Radiology Workflow:
Understanding Technologists' Image QC

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Outline

- Review the IHE Scheduled Workflow integration profile for radiology
- Discuss components of technologist image review
- Discuss where images are rejected and why

IHE Scheduled Workflow Integration Profile

Integrating the Healthcare Enterprise (IHE)

- An initiative sponsored by:
  - RSNA
  - Healthcare and Management Systems Society

IHE Integration Profiles

- Related to a specific workflow process in the enterprise (often involving several systems)
  - Group key transactions together that enable process automation, error reduction, and improved efficiency
  - Use accepted standards (DICOM, HL7, etc.) to communicate information between systems

IHE Scheduled Workflow Integration Profile

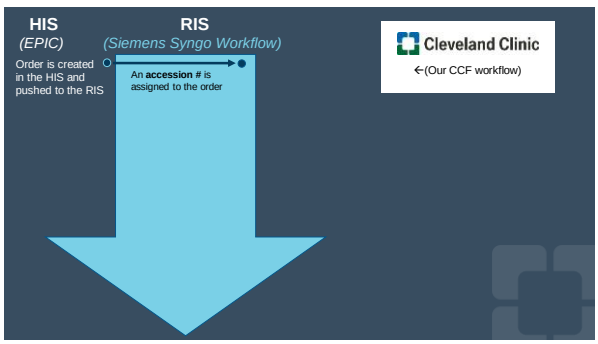
- Describes a communication workflow for ordering/scheduling procedures, acquiring images, and transferring images to PACs that ensures continuity and integrity of imaging data

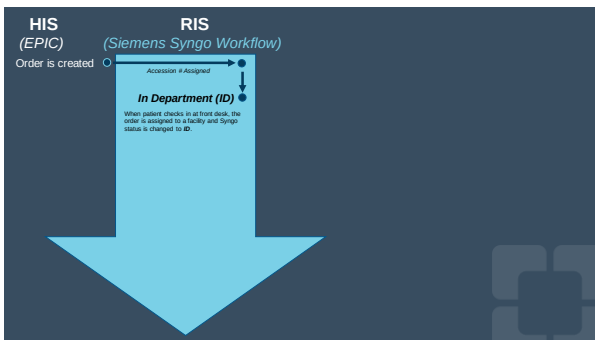
https://wiki.ihe.net/index.php/Scheduled_Workflow

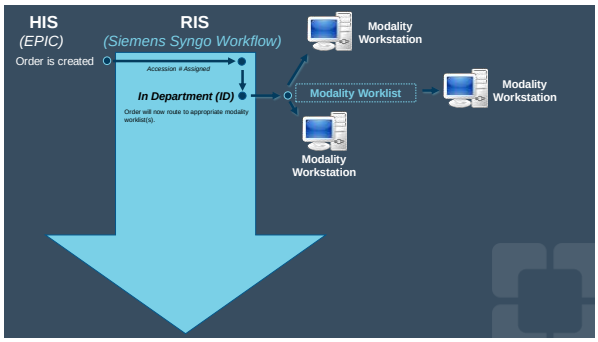
IHE Scheduled Workflow Integration Profile

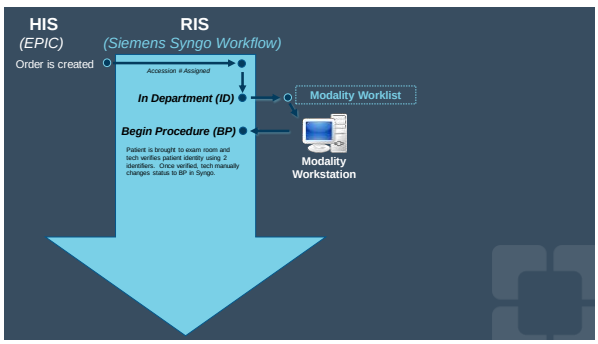
- Defines features that are optional. The end user can choose which they want to use
  - Thus, the exact implementation of the integration profile will be specific to each institution

