



solor

Federal Health Architecture (FHA) Learning Series

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SOLOR: <http://solor.io>

Healthcare Services Platform Consortium Project: <https://www.hspconsortium.org>

Pre-Announcement Announcement!



<http://info.fedhealthit.com/>

Agenda

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Review of January Learning Series

THE PROMISE

- Improve the quality and safety of health-care
- Measure the cost and quality of services
- Integrate multiple providers across organizations in a continuum of care
- Integrate high-quality decision support into the clinical workflows in the continuum of care

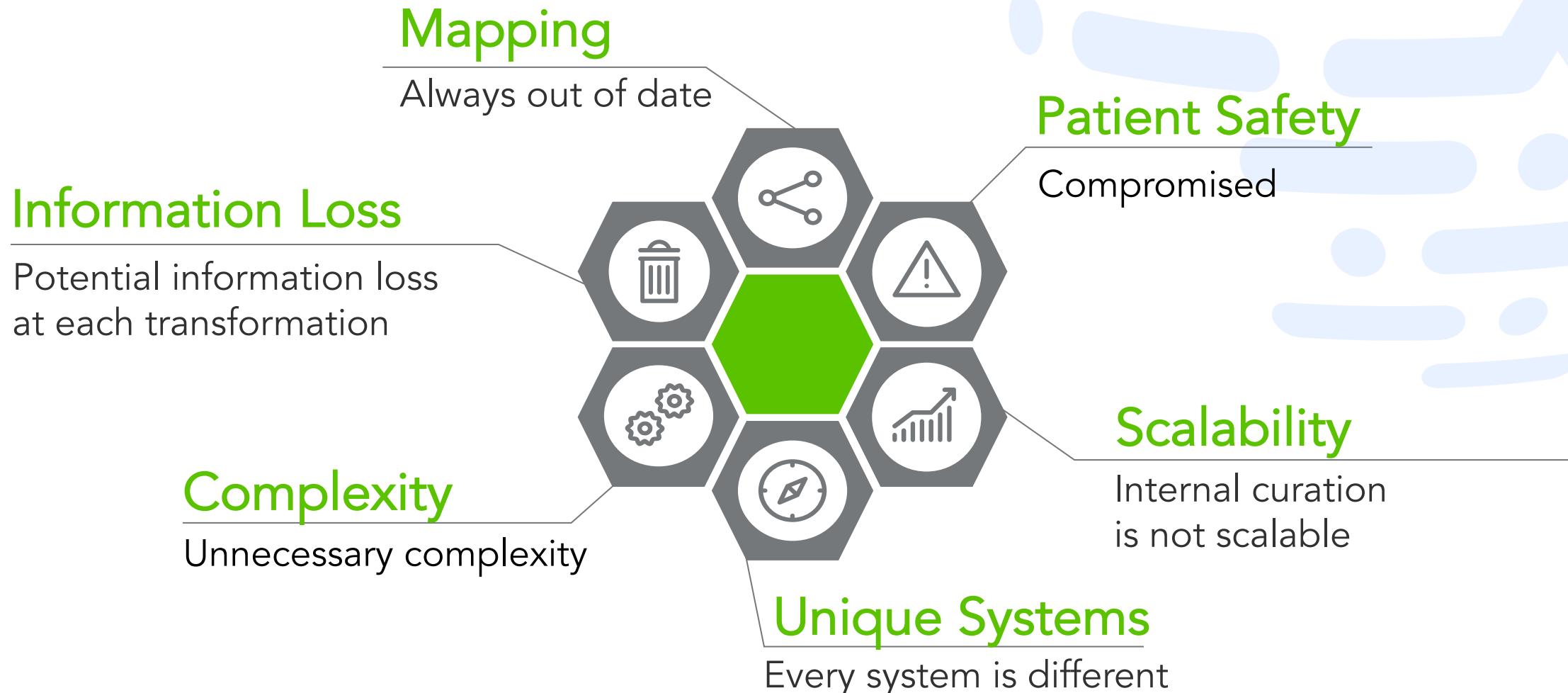
Has THE PROMISE Been Delivered?

- ✓ Improve the quality and safety of health-care*
- Measure the cost and quality of services
- ✗ Integrate multiple providers across organizations in a continuum of care
- ✗ Integrate high-quality decision support into the clinical workflows in the continuum of care.

Encoded data is the foundation needed to deliver the promise!

*Many quality and safety improvement opportunities still exist.

Historical Challenges

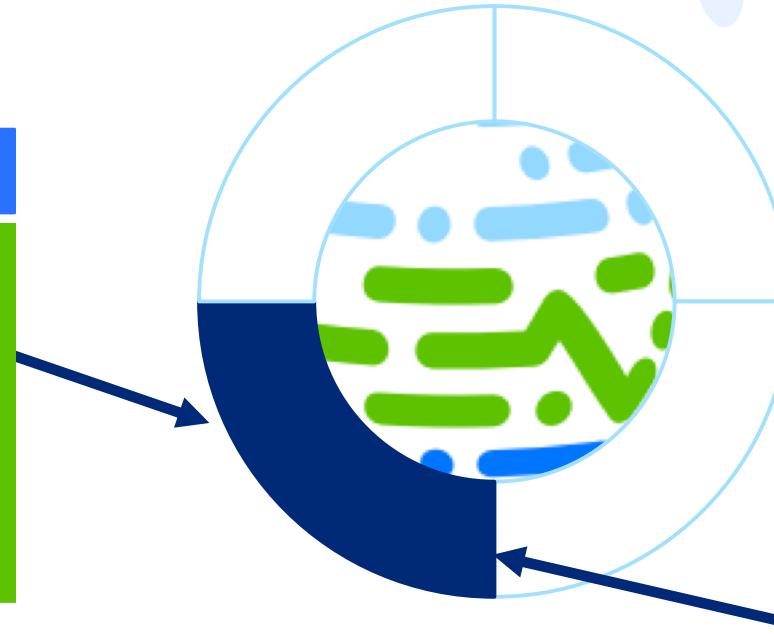


How is SOLOR Different than Mapping?

