

1:00 p.m. - 3:00 p.m.
Technical Track

2-3 Experience with Implementations

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3M*



Towards Data Interoperability

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Interoperability

The ability of one computer system to exchange data with another computer system

**U.S. National Committee on Vital and Health
Statistics**

*Report on Uniform Data Standards for
Patient Medical Record Information*

July 6, 2000

Three Levels of Interoperability

Semantic (common): information in the data fields within the message can be used in an intelligent manner by the receiving computer

Syntactic (functional): message between computers has a common structural definition (format)

Basic: message can be received from another computer, but not interpreted

Examples of Syntactic Interoperability: HL7 2.X

Hospital A

OBX|1|CE|2730-72^Potassium|

Hospital B

OBX|1|CE|2259-73^K|

Hospital C

OBX|1|CE|1817-72^Ser K|

Towards Semantic Interoperability: Data Standardization

Using the same set of codes to encode data throughout a system (a hospital, an organization, a region, a country, a world....)

Example: **Domain – Sex**

Code	Name
1	Male
2	Female
3	Unknown

Example of Semantic Interoperability: Exchanging Standard Terminology Codes

Hospital A

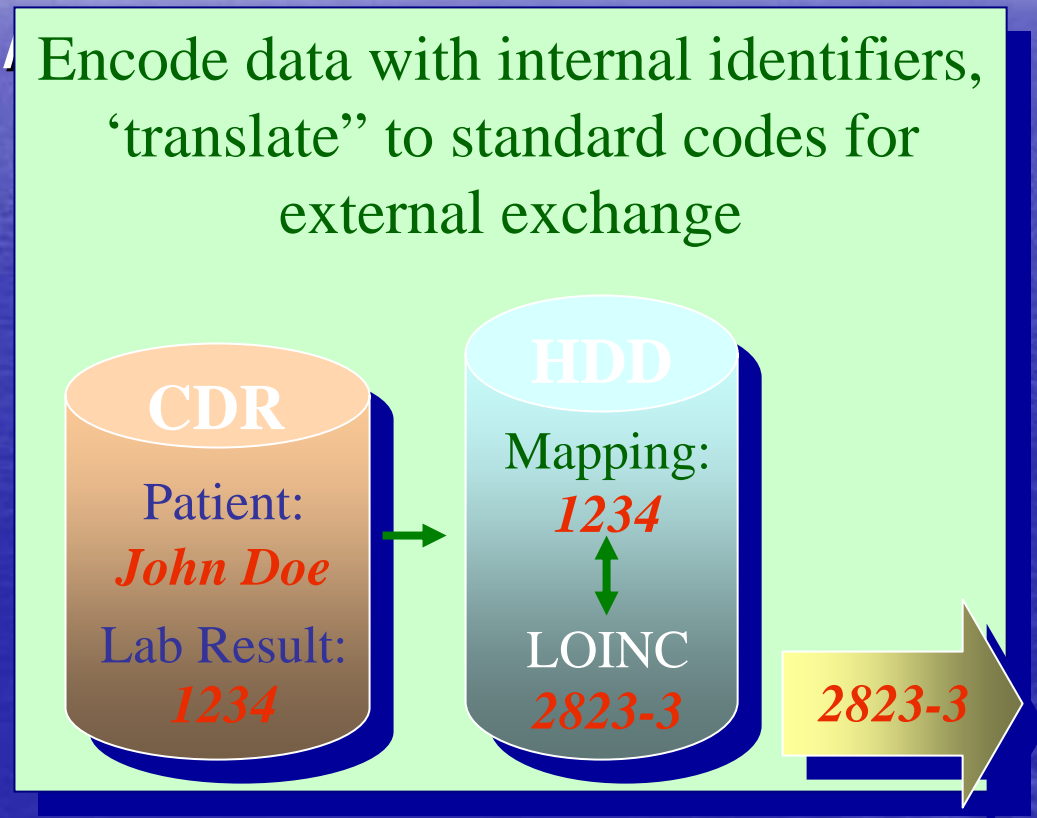
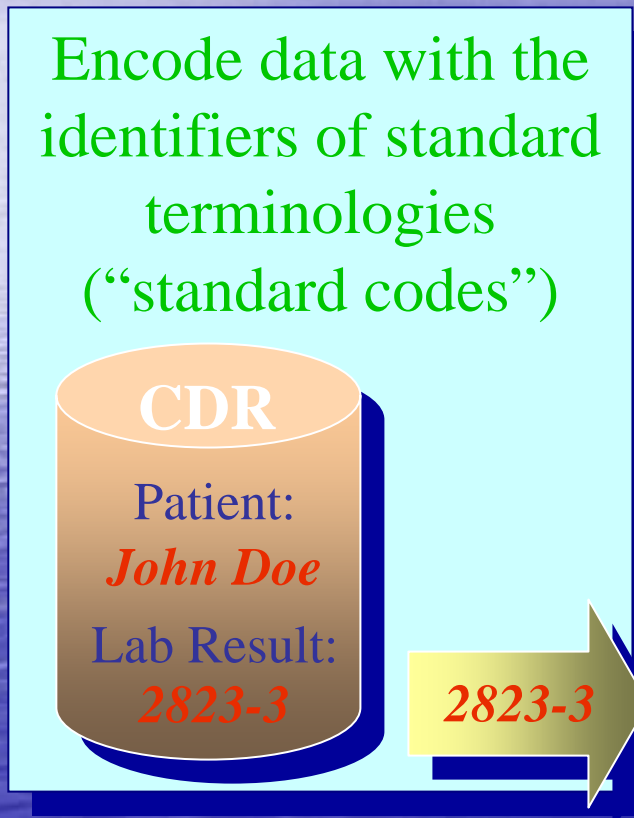
Hospital B

