LEVERAGING WEB-BASED MODULAR TECHNOLOGIES TO ENHANCE MEANINGFUL USE OF EHRs

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Topics for Discussion

- Applying new modular health information technology to current workflow to measure outcomes in cancer patients in an academic medical center
- The use of modular technologies in other Meaningful Use data sets
- Discuss the perceive and documented benefits and physician adoption rates associated with patient-centered data collection and communication
- Coordinating care team responses with meaningful analysis of outcomes data
Radiotherapy Workflow / Process Overview

- Multidisciplinary review
  - Radiation oncologists, medical oncologists, surgeons, pathologists, radiologists review imaging, lab reports, and medical history
- Patient immobilization and imaging for radiation treatment planning
- Treatment target and normal tissue delineation
- Treatment planning
- Patient setup for treatment and plan verification
- Radiation treatment
- On treatment review
- Post treatment follow-up
Simplified Radiotherapy Process

CT SIM → CT → TPS → LINAC → RT-EMR
Detailed Radiotherapy Process

Typical RT dataset/patient includes DICOM Images, Plan, and Dose (300 M byte - 4 G byte)
The Radiation Oncology Patient Portal (ROPP) provides a patient with authenticated and authorized access to a set of patient specific reports and alerts for Meaningful Use as required by the ARRA HITECH Act.

**Patient Portal Attributes:**
- **Secure Patient Login** - patient can login to the portal from a computer outside the enterprise.
- **PRO Completion** - Patients can complete QoL assessments in their secure portal. Assessments can be delivered at specified time points (i.e. pre-treatment, 3 month, 6 month, 12 month, etc).
- **Reminders & Messaging** – triggers set by the provider will send email/SMS text alerts and reminders to the patient and medical team
- **Registration / Health History** - Patients can provide registration and health history information.

An integrated EHR and integrated Medical Team & Patient Portal system enables:

- **Pharmacy, Lab Results, Procedure Eligibility** - data access.
- **Treatment Summary and Relevant Education Materials** - meeting ARRA requirements.
- **Clinical Trials** - Visibility of appropriate ongoing clinical trials, clinical trial matching.
- **Connectivity to remote/home monitoring systems**.
- **Reminders, messages and forms** - triggered based on data values.
- **Data analysis and trends** – on medical team side, patient-level reporting.
### Radiation Oncology Patient Portal: Use Cases / Meaningful Use Criteria

**ARRA HITECH: Act Core Measure (15 Must Be Met)**

<table>
<thead>
<tr>
<th>Measure</th>
<th>ROPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Record Patient Demographics</td>
<td>X</td>
</tr>
<tr>
<td>2. Record Vital Signs &amp; Chart Changes</td>
<td></td>
</tr>
<tr>
<td>3. Maintain Up-To-Date Problem List &amp; Active Diagnosis</td>
<td></td>
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<tr>
<td>4. Maintain Active Medication List</td>
<td>X</td>
</tr>
<tr>
<td>5. Maintain Active Allergy Medication List</td>
<td>X</td>
</tr>
<tr>
<td>6. Record smoking status for patients 13+ yrs old</td>
<td>X</td>
</tr>
<tr>
<td>7. Provide Clinical Summary / Hosp. Discharge Instructions</td>
<td>X</td>
</tr>
<tr>
<td>8. On Request, Provide ePHR</td>
<td></td>
</tr>
<tr>
<td>9. Generate &amp; Transmit ePrescriptions</td>
<td></td>
</tr>
<tr>
<td>10. Computer Provided Order Entry (CPOE) for Medications</td>
<td></td>
</tr>
<tr>
<td>11. Implement Drug/Allergy Interaction Check</td>
<td>X</td>
</tr>
<tr>
<td>12. Implement Prov./Pt. Exchange of Clinical Information</td>
<td>X</td>
</tr>
<tr>
<td>13. Implement &amp; Track One Clinical Decision Support Rule</td>
<td></td>
</tr>
<tr>
<td>15. Report Clinical Quality Measures to CMS / State</td>
<td></td>
</tr>
</tbody>
</table>

