

**MAKING THE "MINIMUM DATA SET" COMPLIANT
WITH HEALTH INFORMATION TECHNOLOGY
STANDARDS**

ATTACHMENT E:

**THE NLM/UMLS TO MAINTAIN LINKS
BETWEEN LOINC CODED ASSESSMENT
QUESTION AND ANSWERS AND CODEABLE
VOCABULARIES -- AN ALTERNATIVE**

The NLM/UMLS to Maintain Links between LOINC coded Assessment Question and Answers and Codeable Vocabularies -- An Alternative

In order for the NHIN to reliability and reproducibly exchange assessment content, it must have ways to (a) uniquely code questions, answers, and answers + questions, and (b) represent the relationship between any of those codes and other CHI endorsed vocabularies. One logical solution for (b) is to use the UMLS, since its Metathesaurus is designed to maintain such relationships, and UMLS is the only authorized distributor of SNOMED codes. Relationships in UMLS are represented at either the Concept or Atom levels. The text of survey items is currently stored within the UMLS as Attributes, so the content needed for (a) is already present within the UMLS, but since they are not stored as Atoms, they can not be used within relationships. Two possible solutions are to (1) extend UMLS to allow the survey questions, answers, and answers + questions to be represented as Atoms, or (2) extend UMLS to support relationships at the Attribute level. Since both proposed solutions involved changes to the UMLS, their potential ramifications would need to be carefully considered.

Although there is precedent for multiple Atoms for a single LOINC item, the lack of associated metadata may make this a non-ideal solution. TABLE 1 shows two Atoms for the LOINC code 28083-4. The String is a concatenation of the 6 main LOINC axes; and there are Atom Unique Identifiers (AUIs) for the full and abbreviated text versions of those six LOINC axes.

TABLE 1: Sample Data from UMLS MRCONSO Table Showing Unique Concepts and Their Associated String Description					
CUI	LUI	SUI	AUI	LOINC	String
C0943734	L1841898	S2144660	A2000256	28083-4	ACUTE PAIN:FINDING:POINT IN TIME:^PATIENT:ORDINAL:OBSERVED.HHCC
C0943734	L1841897	S2144659	A2000255	28083-4	ACUTE PAIN:FIND:PT:^PATIENT:ORD:OBSERVED.HHCC
A single LOINC code has a single concept (CUI), but may have multiple String representations and string identifiers (SUI).					

The UMLS Attribute Table already stores components of survey items needed for mapping to other vocabularies. TABLE 2 shows a subset of those attributes for LOINC code 28083-4, AUI A2000255. The Survey Question Text, Source, and AnswerLists are stored as distinct Attributes, as are the fields from the six primary LOINC axes. Although the LOINC Answer List (LAL) attribute is not as granular as would be needed to represent unique Questions, Answers, and Answers + Questions, UMLS might consider updating the LAL syntax to allow for that granularity. This might be done by adding a new Attribute Name (ATN) to indicate the questions and answers, with one record for each. Presuming that LOINC adopts the proposal for unique tables of Q, A, and Q+A levels, it would have its own unique identifiers for those strings. UMLS would then treat these as Source Asserted Attribute Identifiers (SATUIs), and include them in the Attribute table structure. If such an approach were used, UMLS could use ATUI codes to represent the unique questions, answers, and answers+questions, and relationships to other vocabularies could be done at that level. However, Attributers are not currently included among the unique Strings and Atoms, so such an approach would not take advantage of the UMLS's ability to identify ambiguous strings. Perhaps a mixed solution, of storing this content as Attributes, but also letting Attributes be included within the Strings table might solve that problem, but such a proposal is beyond the scope of this project.