Hospital C

OBX|1|CE|**2823-3**^Potassium:SCNC:PT:SER/PLAS:QN:|

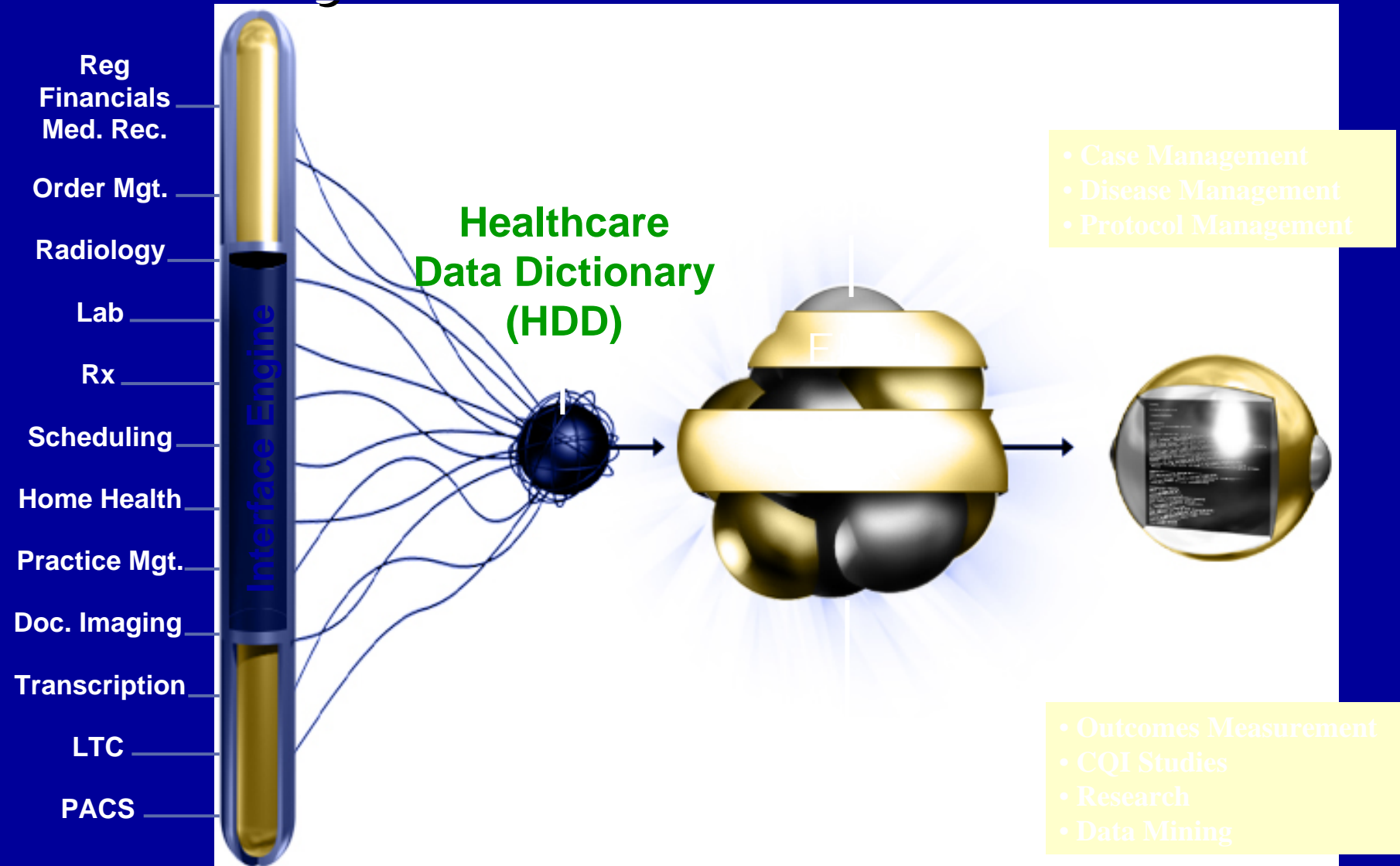
Logical Observation Identifier Names and Codes
(LOINC)

