

# Organizational Track

2 p.m.-3 p.m. Legacy Data Issues

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# Overview

- 8 independently organized and governed regions:
  - Northern California, Southern California, Georgia, Hawaii, Colorado, D.C., Oregon and Ohio
    - **Different** clinical workflows
    - **Different** ancillary interfaces
    - **Different** billing practices due to payor/plan offerings
    - **Different** business model (centralized vs. localized testing)
  - Coding solution to support divergent requirements



# Objectives for using coding standards

- Exchange and pooling of data elements among internal and external entities
- Establishing common data definitions to support the standardized use of terminology for clinical and billing practices
- Standardizing laboratory and electronic medical record (EMR) interface design
- Overcoming geographical and organizational cultural barriers and encourage collaboration

Logical Observation Identifiers Names and Codes (LOINC®) is the foundations for standardization, containing more than 6,000 unique meanings

# Regional laboratory applications

Region	Laboratory System
<b>Northern California</b>	<b>Cerner® Classic</b>
<b>Southern California</b>	<b>Home-dev</b>
<b>Colorado</b>	<b>Misys® version A</b>
<b>Oregon</b>	<b>GGG®</b>
<b>Georgia</b>	<b>Cerner® Millennium</b>
<b>Ohio</b>	<b>Misys® version B</b>
<b>D.C.</b>	<b>Misys® version C</b>
<b>Hawaii</b>	<b>Misys® version D</b>



# Disparate ancillary code-sets

Region	Lab System result code for Cholesterol (2093-3 LOINC®)
National	Cholesterol
Northern California	8752226
Southern California	CHOL_WLA
Colorado	CHOL_AUTO
Oregon	CHOL_WAUTOD
Georgia	5650000
Ohio	CHOLES
D.C.	CHOLPNL
Hawaii	CHOLR

# Method (How the regions did the mapping)

- **The dictionary of LOINC® terms is created and maintained at a National Level**
- **Terms are distributed to the regional database environments via push technology, on a regular 3 week cycle or via hot fixes for urgent situations.**

# Method (How the regions did the mapping)

- While some of the configurations can be customized by region, the database components associated with laboratory results (LOINC® terms) cannot be created or added to at the regional level.
- Each region must find a National (LOINC®) code which translates to their laboratory system's (local) result code



# Identity

- The EPIC database allows each instance (copy) of their result master file to contain regional translation values for these records. This is referred to as 'localization' or the use of 'identity' to link a regional code to the National equivalent.
- If the region needs a code that does not exist, the code is added by a centralized, national team to the National LOINC® database and distributed to all the regional databases to be localized (mapped to their lab system's result codes).



# Identity

- To separate interfaces, a unique identification number is assigned, again at the national level, to each interface from each region. For example:
  - NCAL: 1000                      Lab result component
  - SCAL: 2000                      Lab result component
  - OHIO: 3000                      Lab result component
- Paired with the local laboratory result code, EPIC is able to find the correct translation in EPIC to translate the local result code to the National LOINC® code
  - NCAL lab results interface would send: 1000, 8752226
  - SCAL lab results interface would send: 2000, CHOL\_WLA
  - OHIO lab results interface would send: 3000, CHOLES
- EPIC would translate all of these disparate codes to the National Cholesterol LOINC® code: 2093-3

# The mapping process

- **Step 1: Extract all result codes from the laboratory systems in each of the Kaiser (eight) regions.**
- **Step 2: This lab extract was then compared to an extract taken from the National LOINC® result database.**
- **Step 3: Using a variety of tools which included Microsoft Excel® and Microsoft Access®, the files are matched manually as closely as possible. (National to local codes)**



# The mapping process

- **Step 4:**
  - All regions have a local copy of the National LOINC® result database (via the push technology described before)
  - National populates the display name and LOINC® code in this database. The identity items associated with each LOINC® code is not populated at the National level.
  - The local laboratory system result codes are imported into the identity items of the regional copy of the National LOINC® result database.

