

Annual Report from the RSNA Radiology Informatics Committee for 2009¹

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Over the past year, the Radiology Informatics Committee (RIC) of the Radiological Society of North America (RSNA) achieved some significant milestones toward its goals of promoting education and research in critical emerging technologies and in digital imaging and healthcare information systems, as well as advancing the quality and efficiency of patient care through innovations in technology. In 2009, the RIC benefited from the perfect storm of heightened national interest in healthcare quality, cost, and access combined with the federal promotion and funding of HIT (healthcare information technology) as one of the key solutions to improving the current healthcare system. This year's RIC activities in promoting HIT standards culminated with the RSNA being selected as the recipient of a \$4.7 million National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering (NIBIB) contract to build a secure, patient-centric medical imaging sharing network that is based on open-source principles and open-standards architecture. Under the 2-year contract, RSNA will oversee creation of a Web-based network for sharing images and reports at geographically dispersed sites. Patients will control access to their information through personal health record (PHR) accounts.

This annual report contains detailed summaries about informatics education offered at the 2009 RSNA Annual Meeting, as well as reports from the four RIC subcommittees: Integrating the Healthcare Enterprise (IHE[®]) Subcommittee, Medical

Imaging Resource Center (MIRC[®]) Subcommittee, Reporting Subcommittee, and the RadLex[®] Steering Committee. The activities of these subcommittees span patient care; establishment of national HIT standards for secure sharing of patient information, particularly as they relate to imaging, reporting, and communication; support for education and research; and education of the radiology community about informatics issues.

Although the NIBIB contract award was clearly the most prominent achievement of 2009, it most certainly was not the only highlight of the year. The Reporting Subcommittee made use of RadLex and other technologies to improve diagnostic reporting. RadLex grew dramatically in breadth and impact, and MIRC similarly grew and expanded its impact on clinical trials. The RIC continues to present an exciting refresher course program and workshops at the RSNA Annual Meeting. Other new efforts included creating working groups to address security and quality issues in radiology.

Integrating the Healthcare Enterprise

The IHE Subcommittee, chaired by Dr David Mendelson, made significant progress on several fronts in 2009. Dr Mendelson is also an influential leader in the IHE organization, as he serves as co-chair of the IHE International board.

Abbreviations: caBIG = Cancer Biomedical Informatics Grid, CTP = Clinical Trials Processing, DICOM = Digital Imaging and Communications in Medicine, EHR = electronic health record, HIT = healthcare information technology, IHE = Integrating the Healthcare Enterprise, MIRC = Medical Imaging Resource Center, NIBIB = National Institute of Biomedical Imaging and Bioengineering, ONCHIT = Office of the National Coordinator for Health Information Technology, RIC = Radiology Informatics Committee, TFSS = Teaching File Software Suite

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IHE profiles continue to be adopted as standards for electronic health records (EHRs) by the Office of the National Coordinator for Health Information Technology (ONCHIT) in the United States and by national EHR projects worldwide. IHE International recently completed the process of incorporation, which enables it to form relationships and enter into contracts with other organizations and which boosts its standing as a reference for a variety of HIT implementations worldwide. IHE USA, which focuses on testing and deployment activities domestically, is also in the process of incorporation.

Specifically in the radiology domain, IHE completed several significant achievements. The IHE Radiology Technical Committee updated the XDS-I profile for sharing images and reports to bring it in line with the latest Web Services Internet communication protocols. It also extended the Portable Data for Imaging (PDI) profile, thus improving the compatibility of imaging data exchanged on media by adding new options for the use of digital video disks (DVDs), USB drives, compression, and encryption. It published the Basic Image Review (BIR) profile (which provides baseline specifications for DICOM [Digital Imaging and Communications in Medicine] image viewing applications and which addresses needed features, user interface elements, and minimum systems performance requirements), the MR Diffusion Imaging (MDI) profile, and the CT/MR Perfusion Imaging with Contrast (PIC) profile. The latter profile employed the DICOM Enhanced CT and MR objects to improve consistency in how perfusion and diffusion studies are encoded.