Commitment to Standard Terminologies for Data Exchange



CDR=Clinical Data Repository
HDD=Healthcare Data Dictionary

Role of the 3M Healthcare Data Dictionary

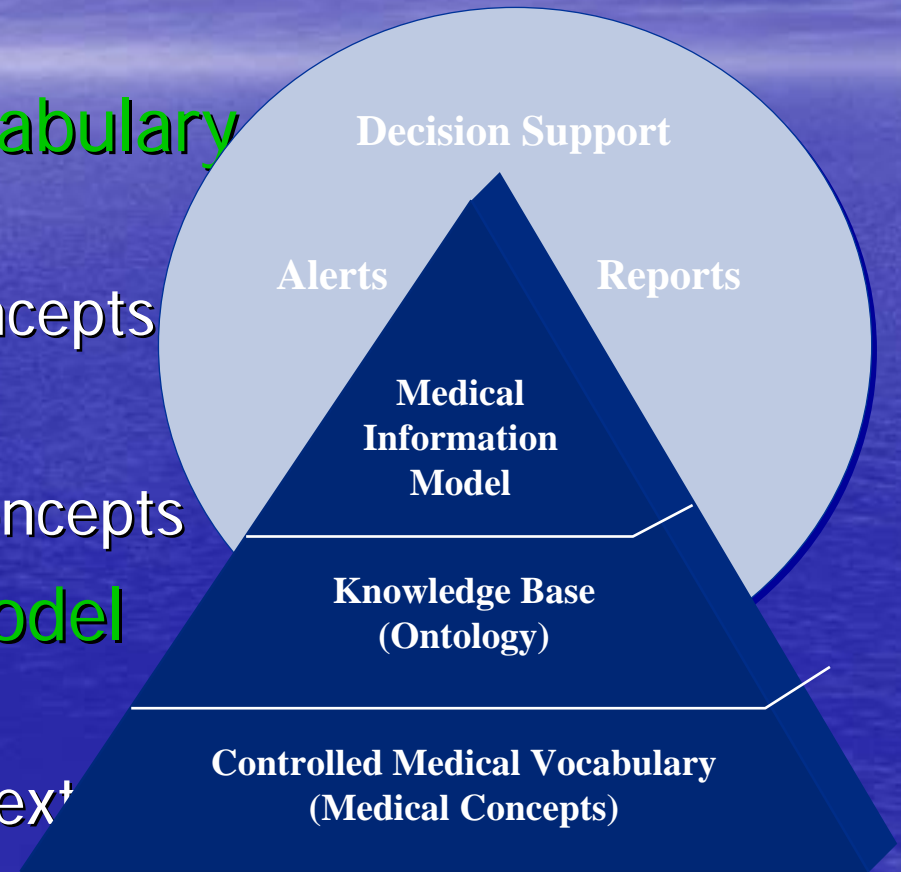


The 3M Healthcare Data

Dictionary

Components of the HDD

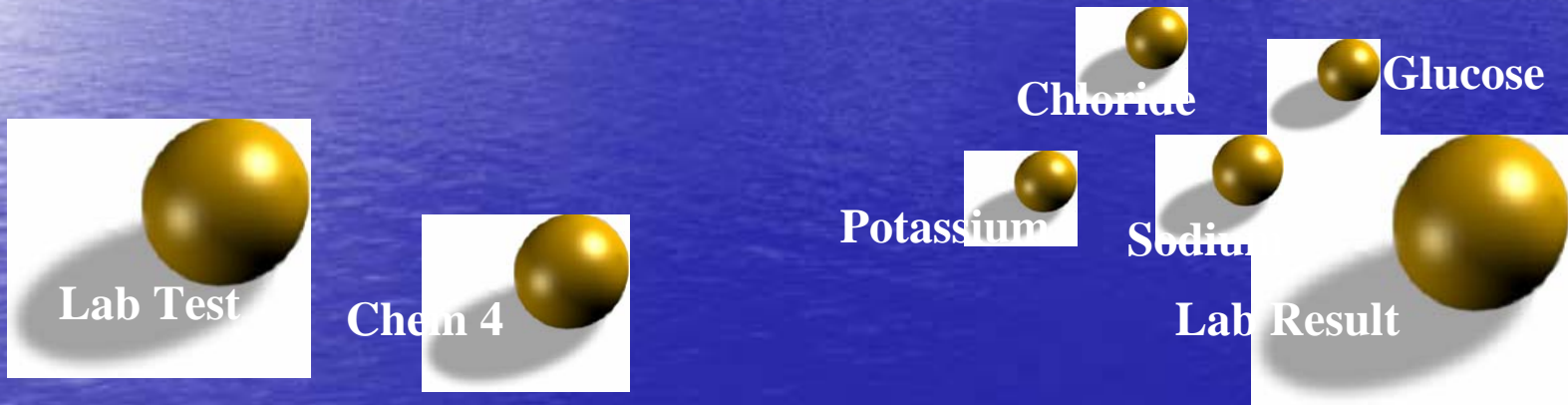
- **Controlled Medical Vocabulary (CMV)**
 - Collection of clinical concepts
- **Knowledge Base (KB)**
 - Relationships among concepts
- **Medical Information Model (MIM)**
 - Establishes clinical context



Controlled Medical Vocabulary

A collection of medical concepts, organized to support synonyms and other lexical characteristics

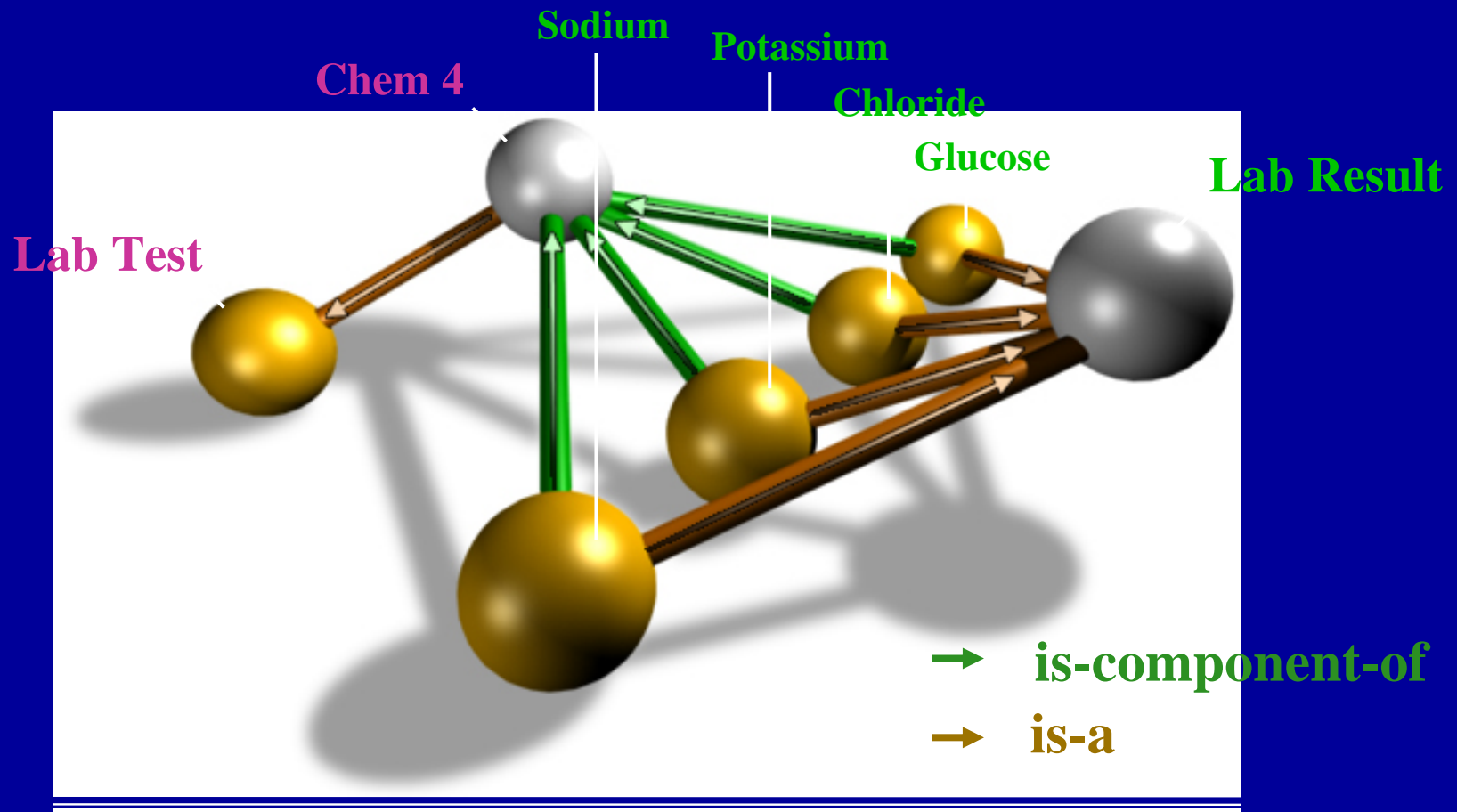
- A concept is a unique, definable idea or item that has a very specific, known meaning



Concept Based Vocabulary

Concept Representation	COLD	COLD	COLD
Concept Domain	a sensory perception	a pulmonary diagnosis	an upper respiratory viral infection
Concept Definition	"I'm feeling cold"	Chronic Obstructive Lung Disease	"I have a cold"
Concept ID	68215	1005480	1005313

