Managing Acquisition Workflow:

Kevin O’Donnell
Toshiba Medical Systems Company
Member, DICOM Std. Cmte & WG-06
Key DICOM Services

- **DICOM Modality Worklist**
  - Provide demographics and order details

- **DICOM Modality Performed Procedure Step (MPPS)**
  - Provide logging/tracking of procedure status

- **DICOM Storage Commitment**
  - Provide confirmation of data storage

- **DICOM Instance Availability Notification**
  - Provide notification of data availability
Modality Worklist – SCU/SCP

- Providing Demographics and Orders to the Modality:

- Provider (SCP):
  - Usually RIS
  - Sometimes PACS
  - third party box

- User (SCU):
  - Usually Modality / Imaging System
  - Could be non-imaging system (e.g. hemo)
  - Sometimes “broker box” as proxy for outdated modality
Modality Worklist – Query

- Modality (SCU) queries RIS (SCP)
  - Query can include filters: (AKA Matching Key Attributes)
    - Date/Time of Study
    - Patient Name, ID
    - Accession #
    - Performing System Name
    - Modality
    - Etc.
  - May indicate desired Return Key Attributes

- Query strategies
  - Narrow query – try to just get specific results
  - Broad query – do additional result filtering on the modality

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Modality Worklist – Response

- RIS (SCP) returns results to Modality (SCU)
  - Results may be null, one worklist entry or many

- Each entry is a scheduled procedure step
  - Does not necessarily match 1:1 with an order (e.g. lung perfusion order)
  - One step is performed by one piece of equipment
  - May or may not be enough to fill an order

- Results include details: (AKA Return Key Attributes)
  - Patient Information
    - ID, Name and Demographics
    - Patient Allergies, Pregnancy Status, Instructions
  - Scheduling Information
    - Date, Time
  - Procedure Information
    - Description, Protocol Codes (defined by each radiology site)
    - Contrast/Medications
  - Order Information
    - Accession #, Study UID, Requesting Physician/Dept
Modality Worklist – Usage

- Modality queries/receives worklist from RIS
- Modality displays worklist to tech
- Tech selects worklist entry
- Modality extracts patient demographics and order details
- Modality inserts details in images, procedure status messages, etc.

- Key Benefits
  - Reduced data entry errors
  - Reduced data entry time
  - Up to the minute scheduling
MPPS – SCU / SCP

● Providing Logging/Tracking of Modality Procedure Status

● Provider (SCP)
  – RIS
  – PACS
  – (one may forward to the other)

● User (SCU)
  – Modality
  – Broker for Modality
  – PACS as Proxy for Modality
MPPS – In Progress

- Indicates a procedure step is In Progress
- Timing is not prescribed
  - SCU may send at “start of procedure”
  - SCU may send after completion
- Tracking Attributes
  - Accession#, SPS ID, Study UID
  - Patient Demographics, etc
  - Logical to populate these from the Modality Worklist
- May provide progress details
  - Data produced
  - Protocol codes performed
- Implicit “Notification” of unscheduled/trauma cases
  - MPPS does not correspond to any SPS
  - SCP may choose to “backfill” an order or perform other reconciliation
MPPS – Completed

- Indicates a procedure step has been Completed
- SCU may or may not send immediately

- Tracking Attributes
  - Accession#, SPS ID, Study UID, Patient Demographics, etc

- List of images (and/or other objects) produced
  - A series is part of only one MPPS

- List of protocol codes actually performed
  - May be different that those requested

- List of materials used

- May or may not complete an SPS
  - Multiple MPPS may be performed for one SPS

- Once MPPS “Completed”, additional/appended data must be associated with a new MPPS
MPPS – Discontinued

● Indicates a procedure step has been discontinued
  – May be aborted
  – May be cancelled

● Reason for Discontinuation
  – Patient no-show, allergy, refusal, pregnancy, death, etc.
  – Cancelled by doctor, duplicate order, incorrect order, etc.
  – Machine failure, wrong worklist entry selected, etc.

  – Assists in billing and rescheduling decisions

● Tracking Attributes
  – Accession#, SPS ID, Study UID, Patient Demographics, etc

● May List images (and/or other objects) produced
● May List protocol codes completed
● May List materials used
MPPS – Usage

- **Billing**
  - Details of procedures actually performed
  - Can bill sooner and more accurately

- **Procedure Status Monitoring**
  - Ordering physician can see if started/acquired/cancelled

- **Workflow**
  - Radiologist can see exams pending/ready for reading

- **Patient Tracking**
  - Know where patient is/was at a certain time

- **Key Benefits**
  - Accurate, detailed data on performed steps
  - Can provide up to date status
Storage Commitment – SCU / SCP

- Providing Confirmation of Data Storage

- Provider (SCP)
  - PACS

- User (SCU)
  - Modality
  - Workstation
  - Another PACS
  - Broker
Storage Commitment – Request/Response

- Modality (SCU) requests commitment from PACS (SCP)
  - Request specifies:
    - List of Data Object UIDs

- PACS (SCP) responds to Modality (SCU)
  - Response specifies:
    - List of Data Object UIDs
    - If fail, Reason for Failure
      - Resource Limit, Objects not found, etc.
Storage Commitment – Usage

- Modality requests after storage complete
- Catches network outage losses
- Catches PACS outage losses
- Catches “I thought the morning shift staff sent all their studies to PACS” losses

- Key Benefits
  - Reduces lost data
  - Eliminates manual confirmation time
Inst. Avail. Notification – SCU/SCP

- Providing Notification of Availability of Imaging Data

- User (SCU): Provides Notification
  - Usually PACS
  - Other devices supporting Retrieve
  - Third party box – query then notify

- Provider (SCP): Uses Notification
  - Usually RIS / Reporting System
  - Maybe Billing System trigger
  - Other Workflow Manager
  - Post-Processing Workstation
PACS (SCU) notifies RIS (SCP) objects are available to be retrieved

**Notification Details**
- Lists object UIDs available
- Identifies Retrieve SCP from which they can be retrieved or Media on which it is stored
- Availability Status: Online / Nearline / Offline / Unavailable
- May list MPPS details that created the data

SCU is usually the holder of the objects
SCU implementation decides timing/grouping
- Could notify when all images in an MPPS Complete message are available
- Could notify when images are available for all procedure steps of an order
Inst. Avail. Notification – Usage

- PACS finishes receiving/storing study images
- PACS notifies Reporting System ready for review

- Generally coordinate scheduling of activity with the transfer of image data between systems
- Helps both “implicit” and “explicit” workflow

- Benefits
  - Allows timely reading workflow and fast reporting
  - Avoids wet reads of incomplete studies
  - Avoids excessive queries to PACS to see if the “images are ready”
Acquisition Workflow

R I S

Worklist Response

Worklist Query

PPS In-progress

PPS Completed

Availability Notification

PPS Completed

PACS

Storage

Storage Commitment Request

Storage Commitment Response

Acquisition Modality

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“Integrating the Healthcare Enterprise”

- DICOM defines individual services
- DICOM standardizes the communications
- IHE bundles together services like those here

For additional useful guidance on implementing these services as a group:

Refer to:
- IHE Radiology Tech Framework, Volume I Scheduled Workflow Profile
  www.ihe.net/tf