Organization A

Local code: 12345

Infiltrating ductal carcinoma
of lower inner quadrant
of breast

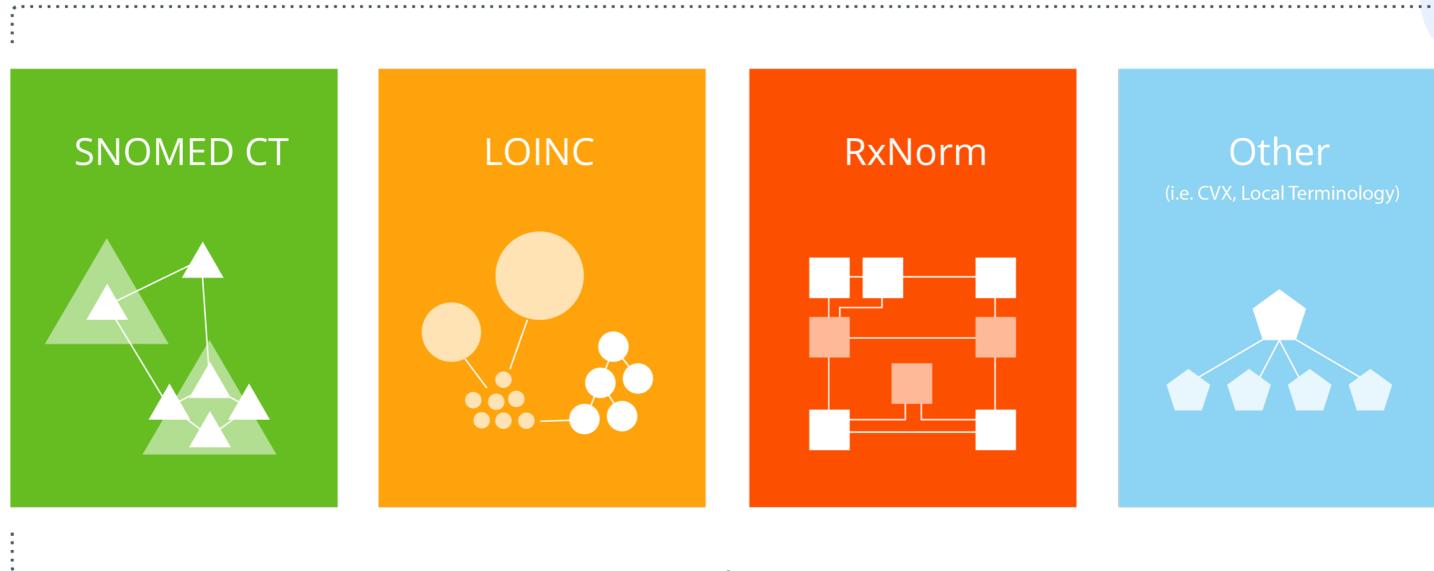


Organization B

Looks for concept in SOLOR
+ Shared extension

Infiltrating ductal carcinoma
of lower inner quadrant
of breast

SOLOR

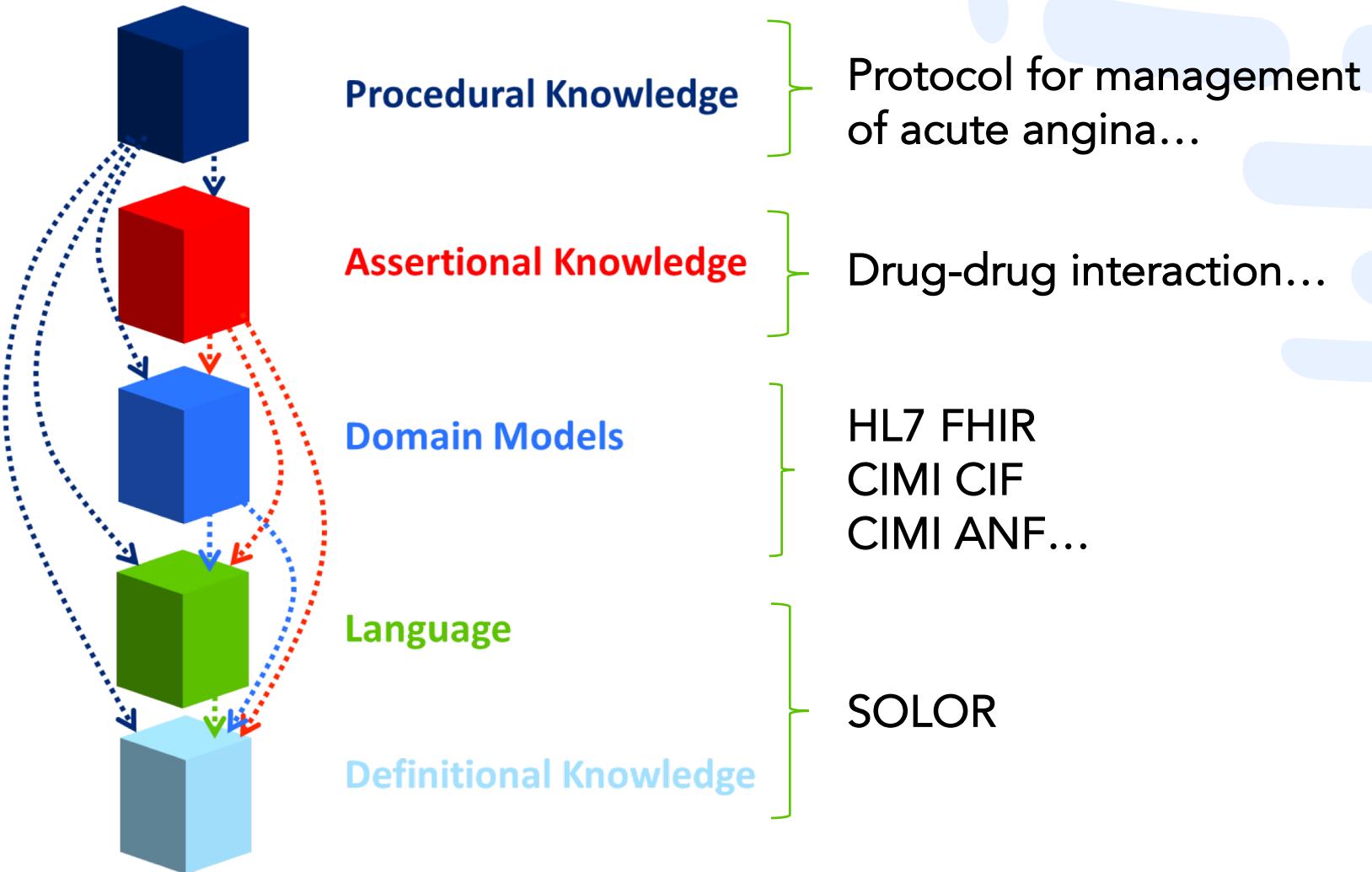


For More Information:

- Listen to January Learning Series #1 [here!](#)
- Send us an [email](#) if you would like further discussion on how SOLOR is different than mapping.

