

HL7/NLM Contract Vocabulary Alignment and Electronic Health Record (EHR) Projects

Preliminary Findings



Office of the
Assistant Secretary
for Planning and
Evaluation (ASPE)

- **NLM Contract**
 - Contract for 2 projects
 - Contract Team
- **EHR Project**
 - Objectives and Scope
 - Why develop an Implementation Guide Tool (IGT)?
- **“NHIN Contractor” Collaboration**
 - Scope & Approach
 - Status
 - Key Outcomes & Observations
- **The Standards Challenge**
 - Preliminary Findings
- **EHR Looking Forward ...**
- **Vocabulary Project**
 - Mappings and Tooling
 - Achievements
 - EHR and Vocabulary Interactions
 - Vocabulary Project Challenges
 - Future Agenda





Introduction

Contract with 2 major projects:

- 1. Vocabulary:** Align HL7 message standards with CHI standard vocabularies; support the EHR side of project to develop implementation guides with prototype vocabulary inclusion; develop syntax for binding of vocabularies to HL7 V3 messages; develop tooling for vocabulary/value set distribution
- 2. EHR:** Develop and pilot test an HL7 Implementation Guide for the transmission of patient information between disparate electronic health record (EHR) systems using HL7 Messaging Standards



Project Management Team

- **Management:**

- HL7 Staff Project Manager:
 - Sarah Ryan
- HL7 Contract Officer:
 - Mark McDougall
- NLM Vocabulary Project Officer:
 - Vivian Auld
- ASPE EHR Project Manager:
 - Suzie Burke-Bebee

- **Technical Leadership:**

- Chris Chute, Stan Huff, and Mark Shafarman, Co-leaders for Vocabulary
- Ed Hammond, Mark Shafarman, and Bill Braithwaite, Co-leaders for EHR



- **Develop and pilot test an HL7 Implementation Guide for the transmission of patient information between disparate electronic health record (EHR) systems while ensuring semantic interoperability.**



Business Objectives

- **Encourage the development of electronic health records by removing barriers to interoperability.**
- **Position HL7 V3 as a viable and demonstrable solution component to EHR development initiatives.**

- **Development of an Implementation Guide Tool (IGT) that will be used to create implementation guides for HL7 V3 messaging.**
- **Use of the Implementation Guide Tool (IGT) to support the development of an Implementation Guide for a pilot project – ideally involving “breakthrough” use case transactions such as medication history query and laboratory result communication.**
- **Identification of HL7 standards issues in the pilot for resolution through the usual HL7 processes.**
- **... where depth of scope has to be limited by available time and resources, efforts are focused on positioning for future expansion.**



Why focus on Implementation Guides?

- **Most “standards” – including V3 Ballot specifications – are not really “implementable” without some trading partner negotiation:**
 - Ambiguities in Core Specifications: Optionality, Unbounded cardinalities, etc.
 - Ambiguities in Data Types: Certain data types may be too complex in practice or be expressed in an unbounded manner;
 - Ambiguities over Coded Values: Contextual (e.g. Context-of-Use-specific) value set bindings need to be established.
- **HL7 V3 Specifications are not always easy to understand:**
 - Not “Business Language” Focused: RIM attribute descriptions are not really business oriented; Business context is usually needed.
- **Most “Standards” – including HL7 V3 – do not sufficiently express all integration requirements:**
 - Information Gaps: Some considerations (e.g. important business rules; transactional considerations, etc.) cannot be easily or completely specified in a message models;
 - Implementation / Roll-out conventions: Formal identifier strategies (e.g. Patients, Providers, etc.) Object Identifiers (OIDs), etc.;
 - Other OSI Layers: OSI Layers 1 – 6 and “7+” may also matter.

- **Implementation Guides (IG) or “Integration Profiles” are a type of artifact that allows message and interaction specifications to be:**
 - Placed into a clear business context;
 - Consolidated into a set of complementary functions;
 - Augmented with quasi-normative (from a testable conformance perspective) and informative text at various layers of integration ranging from the basic technical exchange to business workflow integration;
 - Reviewed and endorsed / validated (as desired or required by a particular community of shared interest);
 - Comprehensively published; and
 - Used by software application builders, certifiers, and buyers / users to support implementation of integrated solutions.



Why develop an Implementation Guide Tool (IGT)?

