Objectives

• Describe the drivers for standardization of healthcare data (including nursing)
• Provide an Overview of LOINC and SNOMED CT
• Examine initial efforts to create a nursing problem list subset to complement the meaningful use problem list using SNOMED CT.
• Illustrate how SNOMED CT and LOINC can be used to bridge disparate nursing terminologies.
Key National Standards

Interoperability Road Map

• Goals: Improve quality/lower costs
• Driver: Person centered health
• Challenges:
  – Right information
  – Right person
  – Right time
  – Between organizations
  – Across products

CMS Blueprint

A Blueprint for the CMS Measures Management System

Version 10.0 September 2013
Volume 1 Measure Development
Volume 2 Measure Maintenance

https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-instruments

Guiding Principles for Big Data in Nursing

Top 10 Recommendations

Developed by the HIMSS CNO-CNIO Vendor Roundtable

Promote Standards and Interoperability

http://www.himss.org/big10
Recommenda&ons
Promote Standards and Interoperability

1) Nurses should promote the use of standardized terminologies that address the documentation needs of the entire care team regardless of care setting. Care delivery settings should create a plan for implementing an ANA-recognized nursing terminology that is mapped to national standards i.e. SNOMED CT or LOINC

http://www.himss.org/big10

Recommenda&ons
Promote Standards and Interoperability

2) Nurses should recommend consistent use of research-based assessment scales and instruments that are standardized through an international consensus body. The lack of standardization makes comparison of data challenging and adds to the burden of cost for copyright permissions and/or licensing of such instruments

http://www.himss.org/big10
Recommendations

Promote Standards and Interoperability

3) The ANA-recognized nursing terminologies should be consistently updated and made available to international standards organizations for translation and complete, comprehensive mapping.

Position Statement

Inclusion of Recognized Terminologies Supporting Nursing Practice within Electronic Health Records and Other Health Information Technology Solutions

Purpose:

• Support the use of recognized terminologies supporting nursing practice
• Promote the integration of those terminologies into information technology solutions.
• Facilitate interoperability between different concepts, nomenclatures, and information systems.

4. When exchanging a Consolidated Continuity of Care Document (C-CDA) with another setting for problems and care plans, SNOMED CT® and LOINC® should be used for exchange. LOINC® should be used for coding nursing assessments and outcomes and SNOMED CT® for problems, interventions, and observation findings.
Interoperability using the DIKW Framework

LOINC = Question (Skin Color)
SNOMED CT = Coded Answer (Pink)
A universal code system for tests, measurements, and observations.

How do you say glucose?

More than 32,000 people in 162 countries use LOINC to make bridges across their islands of health data.

It's free, but invaluable.

www.LOINC.org

---

LOINC®

• Logical Observation Identifiers Names and Codes (LOINC®)
  – Provides a standard set of universal names and codes for identifying individual laboratory and clinical results (observations made on specimens)
  – Also facilitates standardization of observations (other than lab) made on patients such as entries for vital signs, intake/output, EKG, and scales (e.g., Glasgow Coma Scale)

(Regenstrief Institute, 2011)
General Form of Clinical LOINC® Names

LOINC® codes are created systematically using a six axis model

\[ \text{<component>} : \text{<property>} : \text{<timing>} : \text{<system>} : \text{<scale>} : \text{<method>} \]

8331-1  Body Temperature :TEMP :PT :MOUTH :QN

The first 5 parts are mandatory, but \textit{method} is optional. Subparts of the six axes are created as needed in specific subject areas.