Image sharing by means of using the XDS-I profile was showcased in a demonstration at the 2009 RSNA Annual Meeting. In addition to images, the demonstration highlighted the exchange of reports based on the newly developed RSNA radiology reporting templates (which incorporated RadLex terminology) and incorporated patient dose information from the Radiation Exposure Monitoring profile. The demonstration used much of the same architecture that will be deployed in the NIBIB-funded image-sharing pilot project.

These radiology profiles are all highly relevant to daily practice and radiologists' ability to com-

municate with practitioners of other specialties. Several of the profiles were developed in response to concerns of other specialty organizations, and they represent the desire of radiologists to enhance the delivery of care to patients.

Medical Imaging Resource Center

The MIRC is overseen by Dr Eliot Siegel, as chair, and Dr Adam Flanders, as vice chair. MIRC has evolved over the past year in the formation of two distinct product lines: the Teaching File Software Suite (TFSS) and the Clinical Trials Processor (CTP). This creation of two product lines was the logical evolution for serving the needs of two distinct users: those radiologists whose primary interest is the creation of teaching files and those who require secure sharing of research data sets for clinical trials.

The TFSS has undergone some unique enhancements this year that respond to suggestions from the user community and that improve integration with other RSNA-sponsored initiatives. As an example, the TFSS now more tightly integrates with the RadLex terminology such that RadLex terms are automatically discovered and highlighted in every case submitted to a storage service. The terms can be configured and used as a search point for discovering similar cases. This feature will encourage the user community to employ a common language for tagging educational material that ultimately will bridge disparate collections of information.

The TFSS has also been redesigned to integrate with the popular myRSNA[®] portal, which we envision will be used as a medium to store, tag, and share educational information with other RSNA members. At the 2009 RSNA Annual Meeting, attendees previewed a new feature that will permit users to author teaching materials locally and to "publish" this material easily in their personal myRSNA accounts. The published material will be available for viewing directly on the myRSNA site, where it can be supplemented with additional tags (identifiers) and ultimately shared with other users.

Another exciting MIRC pilot project, whose goal is to enhance the online experience for readers of *RadioGraphics*, is currently underway. In designated articles, readers will be able to select a special link that will launch a MIRC teaching file

browser window, which will contain supplemental case material (eg, additional radiologic images, pathologic images, or documentation), and an interactive portal, which will allow the user to browse the entire image data set, including three-dimensional models. This latter feature aims to transform online journal reading into an experience that more closely replicates the environment of the clinical reading room. The enhancement will help differentiate the online journal experience from that of the traditional journal model by leveraging the multimedia support available with modern browsers. It also may extend the longevity of educational materials, which will be available as teaching file and lifelong learning data sets.

RSNA has continued to make its development contractor, John Perry, available to support the National Cancer Institute in its use of the RSNA CTP software as the primary means to obtain images for the National Biomedical Imaging Archive. John has been responsive to the requirements that have been articulated by the Institute, including improved security, performance optimization, and more direct access to the National Biomedical Imaging Archive database by end users of CTP. The CTP software is also being used in other research applications and clinical trials, including the RSNA's NIBIB-funded image-sharing network.

MIRC outreach to other radiology societies has also been instrumental in raising awareness and building the user community. In addition to the successful series of MIRC refresher courses and user group meetings offered at the RSNA annual meetings, courses and demonstrations have been given at the annual meetings of the American Society of Neuroradiology (ASNR), the Association of University Radiologists (AUR), and the Society for Imaging Informatics in Medicine (SIIM) (the latter involved a unique "plug-fest" environment). The American Board of Radiology (ABR) has also adapted a version of MIRC to administer the oral board examination. Marketing and outreach have led to the worldwide use of MIRC teaching file software. Because MIRC has been built with open-source principles, many sites have created unique adaptations of MIRC software to fit their own individual needs. For example, several provincial universities in China have incorporated an adaptation of MIRC for use in training and examining candidates for their oral board examinations.

During the upcoming year, the MIRC Subcommittee will focus on tighter integration with existing and evolving RSNA informatics initiatives, such as RadLex, structured reporting, and myRSNA.

