

A Three-Layer Domain Ontology for Guideline Representation and Sharing

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GLIF is a representation language that was developed to facilitate sharing of clinical guidelines. The latest draft GLIF version, GLIF 3, aims at enabling guideline specifications to be not only readable, but also computable on virtual machines and able to be integrated into institutional applications [1]. The development of a domain ontology is part of the effort to achieve such goals. The domain ontology is critical to unambiguous representation of guidelines and to sharing of guidelines in diverse clinical information systems environments.

In GLIF, the needs of guideline sharing are classified into three levels [2]. On the conceptual level (level A), guidelines only need to be human-readable. On this level, medical terms are just free text strings that do not need to be encoded. On the computable level (level B), guidelines should be able to run on a virtual machine. To execute a guideline on a virtual machine, we need to distinguish between variable and literal data. When data items are more complex than simple types such as text or numbers, it is important to define data models for sharing purposes. On the implementation level (level C), guidelines are integrated with institutional clinical applications. This requires that the data model and vocabulary used by the guideline be mapped to those used by the institutional applications. On levels B and C, ontological knowledge of the attributes of medical concepts and the relationships among medical concepts that go beyond the representation of basic data fields and concept hierarchy, is highly desirable. With such knowledge, we can perform rigorous type checking, range checking, and semantic checking (e.g., whether an expression refers to meaningful characteristics of a concept).

The support of these ontological needs for guideline modeling is separated into three layers. The first layer, *Core GLIF*, is part of the GLIF specification language. It defines a standard interface to medical data and concepts. Core GLIF ontology defines how medical data and concepts should be referenced by guidelines. It also defines the scope of data items and

how the data items acquire their values. Core GLIF is part of the GLIF specification.

The second layer, *Reference Information Model (RIM)*, is essential for guideline execution and data sharing among different applications and different institutions. It defines a basic data model for representing medical information needed in specifying guidelines. It includes high level classification concepts, such as drugs and observations about a patient, and attributes, such as units of a measurement and dosage for a drug, that medical concepts and medical data may have. GLIF requires the RIM to define a class hierarchy for top-level medical concepts and data attributes for each class of medical concepts.

The *Medical Knowledge* layer consists of two parts: a term dictionary and a domain knowledge base. GLIF supports the use of a Medical Knowledge layer, but does not provide one. Though medical knowledge is very desirable, we can only make limited assumptions about its existence because of its huge scope. Hence, we intend to develop a functional interface from GLIF to medical knowledge bases.

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References

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