



# **Radiology Module with DCM4CHEE**

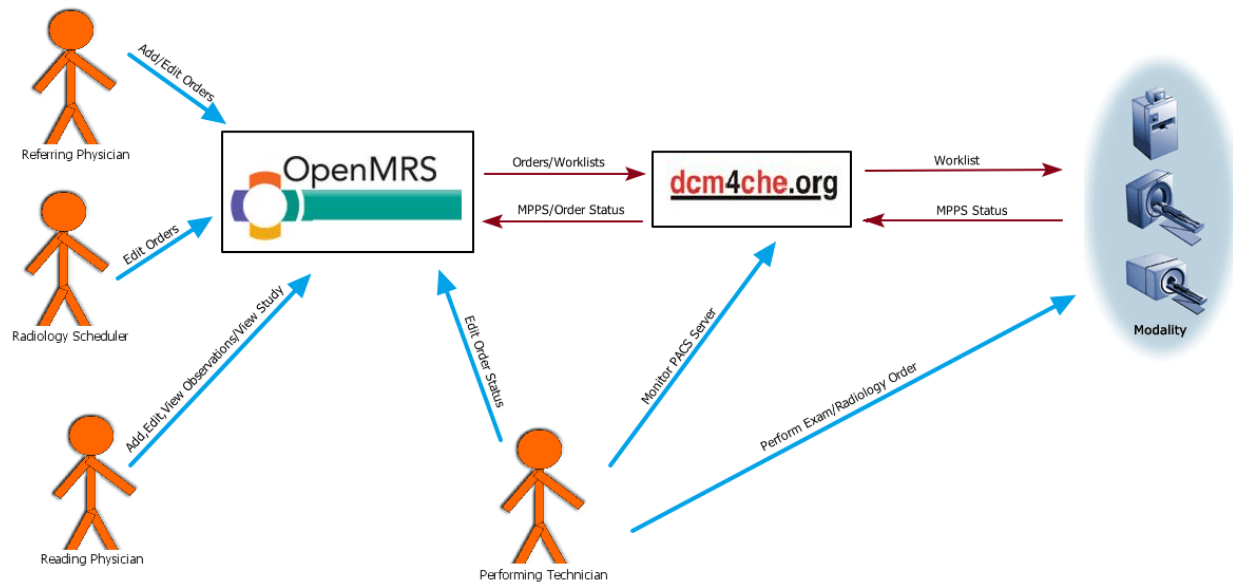
## **User Guide**

**Akhil Ravindran**  
**Mentor : Dr. Barry Levine**

## Table of Contents

<b>OVERVIEW .....</b>	<b>3</b>
<b>NOTES.....</b>	<b>4</b>
<b>MANAGE RADIOLOGY ORDERS.....</b>	<b>4</b>
<b>PATIENT DASHBOARD – VIEW RADIOLOGY SECTION .....</b>	<b>5</b>
<b>ROLES PERSPECTIVE.....</b>	<b>9</b>
ADMINISTRATOR/SUPER USER.....	9
REFERRING PHYSICIAN .....	11
RADIOLOGY SCHEDULER.....	13
PERFORMING TECHNICIAN .....	15
READING PHYSICIAN.....	17
<b>RADIOLOGY MODULE WORKFLOW USING DVTK MODALITY EMULATOR .....</b>	<b>24</b>

## Overview



The radiology workflow contains a number of users, each with their own dedicated tasks and interactions with specified parts of the system:

- Physicians have the ability to add/edit radiology orders and view studies/images from completed orders while diagnosing a patient.
- Orders can be scheduled at an appropriate by time personnel in charge of allocating orders.
- Radiologists/Specialists can view the study to evaluate the image and provide their diagnoses.
- The orders are stored in dcm4chee as modality worklists via HL7 and can be retrieved by modalities by requesting them from dcm4chee.
- The status of the order being performed will be updated in dcm4chee and in turn OpenMRS during each phase of the procedure.
- The images will be stored in dcm4chee within their appropriate study details which can be viewed using DICOM image viewers such as Oviyam 2.0 and Weasis.
- Physicians interact with only OpenMRS.
- Hospital personnel who manage scheduling, resource allocation interact with OpenMRS and dcm4chee.
- Lab technicians control their station and its corresponding modalities while needing to access dcm4chee and OpenMRS only if there are irregularities in communication between the various systems.

## Notes

- Run DCM4CHEE, OpenMRS and the DVTK Modality Emulator.
- **NOTE:** The modality emulator runs only on Windows.
- **NOTE:** If the module has trouble starting up due to port errors or java socket problems.
  - **Start Tomcat or Jetty with the following parameters.**  
`-Djava.net.preferIPv4Stack=true`
- Google Chrome is preferred browser for viewing images via Oviyam.
- Java Web Start is necessary to launch Weasis from the browser.

## Manage Radiology Orders

- Go to OpenMRS → Administration → Manage Radiology Orders.
- Radiology Orders can be added directly from this screen.
- All radiology orders are listed chronologically by default with options to rearrange the table in ascending/descending order based on any column in the table.
- Search for specific orders based on patient or range of dates as to when order was scheduled to take place.
- Hide certain columns in the table that are not necessary.
- Click on the corresponding entry number in the 'Edit' column to view and edit order details.
  - Ability to edit depends on user permissions and privileges.
  - If a reading physician views the order, it redirects to the order's observation form page.

The screenshot shows the OpenMRS web application interface. At the top, there is a navigation bar with links for Home, Find/Create Patient, Dictionary, and Administration. Below this, the main heading is "Manage Radiology Orders" with a sub-link "Add Radiology Order". A search form is present with fields for Patient, Start Date, and End Date, and a "Find" button. Below the search form is a table of radiology orders. The table has columns for Edit, Patient Id, Patient Full Name, Priority, Referring Physician, Scheduler, Performing Technician, Reading Physician, Order Start Date, Modality, Status, Instructions, and DCM4CHEE Modality Worklist Sync Status. Three orders are listed, with the first one highlighted. The footer of the page contains language options and version information.

Edit	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L. Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	SCHEDULED COMPLETED	testing_again	In Sync : Save order successful.
2	101-6	Mr. Horatio L. Hornblower Esq.	HIGH	Super User	Super User	Super User	Akhil Ravindran	2013-11-18 00:00:00.0	Computed Radiography	SCHEDULED IN PROGRESS	Testing_2	Out of Sync : Void order failed. Try again!
3	100-8	Mr. John D Patient	STAT	Super User	Super User	Super User	Super User	2013-11-22 00:00:00.0	Magnetic Resonance	SCHEDULED IN PROGRESS	asdfg	In Sync : Save order successful.

## Patient Dashboard – View Radiology Section

- Goto OpenMRS → Find Patient → Patient Dashboard (for specific patient) → Radiology
- It will list the radiology order history for that respective patient.
- Radiology orders can be added from this screen which will redirect you to the add radiology order form.
- Every orders observation and their corresponding images/studies can be viewed from this interface.
- If an order is completed, observations can be added provided the logged in user has privileges.

# OpenMRS Radiology Module

The screenshot shows the OpenMRS patient dashboard for Mr. John D Patient. The patient's information includes age (38 yrs), birth date (01-Jan-1975), and identification number (100-8). The dashboard has several tabs: Overview, Regimens, Visits, Demographics, Graphs, and Radiology. The Radiology tab is currently selected and highlighted with a red box. Below the tabs, there is a link to "Add Radiology Order" and a section titled "Patient Radiology Orders" which currently displays "No Radiology Orders Present."

This screenshot shows the same patient dashboard but with a radiology order present. The "Add Radiology Order" link is still visible. The "Patient Radiology Orders" section now contains a table with one entry. A red box highlights the "View" link in the first column of the table, with a red arrow pointing to it.

View Obs.	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions
<a href="#">1</a>	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED Unknown	<a href="#">Sample Order</a>

# OpenMRS Radiology Module

The screenshot shows the OpenMRS patient dashboard for Mr. John D Patient. A dialog box titled "Radiology : Order Observations" is open, displaying "Radiology Observations" for the patient. The patient's information includes "Person : Mr. John D Patient" and "Order : 60". A message states "No Radiology Observations Present." Below the dialog, a table lists radiology orders with columns for View Obs., Priority, Referring Physician, Scheduler, Performing Technician, Reading Physician, Order Start Date, Modality, Status, and Instructions. The first entry is highlighted with a red box around the number '1' in the 'View Obs.' column.

View Obs.	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions
1	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED Unknown	Sample Order

This screenshot shows the OpenMRS patient dashboard for Mr. John D Patient, specifically the "Patient Radiology Orders" section. The patient's BMI is calculated as 100.0 kg and height is 22.0. The "Radiology" tab is selected. The table below shows a single radiology order with the status "COMPLETED", which is highlighted with a red box. A red arrow points to the "1" in the "View Obs." column of the first row.

View Obs.	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions
1	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	COMPLETED	Sample Order

# OpenMRS Radiology Module

OpenMRS - Patient Dashboard: localhost:8080/openmrs/patientDashboard.form?patientId=3&phrase=john

OpenMRS  
Home | Find Patient | Dictionary | Administration

Mr. John D Patient  
38 yrs (01-Jan-1975)  
OpenMRS Identification Number: 100-8  
Old Identification Number: 100

BMI: ? (Weight: 100.0 kg, Height: ) CD4: 22.0 | Regimen:

Overview | Regimens | Visits | Demographics | Graphs | Radiology

Add Radiology Order

**Radiology : Order Observations**

Radiology Observations

Person : Mr. John D Patient  
Order : 60  
Study Results : [View Study](#)

[Add/Edit Observations](#) ← Redirects to Add/Edit Observations Page

Previous Observations

Id	Reading Physician	Location	Observation Date	Question Concept	Value	Comment
102	Reading Physician	Unknown Location	2013-12-03 00:00:00.0	REVIEW OF SYSTEMS, CARDIOPULMONARY	<a href="#">View</a>	Sample Observation

OpenMRS - Patient Dashboard: localhost:8080/openmrs/patientDashboard.form?patientId=3&phrase=john

OpenMRS  
Home | Find Patient | Dictionary | Administration

Mr. John D Patient  
38 yrs (01-Jan-1975)  
OpenMRS Identification Number: 100-8  
Old Identification Number: 100

BMI: ? (Weight: 100.0 kg, Height: ) CD4: 22.0 | Regimen:

Overview | Regimens | Visits | Demographics | Graphs | Radiology

Add Radiology Order

**Radiology : Order Observations**

Radiology Observations

Person : Mr. John D Patient  
Order : 60  
Study Results : [View Study](#)

[Add/Edit Observations](#)

Previous Observations

Id	Reading Physician	Location	Observation Date	Question Concept	Value	Comment
102	Reading Physician	Unknown Location	2013-12-03 00:00:00.0	REVIEW OF SYSTEMS, CARDIOPULMONARY	<a href="#">View</a>	Sample Observation

**Observation**

Id: 102  
Encounter: None  
Location: Unknown Location  
Observation Date: 03-Dec-2013  
Question Concept: REVIEW OF SYSTEMS, CARDIOPULMONARY  
Value: SHORTNESS OF BREATH  
Comment:   
Created By: Reading Physician - 03-Dec-2013



## Roles Perspective

### Administrator/Super User

- Has the ability to change/edit all the fields related to a Radiology Order and Study along with the ability to add a new order which is complete. The Super User can also add observations to the order but by going through Patient Dashboard to view the order's observations. An order can be added from Patient Dashboard as well.

The screenshot shows the OpenMRS web application interface. The browser address bar indicates the URL is localhost:8080/openmrs/module/radiology/radiologyOrder.form. The page header includes the OpenMRS logo and navigation links: Home, Find/Create Patient, Dictionary, and Administration. A status bar indicates the user is logged in as Super User with links for Log out, My Profile, and Help.

