IHE Encounter-Based Imaging Workflow (EBIW)

Working DRAFT of PoCUS Update Proposals

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Introduction to this Document

Point-of-care ultrasound (POCUS) has become increasingly prevalent in the fields of emergency medicine, critical care, and anesthesia. This is due in part to advances in technology that have made ultrasound devices smaller, more portable, and more user-friendly, allowing for easy integration into clinical practice. Additionally, POCUS has been shown to provide several benefits, such as enabling rapid diagnosis and management of critically ill patients, reducing the need for more invasive procedures, and improving patient outcomes.

POCUS is non-invasive, safe, and cost-effective compared to other diagnostic imaging modalities. POCUS can be used to evaluate a variety of organ systems, including the heart, lungs, abdomen, and musculoskeletal system. As a result, POCUS has become a valuable tool in many different medical specialties and clinical settings, from primary care clinics to operating rooms and intensive care units.

In recent years, there has been a growing interest in POCUS education and training, with many medical schools and residency programs now offering POCUS training as part of their curricula. Professional organizations, such as the American College of Emergency Physicians (ACEP) and the Society of Critical Care Medicine (SCCM), have also developed guidelines and recommendations for the use of POCUS in clinical practice. All of these factors have contributed to the increasing popularity and adoption of POCUS in healthcare.

This document refines POCUS workflow Use Cases and Requirements with respect to ACEP guidelines and the real-world experience of ACEP members, and will likely result in one or more change proposals to the IHE EBIW, following the IHE CP process.

Items in *blue italics* are editorial comments.

References

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2. ASE/ACEP Focused Cardiac Ultrasound in the Emergent Setting

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4. Use Cases for Encounter-Based Imaging Workflow (EBIW) *(IU Sharepoint)*
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6. Flannigan MJ, Adhikari S. *Point-of-Care Ultrasound Work Flow Innovation: Impact on Documentation and Billing.* J Ultrasound Med. 2017;36(12):2467-2474. doi:10.1002/jum.14284
7. Tayal, Vivek S, et al. *Ultrasound Program Management : A Comprehensive Resource for Administrating Point-of-Care, Emergency, and Clinical Ultrasound*. Cham, Springer International Publishing, 2018.
8. Best Practices in the Communication and Management of Actionable Incidental Findings in Emergency Department Imaging
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POCUS Concepts

IHE Profiles include a "Concepts" section to provide information that is not normative (i.e. Profile conformance "shall language") but would be important for those implementing the profile in products and those deploying the profile in care settings to understand and consider.

The following are POCUS concept material proposed by ACEP as likely useful to include in the Profile.

POCUS Information Model

See Section 47.4.1.1 of EBIW

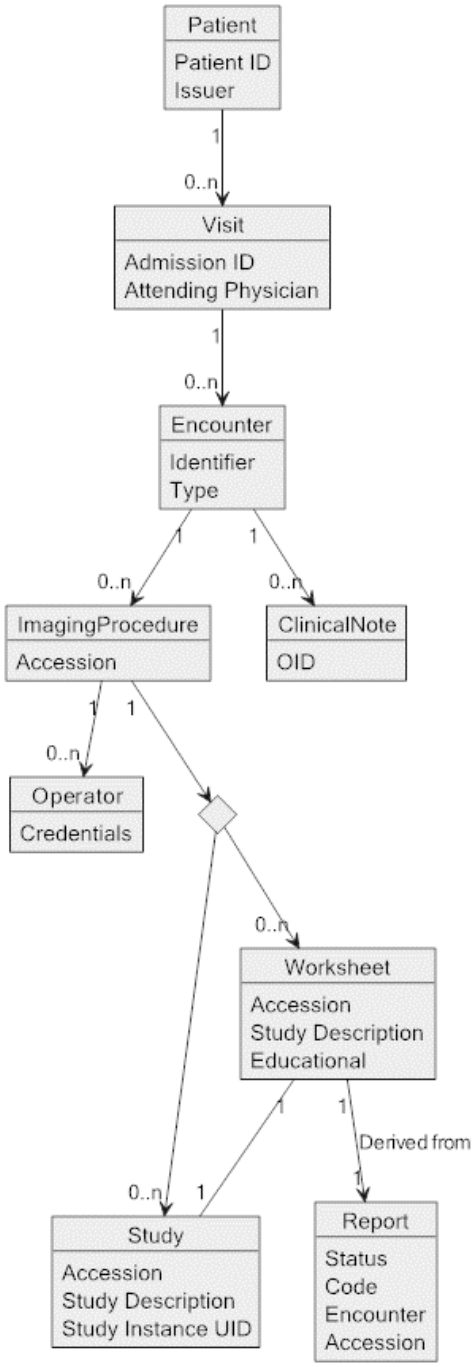


Figure X: POCUS Information Model

Figure X: Diagram Pseudocode for POCUS Information Model

POCUS Credentialing and Privileging

The American Medical Association has affirmed that ultrasound imaging is within the scope of practice of appropriately trained physicians. While credentialing is the process by which a healthcare organization verifies that a healthcare provider has completed the appropriate training and licensure to practice medicine, privileging is the process of granting a healthcare professional the authority to perform an act or procedure, such as POCUS, within a specific clinical setting or scope of practice. Privileging ensures that healthcare professionals have the necessary skills and knowledge for safe and effective use of POCUS within a particular clinical setting (e.g., the Emergency Department).

POCUS privileging is institution-specific and designed to ensure compliance with jurisdictional standards and specialty-specific policies. Each hospital is responsible for creating, granting and overseeing the privileging process. Meeting privileging criteria for POCUS typically involves a combination of formal training, hands-on experience, and assessment of the healthcare professional's knowledge and skill in performing POCUS exams. Physicians, nurse practitioners, physician's assistants and nurses may be privileged globally or on a per-application basis based on local POCUS privileging policies.

To maintain privileges, the healthcare professional may be required to have ongoing education credits (e.g., CME) and/or perform a minimum number of POCUS exams per year. It is generally acknowledged that the intensity of training is significantly higher to obtain initial privileges compared to maintaining this skill, similar to other specialty-specific procedural skills. If quality issues develop, healthcare professionals might be required to undergo more intensive training and proctoring to restore privileges through a focused professional practice evaluation (FPPE).

POCUS Education

[TODO] improve. This is a rough draft

Professional medical associations recommend POCUS as a core competency for medical students, residents, and fellows training in multiple specialties. There are varied pathways for clinicians in training to also obtain POCUS training. It is generally acknowledged that clinicians in training frequently acquire point-of-care ultrasound knowledge, technical skill, and documentation habits more readily than clinicians who've been in practice for a significant amount of time or lack a structured mentoring and training environment afforded to them.

A typical clinician in training pathway includes:

- Completion of a formal POCUS curriculum, which covers various topics such as physics and instrumentation, artifacts, system setup, transducer positioning, and detailed discussions related to specific elements relevant to diagnostic and procedural studies within the specialty-specific applications. This comprehensive curriculum ensures a thorough understanding of POCUS principles and ensures trainees are competent in performing and interpreting specialty-specific POCUS applications.
- Participation in supervised hands-on ultrasound scanning, conducted in either a simulated environment or a clinical setting. During initial training sessions, training and/or clinical exams are frequently performed, with real-time supervision and review by faculty members holding POCUS privileges. As training progresses, training and/or clinical exams are more often performed independently with review by POCUS privileged faculty. Additionally, POCUS experts provide in-depth reviews and constructive feedback to enhance proficiency of exams.
- Demonstration of POCUS proficiency during a dedicated ultrasound rotation. This phase involves performing ultrasound studies primarily for educational purposes, focusing on technical adequacy, accurate interpretation, and appropriate documentation. Patients and co-learners often volunteer to participate as models for educational purposes, typically through verbal or written consent, depending on local expectations and policies. Depending on graduation and/or privileging requirements, proficiency may necessitate a specific number of studies demonstrating disease.

Compliance

Note: this is a works in progress

It is imperative that point-of-care ultrasound exams maintain compliance with departmental documentation standards for patient and provider identification, as well as obtained images (views), purpose (indication), findings (interpretations). Although standards may vary from department to department, this section introduces common pitfalls and presents best practices to ensure that patient medical, educational, and billing records for POCUS studies are accurate and complete.

The table below summarizes data errors that can lead to compliance issues.

Issue	Definition	Significance	Pt ID	Operator ID	US Images	Worksheet	Report signed	Can be sent to EMR?	Resolution
Unassigned Study	The study contains patient identifiers and images are saved. However, the study does not contain information about the operator and who is responsible for completing and/or finalizing the report.	No one has ownership/accountability for the study. This is needed to: • verify privileging • complete the report • send to EMR to incorporate in the patient medical record, and • initiate billing	Y	N	Yes/No	Yes/No	Yes/No	Potential	The study can be claimed by the operator or supervising clinician on the POCUS Manager.
Unreported Study	The study contains images, appropriate patient identifiers and has an operator assigned. However, the study does not yet have a report.	This is a normal stage of the workflow. However, the operator needs visibility to know this task is awaiting completion.	Yes	Yes	Yes	No	No	Potential	Complete and sign a report.

Blind Study	The study contains metadata that includes patient information and operator information. However, there are no saved POCUS images. Because some modalities may save images of the patient information screen, it is possible that a report could be generated, finalized and sent to the EMR. Note: this is different from a study that is missing an expected, or complete set of images.	Because images were never saved on the Modality, the study will never be complete. However, the study may progress and be resulted in the EMR despite not having any ultrasound images. This may create medicolegal risk and billing non-compliance.	Yes	Yes	No	Yes/No	Yes/No	Potential	Based on local policy. The POCUS manager may "block" sending a report and quarantine the study. An addendum may be added to the report indicating no images were saved.
Unidentified Study	The study is assigned to an operator and contains images without patient identifiers. It is possible that patient identifiers can be reconciled in the POCUS Manager allowing the workflow to continue.	This may occur because the study was initiated before the patient was registered. The Operator knows the identity of the patient and can manually reconcile in the POCUS Manager after the study is complete	No	Yes	Yes	Yes/No	Yes/No	Potential	Because the Operator knows the identity of the patient, he/she can reconcile demographics in the POCUS Manager once the patient is registered. See Unidentified patient Alternate Case #9 below.
Orphan Study	The study contains POCUS images without patient identifiers and no operator is assigned. The workflow cannot progress beyond this point.	This is similar to the Unidentified Study, but unlike an Unidentified Study, an Operator is not identified and no one is responsible for reconciling the study.	No	No	Yes	Yes/No	Yes/No	Potential	Based on local policy. Patient could be identified through in investigation/deduction.

