Querying Radiology Appropriateness Criteria from a virtual Medical Record using GELLO

Mor Peleg[1,2] and Daniel L. Rubin[2]

[1]Department of Management Information Systems, University of Haifa, Israel, 31905
[2]Stanford University, Stanford, CA, 94305
morpeleg@mis.hevra.haifa.ac.il; dlrubin@stanford.edu

Abstract. We are representing radiology appropriateness criteria in GELLO and interpreting them against patient data from a vMR

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1. Introduction

The American College of Radiology appropriateness criteria (AC) are evidence-based guidelines to assist referring physicians in making appropriate diagnostic imaging or treatment decisions. 149 AC are found in the National Guideline Clearinghouse (ngc.goc). By employing these guidelines, providers enhance quality of care by choosing the most appropriate procedures. However, as the AC are not in electronic form, it is difficult to ensure they are widely used in practice. Our aim is to encode AC and interpret them against patient data from electronic medical records (EMRs) in order to provide decision support on appropriate imaging or treatments.

2. Methods

We are using HL7's Object-oriented Guideline Expression Language (GELLO) [1] as the language for specifying AC and HL7's Virtual Medical Record (vMR) [2] as a common data model against which the GELLO criteria would be evaluated. GELLO is a standard object-oriented guideline expression language that is vendor-independent and extensible. It is based on the Object Constraint Language (OCL, www.omg.org/ spec/OCL/2.0/) of the Object Management Group (OMG). GELLO can easily be integrated with any HL7 Reference Information Model (RIM)-based data model. A vMR provides an information model for patient data, enabling a guideline-based decision-support system to query a patient's state. HL7 is currently developing the vMR on the basis of the HL7 CareRecord model, which is a refinement of HL7's RIM to support exchange and querying of parts of an EMR.

EMR Patient data would be viewed in a common data model using SQL queries that would convert data from proprietary formats to the vMR schema. This would enable sharing GELLO-encoded AC written against vMR views by different EMRs.

3.   Results

Following is a GELLO criterion for the following AC: "Woman younger than 30 years of age with Palpable Breast Masses". The example uses the v3 RIM.

def: femaleGender : Boolean =
    self.player.oclAsType**(livingSubject).administrativeGenderCode** = 'female'
def: ageThreshold : PhysicalQuantity = '30 years'
def: youngerThan30Years : Boolean= (PointInTime.now() -
    self.player.oclAsType**(livingSubject).birthTime**) < ageThreshold
def: palpableBreastMass : Boolean= self.participation.act.oclAsType
    (observation).value   <-select(code = '268951004 ' and codeSystemName =
    'SNOMED-CT') <-notEmpty()
def: *eligibleForMRIscreening* : Boolean = femaleGender = true and
        youngerThan30Years = true and palpableBreastMass = true

The last variable, *eligibleForMRIscreening*, returns true if the data shows that the patient is female, younger than 30 years, and has a palpable breast mass. The vMR data needed to evaluate this expression is shown in bold. Note that the term palpableBreastMass was specified using a SNOMED code.

4.   Discussion

We examined in detail 30% of the ACs and saw that they could be potentially represented in GELLO. We are now in the process of assessing whether the data that these AC refer to is available in EMRs used at Stanford Hospital.

We are considering two GELLO interpreters that could be used. One is InferMed's GELLO Editor. Its interpreter is under development. It will work with the Care Record model as a vMR and with version 2 of GELLO, which will align with OCL v2.1, which is about to be released by OMG. A second tool that we are considering is Medical Object's GELLO Interpreter. That interpreter works with version 1 of GELLO and with HL7 version 2 and 3 messages.

An alternative approach is to use other expression languages such as GEL or JESS to write the AC using high-level abstractions and map them to simple data items in the vMR views using Knowledge-Data Ontology Mapper [3].

References

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