Summary of the six primary axes (clinical)

- \textbf{Component}
  - Substance or entity that is measured, evaluated, or observed
- \textbf{Kind of property}
  - Characteristic or attribute of the component that is measured, evaluated, or observed
- \textbf{Timing}
  - Interval of time over which the observation or measurement was made
- \textbf{System}
  - System (context) or body part about which the observation was made
- \textbf{Scale}
  - Quantitative, ordinal, nominal (coded), narrative
- \textbf{Method}
  - Procedure used to make the measurement or observation. Only used when it makes an important distinction in sensitivity or specificity
Examples of the six axes

- **Component**
  - Ejection fraction, heart beats, cardiac output, circumference
- **Kind of property**
  - Angle, area, length, mass, pressure, temperature
- **Timing**
  - Point in time, study minimum, maximum in 8 hours
- **System**
  - Head of fetus, tricuspid valve, ventilator setting, patient, family, community
- **Scale**
  - Quantitative, ordinal, nominal (coded), narrative
- **Method**
  - Stated, measured, estimated, ultrasound, spirometry

**LOINC® - Putting it all together**

<table>
<thead>
<tr>
<th>Code</th>
<th>Component</th>
<th>Prop</th>
<th>Time</th>
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<th>Method</th>
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<td>Code</td>
<td>Component</td>
<td>Prop</td>
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<td>System</td>
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<td>Estimated</td>
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<td>Stated</td>
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<td>PT</td>
<td>^FAMILY</td>
<td>ORD</td>
<td>Omaha</td>
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<td>39126-8</td>
<td>Length</td>
<td>LEN</td>
<td>PT</td>
<td>Wound</td>
<td>QN</td>
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<tr>
<td>39107-8</td>
<td>Color</td>
<td>Type</td>
<td>PT</td>
<td>Skin</td>
<td>NOM</td>
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</table>
LOINC ® Panels

- Logical groupings of clinical observations or survey instruments
- Nursing - Assessments are grouped in panels
  - Skin Assessment Panel
  - Wound Assessment Panel
  - Vital Signs Panel
- Scales and instruments are made as Panels
  - Morse Fall Scale
  - Braden Scale
  - Norton Scale
  - Neonatal Pressure Ulcer Risk Assessment

Morse Fall Scale
Morse Fall LOINC® Panel

59453-1  Morse Fall Scale panel

<table>
<thead>
<tr>
<th>LOINC#</th>
<th>LOINC Name</th>
<th>R/O/C</th>
<th>Cardinality Data Type</th>
<th>Ex. UCUM Unit</th>
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<td>Morse Fall scale panel</td>
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<tr>
<td>59454-9</td>
<td>History of falling, immediate or within 3 months [Morse Fall Scale]</td>
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<td></td>
<td></td>
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<tr>
<td>59455-6</td>
<td>Secondary diagnosis [Morse Fall Scale]</td>
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<td></td>
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<tr>
<td>59464-4</td>
<td>Ambulatory aid [Morse Fall Scale]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59457-2</td>
<td>Intravenous apparatus [Morse Fall Scale]</td>
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<tr>
<td>59458-0</td>
<td>Gait [Morse Fall Scale]</td>
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<td></td>
<td></td>
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<tr>
<td>59460-7</td>
<td>Morse Fall risk total # [Morse Fall Scale]</td>
<td>(*)</td>
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</tr>
<tr>
<td>59461-4</td>
<td>Morse Fall risk level [Morse Fall Scale]</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: LOINC answers (LA codes) are used when the scale is a validated instrument.

Morse LOINC® Answers

NOTE: LOINC answers (LA codes) are used when the scale is a validated instrument.
Status LOINC® and Nursing Content

- Many areas incomplete
- Current work happening to determine gaps
  - Physiologic Assessments
  - Basic Med/Surg Assessment Submitted
- Assessment Framework
- New Nursing Judgment (Impression) LOINC codes
- Future Nursing LOINC Landing Page

LOINC® Nursing Gap Analysis

Westra, B.L., Matney, S.A. (2014). LOINC® and Nursing Assessments. Presentation at Big Data Conference, Minneapolis, MN.
Recommendation For WDL Documentation Using LOINC®

- Each institution has Within Defined Limit (WDL) parameters defined.
  - Skin WDL example
    - Skin Color = normal for ethnicity
    - Skin Temperature = Warm
    - Skin Moisture = Dry
- “Impression” codes are used to document a nursing judgment.
  - WDL is one value for the impression observation.
  - If there is concerns, risks, etc. this would be documented as text for this code
- When WDL is selected, the “Defined Limits” name/value pairs must store on the back-end (Epic does this already)
SNOMED CT®