Ghost Study	A study that was performed without patient identifiers, without an operator assigned and without saved POCUS images.	In this scenario, an ultrasound machine was used to obtain images, but nothing was saved (patient information, operator information or POCUS images). There is no evidence that an ultrasound was performed.	No	No	No	No	No		Cannot be resolved
Empty Study	Like the Blind Study, there are no images. In this case, there is also no report. There is some indication that a study was started (e.g. a secondary capture of the demographics UI (a.k.a. patient data screen), or an entry in Modality Database)	Something was started but discontinued before image acquisition.	Yes	Yes	No	Yes/No	Yes/No	No	Based on local policy. In case of a 1-off, this may be ignored, however when it arises as a trend, it may indicate a process issue to the POCUS program leadership (e.g., image transfer is broken, training is needed, etc..).
Unreported Study	There are images but no report. Images may be in the VNA or in the POCUS Manager.	Results in missing information in the patient medical record; the study cannot be billed. It is not clear if the study was clinically indicated or performed for training.	Yes	Yes	Yes	No	No	Potential	The operator or supervising physician generates a report.
Abandoned (Discontinued) Study	There may be images, but the study was intentionally stopped (e.g., due to patient care issues).	It may not be clear if the study was intentionally discontinued or fits int one of the other exception cases in this table.	Yes	Yes	Yes/No	No	No	No	See “Discontinued Study”, below.
Uncredentialed Study	The HCP is licensed, but not credentialed for the performed study type.	The uncredentialed HCP should not sign off on report	Yes	Yes	Yes	Yes	No	No	A credentialed HCP provides an overread.

Temporarily Unlinked Study	*TODO Discuss*		No	No	Yes	Yes/No	No	Potential	*Not linked in EMR? Need to review how to fix…* *Missing Admission ID in DICOM images*
Completed Study	See Use Case #1 Diagnostic Point of Care Ultrasound		Yes	Yes	Yes	Yes	Yes	Yes	N/A this is the Happy Path

Compliance begins with entering data into the POCUS modality, which includes identifying the operator(s), patient and supervising physician. These are critical data and should be prominently displayed on the user interface, free from unnecessary clutter.

Operator Identification

Accurate operator identification is crucial in determining if the operator is privileged to independently perform a specific study type and authorized to authenticate that the study's impressions are valid by signing the report. In cases where the operator lacks necessary privileges for a given study type, a privileged user must review the POCUS exam (including adequacy of POCUS images), edit for accuracy the report and finalize the report to ensure accurate diagnosis, billing, and regulatory compliance. Furthermore, operator identification plays a crucial role in ensuring that POCUS learners, who are completing exams as part of their training/privileging process, receive:

- credit for performing the study,
- timely feedback regarding the completeness of an exam protocol,
- feedback pertaining to technical aspects of image acquisition (gain, depth, measurements, demonstration of essential structures, etc.), and
- timely feedback pertaining to the interpretation of exam images.

POCUS privileges may be global or application specific, depending on local privileging criteria. Due to the specificity of privileges that can vary from one hospital to another, an operator's authorization to perform, interpret and finalize POCUS is likely to be application specific. Therefore, ensuring precise operator identification involves two essential aspects: accurately selecting the operator and correctly identifying the exam and report types the operator is permitted to finalize, based on their POCUS privileges. Improving documentation requires **POCUS vendors to implement measures that promote accurate operator identification**, including, but not limited to the following:

- avoiding manual entry by utilizing barcode scanners, RFID, or QR codes,
- allowing entry of operators through the use of clearly identified fields,
- allowing entry of multiple operators to support multiple POCUS learners,
- allowing operators to “tap in” or “tap out” for participating in the acquisition of a given series,
- implementing system authentication credentials (e.g., ITI-9),
- implementing poke-yoke controls to prevent scanning or transmission of images without identifying the operator,
- requiring the operator to identify themselves at the start of each study (e.g., operator is logged out when the study ends),
- setup options that automatically end exams if there's been no machine activity (button pushes or image / video capture) during a pre-defined timeout period (this functionality could be coupled with an auto-end or auto power-off timeouts), and

- implementing notifications within the system to prompt users to complete necessary exam requirements (e.g., patient identification, operator identification, saved exam images, etc.).

Although this document does not provide a specific profile for enterprise user authentication (e.g., LDAP, AD, OAuth, SAML, Kerberos), **vendors should prioritize measures that promote accurate operator identification**, ensuring that operators utilize enterprise identity credentials (vs. an entry that requires a verification step to reconcile improperly entered information).

Patient Identification

Accurate and efficient patient identification at the modality promotes patient safety, avoids medical record errors, facilitates billing and regulatory compliance, and increases efficiency. As in operator identification, **vendors should implement measures for streamlined accurate patient identification**:

- avoiding manual entry by utilizing barcode scanners, RFID, or QR codes at the Modality,
- configurable policies for the Encounter Manager to remove unnecessary entries from the Modality Worklist,
- support Patient Update/Merge on the Image Manager (POCUS Manager) for patients whose images are captured before they are registered
- notifications to add patient information at the beginning and/or end of a POCUS exam
- automated closure of exams after a pre-determined period of time to prevent inadvertent addition of images to an exam that was previously performed on the modality, but not closed

Modality Worklist

The Modality Worklist (MWL) is a comprehensive list of registered patients that can be filtered based on location. It should be viewed more as a list of patients rather than a list of potential studies. This profile does not specify a method to populate the MWL; however, ADT messages are most common. Other methods include FHIR or HL7 v2 Patient Demographics Queries. An effective Modality Worklist (MWL) for POCUS should possess several key characteristics:

- Dynamic and Real-Time Updates: The MWL should be updated in real-time to reflect the status of patients and their encounters.
- Comprehensive Patient and Encounter Information: The MWL shall support the query matching and return keys specified in Get Encounter Imaging Context [RAD-130].
- Matching and Filtering: The Modality should be capable of filtering based on Institutional Department Name (0008,1040), Patient's Name (0010,0010), Patient ID (0010,0020), or Admission ID (0038,0010), ideally enabling the scanning of the patient's wristband (i.e., barcode, RFID, QR code) to help clinicians quickly find patients in their area of responsibility. If a Modality device is dedicated to a specific department, the MWL response could be filtered based on the department to which that AE is assigned (i.e., Scheduled Station AE Title (0040,0001)).

- Retention of Patients with Multiple Exams: Patients should remain on the MWL even after an initial exam is completed if additional images, studies or follow-up procedures are needed, e.g., volume status assessments, fetal heart rate, repeat IV access, or bladder volume assessments.
- Acceptance and Update of Patient Demographics: The MWL should accept and update patient demographic information as changes occur based on Patient Updates [RAD-12].
- Accession Number Generation and Confirmation: The MWL should generate an initial Accession Number for each imaging study, to be updated and confirmed by the POCUS Manager. The Issuer of Accession Number Sequence shall be included to ensure the uniqueness of accession numbers within the enterprise. The POCUS Manager will generate accession numbers in the process of study splitting, where multiple imaging studies initially acquired under the same accession number, study description, and study instance UID are divided into separate entities with unique accession numbers, study descriptions, and study instance UIDs corresponding to the worksheets completed by the HCP.
- Audit and Traceability: The MWL SCP and Modalities should implement the ATNA Record Audit Event [ITI-20] transaction to track access, modifications, and usage of patient information.
- Scalability and Reliability: The MWL system should be scalable to handle varying patient volumes and support new and multiple departments adopting POCUS. It must ensure continuous availability, especially in high-demand environments like emergency departments and inpatient units.

Supervising Physician

Also known as attending physician, staff physician, “attending”, or in the UK as “consultant”, the supervising physician is responsible for all care in which medical trainees (e.g., students, interns, residents, or fellows) are involved, and has ultimate responsibility for the patient encounter and associated POCUS reports. A supervising physician may also review procedures and encounters, and provide feedback after care is delivered. The EBIW Profile acknowledges the importance of identifying the Attending Physician, however it is not profiled.

The supervising or attending physician role in clinically-indicated point-of-care ultrasound exams is paramount. These physicians are typically required to supervise key components of procedures that are performed by POCUS learners and required to determine if the exam images are of diagnostic quality to aid in medical decision-making, and therefore billable. Attending supervision of the exam may be done during or after POCUS images are acquired. Additional images may be needed if the attending is not present during image acquisition.

While HL7 PV-1.7 contains attending physician information, it does not map to DICOM MWL, which currently offers Requesting Physician (0032,1032) and Referring Physician's Name (0008,0090). *Editorial Note: DICOM CP to add Supervising Physician to DICOM. The General Study Module includes Consulting Physician's Name (0008,009C) and the Consulting Physician Identification Sequence (0008,009D).Referring and Requesting are consultative based imaging terms. "Supervising physician" is a much clearer term.*

Discontinued Study

A POCUS study may be intentionally discontinued at any workflow step by the HCP prior to report signature for clinical reasons (e.g., patient condition, technical issues, patient request, time constraints). It is important to note that this type of discontinuation is deliberate and not related to process breakdowns. The discontinued study may have no images (and still result in a patient entry in the Modality), or contain some images related to a study.

> Note: Some POCUS Modality vendors create a secondary capture of the demographics UI (a.k.a. patient data screen), however this is not considered a clinical image.

The table below provides considerations for the Modality and the POCUS Manager when resolving discontinued studies to prevent potential compliance issues and ensure consistent handling and documentation.

Step	**ID from Use Case #1**	**Considerations**
Before the MWL was queried	1-3	The Modality may consider configurable behaviors for handling unfinished studies. For example: • Confirm the intent to end the current study when the operator re-initiates a MWL query during an active study. • Disallow re-initiating a MWL query when there is an active study. • After an inactivity timeout, and in the absence of an MWL query, confirm whether the operator intends to add images to the current open study (i.e., append) or start a new one. • Implement an inactivity timeout that closes the study and clears any cached operator or patient ID. • Note: Local cybersecurity policies may already require such a timeout. • Differentiate between ending a study without issues and ending a study as discontinued, in order for the Modality to identify the study as being discontinued. *TODO Vol2: is there a way to encode "DISCONTINUED" in an image?* *Procedure Code Sequence (0008,1032)*
After the MWL was queried, but before the images were obtained	4	
After images were obtained, but before they were transferred to the POCUS Manager.	5	

After images were transferred to the POCUS Manager	6	The POCUS Manager may identify Phantom Scans requiring attention. The POCUS Manager may also provide a configurable timeout (typically 24 hours) after which the study is considered discontinued.
After the worksheet was completed, but before the report was signed	7	

This supplement does not define how the Modality or POCUS Manager may dispose of images or other evidence objects. Each implementation shall decide if it is useful to support the storage of the corrected images or other evidence objects, when clinically meaningful.

Reporting

The concept of reporting in the context of point-of-care ultrasound (POCUS) begins with the completion and signing of a worksheet by the operator. This worksheet serves as a comprehensive template, documenting essential details such as clinical history, examination purpose (indication), obtained images (views), and findings (interpretations). Once finalized, the POCUS Manager integrates this information with patient data, culminating in the creation of a procedural report. The report may also include hyperlinks facilitating direct access to the corresponding images stored within a POCUS manager or other compatible viewers, leveraging IID (Invoke Imaging Display) or WIA (Web Image Access).This report encapsulates the interpretive analysis conducted by the physician, summarizing findings, measurements, and diagnostic insights derived from the POCUS study. The report, signed by a Privileged healthcare provider (HCP), is then transmitted to the Electronic Medical Record (EMR) system as an unsolicited observation, providing a vital contribution to the patient's medical record.

