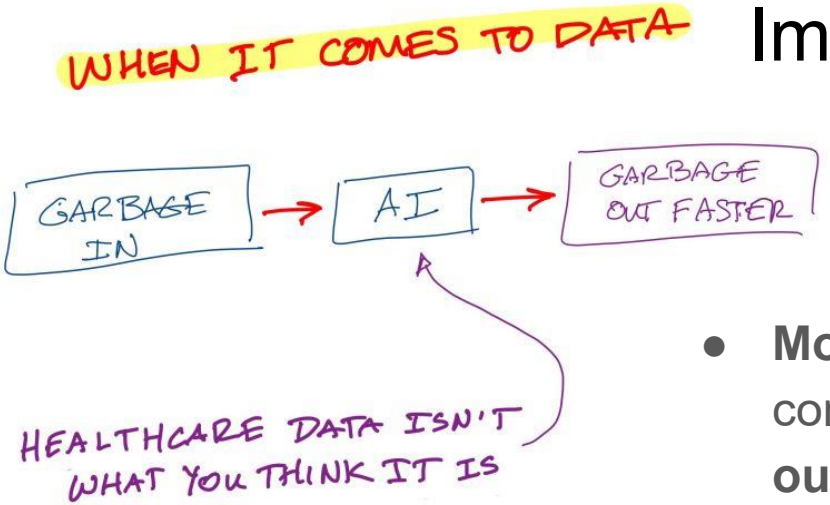
Numerator Statement
# of women 50–74 yrs age w/ **mammogram** to screen for **breast cancer** during **24 months** prior to end of the measurement period.

Denominator Statement
All women aged 50–74 yrs w/ **continuous enrolment** during measurement period and **12 months prior**, exc those with **bilateral mastectomy** or **diagnosed with terminal illness**.

```
IF Patient.gender = female
AND Patient.age in [50, 74]
AND NOT EXISTS (Procedure: bilateral mastectomy)
AND NOT EXISTS (Mammography in last 24 months)
THEN Flag as "Open Care Gap: Breast Cancer Screening Overdue"
```