- Extensive multi-hierarchical concept-oriented clinical terminology
- College of American Pathologists (CAP) developed systems to meet coding needs of US pathologists
  - Began in 1965 – SNOP (Systemized Nomenclature of Pathology)
  - Current version developed by CAP and NHS UK by a merger of SNOMED RT (CAP) and CTv3 (NHS)

Rich Clinical Content
- Finding/disorder (Diseases)
- Procedure/intervention
- Body structure
- Organism
- Specimens
- Pharmaceuticals
- Substances
- Physical objects
- Observable entity
- Staging/scales
- Events
- Social/administrative concepts
- Environment/geographic locations
SNOMED CT® Structure

- **Hierarchies**
- **Parent child relationships**
  - Vertical structure
  - Concept may have multiple parents
- **Relationships between concepts**
  - Using attributes, concepts may be linked to each other
  - Horizontal relationships

Concept

- Basic unit of SNOMED CT®
- Single clinical meaning identified by a unique numeric identifier (ConceptID) that never changes, with a unique human readable name (Fully Specified Name)
- Associated with each concept is a set of relationships to other concepts (the “logical definition”) and a set of names or terms
- Any clinical concept to which a unique Concept Identifier has been assigned
- Concept IDs are permanent
Gastric ulcer 397825006

• Terms:
  – Gastric ulcer (disorder)
  – Gastric ulcer
  – Stomach ulcer
  – GU – Gastric ulcer
  – Gastric ulceration

• Relationships:
  – Is_a → Disease of stomach
  – Is_a → Gastrointestinal ulcer
  – Associated morphology → Ulcer
  – Finding site → Stomach

Hierarchies

• 19 upper level hierarchies
• Each hierarchy has sub-hierarchies
• A code in SNOMED CT® can reside in more than one sub-hierarchy of a top-level hierarchy
Multiple Levels of Granularity

Malignant neoplastic disease (disorder)

Malignant neoplasm of omentum (disorder)

Primary malignant neoplasm of the omentum (disorder)

Clinical Finding Hierarchy

The result of a clinical observation, assessment or judgment

The sub-hierarchy of “Disease” represents those concepts that are necessarily abnormal
Example Nursing Findings

- Constipation (disorder) ID 14760008
- Acute confusion (finding) ID 130987000
- Fatigue (finding) ID 84229001
- Social isolation (finding) ID 422650009
- Activity intolerance (finding) ID 77427003
- Dirty living conditions (finding) ID 424415008
- Feeling powerless (finding) ID 33300005
- Fever (finding) ID 386661006

Procedure

Represent actions performed in the provision of health care; includes administrative, invasive, diagnostic, and education procedures.
Example Nursing Procedures

- Removal of catheter (procedure) ID 103715008
- Intramuscular injection (procedure) ID 76601001
- Irrigation of oral wound (procedure) ID 234932007
- Gait evaluation (regime/therapy) ID 39609006
- Breastfeeding education (procedure) ID 243094003
- Cardiac monitoring (regime/therapy) ID 23852006

SCT - Putting it all together

<table>
<thead>
<tr>
<th>Code</th>
<th>Concept</th>
<th>Semantic Type</th>
<th>Nursing Use</th>
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<tbody>
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<td>267038008</td>
<td>edema</td>
<td>finding</td>
<td>Nursing Diagnosis</td>
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<tr>
<td>423666004</td>
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<td>Assessment</td>
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<td>79654002</td>
<td>edema</td>
<td>morphologic abnormality</td>
<td>None</td>
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<td>edema</td>
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<tr>
<td>8420001</td>
<td>abrasion</td>
<td>procedure</td>
<td>?? APRN doing</td>
</tr>
<tr>
<td>399963005</td>
<td>abrasion</td>
<td>disorder</td>
<td>Nursing Diagnosis</td>
</tr>
<tr>
<td>400061001</td>
<td>abrasion</td>
<td>morphologic abnormality</td>
<td>None</td>
</tr>
</tbody>
</table>