SOLOR in Context

Architectural Layers



What is Separation of Concerns?

- An architectural design principle whereby a system is divided into distinct sections, such that each section addresses a separate concern
- When concerns are well-separated, individual sections can be reused, as well as developed and updated independently
- Each architectural layer addresses separate concerns
- Defining what is being measured is a separate concern from representation of the results of a measurement

What are the Implications of Separation of Concerns?



Measurement is a concern of the domain model

- Quantitative measurement
- Existential measurement



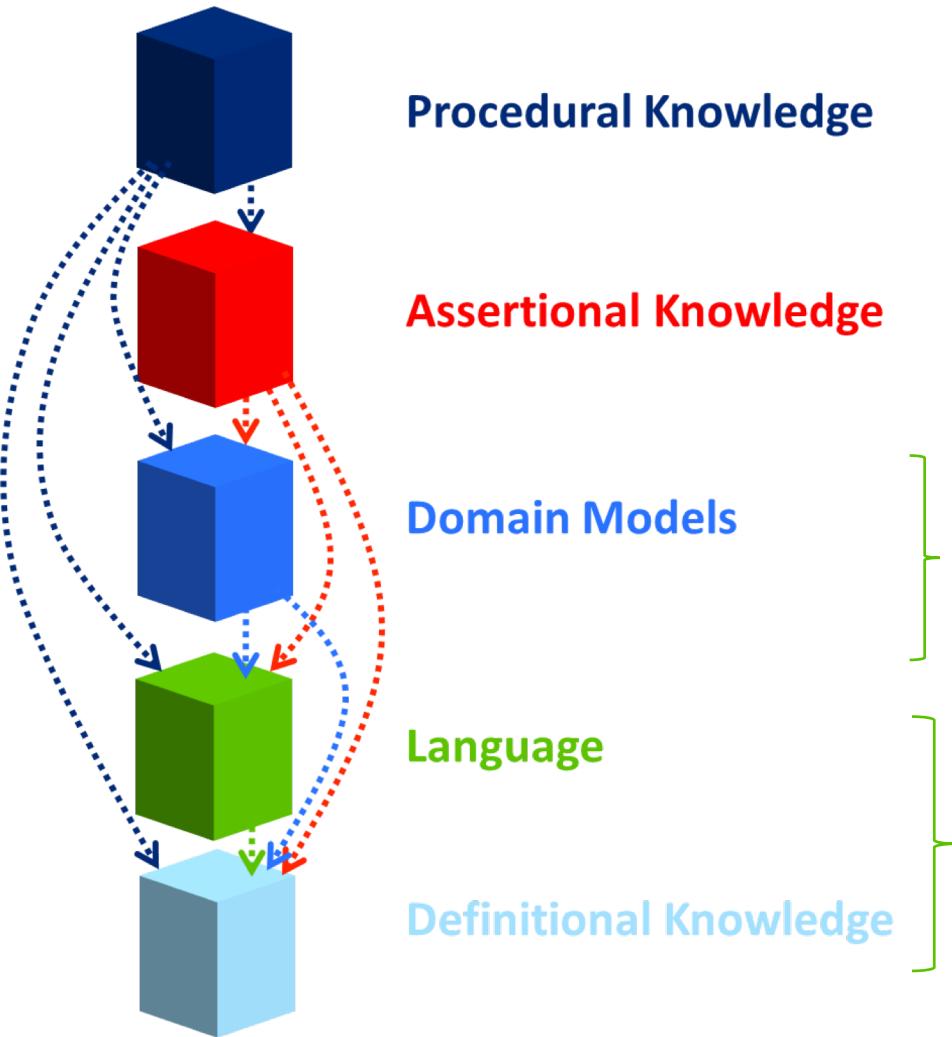
Defining what is measured is a concern for SOLOR

- Dot-blot hemorrhage of the retina
- Pressure ulcer on the left olecranon process
- Type 1 diabetes



Measurement of absence needs to be removed from SOLOR sources to allow layers to address separate concerns

Architectural Layers



Define how to record a measurement
(*Numerical and Subject of Information*)

HL7 FHIR
CIMI CIF
CIMI ANF...

SOLOR

Define what can be measured
(*Description Logic and Language*)

SOLOR Content Improvements

Content work was completed for VA by Book Zurman, Inc. under the Informatics Support Services Contract No. VA701-16-C-0039.

Need for Consistent Representation



Statement model separates concerns (FHIR, CIMI, etc.)

- Measurement supports existential and quantitative results
- Tractable computation, good separation of concerns



Negation in definitional layer causes confusion and delay

- Wrong semantics
- Intractable computation
- Poor separation of concerns

Current inconsistencies require us to identify — and provide solutions for — inconsistent content.

Content Selection and Review

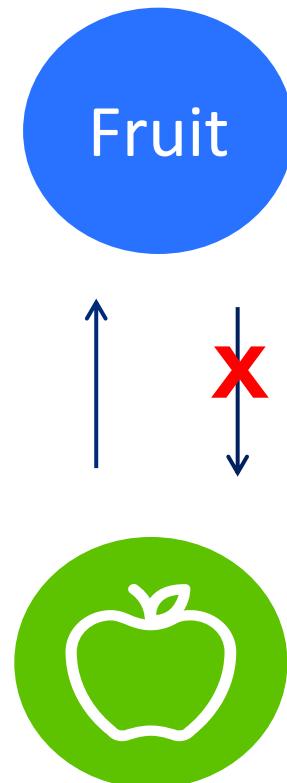
Selection

- Negation (no speech)
- Subject is not patient (father smokes)
- Compound observations (nausea and vomiting)
- 50,000 concepts selected