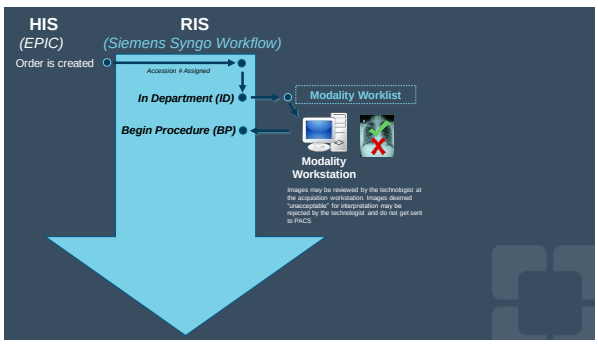
https://wiki.ihe.net/index.php/Scheduled_Workflow

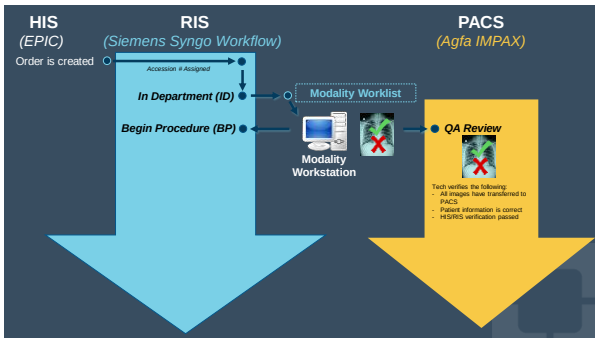


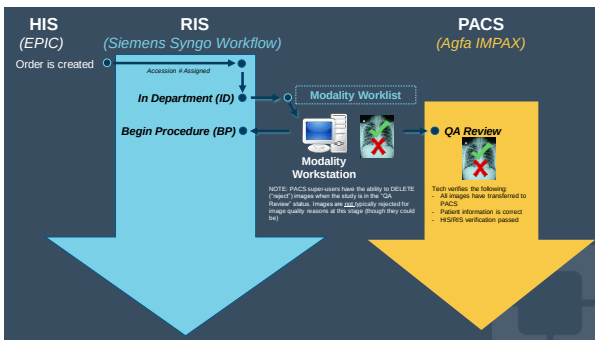


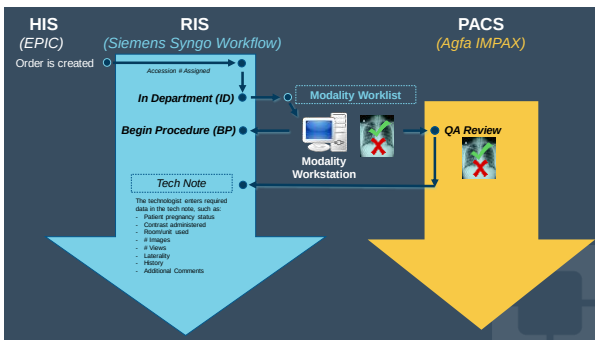

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
Order is created
Accession # Assigned
In Department (ID)
Order will now route to appropriate modality worklist(s).
Modality Worklist
Modality Workstation
Modality Workstation
Modality Workstation

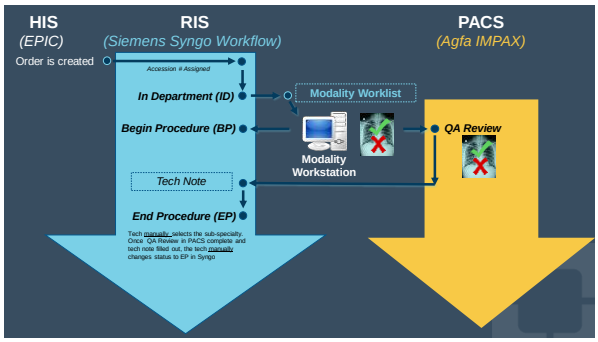

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
Patient is brought to exam room and tech verifies patient identity using 2 identifiers. Once verified, tech manually changes status to BP in Syngo.
Modality Workstation

