Veterans Health Administration
Enterprise Terminology Project
& Mapping issues

Prepared for AHIMA
by Michael J. Lincoln MD,
VHA Chief Terminologist
and the VHA ETS team
October 15, 2005
Brief history of VA computing

• DHCP-Decentralized Hospital Computing Project began in late 1970’s
• VistA-Veterans Integrated Services and Technology Architecture, an outgrowth of DHCP in 1990’s
• CPRS-Computerized Patient Records System-developed to provide user GUI to VistA
  – Virtually all clinical transactions computer-based: physician orders, all notes, problem list, clinical reminders, etc etc etc
  – Massively disseminated to all 169 VA hospitals, 800+ outpatient clinics, 5.6 million patients, 250,000 providers AND UNIVERSALLY ADOPTED by them
### Active Problems
- Diabetes Mellitus W/0 Comp Typ I
- Constipation
- Colon Carcinoma
- Other Specified Counseling
- Diabetes Mellitus Type II or unspecified with N/A Asthma
- Schizophrenia, paranoid type

### Allergies / Adverse Reactions
- Dust
- Computers
- Septra
- Cyclobenzaprine
- Tetracycline
- Digoxin
- Salsalate
- Tc3

### Active Medications
- No active medications found

### Clinical Reminders
- CAGE Screen: DUE NOW
- Tobacco Use Cessation Education: Oct 24, 98
- GAF SCORE: Jun 18, 98
- ASI Screen: DUE NOW

### Recent Lab Results
- Albumin, Fluid Pleural Fluid Sp Lb #5706EA: T 105.8 F Sep 19, 00 (41.0 C)
- Urea Nitrogen Serum Sp Lb #565388: P 20 Sep 19, 00
- Iga Serum #2 Se #2 Sp Lb #565196: R 16 Jun 12, 00
- Igg Serum Sp Lb #565196: BP 120/80 Jun 12, 00
- IgM Serum Sp Lb #565196: HT 57 in Mar 23, 00 (170.2 cm)
- Osmolality, Stool Stool Feces Sp Lb #556: WT 210 lb Aug 10, 00 (95.5 kg)
- Osmolality, Serum Serum Sp Lb #558258: PN 8 Sep 21, 00

### Vitals
- Temperature: 105.8 F
- Blood Pressure: 120/80
- Height: 57 in
- Weight: 210 lb
- Prednisone: 8 mg

### Appointments / Visits / Admissions
- Dec 15, 00 13:00: Mi Med Pc Anchor New S
- Nov 27, 00 08:40: Sac Sur Foot Care
- Oct 03, 00 08:00: Rdg Sur Vascular V-Tel
- Sep 28, 00 11:30: Mtz Med Pc Walk-Ins (kerr)
<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
<th>Onset</th>
<th>Last Updated</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DIABETES MELLI W/O COMPTYPE I</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
<tr>
<td>A*</td>
<td>Diabetes Mellitus Type II or unspecified *</td>
<td>2000</td>
<td>May 17 2000</td>
<td>Mtz Anc Rad Special Procedures</td>
</tr>
<tr>
<td>A</td>
<td>CONSTIPATION</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
<tr>
<td>A</td>
<td>OTHER SPECIFIED COUNSELING</td>
<td></td>
<td></td>
<td>Mtz Anc Tel Care Nursing</td>
</tr>
<tr>
<td>A</td>
<td>Diabetes Mellitus Type II or unspecified with Neurological Manifestations</td>
<td>1996</td>
<td>Jul 21 1999</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Parotid Gland</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
<tr>
<td>A</td>
<td>Sphincter Oddi Dystun</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
<tr>
<td>A</td>
<td>Cancer, Colon</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
<tr>
<td>A*</td>
<td>Schizophrenia, paranoid type</td>
<td>1998</td>
<td>Jul 19 1999</td>
<td>Oak Med Purple Team Lin</td>
</tr>
<tr>
<td>A</td>
<td>Asthma</td>
<td></td>
<td></td>
<td>Oak Med Gold Team Lin</td>
</tr>
<tr>
<td>A</td>
<td>HYPERKERATOSIS OF YAWS</td>
<td></td>
<td></td>
<td>Bob's Test Clinic</td>
</tr>
</tbody>
</table>
AMITRIPTYLINE HCL 25MG TAB 1 TABLET(S) ORALLY QHS for 3 days, 2 TABLET(S) ORALLY QHS for 3 days, 3 TABLET(S) ORALLY QHS Quantity: 90 Refills: 3
“The good thing about a legacy system is that you have one...”