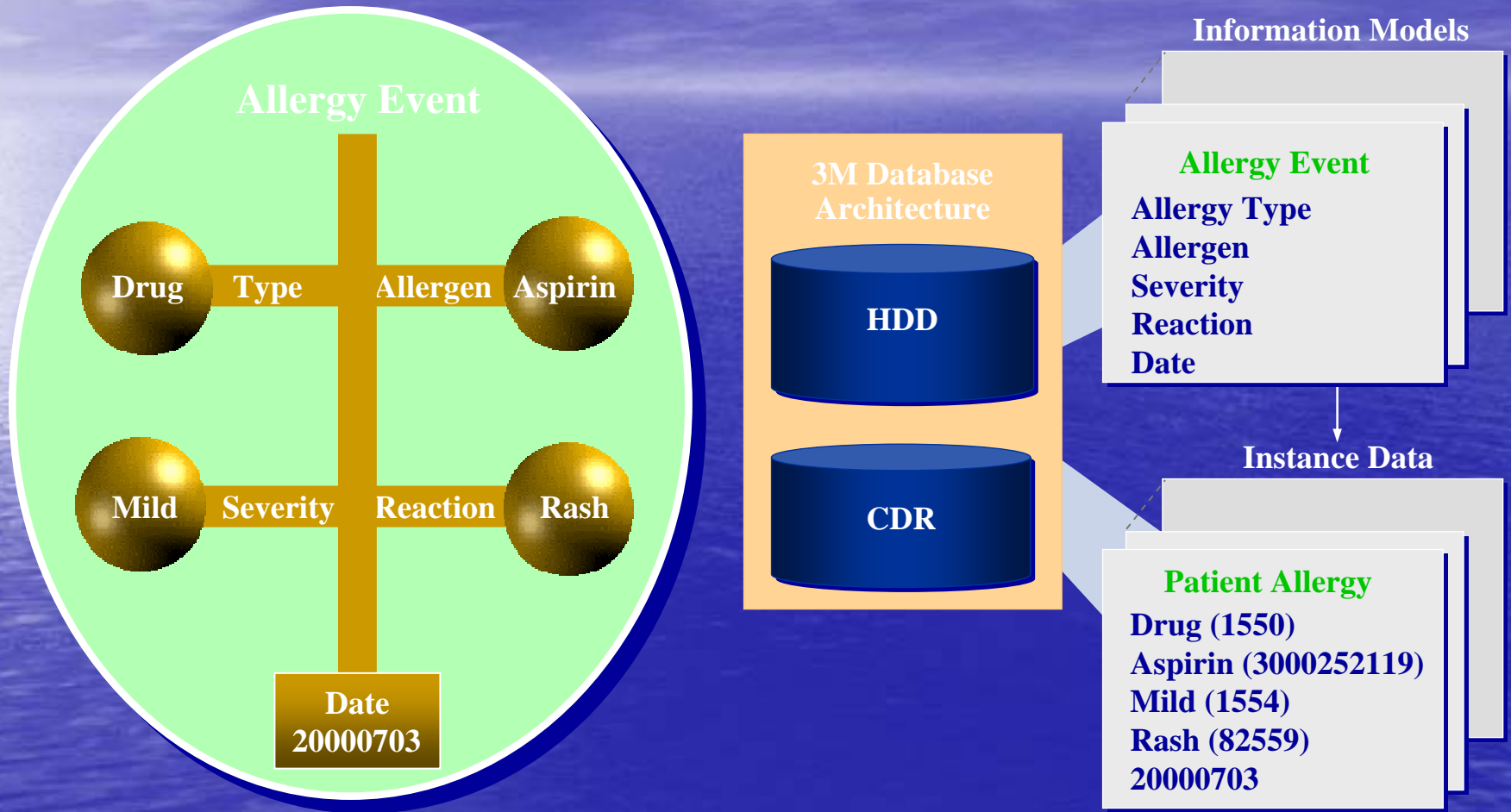
Knowledge Base/Relationships



Medical Information Model

- Describes the relationships among clinical events and terminologies in a fashion that gives them meaning and context
- Enforces accepted truths but allow for uncertainty and variation inherent in medical information
- Clinically correct, complete, flexible and extensible
- Supported by vocabulary and knowledge base
- Obeyed by the data gathering software