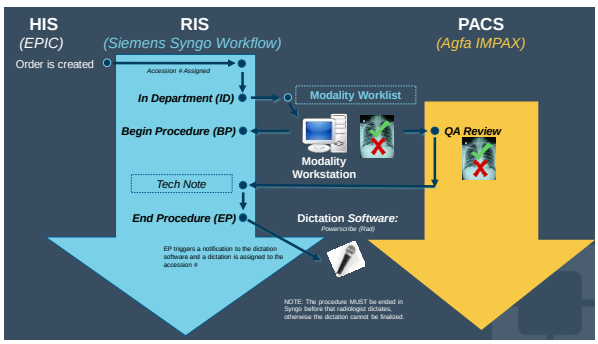

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
Modality Workstation
Images may be reviewed by the technologist at the acquisition workstation. Images deemed "unacceptable" for interpretation may be rejected by the technologist and do not get sent to PACS

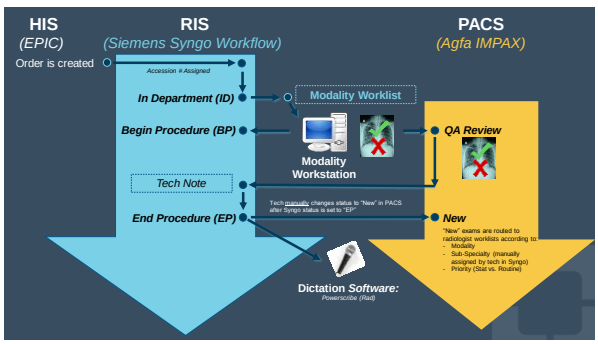

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
Modality
Workstation
QA Review
Tech verifies the following:
- All images have transferred to PACS
- Patient information is correct
- HIS/RIS verification passed

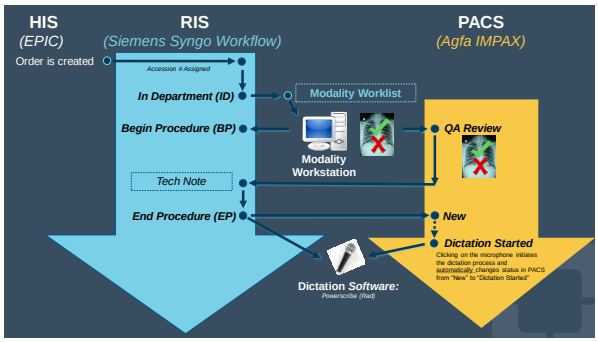

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
Modality
Workstation
QA Review
NOTE: PACS super-users have the ability to DELETE ("reject") images when the study is in the "QA Review" status. Images are not typically rejected for image quality reasons at this stage (though they could be)
Tech verifies the following:
- All images have transferred to PACS
- Patient information is correct
- HIS/RIS verification passed

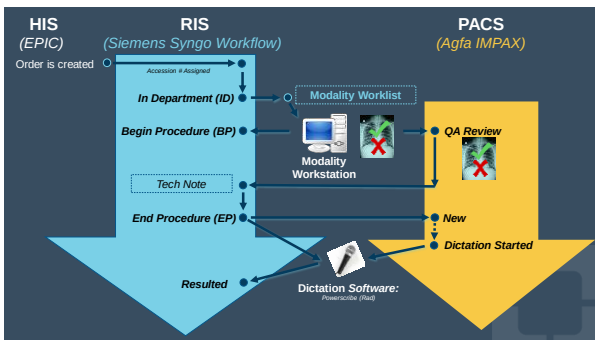

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
Modality
Workstation
QA Review
Tech Note
The technologist enters required data in the tech note, such as:
- Patient pregnancy status
- Contrast administered
- Room/unit used
- # Images
- # Views
- Laterality
- History
- Additional Comments

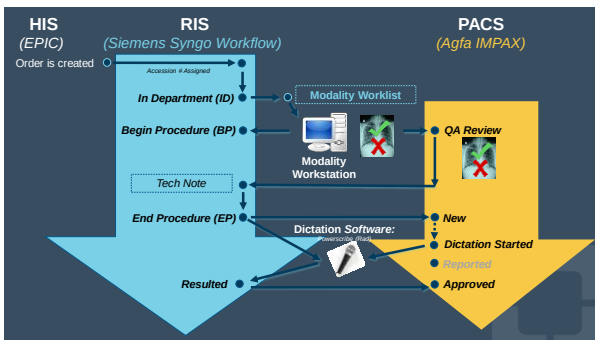

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality Workstation
Tech Note
End Procedure (EP)
Tech manually selects the sub-specialty. Once QA Review in PACS complete and tech note filled out, the tech manually changes status to EP in Syngo

