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Improving the Adequacy of Semantic Models for Assessment Instruments: Modifying Attribute Ranges of LOINC Semantic Model for the Survey Class

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BACKGROUND

LOINC Semantic Model Background

- Use of standardized assessment instruments is ubiquitous in healthcare
- Vast quantities of assessment related data exist in EHRs
- Assessments like surveys & questionnaires are an important tool to assess health and health status

- LOINC (Logical Observations Identifiers Names and Codes)1 has a semantic model for assessments (the survey class) with more than 12,300 assessment-related concepts

- The LOINC semantic model uses 6 attributes (or "axes") to define concepts
  - **Component**
  - **Property**
  - **Time**
  - **System**
  - **Scale**
  - **Method**

In this study, we evaluated differences in ranges of values used for the survey and laboratory classes, and demonstrate how these can be aligned to improve usability of survey content in LOINC

METHODS

- Using the LOINC User Guide, the descriptions of the range of values to be used for each of the 6 LOINC attributes ("axes") for the Laboratory and Survey classes were compared.
- The specified range of values for each axis of Laboratory versus Survey concepts were classified as either 'consistent' or 'inconsistent'.
- For axes classified as 'inconsistent', a subject matter expert (SME) was asked to assign a value to the axis for 10 concepts.
- A terminologist used the 10 concepts to define the abstract class of values selected by the SME.

RESULTS

- The range of values used in the LOINC semantic model was inconsistent for 2 of 6 (33%) attributes, or axes: component and method.
- The definitions for the range of values for these axes were modified to 'clinical construct' for the component axis, and 'versioned assessment instrument' for the method axis.
- Figure 1 depicts an example application of current and proposed models for a new concept for a version of the *Revised Childhood Anxiety and Depression Scale*. The proposed model enables several use cases currently not possible. Notably, it provides a discrete, machine-readable attribute for the construct measured by the assessment, which is the most consistently requested and intrinsic semantic feature of an assessment.

Current State:
The 'component' and 'method' axes do not use appropriate classes as values

Fully-Specified Name	
Component	Revised Childhood Anxiety and Depression Scale 25 item self-report total anxiety and depression score
Property	Score
Time	Pt
System	^Patient
Scale	Qn
Method	RCADS.Reported

Proposed:
The 'component' and 'method' use appropriate classes as values

Fully-Specified Name	
Component	Major depressive disorder & Social phobia+panic disorder+separation anxiety disorder+obsessive compulsive disorder+generalized anxiety disorder
Property	Score
Time	Pt
System	Emotion^Patient
Scale	Qn
Method	Revised Childhood Anxiety and Depression Scale.25-item. self-report ^Psychometric.CTT

Figure 1: Proposed changes to ranges for LOINC axes when modeling the SURVEY class

DISCUSSION + CONCLUSION

- Use of standardized assessments in ubiquitous in healthcare, yet semantic representations are limited today in utility for clinical care, knowledge discovery, and interoperability.
- Inconsistency in ranges used for key attributes for the survey class prevent end users for accessing the most essential feature of an assessment instrument: the clinical phenomena being measured by the instrument.

A simple proposed modification to the application of the LOINC semantic model to the survey class can address some of these gaps and improve semantic representation

ACKNOWLEDGEMENTS + REFERENCES + CONTACT INFORMATION

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References

1. LOINC Steering Committee, "Users' Guide – Standardized Assessment Measures (Section 10)." https://loinc.org/kb/users-guide/standardized-assessment-measures/