Using What You Have to Build What You Need

ABSTRACT

Because of a variety of factors, healthcare systems are notoriously complex and varied, with widespread data redundancy and a lack of central oversight. Medical jargon, colloquial use of terminology, and the proprietary requirements of external entities contribute to data that are difficult to interpret or share. Duke Medicine has embarked upon the building of a system-wide metadata repository to meet this data management challenge. There were, and continue to be, many obstacles, including lack of resources. However, IT and health informatics joined forces to find a solution. By applying the data principles of sharing and reuse, a plan was developed to leverage existing tools, resources, and infrastructure to build a metadata repository. Still in its infancy, the project is slowly making progress, and will lay the cornerstone for future data management efforts.

BIOGRAPHY

Patricia Gunter, MS
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Ms. Gunter has worked in the field of data management for more than 20 years, with a specific interest in information quality, data modeling, and process improvement. She holds a Master of Science in Software Development and Management from Rochester Institute of Technology. She is currently a Senior Informaticist with Duke Translational Medicine Institute, which is part of Duke Medicine, and in the past has held positions with IBM, Xerox, Eastman Kodak, and several healthcare organizations.

USING WHAT YOU HAVE TO BUILD WHAT YOU NEED

ESTABLISHING A SYSTEM-WIDE METADATA REGISTRY

Pat Gunter
Senior Informaticist

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DUKE UNIVERSITY MEDICAL CENTER

- Academic Medical Center
  - Education
  - Research
  - Patient Care
- Tertiary Care/Level A
- 4 Hospitals
- 150+ Clinics and Practices
- 1500+ Beds

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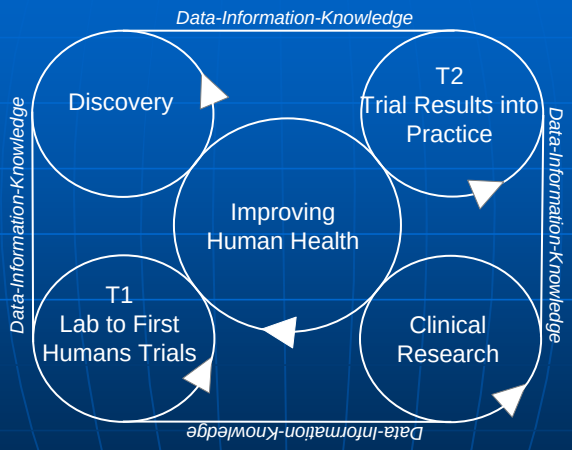
DUKE TRANSLATIONAL MEDICINE INSTITUTE (DTMI)



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DATA ENVIRONMENT

- Silos of operational databases and data entry applications
  - Patient registration
  - Patient billing
  - Clinical systems – surgical, emergency, labs…..
  - Disease registries
  - Etc., etc., etc.
- An enterprise Data Warehouse
- 3+ Million HL7 transactions per day

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BUSINESS PROBLEM – lack of standardized clinical terminology across the enterprise, preventing meaningful sharing and reuse of the data – semantic interoperability

SOLUTION –build a metadata registry that would become a foundation for future data management and data quality efforts

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KEY OBJECTIVES

- Promote consistent semantics across systems by leveraging
  - Controlled terminologies – LOINC, SNOMED-CT, ICD-9, CPT, etc.
  - ISO-11179 standard for metadata registries
  - HL7 messaging standards
- Leverage existing tools, resources, and infrastructure