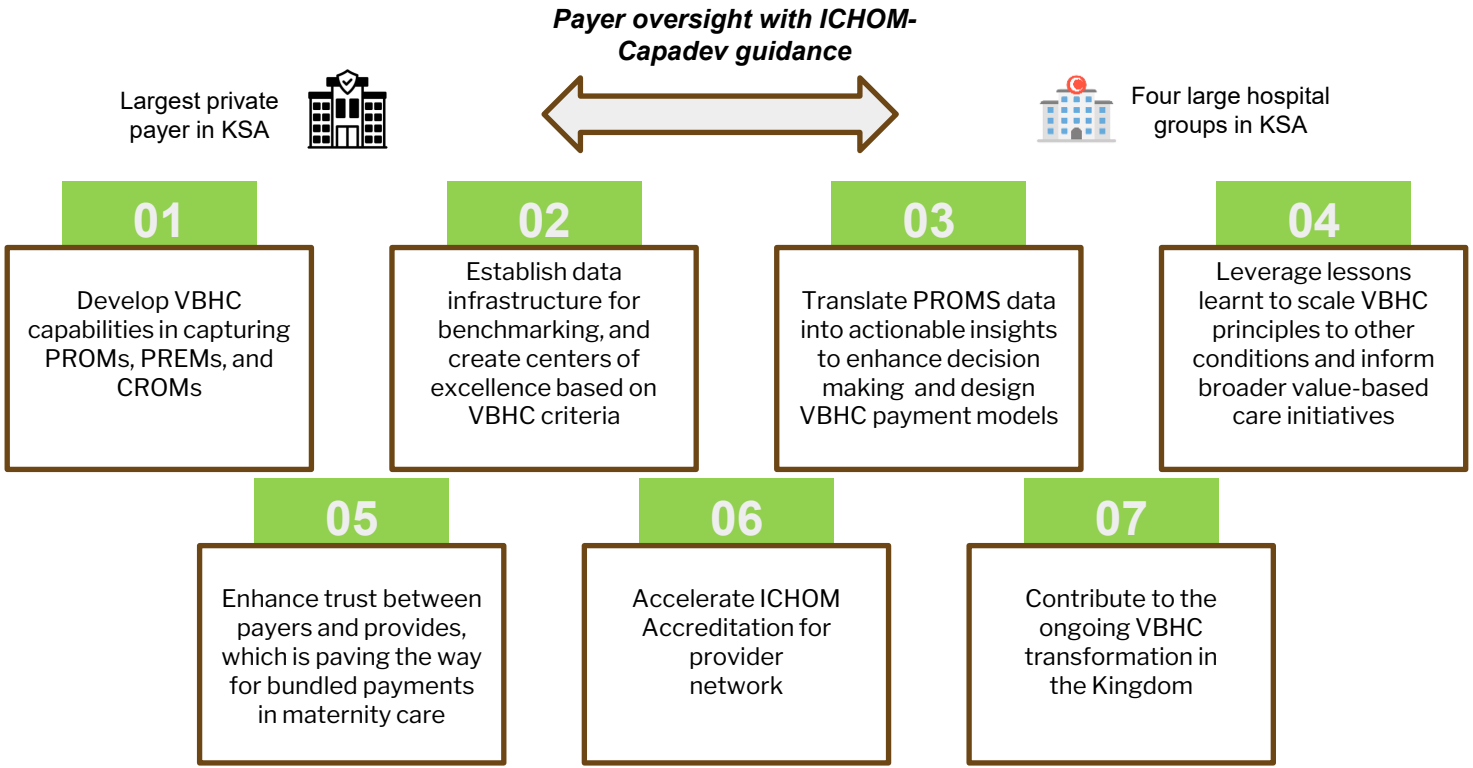
Implications for AI



- **More than ever**: need large, good quality, complete and rich structured data with **long term outcomes**
- For **AI training** and making sense of unstructured and big complex data
  (-omics, sensor/wearable data, SDoH etc.)
- More critically for **acting on available data** in safely, timely and appropriately

Case Study: Maternity Learning Collaborative in KSA

In a recent payer-provider VBHC collaborative in KSA, largest private insurer and 4 providers were guided through outcomes rollout, ultimately progressing toward ICHOM Accreditation



The complete ICHOM pregnancy and childbirth set is collected, including ten PROMs, CROMs and PREMs

Pregnancy and Childbirth Standard Set

Only following touchpoints required for ICHOM Level 1 Accreditation

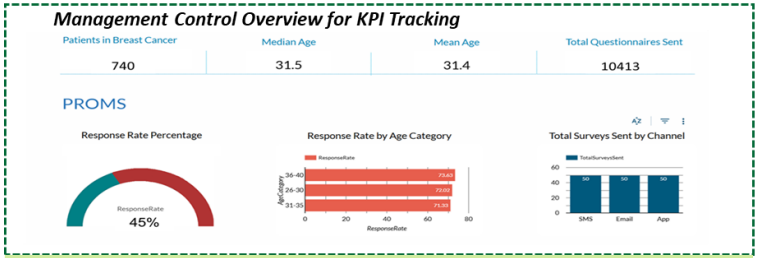
● PROMs

conception | 3 months | 6 months | birth | 3 months postpartum | 6 months postpartum

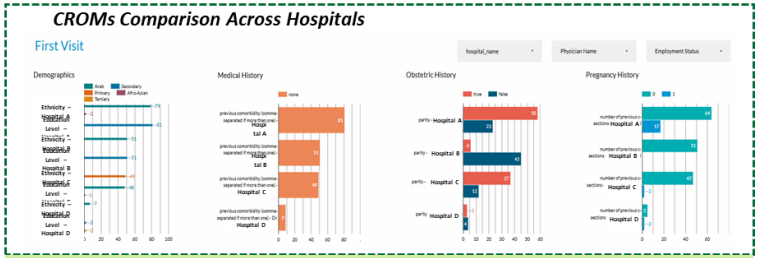
	Outcomes Collected	First Visit	Third Trimester	Immediately After Birth	2 Weeks Post Delivery	6 Months Post Delivery
PROMs	EQ-5D-3L	✓	✓		✓	✓
	ICIQ (Urinary Incontinence)	✓	✓		✓	✓
	Wexner Stool Incontinence	✓	✓		✓	✓
	SIMSS	✓				
	BSES (Breastfeeding)			✓	✓	✓
	MIBS (Mother-Infant Bonding)			✓	✓	✓
	PHQ-2 (Depression)	✓	✓		✓	✓
	EPDS (Postpartum Depression)				✓	✓
	BSS-R (Birth Satisfaction)				✓	
	SexFS (Sexual Function)	✓				✓
	PREMs		✓			✓
	CROMs*	✓	✓	✓	✓	

**: CROMs included information such as case mix variables, baseline data, and delivery related outcomes (complications postpartum, delivery type, neonate complications, etc.)*

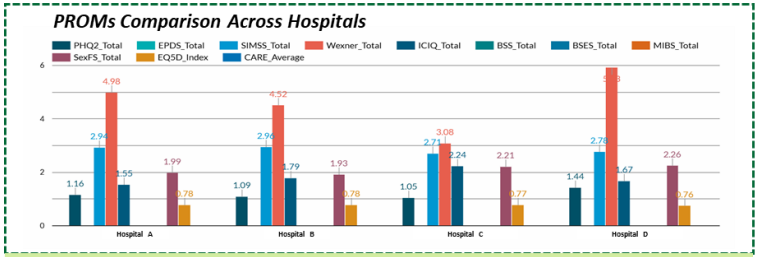
Real-time reporting for comparing hospital performance, reveal unmet patient needs, support VBHC funding models