The main content area is titled 'Admin | Manage Radiology Orders' and 'Order'. The form contains the following fields:

- Patient:  Enter patient name or [More Information](#)
- Related Concept:  Enter concept name or (Optional)
- Priority:  Select
- Scheduled status:  Select
- Performed status:  Select
- Modality:  Computed Radiography
- Instructions:
- Related Encounter:  Enter encounter id, patient name or id (Optional)
- Orderer:  Enter user name (Default value is logged in User)
- Start date:  (dd/mm/yyyy)
- Auto-expire date:  (dd/mm/yyyy)
- Scheduler:  Enter user name
- Performing Technician:  Enter user name
- Reading Physician:  Enter user name

A 'Save Order' button is located at the bottom of the form.

At the bottom of the page, there is a footer with the following text: English (United States) | English (United Kingdom) Last Build: 2013-12-02 14:00 Version: 1.9.3 Build f535e9 Powered by OpenMRS

[Admin](#) | [Manage Radiology Orders](#)

**Order**

Patient	<input type="text" value="John D Patient"/> <a href="#">More Information</a>
Related Concept	<input type="text" value="FRACTURE"/> (Optional)
Priority	<input type="text" value="STAT"/>
Scheduled status	<input type="text" value="SCHEDULED"/>
Performed status	<input type="text" value="Select"/>
Modality	<input type="text" value="Computed Tomography"/>
Instructions	<input type="text" value="Sample Order"/>
Related Encounter	<input type="text" value="Enter encounter id, patient name or id"/> (Optional)
Orderer	<input type="text" value="Referring Physician"/> (Default value is logged in User)
Start date	<input type="text" value="03/12/2013"/> (dd/mm/yyyy)
Auto-expire date	<input type="text" value="04/12/2013"/> (dd/mm/yyyy)
Scheduler	<input type="text" value="Scheduling Physician"/>
Performing Technician	<input type="text" value="Performing Technician"/>
Reading Physician	<input type="text" value="Reading Physician"/>
Created By	Scheduling Physician - 03 December 2013 14:03:52 PST

Discontinued date	<input type="text" value=""/> (dd/mm/yyyy)
Reason discontinued	<input type="text" value="Enter concept name"/> <span style="color: red;">← Enter Concept for discontinuing order</span>

Void Reason	<input type="text" value=""/>
-------------	-------------------------------

↑  
Text Input

[Admin](#) | [Manage Radiology Orders](#)

**Previous Observations**

[Show/Hide](#)

<u>ID</u>	<u>Reading Physician</u>	<u>Location</u>	<u>Observation Date</u>	<u>Question Concept</u>	<u>Value</u>	<u>Comment</u>
72	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	
78	Akhil Ravindran	Unknown Location	2013-11-20 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	edit2
81	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	edit3
84	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	edit4
85	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	addnew
87	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	ZXcvxcvbnmnb
88	Akhil Ravindran	Unknown Location	2013-11-14 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	qwerty 12
93	Akhil Ravindran	Unknown Location	2013-11-15 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	edit 3344
94	Akhil Ravindran	Unknown Location	2013-11-15 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	qwaeq
96	abc zyx	Unknown Location	2013-11-19 00:00:00.0	CHILDS CURRENT HIV STATUS	<a href="#">View</a>	test different user

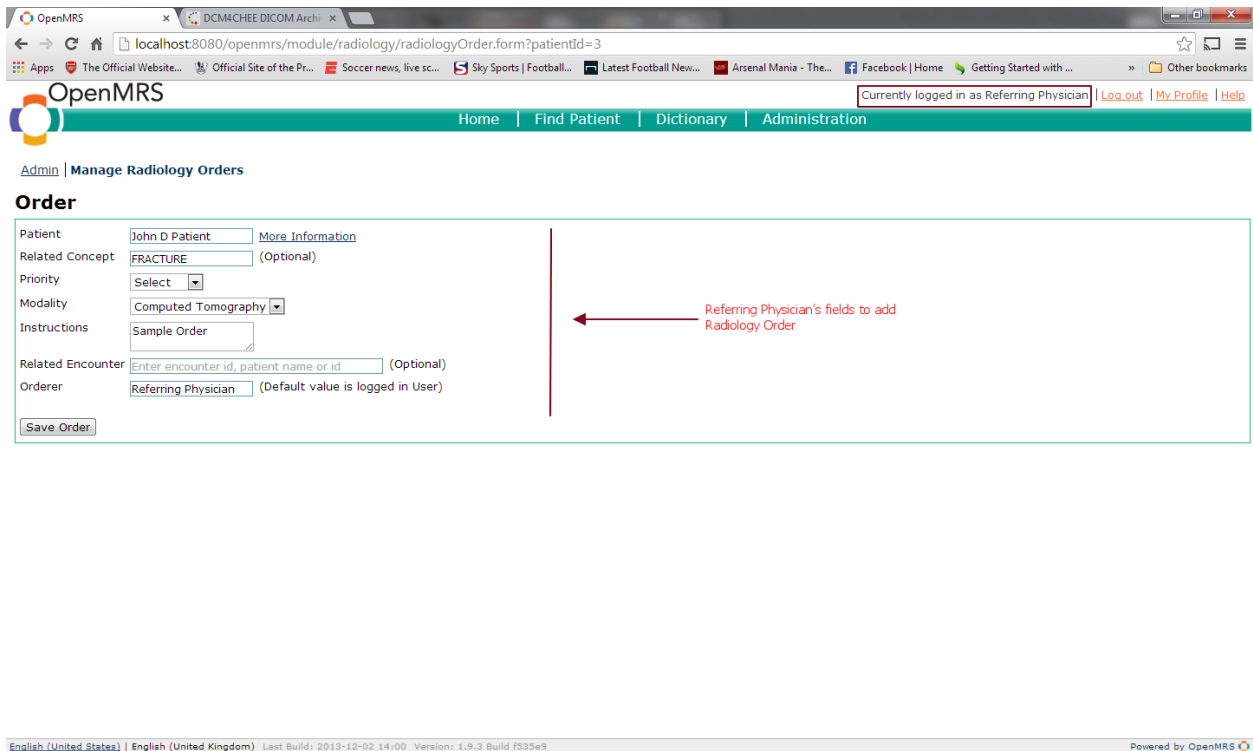
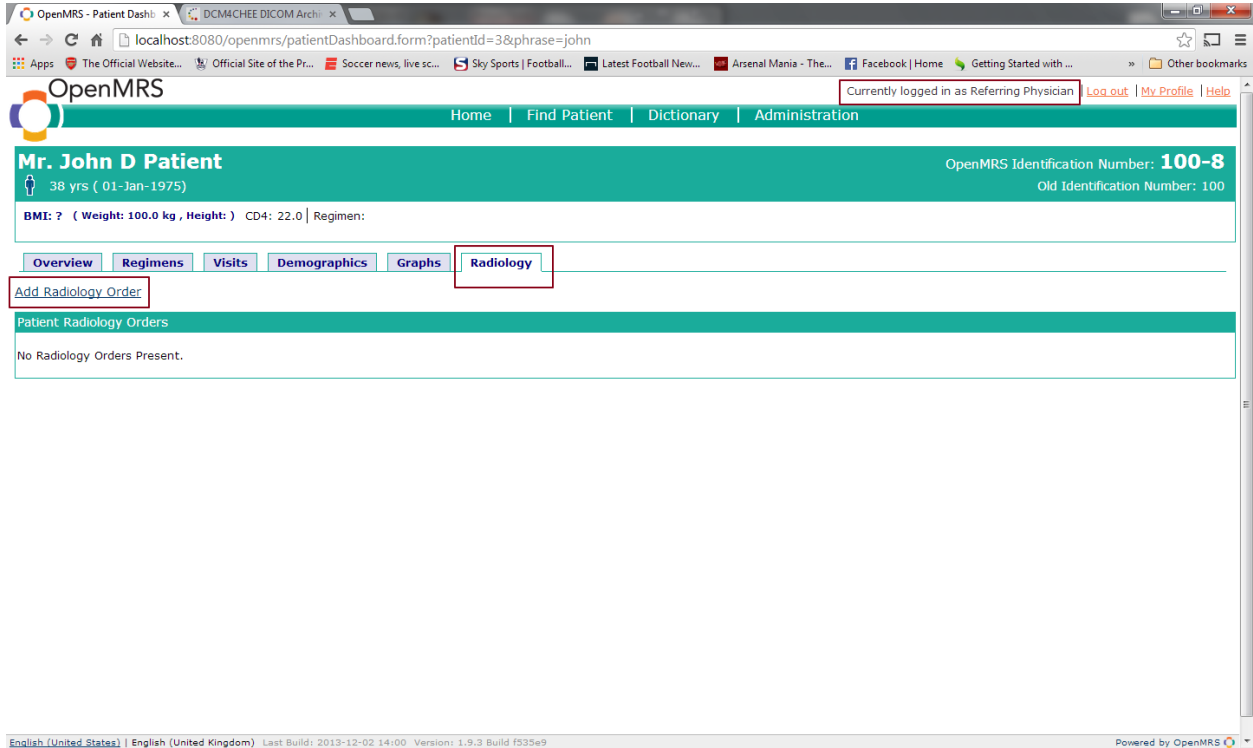
[Add Observation](#)

**Observation**

Person	<input type="text" value="Horatio L Hornblower"/> <a href="#">More Information</a>
Encounter	<input type="text" value="Select"/>
Order	<input type="text" value="30"/>
Location	<input type="text" value="Select"/>
Observation Date	<input type="text" value=""/> (Format: dd/mm/yyyy)
Question Concept	<input type="text" value="Select"/>
Comment	<input type="text" value=""/>
Study Results	<a href="#">View Study</a>

## Referring Physician

- Has the ability to add orders with relevant information needed to perform the order from *Manage Radiology Orders* or *Patient Dashboard*.



# OpenMRS Radiology Module

OpenMRS  
Home | Find Patient | Dictionary | Administration

Order saved

Admin | Manage Radiology Orders

## Manage Radiology Orders

Add Radiology Order

Worklist Clear Results

Patient:  Start Date:  End Date:

Show 20 entries Search:  Show/Hide Columns

Edit	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	SCHEDULED COMPLETED	testing again	In Sync : Save order successful.
2	100-8	Mr. John D Patient	STAT	Referring Physician					Computed Tomography	Unknown Unknown	Sample Order	In Sync : Update order successful.

Viewing 1 - 2 of 2 first Previous 1 Next last

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F335e9 Powered by OpenMRS

Note : The below screenshot reflects the order's information in the *Patient Dashboard* after the scheduler has entered scheduling and reading physician information.