**Validation occurs at many steps in this process but the most important is to validate every local laboratory result code that is mapped to a National LOINC® code. This is a manual process due to the nature of result components and the associated workflows.**

# Sample identity mapping

<b>National Result Component name</b>	<b>National LOINC ® code</b>	<b>OHIO regional lab system result code</b>	<b>NCAL regional lab system result code</b>
Cholesterol	2093-3	Chol	8965325
Triglyceride	2571-8	Trig	1247775
HDL	2085-9	HDL	1224785
Albumin	2862-1	ALB	6682322
Calcium	2000-8	CA	5866665
Sodium	2951-2	NA	5578932



# Challenges

- The eight Kaiser regions have been autonomous in the way they have created procedures and result components. The addition of having to request new result components from a National team not only adds time, but restricts the autonomy they have enjoyed up to now.
- Many of the local result codes were highly region-specific and could not easily fit into the LOINC<sup>®</sup> structure even though result components could be mapped many-to-one. The effort involved in finding a match for these result codes was significant.
- While laboratorians (medical technologists) were the best choice to do this local result code to LOINC<sup>®</sup> mapping, these resources were not dedicated in many regions. Validation and testing, which require dedicated resources, became a challenge.

# Mapping Challenges with LOINC

We had to seek a solution for each challenge, and at the same time, meet our goals.



# Mapping Challenges with LOINC

- 1) The ability to utilize the first six axis in LOINC to derive an unambiguous, meaningful and useful term name.
  - Goal: maintain usability as an organizational priority.
  - Approach: developed naming convention guidelines for commonly used names used in the laboratory
  - Examples:
    - VDRL, not, Reagin Ab
    - Ethanol, not, ethyl alcohol
    - CEA, not, CARCINOEMBRYONIC AG
    - TSH, not, THYROTROPIN

# Mapping Challenges with LOINC

- 2) Differentiate "interface" from "reference" terminology
  - Approach: worked closely with the KP and Vendor Interface teams to understand and meet interface requirements.
  - Example 1:  
Cultures reporting more than one organism (OBX-4, Observation Sub-ID)
    - Some LIS vendors send result codes that LOINC does not support: For cultures, reporting more than one organism in a Microbiology result message like Organism 1, Organism 2, Organism 3 , Organism 4, Organism 5.



# Mapping Challenges with LOINC

- Example 2:
  - Knowing how to handle methodologies in chemistry
  - It may be challenging as to whether to include the methodology or not. In general, LOINC only includes the methodology if it make a difference in specificity and/or sensitivity.
  - Example:
    - ALBUMIN: 1751-7
    - ALBUMIN ELECTROPHORESIS: 2862-1
  
    - HIV 1 RNA, PCR: 23876-6
    - HIV-1 IB: 21009-6

# Mapping Challenges with LOINC

- Example 3:
  - Some LIS result codes do not represent a measurement result, but they need to map to a LOINC concept because they are sent across the interface to the KPHC application.
  - KP region may need a term that is a header for aggregating test results. No matching LOINC code exists, and if the term is modeled and submitted to LOINC, it probably will not be accepted.
  - Example: Lab test name, test performed at.



# Mapping Challenges with LOINC

- 3) The LOINC Short name is not Clinician friendly.
  - 1824-1: AFP Ser-mCnc. We used AFB.
  - 2732-6: PTH Mid Mol SerPI-mCnc: We used PTH.
  - Goal: Make it easy for users to find the terms they need, given that the local names are different from the LOINC names. Also needed user friendly abbreviated result names that are used in clinical information system chart documentation via automated links.
  - Approach: Developed naming convention guidelines that are close to what the KP regional users are accustomed to. Created conversion list to transform LOINC names to common names.

# Mapping Challenges with LOINC

- 4) Ongoing Maintenance with the LOINC Standard
  - Ongoing updates and changes by the LOINC committee
  - Release of updated database versions 1-2 times per year
  - Updates to existing terms
  - Goal 1: Have a well defined approach to maintain LOINC for Kaiser Permanente
  - Approach: Developed process to identify the changes in the new LOINC release such as new codes, updated codes and deprecated codes.
  - Examples: Transformation rules and scripts



# Mapping Challenges with LOINC

- Goal 2: Have a well defined process to communicate LOINC changes to downstream KP regional users.
- Approach: National Terminology team published release notes identifying the terms undergoing the changes.
- Examples: Release Notes, Excel format.

# Mapping Challenges with LOINC

- Goal 3: Ensure that KP is overall in sync with the Standard LOINC Terminology Source
- Approach: Apply a synchronization process with every new LOINC release



# Mapping Challenges with LOINC

- 5) The LOINC Submission Process is a lengthy process.
  - Goal: ensure that the LOINC codes submitted by KP are adopted by the Standard in a timely manner.
  - Approach: developed a process to identify and submit new terms to LOINC.
  - Example: LOINC Submission Process.