In some instances, interim assessments known as Draft Reports or Preliminary Reports may be generated by non-credentialed providers during the interpretation process. These preliminary assessments are subjected to review and overreading by a Privileged HCP before finalization and submission to the EMR. Moreover, the reporting process accommodates the potential need for amendments or enhancements through Report Addenda. These addenda serve as supplementary updates to previously approved reports, offering clarifications, corrections, or additional information, all of which are appended with clear labeling to denote their status as postscript modifications to the original report.

For reporting and billing compliance, HDO has the option to create specific requirements for mandatory information in the report. This includes important details such as MRN/CSN/FIN, accession number, obtained images (views), purpose (indication), findings (interpretations), as well as indicators differentiating between clinically indicated and educational cases. The POCUS Manager is responsible for determining the appropriate report template based on the Study Description and automatically populating it with values obtained from DICOM metadata. Certain organizations may also prepopulate CPT codes, although the reporting healthcare professional (HCP) retains the ability to modify them, if necessary.

> Note: IHE EBIW RAD-132 is an HL7v2 ORU^R01 message specified to include information necessary for the Results Aggregator (typically the EMR) to create an order for billable studies, as well as financial transactions necessary for charging.

A hanging report is a report in the POCUS Manager that has not been signed by a credential HCP. The POCUS Manager is responsible for sending a notification to the Attending Physician of record (either named on the report, or the Encounter.

Types of notifications include:

- "EHR" in box (Provider Notifications) *TODO discuss with ITI or EMR vendor*
- email reminders
- Popup on app
- FHIR Communication Resource

As in other modalities, the POCUS reporting workflow may also require an addendum (e.g., for a finding identified during QA). The addendum is managed on the POCUS Manager and may incorporate the ADD (Addendum) segment to specifically indicate that the message contains an addendum to the original report, providing clear demarcation and details about the addendum.

> Note: Local policy dictates who creates the addendum and its clinical management (e.g., patient call-back, etc.).

Orders

Prospective orders are uncommon in POCUS since clinical decisions to undertake specific actions are made at the patient bedside. Placing an order for an encounter-based imaging procedure can be disruptive to clinical care activities. Clinicians should not have to stop patient care or their typical workflows to enter an order, as this process can be inefficient and interfere with the timely delivery of patient care.

However, orders are important to satisfy billing prerequisites that require a patient's physician note or an order. Orders serve as essential documentation to ensure that imaging procedures are properly tracked and billed, meeting compliance and regulatory standards. While this profile includes a standard mechanism for incorporating imaging results into the EMR, supplementary retrospective orders may help ensure that the necessary details for each imaging procedure are accurately recorded to support seamless integration and communication within the EMR system..

Quality Assurance (QA)

QA processes vary site-to-site. There are two distinct use cases: clinical study QA, and educational study review and feedback. A percentage of clinically indicated POCUS studies undergo QA review based on local sampling plans, and all training studies are subject to QA assessment, as they contribute to a POCUS learners credentialing.

The QA reviewer could be a: supervising physician, lab supervisor, clinical instructor, faculty member who is independently privileged to perform POCUS. The QA reviewer does not counter-sign the report or substitute the roll of the supervising physician to determine how the exam findings should be clinically integrated into patient care. In the event of a medical finding with educational studies, the QA reviewer adheres to local policies for incidental findings. This process may involve reaching out to the volunteer (for training that involves simulation training) or their original provider (for a clinical encounter) to guide them to receive additional evaluation, which most likely requires a follow up patient encounter.

For clinical exams, the QA process involves evaluating studies for errors or misses, with potential options for amending studies according to local policies and generating reports and metrics. Educational exam review focuses on evaluating all exams, providing feedback, and tracking progress through portfolio generation, emphasizing the reconciliation of clinically significant "misses."

Additional considerations include:

- functionality within or beyond the POCUS Manager,
- standard encoding QA comments,
- status indicators (e.g., ready, ongoing and, complete),
- report addenda resulting from the QA review, (and notifying of referring physicians of report updates), and
- context sharing with the Electronic Health Record (EHR).

Because the QA review may discover new clinical findings, timely completion of QA procedures is essential. QA Reports and tracking mechanisms are tailored to local policies and different user types.

Procedural Adjunct Point of Care Ultrasound

Procedural Adjunct POCUS is employed to enhance the precision and safety of invasive procedures. This encompasses procedures such as guided thoracentesis, nerve blocks, and vascular access that are performed in various departments.

Procedural Adjunct POCUS can be further differentiated as static and dynamic guidance. Static guidance often applied periprocedurally (i.e., pre-procedure or post-procedure), serves as a verification tool to ensure the accuracy of needle or catheter placements, simplifying the process of these interventions. In contrast, dynamic guidance involves the simultaneous manipulation of both the ultrasound probe and the invasive device in real-time by the HCP to guide the device to its target.

Image transfer of Procedural Adjunct POCUS images can follow one of two paths: direct transfer to the VNA or to the POCUS Manager:

1. **Transfer to VNA:** When transferred directly to the VNA from the Modality, the HCP generates the procedural report in the EMR, the EMR links the images to the report.
2. **Transfer to the POCUS Manager:** A report is generated based on POCUS manager derived worksheets. These are completed either on the POCUS Manager or through web-based access to the POCUS manager, as in the Diagnostic POCUS use case. Depending on local policy, the HCP creates either:
    a. Full report (as in the Diagnostic POCUS use case), or
    b. A minimalistic, templated, report, explaining that ultrasound guidance was employed during the procedure, and referring the reader to the EMR for the full report.

This document profiles image transfer to the POCUS Manager and report generation in the POCUS Manager. This approach offers consistency with Diagnostic POCUS workflows, and offers benefits such as worksheet-based reporting, coding compliance, medico-legal

documentation of images, quality assurance (QA) of procedural complications, EMR linkage, workflow standardization, and adherence to local credentialing policies.

QA of Procedural Adjunct POCUS is subject to local policy.

Billing practices are also subject to local policy and influence report generation. The imaging component of a guided procedure may either be bundled with the procedure charge, exemplified by image-guided thoracentesis (CPT 32555), or itemized separately, as in a limited chest ultrasound (CPT 76604) plus a thoracentesis without imaging guidance (CPT 32554).

POCUS Use Cases

IHE Profiles include "Use Cases" which demonstrate typical patterns of use and show how Profile transactions would go together, and sometimes interact with real-world actions, to achieve effective integration.

The following are additions and clarifications from ACEP of typical POCUS workflows and variants.

As education plays a fundamental and continuous role in POCUS workflows, this document outlines various educational and non-educational use cases, as summarized below:

Use Case #	Provider	Clinically Indicated	Setting	Image Destination	Report Destination	Notes
Diagnostic POCUS						
1	Privileged	Yes	Clinical	VNA	EHR	Typical “happy path”
2	Learner	Yes	Clinical	VNA	EHR	● Study must be finalized by a privileged in POCUS manager prior to transfer to VNA and EHR. ● Local policy my desire preliminary report
4	Learner	No	Clinical or Educational lab	POCUS Manager	POCUS Manager	● Training only ● Local policy may optionally dictate VNA archive of all POCUS studies
Procedural POCUS						
4	Any	Yes	Clinical	VNA	EHR	Local policy dictates the need to render a dedicated imaging report (vs. procedural report in the EHR)
5	Learner	No	Educational lab	POCUS Manager	POCUS Manager	

Use Case #1 Diagnostic Point of Care Ultrasound

The most typical (“normal”) case involves a diagnostic study performed and reported by a privileged HCP for a registered patient.

A diagnostic study is performed to evaluate a specific medical condition (shock), or to evaluate a patient's anatomy or physiology (left ventricle chamber size and function). This could be an initial evaluation or a reassessment/serial study. The Diagnostic POCUS Use Case is intended to generalize the following scenarios:

1. The patient is registered for an inpatient or outpatient encounter in a healthcare facility (e.g., emergency department, critical care unit, cardiology office, obstetrics and gynecology suite, or operating room).
2. The HCP enters their ID in the POCUS device (i.e., with a barcode scanner, RFID, QR code or manual entry)
3. The HCP enters the patient ID in the POCUS device (i.e., with a barcode scanner, RFID, QR code or manual entry)

    Note: depending on the EMR system, the patient ID could also be a medical record number or billing number known. Examples include: CSN (Contact Serial Number), FIN (Financial Identification Number) or ASN (Appointment Serial Number). See the Compliance section for more information.

4. The POCUS device displays a MWL entry specific to the patient. The HCP confirms the patient demographic information (name, date of birth, gender, etc.). and selects the patient prior to initiating exam specific image capture.
5. The HCP performs a focused POCUS exam (e.g., biliary scan for cholelithiasis). Images are transferred to the POCUS Manager.
6. The HCP accesses the POCUS Manager system (through a client application on a handheld device, client web browser or PC workstation) and searches for the study completed in the previous step.
7. The HCP views the images. The POCUS Manager proposes a worksheet based on the Study Description. The HCP confirms the worksheet, and completes it, entering the obtained images (views), purpose (indication), and findings (interpretations). The HCP identifies the study as clinically indicated (vs. educational).

    Note: See the POCUS Concepts for more information.

8. The HCP applies their electronic signature to the report. This signature is typically generated using a unique identifier tied to the provider's identity within the POCUS Manager.

    Notes:

    1. Technical requirements for electronic signatures are determined by jurisdiction, institution or payors, and out of scope of this document.
    2. The HCP may apply a Confidentiality Code to indicate the degree to which special confidentiality protection should be applied to the report. This does not encode site policy, but rather describes the nature of the study which would facilitate the implementation and invocation of such site policies.

