Integrating the Healthcare Enterprise



IHE Radiology Technical Framework Supplement

10 Prioritization Of Worklists for Reporting (POWR)

Revision 1.1 – Trial Implementation

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Foreword

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This is a supplement to the IHE Radiology Technical Framework V21.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published for Trial Implementation on August 22, 2023 and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the Radiology Technical Framework. Comments are invited and may be submitted at

35 <u>https://www.ihe.net/Radiology_Public_Comments.</u>

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend section X.X by the following:

- 40 Where the amendment adds text, make the added text **<u>bold underline</u>**. Where the amendment removes text, make the removed text **<u>bold strikethrough</u>**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.
- 45 General information about IHE can be found at <u>IHE.net</u>.

Information about the IHE Radiology domain can be found at <u>IHE Domains</u>.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at <u>Profiles</u> and <u>IHE Process</u>

The current version of the Radiology Technical Framework can be found at <u>Radiology Technical</u> 50 <u>Framework</u>.

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Introduction to this Supplement

130 This profile standardizes the data interfaces to provide details relevant to the prioritization of studies on a medical imaging reading worklist.

Closed Issues

1. Should we have an actor that marshals/proxies access to factors for the Prioritizer?

A. No.

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- It would not be that useful in the end and it would be challenging since the proxy wouldn't know what all an unknown Prioritizer is capable of or needs. The feeds are acceptable to existing worklist managers and they seem up to the challenge.
- 2. How should the Procedure Reporter obtain patient/order info to populate RAD-145?

A. Mostly from the DICOM. HL7 messages if needed.

- 140 The Procedure Reporter will be triggered by observation content that it will put into RAD-145 OBX segments. PID needs Patient Name & ID, PV1 needs Patient Class, ORC values are defined in the transaction, OBR needs Universal Service Identifier (i.e., Procedure Code from the DICOM), IPC needs Accession, Study UID, etc. from the DICOM.
- 145 3. Should we profile the Prioritizer getting data from Modality Worklist?
 - A. No.

While MWL does represent a "current" predigested collection of relevant information, it would need regular polling. MWL SCPs usually filter by SCU type and the Prioritizer would want everything, frequently. Today reading worklists seem happy with HL7. Also, MWL might omit/not index details the Prioritizer wants because they are not relevant to acquisition. Experience is that PACS still reconcile acquired images to include supplemental order info because the MWL was incomplete or incompletely transcribed and the order has "primacy".

4. Should we consider also prioritizing acquisition entries on modality worklist?

155 A: No. Beyond minimum scope and probably not that useful. Worklist manager already likely has what they need in the worklist entries and staff manage the rest.

5. Would it be worthwhile to require the Prioritizer to support HL7 SIU appointments?

A: No.

160 This would require a large body of appointments to be tracked by the Prioritizer. The volume of information and the "dynamic" nature of the content (cancellations, changes, etc.) make this challenging, perhaps to the point of impracticality. A better solution will be when a standardized API allows querying for upcoming patient appointments that

	match certain filter parameters. Consider revisiting when FHIR Appointment resources are matured and deployed.
6.	Can the Prioritizer be tested if the logic is non-normative?
	A. Yes. Create a workitem and see it in the reporting worklist, then use a transaction to update a detail that affects priority (based on product documentation or common usage), and check that the worklist order has changed correspondingly.
7.	Should we write message semantics for HL7 V2.7 or FHIR?
	A. Not now. Only approved for Min Effort. As FHIR ServiceRequest, Procedure, Appointment, and Encounter resources gain maturity and adoption, a FHIR named option could be added requiring sources to populate those resources and the Prioritizer to be able to harvest them. The Table in Concepts gives a tidy list of details to look for in those resources. FHIR Patient and ImagingStudy might be mature enough now to list as Optional but again, the profile was only approved for Min Effort and it is incomplete without the other resources. Consider which system might host the Resources. Some might be hosted in the EMR, others in the PACS?
8.	Is "Prioritizer" too generic a name for the actor?
	A. No. The name and description are generic, then this Profile assigns responsibilities relevant to, and focused on, Reporting Worklist Prioritization. Other profiles could/will assign other responsibilities. Similar to how the Acquisition Modality Actor gets mammography-specific requirements in the MAMMO Profile rather than introducing a Mammography Modality Actor.
9.	Should a Prioritizer grouped with OF get exceptions to usual transaction support policy?
	A. No. Grouped actors are not required to <u>use</u> transactions when communicating with a grouped actor but are required to <u>support</u> those transactions to handle sites where they do need to integrate with a non-grouped system. E.g., receive HL7 feeds from different OF in the same organization. And the HL7 transactions are not that hard to receive.
10	Do we need RAD-128 Send Rad Result or RAD-132 Notify of Imaging Results?
	A. Don't think so. They all profile OBX Segments in ORU messages. For our case, the new transaction seems more appropriate. RAD-132 just points to the Study UID flavor OBX specification in RAD-128.
11	Should we further modify RAD-13 or create a new transaction?
	 6. 7. 8. 9. 10. 11.

200	A. Create a new Send Procedural Observations (OMI) The provenance (who/what created this observation) is an important part of the business logic for how to "weight" the observation (and the impact it has on the prioritization) depending on whether it came from a human or an algorithm. This, in part, reflects the
205	Interpretation Codes, we should "reclaim" OBX-15 Producer's ID and move the ACR Actionable codes into OBX-8.
210	Continue using OMI since the contents may be transient, where ORU content is expected to be more persistent. ORU should be the EMR update messages. OMI should not. Results Distribution (RD) will continue to use ORU.
	12. Should this Profile be re-packaged as an extension to SWF, RRWF, AIW-I or some such?
	A: No. A standalone Profile makes it easier to focus on the prioritization actors and transactions.
	13. Do any "feed" requirements deviate unnecessarily from SWF.b?
215	A: No. The requirements here on the ADT, Order Placer, and DSS/Order Filler align with SWF.b; no extra work appears to be required.
	14. How do we distinguish triage scores from (tentative) findings?
220	A. (Revised Answer) Use a third value in <i>OBX-8 Interpretation Codes</i> . Use codes for things like Triage Finding, Preliminary Value, etc. Using a v2.7 field (OBX-28) in a v2.5.1 message is too disruptive for validators and pushing up to v2.7 is too disruptive for implementations. We'll argue that these semantics are part of the meaning of the "finding".
225	(Previous Answer) Use <i>OBX-28 Local Process Control.</i> It should be clear when an encoded "observation" is received, if it means "there is a high enough chance of an ICH that triage should prioritize the case for reading by a radiologist" rather than "an ICH has been observed in this patient". In particular, it should be clear how the OBX contents are intended to be used/processed/handled.
230	
	type information specific use may be specified in a message profile or implementation guide might use this element to convey an internal status during processing before the result is communicated outside the organization". It can be multi-valued.
235	
	<i>OBX-3 Observation Identifier</i> with codes like Pneumothorax, Pneumothorax Triage, Pneumonia, Pneumonia Triage, etc. Would avoid the Code-Value pair being misinterpreted since it's encoded into the pair, but would require every possible finding