# Mapping Challenges with LOINC

- 6) Lack of Resources with adequate laboratorian expertise needed to perform the mapping of local and LOINC codes.
  - Goal: Provide orientation and training to KP resources to be able to perform the mapping.
  - Approach: Conducted training and presentations
  - Examples: Use the LOINC user manual and RELMA



# References

- *Suzanne Spradley , Kaiser Permanente*  
– *Suzanne.Spradely@kp.org*
- *Rita Barsoum, Kaiser Permanente*  
– *Rita.H.Barsoum@kp.org*

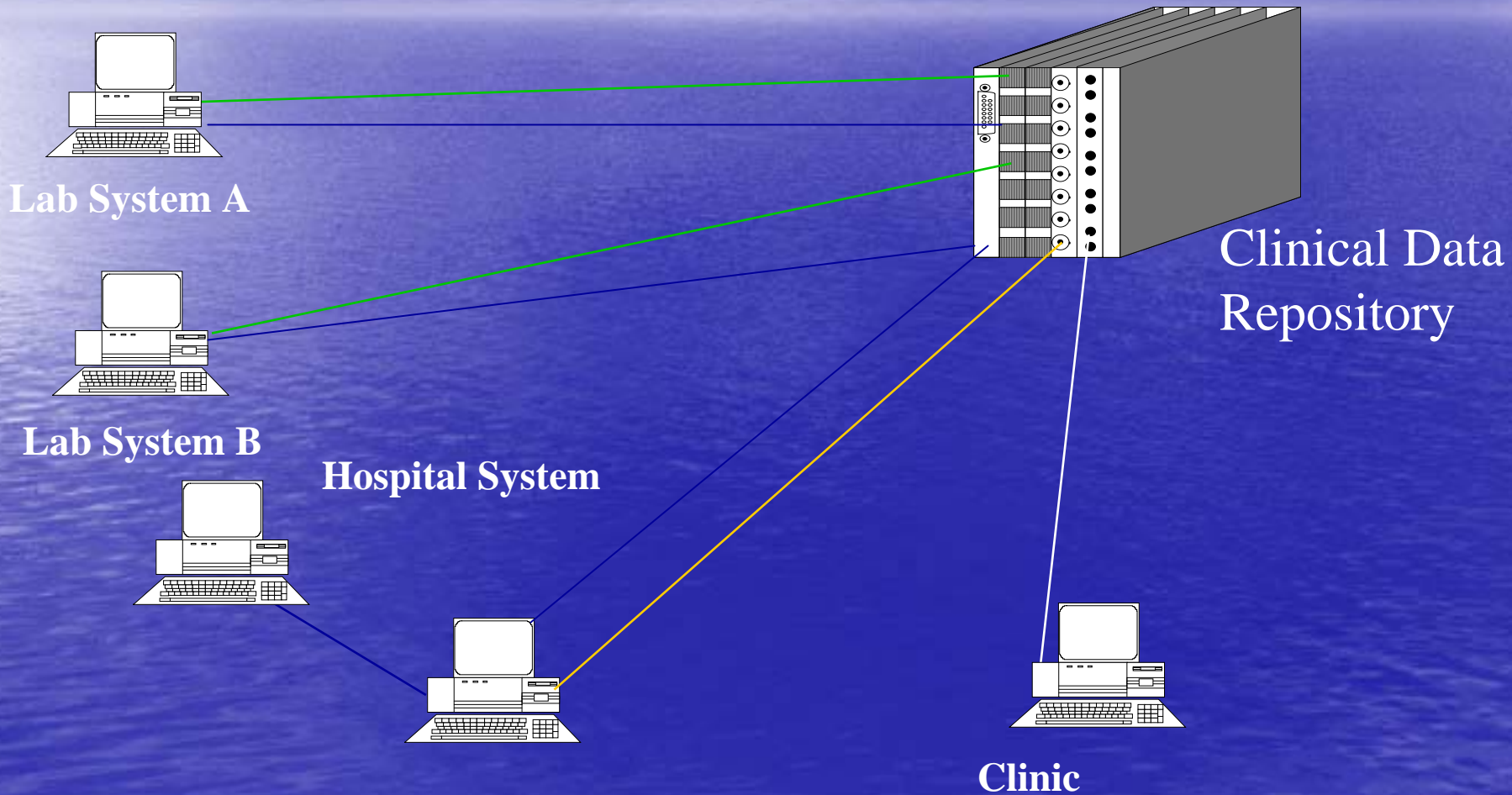
# Legacy Data Issues

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# Interfacing Systems







# Data Dictionary

- Concept Based Data Dictionary
- External Terms (Representations) mapped as synonyms to the concept.
- Hierarchical structure