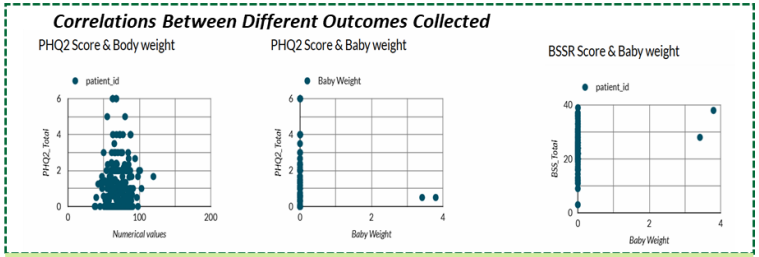
The Management Control page helped payer in tracking key KPIs (e.g., response rate, readmission rate, c-section rate, etc.)



The CROMs page enabled patient and hospital-wide tracking, revealing high C-section rates among specific providers. These providers were consulted, and interventions were introduced to reduce the rates accordingly

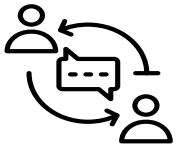


The PROMs page helped in unmasking hidden symptoms which pushed some providers to build referral pathways for patients complaining of depression and incontinence during first trimester visit



The Correlations page helped providers identify links between outcomes, such as breastfeeding confidence and social support. One provider responded by offering lactation education and specialist support for patients with low social backing

Lessons Learnt from the Maternity project to improve adoption, response rates and impact



Structured Patient Onboarding & Communication / AB testing

Maintaining **clear and consistent communication** with patients is vital for continued engagement, especially when **onboarding is initiated by physicians**

Robust Clinician Engagement & Change Management

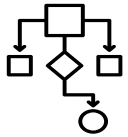
Regular reviews with clinical teams (physicians, nurses, and administrative staff) leads to them subsequently engaging patients, which leads to **higher and quality responses**

Capability building adapted pre-rollout (with **multi-disciplinary team**)

Systematic Utilization of PROMs / evolving SoC

Showing patients how their **PROMs responses are integrated** into their care builds trust and engagement

Ensuring PROM results **drive action** on the part of clinicians – **adjusting care pathways and expanding services**



Embedded Process Flow for Patient Engagement

Creating a **process flow algorithm** for patient interactions, supplemented by pre-developed **patient engagement scripts**, ensures consistent and **effective communication** (brochures, waiting room nudge, etc)

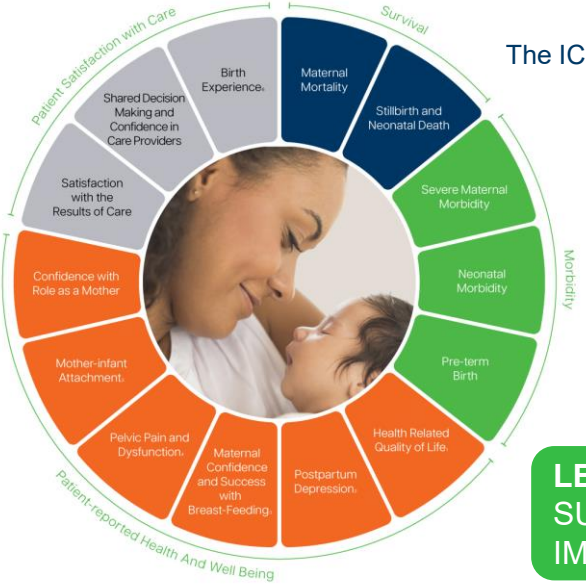
Integrated Practice Unit (IPU) Development

Creating IPUs where all necessary patient services are **integrated** improves **response rates** by streamlining care and providing patients with **care navigation**

Payer Insights & VBHC Payment Models

Ensure **transparency on providers' outcomes** to improve care, and reduce waste and complications (hence, costs), and **elevate network mgt**.
Provide basis for linking validated, uncontested and unified **outcomes to payments.**
Enable **population health and new product offerings**

ICHOM Accreditation to recognize providers' VBHC journeys while delivering on requirements of payors and regulators



ICHOM Accreditation Program

Guiding and Recognizing your VBHC Journey milestones

The ICHOM Accreditation Program is a condition-specific, ICHOM outcomes-focused framework designed to guide and recognize achievements in VBHC

LEVEL 3: GLOBAL VBHC PIONEER — Demonstrated improvements, shared-decision making, and value community participation.

LEVEL 2: EXPERIENCED IMPLEMENTER — Audited validation and integration of outcomes measurement in routine practice and in improvements.

LEVEL 1: SUCCESSFUL IMPLEMENTER — Completion of a full outcomes collection cycle of an ICHOM Set based on a sound protocol, with reported results.

ICHOM ACCREDITATION PROGRAM CANDIDATE

Source: Capadev Analysis

WORLD'S BEST HOSPITALS 2025
Newsweek

Koray Atalag, MD, PhD, FAIDH

Lifelong Learner | Interoperability &
Digital Twin Evangelist | Innovator | S...