240	that might be triaged to have a "duplicate" shadow code created. <i>OBX-5 Observation Value</i> with values like Absent, Present, Triaged Absent, Triaged Likely, etc. Would avoid the Code-Value pair being misinterpreted since it's encoded into the pair, and such OBX-5 values could be applied to any and all relevant Assessments. <i>OBX-8 Interpretation Codes</i> with codes like For Triage Only. For Padiologist Review
245	etc. While one might argue "For Triage Only" relates to interpretation, this field should be information derived from OBX-3/5, not additional information about the nature of the FDA cleared intended use of the algorithm that generated the Observation <i>OBX-13 User Defined Access Checks</i> " to send all of the susceptibilities so that certain privileged users (e.g., Infectious Disease specialists) can review all of the results but non-
250	privileged users would see only the "preferred" antimicrobials to which the organism was susceptible" <i>OBX-29/30 Observation Type/Sub-Type</i> – " enable systems to distinguish between observations sent along with an order, versus observations sent as the result to an order."
255	Type codes for RSLT, SCI (Supporting Clinical Info), and other observations; Sub-type codes for SUPplemental Result, MIR (Micro Isolate Related), and many domain specific. <i>OBX-31 Action Code</i> – " action to be taken for this segment" but geared towards update, delete, etc. of an existing record.
	15. Do we need OBR-24 here?
260	A. No. It is an HL7 code from Table 0074 to describe the department that performed the observation, not the department that ordered the observation.
	16. Should Order Status communication be improved?
265	A: Probably, but not in this (MinUE) Profile. ORC-5 Order Status codes have some ambiguity (CM-Order Complete = Final Report Ready vs Acquisition Finished). Both are useful signals. We could profile distinguishing codes (even including one explicitly for Ready-to-Read?). A common pattern is that CM means acquisition finished, but the reporting work to complete the order is not necessarily done. Some EMRs then look for an inbound ORU with report content tagged
270	as Prelim/Final to know the order is fully complete instead of using ORC-5. Future work might profile ORC-25 Order Status Modifier with "sub-statuses" and/or point to OBR-25 Result Status for the status of individual result elements within an overall order. Or maybe there is eventually a FHIR solution
	17. To what degree do we need to address "Minimally Readable" vs "Fully Readable"?
275	A. Add concept text but no normative requirements. Minimally Readable means the must-haves are present. Site policy might be that a certain type of study is "Fully Readable" when all the nice-to-haves are present (e.g., certain lab results or 3D reconstructions might be helpful but not mandatory). That workitem might be waiting for the nice-to-haves, but if other considerations (SLA targets, patient appointment) start to loom, it might move onto/up the worklist.

280	18. Would it help for this profile to mandate support for certain baseline codes?
	A: No. Identifying default coding for certain factors, would disqualify systems that didn't support those codes. We already require the Prioritizer to have configurable logic and code handling. We can leave code convergence to another initiative.
285	19. Does radiologist subspecialty need a specific data field?
290	A: No The Prioritizer can work out what it needs based on values that may be present in ordering department (like Orthopedics, Pediatrics, Neurology, Cardiology, etc.), modality (like CT, MR, etc.), body part (like head, extremities, etc.) and procedure type (wholebody PET, etc.) Note that subspecialty is mostly for assignment, not prioritization. It is the suspected stroke that takes priority over the rheumatoid arthritis MR, not neurology taking priority over MSK.
	20. Should we add a Worklist Display Actor with required behaviors for display of entries?
295	A. No. There is a concept section (54.4.1.7) on Worklist Presentation. Beyond that, it gets into product design and besides, this is a prioritization Profile not a Reporting Workflow Profile.
	21. Do we need to say anything about "group cases"?
300	A. No. Reading is managed at the component/order level so it's fine. The fact that there was a single scan for multiple orders is mostly irrelevant. Some of the factor information is common, but the prioritization is independent.
	22. Is more text needed to address external studies on the worklist?
305	A: No. Leave it to implementers. Goes beyond MinUE. E.g., Some fields might not be available for external studies and coded values may use different coding systems. There may however, be information available in the referral paperwork etc.
	23. What "flavors" of observation probability should we describe?
310	A. Add Note Text for OBX-9. Full resolution depends on future work, consensus, and CP OBX-9 Probability is available in the Observation segment (e.g., for an AI Triage score or preliminary result). See OBX-9 text in 4.145.4.1.2.1. Might also try to support encoding uncertainty ranges in the future (DICOM CP?) for all quantitative observations.

History of Changes (as of August 2023)

Date	Document Revision	Change Summary
August 2023	1.1	Initial publication of POWR for Trial Implementation.

IHE Technical Frameworks General Introduction

The <u>IHE Technical Frameworks General Introduction</u> is shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to this document where appropriate.

325 9 Copyright Licenses

IHE technical documents refer to, and make use of, a number of standards developed and published by several standards development organizations. Please refer to the IHE Technical Frameworks General Introduction, <u>Section 9 - Copyright Licenses</u> for copyright license information for frequently referenced base standards. Information pertaining to the use of IHE International copyrighted materials is also available there.

10 Trademark

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information on their use.

IHE Technical Frameworks General Introduction Appendices

The <u>IHE Technical Framework General Introduction Appendices</u> are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

340 Appendix A – Actors

Add the following **new or modified** actors to the <u>IHE Technical Frameworks General</u> <u>Introduction Appendix A</u>:

New (or modified) Actor Name	Description	
Prioritizer	Determines the relative priority of items in a list. For example, reading tasks in a reporting worklist.	

345 **Appendix B** – Transactions

Add the following new or modified transactions to the <u>IHE Technical Frameworks General</u> <u>Introduction Appendix B</u>:

New (or modified) Transaction Name and Number	Definition	
Send Procedural Observation [RAD-145]	Send observations that may inform the completion and interpretation of an imaging procedure.	

350 Appendix D – Glossary

Add the following new or modified glossary terms to the <u>IHE Technical Frameworks General</u> <u>Introduction Appendix D</u>:

New (or modified) Glossary Term	Definition	Synonyms	Acronym/ Abbreviation
No new terms			

Volume 1 – Profiles

355 **Domain-specific additions**

None.

Add new Profile Section

54 Prioritization Of Worklists for Reporting (POWR) Profile

360 This profile standardizes the interfaces to provide details relevant to the prioritization of studies on a medical imaging reading worklist.

This profile is presumed to operate in the context of a medical imaging reporting workflow; however, it does not specifically depend on any other workflow profiles.

54.1 POWR Actors, Transactions, and Content Modules

365 This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A. IHE Transactions can be found in the Technical Frameworks General Introduction Appendix B. Both appendices are located at https://profiles.ihe.net/GeneralIntro/index.html.

Figure 54.1-1 shows the actors directly involved in the POWR Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved due to their participation in other related profiles are shown in dotted lines. Actors which have a required grouping (if any), are shown in conjoined boxes (see Section 54.3).



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Figure 54.1-1: POWR Actor Diagram

Table 54.1-1 lists the transactions for each actor directly involved in the POWR Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

380	Table 54.1-1: POWR Profile - Actors and Transactions					
Actors	Transactions	Initiator or Responder	Optionality	Reference		
Prioritizer	Patient Administration [RAD-1]	Responder	R	RAD TF-2: 4.1		
	Patient Update [RAD-12]	Responder	R	RAD TF-2: 4.12		
	Placer Order Management [RAD-2]	Responder	R	RAD TF-2: 4.2		
	Filler Order Management [RAD-3]	Responder	R	RAD TF-2: 4.3		
	Procedure Scheduled [RAD-4]	Responder	R	RAD TF-2: 4.4		
	Procedure Update [RAD-13]	Responder	R	RAD TF-2: 4.13		
	Instance Availability Notification [RAD-49]	Responder	0	RAD TF-2: 4.49		
	Send Imaging Result [RAD-128]	Responderr	R	RAD TF-2: 4.128		
	Notify of Procedural Observation [RAD-132]	Responder	R	RAD TF-2: 4.132		
	Send Procedural Observation [RAD-145]	Responder	R	RAD TF-2: 4.145		
	WADO-RS Retrieve [RAD-107]	Initiator	0	RAD TF-2: 4.107		
	QIDO-RS Query [RAD-129]	Initiator	0	RAD TF-2: 4.129		
ADT	Patient Administration [RAD-1]	Initiator	R	RAD TF-2: 4.1		
	Patient Update [RAD-12]	Initiator	R	RAD TF-2: 4.12		

Actors	Transactions	Initiator or Responder	Optionality	Reference
Order Placer	Placer Order Management [RAD-2]	Initiator	R	RAD TF-2: 4.2
DSS/Order Filler	Filler Order Management [RAD-3]	Initiator	R	RAD TF-2: 4.3
	Procedure Scheduled [RAD-4]	Initiator	R	RAD TF-2: 4.4
	Procedure Update [RAD-13]	Initiator	R	RAD TF-2: 4.13
Image Manager	Instance Availability Notification [RAD-49]	Initiator	R	RAD TF-2: 4.49
/Image Archive	WADO-RS Retrieve [RAD-107]	Responder	R	RAD TF-2: 4.107
	QIDO-RS Query [RAD-129]	Responder	R	RAD TF-2: 4.129
	Notify of Procedural Observation [RAD-132]	Initiator	R	RAD TF-2: 4.132
Procedure	Send Imaging Result [RAD-128]	Initiator	R	RAD TF-2: 4.128
Reporter	Send Procedural Observation [RAD-145]	Initiator	R	RAD TF-2: 4.145

Note: The Send Imaging Result [RAD-128] transaction is defined in the Result Distribution (RD) Supplement. Notify of Procedural Observation [RAD-132] is defined in the Encounter-Based Imaging Workflow (EBIW) Supplement.