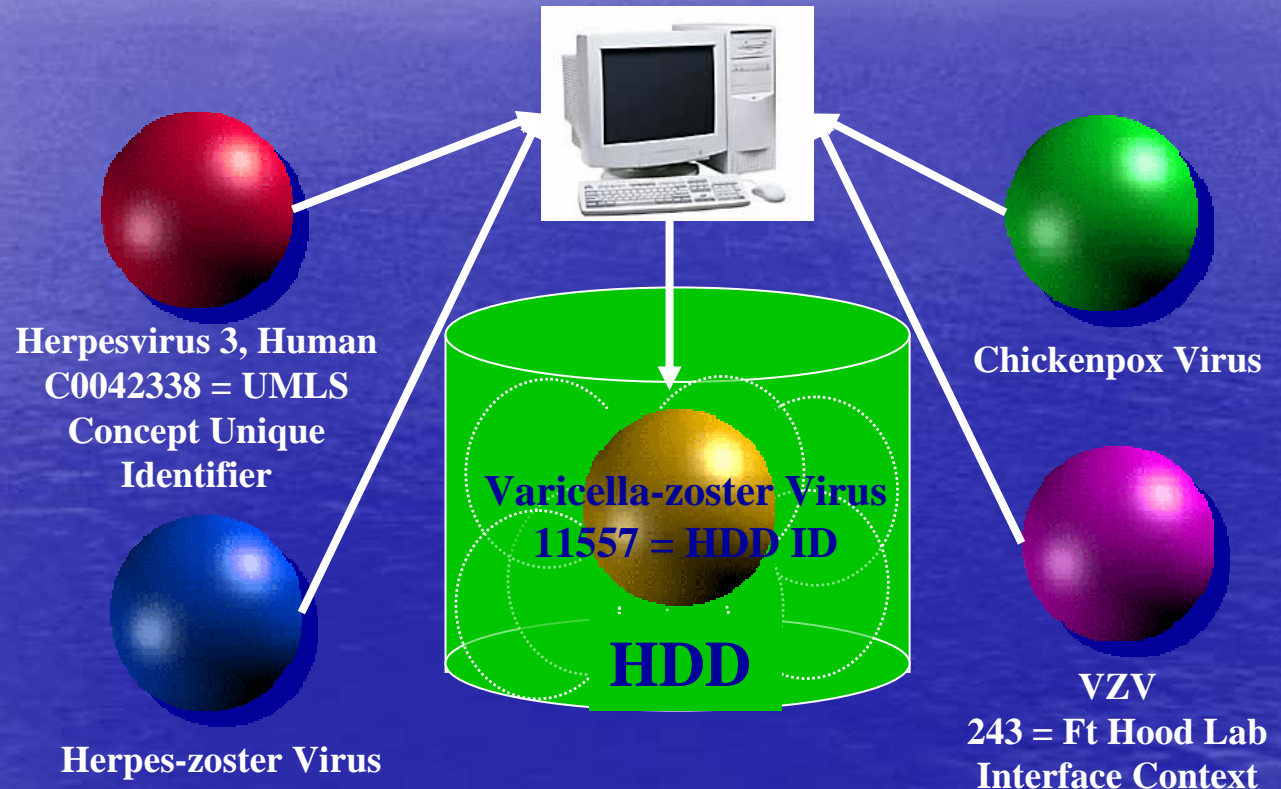
Medical Information Model



Mapping in the HDD

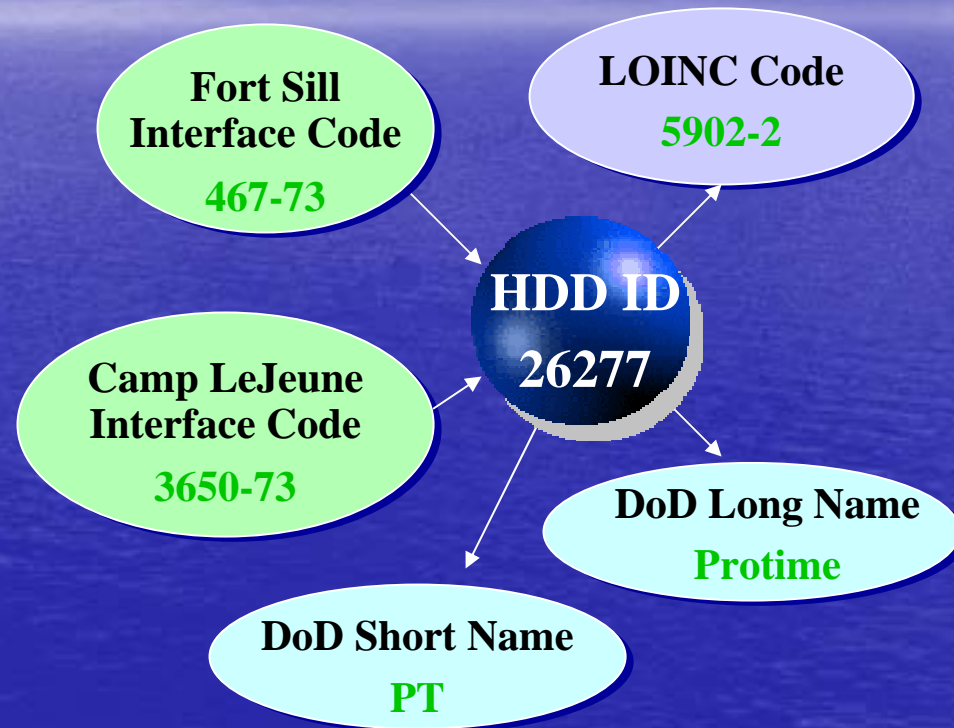
Mapping is the process of creating one-way links between concepts and terms in different vocabularies, both standard and legacy

Mapping is accomplished through a variety of techniques such as representation synonymy, term association, relationship, attribute, granularity, composition/decomposition, etc.