**ARRA HITECH: Act Menu Measure (7 of 12 Must Be Met)**

<table>
<thead>
<tr>
<th>Measure</th>
<th>ROPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Implement Drug Formulary Check</td>
<td></td>
</tr>
<tr>
<td>2. Incorporate Lab Results in Structure Data Format</td>
<td>X</td>
</tr>
<tr>
<td>3. List Patients by Condition for Quality Improvement, Research</td>
<td></td>
</tr>
<tr>
<td>4. Identify Patient-Specific Resources and Provide to Patients</td>
<td>X</td>
</tr>
<tr>
<td>5. Perform Medication Reconciliation Between Care Settings</td>
<td>X</td>
</tr>
<tr>
<td>6. Provide Summary of Care Record for Patients Referred</td>
<td>X</td>
</tr>
<tr>
<td>7. Submit Electronic Immunization Data to Registries</td>
<td></td>
</tr>
<tr>
<td>8. Submit eSyndromic Surveillance Data to Public Health Agencies</td>
<td></td>
</tr>
<tr>
<td>9. For Hospitals Record Advance Directives</td>
<td></td>
</tr>
<tr>
<td>10. For Hospitals, Submit eLab Data to Public Health Registries</td>
<td></td>
</tr>
<tr>
<td>11. Send Reminders to Patients for Preventive/Follow-Up Care</td>
<td>X</td>
</tr>
<tr>
<td>12. Provide Patients with Timely ePHR Access</td>
<td>X</td>
</tr>
</tbody>
</table>

* Highlighted Measures represent those that can benefit from connectivity with or use of a ROPP.

**ARRA HITECH Act Meaningful Use Core and Menu Measures can be found at: [http://healthit.hhs.gov](http://healthit.hhs.gov).**
Patient Portal / Interoperability for Collecting & Aggregating Outcomes Data

National Radiation Oncology Registry (NROR)*
(Disease Site-specific CRO and PRO Data Elements for Each Patient)
Web-based Data Entry / Reporting Template

Data elements independently validated by clinical team

PQI (PAAROT)
OCER
EHR / PHR (Health Vault, Google Health...)
PQRI (Compliance and Quality Reports)

Data element “X”

URL Redirect
RT-PACS
RT-EMR (MOSAIQ, ARIA...)
Clinician Portal (CRO)

PQRI (Compliance and Quality Reports)

ROPP can facilitate the development of a National Radiation Oncology Registry (NROR). ROPP use case will allow abstraction of NROR data elements from RT_EMR, patent/clinician portal and generation of quality reports. ROPP use case is an essential step to achieve “Meaningful Use” of RT-EMR.

*Courtesy IEEE Computer Society; August, 2010; Palta, Frouhar, Zlotecki
Layered Patient Portals in Care Continuum

Radiation Oncology Patient Portal facilitates longitudinal collection of PRO data (HRQoL data)

Layered Patient Portals

(Temporal)

- Pre-treatment Patient Portal
  - Education material, facility info., intake data forms, medical record posting

- On-treatment Patient Portal
  - Appointments, medications, medical test results, alerts & reminders, adverse reaction reporting, etc.

- Post-treatment Patient Portal
  - HRQoL instruments for longitudinal studies, toxicity reporting; rule and role-based communication and feedback

Patient-level data may be exchanged between patient, provided coordinated care team and PHR (e.g. HealthVault, Google Health)

*Courtesy IEEE Computer Society; August, 2010; Palta, Frouhar, Zlotecki
Radiotherapy Data Abstraction for Outcome Studies and EHR

RT Data profile
(Disease Site-specific CRO and PRO Data Elements for Each Patient)
Web-based Data Entry / Reporting Template

PQI (PAAROT)
OCER
EHR / PHR (Health Vault, Google Health...)
PQRI (Compliance and Quality Reports)

RT Data profile

URL Redirect
RT-PACS
RT-EMR (MOSAIQ, ARIA...)

Patient Portal (HRQoL)
Clinician Portal (CRO)

Data element “X”

Data element “∗”

*Courtesy IEEE Computer Society; August, 2010; Palta, Frouhar, Zlotecki

Data elements independently validated by clinical team
RCET Infrastructure

1. **RCET Database**
   - Web Based Electronic Folder & Rapid Review Tools
   - RCET Server
   - SOANS
   - Reviewer PC

2. **RCET Server**
   - NetSys
   - NetSys Image Reader
   - NetSys DICOM-RT Server
   - Imaging Device
   - Film Scanner

3. **Clinic PC**
   - NetSys
   - Images
   - DICOM
   - DICOM-RT
   - RTOG

   - Visualize (2D 3D), DVH, Iso-dose, Cutplane, etc.
   - Case info
   - Review
   - Modify Structures
   - Annotate
   - Etc.