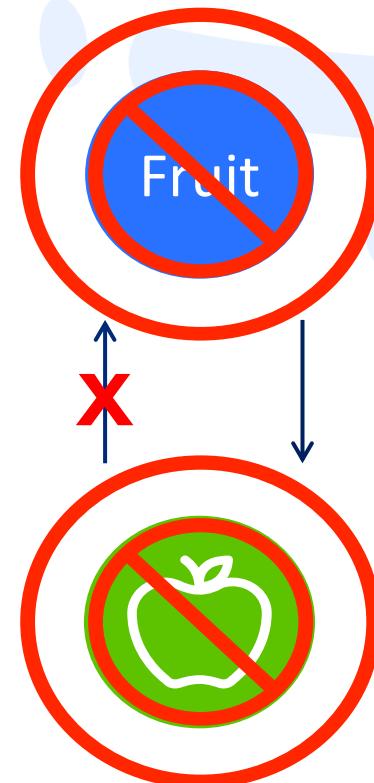
Review Process

- Two independent reviewers
- Disagreements were analyzed and resolved
- 10% sample for each topic reviewed twice

Negation



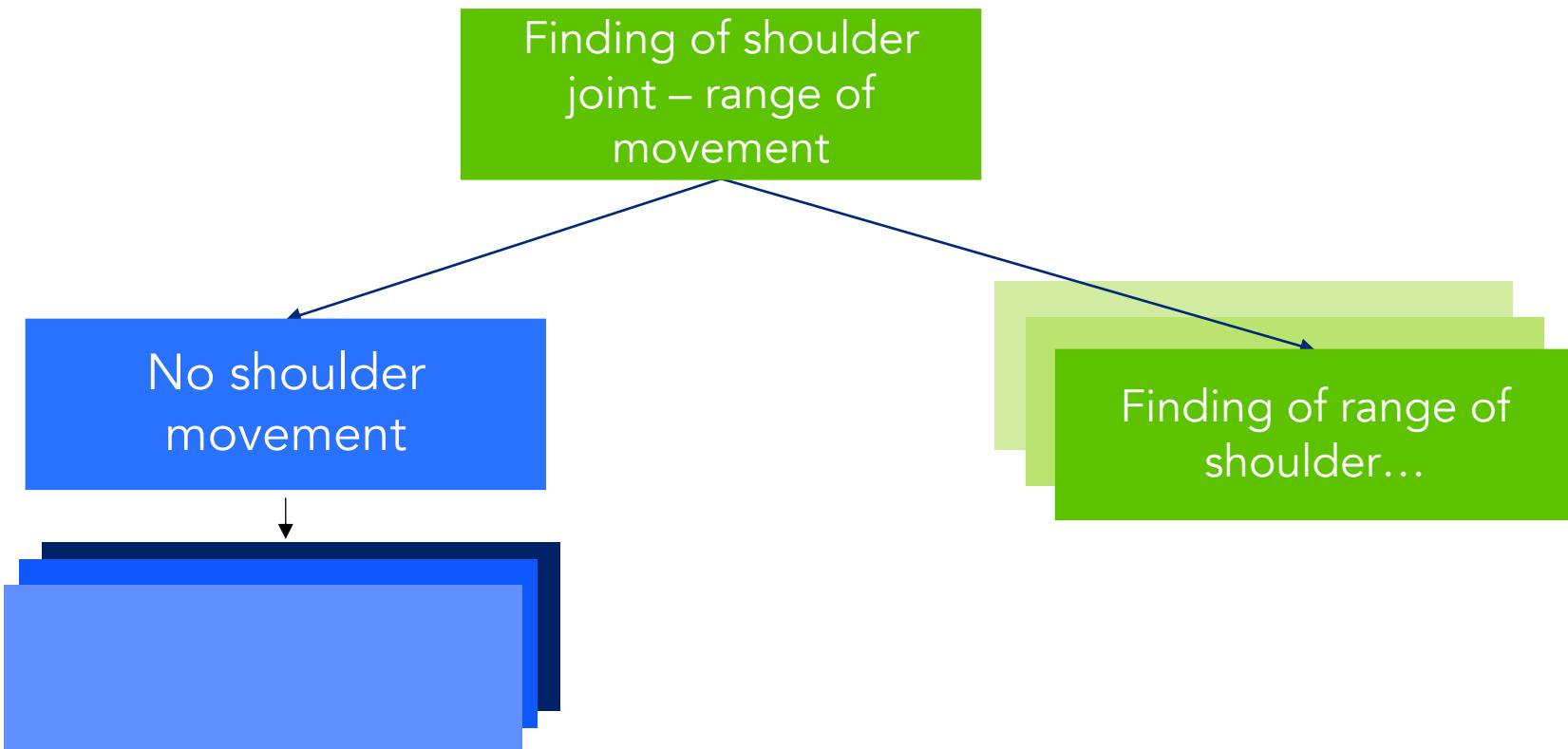
Having an "Apple" = Having a "Fruit"
Having a "Fruit" \neq Having an "Apple"



Having "No Fruit" = Having "No Apple"
Having "No Apple" \neq Having "No Fruit"

