Modernizing VA Legacy Healthcare IT:
RAPTOR Project
(Radiology Protocol Tool Recorder)

Jonathan Medverd, MD
Staff Radiologist, PSHCS
Seattle, WA
Jonathan.Medverd@va.gov
Disclosure

- No financial interests

Gratitude:

- VA Center for Innovation
- SAN Business Consultants, Rockville, MD
RAPTOR

Radiology Protocol Tool Recorder (RAPTOR)

• Developed through VA Center for Innovations

• Decision Support & Workflow tool
  ✓ Safety
  ✓ Quality
  ✓ Efficiency
  ✓ Compliance
Objectives

Radiology Protocol Tool Recorder (RAPTOR)

❖ Why RAPTOR?

❖ What is RAPTOR?

❖ Expected results?

❖ Implications for VA legacy healthcare IT Modernization
Advanced Medical Imaging
- CT  |  MR  | Nuclear Med

Compliance requirement
- Protocol assignment mandate (Joint Commission)
- Workflow documentation (best practices)

Reality requirements
- Efficient ("invisible" work value, therefore undervalued)
- Accuracy important (optimize information)
- Responsibility (accountability & documentation)
VA Form 519a

Date: MAR 15, 2011 09:26 Page 1

Requested: ECT CHEST W/CONT (CT Detailed 71260)

Procedure Message:
- Current Results (within past 14 Days) for BUN & CREATININE Required.
- IF BUN IS BELOW 60, PLEASE ORDER NUCLEIC.

Request Status: PENDING (P)

Requester:
Tel/Page/Doc/Page:

Attend Phys/Curr:
Prim Phys/Curr:
Tel/Page/Doc/Page:
Prim Phys At Order:

Date/Time Ordered: Jan 07, 2011 11:42 am by
Date Desired: Feb 07, 2011

Reason for Study: Lung cancer
Clinical History:
surveillance follow up

Date Performed:
Technologist Initials:
Interpreting Phys. Initials:

Comments:

Case No.: No Case No.
Number/Size Films:

VA Form 519a-ADP

12.7
5.9
1.2
5.9
9.6
1.2
5.9

Department of Veterans Affairs
Poll Question

How long does it take to progress from advanced medical imaging order placement to completed protocol using existing paper system?

• A) 4 Minutes
• B) 4 Hours
• C) 4 Days
• D) 4 Weeks
R A P T O R - Objective

_convert paper-based work flow for advanced medical imaging (CT, MR, Nuclear Med) to an optimized web-based tool_

Leverage _existing_ VHA Information Systems

Simultaneous improvements:
- Productivity
- Quality
- Safety
Tailored electronic environment

- Display and coordinate functionality of information and resources needed to make rapid, informed protocol decisions & actions; facilitate communication
- Capture these medical events reliably and retrievably
Current Paper 519a Form

Current CPRS order & exam workflow supported in RAPTOR web form

Radiologist & Technologist comments captured

Additional patient safety checks & contraindications

RAPTOR
RAPTOR – Worklist
## RAPTOR – Worklist

### Screen Shot

#### RAPTOR Worklist Interface
- **Study**: Magnetic Image, Thoracic Spine
- **Urgency**: Routine
- **Transport**: Ambulatory
- **Patient Category / Location**: Outpatient
- **Workflow Status**: Not Implemented
- **Assignment**: Not Implemented
- **Scheduled**: 2014-4-17 @ 1000

#### Additional Studies
- **Study**: CT Sagittal Coronal Oblique Reconstruction
- **Urgency**: Routine
- **Transport**: Ambulatory
- **Patient Category / Location**: Outpatient
- **Workflow Status**: Not Implemented
- **Assignment**: Not Implemented
- **Scheduled**: 2014-5-12 @ 1300
RAPTOR – Worklist SORTING
RAPTOR - Workflow

**Protocol**
- Active order is assigned then selected.
- Hydration, contrast, informed consent & sedation based on case.
- Radiologist or Resident reviews and approves the protocol.

**Examination**
- Technologist acknowledges protocol.
- Actual hydration, contrast & sedation and radiation are noted.
- Exam is completed.

**Interpretive**
- Radiologist reviews actual vs. planned.
- Post-examination observations are noted.
- Quality Control is noted for completed exams.
### R A P T O R – Protocol Page

<table>
<thead>
<tr>
<th>Tracking ID</th>
<th>Case ID</th>
<th>Procedure</th>
<th>Image Type</th>
<th>Requested By</th>
<th>Patient Location</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>407</td>
<td>Not Implemented</td>
<td>CT ABDOMEN W/O CONT</td>
<td>GENERAL RADIOLOGY</td>
<td>ZZPROGRAMMER, TWENTY TWO</td>
<td>RADIOLOGY MAIN FLOOR</td>
<td>Not Implemented</td>
</tr>
</tbody>
</table>

**Ordered/Due Date:** APR 01, 1993@09:18:37  
**Patient Category:** OUTPATIENT  
**Reason for Study:** NOT ENTERED  
**SSN:** 666612546  
**Transport:** AMBULATORY  
**Urgency:** ROUTINE

**Patient Name:** ZZZRETFOURFORTY, PATIENT  
**Age:** 79  
**Clinical History:** NOT ENTERED  
**DOB:** 04/07/1935  
**Gender:** M

---

1. At risk for contrast. Acute Renal Impairment.  
2. Image guided exam contraindicated due to the use of Metformin.

### Order Overview

- **Requested By:** ZZPROGRAMMER, TWENTY TWO
- **PCP:** Unknown
- **Attending:** Unknown
- **Requested Study:** CT ABDOMEN W/O CONT
- **Reason For Study:** NOT ENTERED

### Medications

- **Med:** (see medications detail)
- **At Risk:**
- **Status:**

### Vitals

- **Temperature:**
  - Date: 03/17, 03/19, 03/21

### Protocol Name

- **CT Chest without IV contrast (normal, low dose):**
  - A standard protocol from the hospital’s radiology notebook.