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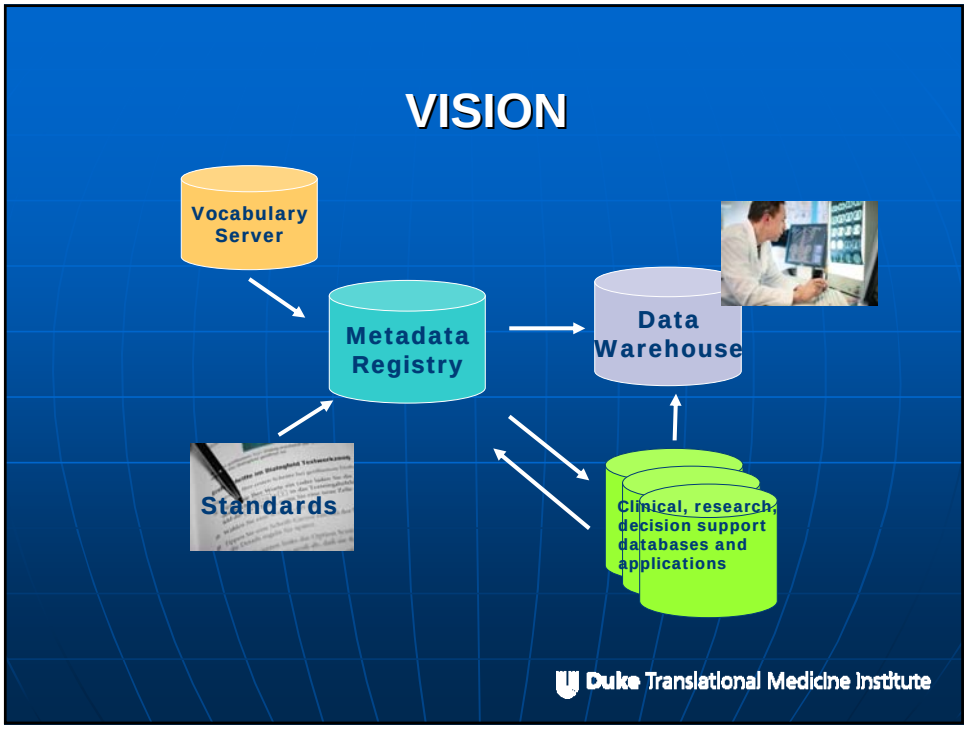

WHAT WE HAD TO WORK WITH

- Silos of operational databases and data entry applications
- A data warehouse with little metadata about what it contained
- A prototype 11179 metadata registry
- New data governance board
- Small commitment of resources
- Desire to move into the future with standardized data

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WHAT WE DIDN'T HAVE

- Funding
- Total buy-in from across the organization
- A plan

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WHERE TO START?

- Think ~~small~~ ~~small~~ ~~small~~ small
- Select a SMALL area of data that is
  - Easily understood
  - Essential to core business – patient care
  - Identified need for standardization
  - Key stakeholders are on board