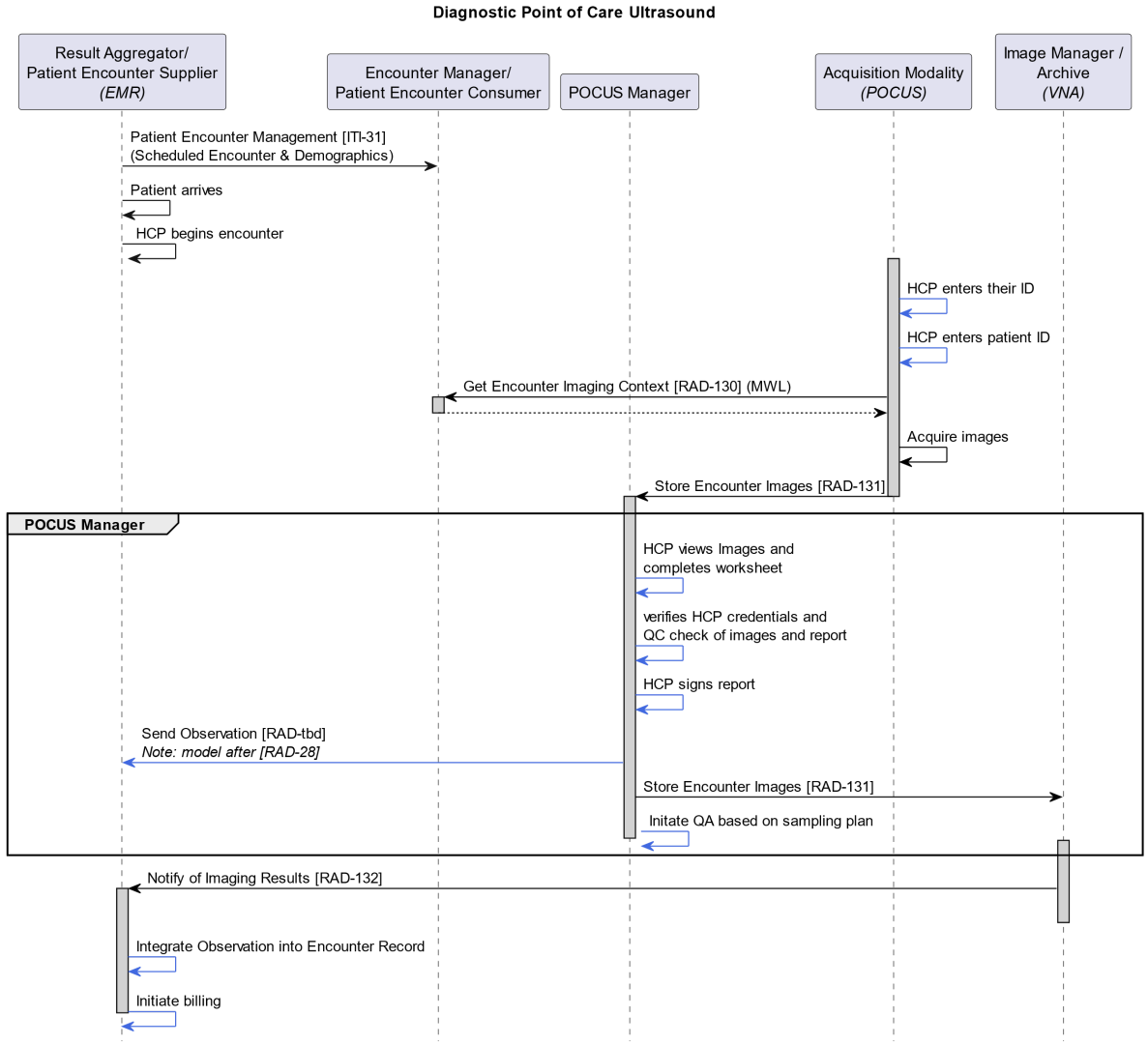
9. The POCUS Manager verifies the HCP credentials, as well as required report elements (i.e., a valid MRN, CSN/FIN, a valid patient name, obtained images (views), purpose (indication), and findings (interpretations)).

10. The POCUS Manager also validates that the study contains at least one image, and that all images contain a valid MRN/CSN/FIN, patient name and accession number issued from either the Encounter Manager namespace, or the POCUS Manager namespace.
11. Because the HCP is credentialed, and both the report and images meet validation criteria, the POCUS Manager sends the report (i.e., the signed report) as an unsolicited observation to the EMR, and transfers DICOM images to an Image Manager/Archive (a.k.a. VNA).
12. The Image Manager/Archive sends a notification to the EMR using Notify of Imaging Results [RAD-132].
13. The POCUS report is associated with the patient encounter in the EMR.

    Note: Based on local policy, the EMR may also create an order for billable studies, as well as financial transactions necessary for charging.

14. The POCUS Manager initiates Quality Assurance based on the local sampling plan.

Use Case #1 Process Flow



Blue arrows: new transactions

Black arrows: existing EBIW transactions

Figure 1-1: Diagnostic Point of Care Ultrasound Use Case Process Flow

The text in below was used to generate the diagram above. Readers will find the diagram more informative. The text is included here to facilitate editing.

```
@startuml
hide footbox
title Diagnostic Point of Care Ultrasound

participant "Result Aggregator/\nPatient Encounter Supplier\n\(EMR\)/" as RA
participant "Encounter Manager/\nPatient Encounter Consumer" as EM
participant "POCUS Manager" as US
participant "Acquisition Modality\n\(POCUS\)/" as Modality
participant "Image Manager /\nArchive\n\(VNA\)/" as VNA

RA->EM: Patient Encounter Management [ITI-31](orScheduled Encounter & Demographics)
RA->RA: Patient arrives
RA->RA: HCP begins encounter
skinparam sequence {
  ArrowColor RoyalBlue
}
activate Modality #D3D3D3
Modality -> Modality: HCP enters their ID
Modality -> Modality: HCP enters patient ID
skinparam sequence {
  ArrowColor Black
}
Modality->EM: Get Encounter Imaging Context [RAD-130] (MWL)
activate EM #D3D3D3
EM-->Modality:
deactivate EM
Modality->Modality: Acquire images
Modality->US: Store Encounter Images [RAD-131]
deactivate Modality
activate US #D3D3D3
skinparam sequence {
 ArrowColor RoyalBlue
}
group POCUS Manager
 US->US: HCP views Images andIncompletes worksheet
```

Figure 1-2: Diagram Pseudocode for Diagnostic POCUS Process Flow

Use Case #2 Non-privileged Operator Clinical and Training POCUS

Training and education is integral in many POCUS workflows. Within each patient evaluation stud(y/ies) may be clinically indicated and/or performed for training.

For example, a pregnant woman might come in with vaginal bleeding and concerned about her baby. A pelvic ultrasound is clinically indicated, yet the provider also obtains permission to image her heart, lungs, and kidneys for credentialing purposes (educational).

In this case, a non-privileged operator (POCUS Learner) performs multiple studies upon a registered patient within a clinical environment.

From Use Case #1

Step #1-4: No change.

Notes:

1. If the Modality supports selecting a supervising physician (e.g., attending physician or staff physician), it may be chosen in Step #3.
2. Multiple operators may be entered in the Modality in case of multiple POCUS Learners (i.e., with a barcode scanner, RFID, QR code or manual entry).

Steps #5: The POCUS Learner simultaneously acquires multiple imaging studies (in this case, Obstetrical Pelvic, Renal, Cardiac, and Thoracic views) concurrently, all with the same Accession Number, Study Description and Study Instance UID.

Step #6: No change.

Step #7a: During the image review, if not previously selected in Step #3, the POCUS Learner designates the supervising physician.

Step #7b: The POCUS Learner performs a hard split, resulting in the creation of three separate studies: Obstetrical Pelvic, Renal, and Thoracic. In this example, the POCUS Learner applies the educational identifier to the Renal and Thoracic reports.

The new studies are associated with their respective reports, with unique Accession Numbers, Study Descriptions, and Study Instance UIDs.

Notes:

1. This may result in images being duplicated in multiple studies.
2. The order of report selection and hard split is determined by the implementer.

Step #8-10: The POCUS manager may also check for the presence of a supervising physician.

Step #10a: For the clinical Obstetrical Pelvic study, since the POCUS Learner is not credentialed, the report from the POCUS Learner is considered draft, and the POCUS Manager identifies it as ready for overread by the supervising physician (see Appendix XX for definitions of different report types).

Note: Some local policies may require the POCUS Manager to send preliminary reports to the EMR and images to the VNA (e.g., in cases where the report has not been signed by a Privileged Operator). It is expected that the POCUS Manager will later send an addended report signed by a Privileged supervising physician.

Step #10b: The supervising physician accesses POCUS Manager and evaluates the images and the draft report. If necessary, they edit the report, and sign it.

Note: In case of a preliminary report, the Preliminary Report is reviewed and signed by a Privileged HCP prior to finalization.

Step #11-14: No change for the clinically indicated Obstetrical Pelvic study; the POCUS Manager sends the report as an unsolicited observation to the EMR, and transfers DICOM images to an Image Manager/Archive (a.k.a. VNA).

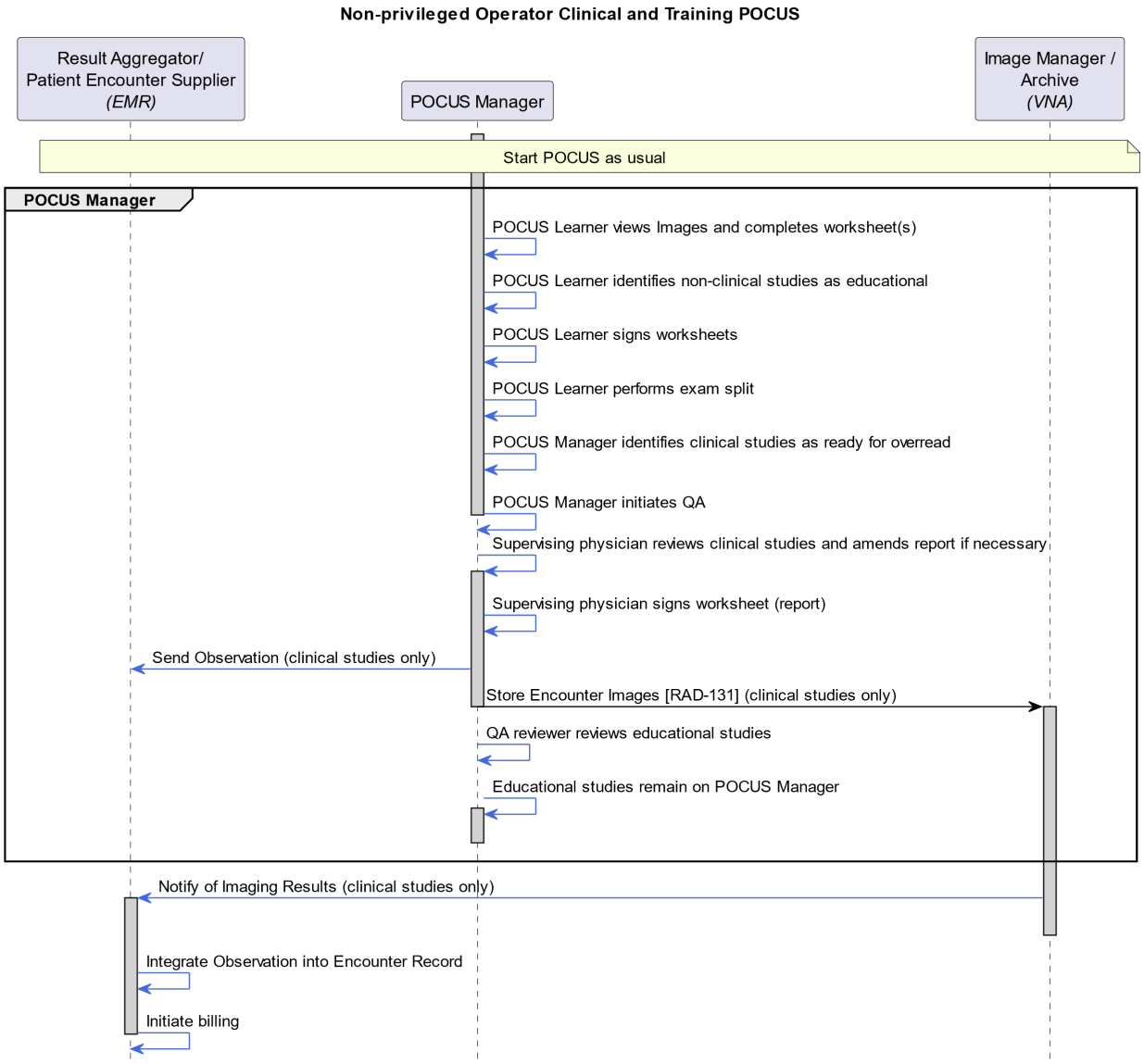
Step #14: No change.