### 2nd Protocol Name

- **Select a second protocol only if more than one is needed for this study.**

### Hydration

- **None**
- **Oral:** 500cc H2O over 2hr pre-scan + post-scan
- **IV:**

### Sedation

- **None**
- **Oral**
- **IV**
RAPTOR – Pre-populated Template
RAPTOR – Custom Text
Pre-population Options
Contraindication details

RAPTOR will compare the patient’s Allergy list against a set of user configurable key words to identify patients with a past history of adverse reaction to imaging contrast agents. If RAPTOR identifies a match, then RAPTOR will flag with user configurable message that consent is required.
Protocol suspended
Vitals tab
Labs tab
RAPTOR – Features

- Tracks entire Protocol Workflow
  - Who did what, when
- Detect “at-risk” drug interactions
- Detect need for informed consent
- Contraindications are acknowledged
- Monitor radiation dose history
- Protocol Library maintained
- RAPTOR can be used throughout the workflow
  - Protocol, Examination and Interpretation phases
### R A P T O R – Before & After

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Before RAPTOR</th>
<th>With RAPTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Paper</td>
<td>Web-based, paperless</td>
</tr>
<tr>
<td>Level of Interoperability</td>
<td>Lowest – paper or scanned paper</td>
<td>Highest – Computational electronic data</td>
</tr>
<tr>
<td>Patient Identifiable Information</td>
<td>Poor (if any) security control</td>
<td>Role based authentication</td>
</tr>
<tr>
<td>Collaboration, communication</td>
<td>Handwritten, Fax or phone</td>
<td>Automated into workflow</td>
</tr>
<tr>
<td>Work distribution</td>
<td>Stacks of paper manually distributed</td>
<td>Entire worklist process is automated with business priorities set by configurable rules</td>
</tr>
<tr>
<td>Records Management</td>
<td>Shred or scanned</td>
<td>Entire process is recorded for management review and reporting</td>
</tr>
</tbody>
</table>
RAPTOR – Expected Benefits

- Improve clinical decisions & patient care
- Replace inefficient paper-based processes
  - No lost paperwork
  - No duplication of paperwork (and effort)
  - No vague documentation of responsibility
- Improve radiologist & department productivity/efficiency
- Benefit medical appropriateness
- Benefit patient safety
- Audit patient consent

…the future of VA legacy healthcare IT modernization?
New development takes too long to deliver
  • Multi-year release cycle is normal
New technology/ideas integration takes too long
Dated technology, needlessly complex
Maintenance, installation and operations difficult
Unanimous panel recommendation for migration to an openly architected, modular, and standards-based platform

Focus on delivering an evolved VistA that is open architected and non-proprietary in design

Based firmly upon the work that has come before

- Harness powerful core of software and business processes embedded within VistA
- Apply modern computing architecture
  - Modular, Extensible
- Fully leverage VA’s investment in VistA

Achieve an interoperable EHR (e.g. DoD, VA)
4.1.5 Ancillary Services

Improvements to ancillary systems such as laboratory, pharmacy, and radiology solutions will provide enhanced support of laboratory, pharmacy, and imaging functions that allow pathologists, pharmacists, radiologists, and associated technicians to more efficiently follow best practices. These enhanced ancillary services will also enable more robust CDS for clinicians, allowing them to provide improved quality, safety, efficiency, and satisfaction in healthcare for Veterans, Service members, and their dependents.
Modernization – RAPTOR Approach

- Open architecture; modular, standards-based platform
  - e.g. Linux, Apache, MySQL, PHP (“LAMP stack”)

- Open source tools
  - e.g. Drupal CMS

- Reuse existing components/services
  - e.g. Web Services
    - VA Medical Domain Web Services (MDWS)
RAPTOR Open Architecture

RAPTOR Users

- Data Adapters
- Web Services
- VistA Data record

- Drupal
- PHP
- Apache

Open DBMS
Open Source – Benefits

- **Innovation Opportunities**
  - using building blocks
  - using abstraction layers

- **Modification & Extension Opportunities**
  - build on existing resources
  - replacement of volatile things simplified

- **Value Opportunities**
  - lower cost (e.g. zero or minimized licensing fees)
  - more options
  - reduced proprietary lock-in risks
  - easier integrations
RAPTOR demonstration – an opportunity for VA and other US government agencies

VA Integrated Platform for Enterprise Radiology (VIPER); currently a concept

• Achievable
  ✓ Read-Write interactivity with VistA
  ✓ Integration of additional modules (e.g. scheduling, radiology information system (RIS) functions, imaging modality interfaces, etc.)
  ✓ Targeted interactivity to de-silo the info and resources
  ✓ Build from what works and is familiar

• Hugely facilitated by open source
Thank You

VIReC Clinical Informatics CyberSeminar
June 17, 2014

Modernizing VHA Legacy IT:
RAPTOR Project
(Radiology Protocol Tool Recorder)

Jonathan Medverd, MD
Jonathan.Medverd@va.gov