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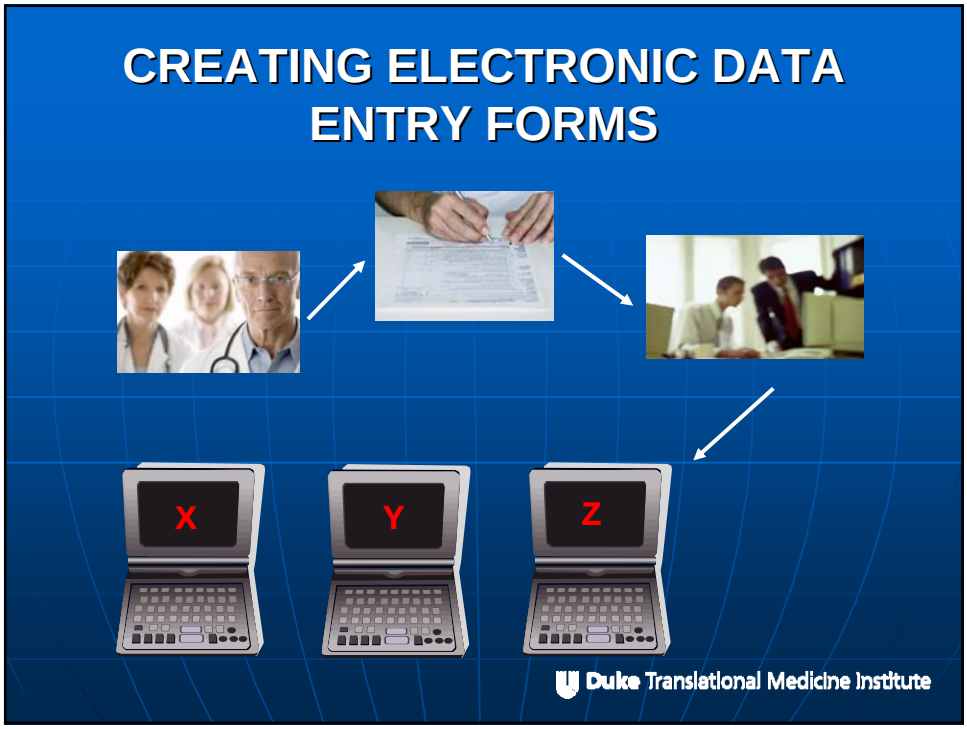
CREATING ELECTRONIC DATA ENTRY FORMS
X
Y
Z
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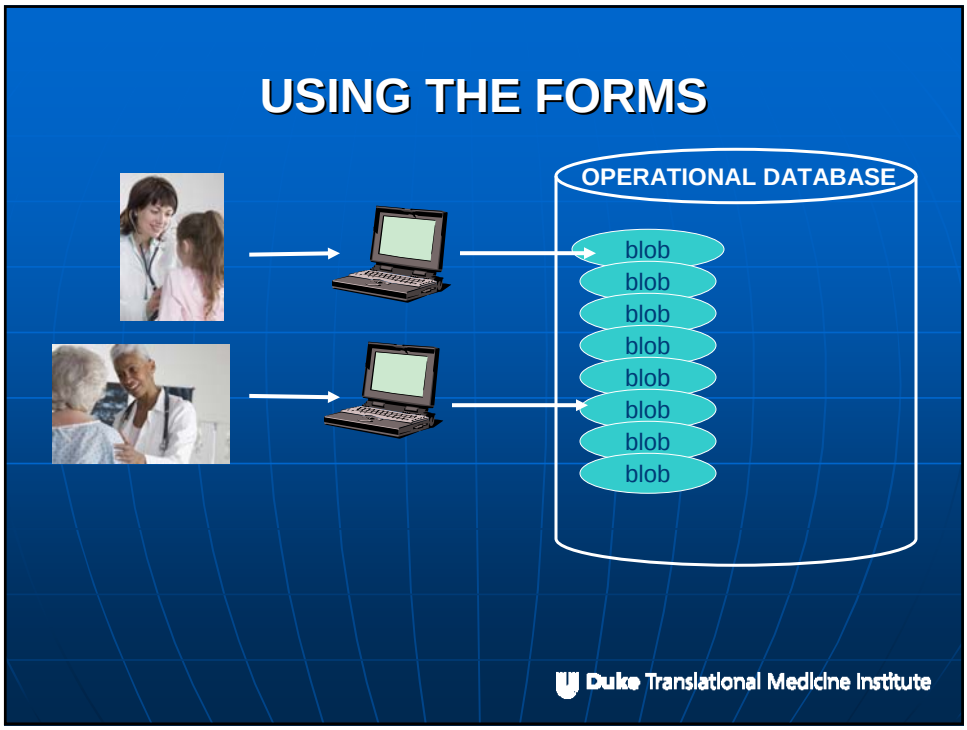
USING THE FORMS
OPERATIONAL DATABASE
blob
blob
blob
blob
blob
blob
blob
blob
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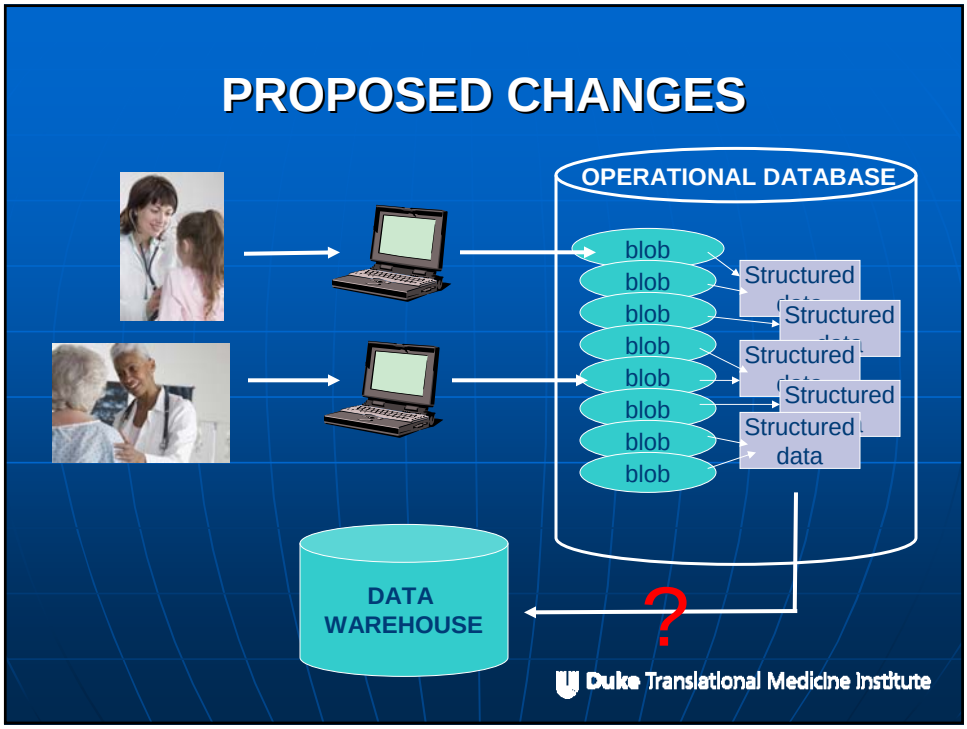
PROPOSED CHANGES
OPERATIONAL DATABASE
blob
blob
blob
blob
blob
blob
blob
blob
Structured
Structured
Structured
Structured
Structured
data
DATA
WAREHOUSE
?
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VITAL SIGNS
Easily Understood
Definite need
• Clinicians are asking for help
Key stakeholders on board
• Vice chancellor for clinical research
• Head of data governance
• Head of data warehouse
• Technical "owner" of electronic data entry screens
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STEPS