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<td>finding</td>
<td>Nursing Diagnosis</td>
</tr>
<tr>
<td>423666004</td>
<td>edema</td>
<td>observable entity</td>
<td>Assessment</td>
</tr>
<tr>
<td>79654002</td>
<td>edema</td>
<td>morphologic abnormality</td>
<td>None</td>
</tr>
<tr>
<td>8420001</td>
<td>abrasion</td>
<td>procedure</td>
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<td>disorder</td>
<td>Nursing Diagnosis</td>
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<td>abrasion</td>
<td>morphologic abnormality</td>
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<tr>
<td>297952003</td>
<td>skin normal color</td>
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<td>Assessment finding</td>
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<tr>
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<td>finding</td>
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</tr>
<tr>
<td>386339009</td>
<td>IV insertion</td>
<td>procedure</td>
<td>Intervention</td>
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</table>
Aligning with Nursing Documentation

- LOINC®
  - Orders (as Panels)
  - Assessment observations
  - Assessment Scales
  - Scale assessment values (LOINC® answers)
  - Nursing Outcomes
- SNOMED CT®
  - Assessment findings
  - Nursing diagnosis (and medical)
  - Nursing interventions (procedures)

IHTSDO News Release

SNOMED CT — Supporting Meaningful Use

Introduction
SNOMED CT is a comprehensive clinical terminology that is freely available for use in the U.S. through the National Library of Medicine (NLM).

Meaningful Use Stage 2 Rules
The Office of the National Coordinator for Health Information Technology (ONC) and CMS have adopted SNOMED CT as one of the key vocabularies for Meaningful Use Stage 2, EHR certification, and health information exchange.

Meaningful Use Objectives Supported
1. Maintains an up-to-date problem list of current and active diagnoses
2. Record patient family health history as structure data
3. Identify and report cancer cases to a State cancer registry
4. Record and track changes in vital signs
5. Record smoking status
6. Provide a summary care record for each transition of care

Resources for implementation of SNOMED CT — encoded problem lists
There is no need to knot at the size and comprehensiveness of the entire terminology — just you should know about some key resources that are designed to help with implementation. These include subsets that identify the most commonly used codes and items, mapping to ICD-10-CM and ICD-10-AM, and browsers that assist in finding other codes for local customization.

Subsets
Several subsets are available:
- CORE Problems List of SNOMED CT: A subset developed by the CORE project (CORE stands for Clinical Observations Recording and Encoding), identifies codes most useful for documentation and encoding of clinical information at a summary level, such as problem list, discharge diagnosis or reason for encounter. Terms in the subset were selected based on their actual frequency of usage in clinical databases.
- Nursing Problem List Subset of SNOMED CT: Intended to facilitate the use of SNOMED CT as the primary coding terminology for nursing problems used in care planning, problem lists in other summary level clinical documentation.

http://ihtsdo.org/fileadmin/user_upload/Docs_01/Publications/SNOMED_CT/SnomedCt_MeaningfulUse_20140219.pdf
Vocabulary-Related Nursing Meaningful Use Requirements

Problem list of current and active diagnoses based on SNOMED CT®

- The SNOMED CT® nursing problem subset
  - Contains SNOMED CT® codes that have a mapping in UMLS to other nursing terminologies
  - Distributed through the US National Library of Medicine Unified Medical Language System (UMLS)
  - Supports Meaningful Use problem list criteria

www.nlm.nih.gov/research/umls/Snomed/nursing_problemlist_subset.html
Recommendations

• The nursing problem list of SNOMED subset should be used in addition to the Core Problems list subset to populate the value set for problem list selection and data exchange.
• Mappings between SNOMED CT nursing problems and other nursing diagnostic terminologies should be obtained by querying the UMLS.
• Nursing terminologies that contain nursing diagnoses should maintain their terminology in the UMLS in order to facilitate mapping and interoperability.
• When nursing diagnoses are found missing, the UMLS administrators should be notified.