# Concepts and Terms

Term

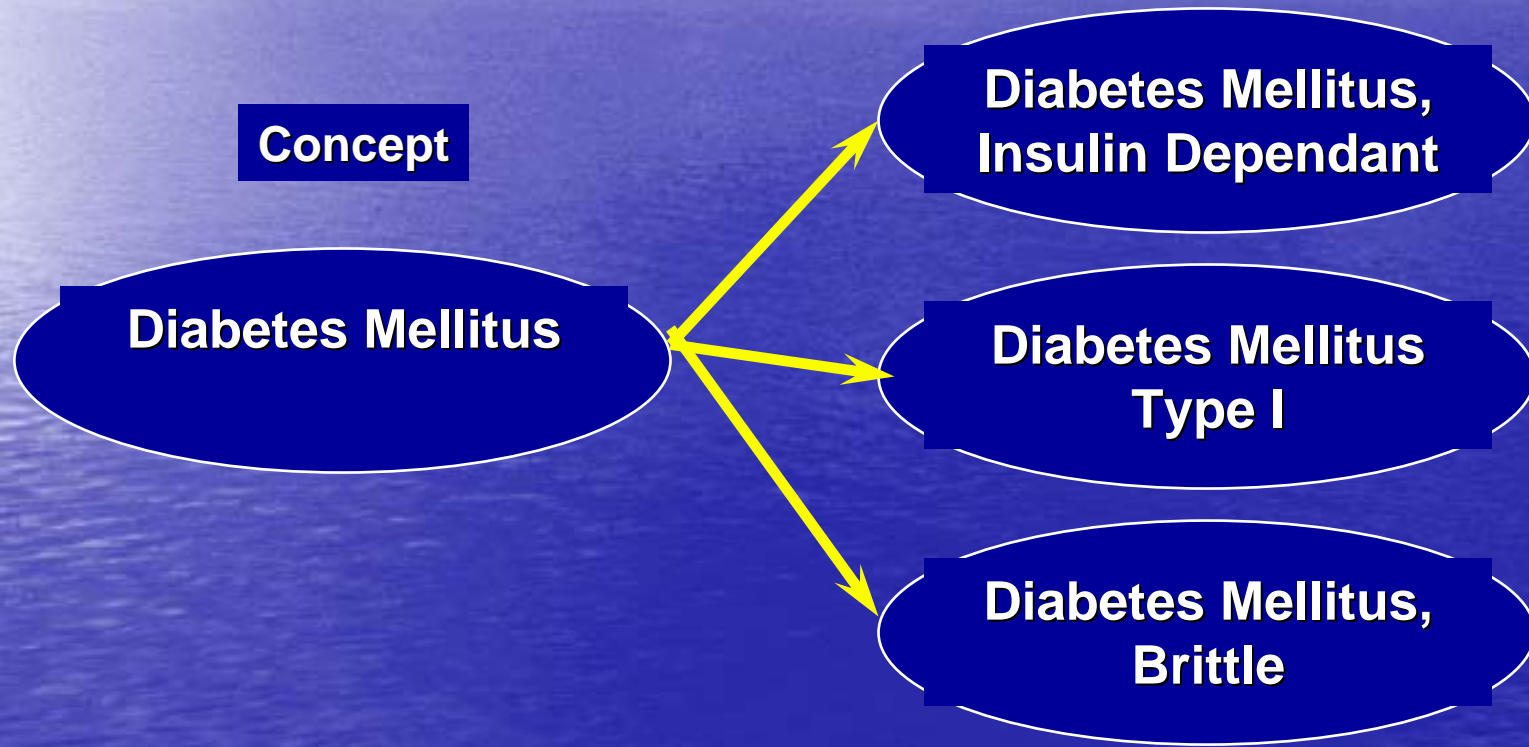
Concept

Diabetes Mellitus

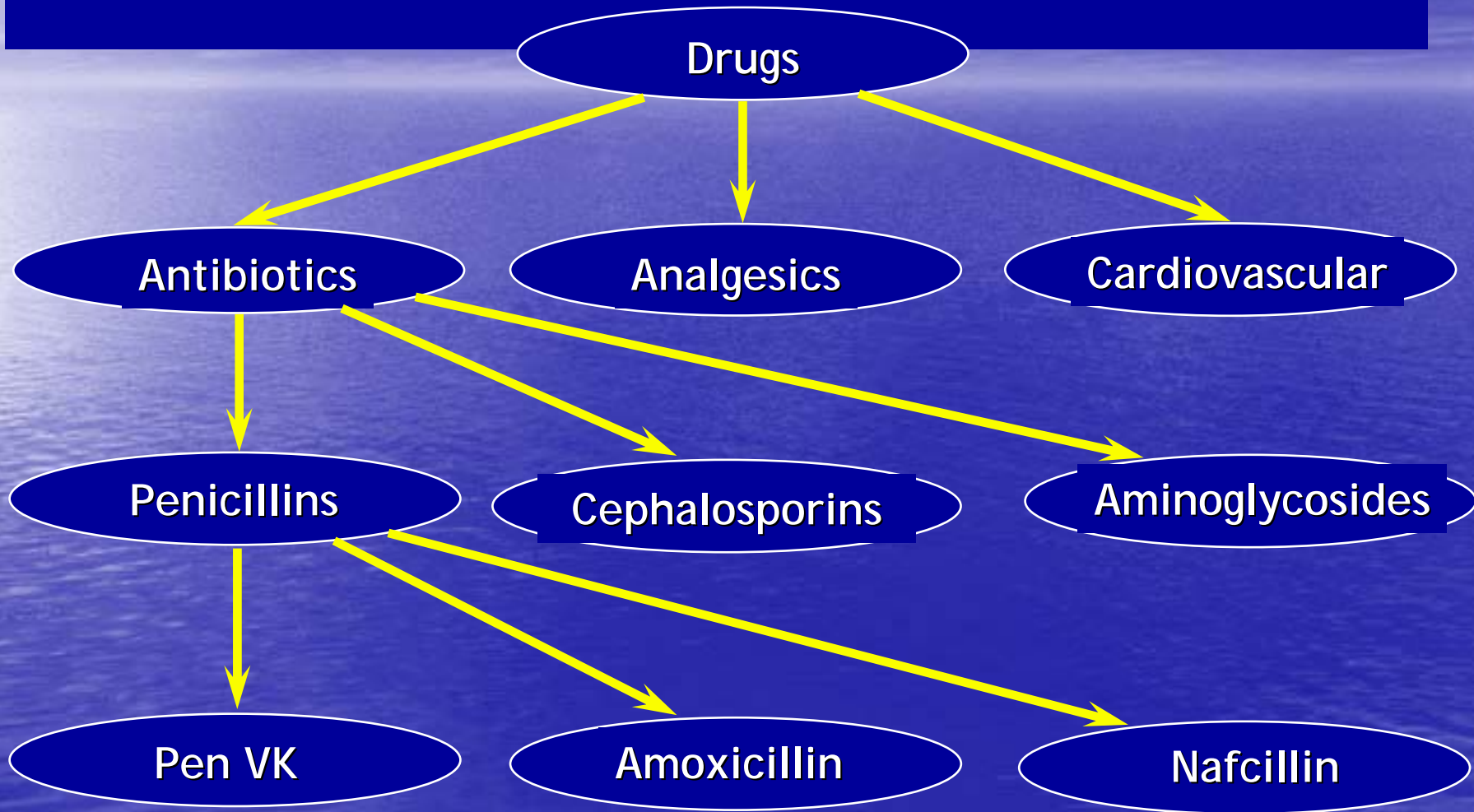
Diabetes Mellitus,  
Insulin Dependant

Diabetes Mellitus  
Type I