- Identify vital sign data elements from existing screens
- Harmonize across the screens and add definitions
- Enter into existing metadata registry
- Identify issues with the registry tool for future enhancement

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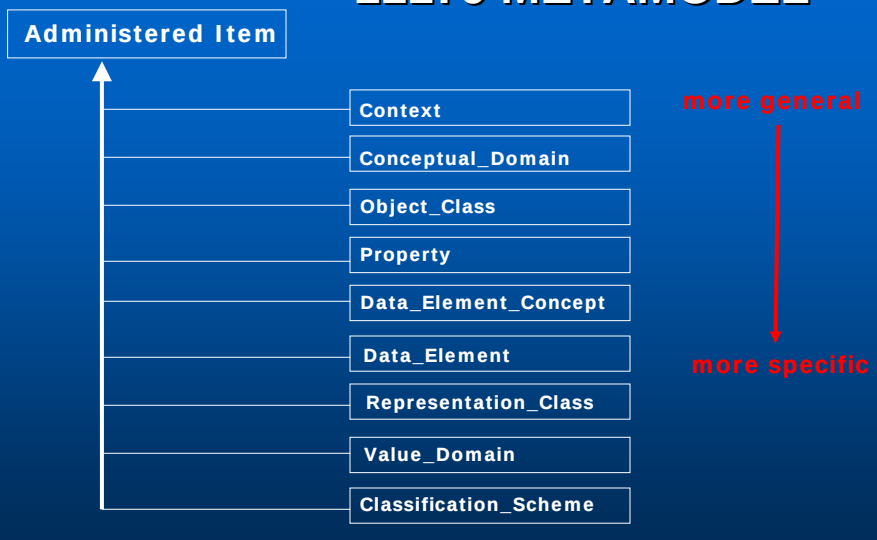
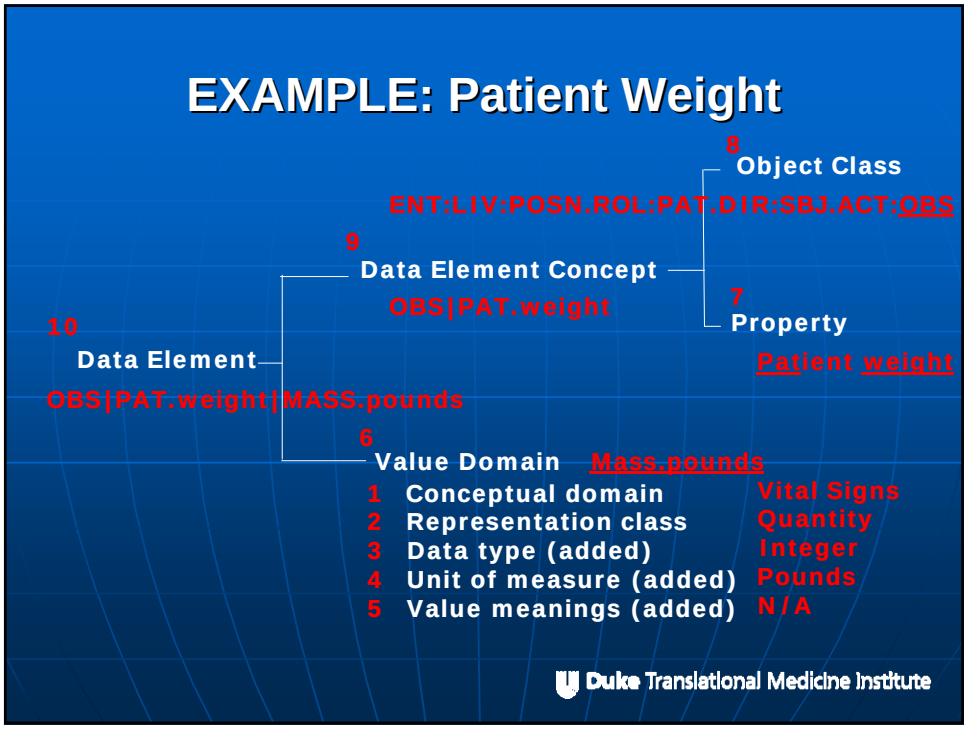
11179 METAMODEL