OpenMRS - Patient Dashb... Currently logged in as Referring Physician | Log out | My Profile | Help

OpenMRS Home | Find Patient | Dictionary | Administration

## Mr. John D Patient

38 yrs ( 01-Jan-1975) OpenMRS Identification Number: 100-8

BMI: ? ( Weight: 100.0 kg , Height: ) CD4: 22.0 | Regimen:

Overview | Regimens | Visits | Demographics | Graphs | Radiology

Add Radiology Order

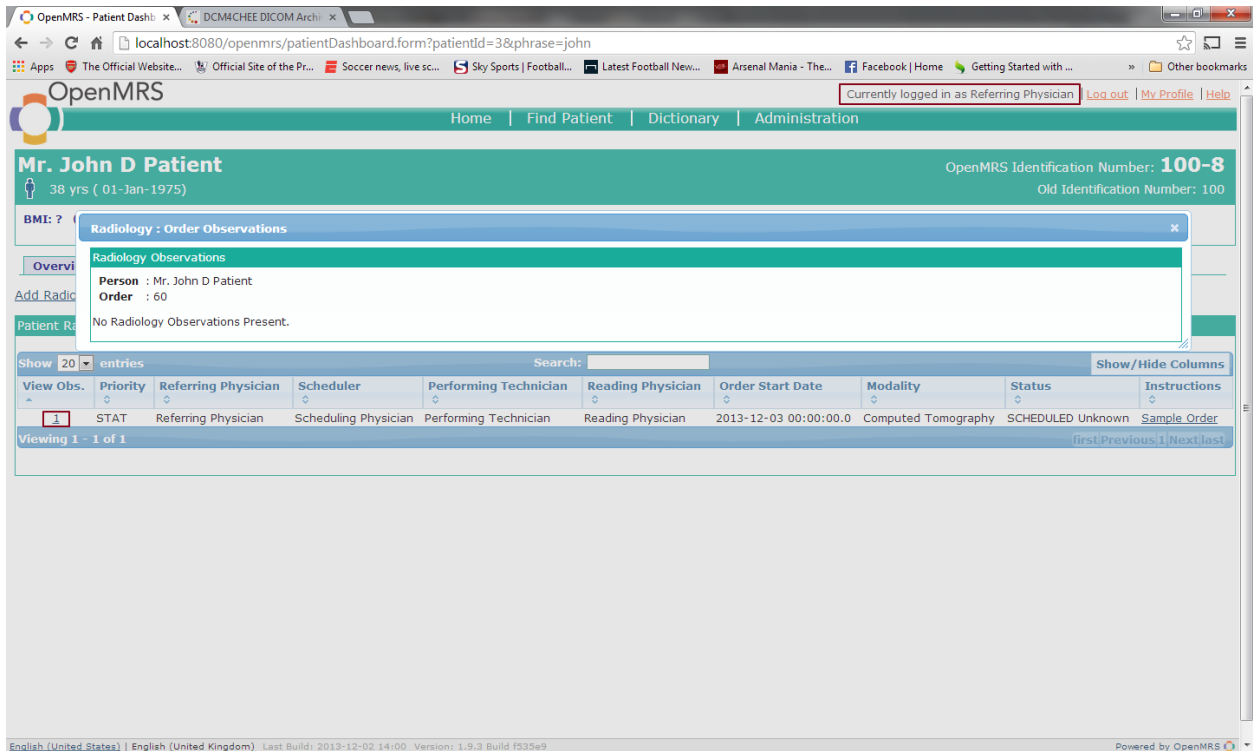
Patient Radiology Orders

Show 20 entries Search:  Show/Hide Columns

View Obs.	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions
1	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED Unknown	Sample Order

Viewing 1 - 1 of 1 first Previous 1 Next last

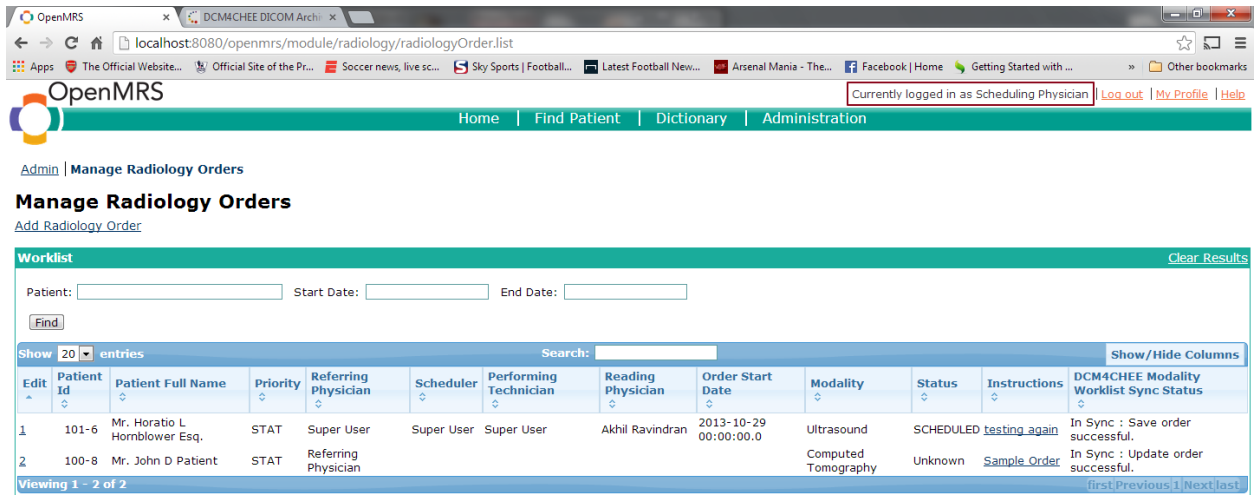
English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F335e9 Powered by OpenMRS



## Radiology Scheduler

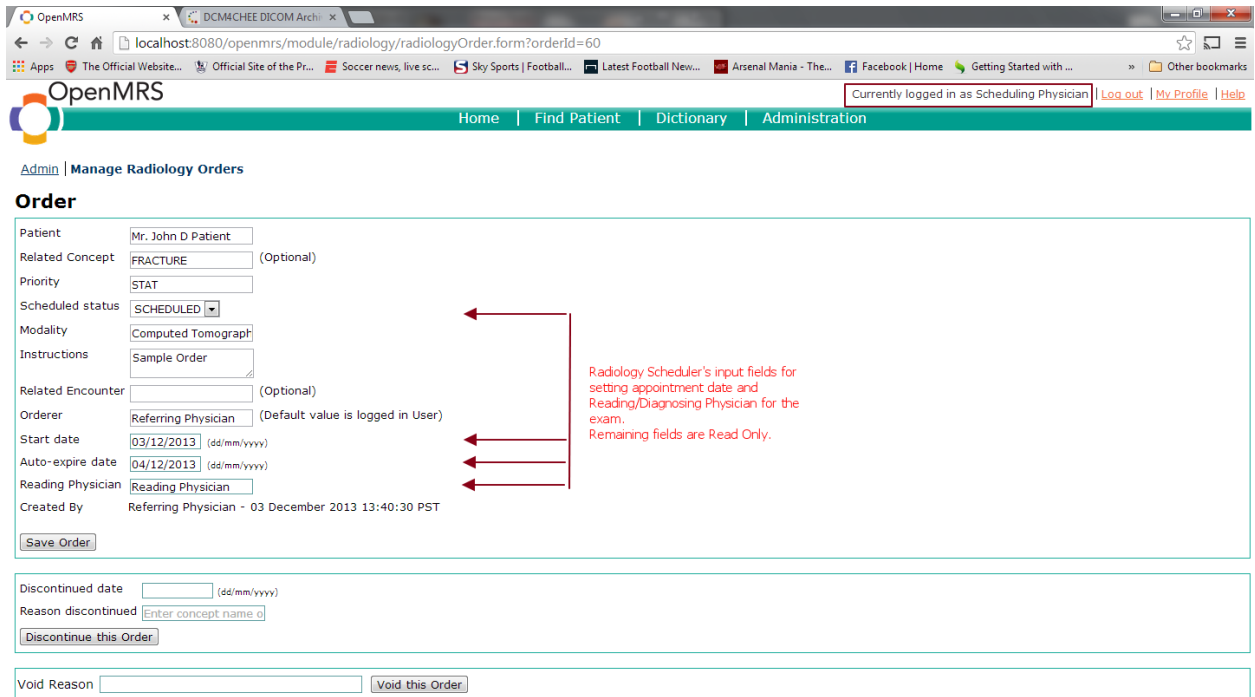
- Has the ability to set up a time for the order/exam to take place, update the status of the order and assign the physician(reading physician) to diagnose the results of the radiology order.

# OpenMRS Radiology Module



The screenshot shows the OpenMRS interface for managing radiology orders. At the top, there is a navigation bar with 'Home', 'Find Patient', 'Dictionary', and 'Administration'. Below this is a header for 'Manage Radiology Orders' with a link to 'Add Radiology Order'. The main section is titled 'Worklist' and contains a search form with fields for 'Patient', 'Start Date', and 'End Date', along with a 'Find' button. Below the search form is a table with columns: Edit, Patient Id, Patient Full Name, Priority, Referring Physician, Scheduler, Performing Technician, Reading Physician, Order Start Date, Modality, Status, Instructions, and DCM4CHEE Modality Worklist Sync Status. The table lists two orders: Order 1 for Mr. Horatio L. Hornblower Esq. (Ultrasound) and Order 2 for Mr. John D. Patient (Computed Tomography). A footer indicates 'Viewing 1 - 2 of 2' and provides navigation links like 'first', 'Previous', 'Next', and 'last'.

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS



The screenshot shows the 'Order' form in the OpenMRS interface. The form contains several input fields: Patient (Mr. John D Patient), Related Concept (FRACTURE), Priority (STAT), Scheduled status (SCHEDULED), Modality (Computed Tomograph), Instructions (Sample Order), Related Encounter (Optional), Orderer (Referring Physician), Start date (03/12/2013), Auto-expire date (04/12/2013), Reading Physician (Reading Physician), and Created By (Referring Physician - 03 December 2013 13:40:30 PST). There is a 'Save Order' button. Below the form are fields for 'Discontinued date', 'Reason discontinued', and 'Void Reason', each with a corresponding button ('Discontinue this Order' and 'Void this Order'). A red arrow points to the 'Scheduled status' dropdown, and another red arrow points to the 'Start date' and 'Auto-expire date' fields. A text box on the right states: 'Radiology Scheduler's input fields for setting appointment date and Reading/Diagnosing Physician for the exam. Remaining fields are Read Only.'

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS

## OpenMRS Radiology Module

The screenshot shows the OpenMRS web interface. At the top, there is a navigation bar with links for Home, Find Patient, Dictionary, and Administration. A notification bar indicates "Order saved". The main heading is "Manage Radiology Orders" with a link to "Add Radiology Order". Below this is a "Worklist" section with search filters for Patient, Start Date, and End Date. A table displays two radiology orders. The second order is highlighted with red boxes around the Scheduler, Reading Physician, and Status columns.

Edit	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	SCHEDULED	testing again	In Sync : Save order successful.
2	100-8	Mr. John D Patient	STAT	Referring Physician	Scheduling Physician		Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED	Sample Order	In Sync : Update order successful.

Viewing 1 - 2 of 2

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F335e9 | Powered by OpenMRS

## Performing Technician

- Has the ability to change the performed status of the order. The performing technician details are reflected in the manage radiology orders table only if the user changes saves the order again after he views it or changes the value of the performed status. This is not necessary under normal operation of the module. The performed status is updated automatically under normal circumstances.

# OpenMRS Radiology Module

OpenMRS  
Currently logged in as Performing Technician | Log out | My Profile | Help

Home | Find Patient | Dictionary | Administration

Admin | Manage Radiology Orders

## Order

Patient: Mr. John D Patient

Related Concept: FRACTURE (Optional)

Priority: STAT

Performed status: IN PROGRESS

Modality: Select IN PROGRESS ph

Instructions: DISCONTINUED COMPLETED

Related Encounter: (Optional)

Orderer: Referring Physician (Default value is logged in User)

Reading Physician: Reading Physician

Created By: Scheduling Physician - 03 December 2013 13:51:20 PST

Save Order

Discontinued date: (dd/mm/yyyy)

Reason discontinued: Enter concept name

Discontinue this Order

Void Reason: Void this Order

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS

Performing Technician fields for the order. Performed status is the only input he has control over in case of glitches while performing order. Under normal execution this value will change automatically. Remaining fields are Read Only.

OpenMRS  
Currently logged in as Performing Technician | Log out | My Profile | Help

Home | Find Patient | Dictionary | Administration

Admin | Manage Radiology Orders

## Manage Radiology Orders

Add Radiology Order

Worklist Clear Results

Patient: Start Date: End Date:

Find

Show 20 entries Search:

Edit	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	SCHEDULED COMPLETED	testing again	In Sync : Save order successful.
2	100-8	Mr. John D Patient	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED Unknown	Sample Order	In Sync : Update order successful.

Viewing 1 - 2 of 2 first Previous 1 Next last

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS

Only on saving order (with or without changing value) the Performing Technician field gets



## Reading Physician

- Has the ability to view the order and its corresponding images and enter observations for that particular study as long as he is assigned to view the study.