SNOMED Negation Example

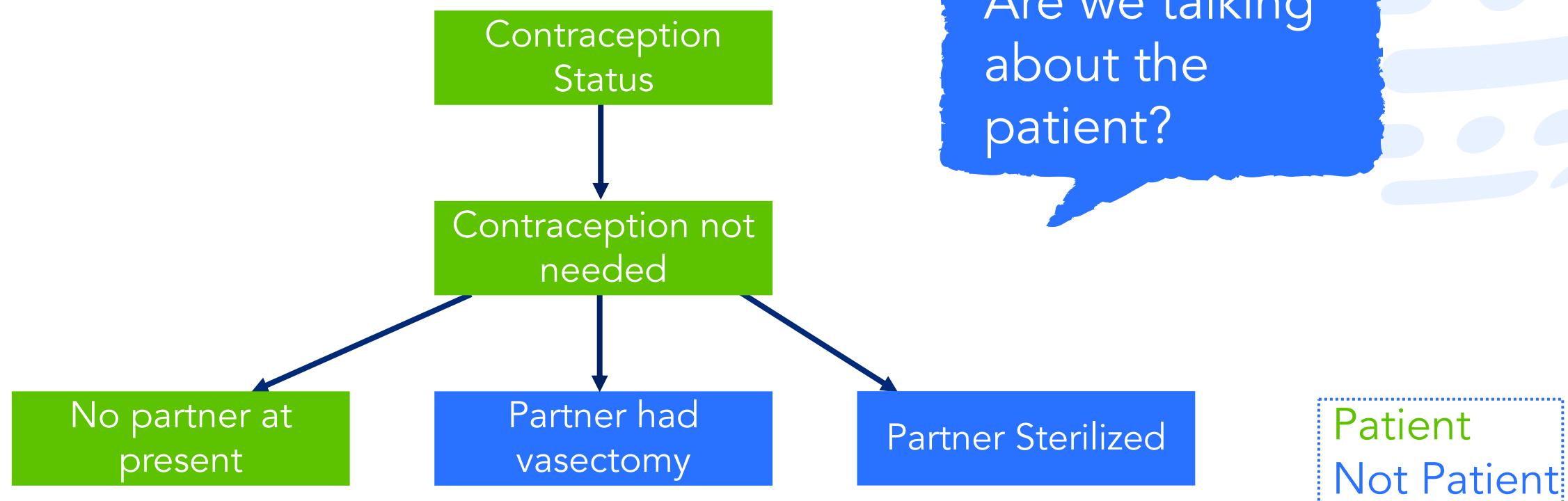
What does “no shoulder joint movement” mean?



No Measurement
Implied
Measurement

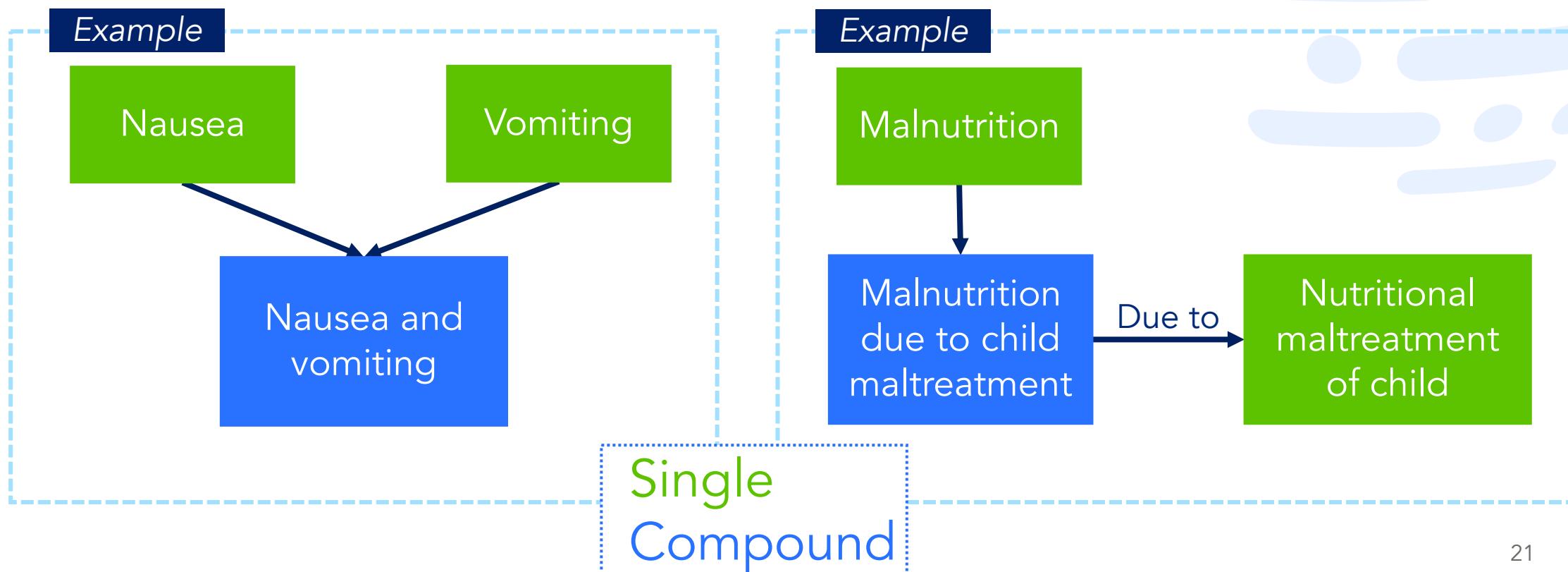
Patient is Not Subject of Record

Results in an inconsistent view of concepts applying only to the patient.



Compound Observations

- Concepts observations are those that involve a combination of more than one observation.
- Combining multiple concepts into one can cause modeling issues that affect retrieval.