Note: Clinical studies are selected for QA based on the local sampling plan, all educational POCUS studies are selected for QA review.

Step #14a: The POCUS Manager segregates the educational Renal and Thoracic reports and images from clinical data. The reports and images are not added to any patient record and are not sent to the EMR/VNA.

Note: Local policy may optionally dictate VNA archive of non-clinical POCUS studies (RAD-131), however, there is no Notification of Results for these images (RAD-132).

Use Case #2 Process Flow



Blue arrows: new transactions

Black arrows: existing EBIW transactions

Figure 2-1: Non-privileged Operator Clinical and Training POCUS Process Flow

The text in below was used to generate the diagram above. Readers will find the diagram more informative. The text is included here to facilitate editing.

Figure 2-2: Non-privileged Operator Clinical POCUS Process Flow

Use Case #3 Non-privileged Operator Training Point of Care Ultrasound

Removed

Use Case #4 Training-only Point of Care Ultrasound

In this case, a non-privileged operator (POCUS learner) conducts an ultrasound study with no clinical intent. This subject can be a non-patient volunteer model, an anatomical phantom, or a procedural phantom, such as a gel phantom or a trans-esophageal simulator.

As in all training scenarios, the primary objective is to impart ultrasound technique, diagnosis skills, and the importance of proper documentation. This includes not only documenting findings in the report but also emphasizing the significance of accurate demographic data entry into the ultrasound system.

From Use Case #1

Step #1: Volunteer (e.g., simulated patient) is not a registered patient.

Step #2: The modality allows entry of multiple operators in case of multiple POCUS learners (e.g., lab partners).

Step #3: No change, however, the POCUS learner operator could, (in order of preference):

- scan an ID band with a fictitious ID,
- enter a fictitious patient ID based on local policy,
- enter a pseudonym based on local policy, or
- use the modality to generate a fictitious patient ID

Step #3a: The POCUS learner also enters the supervising physician (i.e., attending physician, staff physician, or attending). This could be:

- an educational lab supervisor, or
- a fictitious supervising physician

Note: Some programs may not require entry of a supervising physician during lab-based training, and the systems may be configured to skip this step.

Step #4: Depending on departmental policy:

- There may be a standing admission for educational studies,
- the MWL server may be required to generate, or access fictitious patients in the EMR,
- the modality may hold a local cache of MWL responses (see CARD Vol1: 4.3.2), or
- a fictitious patient may be entered manually based on local naming conventions.

Note: The school of medicine or educational lab may be organizationally separated from the clinical environment, and the POCUS device may be required to switch between multiple Modality Worklists, i.e., a production (clinical) and non-production (non-clinical) MWL.

Step #5: Images are sent to a sequestered destination and kept out of the patient care domain. This could be a multi-tenant POCUS manager (i.e. system with clinical and educational organizational tenants), a dedicated POCUS manager, VNA, workstation, or some other DICOM Service Class Provider SCP.

Step #6: No change.

Step #7: When completing the report, the POCUS learner identifies the study as educational, and not intended for clinical diagnosis

Using the educational identifier, the POCUS Manager segregates the report, along with any related images (if they haven't been already), from clinical data. This separated report and its associated images are not added to any patient record and are not sent to the EMR/VNA.

Notes:

1. The educational identifier differentiates learning purposes vs. clinical diagnosis (which is the default pathway).
2. Although educational images and reports are segregated, they are not excluded from operator analytics provided by the POCUS manager.
3. Segregation aims to preventing the introduction of educational studies into the clinical pathway. The means of segregation is not specified in this profile; however, standardized metadata is provided to facilitate segregation.

Step #8-10: No change.

Step #11-13: Not applicable.

Steps #14: No change.

Step #14a: The POCUS Manager segregates the educational reports and images from clinical data. The reports and images are not added to any patient record and are not sent to the EMR/VNA.

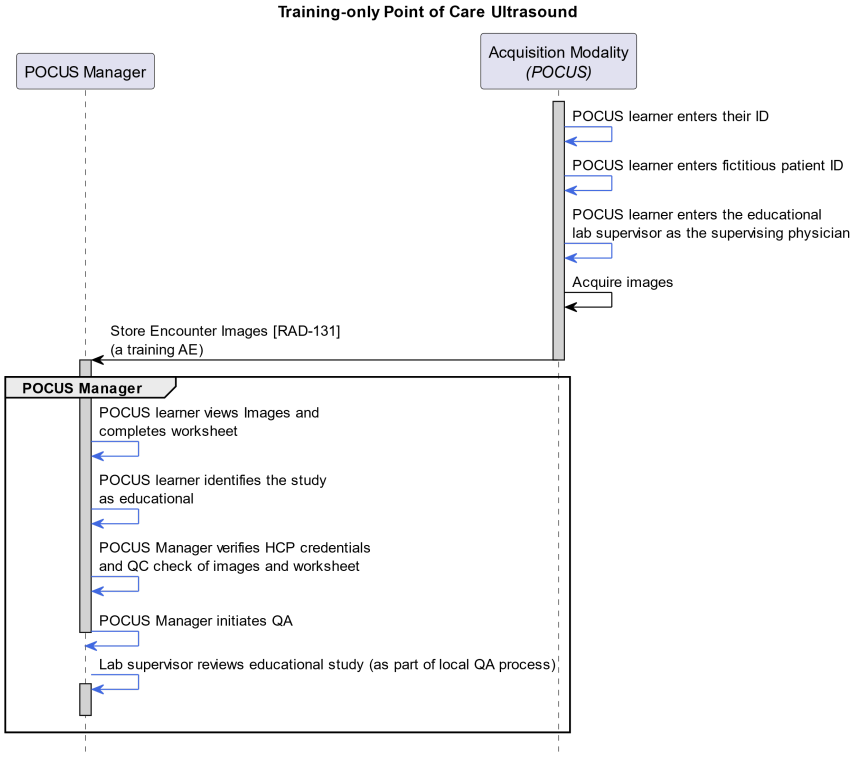
Note: Local policy may optionally dictate VNA archive of non-clinical POCUS studies (RAD-131), however, there is no Notification of Results for these images (RAD-132).

Use Case #4 Process Flow

The figure below depicts a typical POCUS training process flow in a training lab depicting:

1. Manual Entry of Fictitious Patient ID based on local naming conventions. This step allows trainees to practice entering patient demographics.

2. Image Acquisition: Trainees acquire ultrasound images following the designated training protocols. These images are typically captured on phantoms, simulators, or volunteer models in a controlled environment.
3. Sending Images to POCUS Manager: This step mimics the real-world process of transferring images to a responsible party for review and documentation.
4. Lab Supervisor Review: The ultrasound studies are made available for review by the lab supervisor or instructor. This allows the supervisor to assess the quality of the images and the accuracy of the documentation.



Blue arrows: new transactions

Black arrows: existing EBIW transactions

Figure 4-1: Training-only Point of Care Ultrasound Use Case Process Flow

The text in below was used to generate the diagram above. Readers will find the diagram more informative. The text is included here to facilitate editing.

```
@startuml
hide footbox
title Training-only Point of Care Ultrasound

participant "POCUS Manager" as US
participant "Acquisition Modality\n\"(POCUS)\"" as Modality

skinparam sequence {
  ArrowColor RoyalBlue
}
activate Modality #D3D3D3
Modality -> Modality: POCUS learner enters their ID
Modality -> Modality: POCUS learner enters fictitious patient ID
Modality -> Modality: POCUS learner enters the educational/lab supervisor as the supervising physician
skinparam sequence {
  ArrowColor Black
}
Modality->Modality: Acquire images
Modality->US: Store Encounter Images [RAD-131](via training AE)
deactivate Modality
activate US #D3D3D3
skinparam sequence {
  ArrowColor RoyalBlue
}
group POCUS Manager
  US->US: POCUS learner views Images and/or completes worksheet
  US->US: POCUS learner identifies the study/runs educational
  US->US: POCUS Manager verifies HCP credentials/and QC check of images and worksheet
  US->US: POCUS Manager initiates QA
  deactivate US
  US->US: Lab supervisor reviews educational study (as part of local QA process)
  activate US #D3D3D3
  deactivate US
end
@enduml
```

Figure 4-2: Diagram Pseudocode for Training-only POCUS Process Flow

Use Case #5 Procedural Adjunct Point of Care Ultrasound

Procedural Adjunct POCUS is utilized during invasive procedures such as guided thoracentesis, nerve blocks, and vascular access. It offers both static periprocedural imaging and dynamic guidance methods, aiding in the verification of placements or interventions through real-time manipulation of ultrasound probes and invasive devices.

> Note: See the POCUS Concepts for more information.

From Use Case #1

Step #1-6: No change

Step #7: All reporting is managed in the POCUS Manager.

> Notes: The POCUS Manager could:
>
> - propose a procedural worksheet for documenting the procedure note,
> - propose a standard template (boilerplate) if the procedure note is generated in the EMR, or
> - offer a macro that selects, signs and exports a procedural boilerplate procedure note.

Step #8-14: No change

Use Case #6 (Moved to Compliance Section)

Use Case #7 Study Merge

A single POCUS study may be interrupted and completed at a later time - on the same Modality device, or on a different Modality device. For example:

- HCP performs an echo and FAST exam, and later scans a kidney
- A resident performs an initial study, and later, the attending decides more images are needed (e.g., Append to a Normal Case)

There are two important considerations for implementers:

1) The MWL SCP should return active and pending encounters for the operator to select when continuing the study.

    Notes:

    1. Query by Accession number may also be helpful for the HCP to identify the study that they want to continue.
    2. Providing active and pending encounters of the patient enables the HCP(s) to perform different POCUS Studies During the same Encounter.

2) Merge functionality on the POCUS Manger may be considered, (i.e., the opposite of a hard split as described in Step #7b of Use Case #2) in which images having different Study Instance UIDs are updated to have the same Accession Number, Study Description and Study Instance UID.

Vol2: create an option with a POCUS version of Vol2x Table A.1-3, Append Case

Use Case #8 Inadvertent Capture of Images under the Wrong Patient ID

Images may be incorrectly labeled and need to be corrected for patient safety reasons. This issue typically arises due to operator error, such as initiating a study without ending the previous one, selecting the incorrect MWL item, or not selecting the patient from the MWL and instead manually entering a patient name or generating a pseudonym on the modality.