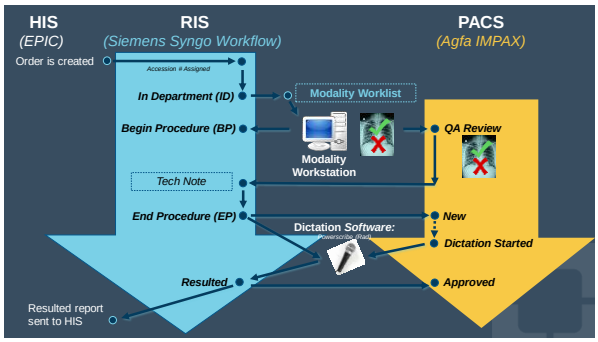

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality Workstation
Tech Note
End Procedure (EP)
Dictation Software:
Powerscribe (Rad)
EP triggers a notification to the dictation software and a dictation is assigned to the accession #
NOTE: The procedure MUST be ended in Syngo before that radiologist dictates, otherwise the dictation cannot be finalized.


HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality Workstation
Tech Note
Tech manually changes status to "New" in PACS after Syngo status is set to "EP"
End Procedure (EP)
New
"New" exams are routed to radiologist worklists according to:
- Modality
- Sub-Specialty (manually assigned by tech in Syngo)
- Priority (Stat vs. Routine)
Dictation Software:
Powerscribe (Rad)


HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality
Workstation
Tech Note
End Procedure (EP)
New
Dictation Started
Clicking on the microphone initiates the dictation process and automatically changes status in PACS from "New" to "Dictation Started"
Dictation Software:
Powerscribe (Rad)

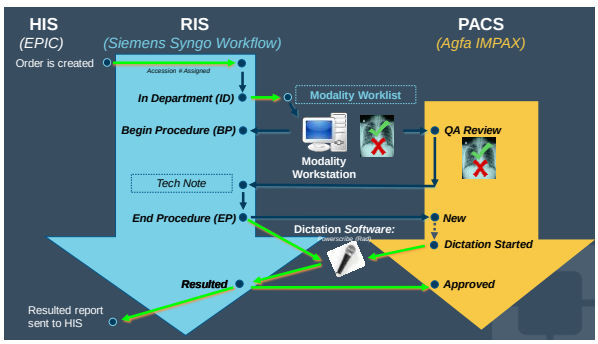

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality
Workstation
Tech Note
End Procedure (EP)
New
Dictation Started
Resulted
Dictation Software:
Powerscribe (Rad)

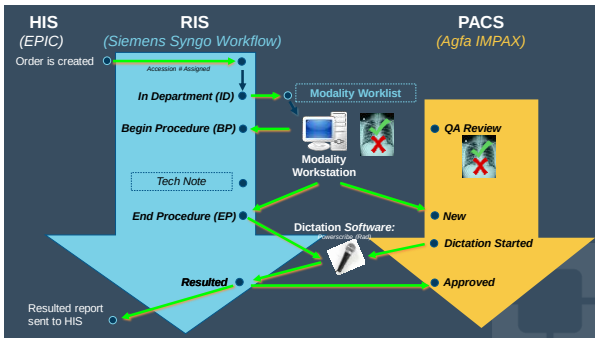

HIS
(EPIC)
RIS
(Siemens Syngo Workflow)
PACS
(Agfa IMPAX)
Order is created
Accession # Assigned
In Department (ID)
Modality Worklist
Begin Procedure (BP)
QA Review
Modality
Workstation
Tech Note
End Procedure (EP)
Dictation Software:
New
Dictation Started
Reported
Resulted
Approved



IHE Schedule Workflow Integration Profile

- Modality Performed Procedure Step (MPPS) messages
  - The image manager (PACS) and Order Filler (RIS) are required to accept these messages, but are not required do anything intelligent with them
- Two transactions defined in IHE technical framework:
  - Modality Procedure Step in Progress
  - Modality Procedure Step Completed