54.1.1 Actor Descriptions and Actor Profile Requirements

385 Most requirements are documented in RAD TF-2: Transactions. This section documents any additional requirements on profile's actors.

54.1.1.1 Prioritizer

The Prioritizer determines the order of items in a reading worklist based on prioritization factors it receives. See Section 54.4.1.1 Prioritization Logic and Section 54.4.1.2 Prioritization Factors and Sources.

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A Prioritizer will likely be implemented as a component of the worklist manager itself. The Prioritizer might be implemented as an internal function of the worklist service, or it might be implemented separately and integrated by the worklist manager vendor using a proprietary API. Or it might be implemented as a new worklist manager that queries an older worklist manager to

395 get the workitems and brings the new prioritization logic to the table. In any case, this profile does not define transactions between the Prioritizer and the worklist manager, so the worklist manager does not appear as an actor here.

The Prioritizer is required to support receiving a set of transactions that provide prioritization factors (see Table 54.1-1) commonly of interest to many sites. Prioritizers may choose to support additional transactions to enable even more sophisticated prioritization logic.

The Prioritizer shall be capable of incorporating the prioritization factors from the following baseline list (when provided by the other actors) in its prioritization logic:

- Indication/Reason for Study
- Patient Type/Ordering Department ٠
- 405 **Order Priority** •

- Ordering Provider
- Modality/Procedure Type
- AI Triage Result
- Exam Complete/Images Available
- 410 The Prioritizer should be prepared to maintain factor values over extended periods of time since messages like Placer Order Management [RAD-2] may be received weeks or months ahead of the corresponding workitem appearing on the worklist.

The Prioritizer shall provide appropriate configurability to support the prioritization policies and preferences of different sites, and to handle local coding systems for key factors. See Section 54.4.1.8.

In each of the HL7-based transactions in Table 54.1-1, the Prioritizer shall implement the HL7 v2.5.1 Message Semantics.

420 **54.1.1.2 ADT**

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The ADT (Admission, Discharge, and Transfer) Actor provides information about patients, including their demographics and location.

In each of the HL7-based transactions in Table 54.1-1, the ADT shall implement the HL7 v2.5.1 Message Semantics.

425 Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2x: Appendix N.

54.1.1.3 Order Placer

The Order Placer provides information about imaging procedure orders placed and updated at the Order Placer.

- 430 In each of the HL7-based transactions in Table 54.1-1, the Order Placer shall implement the HL7 v2.5.1 Message Semantics.
 - Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2x: Appendix N.

54.1.1.4 DSS/Order Filler

435 The DSS/Order Filler provides information about the status of imaging procedures and for new orders initiated by the imaging department, for example urgent studies for unidentified patients.

In each of the HL7-based transactions in Table 54.1-1, the DSS/Order Filler shall implement the HL7 v2.5.1 Message Semantics.

440 Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2x: Appendix N.

Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2x: Appendix N.

54.1.1.5 Image Manager/Image Archive

The Image Manager/Image Archive provides information about imaging data collected for the imaging procedures being reported on.

In each of the HL7-based transactions in Table 54.1-1, the Image Manager/Image Archive shall
 implement the HL7 v2.5.1 Message Semantics.

Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2x: Appendix N.

54.1.1.6 Procedure Reporter

The Procedure Reporter provides information about results generated for the imaging procedures being reported on.

The Send Procedural Observation [RAD-145] transaction is used by the Procedure Reporter to communicate triage or preliminary findings for the current procedure. Send Imaging Results [RAD-128] can be used by the Procedure Reporter to communicate findings from prior procedures, perhaps obtained from the EMR or findings management system, that might be

455 relevant to prioritization of the current procedure. For example, a triage signal of a potential ICH might be more significant and prioritized higher if this is new or unexpected information, rather than re-detection of a known existing ICH from a prior scan the previous evening.

54.2 POWR Actor Options

Options that may be selected for each actor in this profile, if any, are listed in the Table 54.2-1. Dependencies between options, when applicable, are specified in notes.

Actor	Option Name	Reference
Prioritizer	No options defined	
ADT	No options defined	
Order Placer	No options defined	
DSS/Order Filler	No options defined	
Image Manager/Image Archive	No options defined	
Procedure Reporter	No options defined	

Table 54.2-1: Prioritization Of Worklists for Reporting – Actors and Options

54.3 POWR Required Actor Groupings

An actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile *in addition to <u>all</u>* of the requirements for the grouped actor (Column 2) (Column 3 in alternative 2).

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Section 54.5 describes some optional groupings that may be of interest for security considerations and Section 54.6 describes some optional groupings in other related profiles.

		• •	
POWR Actor	Actor(s) to be grouped with	Reference	Content Bindings Reference
Prioritizer	None		
ADT	None		
Order Placer	None		
DSS/Order Filler	None		
Image Manager/Image Archive	None		
Procedure Reporter	None		

Table 54.3-1: Prioritization Of Worklists for Reporting - Required Actor Groupings

54.4 POWR Overview

470 **54.4.1 Concepts**

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This section presents concepts and considerations that may be helpful to better understand, implement, and deploy this profile. This material is informative; there are no conformance requirements in this section.

54.4.1.1 Prioritization Logic

- 475 The POWR Profile does not place requirements on how the Prioritizer chooses to order the items on the reading worklist. This business logic is left to the implementation and it is expected that details of the logic are likely to vary from site to site based on the nature of their practice, local policies, needs, and preferences. The Profile does address making sure that the data which may drive the business logic is made available to the Prioritizer by the sources of that data.
- 480 Some goals the prioritization logic may be trying to pursue include:
 - Clinical Urgency accelerate items for which completing and releasing the report minutes or hours earlier might result in better clinical outcomes, e.g., potential stroke. See also Section 54.4.1.3 Outcome Risk.
 - Decision Points ensure items which would provide information relevant to an imminent clinical decision are available in time for inclusion/consideration, e.g., a tumor assessment for a patient meeting with their oncologist this afternoon
 - Workflow Efficiency adjust item timing to facilitate overall hospital workflow and efficiency, e.g., move up an item that requires the specialized expertise of a radiologist that is about to go off shift, or accelerate an item that might allow a patient to be discharged from a currently over-crowded emergency department
 - SLA ensure items are completed and reports available within the terms of the service level agreement applicable to the source of the order

Prioritization logic will need to balance the above, potentially competing, goals and also multiple, potentially competing, factors within those goals.

495 A benefit of incorporating multiple factors in the logic is that it can further break-down and sequence groups of items that would otherwise have been in the same "bin" and nominally "tied" at the same position in the worklist. Rather than presenting all the "STAT" orders as a group with no particular sequence, the other factors could produce finer grained bins or item ranking.

Implementation logic should be prepared to handle cases where the information collated from
 multiple sources may include inconsistent or conflicting information. This is not uncommon for a variety of practical reasons.

Implementations should also consider being able to display and/or log the specific factors that contributed to the prioritization of specific studies. This can help radiologists understand and build trust in the algorithm, and can support troubleshooting or refinement of the business logic over time.

505 over time.

Implementers should also be prepared for the logic to vary based on the type of practice, which affects the frequency, priority, and handling of different types of cases. An emergency department might rank a broken foot or a lung nodule differently than an oncology practice.

As an example of prioritization logic that was implemented and assessed in practice, see Impact

- 510 of a Reading Priority Scoring System on the Prioritization of Examination Interpretations, Gaskin et al, AJR 2016 (<u>https://www.ajronline.org/doi/full/10.2214/AJR.15.14837</u>). Studies were prioritized into categories based on factors shown in Table 1 below. The category was mostly determined by the technologist and a key point was that they were "able to escalate the reading priority if they detect an unexpected fracture or bleed, notice an incorrectly entered order
- 515 priority, or are aware of an imminent clinic appointment in 30 minutes". The paper noted that at their facility categories 5 & 7 were created for logic reasons but in practice were used less than 1% of the time and might not be missed if removed.