ISO/IEC 11179: Information Technology – Metadata Registries (MDR). International Organization for Standardization, Geneva, Switzerland. 2003-2005.


EXAMPLE: Patient Weight
8
Object Class
ENT:LIV:POSN.ROL:PAT.DIR:SBJ.ACT:OBS
9
Data Element Concept
OBS|PAT.weight
7
Property
Patient weight
10
Data Element
OBS|PAT.weight|MASS.pounds
6
Value Domain
Mass.pounds
1 Conceptual domain
2 Representation class
3 Data type (added)
4 Unit of measure (added)
5 Value meanings (added)
Vital Signs
Quantity
Integer
Pounds
N/A
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NICU Data Dictionary - Windows Internet Explorer
DukeNICU
Duke University Medical Center
Neonatal Intensive Care Unit
Home | Log Out | Help | Contact
Data Element
Data Element Concept
Object Class
Property
Conceptual Domain
Value Domain
Context
Representation Class
Classification Scheme
Administration
Reports
Welcome to the NICU
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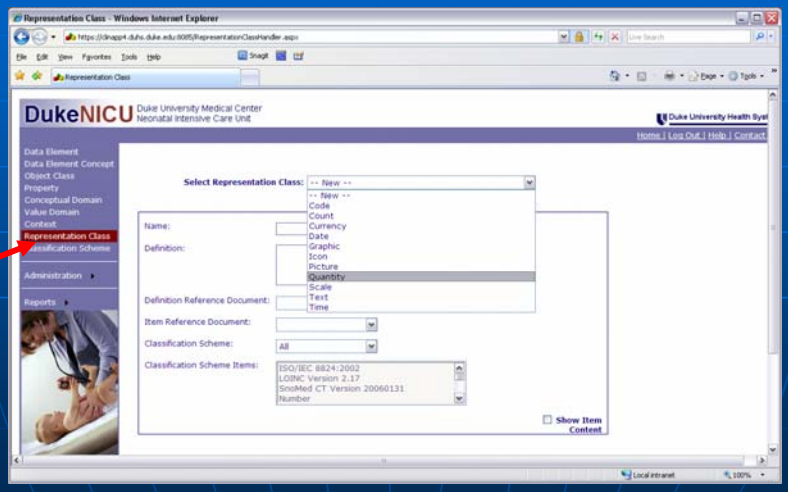
REPRESENTATION CLASS