The screenshot shows a web browser window displaying the OpenMRS interface. The address bar indicates the URL is localhost:8080/openmrs/module/radiology/radiologyObs.form?orderId=60&obsId. The page header features the OpenMRS logo and navigation links: Home, Find Patient, Dictionary, and Administration. A user notification indicates the user is logged in as 'Reading Physician' with links for Log out, My Profile, and Help. Below the header, there are links for Admin and Manage Radiology Orders. The main content area is titled 'Observation' and contains a form with the following fields:

- Person: John D Patient (with a 'More Information' link)
- Encounter: Select
- Order: 60
- Location: [Dropdown menu]
- Observation Date: [Text input] (Format: dd/mm/yyyy)
- Question Concept: Select
- Comment: [Text area]

At the bottom of the form are two buttons: 'Save Observation' and 'Cancel'.

At the very bottom of the page, there is a footer with the text: English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build 1535e9 | Powered by OpenMRS

- Once the order is completed, the reading physician will be able to view the study and correspondingly add, view and edit older observations.

# OpenMRS Radiology Module

OpenMRS | Manage Radiology Orders

## Manage Radiology Orders

[Add Radiology Order](#)

Worklist Clear Results

Patient:  Start Date:  End Date:

Show 20 entries Search:  Show/Hide Columns

Obs. Id	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L. Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	COMPLETED	testing again	In Sync : Save order successful.
2	100-8	Mr. John D Patient	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	COMPLETED	Sample Order	In Sync : Update order successful.

Viewing 1 - 2 of 2 first Previous 1 Next last

English (United States) | English (United Kingdom) Last Build: 2013-12-02 14:00 Version: 1.9.3 Build f535e9 Powered by OpenMRS

OpenMRS | Manage Radiology Orders

## Observation

Person:  [More Information](#)

Encounter:

Order:

Location:

Observation Date:  (Format: dd/mm/yyyy)

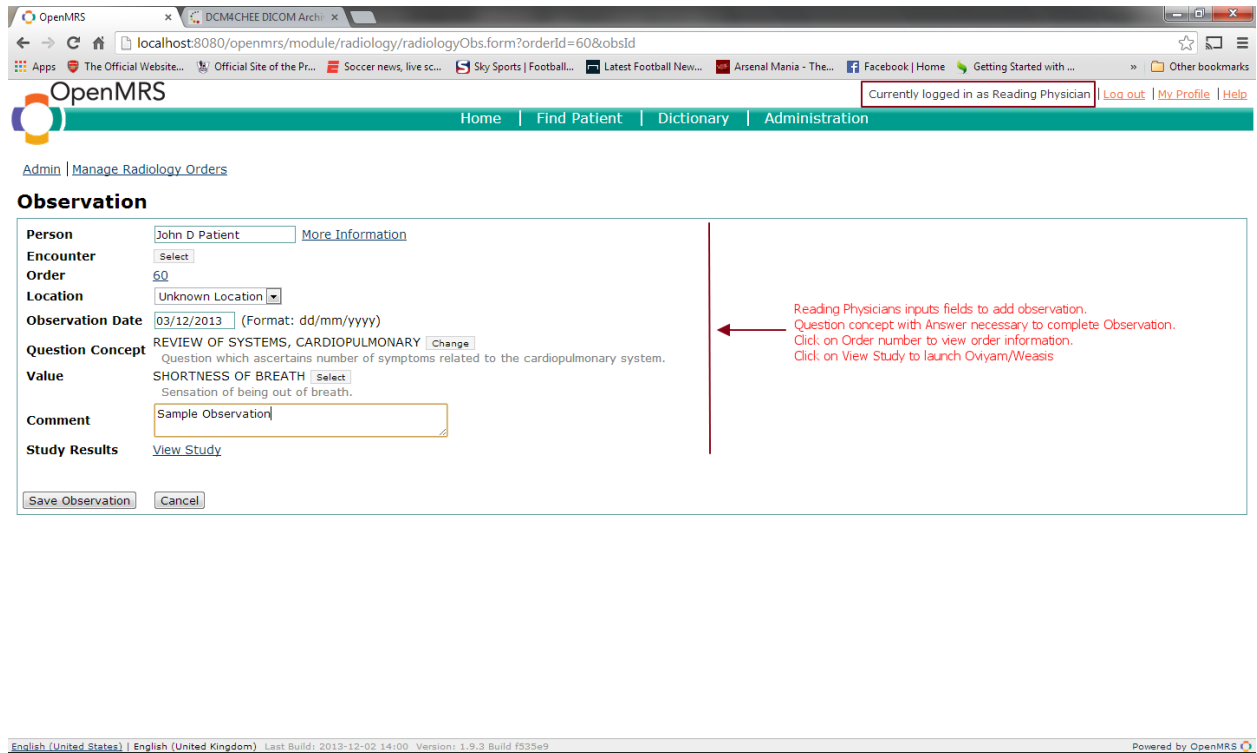
Question Concept:

Comment:

**Study Results** [View Study](#)

English (United States) | English (United Kingdom) Last Build: 2013-12-02 14:00 Version: 1.9.3 Build f535e9 Powered by OpenMRS

# OpenMRS Radiology Module

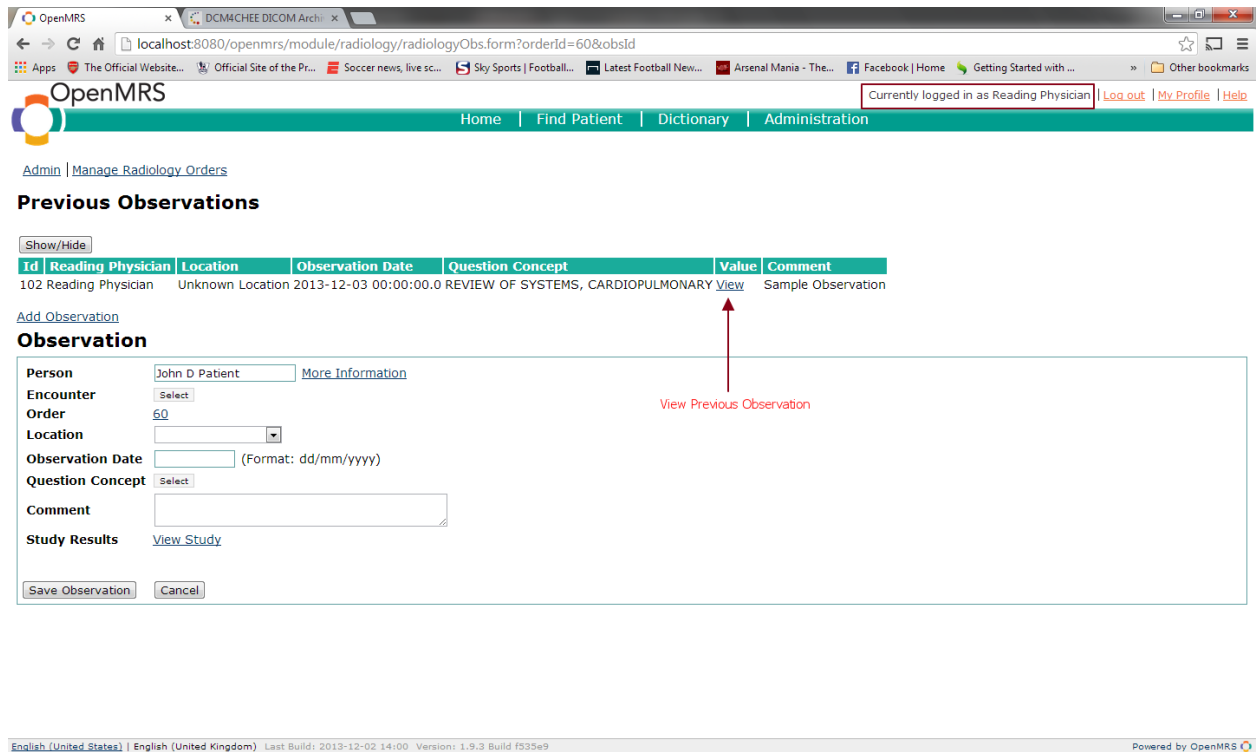


The screenshot shows the OpenMRS web interface for adding a radiology observation. The browser address bar shows the URL: localhost:8080/openmrs/module/radiology/radiologyObs.form?orderId=60&obsId. The user is logged in as a Reading Physician. The form includes the following fields:

- Person:** John D Patient (with a [More Information](#) link)
- Encounter:** Select
- Order:** 60
- Location:** Unknown Location
- Observation Date:** 03/12/2013 (Format: dd/mm/yyyy)
- Question Concept:** REVIEW OF SYSTEMS, CARDIOPULMONARY (with a [Change](#) link)
- Value:** SHORTNESS OF BREATH (with a [Select](#) dropdown)
- Comment:** Sample Observation
- Study Results:** [View Study](#)

Buttons at the bottom of the form are **Save Observation** and **Cancel**. A red arrow points to the form with the text: "Reading Physicians inputs fields to add observation. Question concept with Answer necessary to complete Observation. Click on Order number to view order information. Click on View Study to launch Oxyjam/Weasis".

Footer: English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS



The screenshot shows the OpenMRS web interface for viewing previous observations. The browser address bar shows the URL: localhost:8080/openmrs/module/radiology/radiologyObs.form?orderId=60&obsId. The user is logged in as a Reading Physician. The page includes a **Previous Observations** section with a [Show/Hide](#) button.

<a href="#">Id</a>	<a href="#">Reading Physician</a>	<a href="#">Location</a>	<a href="#">Observation Date</a>	<a href="#">Question Concept</a>	<a href="#">Value</a>	<a href="#">Comment</a>
102	Reading Physician	Unknown Location	2013-12-03 00:00:00.0	REVIEW OF SYSTEMS, CARDIOPULMONARY	<a href="#">View</a>	Sample Observation

Below the table is an **Add Observation** link and another **Observation** form. A red arrow points from the [View](#) link in the table to the **Observation** form with the text: "View Previous Observation".

Footer: English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build F535e9 | Powered by OpenMRS

OpenMRS

Currently logged in as Reading Physician | [Log out](#) | [My Profile](#) | [Help](#)

[Home](#) | [Find Patient](#) | [Dictionary](#) | [Administration](#)

[Admin](#) | [Manage Radiology Orders](#)

### Previous Observations

[Show/Hide](#)

Id	Reading Physician	Location	Observation Date	Question Concept	Value	Comment
102	Reading Physician	Unknown Location	2013-12-03 00:00:00.0	REVIEW OF SYSTEMS, CARDIOPULMONARY	<a href="#">View</a>	Sample Observation

[Add Observation](#)

### Observation

**Id** 102

**Person**  [More Information](#)

**Encounter**

**Order**

**Location**

**Observation Date**  (Format: dd/mm/yyyy)

**Question Concept** REVIEW OF SYSTEMS, CARDIOPULMONARY  
Question which ascertains number of symptoms related to the cardiopulmonary system.

**Value** SHORTNESS OF BREATH [Change](#)  
Sensation of being out of breath.

**Comment**

**Study Results** [View Study](#)

**Created By** Reading Physician - 03-Dec-2013

**Edit Reason**

**Void this Observation**

**Reason**  ← Text input here to void Observation.

English (United States) | English (United Kingdom) | Last Build: 2013-12-02 14:00 | Version: 1.9.3 Build #63648 | Powered by OpenMRS

- Observations can be viewed from Patient Dashboard. But adding/editing observations will need privileges to do so. The reading physician or authorized user can add observations from Patient Dashboard as well.

