# Partners Healthcare Order Set Schema: An Information Model for Management of Clinical Content

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**Summary.** Developed by the Clinical Knowledge Management and Decision Support Group at Partners HealthCare and the Decision Systems Group at Harvard Medical School, the XML-based Order Set Schema presented in this chapter is the result of a broader enterprise-wide knowledge management effort to enhance quality, safety, and efficiency of provided care at Partners HealthCare while maximizing the use of new clinical information technology. We are in the process of deploying the Order Set Schema at two Partners-based, Harvard-affiliated academic medical centers the Brigham & Women's Hospital (BWH) and Massachusetts General Hospital (MGH), Boston, MA, so that existing content in the Computerized Physician Order Entry (CPOE) systems at these two institutions can be successfully extracted and mapped into the proposed schema. In this way, "hardwired" knowledge could be mapped into taxonomies of relevant terms, definitions and associations, resulting in formalized conceptual models and ontologies with explicit, consistent, user-meaningful relationships among concepts to support collaboration, and content management that will promote systematic (a) conversion of reference content into a form that approaches specifications for decision support content; (b) development and reuse of clinical content while ensuring consistency in the information; and (c) support an open and distributed review process among leadership, content matter experts, and end-users. Further, incorporating metadata into our unified content strategy will improve workflow by enabling timely review and updating of content, knowledge life-cycle management, and knowledge encoding; reduce costs and; aid authors to identify relevant elements for reuse while reducing redundant and spurious content. Ultimately, we view our knowledge management infrastructure as a key element for knowledge discovery.

## 1 Introduction

Real-time decision support can be incorporated in Computerized Physician Order Entry Systems (CPOE) to avoid medication errors, dosage errors, and adverse drug interactions, known patient allergies, and to calculate dosages based on patient-specific characteristics, and best practice recommendations for care [1, 2]. CPOE, of course, deals with other kinds of orders, procedures,

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and scheduling requests besides medication orders, and decision support can be useful for these as well. Order Sets (OSs), an important part of CPOE systems, are defined as collections of orderables aimed to improve the organization and quality of the ordering process. Order Sets are structured units of work that provide mnemonic value, convenience and efficiency, and clinical decision support during the ordering process. Sharing OSs can facilitate best practices.

As part of the five ongoing Signature Initiatives to enhance quality, safety, and efficiency of provided care, Partners HealthCare has been focusing efforts on maximizing the use of new clinical information technology. As a result, the Clinical Informatics Research and Development (CIRD) group at Partners HealthCare is leading the development of clinical systems strategies, conducting applied informatics research and development and addressing key issues in Partners enterprise clinical systems, especially those involving complex clinical workflows, usability, controlled terminology, knowledge management, and clinical decision support [3]. This work has been done in collaboration with the Decision Systems Group, a biomedical informatics research and development laboratory at Brigham and Women's Hospital (BWH) (one of the Partners-based, Harvard-affiliated academic medical centers).

The objective of this chapter is to present an OS Schema developed by the Clinical Knowledge Management and Decision Support Group at Partners HealthCare and the Decision Systems Group, and to provide a brief introduction to key issues involved in its implementation. The OS Schema is the result of a broader enterprise-wide knowledge management effort to identify and leverage current clinical knowledge across Partners institutions. This chapter has been divided into five main topics: (a) a brief introduction to knowledge representation and management, including ontologies; (b) a description of the clinical content identified in OSs, (c) an introduction to the main elements of UML, XML Schema, and Health Level Seven (HL7) as the standards we aimed to incorporate in our approach; (d) a complete description of the OS Schema developed; and, finally, (e) a summary of accomplishments.

## 2 Knowledge Representation and Management at Partners Healthcare

Partners Healthcare is a heterogeneous integrated healthcare system that offers patients a continuum of coordinated high-quality, safe, and efficient health care. The clinical information systems that support care across the enterprise are equally heterogeneous; hence, clinical decision support content is of varying composition and structure across Partners [4]. Several clinical information systems have been developed internally by Partners and are currently in place across Partners' hospitals. Such systems consist of a wide variety of clinical applications including a results manager to help clinic physicians