Read Priority Score (Category)	Guiding Description for Technologists to Use at End of Examination in the RIS
1 (Critical)	Critical test, trauma alert, stroke alert, operating room instrument miscount, code
2 (ED/Urgent)	ED nonalert trauma, other ED, inpatient trauma spine clearance
3 (Inpatient urgent)	Unit patients and other acutely ill inpatients; discharge pending today
4 (Outpatient urgent)	Clinic appointment < 2 hours away, physician awaiting call, or technologist concerned by finding
5 (Clinic visit today)	Appointment > 2 hours away
6 (Inpatient routine)	Not acutely ill and no discharge pending today
7 (Clinic visit tomorrow)	Outpatients with known next-day clinic appointments
8 (Outpatient routine)	Routine outpatients
9 (Outpatient minus)	Outpatient radiographs viewed by specialist in clinic today (e.g., orthopedic or gastrointestinal clinic)

 TABLE I: Read Priority Scoring System With Guiding Definitions in the Radiology Information System (RIS)

Note—Technologists must enter a read priority score that is based on all information available to them on completing an examination. A score is issued from 1 to 9 that conveys the degree of urgency for interpretation ranging from critical, highly time-sensitive inpatient and emergency department (ED) scenarios (e.g., codes, stroke alerts, and operating room instrument miscount studies) to much less time-sensitive scenarios (e.g., spine radiographs reviewed by a spine surgeon in the clinic). These nine levels of reading priority were agreed on by our clinical radiologist leaders and include various common clinical scenarios in our health enterprise, including inpatients, outpatients, teleradiology patients, and ED patients.

54.4.1.2 Prioritization Factors and Sources

520 The Prioritizer may use a variety of factors to prioritize items in the reading worklist, and it obtains those factor values from a variety of sources.

Some details considered to be potentially relevant are listed here and mapped to fields in existing IHE transactions. To provide some conceptual organization, the factors are grouped in the table into categories about: the current patient admission, the placed imaging order, the performed imaging procedure, the procedure results, and other details from the patient's medical record.

Factor	Source Segment- Field	Transaction	Notes
	Patient	Admission M	etadata of Interest
Patient Type	atient Type PV1-2 Patient Class		Inpatient, Outpatient, Preadmit, ER, OB https://www.hl7.org/fhir/v2/0004/index.html
Patient Location	PV1-3 Assigned Patient Location	[RAD-1] & [RAD-12]	Subfields for Facility, Building, Floor, Room, Bed, Description May help with external study identification
Department	PV1-3.6 Person Location Type	[RAD-1] & [RAD-12]	"D" indicates the location is a department
	PV1-3.1 Point of Care	[RAD-1] & [RAD-12]	Name of the department
Treatment Service	PV1-10 Hospital Service	[RAD-1] & [RAD-12]	Type of service/treatment, not department name
Attending Doctor	PV1-7 Attending Doctor	[RAD-1] & [RAD-12]	
Referring Doctor	PV1-8 Referring Doctor	[RAD-1] & [RAD-12]	
Admitting Diagnosis	DG1-3 Diagnosis Code & DG1-6 Diagnosis Type Also PV2-3 Admit Reason OBR-13 Relevant Clinical Information		 DG1-6 Diagnosis Type will indicate if the diagnosis in DG1-3 is for A – Admitting, W – Working, or F – Final diagnosis. OBR-13 Relevant Clinical Information may contain suspected diagnosis. ADT admission messages may contain a DG1 segment associated with the PV1 segment. Both an OMG_019 message and an OMI_023 message may contain an ORC segment and may contain a DG1 segment associated with the OBR segment.
Patient Consciousness	PV1-15 Ambulatory Status OBR-12 Danger Code (aka Patient State)		
Scheduled Patient Departure/Discharge	ADT A16 Discharge Pending		ADT A16 might not be sent to Radiology systems by default so that may need to be configured. Also, Reason for Study (see Order Metadata) might indicate directly or indirectly that the purpose of the study includes enabling patient flow. Some procedures are ordered specifically to enable discharge. E.g., an x-ray to confirm no pneumothorax after removal of a chest tube. Admission policy might dictate a spine clearance X-ray or CT for patients arriving on a back board. If the ED doctor requests an overread it has high priority since patient access is hindered until confirmed.

Table 54.4.1.2-1: Prioritization Factors and Sources

Factor	Source Segment- Field	Transaction	Notes			
Order Metadata of Interest						
Order Priority	TQ1-9 Priority	[RAD-2] & [RAD-3]	STAT, ASAP, Routine, Pre-op, Callback, Timing Critical (OBR-5 and ORC-7, which addressed Priority, were Retired in V2.4 and V2.5 respectively and removed in V2.7)			
Ordered Procedure Type	OBR-4: Universal Service Identifier	[RAD-2] & [RAD-3]	Code for the requested observation. LOINC & SNOMED CT are referenced as sources			
	OBR-44 Procedure Code & OBR-45 Procedure Code Modifier	[RAD-2] & [RAD-3]	Code for the imaging procedure. Components 1-3 contain the Requested Procedure Code. Component 5 may contain the Requested Procedure Description. Modifier usage depends on the code/coding system used in OBR-44 Per RAD-4, the Order Filler may expand an order into multiple Requested Procedures, so one OMG/OMI may contain multiple "Orders" with the same OBR-4 code and different OBR-44 codes			
Indication/Reason for Study	OBR-31 Reason for Study	[RAD-2] & [RAD-3]	Coded value			
Follow-up Status			Whether this study is a follow-up to a preceding finding. This may or may not be apparent in the Indication/Reason for Study.			
Order Creation Date/Time	ORC-37: Order Creation Date/Time	[RAD-2] & [RAD-3]	This may be days or months in advance of when the ordered procedure is performed			
Order Update Date/Time	ORC-9 Date/Time of Order Event	[RAD-2] & [RAD-3]	The datetime of the change in order status (New, Cancelled, Discontinued, or Status changed)			
Ordering Physician	ORC-12 Ordering Provider	[RAD-2] & [RAD-3]	Implementations should be prepared to check both these fields as one or the other may be absent.			
	OBR-16 Ordering Provider	[RAD-2] & [RAD-3]				
Ordering Dept/Facility	ORC-17 Entering Organization	[RAD-2] & [RAD-3]				
Ordering Provider	ORC-12 Ordering Provider	[RAD-2] & [RAD-3]				
"Expected" Result Date/Time	ORC-27 Filler's Expected Availability Date/Time	[RAD-2] & [RAD-3]	When the order results are expected to be available. In addition to this explicit value, the Prioritizer logic may also encode inferences. E.g., after "business hours", there may be no one to receive results for outpatient procedures until the next morning, so priorities may drop relative to acute care studies which may be acted on sooner.			
Order Status	ORC-5 Order Status	[RAD-2] & [RAD-3]	CM=Completed; some systems interpret as Final Report available, others interpret as acquisition complete. Per the <u>AIW-I</u> Profile, A=Available; some, not all, results available.			
Order Type	ORC-29 Order Type	[RAD-2] & [RAD-3]	Procedure in Inpatient or Outpatient setting;			
Target Turn Around Time / applicable SLA			Service Level Agreements (SLA) are agreed upon with ordering organizations and typically specify a target Turnaround Time (TAT) in minutes for different categories of studies such as Trauma/Stroke, STAT, Urgent, Emergent, Inpatient Routine, Outpatient Routine.			