Diabetes Mellitus,  
Brittle

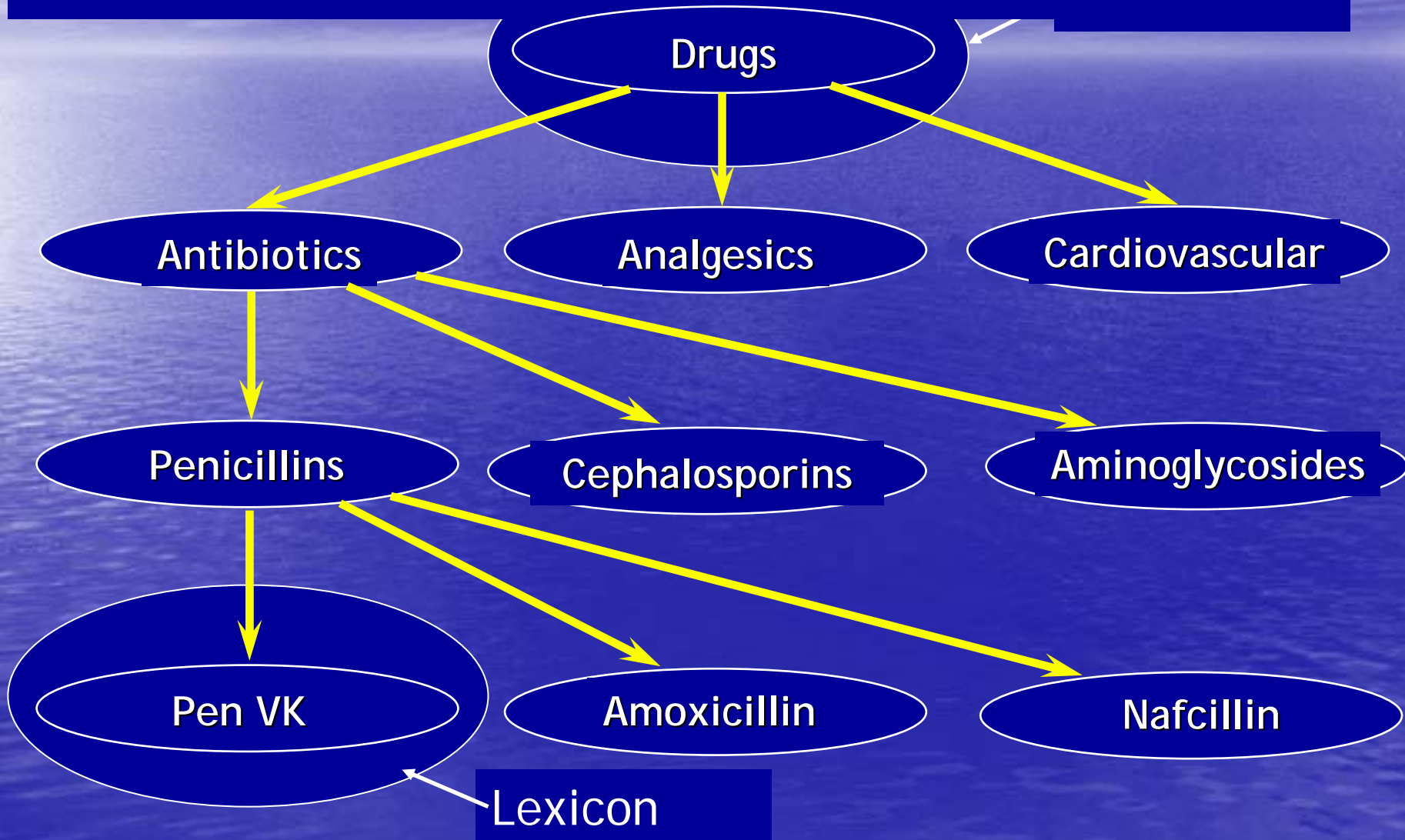


# Hierarchical Structure





# Matching



# Standardized Terminologies Used

- Orders = LOINC
- Observations = LOINC
- Values = SNOMED
- Drugs = First Data Bank
- Billing = CPT/ICD-9

# Terms Created Locally

- Orders – if not in LOINC
- Nursing problems – role based
- Goals – come from Clinical Practice Guidelines
- Values not found in external terminologies