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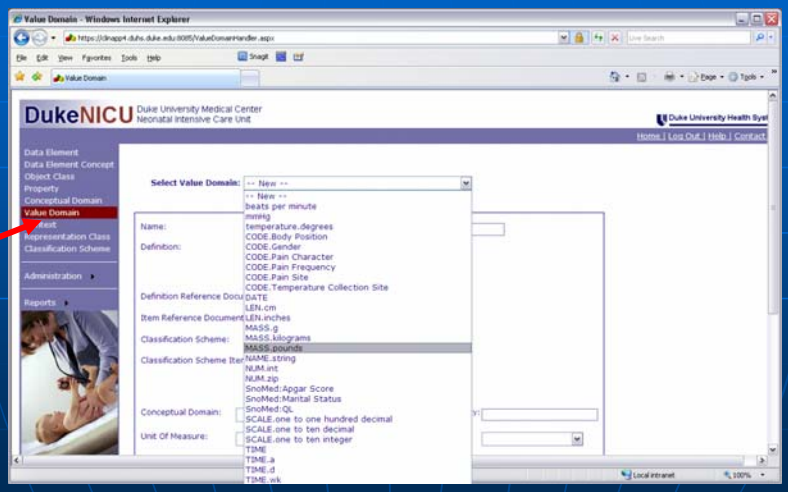
VALUE DOMAIN



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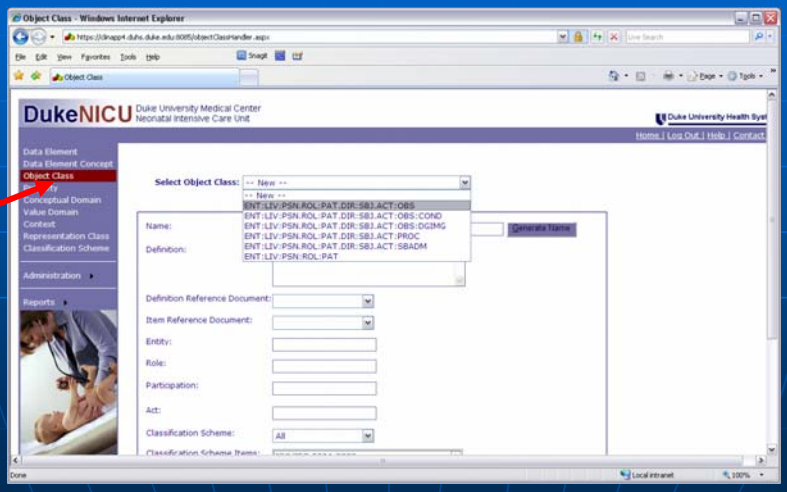
OBJECT CLASS



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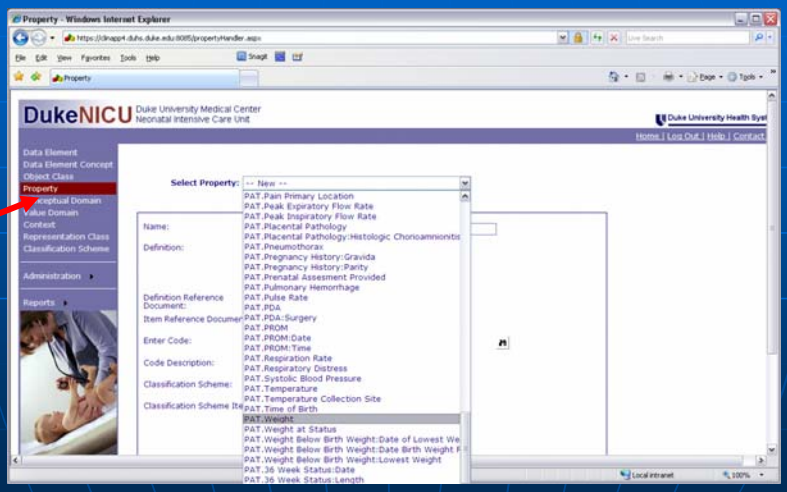
PROPERTY