# OpenMRS Radiology Module

OpenMRS - Patient Dashb x DCM4CHEE DICOM Archi x

localhost:8080/openmrs/patientDashboard.form?patientId=3&phrase=john

OpenMRS Home | Find Patient | Dictionary | Administration

Currently logged in as Reading Physician | Log out | My Profile | Help

**Mr. John D Patient** OpenMRS Identification Number: **100-8**  
 38 yrs ( 01-Jan-1975) Old Identification Number: 100

BMI: ? ( Weight: 100.0 kg , Height: ) CD4: 22.0 | Regimen:

Overview | Regimens | Visits | Demographics | Graphs | Radiology

Add Radiology Order

Patient Radiology Orders

Show 20 entries Search: Show/Hide Columns

View Obs.	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions
1	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	COMPLETED	Sample Order

Viewing 1 - 1 of 1

English (United States) | English (United Kingdom) Last Build: 2013-12-02 14:00 Version: 1.9.3 Build F535e9 Powered by OpenMRS

OpenMRS - Patient Dashb x DCM4CHEE DICOM Archi x

localhost:8080/openmrs/patientDashboard.form?patientId=3&phrase=john

OpenMRS Home | Find Patient | Dictionary | Administration

Currently logged in as Reading Physician | Log out | My Profile | Help

**Mr. John D Patient** OpenMRS Identification Number: **100-8**  
 38 yrs ( 01-Jan-1975) Old Identification Number: 100

BMI: ? ( Weight: 100.0 kg , Height: ) CD4: 22.0 | Regimen:

Overview | Regimens | Visits | Demographics | Graphs | Radiology

Add Radiology Order

Patient Radiology Orders

Radiology : Order Observations

Radiology Observations

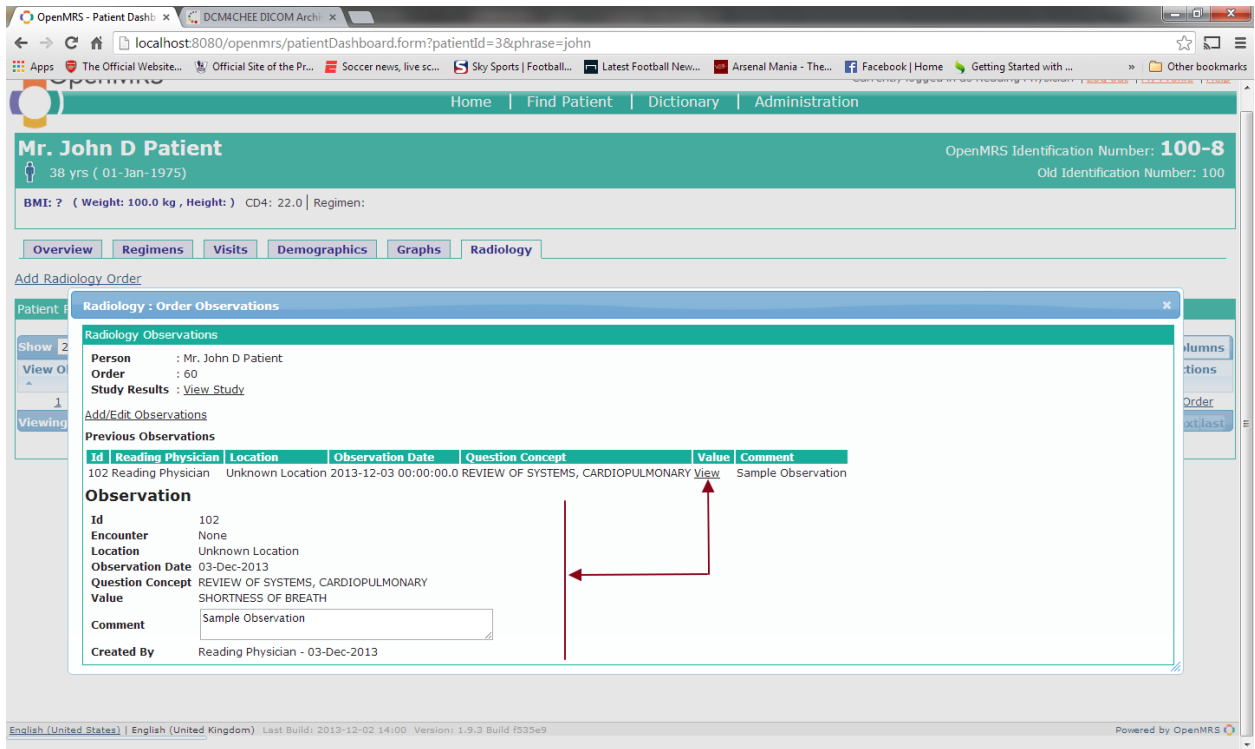
Person : Mr. John D Patient  
 Order : 60  
[Study Results - View Study](#)  
[Add/Edit Observations](#) ← Redirects to Add/Edit Observations Page

Previous Observations

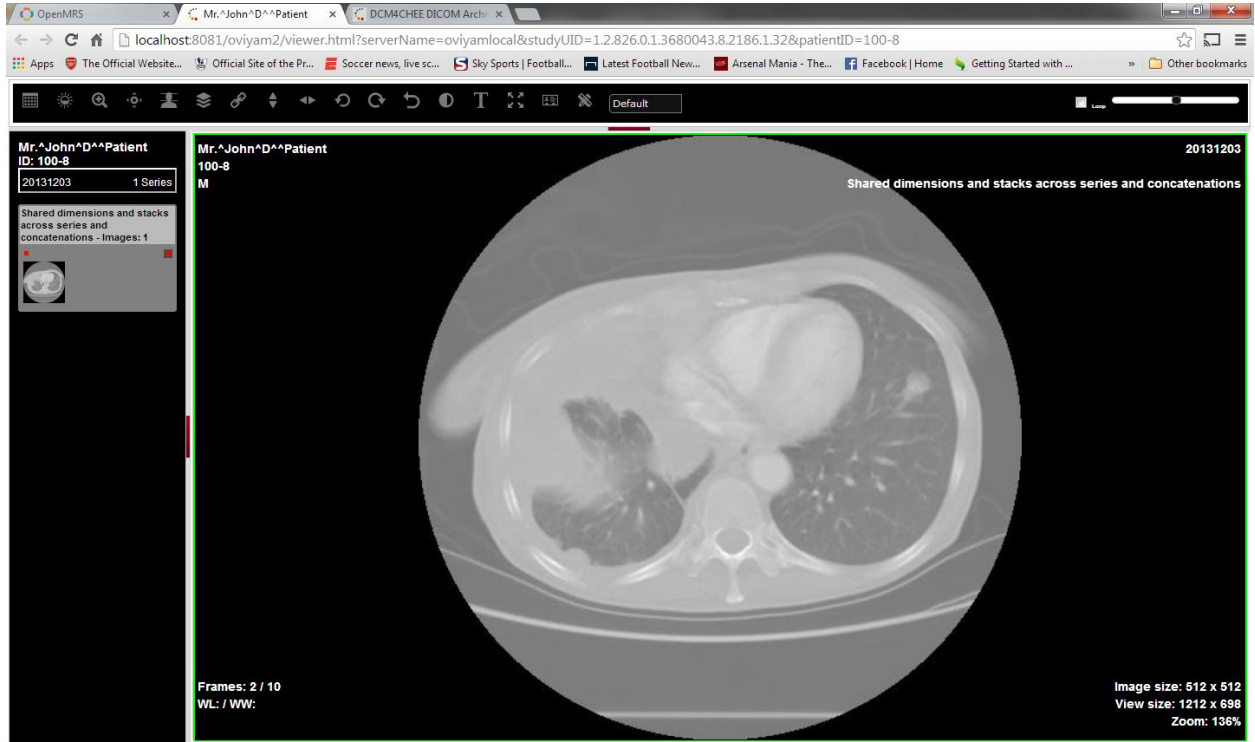
Id	Reading Physician	Location	Observation Date	Question Concept	Value	Comment
102	Reading Physician	Unknown Location	2013-12-03 00:00:00.0	REVIEW OF SYSTEMS, CARDIOPULMONARY	View	Sample Observation

English (United States) | English (United Kingdom) Last Build: 2013-12-02 14:00 Version: 1.9.3 Build F535e9 Powered by OpenMRS

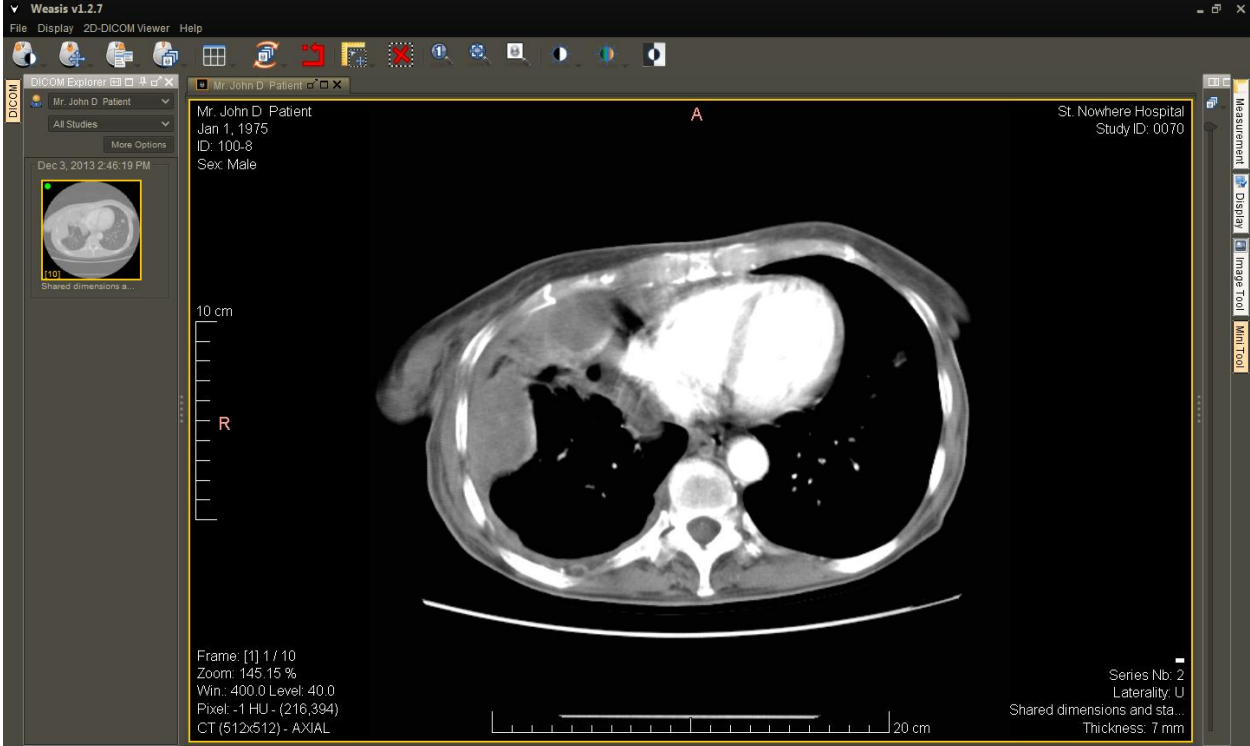
# OpenMRS Radiology Module



- The reading physician can view the study from Oviyam/Weasis.



Study in Oviyam2.0



Study in Weasis.

## Radiology Module Workflow using DVTK Modality Emulator

- **Modality Worklist in DCM4CHEE** - The order details are continually updated as and when relevant information is entered by the different users to complete the order details. The completed order/worklist in dcm4chee is shown below. Worklist creation/editing/deletion is managed through HL7 messages.
- Check the dcm4chee console for modality worklists. Run an empty search to retrieve all Worklists(orders).

