Metadata as the Key to Semantic Interoperability in Clinical Data Systems

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Society for Clinical Trials May 16 – 18 Vancouver, Canada
May 16, 2011

NCI's Call for Standardization in Clinical Data Collection

- "Armitage Report"
  - August 1997
  - Call for uniform data collection
    - to promote efficient protocol implementation
    - to enhance the ability to share and compare data

Birth of the CDE Initiative

- Sponsored by NCI's Cancer Therapy Evaluation Program (CTEP) with support from the NCI Center for Bioinformatics
- Initiated for Phase III NCI-sponsored Cooperative Group oncology trials
- Mandated the use of CDEs as semantically annotated metadata

What are Metadata?

Metadata serves as the semantic backbone of the CDE. Metadata are descriptive terms used to unambiguously define the data, but are not the data themselves.

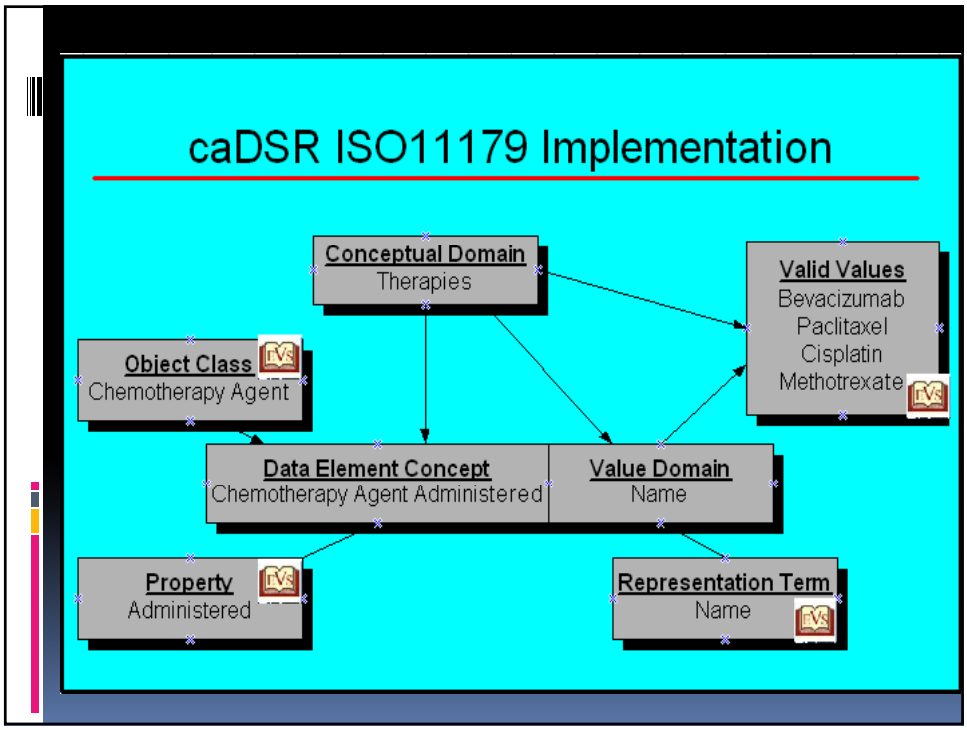
A search for 'Agent' retrieves the following:

Agent Name	Taxol
NSC Number	007

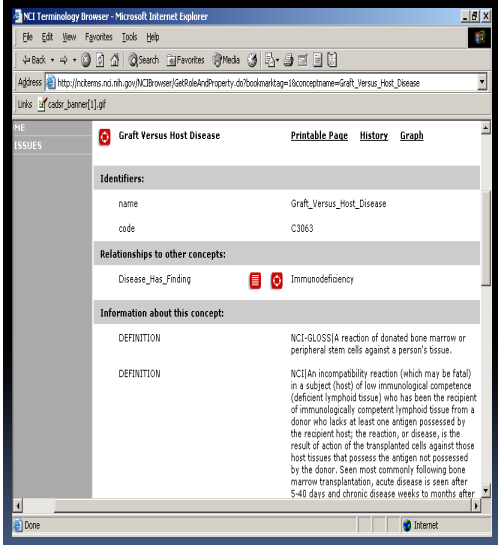
Do you really know what you have?

