Implementation of a standards-based, CDA-compliant anesthesia record

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Introduction

With the increasing use of anaesthesia information management systems (AIMS) there is the opportunity for different institutions to aggregate and share information both nationally and internationally. Potential uses of such aggregated data include outcomes research, benchmarking and improvement in clinical practice and patient safety. However, these goals can only be achieved if data contained in records from different sources are truly comparable and there is semantic inter-operability. This paper describes the development of a standard terminology for anesthesia and also a domain analysis model and implementation guide to facilitate a standard representation of AIMS records as XML documents that are compliant with the HL7 V3 Clinical Document Architecture (CDA) schema. A representation of vital signs that is compliant with the ISO 11073 standard and convergence with the IHE Technical Framework are also discussed.

Methods

In 2002, the Anesthesia Patient Safety Foundation (APSF) established the Data Dictionary Task Force (DDTF), to develop a standardized anesthesia terminology for use in AIMS. An agreement between APSF and SNOMED International to enhance the anesthesia content of SNOMED CT was signed in 2003. In order to reflect its international membership the DDTF adopted the name International Organization for Terminologies in Anesthesia (IOTA). The group's *modus operandi* was to develop and review top-level headings for the terminology and then to create subsidiary hierarchies of terms of relevance to anesthesia. In all cases, the first stage was to review SNOMED CT content to identify any existing terms that satisfied requirements. Where such matches were found the SNOMED concept description and concept identifier were copied to the IOTA terminology. A terminology editor was built on the Protege ontology editor using the Protege-OWL plugin and a custom plugin (developed by the Department of Computer Science, Manchester University UK). The latter provided a user interface that was optimized for use by clinicians and provided a convenient means to cross-reference terms taken from other classifications. Where terms did not exist in SNOMED CT these were added to the IOTA terminology as native IOTA terms and subsequently submitted to the SNOMED CT Extensions Board for consideration for inclusion in future releases.

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In parallel with this activity the HL7 working group for the Generation of Anesthesia Standards (GAS WG) developed a set of anesthetic use cases and a domain information model and also defined structural aspects of the anesthetic record. The GAS WG worked closely with the HL7 Healthcare Devices WG to define ways in which the ISO 11073 Terminology and Domain Information Model (DIM) could be applied to the representation of vital signs in the anesthetic record. In 2009 the HL7 Technical Steering Committee approved a formal project to develop and publish a CDA Implementation Guide to assist those wishing to create HL7 CDA-compliant anesthetic records.

Results

The IOTA term set now comprises approximately 4,500 terms that it are intended to meet most requirements. Nearly all of these terms are mapped to SNOMED CT. Work continues to increase coverage for some more specialized areas.

A prototype example of an anesthetic record, rendered as a CDA-compliant XML document has been created that reflects a general use case (general anesthetic, repair of aortic aneurysm). This has been used in a pilot project to demonstrate the feasibility of transferring information from an AIMS system to the US National Surgical Quality Improvement Program (NSQIP) database. Work on the representation of vital signs data compliant with the HL7 RIM / CDA and the ISO 11073 DIM is well advanced.

Discussion

It is anticipated that the first draft of an implementation guide for CDA-compliant anesthetic records will be available during 2010. This will also define value sets for the various elements of the record taken from the IOTA terminology. It is hoped that this will facilitate the sharing and aggregation of anesthetic data with consequent improvements in the quality of patient care.

References

Gardner M., Peachey T. A Standard XML Schema for computerised anaesthetic records. Anaesthesia, 2002, 57, pp1174-1182

Walsh JL, Hurrell MJ, Wu H, Tomeh M, Monk T. Mapping Anesthesia Records to Standard Terms Enables Inclusion of AIMS Data in the NSQIP Database. Abstract presented at the American Society of Anesthesiologists Annual Meeting, 2009. New Orleans, LA.