Reporting Subcommittee

The Reporting Subcommittee is chaired by Dr Curtis Langlotz, with Dr Charles Kahn serving as vice chair. In 2009, the subcommittee made significant progress toward achieving its mission of creating a library of clear and consistent radiology report templates with structured data, including RadLex and other standard terminologies. These report templates will represent best practices that can be adopted and adapted based on local practice patterns.

The RSNA's Reporting Subcommittee, in collaboration with over a dozen radiology subspecialty organizations, recruited 12 template development subcommittees. These subcommittees created an initial set of 68 consensus radiology report templates. The subcommittees followed a consensus process for collaborative authoring by using WebEx meetings, electronic mail, Google groups, and wiki technology (see <http://reportingwiki.rsna.org>). In cooperation with the College of American Pathologists, the Reporting Subcommittee agreed on a standard technical format for publishing templates that used RELAX NG (*REgular LAnguage for XML Next Generation*), a form of XML, and converted the subcommittees' templates into computable form. RSNA drafted a license agreement for the radiology report templates and retained a template librarian to manage what is expected to be a growing library of such templates.

The Reporting Subcommittee also held a Structured Reporting Vendor Forum in which 11 commercial vendors displayed and explained the capabilities of their systems to use reporting templates and to generate structured diagnostic reports. In addition, subcommittee members published four articles related to RSNA structured reporting activities (1–4).

In 2010, the subcommittee plans to increase the number of templates available by continuing the template development process through two

additional cycles. It will develop the online template library into an interactive online searchable database, into which all radiologists can submit their own templates and comment on existing templates. The subcommittee will conduct a workshop to promote the use and evaluation of structured reporting in radiology practice. It also will develop software tools for Web-based authoring, display, and distribution of the structured reports in the library.

RadLex

The RadLex radiology lexicon, overseen by the RadLex Steering Committee chaired by Dr Daniel Rubin, continues to grow, both in the breadth of its coverage and in the range of applications that are using it. Currently, RadLex contains 30,501 entries, which represent all terms, whether primary, synonyms, or foreign equivalents. There are also 834 instances of matching concepts from other knowledge bases (ie, ontologies). RadLex is currently being used by the MIRC, myRSNA, and Reporting Subcommittee projects, as well as by numerous outside services and applications.

In 2009, the RadLex Steering Committee undertook a major initiative to augment the neuroanatomic content of RadLex. The work was funded by NIBIB, with the goal to produce useful content in RadLex that would enable a biomedical research paradigm. Working with the team from the University of Washington School of Medicine, the committee harmonized the neuroanatomic axis of RadLex with the Foundational Model of Anatomy (FMA) (5), bringing into RadLex the rich ontologic structure of FMA. At the same time, the committee incorporated major anatomic labeling schemes, such as the Talairach atlas, FreeSurfer, Anatomical Automatic Labeling (AAL), and NeuroLex. With this information, researchers can use RadLex to annotate functional neuroimaging data sets and to analyze them at varying levels of anatomic granularity.

In addition to this new content development, RadLex was reviewed by the National Cancer Institute to identify possible errors or other problems. The review resulted in many general corrections, such as removing misspellings and rectifying erroneous structures or relations. RadLex also underwent a Silver compliance review by the caBIG (Cancer Biomedical Informatics Grid) and its Vocabulary and Common Data Elements (VCDE)

Workspace and was designated to be Silver compliant for value domains. Eventually, when RadLex incorporates more definitions, it will be eligible for consideration of full Silver compliance status. RadLex has been adopted by the caBIG Annotation and Image Markup project.

A large effort to create a set of standard names of “orderables” and procedure steps (the “chargemaster project”) for radiography, CT, and MR imaging was undertaken, and a draft has been delivered with the goal of release at the 2010 RSNA Annual Meeting. This work has attracted a great deal of interest from the U.S. Department of Defense and Veterans Health Administration, who are interested in adopting it for standardizing the naming of their procedures. In addition, funding for additional work on this project for other modalities and for mapping it to Current Procedural Terminology (CPT) codes may be available from the Department of Defense.