Alignment with Care Plan (and what’s new)
Example using a Use case

Joe Jones is a 74 year-old male who is three weeks status post total left hip replacement. His skin is warm and dry. He has been discharged from the hospital with a stage 1 pressure ulcer on the left hip. He is taking Percocet 5mg q4-6 hours for pain and uses a walker to get out of bed with assistance. His total Morse Fall Score is >50 which makes him a Fall Risk.
### Health Concerns

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
<th>LOINC</th>
<th>SNOMED CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Concern</td>
<td>Total hip replacement</td>
<td>Medical problem</td>
<td>total replacement of hip (procedure)</td>
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<td></td>
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<td>Concept Code: 52734007</td>
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<td>pressure ulcer stage 1 (disorder)</td>
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<td>Concept Code: 421076008</td>
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<td>Risk for falls</td>
<td>Medical problem</td>
<td>at risk for falls (finding)</td>
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### Assessment

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<td>Skin moisture</td>
<td>Dry Skin</td>
<td>Moisture:Type:Pt:Skin:Nominal::</td>
<td>dry skin (finding)</td>
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<td>Concept Code: 16386004</td>
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<td>Skin temperature</td>
<td>Warm skin</td>
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<tr>
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<td>Morse fall risk level:Find:Pt: ^Patient:Ord:Morse Fall Scale</td>
<td>High Risk (MFS Score 50+)</td>
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<td><strong>LOINC Concept Code:</strong> LA13040-3</td>
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ICN/IHTSDO Collaboration Agreement
ICN and IHTSDO extend collaboration
to advance harmonisation of health terminology

Geneva, Switzerland & Copenhagen, Denmark, 1 September 2014 - The International Council of Nurses (ICN) and the International Health Terminology Standards Development Organisation (IHTSDO) today announced an updated collaboration agreement to advance terminology harmonisation and foster interoperability in health information systems. The new collaboration agreement signed today will be reviewed on completion of the work or in April 2016, whichever is earliest.

The overarching goals of this collaboration are to ensure that nurses worldwide have the tools they need to carry out their jobs effectively, that they are not disenfranchised from the global informatics infrastructure, and that they remain active in the collection of meaningful and useful health information.

As part of the collaboration agreement, ICN, owner of the International Classification for Nursing Practice (ICNP), and IHTSDO, owner of SNOMED CT, have agreed to undertake further work that defines the relations between SNOMED CT and ICNP to enable their interoperability in health information systems globally. It builds on work already undertaken to produce an equivalence table for nursing diagnoses.

In the coming years IHTSDO and ICN will focus on two key areas of work: joint publication of a completed equivalence table between SNOMED CT and ICNP for Nursing Diagnoses, and joint publication of a completed equivalence table between SNOMED CT and ICNP for nursing interventions.

Focus of the Agreement
To create an equivalency map from ICNP concepts to SNOMED CT Concept

• Nursing Diagnostic Concepts
  – Must be actual or potential (e.g. risk) and negative (e.g. impaired ability to manage medication) or positive (able to manage medication)
  – Map to Clinical Findings in SNOMED CT®
• Nursing Intervention Concepts (IC)
  – ICNP Nursing Interventions are actions performed by the nurse.
  – Map to Procedures in SNOMED CT®
• A joint publication with equivalency tables will be produced jointly.

Nursing Big Data Nursing Assessment Project

• Goal is to
  – Create a framework for organizing assessment data in LOINC
  – Map concepts to LOINC (SNOMED CT for answers)
  – Determine the LOINC coverage for frequently documented assessments
  – Submit assessment concepts to LOINC if currently not covered
• Data driven consensus method resulting in:
  – The assessment framework
  – Observations concepts used within the framework
  – Observation values (SCT)
Conclusion

• National Standards emerging for nurse collected data
• Multiple terminologies are required to transmit nursing care data
  – SNOMED CT® – Problems, Observation Values
  – LOINC® – Clinical Observations, Scales, Scale Answers, Document Names and Headings
  – OMB – Race and Ethnicity
  – RxNorm – Medications
  – and more...
• Not all of the content required to support nursing exists

Questions

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