Factor	Source Segment- Transac Field		Notes
Turn Around Time Predicted by Dept.			
	Pro	cedure Metad	ata of Interest
Modality	IPC-5 Modality	[RAD-4] & [RAD-13]	Populated with Defined Terms from DICOM Modality attribute
Time of Scan	TQ1-7 Start Date/Time	[RAD-4] & [RAD-13]	In RAD-4 this is likely the scheduled time. In RAD-13, this may have been updated to contain the performed time. Older implementations use OBR-27 instead of the TQ1 segment.
Performed Procedure Type	OBR-44 Procedure Code & OBR-45 Procedure Code Modifier	[RAD-4] & [RAD-13]	In RAD-4 this is likely the scheduled procedure. In RAD-13, this may have been updated (likely manually) to contain the performed procedure. If the change is significant, the prior order may have been cancelled and a new order placed where the ordered procedure matches what was/will be performed. If OBR-5 is CM, the value here hopefully reflects such changes. See also Ordered Procedure Type notes above.
Protocol	IPC-6 Protocol Code	[RAD-4] & [RAD-13]	Scheduled protocol (performed protocol might differ)
Anatomy Imaged			Often inferred from the Procedure Code, but could also be obtained from DICOM information. Anatomy may be more relevant to Assignment than Prioritization. See Section 54.4.1.4.
Image Availability	Instance Availability Notification (IAN)	[RAD-49]	An IAN sometimes contains the full list of study images; however, image availability should not be inferred to mean that acquisition has completed since additional procedure steps (and MPPS) might be in progress. A Prioritizer might delay putting a study on the worklist until IAN indicates there are some images available. The absence of
			images when an SLA threshold is approaching might trigger an exception to find out where they are stuck.
Technologist Notes	NTE-3 Comment NTE-9 Coded Comment	[RAD-4] & [RAD-13]	It is not uncommon for the imaging technologist or other staff in the imaging suite to obtain information relevant to prioritization of the study and record those in notes. Examples include direct observations of the patient, unusual features in the images as they are acquired, or information about the time and type of the patients next encounters, like an oncology consultation. Unfortunately, such information is typically non-coded making it challenging for the Prioritizer to obtain and parse. NTE segments may be associated with OBR segments in OMI
		Polatod Posult	messages.
Presence/Absence of	OBX-3: Observation		Observation (might be condition is present (or absent) might be
Triage Condition	Identifier	[KAD-143]	a finding, etc.)
	OBX-5: Observation Value (OBX-6: Units)	[RAD-145]	
Severity of Triage Condition	OBX-5: Observation Value	[RAD-145]	See OBX-5 note in RAD TF-2: 4.145.4.1.2.1

Factor	Source Segment- Field	Transaction	Notes
Abnormality	OBX-8: Interpretation Codes	[RAD-145]	Normal, Abnormal, Critically Abnormal, etc. See RAD TF-2: 4.145.4.1.2.1.1
ACR Flag for the Triage Condition	OBX-8: Interpretation Codes	[RAD-145]	See RAD TF-2: 4.145.4.1.2.1.1
Certainty/Confidence of Triage Condition	OBX-9: Probability	[RAD-145]	See RAD TF-2: 4.145.4.1.2.1
Observation Provenance	OBX-17 Observation Method OBX-18 Equipment Instance Identifier	[RAD-145]	See RAD TF-2: 4.145.4.1.2.1 Prioritization logic might have higher confidence and weight some sources more highly than others.
Observation Handling	OBX-28: Local Process Control	[RAD-145]	Per HL7, this field can "convey an internal status during processing before the result is communicated outside the organization". It is used in this Profile to indicate handling such as whether it is appropriate to include the observation as a finding in the medical record. Triage scores, for example, should not be captured or used as findings. Forwarded prior observations should not be duplicated into the medical record.

Similar observations may be expected for AI output that represents preliminary findings rather than triage scores. Other observations relevant to prioritization might come from emergency physicians, technologists, pre-readers, residents or conventional CAD software. Observations from prior procedures (with the date/time of each finding) can be relevant to prioritization logic. Also, Patient History and relevant findings from Lab/Pathology.

Workflow Information of Interest

Workflow Information of Interest includes imaging procedure workflow (to complete the imaging study and prepare data to be used during reporting) and clinical workflow (related to what the patient's next clinical encounters are and when they are taking place, which may place constraints on when the imaging report is needed).

Imaging procedure workflow factors are discussed in Section 54.4.1.6 Ready to Read. These signals are currently either set manually by an operator or inferred from other data flows.

Clinical workflow factors are not well supported by standards yet, and may be entered manually by staff who have asked the patient or been contacted by the referring physician. In some sites, there may be notes in the order or EHR indicating the patient is going to the OR, or has an upcoming appointment in 2 hours, etc.

Notes: 1. The HL7 segments in this table mostly reflect HL7 v2.5.1 which is commonly used in IHE Radiology transactions. Implementations may support transcoding to other versions.

2. Patient Administration [RAD-1] and Patient Update [RAD-12] are ADT-based transactions. Leveraging an ADT feed brings with it the challenge and obligation to keep up with a potential stream of pre-admits, admits, merges, discharges, readmits, transfers, transfer cancellations, etc. and associated complexities.

3. Placer Order Management [RAD-2] and Filler Order Management [RAD-3] are OMG-based transactions

4. Procedure Scheduled [RAD-4] and Procedure Update [RAD-13] are OMI-based transactions

5. In HL7 v2.7, many person, organization, and device fields were retired and replaced with a more uniform and consistent PRT (Participant) Segment. Prioritizer implementations may find it useful to be prepared to accept such encodings.

Prioritizers may have access to other messages and sources, and are not prohibited from incorporating other details to which they have access. The sources and transactions described in this Profile may serve as a useful template and framework for such cases.

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540 The Prioritizer may find some factors are correlated or may be inferred. E.g., in some facilities, all orders from the emergency department are automatically given a priority of STAT.

For an imaging "Group Case", where a single imaging procedure satisfied multiple orders, the orders are independently available on the worklist for reading. Different parts of the scan may be read by different radiologists (e.g., head and chest); however, when it is appropriate for a single radiologist to do all the reads, a Prioritizer might list them together.

54.4.1.2.1 Out of Scope Factors

The following factors were identified as potentially useful to consider for prioritization logic but were left out of scope for this Profile due to the lack of prevailing standard for communicating them.

- staff credentials, qualifications, and licensing
 - staff scheduling

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54.4.1.3 Outcome Risk

A significant thread running through a number of prioritization factors is the risk of poor outcomes for the patient. The premise is that if patients with a higher outcome risk are moved up the worklist, the presence and nature of the risk will be recognized and resolved more quickly, and they have a better chance for a better individual outcome, leading also to better outcomes overall.

E.g., A CT study for the oncology department might be prioritized higher than an outpatient joint x-ray since the likelihood of positive findings is higher and the x-ray is likely also being reviewed by orthopedics.

In some sense, the prioritization logic is trying to aggregate multiple outcome-correlated factors for each study so it can be directly compared and ranked relative to the other studies on the worklist. The Prioritizer might handle this directly, or a sophisticated Procedure Reporter or AI triage application might try to generate and submit an aggregate score for a study when multiple triage results have been generated.

Some sites may decide to prioritize solely on the most clinically significant triage result. Others might decide that additional less significant results still contribute incrementally to the outcome risk. E.g., A study with an ICH and a skull fracture might prioritize higher than one with just an ICH. For a pulmonary embolism, a centrally-located embolism might prioritize higher than a

570 peripheral one, and a larger embolism might prioritize higher than a smaller one, but the presence of additional emboli might prioritize higher than a solitary one, and whether the emboli are unilateral or bilateral.

For a rib fracture study, considering the number of fractures, which ribs were fractured, whether they are contiguous, bilateral, displaced or not, can indicate increased risk of a pneumothorax or

575 other associated injuries (e.g., fracture of first rib is often associated with significant associated injuries) even without an AI triage suspecting those conditions. Lung nodule assessment of

location, characteristics and size might prioritize the most suspicious, which is not always the largest.

In the absence of a unified scale of patient risk (perhaps analogous to the micromort scale of mortality risk of different activities) that aggregates the potential outcome severity of different risks with the likelihood of those risks, it is left to the Prioritizer to support the ranking paradigms chosen by their sites.

Academic frameworks such as the Classification of life- and limb-threatening injuries and bleeding (<u>https://sjtrem.biomedcentral.com/articles/10.1186/s13049-023-01083-z/tables/1</u>) may also prove useful.

54.4.1.4 Prioritization and Prior Observations

Sometimes observations from prior procedures may factor into prioritization of current procedures.