The RSNA identified a staff developer to help with continued technical development to support RadLex, such as creating scripts to automate bringing new content into RadLex and maintaining and extending its Web distribution. In addition, a new version of RadLex is now being distributed by the National Center for Biomedical Ontology (NCBO) BioPortal.

Agreement was reached with the American College of Radiology (ACR) to incorporate the BI-RADS (Breast Imaging Reporting and Data System) into RadLex and to work cooperatively with the BI-RADS committee in creating the RadLex breast imaging terminology. A chair for the breast imaging subcommittee has been appointed and is recruiting members for the subcommittee.

Goals for RadLex in 2010 will be to embark on a second year of funding from NIBIB, to add definitions to RadLex terms, and to continue work on the chargemaster project (to be extended to the domains of nuclear medicine, interventional radiology, and ultrasonography). The breast imaging subcommittee will be constituted, and work on incorporating the BI-RADS into RadLex will begin.

Informatics Education

At its 2009 Annual Meeting, the RSNA continued to provide a full spectrum of informatics education, with courses that have evolved to meet needs of practicing radiologists, researchers, and educators. The 2009 informatics refresher courses consisted of four tracks with a total of 32 courses.

Two tracks (26 and 30) used a traditional didactic format, and two others (53 and 54) were

held in a workshop setting. The didactic tracks were renamed to better reflect their content. Track 26, “radiology informatics in clinical practice” (co-organized with the Society of Imaging Informatics in Medicine), contained eight courses related to topics that arise in the daily practice of radiology, including four new courses: “Communicating Results,” “Advanced Visualization,” “Enterprise Imaging,” and “Image Management of New Acquisition Modalities.” Track 30, “imaging informatics for clinical, research, and educational enterprises,” included eight courses on research or education topics, as well as some clinical topics concerning the overall specialty, with two courses being new: “Electronic Teaching Files” and “IT Management for Radiologists.” The latter was presented in a highly interactive format, piloting new features of RSNA’s online audience response system.

Courses for the workshop tracks (53 and 54) were held in computer laboratories, with one to three attendees seated in front of each of 24 computer workstations. In this format, attendees followed along with interactive exercises presented by the instructor, and roaming proctors helped individual attendees with problems. Track 53 is an introduction to applications for three-dimensional visualization. A new feature of this track was the utilization of multiple software vendors who provide thin-client platforms. Each of the four courses in this track covered applications for a different anatomic region: gastrointestinal and genitourinary imaging, vascular imaging, neuroimaging, and cardiac imaging. Track 54 offered four introductions to software or Internet resources helpful to radiologists.

Finally, 24 unique informatics “out-of-band” courses were held at RSNA 2009, some of which were repeated for a total of 34 sessions throughout the week. New courses offered this year included “Quantitative Medical Imaging for Clinical Research and Practice,” “Research and Discovery: Online Databases at Your Fingertips,” and “Using myRSNA: Hands-on Workshop.”

Conclusions

As we look to the future, the RIC has two primary strategic concerns: (a) “telling” the RSNA informatics story to the RSNA membership and to the wider community and (b) continuing to participate meaningfully and with appropriate recognition in national HIT activities. The RIC committee members are working with RSNA staff to develop messages that capture the value

of RSNA informatics projects for practicing radiologists: for example, the simple tagline, “solutions for quality and efficiency.” The committee is also making a judicious attempt to work with the American College of Radiology and other selected organizations to harmonize and coordinate its efforts and to present a united front for radiology before the ONCHIT and other federal agencies established to deploy the EHR.

In appointments to the RIC, we strive to maintain a balance between well-established radiology informatics experts and outstanding researcher-practitioners early in their careers. Our committee and subcommittee members contribute selflessly and tirelessly to RIC projects. This year, no one contributed more than David Mendelson, whose work was instrumental in winning the NIBIB image-sharing contract.

Over the years, the RIC (and its previous incarnation, the Electronic Communications Committee or ECC) have benefited from the support, leadership, and direction of the RSNA Board of Directors and the dedicated efforts of the RSNA staff. Most recently, Drs Gilbert Jost, Burton Drayer, and Ronald Arenson have devoted their vision and talents to the goals of the RIC, efforts that are deeply appreciated by the committee and subcommittee members.

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