The screenshot shows the DCM4CHEE web interface. The 'Modality Worklist' tab is selected. The search criteria are: Patient Name (empty), Patient ID (empty), Issuer (empty), Start Date from 10/29/2013 00:00 to 10/29/2013 00:00, and Accession No (empty). The search results table is as follows:

Patient Name	Birthdate	SPS Description	Modality	SPS Status	Start date	Station AET	Station Name	Accession number
Mr. ^Horatio^L^Esq.^Hornblower	5/1/1941	testing again	US	COMPLETED	10/29/2013 00:00	UNKOWN	UNKOWN	
Mr. ^John^D^^Patient	1/1/1975	Sample Order	CT		12/3/2013 00:00	UNKOWN	UNKOWN	

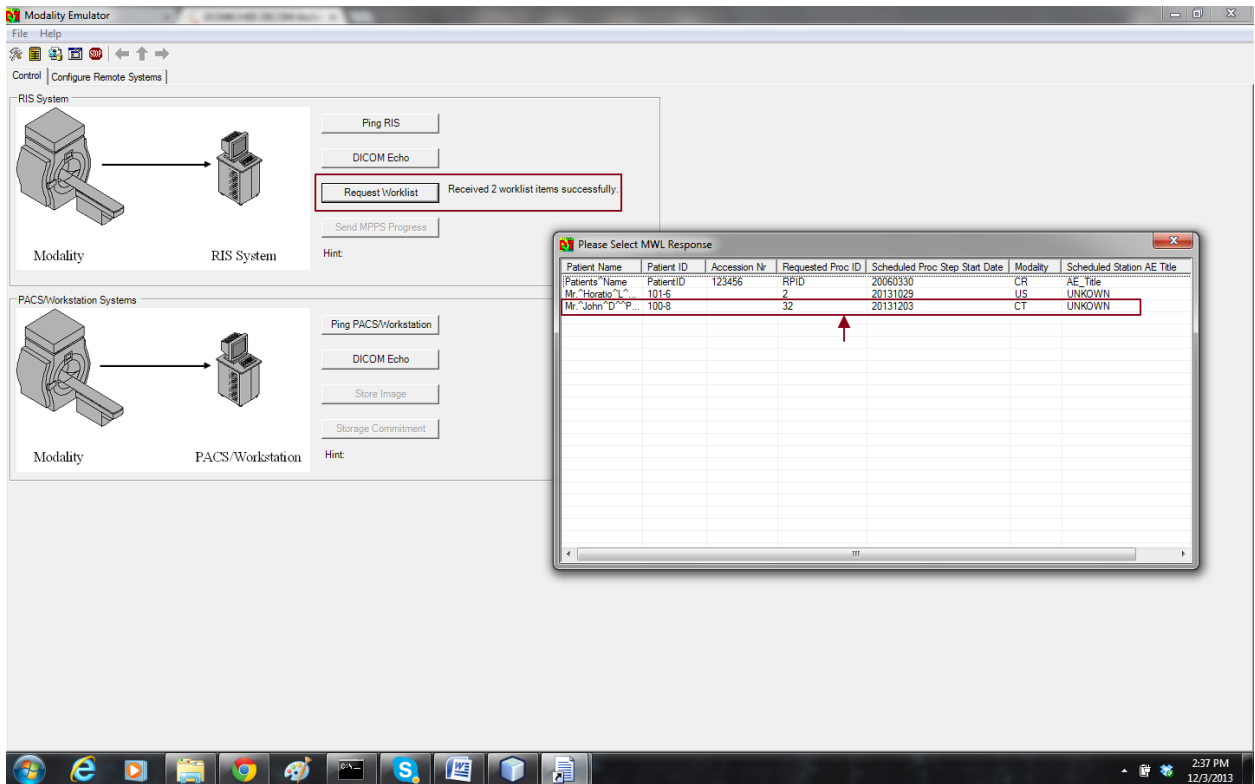
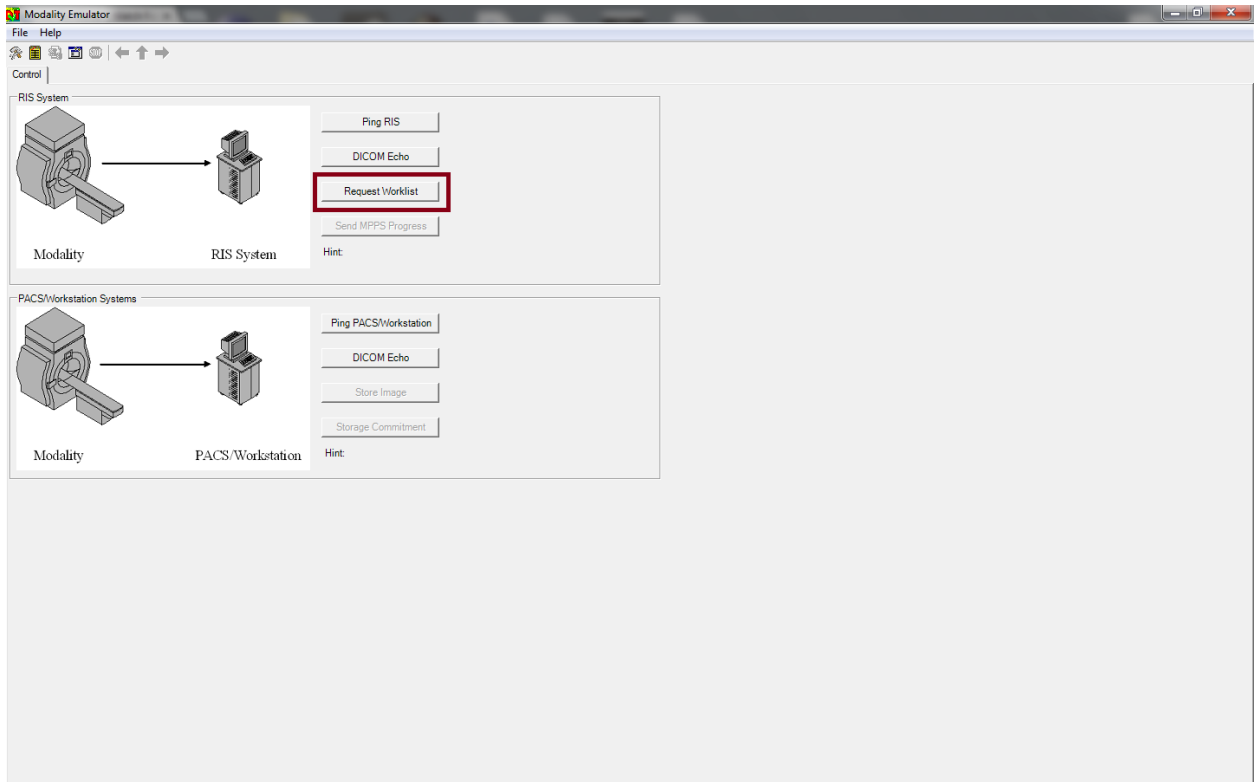
The second entry is expanded to show DICOM metadata:

Specific Character Set	(0008,0005)	CS	10	ISO_IR 100
Patient's Name	(0010,0010)	PN	20	Mr. ^John^D^^Patient
Patient ID	(0010,0020)	LO	6	100-8
Issuer of Patient ID	(0010,0021)	LO	0	
Patient's Birth Date	(0010,0030)	DA	8	19750101
Patient's Sex	(0010,0040)	CS	2	M
Study Instance UID	(0020,000D)	UI	32	1.2.826.0.1.3680043.8.2186.1.32
Requested Procedure Code Sequence	(0032,1064)	SQ	-1	
>Item #1				
>Code Value	(0008,0100)	SH	12	Sample Order
>Coding Scheme Designator	(0008,0102)	SH	0	
>Code Meaning	(0008,0104)	LO	0	
Scheduled Procedure Step Sequence	(0040,0100)	SQ	-1	
>Item #1				

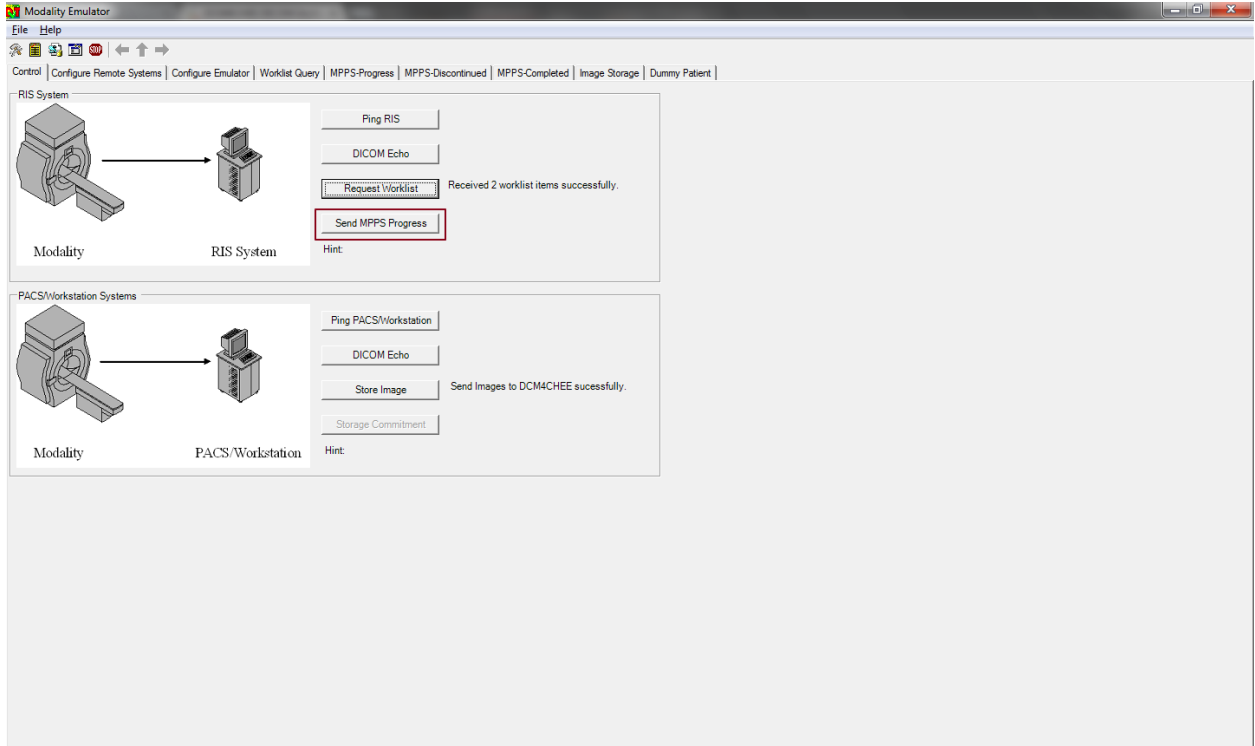
- In the Modality Emulator, Click Request Worklist and choose the order that was just made in OpenMRS.



# OpenMRS Radiology Module



- Send MPPS In progress to indicate the procedure has started.