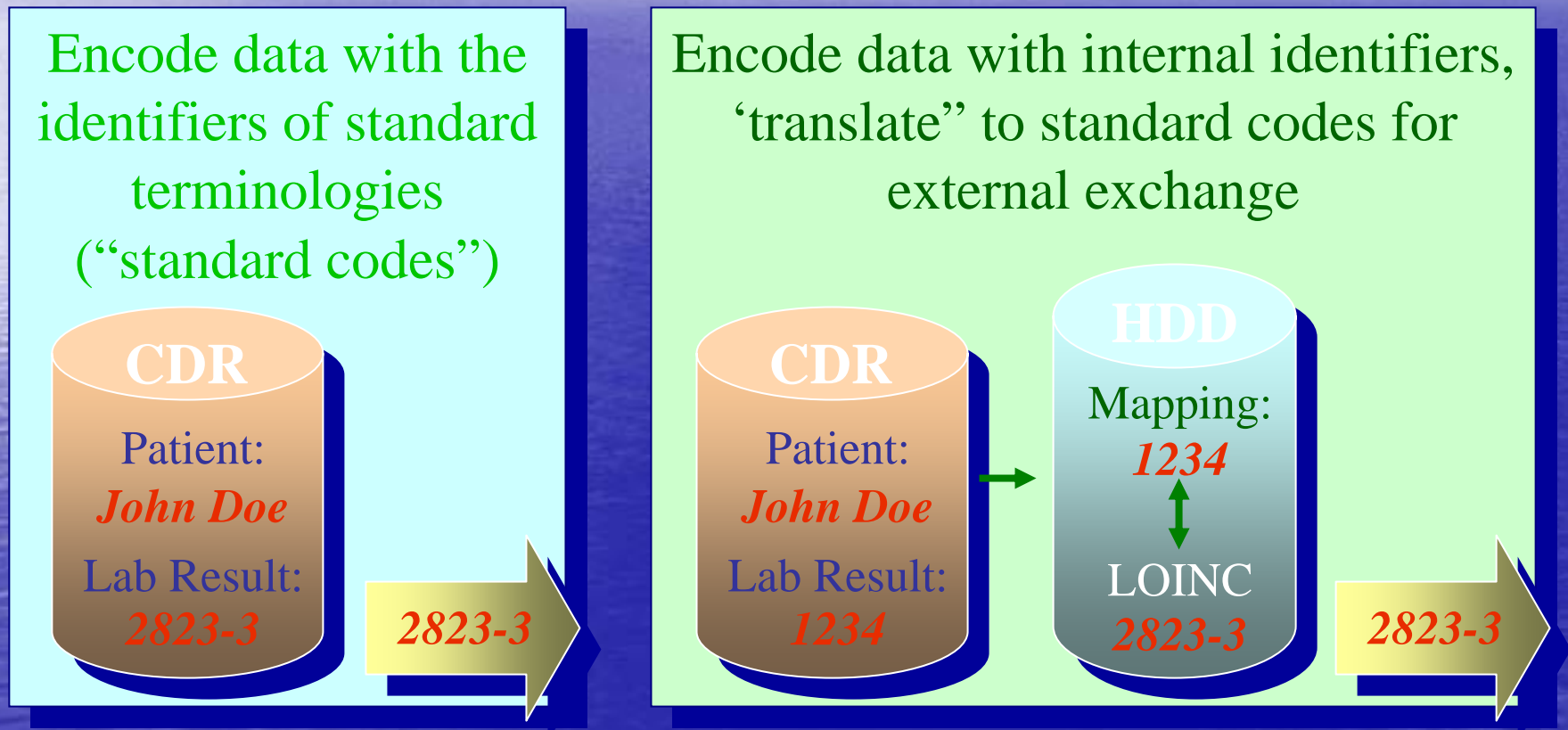
HDD Mapping Result

- A universal cross reference map accounting for all concepts and terms in the HDD
- The HDD manages ongoing updates from standard terminologies as well as local additions and changes from health care facilities
- Through mapping in the HDD, the enterprise's data is now exchangeable and interoperable with the rest of the world via standard codes, e.g. LOINC



Commitment to Standard Terminologies for Data Exchange

Two Approaches



CDR=Clinical Data Repository
HDD=Healthcare Data Dictionary

Issue with Encoding Data Using Standard Codes

Shift in Meaning of a Standard Code

NDC 00074433501

Before July 2002

CDR

Patient:

John Doe

Medication:

00074433501

Liposyn (Fat Emulsions), 10%, IV Solution, IV, Abbott Hospital, 200ml Bag

After July 2002

CDR

Patient:

John Doe

Medication:

00074433501

Paclitaxel (Paclitaxel, Semi-Synthetic), 6mg/ml, Vial, Injection, Abbott Hospital, 5ml Vial

The HDD Approach to Shift in Meaning of a Standard Code

HDD ID 3000493238

Before July 2002

CDR

Patient:

John Doe

Medication:

3000493238

**Active NDC
00074433501**

Liposyn (Fat
Emulsions),
10%, IV
Solution, IV,
Abbott
Hospital,
200ml Bag

After July 2002

CDR

Patient:

John Doe

Medication:

3000493238

**Inactive NDC
00074433501**

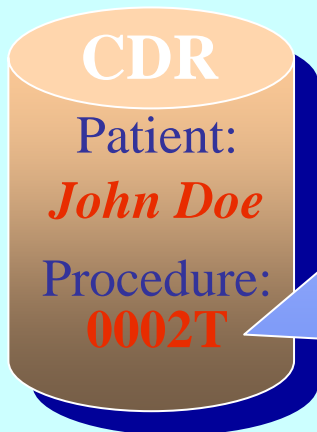
Liposyn (Fat
Emulsions),
10%, IV
Solution, IV,
Abbott
Hospital,
200ml Bag

Issue with Encoding Data Using Standard Codes

Removal of Standard Codes

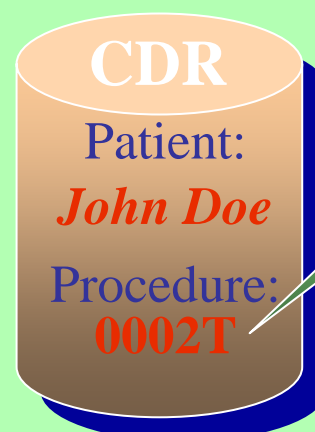
CPT 0002T

Before December 31, 2003



Endovascular repair of infrarenal abdominal aortic aneurysm or dissection; aorto-uni-iliac or aorto-unifemoral prosthesis

After December 31, 2003



?

The HDD Approach to Removal of Standard Codes

HDD ID 14780136

Before December 31, 2003

Active CPT Code:
0002T

Endovascular repair
of infrarenal
abdominal aortic
aneurysm or
dissection; aorto-
uni-iliac or aorto-
unifemoral
prosthesis

CDR

Patient:

John Doe

Procedure:

14780136

After December 31, 2003

Inactive CPT Code:
0002T

Endovascular
repair of infrarenal
abdominal aortic
aneurysm or
dissection; aorto-
uni-iliac or aorto-
unifemoral
prosthesis

CDR

Patient:

John Doe

Procedure:

14780136

Issue with Encoding Data Using Standard Codes

Lack of Comprehensive Standard Codes



Issue with Encoding Data Using Standard Codes

Lack of Comprehensive Standard

Codes

Many lab results will never receive a LOINC code – reasons include:

- Reporting a panel of multiple results through a single result field
- An interpretive data field containing only theoretical information
- Lab observations used for internal system processes only, e.g. "DNA Samples"
- Attributes that are not compliant with LOINC definitions or rules, e.g., "ABO Group, Serum or Plasma, Qualitative"



At least 2,000 will never receive a LOINC code

The HDD Approach to Lack of Comprehensive Standard Codes

Lab Results	# of Unique Lab Results	# of Unique Lab Results With LOINC Code	Proportion of Unique Lab Results With LOINC Code
HDD	43,664	27,509	63.0%
Used by U.S. DoD	21,171	9,925	46.9%
Used by Commercial Sites	13,400	6,752	50.4%

Issue with Encoding Data Using Standard Codes Local Extensions

Codes added at a health care facility to encode data when the appropriate, equivalent code is not yet found in the standard vocabulary

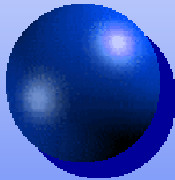
- Many of these may never be added to standard vocabularies

Issue with Encoding Data Using Standard Codes **Local Extensions**

An institution may still want additional concepts not provided by standard terminologies:

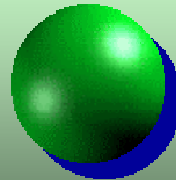
- The concepts are of different granularities

