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Networking and Health Information Exchange

Unit 7b
Supporting Standards for EHR Application

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Unit 7b Objectives

- Understand standards for clinical guidelines
- Understand object-oriented expression language for clinical decision support - GELLO

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Guidelines

- Computer-interpretable guidelines
- Sharing computer-interpretable guidelines
- Guidelines
 - Deliver patient-specific recommendations
 - Integrated with EHRs
 - Automated reminders and alerts
 - Decision support and task management

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Expressiveness

- Ability to express knowledge content of different types of guidelines
 - Structured parts – definitions, recommendations, algorithms
- Decision-support guideline tasks
 - Expressive decision model
 - Specifying work to be performed
 - Data interpretation
 - Generating alerts and reminders

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Comprehensibility

- Guideline visualization and readability
- Complexity management
- Coherence facilitation (e.g., support material)

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Implementation Requirements

- Ease of guideline integration into clinical environments
- Ease of sharing actual specifications

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Guideline Interchange Format (GLIF)

- A format for sharing clinical guidelines independent of platforms and systems
- Based on a object-oriented logical model of concepts
- Has an XML-based syntax
- Is an executable model

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GLIF Model

- Flowchart representation of a temporal sequence of clinical steps
- Guideline has title and author
- Guideline Step
 - Decision step
 - Action step
 - Branch step
 - Synchronization step
 - Patient sleep step

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GLIF Classes

- Action steps: recommendations for clinical actions to be performed
 - E.g., prescribe aspirin
- Decision steps: decision criteria for conditional flowchart traversal
 - E.g., if patient has pain, then ...
- Branch and synchronization steps allow concurrency
- Patient-state sleep: characterizes patient's clinical state

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Three Representation Levels

- Author/viewer level
 - Conceptual flowchart of clinical actions and decisions
 - Aids in human understanding
- Abstract machine representation
 - Can be executed by an interpreter
 - Correctness can be analyzed
- Integration into application environments

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Abstract Machine Representation

- Unambiguous syntax for logical expressions based on Arden Syntax
- All logical expressions & actions refer to defined concepts (medical ontology)
- Allowed values, ranges, and time constraints
- Can be interpreted and analyzed for correctness
 - Syntax, type, and range checking

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Guideline Elements Model (GEM)

- Developed at Yale Center for Medical Informatics
- It is a hierarchical data structure to organize the heterogeneous information contained in practice guidelines
- Includes a XML editor specifically for guideline markup called GEM Cutter

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Structure of GEM

```
<knowledge.components>
<recommendation>
<Conditionals>
  <decision.variable>
    <value>
    <test.parameter>
    <action>
  ...
  <logic>
  ...
<imperative>
  <directive>
  <logic>
  ...
<Definition>
  <Term>
    <Term.meaning>
  <Algorithm>
    <Action.step>
    <Conditional.step>
    <Branch.step>
    <Synchronization.step>
```

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GELLO

- Object-oriented expression language for clinical decision support
- Based on Object Constraint Language
- Used to
 - Build up queries to extract and manipulated data from EHRs
 - Construct decision criteria by building up expressions to reason about particular data features/values such as guidelines
 - Create expressions, formulae, and queries for applications within other HL7 standards

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Expression Language

- Used for specifying decision criteria and deriving summary values
- Provides basic built-in data types, assuming an underlying data model virtual medical record (VMR) that is a refinement of the HL7 RIM
- Major problem to sharing clinical knowledge is lack of common format for data encoding and manipulation

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Example in GELLO

```

Let month : CodedValue = Factory.CodedValue("SNOMED-CT",
"258706009")
Let finding : CodedValue = Factory.CodedValue("SNOMED-CT",
"246188002")
Let azotemia : CodedValue = Factory.CodedValue("SNOMED-CT",
"371019009")
Observation ? exists(code.equal(finding) and value.implies(azotemia)
and effective_time.intersect(ThreeMonthsAgo, PointInTime.NOW)))

```

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Summary

This subunit has discussed guideline representation models. The future of such work is likely to be based on GELLO. Guidelines themselves are very important. Use of guidelines should increase significantly with pressure from meaningful use.

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