- Once the In progress status has been sent, the updated status message is reflected in dcm4chee and OpenMRS. The emulator gives you options to discontinue the order or store image

# OpenMRS Radiology Module

Search

Patient Name   
  Patient ID   
  Issuer   
 Start Date from  to    
 Accession No

Modality   
  Station AET   
  Station Name   
 Status

Pagesize 10    Entry 1 to 2 of 2

Patient Name	Birthdate	SPS Description	Modality	SPS Status	Start date	Station AET	Station Name	Accession number
Mr.^Horatio^L^Esq.^Hornblower	5/1/1941	testing again	US	COMPLETED	10/29/2013 00:00	UNKOWN	UNKOWN	
Mr.^John^D^^Patient	1/1/1975	Sample Order	CT	STARTED	12/3/2013 00:00	UNKOWN	UNKOWN	

OpenMRS    Home | Find/Create Patient | Dictionary | Administration    Currently logged in as Super User    Log out | My Profile | Help

Admin | Manage Radiology Orders

## Manage Radiology Orders

[Add Radiology Order](#)

Worklist Clear Results

Patient:     Start Date:     End Date:

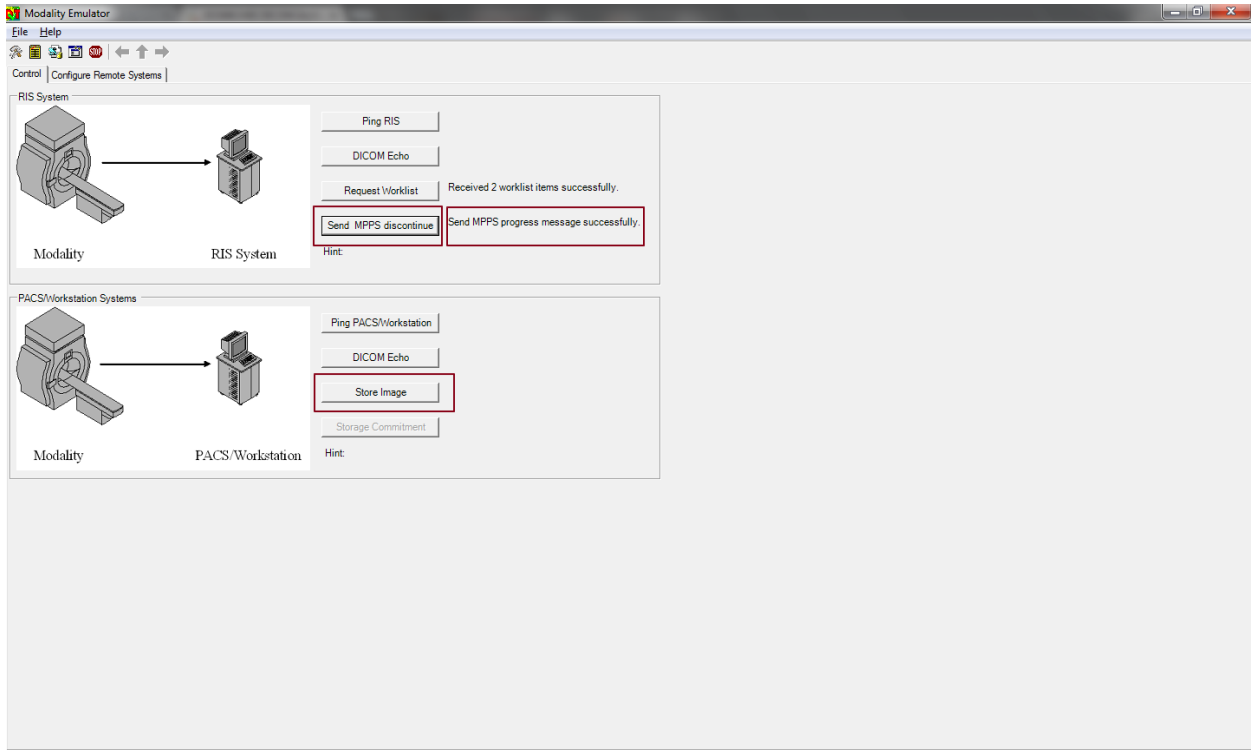
Show 20 entries    Search:     Show/Hide Columns

Edit	Patient Id	Patient Full Name	Priority	Referring Physician	Scheduler	Performing Technician	Reading Physician	Order Start Date	Modality	Status	Instructions	DCM4CHEE Modality Worklist Sync Status
1	101-6	Mr. Horatio L Hornblower Esq.	STAT	Super User	Super User	Super User	Akhil Ravindran	2013-10-29 00:00:00.0	Ultrasound	SCHEDULED COMPLETED	testing again	In Sync : Save order successful.
2	100-8	Mr. John D Patient	STAT	Referring Physician	Scheduling Physician	Performing Technician	Reading Physician	2013-12-03 00:00:00.0	Computed Tomography	SCHEDULED IN PROGRESS	Sample Order	In Sync : Update order successful.

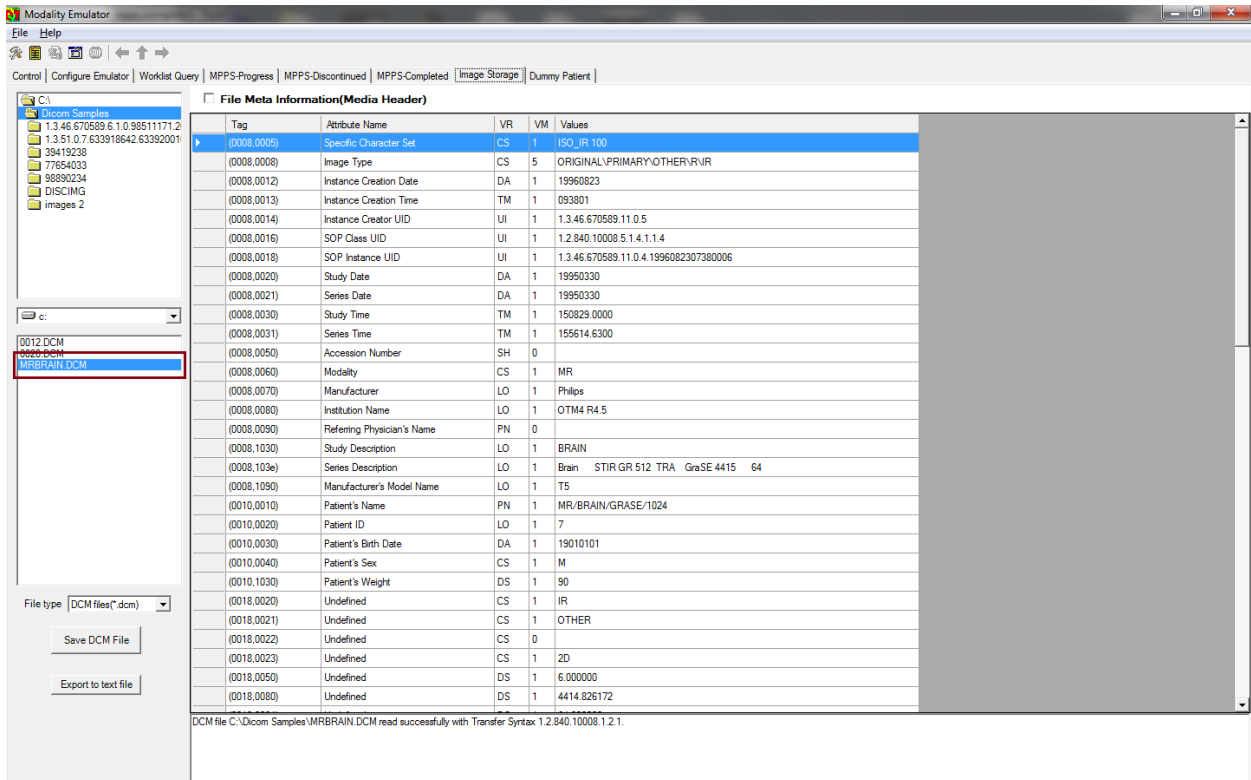
Viewing 1 - 2 of 2    [first](#) [Previous](#) [1](#) [Next](#) [last](#)

English (United States) | English (United Kingdom)    Last Build: 2013-12-02 14:00    Version: 1.9.3 Build f335e9    Powered by OpenMRS

# OpenMRS Radiology Module



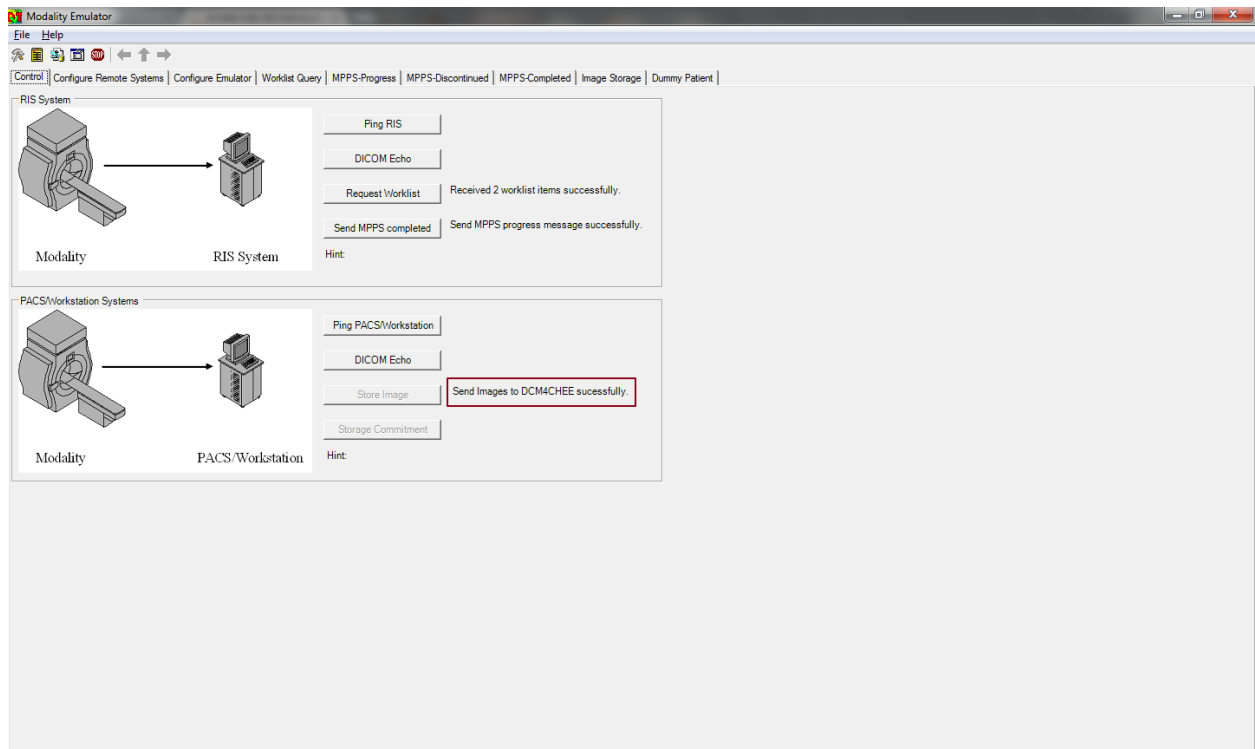
- Click on the image storage tab to choose the image you want to send and return to the control and click “Store Image”.



## OpenMRS Radiology Module



- After the image has been sent successfully, the image will appear in the archive.



## OpenMRS Radiology Module

The screenshot shows the OpenMRS web interface. The 'Folder' menu item is highlighted. The search results table is as follows:

⊕ Patient Name	Patient ID/Issuer	Birth Date	Sex	Comments		
⊕ Study Date/Time	Study ID	Accession No	Modality	Description	#S/#I	Availability
⊕ Mr. Horatio L Esq Hornblower	101-6	5/1/1941	M			
⊕ 10/29/2013 11:29	StdyId:001		US	Exercise Echocardiogram	1/1	ONLINE
⊕ Mr. John D Patient	100-8	1/1/1975	M			
⊕ 12/3/2013 14:46	0070		CT		1/1	ONLINE

- Click on the 'Send MPPS Complete' button to complete the order.