Terminology A

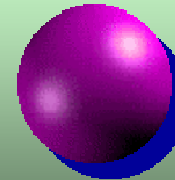


Catholic

Terminology B



Roman Catholic



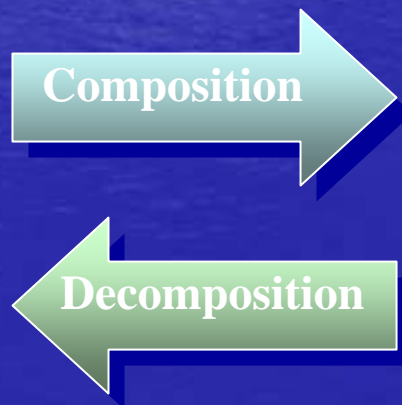
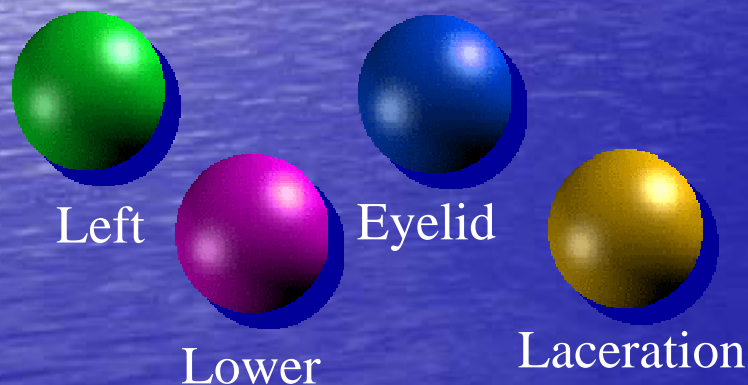
Catholic Non-Affiliated

Issue with Encoding Data Using Standard Codes

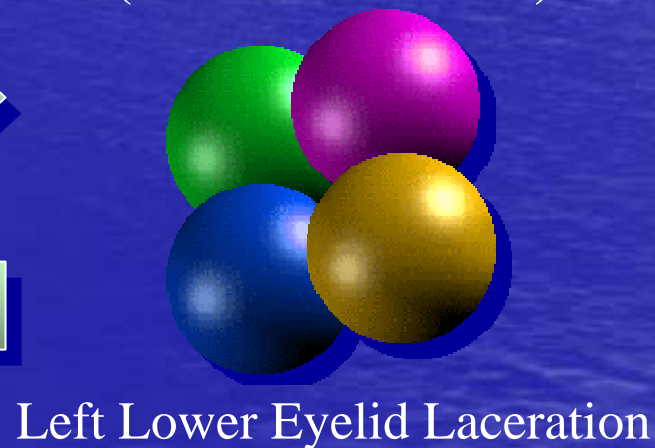
Local Extensions

Additional concepts not provided by standard terminologies:
Concepts of different compositional/decompositional structure

Vocabulary “Atoms”
(Post Coordination)



Vocabulary “Molecule”
(Pre-Coordination)



Issue with Encoding Data Using Standard Codes

Local Extensions

- The concepts are strictly local, e.g. locally made drug compounds
- The concepts are redundant according to standard terminologies, but are needed to support softwares
- The concepts are not definable according to standard terminologies, but are needed to support workflows

