Guideline Interchange Format:  
A Representation for Sharable, Computer-interpretable Guidelines

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The GuideLine Interchange Format (GLIF) is a format for sharing computer-interpretable clinical guidelines independent of platforms and systems. GLIF is based on an object-oriented logical model of concepts that can be used to model a guideline, and has an RDF-based syntax. The ability to share guidelines is central to the GLIF methodology. Sharing is supported by: (1) a multi-level representation that facilitates sharing guidelines across different institutions and software applications; (2) a consensus-based multi-institutional process for developing GLIF that involves research groups from Stanford, Harvard, and Columbia Universities; (3) an open process resulting in a product that is not proprietary; and (4) a data model that is designed to support multiple vocabularies and medical knowledge bases.

GLIF version 2 (GLIF2), published in 1998, enabled modeling of a guideline as a flowchart of structured steps, representing clinical actions and decisions. However, the attributes of structured constructs were defined as text strings that could not be parsed, and therefore such guidelines could not be used for computer-based execution that required matching of guideline criteria to patient-specific data.

GLIF3 is a developing version of GLIF, designed to support computer-based execution. GLIF3 builds upon the GLIF2 framework but augments it by introducing several new constructs and requiring a more formal definition of decision criteria, action specifications and patient data.

There are three different levels at which a GLIF3-encoded guideline may be represented. The first is the author/viewer level that models the guideline as a conceptual flowchart of temporally ordered clinical steps, which facilitates human understanding. Different guideline steps are possible. They represent clinical actions, decisions and patient states, as well as branch and synchronization steps that enable concurrency. The model is hierarchical and allows action and decision steps to contain sub-guidelines. This enables the viewer to browse the flowchart at different levels of granularity.

The second representation level is a formal representation of decision criteria and actions that can be analyzed for correctness and executed by an interpreter. In order to support a formal model, GLIF3 uses a formal expression language and a medical domain object model. The formal expression language is a superset of the Health-Level 7 (HL-7) Arden Syntax’s logic grammar that is used by GLIF3 for specifying decision criteria and patient states. GLIF3’s medical domain object model is being designed to enable GLIF3 steps to refer to patient data items that are defined by a controlled terminology. The controlled terminology includes standard medical vocabularies that include concept definitions and codes (e.g., the Unified Medical Language System (UMLS) of the National Library of Medicine) as well as standard data models for medical concepts and their attributes (e.g.,
HL-7’s Unified Service Action Model, which is GLIF3’s default medical domain object model).

The third representation level, which is not supported yet, will represent application-specific mappings and modifications that facilitate integration into application environments. Other features of GLIF3 include a flexible decision model, event-based control flow, and iterations in actions and decisions.

We are using Protégé, a knowledge-engineering environment developed at Stanford Medical Informatics, as a GLIF3 authoring tool. We have added to it feature that enable import and export of GLIF3-encoded guidelines that are devoid of visualization-specific details. Protégé automatically lays out guideline flowcharts that are imported. In order to validate the expressiveness of GLIF3, we are using Protégé to encode several clinical guidelines. These include: (1) Managing Cough as a Defense Mechanism and as a Symptom, a Consensus Panel Report of the American College of Chest Physicians, (2) Prevention and Control of Influenza, of the Advisory Committee on Immunization Practices, and (3) Pharmacologic Treatment of Acute Major Depression and Dysthymia of the American College of Physicians – American Society for Internal Medicine.