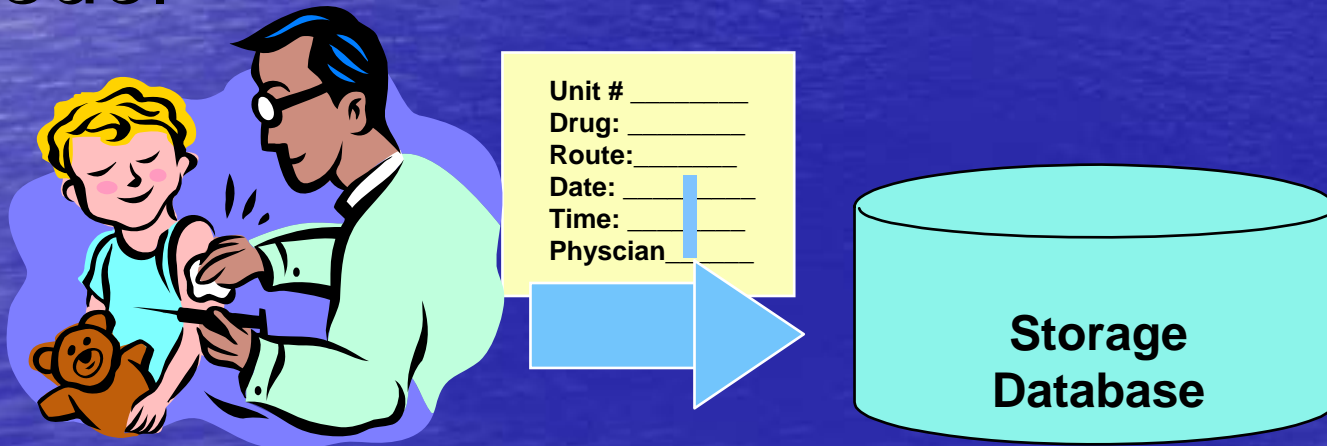


# Pre/Post-coordination

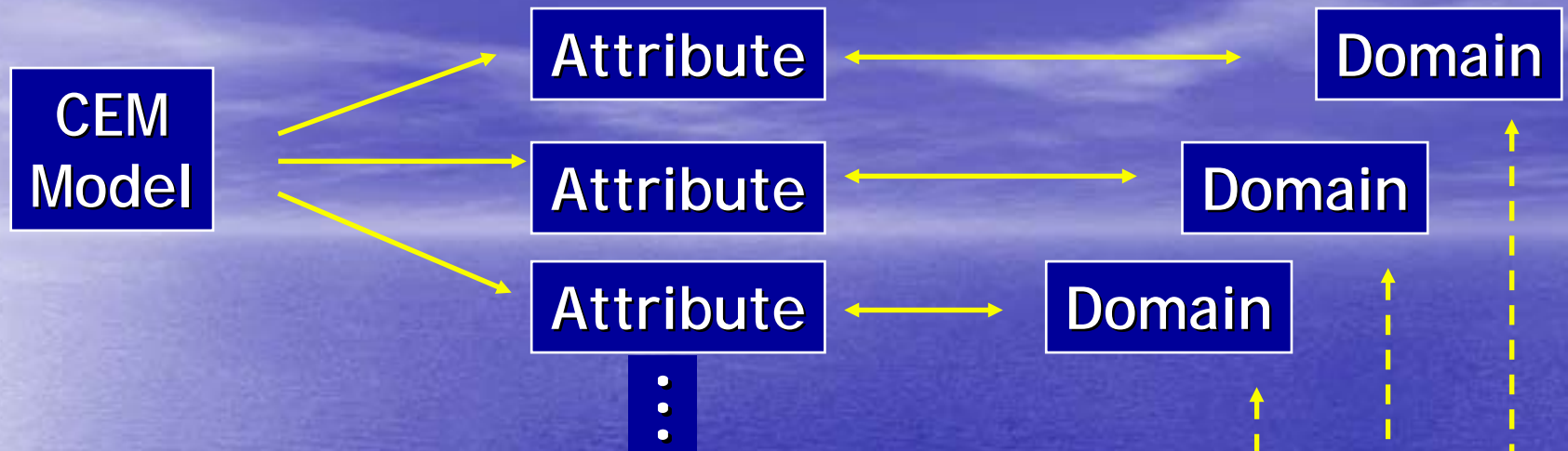
- Complex Vocabulary  $\Rightarrow$  Simple data model
  - 20.4.4.58.6.2 Chest X-ray shows abnormal inflation in left lower lobe
- Simple Vocabulary  $\Rightarrow$  Complex data model
  - Procedure: Chest X-ray
  - Finding Type : shows
  - Finding: inflation
    - Qualitative Qualifier: abnormal
  - Location Relationship: in
  - Location: lobe (of lung)
    - Laterality Qualifier: left
    - Upper/Lower Qualifier: lower