- A specific example is a "clinical false positive", where a triage AI detects a significant condition, such as an intracranial hemorrhage (ICH), in the current imaging procedure and that would normally cause the study to be prioritized high on the worklist to get a definitive finding from the radiologist so that urgent care could be initiated if needed. However, if the ICH was an already known condition (as indicated perhaps by a prior finding of the ICH from a procedure earlier in the day) which has already been factored into the care plan, then it might not merit moving the study up the worklist. The prior observation(s) would still also be useful to make available to the
 - radiologist during their interpretation.

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One could imagine similar examples for the detection of lung lesions and the potential disruption in a cancer imaging center, where such lesions are typically common and already known, of moving all studies with such observations to the top of the worklist.

600 This profile specifies transactions to obtain such information, but leaves the subtleties of such logic to implementations and site policies. A Procedure Reporter with access to prior findings could send additional [RAD-145] transactions to convey those to the Prioritizer. The Prioritizer would need to pay attention to the date/time fields in the OBXs which would identify the "prior" observations as being generated from earlier imaging procedures rather than the current one.

605 **54.4.1.5 Prioritization vs. Assignment**

Implementations of worklists may include the ability to assign individual workitems or sets of workitems to one or more specific reading clinicians or groups or roles. Worklists are essentially a "resource allocation task" where the reading clinicians are the resource.

While assignment is technically different from prioritization, some of the same factors may be 610 relevant, so this profile may be useful to support that use case too. This Profile does not, however, specifically require the Prioritizer to support assignment. Implementations that choose to support assignment might manage separate worklists for each resource. Alternatively, they might manage a single worklist and present user-specific views that represent their assignments.

A single worklist might make it easier to avoid losing track of uncompleted workitems and
 reassign them as needed. Implementations might perform assignment before prioritization, after
 prioritization, or have a blended logic that does them together.

Considerations specific to assignment logic might include leveraging 3rd party reads by nighthawk services, allowing radiologists to "claim" multiple items to work on as a group, locking studies that are currently "claimed" by one radiologist from being assigned or selected by

620 another, countering "cherry-picking", and providing "balance/fairness" of workload across radiologists while leveraging expertise.

Assignment in some sites is done by a human who incorporates local knowledge such as the expertise of available readers and the local procedure mix and workflows. One could also imagine a Prioritizer that presents a human operator some or all the relevant details discussed

625 here and lets them assign and/or sort the workitems, essentially a Prioritizer with human-driven business logic.

54.4.1.6 Ready to Read

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In addition to prioritizing items on the reading worklist, a related task is determining when it is appropriate to put an item on the worklist in the first place. Two key types of factors that affect this determination are data availability and data quality.

For each type of study, there will be a set of data that is necessary to be able to read the study, and data that is desirable to have when reading the study. Initially, a study might be kept off the worklist if desirable elements are not yet available, to allow time for things like processing and data transfer to complete (i.e., the study is "Minimally Readable" but not yet "Fully Readable").

635 After a while, other factors may take precedence and as long as the necessary data is available, the study might be considered ready to read. Alternatively, the study might be put on the worklist with an indicator that additional data is still pending, which would allow for a quick initial read when needed and a re-read later when the data is complete.

Which data elements are considered necessary, and which are considered desirable, for a given type of study will likely vary from site to site and potentially from radiologist to radiologist, and might also depend on the reason for the study. The Prioritizer may incorporate availability of data such as the acquired images, alternate reconstructions, generated 3D views, pre-fetched priors, sonographer worksheets, clinical analysis results, and AI results. Additionally, the Prioritizer may monitor workflow information, such as that provided by the Radiology <u>AI</u>

645 <u>Workflow for Imaging</u> (AIW-I) Profile, to track whether certain processing steps have been scheduled, started, and been canceled and/or completed, to estimate when/if additional data may be available soon.

Data quality information can also affect whether the study is Ready to Read. Sites may have QA assessments of details such as:

- whether all the expected data has been acquired,
 - whether the image quality is adequately diagnostic,

- whether the performed procedure matches the order, specifically to detect:
 - o body part mismatch
 - o laterality discrepancy (e.g., bilateral shoulder ordered but only right shoulder imaged)
- coverage discrepancy (e.g., CT chest/abdomen/pelvis ordered but only chest/abdomen images).

Such assessments may be increasingly AI-based, in which case the quality findings might also be conveyed using the Send Procedural Observations [RAD-145] transaction. Quality issues would likely trigger exception handling to avoid spending radiologist time on inadequate datasets. For that matter, exception handling might also be driven by a prioritized worklist with many of the

660 that matter, exception h factors discussed here.

A specific factor worth calling out for consideration during QA is the Indication/Reason for Study. In addition to affecting prioritization, this factor is also critical information to guide the radiologist, as well as important for billing. Again, this QA might be performed by humans, AI,

665 or a collaboration of both. Proactive exception handling while the patient is still available, which could be triggered before acquisition, might include contacting the referring physician to obtain a better history to improve patient care and departmental efficiency. An indication of "rule out <something>" is generally not a billable history, and is often not adequate for the radiologist.

54.4.1.7 Worklist Presentation

- 670 The POWR Profile does not place requirements on how the worklist is presented to reading clinicians. The implementation may choose to:
 - communicate priority using color, font, visibility, item ordering, or item grouping
 - provide the ability to re-sort or filter the presented workitems
 - allow configuration of what details are shown for each entry
 - it is worth highlighting that Tech Notes may contain highly relevant details about the patient, the procedure, and clinical workflow, albeit in an uncoded form.
 - expand an entry for more information, etc.
 - use different presentation depending on the user and their role and preferences
 - provide the ability to group workitems that have been prioritized similarly and configure names/labels for those groups
 - e.g., a site might choose to organize the worklist items into five groups labelled Critical, Urgent, High, Medium, and Routine; another site might have different groups and might prefix the labels with a number to facilitate sorting.

It is not uncommon to present multiple workitems to a radiologist and allow them to select an item other than the top item. Consider what factors to display in the worklist items to help the radiologist select which workitem to work on.

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Similarly, this Profile does not specify a standardized query for reporting worklist clients. See Section 54.6 Cross-Profile Considerations for pointers to relevant reading worklist profiles.

54.4.1.8 Codesets

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690 While this profile does not mandate the use of particular codesets for many of the factors and details that are coded, agreeing within the local site or organization on common codesets will be a key prerequisite of effective deployment of this profile.

To understand and apply the correct semantics for factor values that are coded, the Prioritizer will need to be familiar with, or be reconfigured for, the codesets used by each of the sources for each of the coded details they provide. Conformance of sites and products to Regional or

National codesets would be a forward-looking step that may yield benefits in the future. Ideally, the various systems that generate observations (e.g., AI algorithms or the Task

Performers or Platforms that proxy the AI output back into medical data formats) would be configured to use standardized codesets. In the absence of that, the Procedure Reporter will be transcoding various observations into the [RAD-145] transaction and could, if it were to be

700 transcoding various observations into the [RAD-145] transaction and could, if it were to be configured with mapping tables, be able to "normalize" the output of various observation generators and make implementation easier for the Prioritizer.

With respect to AI results (whether triage or diagnostic findings), refer also to the Codesets section in the <u>AI Results</u> (AIR) Profile.

705 Code Sources and Maintenance

DICOM codesets are largely constructed from SNOMED CT codes (that are free for use worldwide in the context of DICOM), LOINC codes (that are free for use worldwide), and DICOM codes (that are free for use worldwide). Specifically, the imaging procedure codes in the RadLex Playbook subset of LOINC may be particularly relevant here.

710 **54.4.1.9 Value of Effective Prioritization**

Implementation of this Profile will be driven in part by the value expected to be derived from more effective prioritization of reading worklists.

Potential tangible benefits and corresponding metrics include:

- Achieving a higher rate of positive outcomes (or a lower rate of negative outcomes) for particular clinical scenarios, e.g.
 - Lower mortality rate for myocardial infarction patients
 - Lower morbidity for intracranial hemorrhage patients
- Meeting SLA (Service Level Agreement) criteria for a greater number of studies, e.g.
 - Report Turnaround Times

- Conforming to clinical practice guidelines or site policies for a higher percentage of patient cases, e.g.,
 - Time from suspected stroke arrival to interventional procedure or drug
 - Achieving higher patient satisfaction for particular patient types or services, e.g.
 - Satisfaction survey scores for outpatients in the imaging service
- 725 An interesting benefit of having relevant factors being fed to an active prioritization system is that changes to the logic can be made in a controlled fashion to assess the resulting impact, supporting a continuous improvement process.