If the error is identified prior to transferring images to the VNA, and prior to sending the report to the EMR, patient information can be reconciled by the POCUS Manager. To obtain authoritative patient demographics for reconciliation, implementers may consider utilizing the same mechanisms used to generate the Modality Worklist. The POCUS Manager may also be grouped with a Patient Demographics Consumer in the Patient Demographics Query (PDQ), Patient Demographics Query HL7 V3 (PDQV3) or the Patient Demographics Query for Mobile (PDQm) profiles.

Notes:

1. The POCUS Manager is expected to provide accurate and consistent demographics and encounter details to avoid discrepancies. Direct reconciliation on the modality is discouraged as they often lack the sophisticated capabilities required to handle reconciliation tasks, which are better managed by central systems.
2. Identification burned into the pixel data may be difficult to correct. Such images may need to be corrected on the Modality. When burned in PHI is not corrected, it can pose a risk to patient privacy within patient access applications.

If the error is identified after transferring images to the VNA, and after sending the report to the EMR, the POCUS Manager may be grouped with a Change Requestor in the Imaging Object Change Management (IOCM) profile. Reconciliation is handled in the EMR based on local policies. Typically, the incorrect report is deleted in the EMR, and then resent.

TODO discuss with ITI or EMR vendor

Use Case #9 Unidentified Patient Registered under Pseudonym

An emergency patient may be registered under an anonymous pseudonym based on a locally defined naming convention. As a result, no valid Patient ID is available to the Encounter Manager when generating the Modality Worklist.

A temporary ID and name are generated in the EMR, conveyed to the POCUS Manager and returned to the Modality in the MWL response. The temporary ID and name are selected by the HCP and the study proceeds as normal.

The POCUS Manager may be grouped with an Image Manager / Image Archive, and the EMR may be grouped with an ADT in the Patient Information Reconciliation (PIR) profile. When the patient's identity is confirmed, the EMR sends a Patient Update (Merge) transaction to the POCUS Manager to update demographics in the objects it possesses, or will receive, from the Modality.

Use Case #10 Modality Based Worksheet

While performing a study, the HCP opens a link to complete a worksheet(s) and sign the report from the Modality *cart* at the patient bedside.

Specific variants include:

1. The HCP opens an application on a handheld device to complete a worksheet(s) and sign the report. *TODO Is there a standardized method to launch an app in-context?*
2. If there is no active study on the Modality, the HCP launches the reporting application and selects a patient from a list.
3. *SR to worksheet*
4. *Download worksheet to Modality (API, e.g. FHIR Questionnaire)*

Note: group with CT

Elaborate in-context (modality active system, vs modality being a remote user agent)

How to profile in Vol2: FHIR Questionnaire? Rest API (like IID)? SMART?

Appendix xx – POCUS Definitions

[Editorial note: These terms may be incorporated into the Concepts section, removed, or incorporated into the IHE Glossary, here https://profiles.ihe.net/GeneralIntro/ch-D.html. *During the drafting of this work-item they are here for reference in order to provide consistency]*

Attending Physician

> A fully licensed independent (vs. educationally licensed) medical doctor who has completed all necessary residency training and is board-certified. Also known as staff physicians or supervising physicians, Attending physicians hold faculty positions at medical schools or teaching hospitals and are responsible for the overall care of a patient in a hospital or clinic setting. Attending physicians have the capability of obtaining application-specific and/or global POCUS privileges.

Advanced Practice Provider

An Advanced Practice Provider (APP) is a health care provider who is not a physician but who performs medical activities typically performed by a physician. APPs can be awarded POCUS privileges based on state licensure rules and facility privileging policies.

Compliance

Policies or Adherence to expected requirements for medical documentation for POCUS studies are accurate, complete, and traceable across the enterprise.

Credentialing

The process of verifying a healthcare professional's training and competency for a specific clinical application. Clinical applications are typically based on POCUS acquisition and facility department. Successful completion of the credentialing process results in POCUS privileges.

Draft Report

In the context of POCUS, this is an interim report (see Report, below), generated by a non-credentialed provider during the interpretation process. The draft report remains within the POCUS Manager until it is reviewed and signed (i.e. overread) by a Privileged HCP.

Educational POCUS study

A POCUS study obtained for teaching purposes and not intended for clinical diagnosis or research.

Operator

One or more healthcare practitioners performing a POCUS study.

Partially Privileged Operator

Users that have completed credentialing to obtain privileges in some applications, but not all.

- If credentialed for a given application, they are considered a Privileged User.
- If not credentialed for a given application, they are considered a POCUS learner.

Operators' privileging should be considered in the context of a given POCUS application (i.e. study).

POCUS Learner

An operator without privileges, who is in process of obtaining them. This person could be any type of a teaching/learning situation.

Preliminary Report

Similar to a Draft Report, the Preliminary Report contains initial impressions and findings recorded by a non-credentialed provider. It is submitted to the EMR as an unsolicited observation following the examination. Subsequently, the Preliminary Report is reviewed and signed by a Privileged HCP prior to finalization. The Preliminary Report

may be appended based on further observations by the Privileged HCP (see Report Addendum).

Privileged User

A POCUS operator who has obtained (and continues to maintain) POCUS privileges (see "Privileging"). A Privileged User can sign reports and export signed reports (within the scope of their POCUS privileges) to the EHR without supervision.

POCUS privileging for a given HCP is constrained by their professional credentials and departmental scope of practice (i.e., an emergency physician typically performs POCUS in the ED).

The POCUS manager should distinguish POCUS operators based on their privileges.

Privileging

The process of authorizing an HCP to independently conduct POCUS for designated applications, within the defined scope of practice for their department, within the healthcare facility where the provider works. Privilege policies are established by the facility privileging committee, and typically:

- facility-specific (e.g., hospital),
- department/unit/service-specific (e.g., ED, or ICU), and
- application-specific (e.g., abdominal, lung, musculoskeletal).

Different departments may determine applications and type of privileging.

Privileging reciprocity between facilities within the same health system is often granted, but not guaranteed.

The POCUS manager should distinguish application-specific POCUS studies in order to facilitate enforcement of local privileging policies.

Quality Assurance

A process that involves a thorough examination of the technical quality, completeness, and adherence to established protocols of POCUS studies. The purpose of QA is to ensure the accuracy and reliability of the study findings, as well as to identify any potential areas for improvement for individual operators or in the POCUS workflow or image acquisition techniques.

Quality Control

Quality management activity focused on ongoing monitoring and correction of compliance issues of individual POCUS studies (see https://asq.org/quality-resources/quality-assurance-vs-control)

Report

A documented interpretation and analysis of a POCUS study summarizing the findings, measurements, and interpretations made by the interpreting physician. The report is reviewed and signed by a Privileged HCP and submitted to the EMR as an unsolicited observation.

Report Addendum

An “addendum” is the supplementary text added at the end of a previously approved radiology report, to correct or expand on an original statement[1]. It serves to provide supplemental information, clarifications, updates, or corrections to the original report. The addendum is typically labeled clearly to indicate its status as an addition to the original report and may include the date of the addendum's creation.

Worksheet

A template or form used by the operator after an ultrasound examination to document their findings. The worksheet typically includes: relevant clinical history, obtained images (views), purpose (indication), measurements and findings (interpretations). In the context of point-of-care ultrasound (POCUS), when the Privileged operator completes and signs the worksheet, the POCUS Manager combines it with patient information, thus constituting the report.

Appendix xy – Use Case Mapping to Data Elements

Use Case #1 Diagnostic Point of Care Ultrasound

<This is another pass at the data/metadata collection sequence, and possible exceptions, from the completed diagnostic use case. I followed Kevin’s convention of putting metadata items in [square brackets] for now to distinguish the Patient (human) from the [Patient] (metadata), and terms in italics, to see if that is helpful. The text is ***not complete*** *here. Wanted to test the format. Some of the statements likely need factual fixing>*

The most typical (“normal”) case involves a diagnostic study performed and reported by a privileged HCP for a registered patient.

A diagnostic study is performed to evaluate a specific medical condition (shock), or to evaluate a patient's anatomy or physiology (left ventricle chamber size and function). This could be an initial evaluation or a reassessment/serial study. The Diagnostic POCUS Use Case is intended to generalize the following scenarios:

1. The patient is registered for an inpatient or outpatient encounter in a healthcare facility (e.g., emergency department, critical care unit, cardiology office, obstetrics and gynecology suite, or operating room).[Encounter]
2. The HCP enters their ID in the POCUS device (i.e., with a barcode scanner, RFID, QR code or manual entry) [Operator Identification Sequence] [Referring Physician Identification Sequence]
3. The HCP enters the patient ID in the POCUS device (i.e., with a barcode scanner, RFID, QR code or manual entry) [Patient Demographics]
4. The POCUS device displays a MWL entry specific to the patient. The HCP confirms the patient demographic information (name, date of birth, gender, etc.). and selects the patient prior to initiating exam specific image capture.[Get Encounter Imaging Context (RAD-130)]

[1] 10.1055/s-0041-1734351

5. The HCP performs a focused POCUS exam (e.g., biliary scan for cholelithiasis). Images are transferred to the POCUS Manager. [Store Encounter Images (RAD-131)] [Performed Procedure Step Description]
6. The HCP accesses the POCUS Manager system (through a client application on a handheld device, client web browser or PC workstation) and searches for the study completed in the previous step.
7. The HCP views the images. The POCUS Manager proposes a report template based on the Study Description. The HCP confirms the report template, and completes it, entering the views obtained, indications, findings, and interpretation. The HCP selects a flag that indicating that the study is clinically indicated (vs. educational). [Report] [Patient Demographics][Encounter][Referring Physician Identification Sequence][Performed Procedure Step Description] [Educational flag]
8. The HCP provider applies their electronic signature to the report. This signature is typically generated using a unique identifier tied to the provider's identity within the POCUS Manager. [Confidentiality Code]
9. The POCUS Manager verifies the HCP credentials, as well as required report elements (i.e., a valid MRN, CSN/FIN, a valid patient name, views, indications, interpretation views, indications, and interpretation). [Patient Demographics][Encounter] [Referring Physician Identification Sequence][Performed Procedure Step Description][Operator Identification Sequence][Accession Number][Issuer of Accession Number Sequence]
10. The POCUS Manager also validates that the study contains at least one image, and that all images contain a valid MRN/CSN/FIN, patient name and accession number issued from either the Encounter Manager namespace, or the POCUS Manager namespace. [Patient Demographics] [Encounter] [Referring Physician Identification Sequence][Performed Procedure Step Description][Operator Identification Sequence][Accession Number][Issuer of Accession Number Sequence]
11. Because the HCP is credentialed, and both the report and images meet validation criteria, the POCUS Manager sends the report (i.e., the signed report) as an unsolicited observation to the EMR, and transfers DICOM images to an Image Manager/Archive (a.k.a. VNA). [RAD-131][ORU]
12. The Image Manager/Archive sends a notification to the EMR using Notify of Imaging Results [Notify of Imaging Results (RAD-132)].
13. The POCUS report along with hyperlinks to review the study image data in PACS are associated with the patient encounter in the EMR.

    Note: Based on local policy, the EMR may also create an order for billable studies, as well as financial transactions necessary for charging.

