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QRR005

DICOM4QI Demonstration and Connectathon: Structured Communication of Quantitative Image Analysis Results Using the DICOM Standard

Participants
Andriy Fedorov, PhD, Boston, MA (*Presenter*) Research support, Siemens AG
Lauren J. O'Donnell, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Daniel L. Rubin, MD, MS, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
David A. Clunie, MBBS, Princeton, NJ (*Abstract Co-Author*) Owner, PixelMed Publishing LLC; Consultant, Carestream Health, Inc; Consultant, CureMetrix, Inc; Consultant, MDDX Research & Informatics; Consultant, General Electric Company; ;
David Flade, DIPLENG, Feldkirchen, Germany (*Abstract Co-Author*) Employee, BrainLAB AG
Marco Nolden, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans Meine, Bremen, Germany (*Abstract Co-Author*) Nothing to Disclose
Chris Hafey, San Diego, CA (*Abstract Co-Author*) Employee, StatRad, LLC
Erik Ziegler, MSc,PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Paul Wighton, PhD, Chelsea, MA (*Abstract Co-Author*) Employee, CorticoMetrics LLC
Dirk Smeets, PhD,DIPLENG, Leuven, Belgium (*Abstract Co-Author*) Employee, icoMetrix NV
James L. Reuss, PhD, Elm Grove, WI (*Abstract Co-Author*) Employee, Prism Clinical Imaging, Inc ; Stockholder, Prism Clinical Imaging, Inc
Christian Herz, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Justin Kirby, Bethesda, MD (*Abstract Co-Author*) Stockholder, Myriad Genetics, Inc
Jayashree Kalpathy-Cramer, MS, PhD, Charlestown, MA (*Abstract Co-Author*) Consultant, Infotech Software Solution
Michael Onken, Oldenburg, Germany (*Abstract Co-Author*) CEO, Open Connections GmbH;
Joerg Riesmeier, Oldenburg, Germany (*Abstract Co-Author*) Consultant, J. Riesmeier
Gordon J. Harris, PhD, Boston, MA (*Abstract Co-Author*) Medical Advisory Board, Fovia, Inc; Member, IQ Medical Imaging LLC; Member, Precision Imaging Metrics LLC; ;
Steve D. Pieper, PhD, Cambridge, MA (*Abstract Co-Author*) CEO, Isomics, Inc; Employee, Isomics, Inc; Owner, Isomics, Inc; Research collaboration, Siemens AG; Research collaboration, Novartis AG; Consultant, Harmonus; Research collaboration, gigmade
Ron Kikinis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

andrey.fedorov@gmail.com

BACKGROUND

Accurate and unambiguous communication of derived image-related information is critical for the emerging applications of quantitative imaging (QI), such as disease assessment, evaluation of treatment response and image-guided therapy. Digital Imaging and Communications in Medicine (DICOM) is the standard supported ubiquitously by commercial imaging devices that can be used to describe such information in a structured and coded form harmonized with the data generated by the modalities. DICOM defines both communication interfaces and data formats for images and image-related information (including measurements, regions of interest (ROIs) and segmentations). While a variety of DICOM object types exist for describing derived image-related information, thus far they have found very limited acceptance both in the academic community and among the manufacturers of radiology workstations implementing QI analysis methods. As a result, longitudinal tracking, comparison of methods, and secondary analyses are challenging, while applying QI for analyzing patient image data is difficult or impossible to perform across different platforms. DICOM4QI is a collaborative demonstration and connectathon established at RSNA 2015 QIRR. Its mission is to raise awareness of the importance of standardized communication of QI data and the relevant capabilities of the DICOM standard, and to increasing adoption of DICOM in communicating QI analysis results in a structured and interoperable manner.

METHODOLOGY/APPLICATION

We will demonstrate and evaluate support for communication of the following objects defined in the DICOM standard: The DICOM Segmentation image object (SEG) represents a classification of pixels in one or more referenced images. Among other capabilities, SEG provides unambiguous specification of the anatomy being segmented using structured terminology. The DICOM Parametric Map object (PM) can be used to encode floating-point pixel maps of derived parameters, such as results of pharmacokinetic analysis of Dynamic Contrast-Enhanced MRI, or modeling of the Diffusion-Weighted MRI (DW-MRI). The DICOM Structured reporting template 1500 (SR-TID1500) can be used to communicate measurements calculated over an image region defined by, for example, volumetric segmentation. The DICOM Tractography results object (TR) can be used to encode brain white matter tracts estimated from the DW-MRI data.

DEMONSTRATION STRATEGY

This exhibit will continue and further expand the scope of the prior QIRR exhibits at RSNA 2015 and 2016, and will have the components described below: The Software demonstration component will provide live demonstrations of publicly available QI analysis workstations (such as 3D Slicer, MITK and ePAD), as well as live and/or recorded demonstrations of the capabilities of commercial products. The Community repositories demonstration component will discuss relevant DICOM datasets available publicly in repositories, such as the NCI Cancer Imaging Archive (TCIA). The Connectathon component will demonstrate how sample validated reference DICOM QI objects can be interpreted by the participating workstations. We will provide a publicly available collection of objects (SEG, PM, SR, TR) produced by the participating workstations. We will also provide a status update on the parallel effort of developing mechanisms and tools to support conversion between certain types of Annotation Image Markup (AIM) documents and SR-TID1500. The Educational component will provide in-depth coverage of the capabilities provided by DICOM related to QI support in the form of a poster. The Tool inventory component will share a publicly accessible catalog of the software

tools that support DICOM applied to QI. All of the results of the connectathon will be publicly available online at https://qiicr.gitbooks.io/dicom4qi/. Compared to DICOM4QI 2016, we will introduce the following updates to the connectathon: Expand the scope by discussing and demonstrating new a new type of relevant DICOM object (TR). Emphasise clinically relevant applications of QI by demonstrating longitudinal evaluation of findings (e.g., evaluation of lesion response to treatment). Demonstrate how DICOM QI objects can be used to generate human-readable summary documents. Introduce new user-level workflows in 3D Slicer to support longitudinal evaluation of changes. In addition to the tools participating last year (3D Slicer, Brainlab, MITK), we will also present new tools and workstations (CorticoMetrics, Prism Clinical Imaging, OHIF) — both freely available and commercial — that support the relevant DICOM object types.

REFERENCES AND PUBLICATIONS

Fedorov et al. (2016) DICOM for quantitative imaging biomarker development: a standards based approach to sharing clinical data and structured PET/CT analysis results in head and neck cancer research. PeerJ 4:e2057 https://doi.org/10.7717/peerj.2057

Meet-the-Experts Schedule:

Monday 12:15pm - 1:15pm Tuesday 12:15pm - 1:15pm Wednesday 12:15pm - 1:15pm

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Daniel L. Rubin, MD, MS - 2012 Honored EducatorDaniel L. Rubin, MD, MS - 2013 Honored Educator