The screenshot shows the Modality Emulator interface. The 'Send MPPS completed' button is highlighted with a red box. The interface displays the following information:

**RIS System**

Modality → RIS System

Ping RIS  
DICOM Echo  
Request Worklist Received 2 worklist items successfully.  
**Send MPPS completed** Send MPPS progress message successfully.  
Hint:

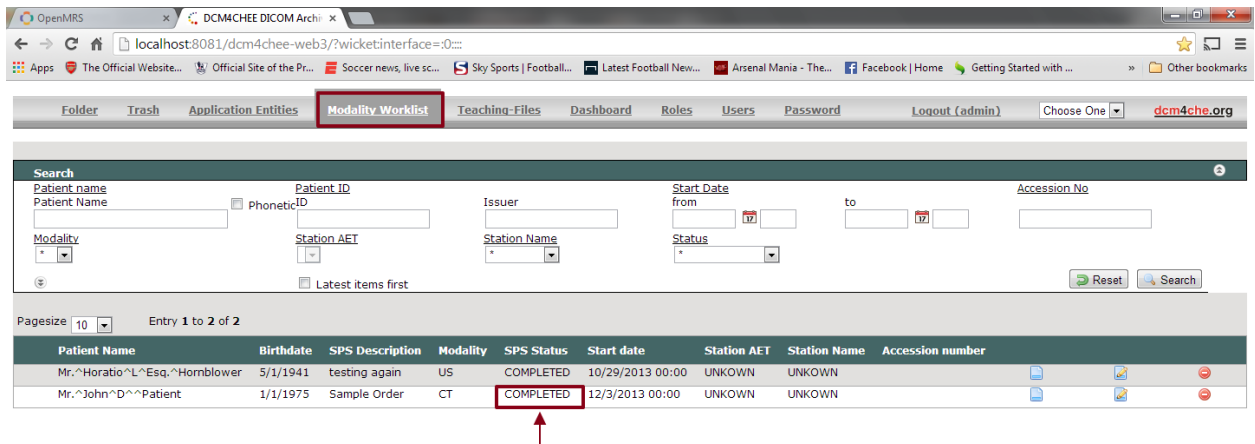
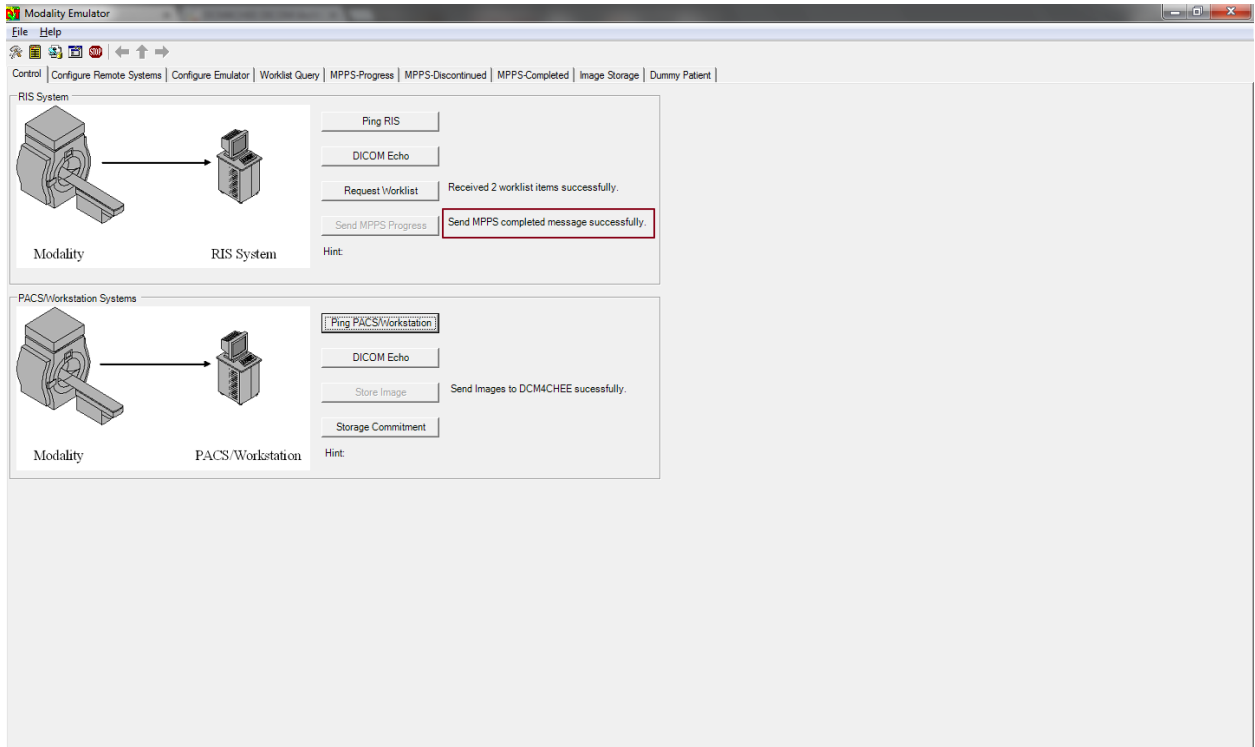
**PACS/Workstation Systems**

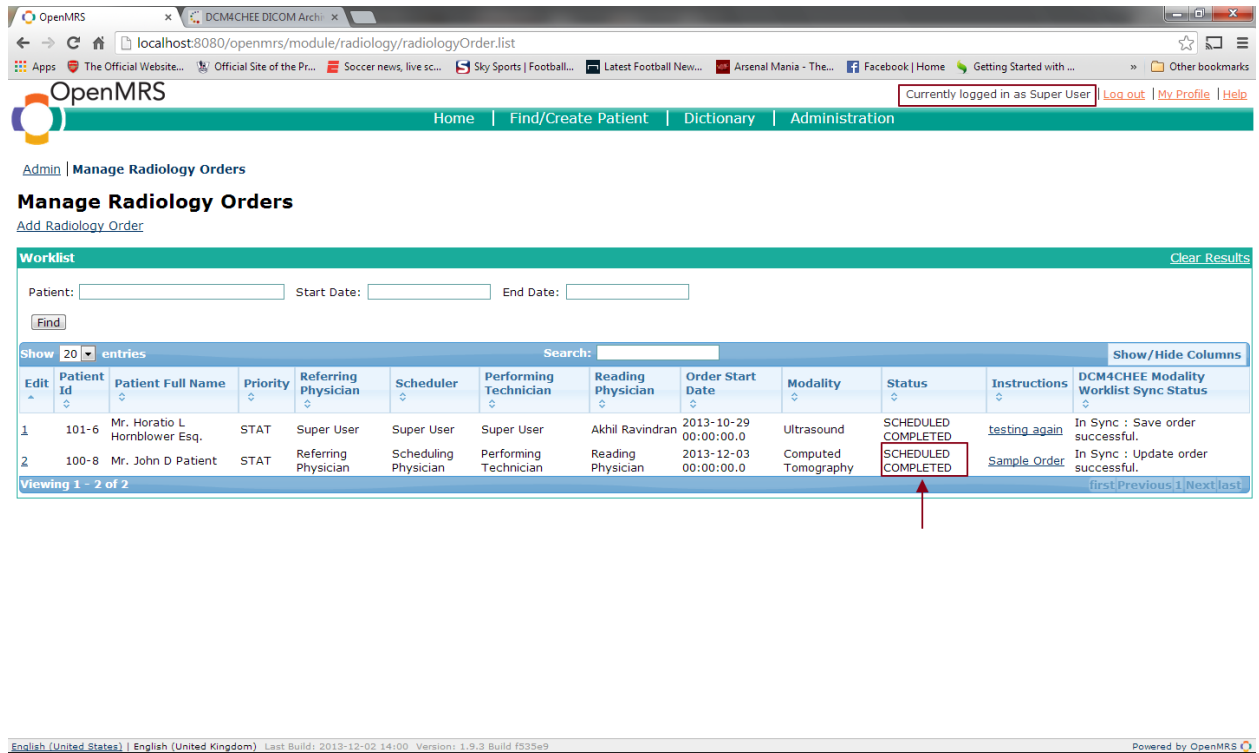
Modality → PACS/Workstation

Ping PACS/Workstation  
DICOM Echo  
Store Image Send Images to DCM4CHEE successfully.  
Storage Commitment  
Hint:

- The completed status will be reflected in dcm4chee and OpenMRS once the MPPS completed message is sent successfully.

# OpenMRS Radiology Module





- The image can be viewed in Oviyam/Weasis by the Reading Physician and observations can be added for the Radiology Study.
- NOTE: If Modalities have only image storage capabilities but do not have the MPPS feature as part of their specification. DCM4CHEE has an MPPS emulation service which can be used for reflecting the order/worklist status in OpenMRS which can be done as shown below.



# OpenMRS Radiology Module

Folder    Trash    Application Entities    Modality Worklist    Teaching-Files    Dashboard    Roles    Users    Password

Logout (admin)    Choose One    dcm4che.org

---

**Search**

Patient Name:     Patient ID:     Issuer:     Study Date: from  to     Accession No:

Phonetic     Exact search

Modality:     Source AET:

Latest studies first    Search for: Study    Expand To: auto       

---

Pagesize: 10    Study 1 to 6 of 6           

Show column titles

Patient Name	Patient ID/Issuer	Birth Date	Sex	Comments		
Study Date/Time	Study ID	Accession No	Modality	Description	#S/#I	Availability
Akhil^Ravindran	200-6	10/7/1987	M	Demonstration Patient for enhanced XA testing activities!		
9/27/2013 22:35	UNKNOWN		CR	Echocardiogram	9/9	ONLINE
9/27/2013 22:45	UNKNOWN		XA	Echocardiogram	1/1	ONLINE
enhanced XA^Test^^Siemens	SMSenhXAtest200906	11/4/1958	M	Demonstration Patient for enhanced XA testing activities!		
6/2/2009 15:59	090602enhXAdemo1	20090602SMSenhXA	XA	derived enhXA3D from enhXA rotational Acq 1/1		ONLINE
Mr.^John^D^^Patient	100-8	1/1/1975	M	Demonstration Patient for enhanced XA testing activities!		
10/17/2013 01:27	UNKNOWN		MR	Echocardiogram	8/8	ONLINE
MR/BRAIN/GRASE/1024	7	1/1/1901	M			
3/30/1995 15:08	191		MR	BRAIN	1/1	ONLINE
Rubo DEMO	123-45-6789	10/16/1923	F			
3/23/1994 14:51	027893462		US	Echocardiogram	1/1	ONLINE

Phonetic     Exact search

Modality:     Source AET:

Latest studies first    Search for: Study    Expand To: auto       

---

Pagesize: 10    Study 1 to 6 of 6           

Show column titles

Patient Name	Patient ID/Issuer	Birth Date	Sex	Comments		
Study Date/Time	Study ID	Accession No	Modality	Description	#S/#I	Availability
Akhil^Ravindran	200-6	10/7/1987	M	Demonstration Patient for enhanced XA testing activities!		
9/27/2013 22:35	UNKNOWN		CR	Echocardiogram	9/9	ONLINE
9/27/2013 22:45	UNKNOWN		XA	Echocardiogram	1/1	ONLINE
enhanced XA^Test^^Siemens	SMSenhXAtest200906	11/4/1958	M	Demonstration Patient for enhanced XA testing activities!		
6/2/2009 15:59	090602enhXAdemo1	20090602SMSenhXA	XA	derived enhXA3D from enhXA rotational Acq 1/1		ONLINE
Mr.^John^D^^Patient	100-8	1/1/1975	M	Demonstration Patient for enhanced XA testing activities!		
10/17/2013 01:27	UNKNOWN		MR	Echocardiogram	8/8	ONLINE
10/17/2013 01:26	1		MR	SeriesDescription	1	ONLINE
10/17/2013 01:26	1		MR	SeriesDescription	1	ONLINE
10/17/2013 01:26	1		MR	SeriesDescription	1	ONLINE
10/17/2013 01:26	1		MR	Brain STIR GR 512 TRA GraSE 4415 64	1	ONLINE
10/17/2013 01:26	1		MR	SeriesDescription	1	ONLINE
10/17/2013 01:26	2		MR	Post-Stress	1	ONLINE
10/17/2013 01:27	1		MR	SeriesDescription	1	ONLINE
10/17/2013 01:27	3		MR	RotationalAngioNative	1	ONLINE
10/17/2013 01:25	1605.0	27	MR	Directional Coronary Atherectomy	1/9	COMPLETED
10/17/2013 01:26	5		MR	SeriesDescription	1	ONLINE
10/17/2013 01:26	1		MR	SeriesDescription	1	ONLINE