- ***Precision & Efficiency:*** Tight linkage to underlying messaging artifacts will drive precision and internal consistency of implementation guides. Leveraging of the core artifacts also enables efficiencies in guide production.
- ***Best Practices:*** Content templates – even if these are evolving – can allow best practices to be propagated and helps assure rigor in guide development.
- ***Guide Portfolio Consistency:*** Format templates can help drive consistency among guides within a broader specification portfolio.



Longer-Term IGT Goals

- **Complete Specification**

- IG containing all information necessary to develop a compliant solution - conformant messages created on disparate information systems by different programming teams using the same IG will be interoperable.
- Tooling should be integrated with and derive as much information as possible automatically from existing or future HL7 Development tools.

- **Programmatic Conformance Testing**

- Tooling should produce automated conformance tests so that any message could be analyzed for conformance with the IG.

- **Cross-Version Capabilities**

- Support to document V2 and V3 messages as well as V3 CDA documents within an IG (or a set of IGs).
- Tooling should produce an automated translator to change a V3 message or CDA Document to or from an equivalent V2 message – assuming adequate information exists in the V2(+) message.

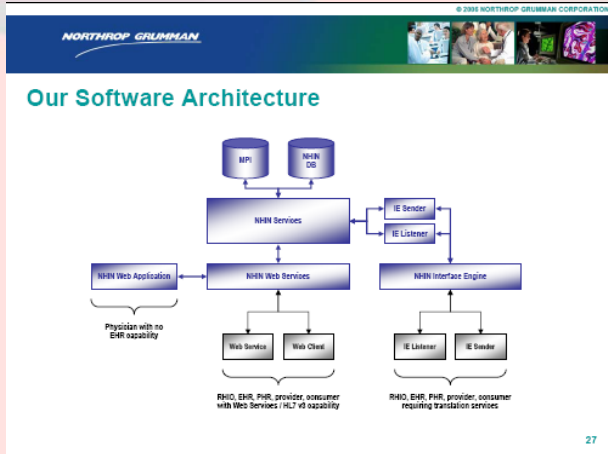


“NHIN Contractor” Collaboration

- Seeking ...
 - Practical Implementations, of
 - Key transactions,
 - Ideally based on HL7 V3 with V2 mapping challenges.



- **NHIN Prototype projects offer ...**
 - Real world scenarios;
 - Strong transactional alignment (due to shared “breakthrough use case” driven goals);
 - Potential partners with HL7 V3 at the core of their solution prototypes ...



- Accenture &
- Northrop Grumman





“In Scope” Transactions

Laboratory	<ul style="list-style-type: none">• Query / Response• Unsolicited Result
Medication	<ul style="list-style-type: none">• Query / Response
Demographics	<ul style="list-style-type: none">• Admit Request



Approach

- **HL7 tooling enhancements design and development**
- **Independent engagement streams with each collaboration partner ...**
 - Grounding dialog with each collaboration partner;
 - Basic training pertaining to extended HL7 V3 tooling to enable creation of “annotated” messaging specification (i.e. embedded documentation, tightly and rigorously coupled with specification);
 - Collaboration partner team driven development of message specification content (some “as built”, some prospective);
 - NLM/EHR Project team driven finalization and assembly of guides; and
 - Collaboration partner review and comment.

- **Model tool (Visio) enhancements**
 - Production ready
 - Release targeted prior to San Diego meeting
- **IGT assembly component**
 - Strong “beta”



Status – Northrop Grumman Guide(s)

- **Input materials received for core transactions as follows:**
 - Laboratory
 - Query Lab Result
- **Review Draft being finalized.**
- **Northrop Grumman team comments pending (review pending distribution of draft guide(s)).**



Status – Accenture Guide(s)

- **Input materials received for transactions as follows:**

- ADT

- Inpatient Admission
- Inpatient Discharge
- Outpatient Registration
- Inpatient Preadmission
- Change outpatient to inpatient
- Patient Update
- Cancel inpatient admission
- Cancel inpatient discharge

- Medication

- Intolerances

- Laboratory

- Specimen Received; create new specimen observation event
- Nullify specimen observation event
- Complete specimen observation event
- Activate or revise active specimen observation event
- Revise completed specimen observation event
- Cancel specimen observation event

- **Review Draft being finalized.**
- **Accenture team comments pending (review pending distribution of draft guide(s)).**



Key Outcomes & Observations

- **Process**

- Excellent collaboration ... despite resource challenges and tight timelines of core project.