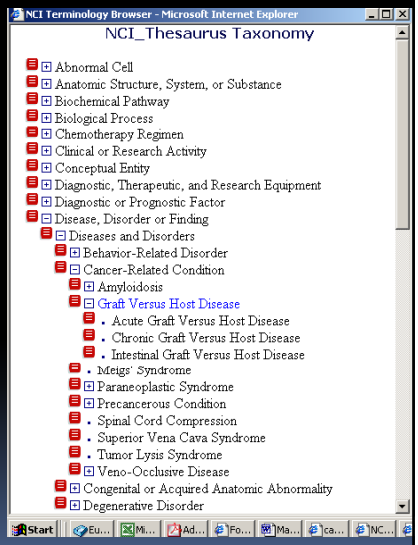
Without controlled, conceptually based metadata you can't be certain.

FDA Metadata	CIA Metadata
Agent- A chemical compound administered to a human being to treat an existing disease or condition, or prevent the onset of a disease or condition.	**Agent**- A sworn intelligence agent; a spy.
NSC Number- Identifier given to a chemical compound by the Nomenclature Standards Committee of the US Food and Drug Administration (FDA).	**NSC Number**- Coded identifier given to an intelligence agent by the National Security Council.
Agent Name - Taxol[The trade name of an antineoplastic medication that interferes with the growth of cancer cells and slows their growth and spread in the body. Taxol is used in the treatment breast, ovary and lung cancers, and AIDS-related Kaposi's sarcoma.]	**Agent Name - Taxol**[Code name given to Valerie Plame, an undercover agent of the Central Intelligence Agency (CIA)]
NSC Number - 007[The numeric identifier given to the chemical compound Taxol [paclitaxel] by the Nomenclature Standards Committee of the US Food and Drug Administration (FDA).]	**NSC Number - 007**[The code number used to identify Valerie Plame, an undercover agent of the CIA.]



EVS Tie-In





Two-Tiered Process

- Step 1: Develop a set of disease-specific template case report forms (CRFs) that represent 80% of the questions routinely incorporated into an average set of CRFs
- Step 2: Implement a review process to ensure compliance and allow for incorporation of new questions as specific protocols dictate

Step 1 Template CRF Development
A: Review Existing CRFs

- Identify areas of clinical trial specialization
- Gather active CRFs from participating sites
- Identify reporting standards
- Create "strawman" CRFs based on analysis

Step 1
B: Consensus Building

- Collaborative committee process
- Diversify the committee members (Statisticians, Data Monitors, CRAs, Research Nurses, MDs, etc.)
- Face-to-face meetings and conference calls

Step 1
C: Curation of CDEs

- Utilize a metadata standard (i.e., ISO 11179)
- Use a controlled, concept-based vocabulary or ontology (i.e., NCI Enterprise Vocabulary Service (EVS))
- Employ publicly-available web-based tools (i.e., NCICB Data Standards Repository (caDSR))

Step 2 Compliance Review Process
A: Define the Process

- Ensure all stakeholders understand respective responsibilities
- Develop lines of communication
- Make all stakeholders accountable

Step 2
B: Allow for Evolution

- Allow for scientific advances
- Process should be dynamic to allow for efficiencies
- Leverage emerging technology (e.g., Oncology Patient Enrollment Network (OPEN), electronic data capture systems, data exposure systems)

Current Template Development Status

- Developed template CRFs for
  - 11 individual cancers
  - Bone Marrow Transplant Clinical Trials Network
  - National Institute for Dental and Craniofacial Research
  - AIDS Malignancy Consortium
- Currently under development
  - Substance Abuse module for an electronic health record sponsored by the National Institute for Drug Abuse

Current Compliance Review Status

- CDE-compliance review performed on more than 200 protocols and associated CRFs
- Provided ongoing training to interested stakeholders to keep CDEs front and center
- Played integral role in leveraging OPEN and Medidata Rave for use by the Cooperative Groups

Questions?