Technologist Image Review

Prospective QA

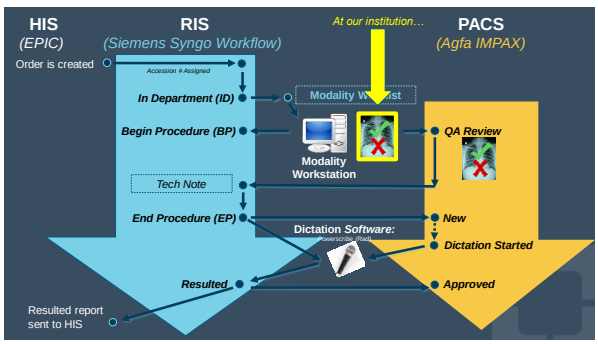
Retrospective QA

Prospective QA

- Assessment of Image Quality:
  - Patient positioning
    - Relevant anatomy is included?
    - Appropriate rotation?
    - Appropriate obliquity?
    - Proper centering?
  - Artifacts
  - Appropriate technique?

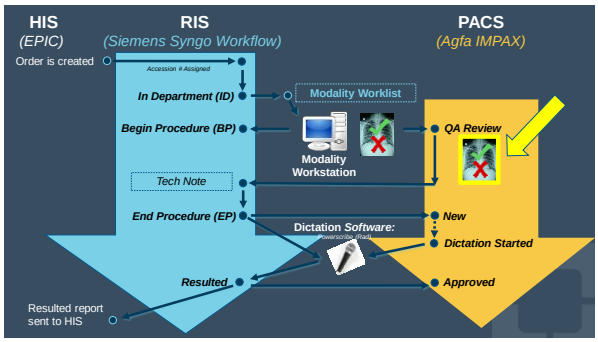
Prospective QA

- Technical factors to check (as applicable):
  - Lead markers
  - Skin markers
  - Magnification balls
  - Annotations



Prospective QA

- Verification in PACS:
  - All images transferred and displaying properly
    - Acquired views and exam tags are correct
    - Images oriented properly
    - Annotations displayed
  - Patient information is correct
  - HIS/RIS verification passed

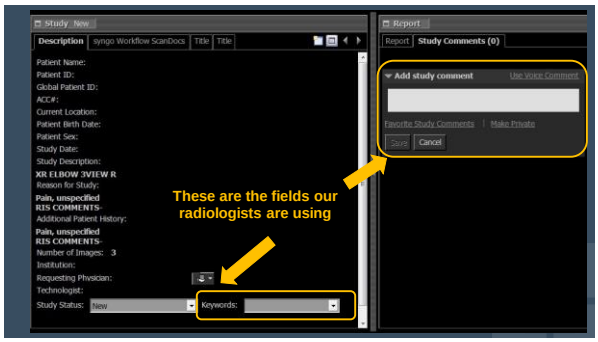


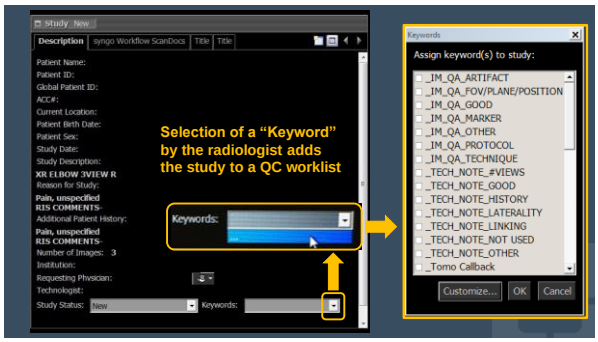
Prospective QA
(at our institution…)

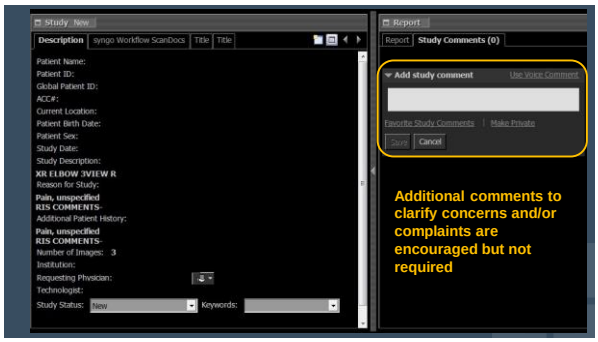
- Who conducts it?
  - *the technologist that acquired the images*
- When/where in the technologist workflow is it performed?
  - *Image quality assessed at the modality workstation*
  - *Additional technical items assessed in PACS prior to ending the procedure in the RIS*

