IHE-RO: From System Incompatibility to Clinical Solutions

Charles Able[1], Colin Field[2], Nick Linton[3], Walter Bosch4
1 Wake Forest University School of Medicine, Winston Salem, NC, USA, 2 Cross Cancer Institute, Edmonton, Alberta, Canada, 3 Elekta Impac Software, Kanata, Ontario, Canada, 4 Washington University School of Medicine, St. Louis, MO, USA.

The Radiation Oncology domain of Integrating the Healthcare Enterprise (IHE-RO) is an ASTRO sponsored initiative by healthcare organizations, professionals and industry to improve the way computer systems in healthcare share information. This article is part of our effort to educate all stakeholders, such as Medical Physicists, about the process and tangible results of the IHE-RO.

Introduction

The goal of Integrating the Healthcare Enterprise (IHE) is to enable the sharing and exchange of all information relevant to a patient's care between all healthcare systems thereby eliminating "inter-operability" challenges. Each domain of the IHE (i.e. radiation oncology, radiology, cardiology, laboratory, etc.) has a Planning Committee (PC) and a Technical Committee (TC). Membership on the PC and TC is available to all IHE members. The only requirement for membership in IHE is an organizational commitment to the stated goal, there is no monetary cost to join the IHE. Membership applications are available at **http://www.ihe.net/governance/index.cfm#membership** .

ASTRO sponsors the Radiation Oncology domain of IHE (IHE-RO). Medical Physicists, Radiation Oncologists and representatives from Radiotherapy Medical Equipment vendors form the PC.

The PC for the Radiation Oncology domain or any domain:

- Recruits vendors of relevant information systems and users with clinical and operational experience
- Prioritizes & coordinates domain activities
- Identifies, gathers, reviews and prioritizes integration and information inter-operability problems (**http://en.wikipedia.org/wiki/Use_cases**)
- Selects inter-operability problems based on technical feasibility and effort evaluation for consideration by the TC
- Approves inter-operability problems selected by the TC for the development of solutions
- Develops educational materials for the domain and clinical solutions

The TC includes computer scientists and representatives of the standards working groups as well as Medical Physicists, Radiation Oncologists, and representatives from Radiotherapy Medical Equipment vendors.

The TC for the Radiation Oncology domain or any domain:

- Recruits vendors of relevant information systems and users with technical experience
- Assesses the feasibility and estimated effort of inter-operabillity problems selected by the PC

continued -IHE-RO: From System Incompatibility to Clinical Solutions

- Builds consensus on the appropriate standards-based solutions to a selected inter-operability problem
- Develops Integration Profiles (clinical solutions) to document the technical aspects to resolve the inter-operbility problem in detail
- Maintains the Technical Framework for the domain. The Technical Framework documents all Integration Profiles, which describes the solution to the inter-operability problem. The solution is described in terms of Actors, a system or part of a system that creates, manages or acts upon data; and Transactions, a specific interaction between Actors to exchange information using current established standards.

Inter-operability problems and Clinical Solutions

One of the principal tasks of the PC is to solicit, define and prioritize inter-operability issues as defined clinical incombatility problems (Use Cases). A Use Case is a description of how end-users will accomplish a goal by performing a task or a series of tasks using systems (or software), and includes the responses of the systems (or software) to user actions. Inter-operability problems will be solicted from the radiotherapy community, and "champions" will be selected to present each issue (Use Case). Past, current and future Use Cases are summarized on the IHE wiki at **http://wiki.ihe.net/index.php?title=Radiation_Oncology#Use_Case_Selection**. All Use Cases are prioritized, and the TC evaluates the feasibility and effort required to satisfy a Use Case. Annually, the top 3 Use Cases which are deemed feasible to solve are identified by the TC and approved by the PC. The Use Case is then developed into a clinical solution (Integration Profile) description.

An integration profile provides an implementation guide for equipment vendors, and an effective shorthand for healthcare providers to specify integration requirements when purchasing systems.

continued -IHE-RO: From System Incompatibility to Clinical Solutions

The Integration Profile (clinical solution) describes the clinical information and workflow scenario and also documents how to use established standards (e.g. HL7, DICOM) to accomplish it. A group of systems that implement the same Integration Profile address the Use Case scenario in a mutually compatible way. Public comments are solicted as the final step in the development of an integration profile. A brief summary of completed IHE-RO integration profiles are available at **http://wiki.ihe.net/index.php?title=Profiles#IHE_Radiation_Oncology_Profiles**

Connectathons are annual events hosted by the TC where equipment vendors bring products and test their inter-operability with other vendors against the defined IHE Profiles (clinical solutions). These connectathons require a significant effort by the vendors and the IHE-RO. The efforts of those participating in the connectathon (vendors and committee members) provides the final link to the successful implementation of IHE Integration Profiles. Public Demonstrations are public events which demonstrate IHE Profiles by vendors who have passed the connectathon tests. Public demonstrations have been held periodically at the ASTRO annual meeting.

Summary

The IHE-RO takes on inter-operability problems between healthcare systems in radiation oncology and works to resolve them in a systematic way using established industry standards. The PC solicits inter-operability problems from clinical radiotherapy professionals and transforms them into Use Cases. The TC takes the Use Cases that have been approved and develops an implementation roadmap for vendors that is called an Integration Profile. Once the vendors have implemented the Integration Profile they come together at a Connectathon and demonstate that the inter-operability problem has been resolved.

The IHE-RO is committed to tackling practical clinical concerns. An example currently under consideration is the Structure Template, Creation, Export, and Import Use Case. The use of anatomical structures is pervasive in image based radiotherapy treatment planning and delivery. While the DICOM standard provides a means to represent structure sets associated with image series, inconsistent identification of anatomic structures limits the ability to automate treatment planning and plan evaluation for individual patients. Lack of standardized structure names also makes difficult the comparison of plans among patients, e.g., in registries and clinical trials. Ongoing development of a standardized structure nomenclature by the ATC, RTOG, and other collaborators is an important first step toward consistent and predictable structure identification. To facilitate the practical implementation of such a nomenclature for clinical workflows and clinical trials data analysis, the IHE-RO is working to define a template for communicating structure identifiers across platforms and systems. The use of structure templates for national clinical trials would help improve the consistency of structure delineation for patients on these trials and would increase the efficiency of quality assurance review and analysis of the data submitted. Therefore, this Use Case is one of several practical problems currently being addressed by IHE-RO.

If you are aware of an interoperability issue in the Radiation Oncology domain, please prepare a one page summary of the problem and go to **http://astro.org/Research/ResearchHighlights/IHERO/documents/IHEROsub.pdf** to submit the issue to IHE-RO. Please contact the IHE-RO secretariat or any of the committee co-chairs to submitt a Use Case or if you'd like additional information.