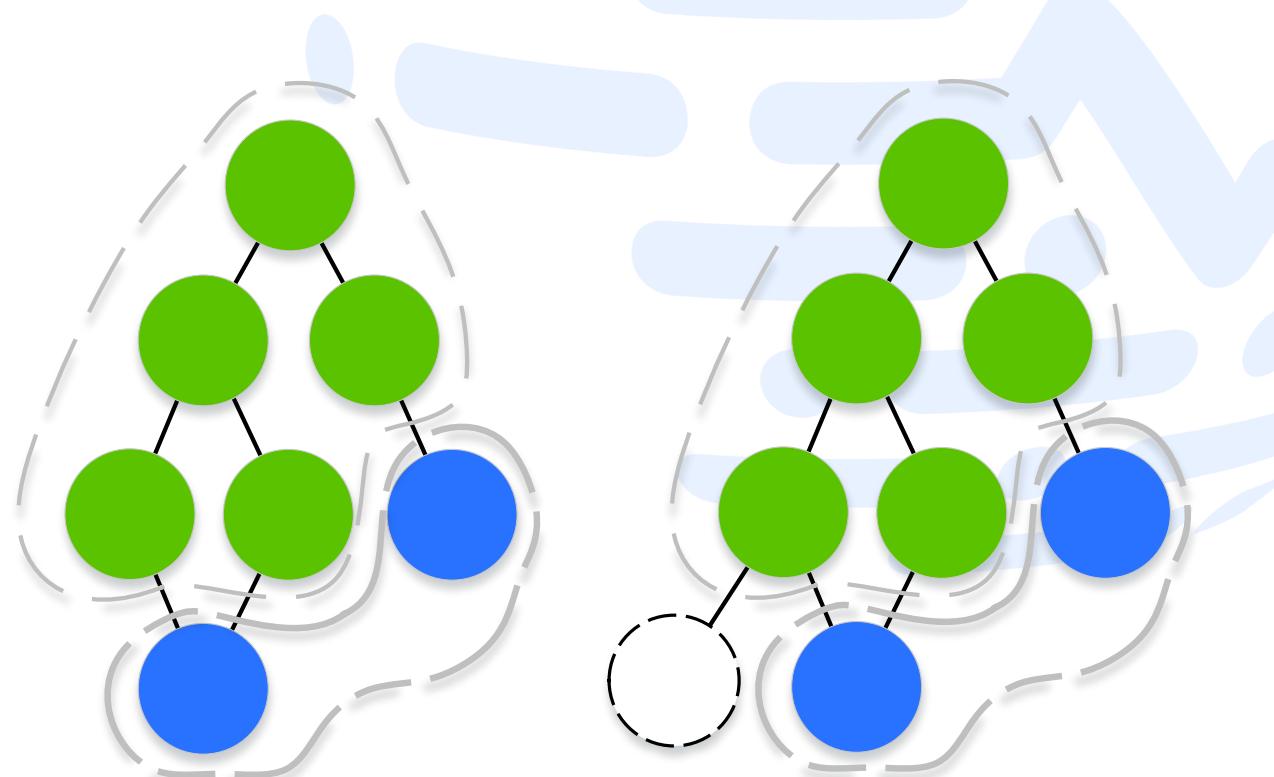
Results Represented as Refsets

- Support integrated queries
- Provide a consistent method for content update and maintenance
- Provide a better alternative to spreadsheets

Is Not [Topic]

Is [Topic]

New Concept

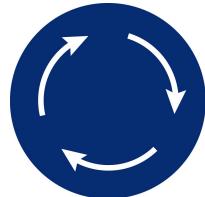


SOLOR Release Files of SNOMED CT Improvements

Extract, Transform, and Load



SNOMED
Release Files



SOLOR
Release Files



SOLOR Viewer

SOLOR Assemblage View

Col...		▼ Negated assemblage	4,707 semantics
		author time	module path
MBR	Negated assemblage Brain stem contusion without open intracranial wound AND with prolonged loss of consciousness (more than 24 hours) AND return to pre-existing conscious level	 Deloitte User 2017-06-30 0...	Deloitte Health Development...
MBR	Negated assemblage Open wound of nape of neck without complication	 Deloitte User 2017-06-30 0...	Deloitte Health Development...
MBR	Negated assemblage No diagnosis on Axis II	 Deloitte User 2017-06-30 0...	Deloitte Health Development...
MBR	Negated assemblage Failure to maintain weight	 Deloitte User 2017-06-30 0...	Deloitte Health Development...

Concept View of Assemblage Member

The screenshot shows the SNOMED CT Concept View for the concept "No shoulder movement (finding)". The top navigation bar includes buttons for "+", "empty", "No shoulder movement", and "Focus ON". The main area displays the concept details under the "CON" section, indicating it is "Active in SNOMED CT® core modules on Development path". Below this, the "Extensions:" section lists several entries:

Extension Type	Description	Action
REF	SNOMED legacy implication	+ 📎
STR	Sufficient concept definition	+ 📎
MBR	Negated assemblage Member	+ 📎
MBR	Not compound assemblage Member	+ 📎
MBR	Patient is subject assemblage Member	+ 📎

A red bracket groups the last three rows (MBR extensions). A green dashed box contains the text "Concept is a member of these assemblages".

SOLOR Content Integration Update

LOINC Improvements



Better integration through improved description logic



OWL EL++ with concrete domains

- Multiple sufficient sets
- Support for numeric values and ranges



Compatible with SNOMED's stated future direction

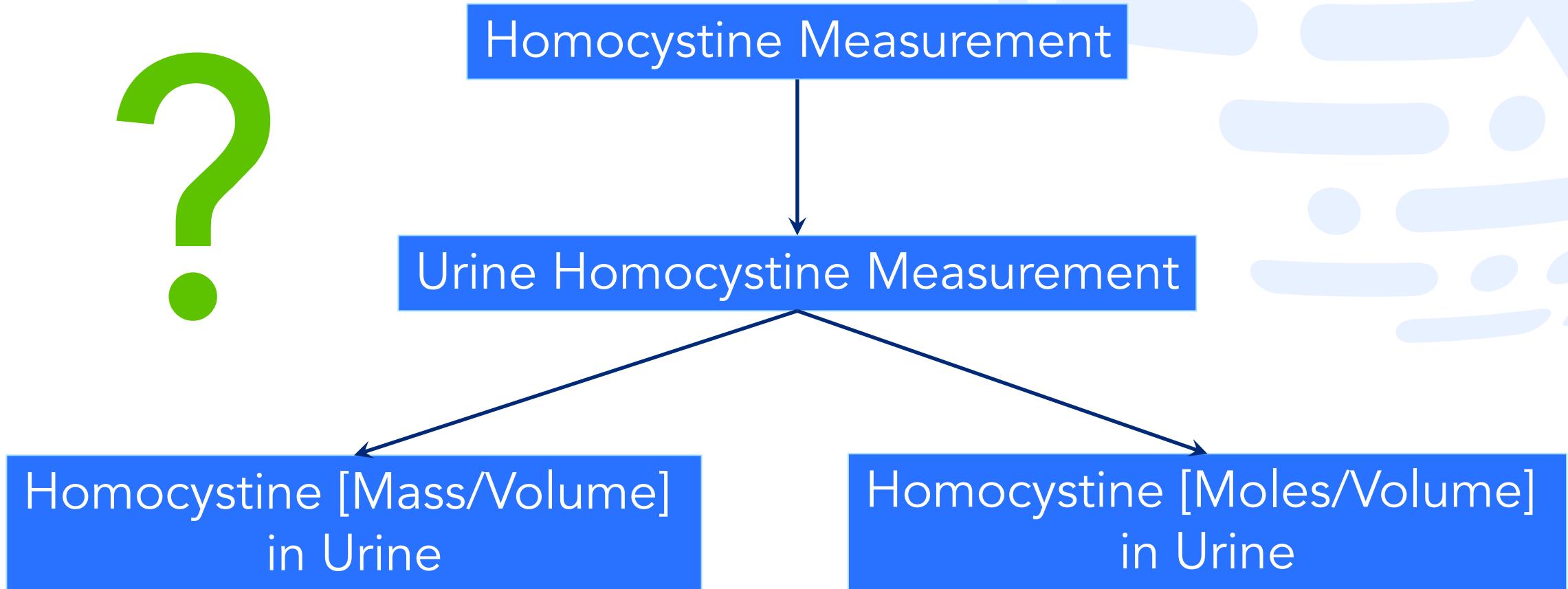
+urine +homocystine

Result
Urine homocystine measurement
Urine homocystine level
Urine homocystine measurement (procedure)
Homocystine [Presence] in Urine
Homocystine [Mass/volume] in Urine
Homocystine [Moles/volume] in Urine
Homocystine Free [Moles/volume] in Urine

