LesionTracker
Open Source Oncology Web Viewer
Funded through NCI ITCR U24 Program

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Mass General / HMS
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In 2004, Dana-Farber/Harvard Cancer Center (DF/HCC) investigators were struggling to get reliable, timely, protocol compliant image assessments.

TIMC was created to provide:

- Protocol adherence
- On time results
- Ease of use for staff
- Metrics and analytics
- Fiscal tracking
- Audit support
Overview of TIMC

- Founded in 2004 and co-directed by Drs. Harris and Vanden Abbeele at DF/HCC (5 hospitals)
- Approved as NCI Shared Resource in 2006
- Performs over 10,000 clinical image analyses per year
- Manages over 700 active clinical trials
- Self-sustaining through Core chargeback revenue

Visit http://www.tumormetrics.org for more information
Need for Clinical Trial Informatics

- Trial requirements are growing in complexity
  - Not just RECIST anymore; over a dozen criteria
  - Modifications to standard criteria are common
- Adequate clinical trial imaging review/reporting tools usually only available to Clinical Research Organizations (CROs)
- Need the ‘right assessment for the right scan at the right time’
Precision Imaging Metrics

System was developed to address the need to manage:

- Trial/patient registration and image assessment requests
- Demanding requirements for turnaround time
- Work lists, results reporting, and protocol compliance
- Communication between radiology and oncology

Visit http://www.precisionmetrics.org
Metrics Manager

Integrated image application built on open-source PC platform
In use for ~5 years but starting to show its age

**Pros**
- Replaced manual measurement entry
- Improved efficiencies
- Implemented response criteria conformance checks

**Cons**
- Deployment is challenging
  - All clients need to be updated for each release
  - IT involvement to install software, configure DICOM connections and firewall exceptions
- Only compatible with Windows
- Must be on hospital network
Open Health Imaging Foundation (OHIF)

- Established ~1 year ago as US 501(c)3 non-profit foundation
- Aims to produce enterprise-grade, open-source medical imaging software

Visit http://ohif.org/
LesionTracker

- Quantitative imaging package optimized for oncology clinical trials workflow
- Funded by PAR-13-294 grant for Advanced Development of Informatics Technology (U24)
  - NCI Cooperative Agreement

Visit http://lesiontracker.ohif.org
Goals for LesionTracker Grant

Create a vendor-neutral, extensible zero-footprint image viewer for display and oncology analysis of DICOM images

- **Zero-footprint**: Web-based viewer using HTML5/CSS3/Modern JavaScript
- **Secure**: Roadmap to be HIPAA and 21CFRPart11 compliant
- **Reliable**: Implement software best practices and QMS
- **State-of-the-art**: Performance & functionality expected in modern imaging viewers
- **Developer-friendly**: Standalone study list and viewer package with API to allow easy integration with third-party sites/software
- **Open**: Commercially permissive software license (MIT) developed on GitHub with open Jira instance
User Management

Authentication

Audit Trails

Sign In.

Tumor tracking in your browser.

Your Email

Password

Sign In

NEED AN ACCOUNT?

FORGOT PASSWORD?

Open Health Imaging Foundation

Search User 2016-03-31 2016-04-08 Created

2016, Apr 07, 12:54 PM
Trinity Urban viewed record 1.3.6.1.4.1.25403.345050736522.5748.201603211115147.11 in the Study collection, regarding patient Liver.

2016, Apr 07, 10:09 AM
Matt Rowe viewed record 1.3.6.1.4.1.25403.345050736522.5748.201603211115147.11 in the Study collection, regarding patient Liver.

2016, Apr 06, 02:07 PM
Rob Lewis viewed record 1.3.6.1.4.1.25403.345050736522.5748.201603211115147.11 in the Study collection, regarding patient Liver.

2016, Apr 06, 00:28 AM
Ali Hassanabadi viewed record 2.16.640.1.113669.632.251.300013.20120309124512.1 in the Study collection, regarding patient CHENNINENG.

2016, Apr 05, 02:09 PM
Gordon Harris viewed record 1.3.6.1.4.1.25403.345050736522.5748.201603211115147.11 in the Study collection, regarding patient Liver.
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Architecture

- **Cornerstone** (https://github.com/chafey/cornerstone): JavaScript library to display interactive medical images including but not limited to DICOM
- **Meteor** (https://www.meteor.com/)
- Full stack JavaScript (i.e. both client/server)
- Reactive UI rendering
- **Flexible MongoDB** (https://www.mongodb.com): schema-less database for easy development
Clinical Meteor Collaboration

- Set of packages for User Management, Compliance, Form-based trial features
- 21CFRPart11 and HIPAA Compliance is on roadmap
- Verification/Validation testing

http://clinical.meteor.com/
PACS Connection Protocols

To retrieve metadata:
- DICOMWeb: Query based on ID for DICOM Objects (QIDO)
- DICOM message service element (DIMSE) protocol

To retrieve files:
- DICOMWeb: Web Access to DICOM Objects (WADO)
- Developed against Orthanc (http://www.orthanc-server.com)
- Tested with Orthanc and dcm4che (http://www.dcm4che.org)
Roadmap

In-Progress
- Hanging Protocol support
- Improved study list
- User Management support

Upcoming
- User Interface Design
- Integration with Slicer
- Improved oncology support
- QMS/Compliance
Compliance

- **Jira**: Issue Tracking
- **Zephyr**: Test Management
- **Qualio**: QMS Software to manage SOPs, approvals, training, etc.
- **Risk Management**
Integration with 3D Slicer

Benefits:
- Slicer has an extensible plug-in architecture
- Support for vast repository of tools
- Active developer community

Goals:
- Roundtrip Client-Server segmentation
- Server-side 3D rendering

https://www.slicer.org
ITCR / QIN potential collaborations

- QIICR / ePad: DICOM-SR, DICOM-SEG, AIM (Fedorov / Rubin)
- 3D Slicer (Pieper)
- Radiomics (Aerts)
- Pathology (Saltz)
- TCIA (Pryor)
- Challenges (Jayashree)
- XNAT (Marcus)
Team

MGH
- Gordon Harris
- Olga Kulay
- Matt Leary
- Trinity Urban

Collaborators
- Aysel Afsar
- Chris Hafey
- Rob Lewis
- Evren Ozkan
- WeiWei Wu
- Erik Ziegler
Thanks!

Any questions?

You can contact me at gjharris@partners.org