Open Issues from ACEP

This table contains open issues raised by the ACEP workgroup:

Q: How should the acquisition of multiple studies (e.g., Obstetrical Pelvic, Renal, and Thoracic views) on the same patient be managed?

We considered 3 options:

1) *The Modality allows the operator to change exam type during a study (i.e. the Modality does not require the operator to perform Steps #1-4 after the complete the Obstetrical Pelvic study).*
2) *Use Case #2 profiles a hard split option, which seems more practical since each protocol has overlapping images. This does not preclude modalities from allowing an operator to change an exam type while scanning a patient. Comment is sought on this approach.*
3) *Copy all images acquired into each study. This results in duplicate images, however the impact on storage is negligible.*

Closed Issues from ACEP

This table contains closed issues raised by the ACEP workgroup:

Q:How should be image transfer and reporting be handled for Procedural Adjunct Point of Care Ultrasound?

A: Image transfer options include sending images to the VNA, and sending images to the POCUS Manager.

Reporting options include: a comprehensive report generated in the EMR, a report based on an order (order-based workflow), or a comprehensive report generated in the POCUS Manager.

We chose to profile sending images to the POCUS Manager and generating reports in the POCUS Manager. This offers consistency with Diagnostic POCUS workflows, and offers benefits such as worksheet-based reporting, coding compliance, medico-legal documentation of images, quality assurance (QA) of procedural complications, EMR linkage, workflow standardization, and adherence to local credentialing policies.

In terms of POCUS Manager reporting, local policy may dictate: a minimalistic report in POCUS manager w/a comprehensive report in EMR, or a comprehensive report in the POCUS Manager. In either case, the objective is to avoid duplicate documentation.

We also note that transferring images directly to the VNA, could result in missed QA opportunities, difficulty in linking images back to the procedural report in the EMR, and duplicated or missing Accession Numbers.

Q:How should a "hanging report"(i.e. a report that has not been signed) be addressed by the POCUS Manager?

A: The attending named on the report should be notified. If there is no attending named, the attending of record based on the Encounter should be notified. Types of notifications include:

- *email reminders*
- *"EHR" in basket (Provider Notifications)*
- *Popup on app*
- *FHIR Communication*

Q: Is it sufficient to encode confidentiality codes in the report, or should DICOM images contain confidentiality codes as well?

A: In the report only. Certain study findings may require tighter controls. OM1-30 (Confidentiality Code) applies to an observation, however there is no corresponding attribute in DICOM. Both the Confidentiality Constraint on Patient Data Description (0040,3001) and Requested Procedure Module Attributes Confidentiality Code (0040,1008) are intended to indicate confidentiality constraints from the Order Filler in an order-based workflow. DICOM cp1982 was created to address confidentiality constraints on visible light images.

Q: Should any "roles" be encoded on the Modality (i.e. Referring Physician's Name or Name of Physician(s) Reading Study)?

In POCUS it is important to identify: who saved images and who is responsible for signing.

The Operator Identification Sequence (0008,1072) in the General Series Module can encode multiple Operators (i.e., who saved images). For example:(1093745721,99NPI,"Ferre, Robinson"). This is ideal for POCUS workflows in which it is common to have 1-3 operators

Knowing the role of the Operator up front can be valuable for report sign-off accountability.

On the other hand, the person signing the report may not be one of the operators.

Referring Physician's Name could be included in the incoming MWL, however, Name of Physician(s) Reading Study potentially adds UI interactions and typographical errors on the modality.

A: No, operator mapping should be performed on the POCUS Manager

Q: Should the type of study be identified on the Modality or on the POCUS Manager?

IHE SVS or SVCM profiles (SOAP or FHIR) could be used to copy a list of study types from the POCUS Manager to the Modality, alternatively for educational studies, the Modality could a broad study type: diagnostic, educational, procedural. This could be populated in Reason for Performed Procedure Code Sequence.

A: Ultimately, on the POCUS manager. The profile does not specify how the modality identifies the study/exam type. It could be based on the protocol, worksheet, department, etc..

Q: Where should HCP credentials be verified (e.g., should the modality verify credentials, or should credentialing be verified on the POCUS Manager)?

A: Credentialing/privileging should be managed by the POCUS Manager. Operator credentials do not need to be validated on the modality. The operator must identify themselves to determine if a privileged provider is required to sign (i.e. overread) the report.

Q: Should a transaction to "obtain credentials" be profiled on the POCUS Manager? If so, is there a preference for a standard? The HPD data model includes credentials. Likewise, practitioner.qualifications in FHIR could be profiled.

A: No, paperless credentialing are closed and do not provide standardized interfaces (for regulatory reasons) to query provide credentials.

Q: Should all studies undergo QA? Not all care areas have the resources or time to perform QA every study

QA is defined as: a review of technical proficiency, interpretive accuracy, and appropriate clinical indications.

A: No, QA sampling plans are site specific

Q: Should all studies be routed to the POCUS Manager?

A: It is the position of this document that all procedural and diagnostic studies should be routed to the POCUS Manager. In the case of procedural studies, the POCUS Manager should streamline reporting and signature whenever possible.

It is acknowledged that some departments may opt for a workflow that routes procedural studies to an Image Archive.

Q: LDAP is included in the Best Practice Recommendations and commonly implemented in other domains (imaging, bedside monitors, EKG, etc..). Authentication is recommended in FDA cybersecurity guidance(s) and required by VA/DoD, as well as several institutions. On the other hand, not all ultrasound devices have LDAP capabilities, nor do they require log-in.

Whether on dedicated equipment, or a mobile application, user IDs should be input easily, using methods such as barcode scanning. IN POCUS one or more operators need to be associated with enterprise user accounts, permissions and NPIs for downstream workflow activities.

Should user authentication be profiled? If so, how?

A: No. There is no one-size fits all authentication standard, however user identification is important for determining POCUS Privileges (see "Compliance" section)

Q: EBIW mentions barcode, but did not specify transactions in order to offer flexibility.

As mentioned above, barcode is a desired user function. Wristbands may include a multitude of identifiers that could be mapped to Admission ID, which is already R+ in EBIW. Should a specific barcode transaction be avoided?

How to handle barcode scan of an operator? DICOM attributes for operator, physician, etc.. have VR PN (patient name). How does an employee barcode decode?

A: No. This document takes the same approach as EBIW. There is no one-size fits all standard in practice, however user identification is important (see "Compliance" section)

Q: Where should the report be signed?
A: The report is electronically signed by the privileged user in the POCUS Manager. An un-privileged user may sign a report (i.e. preliminary, or "interpreted by"); however the report must be countersigned signed by a privileged user (i.e., verified by)
Technical requirements for electronic signatures are determined by jurisdiction, institution or payors, for example:

- *CMS*
- *AHMIA (American Health Information Management Association)*
- *Michigan Uniform Electronic Transaction Act*

Also see IHE DSG
Requirements for electronic signatures are out of scope of this document.

Q: Should this Use Case profile DICOM Storage Commitment
A: No: Storage Commitment is not required in EBIW

Q: Does the order creation on the EMR need to be profiled?
A: No, this process is locally defined and EMR-specific. RAD-132 is an HL7v2 ORU^R01 message specified to include information necessary for the Results Aggregator (typically the EMR) to create an order for billable studies, as well as financial transactions necessary for charging

Q: For legacy reasons, some modality vendors provide Secondary Capture of the patient demographics UI to record additional patient history typed in by the operator. Should this be Encoded in DICOM for display on the POCUS Manager?
A: Yes one of the following should be profiled in Vol2:

Module	Element Name	Tag	VR	Type
Patient	Patient Comments	(0010,4000)	LT	3
Patient Study	Additional Patient History	(0010,21B0)	LT	3

Q: Should preliminary reports form a POCUS Learner be sent to the EMR before they are overread by a supervising physician?
A: No. Preliminary reports should remain on the POCUS Manager until overread. A note has been added to explain the exception case in which POCUS Learners are unsupervised, and preliminary reports may be sent to the EMR, and addended after the overread.

Closed Issues from EBIW

This table contains issues that were closed during IHE Rad Tech committee preparation of the IHE EBIW Profile for Trial Implementation. IHE records closed issues so that if/when new considerations come to light, the issues can be revisited. A selected set of closed issues are listed here that may be worth a second review from the ACEP workgroup:

Q. Should images be linked to reports or pasted directly into them?

A. Linked by using the shared encounter ID, which is part of the metadata.

Comment: ACEP WG should confirm the use of Encounter ID TODO: ITI

Q. How are documents from the same encounter (images, notes, reports) grouped/linked?

A: Accession Number

Accession number mirrors how ordered procedures link the images to the report and link both to the EMR record. Date/time of acquisition (if known to reasonable accuracy) for known patient also helps.

Some sites use both an accession number and an encounter ID (visit id + department id). Others do a query template to match a combination of visit ID & department & doctor. Coded document titles are helpful (e.g., with LOINC codes).

Many EMR/DB products will store relationships internally in proprietary ways. Some EMRs will create an artificial order # after the fact to use for indexing in the record.

Later documents can also point to the encounter imaging procedure using the accession number. Accession number is associated with the Study Instance UID which can be used to invoke a display profile.

(Proprietary EMRs can also do things the hard way: query the VNA whenever a patient is launched in a patient browser and also get order data from the order database and use that to build an index. If no order, it use the DICOM metadata to add an entry to the browser index.)

Q. What is the scope of uniqueness for Encounter/Visit numbers?

A. Uniqueness is handled by qualifying the encounter ID with an assigning authority

For inpatient, encounter ID is unique in the EMR across the enterprise, or unique within the scope of issuing system

For outpatient, encounter ID is unique for each department.

Comment: ACEP WG should confirm the use of Encounter ID

Q1. Do we need to profile John Doe cases?

A: Explain how it could be handled but don't profile specific requirements.

Procedure and Pixel metadata should be populated as usual.

Encounter metadata will be mostly as usual, but perhaps a bit sparser due to likely urgent care context. If the John Doe is admitted, they will have a wristband and an Admission ID and the imaging device will still have whatever information it has about the department, operator, location context.

Patient metadata will be sparser and the name/ID will likely be placeholders.

Sites will have local methods for assigning John Doe MRNs etc. and modalities and encounter managers should be prepared to deal with those.

Existing patient-merge/Patient Information Reconciliation methods on the PACS and RIS should work as usual for data stored with placeholder demographics.

Q. Where, if anywhere, should configuration of procedure lists be required?

A. Don’t require.

This draft (see Section 47.4.1.9) notes that lightweight modalities could configure “pick lists” of likely procedures from which users could select. E.g., the camera in the dermatology clinic would be configured with a different list than the camera in the burn unit.

Alternatively, the Encounter Manager could support such configurable lists and would provide the appropriate list to each modality based on its reported department. That would centralize configuration of the lists rather than having to configure and update each of the individual modalities. Could also make use of the Shared Value Sets (SVS) Profile or FHIR codeset services when they’re ready.

Neither of the above are required, leaving it up to users and their set of vendors to work something out.

Q. Should we create an Encounter Module?

A. Not for now.

We are looking for something that happens 1-n times during a visit.