SNOMED Concepts

LOINC
Concepts

Taxonomy



... Not Quite

- ▼ ○ Homocystine measurement
 - ⬆ ○ Plasma homocystine measurement
 - ⬆ ○ Serum homocystine measurement
 - ⬆ ○ Procedure
 - ➡ ○ Procedure by method
 - ➡ ○ Evaluation procedure
 - ➡ ○ Measurement
 - ➡ ○ Measurement of substance
 - ➡ ○ Measurement of substance in specimen
 - ⬆ ○ Measurement of amino acid
 - ⬆ ○ Evaluation of urine specimen
 - ➡ ○ Measurement of amino acid in urine
 - ➡ ○ Urine homocystine measurement

Observable Entity

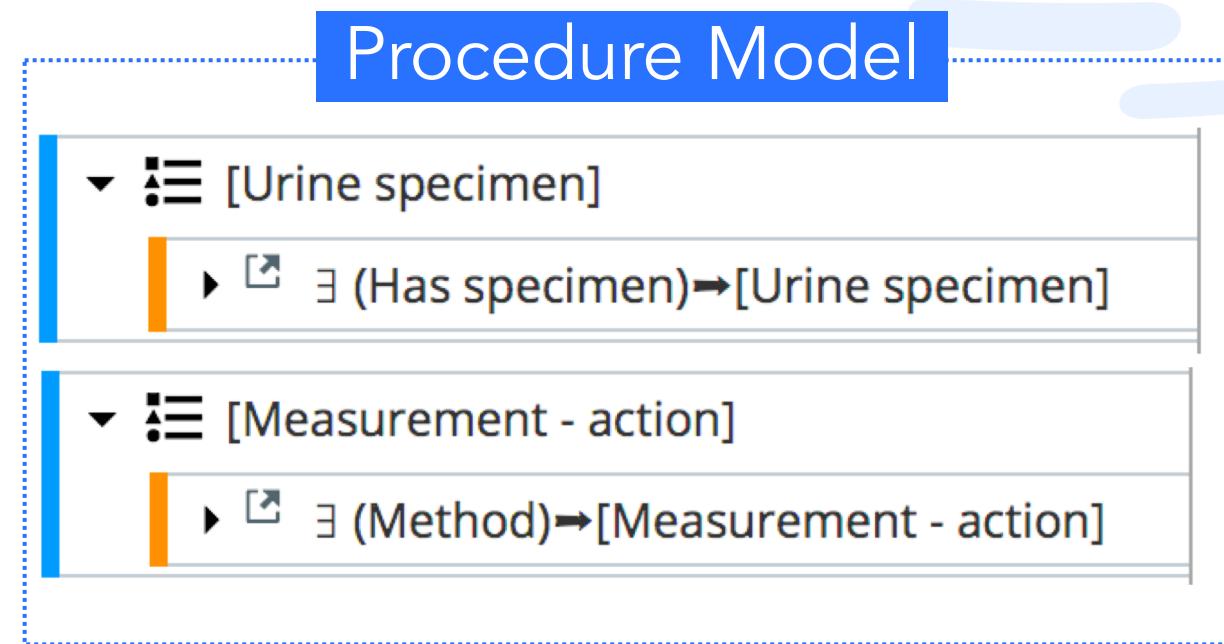
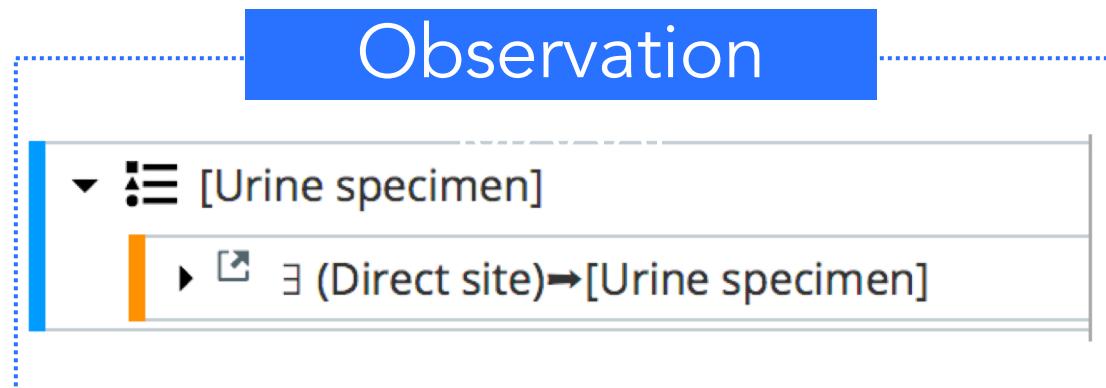
Homocystine [Mass/volume] in Urine

SNOMED ↔ LOINC

▶ FQN	Urine homocystine measurement (procedure)
[2] ⓘ	
▶ SYN	Urine homocystine measurement
[2] ⓘ	
▶ SYN	Urine homocystine level
[2] ⓘ	
DEF	Sufficient → And → Some Role group → And → Some Component → Homocystine Some Role group → And → Some Method → Measurement - action Some Role group → And → Some Has specimen → Urine specimen Measurement of amino acid in urine Homocystine measurement
[1] ⓘ	