54.4.2 Use Cases

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54.4.2.1 Use Case #1: Basic Prioritization

730 A Prioritizer determines the sequence of items in the worklist based on factors received over time from a variety of sources.

54.4.2.1.1 Basic Prioritization Use Case Description

The Prioritizer receives details about the patient, the imaging procedure, and the healthcare provider workflow, that may be factors in deciding the priority of each study relative to the other studies in the reading worklist.

Several common systems that provide prioritization factors are shown in Figure 54.4.2.1.2-1. For a more complete list of potential sources, see Section 54.4.1.1 Prioritization Factors and Sources. Although only one transaction of each type of feed is shown, there will be a regular flow of such patient, order, and procedure transactions.

- 740 The figure shows a single execution of the prioritization logic when a new study is identified by the PACS (Image Manager/Image Archive) as being available. However, the Prioritizer will likely be updating the worklist continuously as factor values change, for example as additional clinical information about the patient is obtained, the target turnaround time of given study draws closer, a new procedure is scheduled for the patient, etc. The Prioritizer might regenerate the
- 745 worklist each time a worklist query is received or with some scheduled frequency. The timing and frequency of worklist prioritization is left to the implementation.

The figure shows the "Exam Complete" status being set manually by the technologist after they complete QC and confirm the study content in the PACS appears correct and complete. Alternatively, business logic might use C-FIND or QIDO-RS queries for images, and/or

750 information from Instance Availability Notification (IAN) and/or Modality Performed Procedure Step (MPPS) messages.

The RIS (DSS/Order Filler) often has an "Auto-complete" function triggered by a configurable timeout, such as 4 hours after initial receipt of images for a study, indicating the study should be read if it has not already. Conversely, the RIS or PACS may have an "Auto-finalization" function

that creates a placeholder report to disable a study going onto the reading worklist because the images it contains are not intended to be "read", for example because they are priors or they were collected for non-diagnostic purposes like image-guidance for another procedure.

The figure shows a "workstation" (WS) as a placeholder to represent the set of systems that constitute the reporting environment for the radiologist. This might be a single integrated system, or independent Image Display and Report Creator systems, or some other product architecture.



54.4.2.1.2 Basic Prioritization Process Flow

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The text in Figure 54.4.2.1.2-2 was used to generate the diagram in Figure 54.4.2.1.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

title Basic Prioritization
participant ADT participant Order Placer as OP participant DSS/nOrder Filler as OF participant Prioritizer as Pri participant Acquisition/nModality as Mod participant IM/IA as IM
ADT->Pri: Patient Administration [RAD-1] ADT->Pri: Patient Update [RAD-12] OP->Pri: Placer Order Management [RAD-2] OF->Pri: Filler Order Management [RAD-3] OF->Pri: Procedure Scheduled [RAD-4] OF->Pri: Procedure Update [RAD-13] Mod->Mod: Perform imaging\nprocedures Mod->IM: Tech performs\nstudy QC OF->OF: Tech "completes"\nthe study OF->Pri: Procedure Update [RAD-13]
Pri->Pri: Update Reading Worklist\nItem Prioritizations WS->Pri: Query Reading Worklist note over IM,WS: Read Study

Figure 54.4.2.1.2-2: Diagram Pseudocode for Basic Prioritization Process Flow

54.4.2.2 Use Case #2: AI Triage Variant

A Prioritizer receives clinical triage results generated by an AI which impact the urgency of reading the study. This use case is essentially an extension of Use Case #1.

54.4.2.2.1 AI Triage Variant Use Case Description

Although Figure 54.4.2.2.2-1 shows a single AI generating a triage result, one can imagine multiple AI algorithms producing both triage results and tentative findings.

The figure shows the technologist setting "Ready to Read" as soon as the images are ready. Then when the Prioritizer is informed of the AI triage results, it recomputes the worklist priorities, potentially moving the associated study up or down the list if it has not already been read. Alternatively, when the AI is providing critical analysis, the technologist might not set "Ready to Read" until after the AI results are available, or it might be set automatically.

The figure shows a transaction pattern based on the AIW-I and AIR Profiles.

780 The figure shows the AI Task Performer and the Procedure Reporter as a grouped actor to simplify this diagram. Typically, these may be separate actors.



54.4.2.2.2 AI Triage Variant Process Flow

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Figure 54.4.2.2.2-1: AI Triage Variant Process Flow

The text in Figure 54.4.2.2.2-2 was used to generate the diagram in Figure 54.4.2.2.2-1. Readers will generally find the diagram more informative. The text is included here to facilitate editing.

title AI Triage Variant

participant ADT participant Order\nPlacer as OP participant Order\nFiller as OF participant Prioritizer as Pri participant Acquisition\nModality as Mod participant AI Task Performer/nProcedure/nReporter as AI participant IM/IA as IM note over ADT, Pri: Feed transactions as shown in Use Case 1 Mod->IM: Store images OF->OF: Tech "completes"\nthe study OF-->Pri: Pri->Pri: Update\nReading Worklist\nItem Prioritizations note over IM,AI: See AIW-I and AIR Profiles AI->IM: Retrieve Images AI->AI: Perform Inference AI->Pri: Send Procedural Observation [RAD-145] Pri->Pri: Update\nReading Worklist\nItem Prioritizations WS->Pri: Query Reading Worklist note over IM,WS: Read Study

Figure 54.4.2.2.2-2: Diagram Pseudocode for AI Triage Variant Process Flow

790 54.5 POWR Security Considerations

Most prioritization factors in this profile contain personal health information (PHI) such as demographics and other clinical information. It is appropriate for products implementing the Prioritization Of Worklists for Reporting (POWR) Profile to include appropriate PHI controls. Specifying such general mechanisms and features is outside the scope of this profile.

795 **54.6 POWR Cross Profile Considerations**

AIW-I – AI Workflow for Imaging Profile

A Procedure Reporter in AIW-I might be grouped with a Procedure Reporter to feed AI result information to a Prioritizer to affect the reading worklist.

A Watcher in AIW-I might be grouped with a Prioritizer to obtain information about the progress 800 (Scheduled, Claimed, In-Progress, Complete, Canceled) of tasks, such as AI processing, that are preparing data that may be used in a reporting task. Some sophistication may be required, e.g., one might delay reading a procedure when important analysis is not yet available, but should not delay indefinitely. In such cases, the turnaround time constraints from the Service Level Agreement with the ordering provider might serve as a "backstop", or manual exception handling

805 might be required. In a related sense, if a triage result is not yet available and the reporting workitem would otherwise be read now, there is no need to delay since the only effect of triage would be to move it up the worklist.

AIR – AI Results Profile

An Evidence Creator, Image Manager/Image Archive, or Imaging Document Consumer in AIR 810 might be grouped with a Procedure Reporter to send potentially relevant AI Results to the Prioritizer.

SOLE – Standardized Operational Log of Events Profile

An Event Reporter in SOLE might be grouped with a Procedure Reporter or a Prioritizer to log events relevant to metrics described in Section 54.4.1.9 Value of Effective Prioritization.

815 SWF.b – Scheduled Workflow.b Profile

A DSS/Order Filler or an Image Manager/Image Archive in SWF.b might be grouped with a Prioritizer if they are managing the reporting worklist.

RRR-WF – Radiology Remote Reading Workflow

A Task Manager in RRR-WF might be grouped with a Prioritizer to prioritize the reading worklist and make the prioritized list available to Task Performers using a DICOMweb query.

XRR-WD – Cross-Enterprise Remote Read Workflow Definition

A Task Manager in XRR-WD might be grouped with a Prioritizer to prioritize the reading worklist and make the prioritized list available to Task Performers using a Registry Stored Query for workflow documents in an XDS Repository.

Appendices to Volume 1

Not applicable.

Volume 2 – Transactions

Add new transaction Send Procedural Observation [RAD-145]

830 4.145 Send Procedural Observation [RAD-145]

4.145.1 Scope

This transaction is used to transfer observations with information one might use to complete and interpret an imaging procedure.