- **Content**

- Solid core content for those annotated / documented message specifications that could be made available within the collaboration timeframe.
- Pilot project-specific “Vocabulary” considerations could not be addressed – but efforts are underway to elaborate vocabulary related issues in a more general manner.
- Limited opportunity to explore V3/V2 mapping capabilities (However, a separate NCPDP Script-to-V3 mapping was developed to test HL7 mapping tool).
- Less “supplemental” content (e.g. other OSI layers; operational considerations; etc.) ... but that is not seen as critical given the focus on semantic interoperability.



**A range of Standards Development Organizations (SDOs):
Offering technical frameworks as
well as forums & governance
mechanisms for collaborative
decision making.**

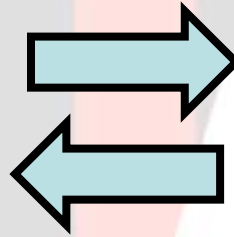


The Standards Challenge – Preliminary Findings

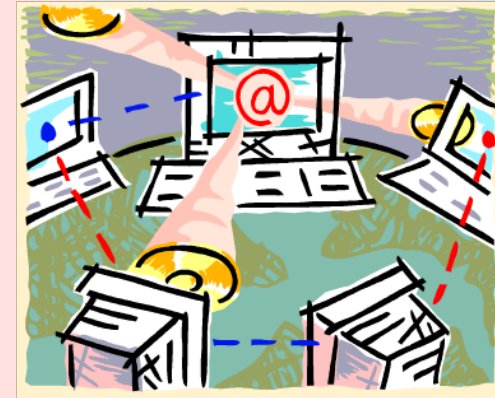
NHIN Prototype



NHIN “Subnet”



NHIN Prototype



NHIN “Subnet”

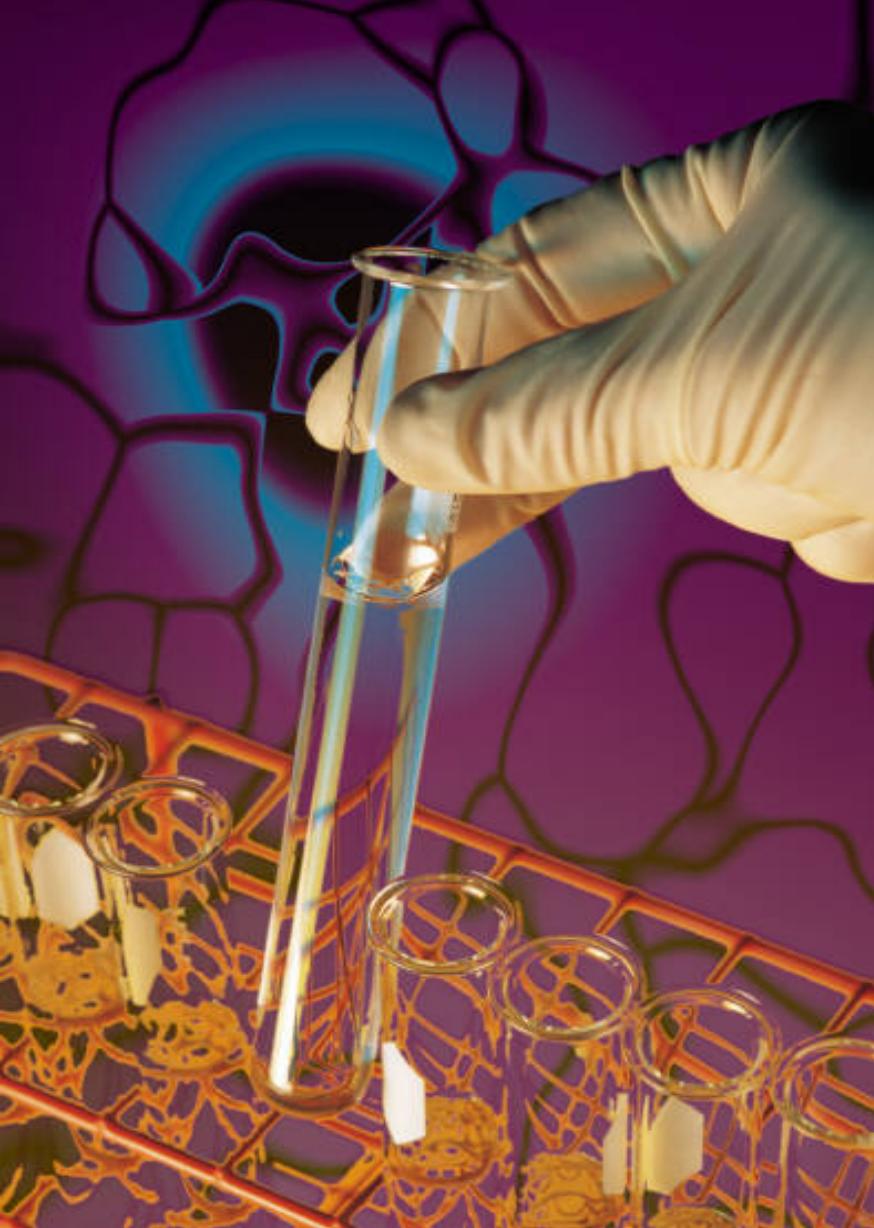
“Subnet”
Internal Integration
Challenges