If we created it, it would contain attributes like:

- Encounter ID
- Issuer of Encounter ID
- Encounter UID
- Reason for Encounter
- Reason for Encounter Code Sequence?
- Encounter Start Datetime
- Encounter End Datetime
- Encounter Location
- Encounter Care Team

HL7 makes Encounter a synonym for Visit so it doesn't really exist in the sense we want. FHIR renames Visit to Encounter but allows nesting so that there can be Encounters within Encounters which would serve our needs. Once FHIR gets there we may want to mirror that in DICOM/IHE. In the meantime, the Accession provides a proxy handle, and managing Imaging Procedures will likely serve most of our other purposes at the sub-encounter level.

PAM covers patient visit and account in great detail and complexity with national variations but doesn't model down to the level we're looking for. The U.S. uses X12 based on HHS definitions of Encounter etc.

Outpatient encounters tend not to have "sub-encounters" so it's a bit simpler.

Q. Should the device get the context before starting imaging, or after, or both?

A: Model before, allow for both.

In principle the device gets the metadata, then acquires images, applies metadata, submits to archive. Can also acquire images, get metadata, apply metadata, submit to archive. The later might be handy for ad hoc workflow.

Comment: ACEP WG – before, exceptions for after are included in Use Cases & Compliance

Q7. How can "completed" work be filtered out and just return active and pending encounters?

A: No definitive way. Left to implementations.

It is more convenient if the query from the Acquisition Modality to the Encounter Manager can return a fairly short and relevant list of patients/encounters. For example, it would be good not to return patients/encounters that have already been completed, but that may be hard to determine. If the Encounter Manager monitors ADT discharge messages it can likely omit discharged patients. The Encounter Manager could also monitor RAD-132 notification messages and omit patients with completed imaging procedures, however it might not be unusual for patients to have multiple imaging procedures during a visit or periodically to have to repeat a completed procedure.

Comment: Added additional concepts to the Compliance Section

Q. Should the profile specify creating orders?

A. If the EMR wants an order, it can choose to create one internally.

Orders aren't necessary for the profile to work. If the EMR depends on orders for something (like managing internal data indexing or billing) it is welcome to create orders based on the information provided to it as its choice, not something driven by the modality or the Encounter Manager.

The encounter manager will create an accession number so the images are populated with it, and that accession number is communicated to the Result Aggregator which is assumed to be part of the EMR or a proxy for the EMR. The EMR can then use the accession number to populate an order if it wants to create one and the main linking IDs are aligned just like in ordered images.

Note, sometimes there are other results in a single encounter that need to be linked (not just an image, but an image with other reports or data, progress notes, op note, etc.). If the EMR is creating orders it might create multiple orders for those and thus shoot itself in the foot?

Importantly, PoC docs don't like anything slowing down patient care. They dislike the implication that a physician authorized this in advance. If accession number is not inherently an order, it might be OK.

For radiology, Billing/workflow wise, order is used to gate processing since you don't get paid for orderable studies unless there actually is an order.

Comment: ACEP WG reviewed this and addressed it in the Happy Path

Q. How should the EMR/Result Aggregator be notified of new imaging content?

A. ORU-R01 (See also R01 vs R30 question)

EMRs are used to getting this kind of messages about new "results".

N.B. for ordered results, the metadata might often be just enough to match the result to the order and take the rest of the details from that order. Since the encounter case likely doesn't have an initiating order for these results, the message needs to include adequate metadata to properly link into the patient records and for the EMR to construct a proxy order if it needs to.

- patient, date, SUID, which department, anatomy, procedure name guidelines
- thumbnails are really nice
- If the metadata becomes too extensive, might just notify the EMR of the new objects and let it inspect them if it wants extensive metadata rather than try to replicate the full header in the ORU

Rejected Alternatives:

MDM (newer ORU with attachments) not selected because ORU is more widely supported and we don't need to ship the images as attachments. MDM-T01 uses TXA segment.

CARD-14 does this from the Archive to the EMR, sending Study UID, a URI and the Filler/Placer Order # and Universal Service ID (in OBR-4)) but CARD IEO does not mention accession number.

The IRWF.b approach of Automated Order Placement was deemed too heavy-weight and too order centric. That made sense for IRWF where there was generally an ordered read, but that doesn't apply to most encounter-based imaging. Request Filling of Order [RAD-78] was an OMI msg and ORI response from OF.

DICOM Instance Availability Notification service [RAD-49] likely not supported by EMR.

Filler Order Management (New Order) [RAD-3] or Procedure Scheduled [RAD-4] are again too order centric.

Appointment Notification [RAD-48] conversely has the RIS notifying the HIS using SIU S12, S13, S15

Q13. How should the IM/IA recognize an encounter-based study (so it can send [RAD-132] and how should the Result Aggregator/EMR recognize encounter-based Accessions?

A: Accession Number and Request Attribute Sequence are good clues

See text in Section 4.132.4.1.1 Trigger Events.

If implemented, Issuer of Accession Number might also help to identify those from the Encounter Manager, or if a prefix-suffix-known range is used in the Accession Number value. If there are multiple encounter managers, one would need to check a list against issuer.

The presence and content of Procedure Scheduled [RAD-4], MPPS [RAD-7] and Filler Order Management [RAD-2] transactions.

Conceivably, the IM/IA could have a special AE Title for receiving encounter-based images. That would be permitted but is probably not necessary.

In addition to avoiding extraneous messages, this should also be able to avoid conflict with the SWF.b PIR behaviors which could otherwise trigger duplicate order creation (by EMR from 132 and by DSS/OF from SWF.b PIR)

Image Attribute	EBIW	SWF.b Simple	SWF.b Unsched.	SWF.b Group	Imported
Accession Number	*value*	*value*	*Empty*	*Value or Empty (if diff)*	*Empty or MWL Value*

Issuer of Accession#	EM	RIS	n/a	RIS	RIS or empty
Study Instance UID	Study UID	Study UID	Study UID	Study UID	Study UID
Referenced Study Seq.	<Study UID>	Study UID	Empty	2x Study UID	Copied either
Req. Attrib. Seq.	***Empty***	***1 item***	***Empty***	***2 items***	***1 copied item***
>Requested Proc. ID	n/a	Value (RIS)	n/a	Value (RIS)	
>SPS ID	n/a	Value (RIS)	n/a	Value (RIS)	
Admission ID	Yes	Maybe	No	Maybe	Maybe
Source Device					
RAD-4 Proc Scheduled Msg	*No*	*Yes*	*Later*	*Yes x2*	
RAD-7 MPPS Complete	*No?*	*Yes*	*Yes*	*Yes xN*	
Procurement Type	*ENCOUNTER*	*ORDER*	*UNSCHEDULED*	*ORDER/ GROUP*	*IMPORT*

Operator/Modality knows. Would be nice to indicate explicitly in the header. Probably needs a DICOM CP to either:

- add Identifier Type Code (0040,0035) to Issuer of Accession Number (like exists in the Issuer of Patient ID Qualifier Sequence) and consider encounter accession numbers to be a different "type" of identifier than other accession numbers
- add a Procurement Method attribute to indicate whether this site procured the images by ENCOUNTER, ORDER, IMPORT, or UNSCHEDULED, or something like that

The main flags in the SWF.b unscheduled case for unknown patient are that the modality sends an MPPS to the DSS/OF with the Referenced Study Sequence empty or absent and in the image, the **Accession Number shall be empty/zero length**. The DSS/OF recognizes the temporary patient ID and waits for the ADT to broadcast a merge after the patient is properly ID'd and registered. The DSS/OF echoes the patient update (merge) to the IM/IA and RM. Then the DSS/OF creates an order with a new requested procedure that matches the completed procedure, the new demographics and details of the completed procedure, and sends it to the OP. Then the DSS/OF sends a Procedure Scheduled with the new requested procedure and order to the IM/IA.

(The Referenced Study Sequence seems more relevant in the MPPS than in the Image IOD).

Q14. What else could we think about in conjunction with the digital camera proposal?

A: Current profile is appropriate to PoC US Devices. The following notes are for next cycle

The current intention for digital cameras next cycle is to introduce a RESTful push of images (WIC/STOW-RS) that is the JPEG with a dozen or so metadata tags, and a RESTful query to send the Admission/Patient ID and get back the handful of metadata tags that will be copied over into the STOW message.

Some other topics that can be revisited include:

- Consider a "push flow" for Record Driven Acquisition (of interest to several participants). The practitioner might interact with the encounter manager or patient record viewer to initiate follow up or supportive imaging which results in some kind of

push of associated context (and instructions?) to the modality. Or at least have the matching worklist item cued up to return.

- Consider the model of walking the operator through what they have to do. Maybe body map has the same 25 images and you guide them, e.g., the camera tells you what to shoot rather than you picking what you shoot. It becomes a camera protocol. Consider if there are other workflow changes/use cases needed to support medical photography process.
- What guidance can we provide on how encounter-based studies can/should be divided into Series?
- If a device spawns a new "encounter/procedure/study" for each acquisition, how do you relink those that are really part of the same actual encounter/procedure/study? E.g., photographic multiple body parts on the camera. Could have "bookend" images or signals that are processed by the "modality" (keeping in mind that the profile specifications are targeted at the software not the SLR).
- It's hard to find data that has been put into the patient record. Encounter images are used in more varied ways (in the EMR and beyond the EMR) than radiology perhaps. Launching a different viewer for each different data type and data source raises additional integration questions.
- Consider diagramming Diagnostic Imaging, Procedural Imaging and Evidence Imaging. Delineate EBI vs Enterprise Imaging vs mobile vs consumer vs lightweight vs web APIs vs ...
- Address "deferred completion" patterns. E.g., for a patient in ICU during the day, they acquire and send images and then finish labelling/assigning body parts and procedure metadata posthoc on the encounter manager. Sometimes another patient might be acquired without having closed the prior encounter leading to miss-assigned images that are then (hopefully) corrected too during the posthoc processing. Potential problems of two systems editing the metadata without being fully on the same page.
- While PoC US deployment motivation might be driven/justified/funded by ability to properly track and bill for the procedures, managing cameras might be more about risk mitigation since their use is less diagnostic procedures and more operations and documentation.
- Might require the Modality Actor to populate the Original Attributes Sequence when tinkering with values generated by the digital camera.
- How much do we need to describe the capture device Device Type? Is a value for Modality and Model enough? Do we need modality subtype to hold something like "medical photography" to specialize VL?
- Consider guidance for populating Contributing Equipment Sequence (0018,A001) to describe the camera while allowing the Modality Actor to create the DICOM instance. The sequence includes many details that can then differ for each contributing device:
    - Institution Name
    - Institutional Department Name

- Station Name
- Operator's Name
- Operator's ID
- Contribution Datetime
- Contribution Description

Q. How should the new requirements be added/packaged?

A. Option A

Option A: "Complete" existing EBIW Profile by adding a Lightweight Modality with RESTful transactions to the Encounter Manager and the Image Manager.

Option B: Add a RESTful Option and a DIMSE Option to the existing Profile?

Option C: Have two EBIW Profiles (EBIW and EBIW-RS?)