Retrospective QA

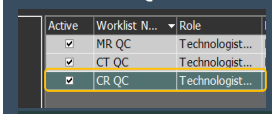
- Method for collecting radiologist feedback on image quality (good or bad)
- Process for reviewing cases flagged by the radiologist
- Feedback mechanism for communicating flagged cases to the technologist that acquired the images


These are the fields our radiologists are using

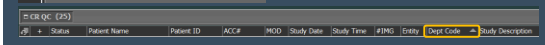

Selection of a "Keyword" by the radiologist adds the study to a QC worklist
Keywords:
Assign keyword(s) to study:
_IM_QA_ARTIFACT
_IM_QA_FOV/PLANE/POSITION
_IM_QA_GOOD
_IM_QA_MARKER
_IM_QA_OTHER
_IM_QA_PROTOCOL
_IM_QA_TECHNIQUE
_TECH_NOTE_#VIEWS
_TECH_NOTE_GOOD
_TECH_NOTE_HISTORY
_TECH_NOTE_LATERALITY
_TECH_NOTE_LINKING
_TECH_NOTE_NOT USED
_TECH_NOTE_OTHER
_Tomo Callback
Customize...
OK
Cancel


Additional comments to clarify concerns and/or complaints are encouraged but not required

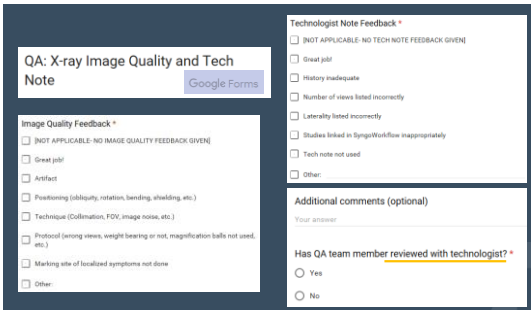
QA Tech – Image Review



- QC worklists are modality based



- QC worklists are reviewed daily by Lead QA Techs
  - Techs are assigned to specific Modality(s) and Department Code(s)



QA Tech – Image Review

- Once “X-ray Image Quality and Tech Note” form has been submitted
  - Lead tech removes “Keyword” from the study in PACS
  - Study drops off of the QC worklist

Image Rejection

Image Rejection: Where?

- At the modality
- In PACS

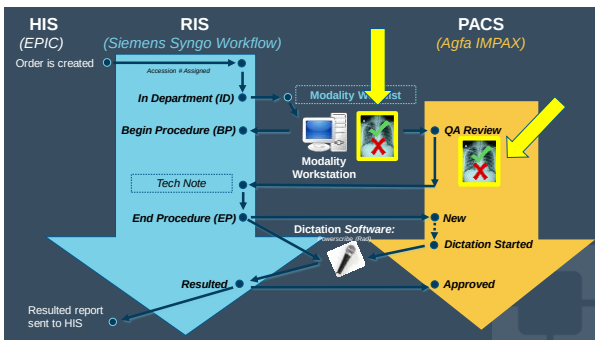


Image Rejection: CCF Workflow

- Images are reviewed for image quality at the modality workstation
  - Images deemed “unacceptable” for interpretation are rejected at the modality and do not get sent to PACS

Image Rejection: CCF Workflow

- PACS super-users DO have the ability to reject images from PACS while the study is in “QA Review”
- Reasons for rejecting images at this stage might include:
  - Images need to be reprocessed
  - Tech FORGOT to delete the image at the modality workstation for poor quality
  - There is an issue on the PACS side with an image (partially transferred or corrupted) and they need to delete and re-send Image
  - Image was tagged under the incorrect exam tag at the modality

Key Takeaways

- When a technologist thinks of image QC, it often involves far more than just checking the image quality
- Images can be rejected at the modality or in PACS

Cleveland Clinic
Every life deserves world class care.