Homer R. Warner, MD, PhD
ACMI; member, National Academy of Sciences;
Chairman emeritus, University of Utah
Department of Med Informatics
Limitations of VistA legacy

- Data standardization lacking among sites
- Local EHR repositories (of non-standard data)
  - Limited “Remote Data Views” from other VAMC
  - Recent Federal Health Information Exchange (FHIE) with DoD inside RDV paradigm
- Limited “computability” of EHR data
  - Mappings from VistA clinical systems to standard coding systems is limited (e.g., Problem List)
  - VistA doesn’t take advantage of robustly computable terminologies such as SNOMED
## State of the STATE file

<table>
<thead>
<tr>
<th>IEN #</th>
<th>San Francisco</th>
<th>Manila</th>
<th>Lexington</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2</td>
<td>Alaska</td>
<td>Alaska</td>
<td>Alaska</td>
</tr>
<tr>
<td>#61</td>
<td>Manitoba</td>
<td>Canal Zone</td>
<td>(no entry)</td>
</tr>
<tr>
<td>#91</td>
<td>(no entry)</td>
<td>Canada</td>
<td>Mexico</td>
</tr>
<tr>
<td>#99</td>
<td>France</td>
<td>Quebec</td>
<td>(no entry)</td>
</tr>
</tbody>
</table>
“Getting to Yes”

- **3396 instances of “Yes – No” code sets in DoD, VA, and IHS systems**
  - Over 800 in VA systems, 5 in the “New Person” file alone!

- **30 unique ways to say it**
  - E.g. Yes = 1 No = 2
  - E.g. Yes = Y No = 0 …
Propranolol 10Mg Tab
Enterprise Terminology
Systems initiative in VHA

• Enterprise-centric terminology
  – “All applications/services shall use an enterprise level service as the single authoritative source for terminology.” (Core Specifications for Re-hosting Initiatives, July 2004)

• ETS terminologists and Data Standardization project analyze, create, and implement:
  – Content standards for ...Pharmacy, Lab, Allergy, Documents, and other clinical domains
  – Server systems to host and deploy the content
  – A “New Term Rapid Turnaround” system responsive to field requests for additional content
Enterprise Terminology approach

- Robust maintenance tools: programmable, extensible, vendor-based as appropriate
- Good terminology practices: VUIDs, versioning, concept permanence, etc *
- Computerized quality control
  - Concept classification engine
  - Smart maintenance: New Term Rapid Turnaround, SDO updates by subscription, FDA Structured Label, New Drug Transaction…etc.
  - Harmonization of multiple domains
- Focus on CHI and NCVHS designated standards
- Meet HealtheVet architectural guidelines
- Standard APIs

*www.hl7.org/library/committees/vocab/Good_Vocab_Practices_May_00_Cleveland.doc
Standards used in VHA

- HIPAA mandated code sets
  - ICD-9 CM, HCPCS, CPT
- SNOMED-CT
  - Federal license includes ICD-9 CM map
- Drug terminology
  - UMLS RxNorm & VA National Drug File Reference Terminology (NDF-RT)
- Laboratory Observation and Identifiers Numeric Codes (LOINC)
Standards used in VHA (2)

- “Clinical LOINC”, the part of LOINC dealing with non-laboratory results
  - Document Titles
- VHA terminology subsets
  - Allergy & vital signs: mapped to SNOMED
  - Diagnosis & Procedures subsets, mapped to SNOMED-CT
    - Kaiser Permanente-VHA collaboration
Standardizing Lab Data

• Each of 128 VHA sites uses different “Lab file” to name results
  – “Serum sodium” at SLC VAMC
  – “Serum NA+” at Nashville VAMC

• Non computable results mean a provider must read to understand
  – Computerized support not operative across sites
  – Unable to aggregate data across sites
Standardizing Lab

• CHI recommendation to use Lab-LOINC for laboratory results

• All 128 VistA databases extracted
  – 294,161 total tests; chemistry tests to be mapped (193,784 active chem)
  – Ca. 90% amenable to central mapping to LOINC using RELMA
  – Remaining ca. 10% required additional information from local site
Standardizing Problems

• Previously VHA used “Lexicon Utility”, based on UMLS, used to name patient problems
  – Difficulty of “unresolved” (to ICD-9) problem narratives
  – Alternative is to limit clinicians to use ICD-9 & CPT only to represent clinical entities

• Administrative codes inadequate to represent clinical entities
  – Example: *Mitral valve prolapse with valve regurgitation* SCTID 409712001 codes to *Mitral valve disorders* ICD-9 CM 424.0
VHA approach to Problem List

• VHA Problem: Clinicians can’t “document once” with documentation be “reused many times”, e.g. for billing or reporting disease morbidity

• Good solution: transition to SNOMED-CT based “Diagnosis Subset”
  – “Diagnosis” recognizes re-use outside of PL application
  – Collaboration with Kaiser to create subset
  – Subset includes mapping of SNOMED to ICD-9 CM

• Enhanced solution: Jim Campbell/AHIMA and others working on knowledge base for ICD-9 CM coding from SNOMED
ICD-9 CM mapping

• “Out of the box” ICD mapping in Federal SNOMED license
  – Result is “one best” ICD code
  – Works in one direction only: one SNOMED-> single best ICD-9 term
    (reverse would be have to be one to many)

• Not adequate for billing:
  – No account of co-occurring conditions, age, other factors
Why do SNOMED to ICD-9 CM mapping?