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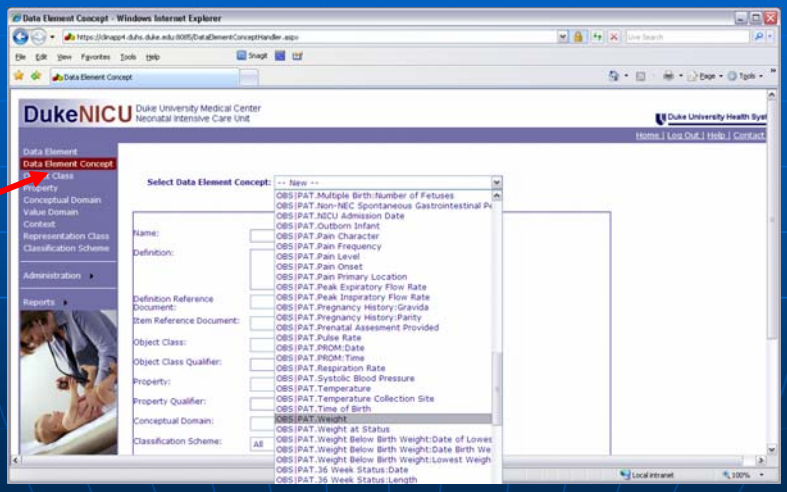
DATA ELEMENT CONCEPT



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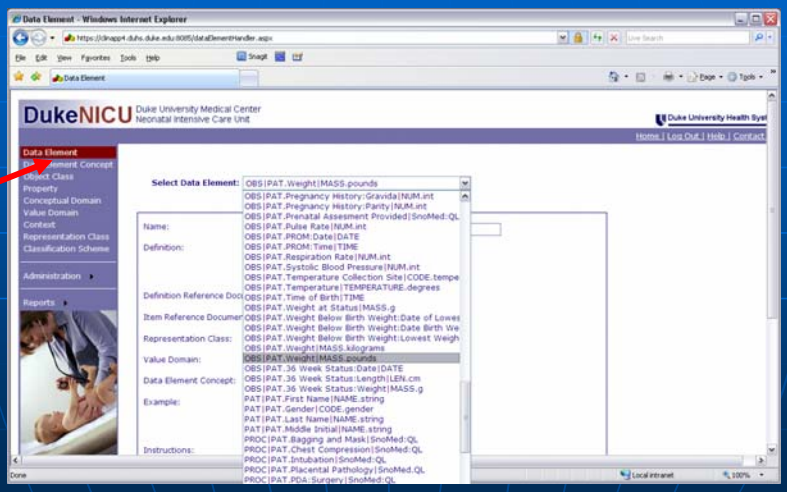
DATA ELEMENT



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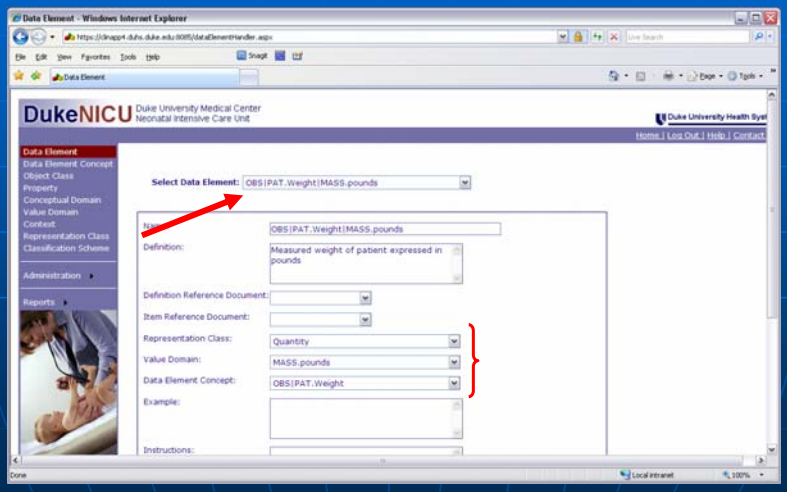

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WHAT IS HL7?