“Subnet”
to
“Subnet”
Integration
Challenges

“Subnet”
Internal Integration
Challenges



The Standards Challenge – Preliminary Findings



- **Models for Laboratory Result Transactions available from both collaboration partners.**
- **Both solutions use HL7 V3 which enables ready comparison of approaches but also creates challenges.**
- **Variations are driven by architecture and product choices**
- **Our observations are solely focused on potential downstream NHIN “Subnet” to “Subnet” communication consequences.**
- **Similar analysis could be undertaken in other clinical domains (*e.g.* medication, ADT, *etc.*).**



The Standards Challenge – Preliminary Findings

Two distinct approaches to Laboratory Result message design ...

- **Northrop Grumman**

- Specification is closely aligned to HL7 ballot.
- Narrow but focused functionality ...
 - Tightened constraints
 - No specimen info included
- ... akin to a use-case specific profile that enables tight integration.
- Decentralized “query” model.
- Appears to focus on edge-point vocabulary translations / normalization.

- **Accenture**

- Specification is based on Oracle HTB product and hence from an earlier version of the HL7 V3 standard.
- Broad capability ...
 - Many attributes, some optional
- ... supports various use cases without tight constraint.
- Centralized “event aggregation” model.
- Appears to focus on central data store based vocabulary translation / normalization.



The Standards Challenge – Preliminary Findings

- **“Subnet” to “Subnet” Integration consequences ...**
 - Refined Use-case based alignment is required to ...
 - Define consistent end-node specifications:
 - How does data come from clinical point of service into any given NHIN “subnet”?
 - How does a clinical point of service query through the NHIN to another data store or end point?
 - Define “subnet” to “subnet” based integration.
 - Alignment will require ...
 - Consistency in functional coverage (e.g. from a lab perspective: inclusion of specimen; inclusion of supporting clinical data; support for various result grouping constructs, etc.).
 - Consistency – on a use-case by use-case basis – on the associated terminology approach.



The Standards Challenge – Preliminary Findings

HL7 V3 helps ...

- **Provides consistent data model to enable comparison and alignment of requirements and/or solutions.**
- **Provides formal message development mechanism supported by tooling and now improved documentation mechanisms.**
- **Positions for scalable vocabulary / value set designation.**



The Standards Challenge – Preliminary Findings

HL7 V3 also creates challenges ...

- **Dynamic model / architecture issues need to be addressed ... various architectural patterns will need to be supported (*e.g.* query vs. central event aggregation vs. document oriented approaches).**
- **“Standard” vs. “Profile” ... HL7 committees often working at different levels ... in fact, both may be needed: International baseline standard and US NHIN viable “profiles”.**
- **Tooling re. vocabulary domain vs. value set specification remains to be improved.**
- **Clear OID implementation strategy is required for trading networks (*e.g.* NHIN).**
- **Messaging and Clinical Document Architecture (CDA) alignment needs to be resolved.**
- **“Hidden” stability issues need to be resolved – For example, some content that has passed membership ballot uses CMETs which have not yet passed.**
- **Data types require constraints and associated conformance verification.**



Go-forward opportunity ...

- **Establishment of V3 based (or multi-version) Implementation Guides based on specific use case profiles ...**
 - General Ambulatory Care
 - Inpatient Settings
 - ...
- **... and architectural patterns ...**
 - Centralized Event Repository vs. Distributed query / response model
 - Transactional vs. Document Based
- **Aligning HL7 based standards infrastructure, baseline outputs and consensus processes with other context-of-use specific consensus processes (e.g. HITSP) to,**
 - Confirm functional coverage of specific NHIN guides;
 - Confirm functional coverage of specific NHIN transactions;
 - Confirm baseline value set assignment for NHIN build-out.