Dr. X's Magic Mouthwash

Pregnancy Test
- Nursing

Pregnancy Test
- Lab

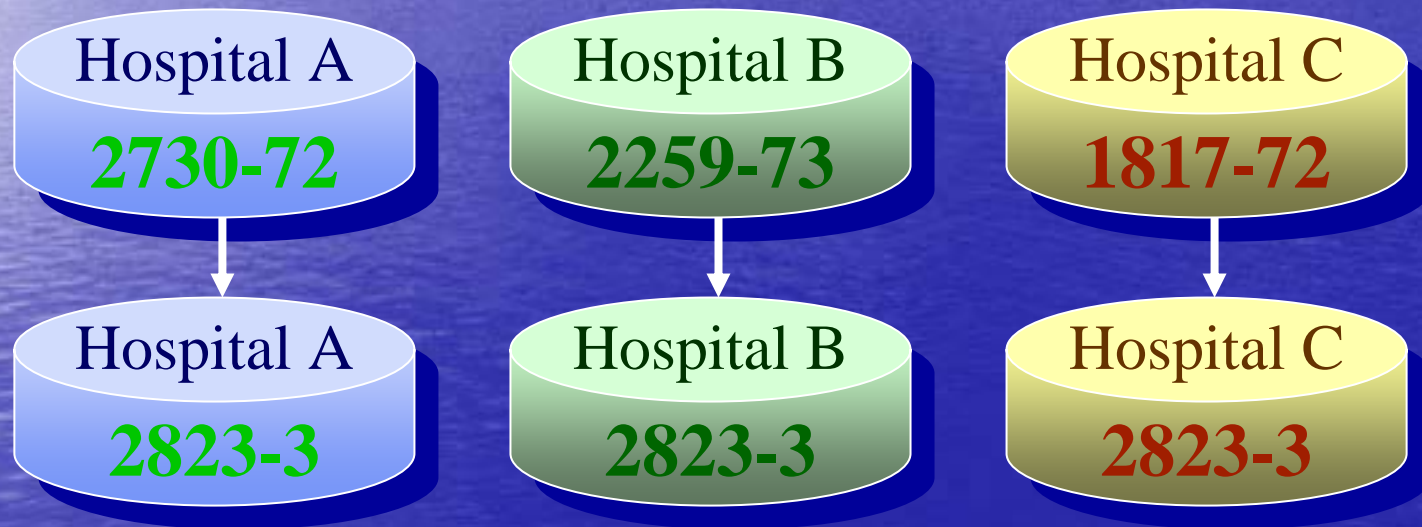
Specimen #1

Specimen #2

Issue with Encoding Data Using Standard

Codes **Potential Loss of Historical Data**

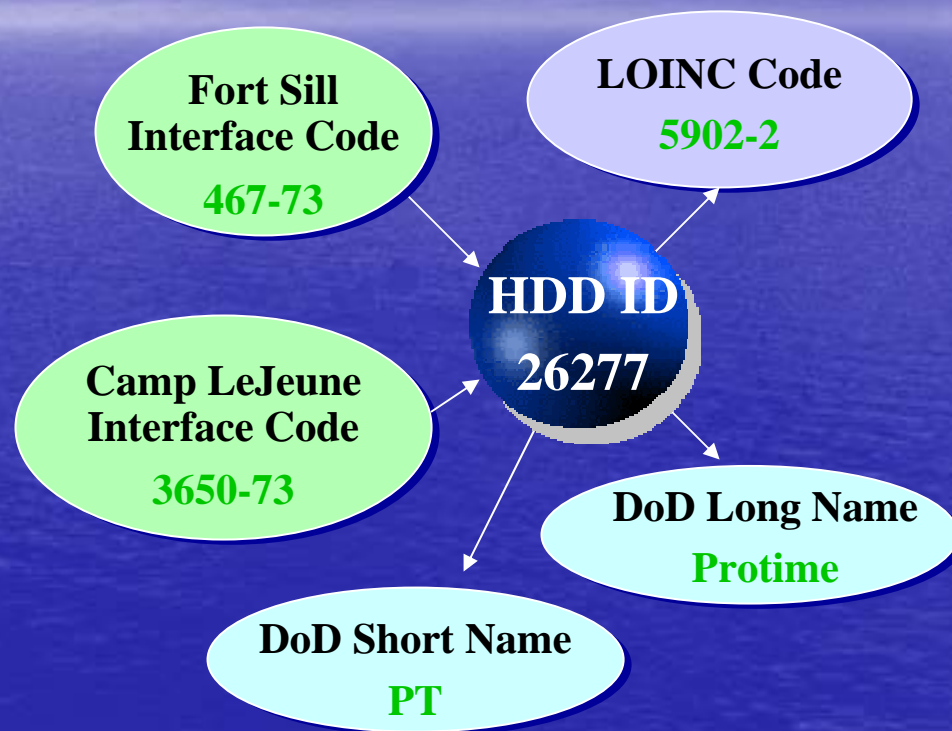
If the legacy data has been encoded with a different or non-standard terminology – e.g. lab result: **Serum Potassium**



Paper records or text printouts would be needed for past medical data, e.g., for a follow up visit

The HDD Approach to Local Extensions and Backward Compatibility

- A universal cross reference map accounting for all concepts and terms in the HDD
- The HDD manages ongoing updates from standard terminologies as well as local additions and changes from health care facilities
- Through mapping in the HDD, the enterprise's data is now exchangeable and interoperable with the rest of the world via standard codes, e.g. LOINC



Additional Issues with Encoding Data Using Standard Codes

- Data transformation is needed if data is first stored as a temporary code until the standard code becomes available
- Additional effort of translation is needed if alternate or additional standards are requested for data communication
- The standard terminology (and version) needs to be identified and stored together with the code

The HDD Approach – Incorporate and Map Multiple Terminologies

No single medical vocabulary covers all operational needs

- Different standard terminologies are developed for different domain areas of health care

e.g. *LOINC* for laboratory result names;

RxNorm for clinical drugs

- Different standard terminologies are developed for different purposes in the same domain

e.g. *ICD9CM* in the U.S. for reimbursement;

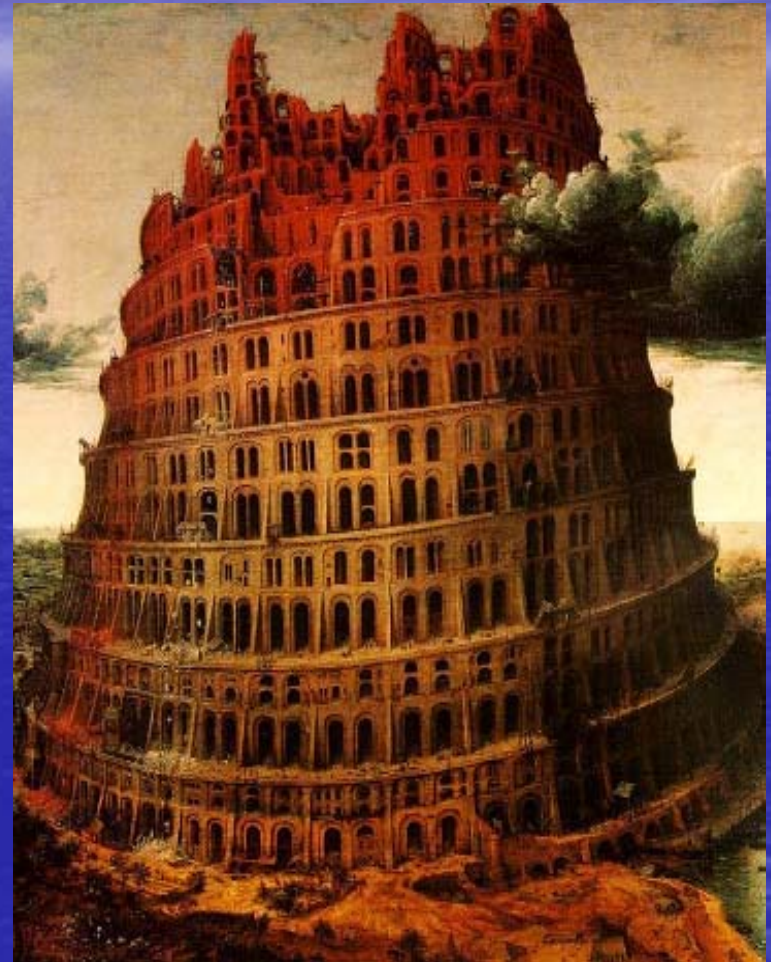
SNOMED CT for clinical documentation



The HDD Approach – Mapping for Backward Compatibility

No single medical vocabulary covers all operational needs

- Different health care applications developed different data dictionaries
- Health care facilities have legacy terms in addition to, or instead of, standards:
 - Proprietary terminologies from different commercial applications
 - Self-developed vocabularies/applications
 - Customization/modification of standards or application data dictionaries



The HDD Approach – Offload Resource and Expertise Burden

- An institution may not wish to replace legacy systems
- An institution may not have the manpower or financial resources to convert the local/legacy terms to standard ones, and to maintain currency with reference terminologies (deal with updates)



The HDD Approach – Adopt/Adapt/Develop

- Standard terminologies may be difficult for the user to understand, e.g. LOINC lab result name
2823-3 Potassium:SCNC:PT:SER/PLAS:QN:
- Standard terminologies may have errors or redundancies e.g. in SNOMED CT, there is aspirin as a substance and a different aspirin as a **pharmaceutical/biologic product**
- Standard terminologies may not exist or be in common use for a particular area, e.g. dosage frequencies

The HDD Approach

Commit to using standard terminologies for data exchange

The LOINC committee recommends that LOINC codes should be recorded “as attributes of existing test/observation master files” for use in the appropriate message segments to communicate among systems

Mapping among standard and legacy terminologies for backward compatibility and transparency - minimal change to current operation



Clinical Vocabulary Mapping Methods Institute
Saturday, October 15, 2005