▶ FQN	Homocystine Free [Moles/volume] in Urine
[1] ⓘ	
▶ SYN	Homocystine.free Ur-sCnc
[1] ⓘ	
DEF	Necessary → And → Phenomenon Sufficient → And → Some Role group → And → Some Time aspect → Single point in time Some Role group → And → Some Direct site → Urine specimen
[3] ⓘ	
	Some Role group → And → Some Component → Free homocystine Some Role group → And → Some Property type → Substance concentration Some Role group → And → Some Scale type → Quantitative Some Role group → And → Some Inheres in → Urine

Minor Model Differences



Multiple Sufficient Sets

▼ Sufficient set: Hcys Ur-mCnc

↳  Observation

▶  [Homocysteine]

▶  [Mass concentration]

▶  [Quantitative]

▶  [Single point in time]

▶  [Urine specimen]

▶  [Urine]

▼ Sufficient set: Hcys Ur-mCnc

↳  Procedure

▶  [Homocysteine]

▶  [Mass concentration]

▶  [Measurement - action]

▶  [Quantitative]

▶  [Single point in time]

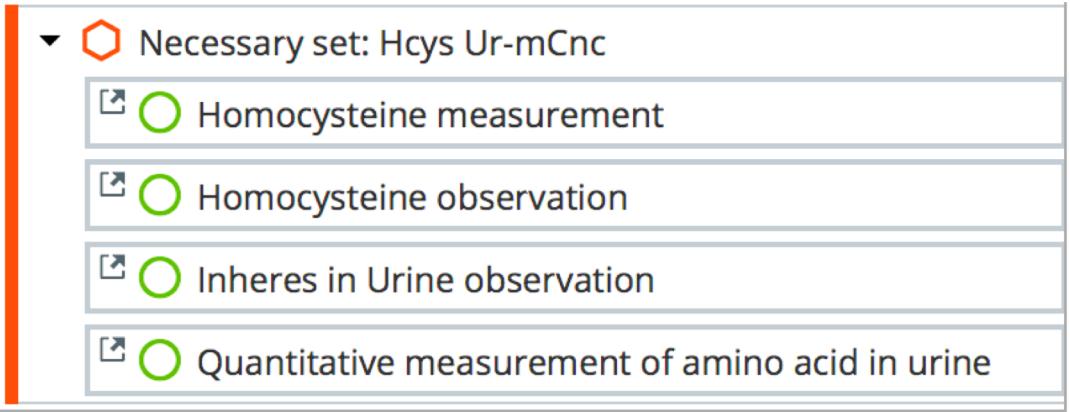
▶  [Urine specimen]

▶  [Urine]

Organizing Concepts, Classification

- ▼ ◊ Necessary set: Hcys Ur-mCnc
 - ↳ ○ Homocysteine measurement
 - ↳ ○ Homocysteine observation
 - ↳ ○ Inheres in Urine observation
 - ↳ ○ Quantitative measurement of amino acid in urine

New Taxonomy



- Inheres in Urine observation (OP)
 - ◆ Observation (SOLOR)
 - Substance observation (OP)
 - Amino acid observation (OP)
 - Homocysteine observation (OP)
 - ◆ Procedure (SOLOR)
 - Procedure by method (procedure)
 - Evaluation procedure (procedure)
 - Measurement procedure (procedure)
 - Measurement of substance (procedure)
 - Measurement of amino acid (procedure)
 - Homocysteine measurement (procedure)
 - Homocysteine [Mass/volume] in Urine

Why Does this Matter?



The ability to find all equivalent concepts is:

- Necessary for decision support
- A patient safety issue



If not done properly in the defining taxonomy:

- Each decision support rule has to take into account all the different ways to represent the same thing
- Redundant effort at best
- Greater opportunity for omissions that may result in patient harm

RxNorm Integration

⌚ 🔎 ▾ Product containing aspirin (medicinal product)

🔧 Expand All

▼ CON

9 Active in SNOMED CT® core modules on Development path

Extensions:

REF	SNOMED legacy implication
9	Necessary but not sufficient concept definition
STR	SCTID
9	7947003
STR	RxNorm CUI
3	1191

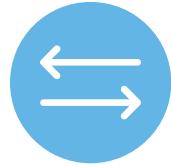


RxNorm – Update



SNOMED is working to finalize an International Drug Model

- Participation from NLM, NHS, Australia, others
- Due out this year



RxNorm may align with this model

- Example of collaborative contribution
- Don't want to reinvent the wheel



Get Started with SOLOR— What's Next—Get Involved

Get Started with SOLOR

- ➡ Download the newly released SOLOR Viewer 1.2 from
<http://solor.io>

- ➡ Download SOLOR Content from:
 - SNOMED CT – Content Improvements
<https://healthservices.atlassian.net/wiki/spaces/SOLOR/pages/333119489/SOLOR+Assemblies>
 - SNOMED CT – Skin Wound Assessment Extension
<https://healthservices.atlassian.net/wiki/spaces/SOLOR/pages/200114251/SOLOR+Skin+Wound+Assessment+Extension>

What's Next

- Celebrate...vacation...enjoy life...get fit... 😊
- Continue efforts on LOINC integration
- Export RF2 Zip files for terminology servers
- Continue improvements to SNOMED CT
 - Inverse Concepts (Normal vs. Abnormal)
 - Primitive Concepts
 - Laterality Concepts

Get Involved

- SOLOR project information on HSPC Confluence
 - <https://healthservices.atlassian.net/wiki/spaces/SOLOR/overview>
- Sources for Documentation and Tools
 - KOMET – <https://github.com/OSEHRA/komet>
 - ISAAC – <https://github.com/OSEHRA/ISAAC>
- SOLOR JIRAs
 - <https://healthservices.atlassian.net/projects/SOL/summary>
 - <https://healthservices.atlassian.net/projects/SIK/summary>
- SOLOR Website
 - <http://solor.io>
 - <http://solor.io/blog/>
- SOLOR Viewer App and User Guide
 - Navigate to Learn More section of <http://solor.io>



Thank You!

- Attendees
- Healthcare Services Platform Consortium (HSPC)
- Veterans Health Administration (VHA)
- Intermountain Health
- PenRad
- Book Zurman
- Cognitive
- Deloitte
- Sujanski & Associates
- TermMed
- CSIRO
- Amplified
- VetsEZ
- Federal Health Architecture (FHA)

Q & A