TABLE 2: Sample Data from UMLS MRATT Table Showing Extended LOINC Attributes Associated with a Single LOINC Code			
ATUI	ATN (Attribute Name)	SATUI	ATV (Attribute Value)
AT28331085	LAL (AnswerList)		IMPROVED, STABILIZED, DETERIORATED
AT28398053	LCL (Class)		SURVEY.NURSE.HHCC
AT28582102	LOINC_COMPONENT		ACUTE PAIN
AT28605219	LOINC_METHOD_TYP		OBSERVED.HHCC
AT28636817	LOINC_PROPERTY		FIND
AT28671631	LOINC_SCALE_TYP		ORD
AT28705795	LOINC_SYSTEM		^PATIENT
AT28728565	LOINC_TIME_ASPECT		PT
AT28744038	LQS (Survey Question Source)		HOME HEALTH CARE CLASSIFICATION Q45.1
AT28780799	LSR (Survey Question Text)		0
AT28822964	SOS (Scope Statement)		PHYSICAL SUFFERING OR DISTRESS, HURTING

Storing Vocabulary Matches within LOINC

Regardless of where the unique identifiers for survey components are stored, ones will be needed to support vocabulary matches. Anticipating this, Dr. White proposed that the LOINC committee create their own identifiers for these strings, and encode them within the structured AnswerLists so that computer systems could readily match LOINC answers to other vocabularies, and also use these when transmitting HL7 messages. This proposal would need to be reviewed by LOINC, HL7, CMS, UMLS, and possibly other stakeholders.

The proposal is to have LOINC use syntax for the AnswerLists which facilitates creation of HL7 messages. As described previously, the OBX-5 segment would transmit the response to a survey item, using the syntax *Value^Message^Coding_System* followed by *AlternateValue^AlternateMessage^AlternateCodingSystem*. The *Message* section is free text, and optional, but Dr. White proposes that LOINC and HL7 add a sub-syntax to it. For example, answer 2 for MDS question B4 could be transmitted as:

OBX|5|CE|2^[[?]] MODERATELY IMPAIRED-decisions poor, cues/supervision required^LN.

Thus, the *Message* would have the sub-syntax *[AQUID] Original_Message*. This *AQUID* would be the identifier at the level of Answer within context of Question, and *Original Message* would be that Answer. Supporting tables within LOINC or elsewhere would maintain the mapping of that *AQUID* to the unique identifiers at the Answer and Question levels, thereby supporting relationships to other vocabularies. Logistically, it may make sense for LOINC to maintain its own unique coding system for *AQUID*. These might then become the Source Attribute Unique Identifier (SATUI) or related code within UMLS.

This approach would not impose any additional burden on instrument authors. They would simply need to create instruments using an approach compatible with the LOINC syntax. The LOINC group would run the algorithms to determine whether the questions, answers, and answers within the context of questions had been previously used; determine the proper *AQUID* for each answer choice, and store the original content and *AQUID* within the AnswerList structure.

This approach also eliminates much of the burden of generating properly formed HL7 messages. The LOINC AnswerList syntax would already include the properly formed OBX-5 segment for the LOINC component of the response. The presence of the *AQUID* would facilitate identification of mappings to other vocabularies.

Such an approach would support the administrative simplification goal. Since LOINC would store unique identifiers for all possible answers to survey questions within the formatted AnswerList syntax, computer systems could retrieve all known semantic matches to those answers within other vocabularies, such as a set of relevant SNOMED codes. The computer system could search for those SNOMED codes within the electronic health record. If some were found, the computer system would then be able to construct proper HL7 messages for that content by concatenating the LOINC AnswerList syntax and the identified SNOMED or related terms as alternate codes. A similar approach could be used to transmit alternate codes for the OBX-3 segment.

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PDF Files Available for This Report

- Main Report <http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT.pdf>
- ATTACHMENT A: BIPA, Sec. 545. Development of Patient Assessment Instruments
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-A.pdf>
- ATTACHMENT B: Encoding Nursing Home Resident MDS Observation and
Assessment Data: Do HL7 Messaging Standards Support its Transmission?
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-B.pdf>
- ATTACHMENT C: Side-by-side depiction of MDSv2 and Content Matching Results
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-C.pdf>
- ATTACHMENT D: Additional Item Matching (emerging MDSv3 items)
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-D.pdf>
- ATTACHMENT E: NLM/UMLS to Maintain Links between LOINC coded Assessment
Question and Answers and Codeable Vocabularies -- An Alternative
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-E.pdf>
- ATTACHMENT F: The specific vocabulary codes that correspond with each of the
standardized vocabulary matches identified in Attachments C and D
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-F.pdf>
- This Attachment is also available as an **Excel** file at:
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT-F.xls>

This full report and links are also available in **HTML** format at:
<http://aspe.hhs.gov/daltcp/reports/2006/MDS-HIT.htm>