• Enter clinical data using a clinical terminology
  – Example: SNOMED CT Concept ID 27679008 – Pulmonary Hypertension with extreme obesity
  – Map to: ICD-9-CM target codes 416.8|278.00

• “Code once, use many times”
  – A map from a clinical terminology to a classification scheme such as ICD-9-CM provides important billing information
Available SNOMED mappings

- SNOMED-CT to ICD-9 CM available under Federal license
- Other mappings (extra $$ as these are not licensed by Feds)
  - ICD-10 and OPCS 4 in accordance with U.K. standards
  - ICD-O (Oncology) v3
  - Nursing classifications (NANDA, NIC, NOC, PNDS, Omaha)
VHA Drug Terminologies and mappings

• VHA has created National Drug File Reference Terminology (NDF-RT)
  – Reference information model includes mappings to internal VA standards and external standards

• External standards
  – Drug database vendor information
  – UMLS diseases & SNOMED CT diseases
VA class information added

NDF-RT 2004

Lacked some NDF fields required by VistA...

File Name and IEN properties facilitate NDF “reconstruction” for legacy VistA
Types of NDF-RT mappings

• Disease Kinds
  – Mapped to UMLS Diseases
  – Now to be also mapped to SNOMED CT

• Legacy drug sources in VistA
  – VHA “NDF” drug classes, generics, etc

• External sources
  – NDC codes
  – Drug database vendors
Smart maintenance of mappings and other changes

• Terminology maintenance is a “big ticket” item
  – Especially true for drugs: VA faces ca. 200 new products, 500 new supplies, 3000 NDC changes/mo.
  – Hence often infrequent and insufficient

• Take advantage of new data flows and automate the process
  – FDA “Structured Product Label” linked to VHA “New Drug Transaction” imports SPL data into TDE
  – Also extensible to import drug db vendor updates into TDE
  – Subsequent review by VHA Pharmacy Benefits Managers and Pharmacologists
<activeIngredient>
  <quantity>
    <numerator value="50" unit="micrograms"/>
    <denominator value="1" unit="mL"/>
  </quantity>
</activeIngredient>

<substance>
  <code code="TBD" codeSystem="1.2.3.4" codeSystemName="FDA"/>
  <name>latanoprost</name>
  <activeMoiety>
    <activeMoietyEntity>
      <code code="TBD" codeSystem="1.2.3.4" codeSystemName="FDA"/>
      <name>latanoprost</name>
    </activeMoietyEntity>
  </activeMoiety>
</substance>
CAPOTEN is indicated to improve survival following Left Ventricular (LV) Dysfunction after Myocardial Infarction to improve survival and reduce morbidity in clinically...
<xml version="1.0"/>
<!DOCTYPE ndts (View Source for full doctype...)>  
- <ndts date="10-1-2001" authority="Apelon, Inc.">
  <!-- type 1 transaction: new active ingredient -->
- <ndt type="add">
  - <ndc>
    <!-- labeler code="6660" name="SWEDISH ORPHAN INTERNATIONAL AB" -->
    <product code="7002" cui="" tradename="ORFADIN CAPSULES" />
    <package code="05" cui="" type="BOTTLE" size="60" />
    <doseform cui="C0006935" name="CAPSULE" />
  - <routes>
    <roa cui="C0442027" name="ORAL" />  
  </routes>
  - <ingredients>
    <ingredient name="Nitisinone" strength="5" unit="MG" cui="C0173083" />
  </ingredients>
- <physiologicalEffects>
  <physiologicalEffect cui="C0025521">Inborn Error of Metabolism  
    Treatment</physiologicalEffect>
</physiologicalEffects>
- <pharmacokinetics>
  <pharmacokinetic cui="">Hepatic Metabolism</pharmacokinetic>
  <pharmacokinetic cui="">Renal Excretion</pharmacokinetic>
</pharmacokinetics>
- <mechanismsOfAction>
  <mechanismOfAction cui="C0000507">4-Hydroxyphenylpyruvate Dioxygenase"
Using the Transactions Panel in Apelon’s TDE software, the user imports a file of New Drug Transactions. Each transaction can add, update or delete one or more concepts from NDF-RT. Transactions are color-coded and can be sorted for convenience.
The Concept Versions Panel allows the user to see how a concept is changed in the transaction.
Each Concept in the transaction can be edited using the Tree Editor (or other standard TDE editing features).
Mapping tools used

- **Domain specific tools:** RELMA (REgenstrief LOINC Mapping Assistant)
  - [http://www.loinc.org](http://www.loinc.org)

- **Apelon TermWorks:** an Excel plugin for mapping spreadsheets; requires Apelon terminology server

- **Apelon Terminology Development Environment (TDE)**

- **SNOMED CT “CLUE” Browser**
  - Provided by Clinical Information Consultancy, [http://www.clininfo.co.uk/clue5/clue.htm](http://www.clininfo.co.uk/clue5/clue.htm)
Question Time
Clinical Vocabulary Mapping Methods Institute
Saturday, October 15, 2005