- ISO /ANSI (SDO) for the development of healthcare clinical and administrative data standards
- Standardizes the format and content for information exchange within and among healthcare institutions

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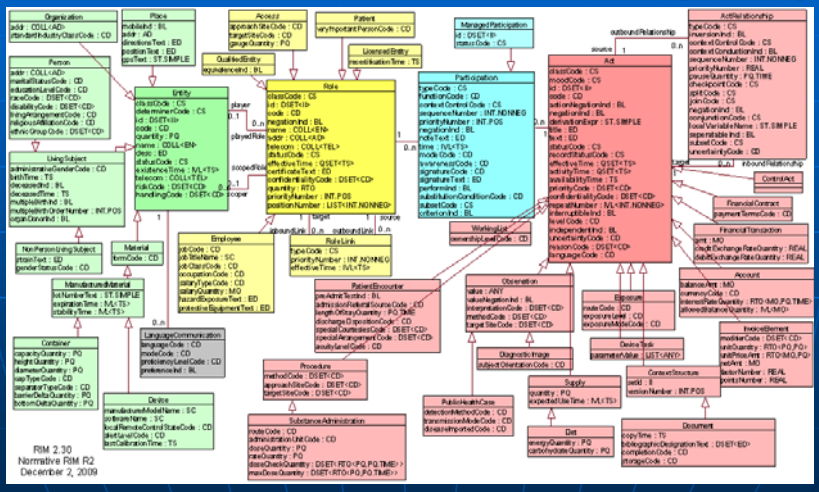
HL7 REFERENCE INFORMATION MODEL (RIM)



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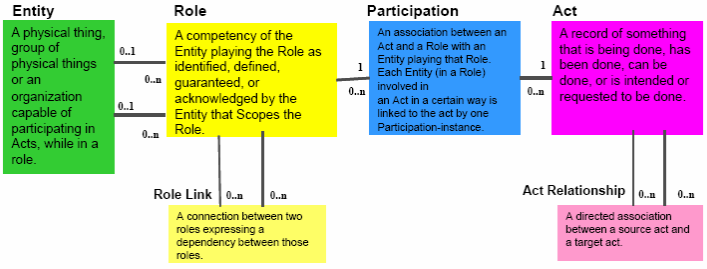
HL7 REFERENCE INFORMATION MODEL (RIM)

- **Acts connect to Entities in their Roles through Participations, but can also connect to other Acts through Act Relationships.**



- **Classes are color coded:**
  - Green = Entity, Yellow = Role, Blue = Participation, Red/Pink = Act, Purple = Infrastructure, Lilac = message controller.

Ellen Torres Master's Project, Oregon Heath & Science University, 2010

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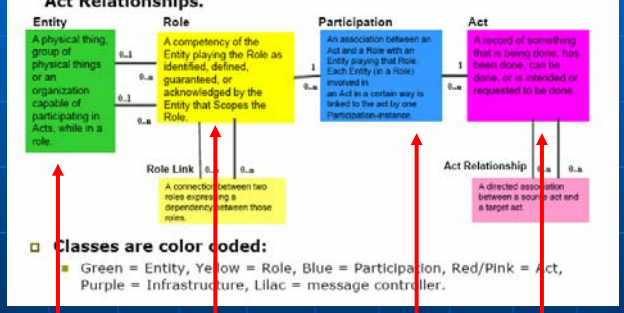
Linking to the RIM

- Acts connect to Entities in their Roles through Participations, but can also connect to other Acts through Act Relationships.



- Classes are color coded:
  - Green = Entity, Yellow = Role, Blue = Participation, Red/Pink = Act, Purple = Infrastructure, Lilac = message controller.

Object Class ENT:LIV:PSN.ROL:PAT.DIR:SBJ. ACT.OBS

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WHY THE NEED TO LINK?

- Leverage work already done
- Create a link from Duke to the rest of the healthcare world



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WHAT'S NEXT

- Complete technical infrastructure (the vision)
- Improve the repository tool
- Keep adding data elements
- Refine the processes
- Engage the data governance board
- Increase usage and stakeholder involvement

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CONCLUSIONS

- Have a vision to work toward
- Choose a small area to begin
- Leverage what you already have
- Link to existing standards
- Celebrate the little accomplishments
- START NOW!

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