- **External Database**
Performs Auto Archiving of Submitted Case Data

Allows Fast Multi User Internet Access

Data Authoring and Versioning (DAV) control keeps track of authors and changes to the data

The database is designed to overcome network bandwidth limitations and allow future growth
This component is best understood in analogy with Picture Archiving Computerized Systems (PACS)
The SOANS deals with any data object encountered in radiation therapy
The SOANS is protocol centric in data organization
The SOANS supports secure encrypted data transfer across a wide area network (WAN)
The SOANS provides the interface between the database and the client applications
The SOANS can be queried for data objects based on any of their database attributes (similar to PACS)
A thick client application

Allows Preparation and Submission of Radiotherapy and Diagnostic Imaging Data

DICOM Server and Image Interpreter imports

Performs Anonymization of Patient Data

Views Are Set for Rapid Web Review
Allows review of Data Prepared with the NetSys PC Client: JPEG snapshots of the originals
Viewing of CT, MR, Port Film, DRR, DVH, scanned images, and Radiotherapy Plan
Accessible Seconds After Submission
Secure WAN Multi User Access

A thin client application
Rapid Image Viewer

- Displays diagnostic and treatment verification images
- Images are organized in an electronic folder
• Data exchange and reporting to data registries to meet ARRA HITECH Act Stage 1 and forthcoming Stage 2 & 3 Requirements.
Based on a user’s role (i.e. physician, researcher, nurse, or other medical team member will be able to:

- **Patient Account & Consent Management** - create, access, update, send/receive messages.

- **Update Patient Portal Data** - schedule modifications, medications / refills based on patient request.

- **Set patient specific alerts**

- **Send / Receive Quality Alerts** - triggered by roles, metrics, tasks and form completion & outcomes data collection, toxicity grades, lab results & related adverse events and messaging are necessary for quality care and treatment.

- **Generate Quality Metrics Reports** - including identifying QA performed on behalf of patient, e.g. IMRT QA or lack thereof and real-time national quality benchmark data.
Radiation Oncology &
Coordinated Care Team
Patient Workflow
1) Patient logs on to their secure, web portal.

2) Completes CCR, outcomes assessments and forms at specific time points.

3) Receives reminders for forms completion, appointments.

4) Secure 2-way messaging for appt / refill requests & needs.

5) Ability to view/store labs, imaging.

6) Receive Treatment Summary (CCR/CCD) and Treatment Pathway follow-up reminders / educational material.
Data Cascades Between EMR / VTOC Forms
Roles & Rules-Based Alerts

Set / Send Alerts & Triggers from Discreet Form Data
Includes Form Sharing Library & Best Practice Templates
Data ‘cascades’ between EMR and VTOC portal system for form auto-completion and reporting, including:

- VTOC forms data from Registration, H&P, Toxicity QoL forms
- Roles-based forms completion.
- Rules-based notification
Scheduled Data Export to EMR

- Mapping / Crosswalk of VTOC forms & files
- Auto-export to EMR via HL7 message w/ Document Type
Radiation Oncology Quality Reporting by Disease Type

EMR Connectivity for Aggregate Quality Measures Dashboard with National Benchmark Data & Reporting/Filters on a Department Level
Patient-Level & Aggregate Reporting

- Patient Lists by Diagnosis / Self-Generated Reporting Queries for Clinical & QoL data.
- Demographic, Procedure & Diagnosis Data Filters w/ Excel® export.
• **5,000+ Patients** - with OTV and long-term QoL data including: IPSS, EPIC, IIEF

• **1,000+** patients actively using patient portal
  
  o 80% online participation
  
  o 90%+ want to keep using it long-term
  
  o Average age: 60+ yrs old

• VTOC Cancer Center sites nationally include:
  
  o UF Shands / UFPTI
  
  o UPENN
  
  o ProCure Treatment Centers
  
  o Henry Ford
  
  o UCSF
  
  o UCLA / Athena Breast Cancer Registry
  
  o ASTRO PAAROT National MOC Quality Reporting Program

• Other Results Include:
  
  o 6 Peer Reviewed Abstracts
  
  o 30% post-treatment quality of life
  
  o 30% missed canceled
  
  o RTOG 0828 (20 Sites) Measuring: Form Completion/Quality, Patient Compliance & Alerts
Clinical Team / Patient Paperless Workflow
- Registration, H&P, PROs, eCRFs, CCR/CCD delivered to patient for Treatment Summary

Alerting & Reporting
- Layer on top of EMR & Practice Management Systems for collecting QoL and toxicity data sent via email/SMS text as actionable triggers

Integration
- Data Extraction & Mapping
- HL7, XML, CSV Connectivity

Web & Mobile Access
- Providers, Patients, Registry Admin

Messaging, Compliance & Education
- Clinical templates deliver and collect information

Large Scale Data Capture & Analytics
- Community connectivity
ROPP: Overarching Data Exchange

NHIN Direct: Point-to-Point Patient-Level Data Exchange Model
That may be used for the ROPP

* Courtesy of Office of the National Coordinator for HIT (ONC): [http://healthit.hhs.gov](http://healthit.hhs.gov)