- **NHIN**
- **Collaboration**
- **Vocabulary**
- **Tooling**
- **Reporting Out**



Next Steps for EHR

- **NHIN Collaboration**
 - Walk-through materials with NHIN contractors to seek feedback and incorporate same in final deliverables
 - Be available at upcoming NHIN forum to support NHIN contractors as needed
- **Vocabulary Gaps**
 - Address vocabulary gaps by building a “for example” guide (based on a transaction from one of the contractors) that adds specific vocabulary “value set” references
- **Tooling**
 - Continue to elaborate tooling through to early January
 - Publish tooling to HL7 community (January target)
- **Reporting Out**
 - Report out to HL7 community during January 8 – 12 Working Group meeting in San Diego
 - Summarize final findings



- **Mapping of HL7 vocabularies to CHI**
 - First round completed, Health Language, Inc, May 2006
 - Second Phase, ongoing, awarded to Ted Klein Consulting, August 2007.
 - Engage community of HL7 TC's and SIG's in content review
- **Vocabulary tooling development, joint support from HL7 and NLM project,**
 - Mayo Biomedical Informatics, December 2006
 - Initial emphasis upon HL7 “Harmonization” process
 - Advance tooling to address difficulties noted in Guideline projects
 - Build upon Common Terminology Services framework



- **Work fostered and clarified by NLM Contract**
 - Distilled by two Vocabulary structure retreats in Rochester, MN
- **Definition of HL7 “Realms”**
 - Universal, Representative, Example, Unclassified
 - US, Canada, UK, etc.
- **Clarification of Vocabulary Infrastructure**
 - Domains, Value Sets, Versioning, Source Classifications
 - Mechanics, Maintenance, Access Methods



EHR and Vocabulary Interactions

- **Collaborative efforts to specify vocabulary “hooks”**
 - Explicit linkages to value sets in Implementation Guides
 - Intended to enable algorithmic, machinable integration
 - “Hook” formats and syntax drafted
- **Implementation barriers**
 - Legacy HL7 vocabulary model does not:
 - Distinguish Domains from value sets
 - Fully support algorithmic access
 - NHIN Contractors struggle with vocabulary interoperability
 - Variable approaches to content synchronization within RHIO
 - Adoption of “US Realm” values sets a future state



Vocabulary Project Challenges

- **Interoperability requires standard vocabulary content and methods**
 - *Comparable and consistent* patient data as mantra
 - Message structures and architecture can only go so far
- **Resources to attain interoperability are still needed.**
 - Funding beyond current contract
- **Realization of interoperability**
 - Use of content standards is mandatory for interoperability.
 - Must ultimately harmonize
 - *Implicit semantics* of information models
 - *Explicit semantics* of vocabulary contents



Vocabulary Project Future Agenda

- **Vocabulary development and distribution**
 - Editing, sub-setting (value sets), versioning, access methods
 - Meld vocabulary tooling across federally supported projects
 - NIH (CTSA, caBIG), NLM, CDC (PHIN), Homeland Security
 - Standardize binding syntax for Implementation Guides
- **Advocate for ownership of US Realm content authority**
 - ONC, NLM, HITSP, HL7,...
 - Conformance profiles for use of CHI vocabularies
 - LOINC, SNOMED



Dialog & Questions ...



More Info?

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- **Implementation Guide Overview**

- **Enhanced Visio Message Modeling Template**
 - Enables structured attribute based business annotation (*e.g.* Rationale, Implementation Notes, Mapping Notes, *etc.*)
- **Dynamic Model Workbook framework**
 - Provides basic framework for structured reflection of transactions in terms of the underlying interactions and the associated message models.
 - Will drive generator for schemas and other outputs – bypassing more heavy weight PubDB process.
- **Implementation Guide MS-Word Template**
 - Enables Implementation Guide content development with rigorous linkages to hard specification elements

- **Develop Core Artifacts**

- Define annotated Message models for payload and wrappers
- Define dynamic model workbook

- **Define Implementation Guide**

- Determine functional coverage (*i.e.* transaction set)
- Develop or reference – by linkage or inclusion – general content (template suggests key content topics)
- Develop detailed transactional specification content
 - General business information
 - Interaction based guidance
 - Business rules
 - Sender / receiver pre- and post-conditions
 - *Etc.*
- Provide reference linkages to Schemas and any other “hard” specification components

Questions



More Info re. IGT?

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