# Information Model

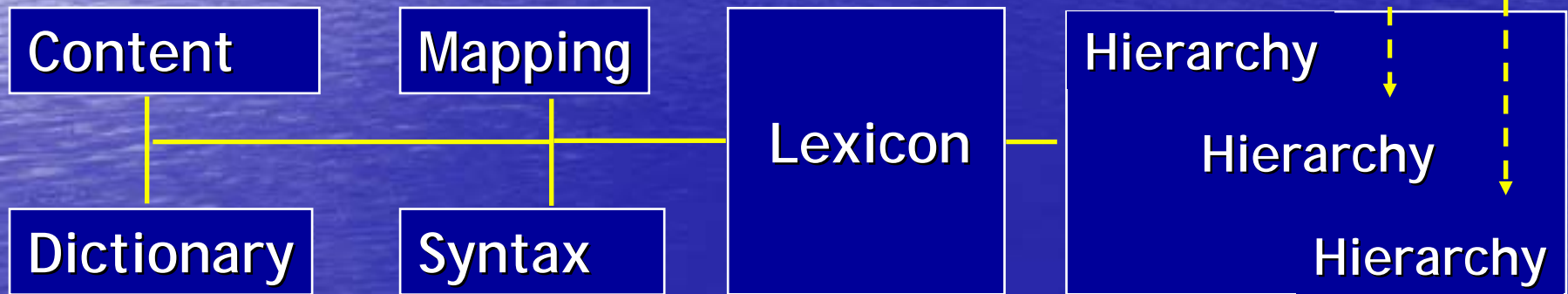
- A set of templates (data structures)
- Used to store data as medical events
- Currently Use XML Clinical Element Model



# Information Model and Vocabulary



# Terminology Model





HELP System

Rectal Temperature

PTXT Code: 13.1.1.2.4.6.8.9

<VitalSigns>

<Temperature>97.6</Temperature>

<BodyLocation>Oral</BodyLocation>

</VitalSigns>

# Labor and Delivery Application

## Group B Strep Neg

### Code: AAB224

<LabObservation>

<Group B Strep>Negative</Group B Strep >

<SubjectOfInformation>PrenatalRecord

</SubjectOfInformation>

<Comment>Not a verified lab</Comment>

</LabObservation>

# Help2 Clinical Desktop

- Retrieves information from the CDR
- Originally developed to view Laboratory data
- Additional modules created for different use cases
  - Clinical notes, image types and demographics
  - Laboratory and Microbiology results
  - Radiology, allergies and medications



# Text Reports

- Controlled list of document names
  - New names are requested through a webform
- Scanning or direct electronic input
- Some coded content is available for Progress notes
- Encounters view designed to mimic paper chart organization

## Encounters

Time

1 Total encounter(s).

(Please click on row to view encounter details.)

Admit	Dsch	Enc #	Facility
05/03/2005		5604129	McKay-Dee Hospital Center

[General](#)
[Location](#)
[Role](#)
[Insurance](#)
[Document View](#)

Return to Menu
 View Previous
 View Next
 All Selected

[Open All](#)
[Close All](#)
[Select All](#)
[Unselect All](#)

- Progress Notes
  - 06/15/2005 Progress Notes
  - 06/14/2005 Progress Notes
  - 06/10/2005 Progress Notes
  - 06/10/2005 Progress Notes
  - 06/10/2005 Progress Notes
  - 05/25/2005 Progress Notes
  - 05/13/2005 Progress Notes
  - 05/11/2005 Progress Notes
  - 05/10/2005 Progress Notes
- Correspondence
- Diagnostic Imaging
- Encounter Problem List

- Select Patient
- Lab
- Micro
- Clinical Notes
- Radiology
- Allergies
- Medications
- Problems
- Vital Signs
- Height/Weight
- Demographics
- ECG
- Insurance
- Message Log
- Lab Order Entry
- Inpatient Reports
- Alert Review
- Web Forms
- HELP/Tandem
- Orders
- Report Manager
- HotText
- Protocols
- Population View
- Encounters
- DRT
- Web Kids
- CAP Protocol
- Image Acquisition
- EDIS
- NICU Prob By System
- Inbox
  
- E-Resources
- Need Help?
- Password
- CD Info

Comments

# Lab to LOINC

- Laboratory team creates a new test in the Lab system
- They submit a mapping request on a spreadsheet
  - LOINC code may be included in the request
- LOINC mapping is validated and the test code and display are mapped in the Data Dictionary as terms



# Issues

- No definitions in some legacy systems.
- Lack of understanding regarding terminology server and standardized terminologies.
- Pre vs. Post-coordination
  - Decomposition into information model.
- Lab shifts meaning without changing mapping.

Questions?





Clinical Vocabulary Mapping Methods Institute  
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