This transaction is not intended to be used to populate the patient medical record directly. The observations here may reflect preliminary, triage, or workflow signals that do not necessarily represent findings appropriate to put into the medical record. Content corresponding to some of these observations might ultimately end up reflected in the patient medical record, but that would be done through other channels and processes, possibly using ORU messages.

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Note: It can be useful to circulate prior observations in support of a current procedure; however, this transaction should not be used for that purpose. Send Imaging Result [RAD-128] is an appropriate transaction for such purposes.

4.145.2 Actor Roles

The roles in this transaction are defined in the following table and may be played by the actors shown here:

Role:	Sender: Transmits observation details.
Actor(s):	The following actor(s) may play the role of Sender:Procedure Reporter
Role:	Receiver: Receives and uses observation details.
Actor(s):	The following actors may play the role of Receiver:PrioritizerReport Creator

Table 4.145.2-1: Actor Roles

845 Transaction text specifies behavior for each role. The behavior of specific actors may also be specified when it goes beyond that of the general role.

4.145.3 Referenced Standards

- HL7 Messaging Standard v2.5.1, Observation Reporting (Chapter 7)
- HL7 Messaging Standard v2.5.1, Control (Chapter 2)

• RAD TF-2: 2.3.1 Conventions for HL7 v2.5.1 messages

4.145.4 Messages



Figure 4.145.4-1: Interaction Diagram

4.145.4.1 Send Observation Message

855 The Sender sends an observation (e.g., a triage result, prior finding, or tool-generated observation) to the Receiver.

The Sender shall be able to send an imaging result to more than one Receiver. The Receiver shall support reception of such messages from more than one Sender.

4.145.4.1.1 Trigger Events

860 The Sender determines, or is instructed by an operator, that it is necessary to send an observation to the Receiver.

For example, a Sender might:

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- be programmed to send an AI-generated triage result or an observation by the technologist of something unusual in the scan for consideration by a system that prioritizes imaging studies on a reporting worklist
- be instructed by the operator to send a measurement to the Report Creator for possible inclusion by the radiologist in the report
- send findings extracted from prior reports to an analysis program to plot and compare to corresponding current findings
- 870 Depending on the context, abnormal, normal, and indeterminate observations might all be valid triggers.

4.145.4.1.2 Message Semantics

The message is an HL7 2.5.1 Imaging Order (OMI^O23) message. The Sender is the HL7 sender. The Receiver is the HL7 recipient. The primary content is one or more observations in OBX segments.

This HL7 v2.5.1 OMI message is very similar to an HL7 v2.3 ORM message.

The segments shown in Table 4.145.4.1.2-1 shall be included. All other segments are optional.

Segment	Meaning	Card.	HL7 chapter
MSH	Message Header	[11]	2
PID	Patient Identification	[11]	3
{ORC}	Common Order	[1*]	4
OBR	Order Detail	[11]	4
{OBX}	Observation/Result	[1*]	7
{IPC}	Imaging Procedure Control	[1*]	4

Table 4.145.4.1.2-1: OMI Segments

The Sender shall include one or more Observations encoded in OBX Segment(s) as specified in 880 Section 4.145.4.1.2.1.

The Accession Number (IPC-1) and Patient ID (PID-3) provided by the Sender will be particularly important for the Receiver to associate the observations with the correct patient and procedure.

The value of fields *ORC-1 Order Control* and *ORC-5-Order Status* shall reflect the status of the current underlying order, the completion of which these observations are intended to support. It is likely appropriate for the Sender to populate *ORC-1* with a value of SC, meaning "Status Change". The value of ORC-5 will reflect local practices and policies.

When the Sender is forwarding an observation extracted from a prior report or procedure, the OMI message containing the observation shall contain dates and order IDs that reflect the prior order that generated the prior result. When the Prioritizer receives such a message, it will need to associate it with the current order on the worklist based on matching the patient identifiers.

It is expected that the Receiver will process OMI messages with dates in the (distant) past rather than ignoring them. However, recording such an observation into the clinical record would likely be duplicative.

895 4.145.4.1.2.1 OBX segments – Observations

This section specifies the OBX segment provided by the Sender.

The OBX segment conveys observations and finding primitives, such as CAD or AI results.

Multiplicity: This OMI message may contain multiple Observations, each of which will have a single OBX segment (and optional PRT segments). The Sender will create separate OBX

900 segments for each Observation included in the message. It is common to have multiple related observations which could be relevant to the Receiver.

The Observation/Result (OBX) Segment definition is based on HL7 Version 2.5.1 (Chapter 7, Observation Reporting, Section 7.4.2).

Note: OBX-8 was renamed by HL7 from Abnormal Flags to Interpretation Codes and the data type upgraded to CWE. This transaction reflects those changes. In HL7 v2.5.1, OBX-20 was reserved for harmonization with V2.6 which is shown here.

The fields in this OBX Segment shall be further constrained as specified in Table 4.145.4.1.2.1-1.

							•
SEQ	LEN	DT	Usage	Card	TBL#	ITEM #	ELEMENT NAME
1	4	SI	R	[11]		00569	Set ID – OBX
2	2	ID	R	[11]	0125	00570	Value Type
3	250	CE	R	[11]		00571	Observation Identifier
5	483 or 99999	NM, CE or TX	R	[11]		00573	Observation Value
6	250	CE	С	[01]		00574	Units
7	60	ST	0	[01]		00575	Reference Range
8	20	CWE	RE	[0*]	0078	00576	Interpretation Codes
9	5	NM	RE	[01]		00577	Probability
10	12	ID	0	[0*]	0080	00578	Nature of Abnormal Test
11	1	ID	R	[11]	0085	00579	Observation Result Status
14	26	TS	R	[11]		00582	Date/Time of the Observation
15	250	CWE	R	[11]		00583	Producer's ID
16	250	XCN	0	[0*]		00584	Responsible Observer
17	250	CWE	R	[11]		00936	Observation Method
18	22	EI	R	[1*]		01479	Equipment Instance Identifier
19	26	TS	0	[01]		01480	Date/Time of the Analysis
20	250	CWE	0	[0*]		02179	Observation Site

Table 4.145.4.1.2.1-1: OBX Segment Fields

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Adapted from the HL7 Standard, version 2.5.1

Field *OBX-2 Value Type* identifies the encoding of Field *OBX-5 Observation Value*. *OBX-2* shall have the value "CE" (coded element), NM (numeric) or TX (text data).

Field *OBX-3 Observation Identifier* shall contain the code identifying the specific type of Qualitative Finding or Measurement for which a value is provided in OBX-5:

- 915
- The code may be extracted from the attribute (121071,DCM,"Finding") in an Imaging Analysis Result formatted SR document.
 - Standard coding systems, such as RadElements, LOINC and SNOMED are strongly recommended, although local coding systems may be used.

Field OBX-5 Observation Value shall contain the finding or measurement value itself.

920	Notes: 1. When the Observation originated as a measurement or qualitative finding primitive described in the IHE Radiology Technical Framework Supplement - AI Results RAD TF-3: 6.5.3. (currently published for trial implementation) the values of OBX-3 and OBX-5 may be transcoded from the corresponding SR Concept-Value pair.
	2. It is very important to parse OBX-5, even for qualitative findings. The full semantics of OBX-3 = (59282003, SCT, "Pulmonary embolism") are not apparent without recognizing OBX-5 = (272519000, SCT, "Absent")
925	3. OBX-5 may contain a value which is an assessment of the severity of a qualitative finding identified in OBX-3, e.g., using codes for mild, moderate, or severe. In this case, the fact that the finding is present is implicit in the assessment that it is mild, moderate, or severe.
930	Field <i>OBX-6 Units</i> If OBX-2 is NM and the quantity is not unitless, then this field shall be included and contain the ISO or ANSI units, as defined in HL7 v2.5.1. If the quantity is unitless, this field may be omitted or may contain an appropriate code.
	Field <i>OBX-7 Reference Range</i> may include the threshold or range that was the basis for the values (such as urgency or severity) in <i>OBX-8 Interpretation Codes</i> .
935	Field <i>OBX-8 Interpretation Codes</i> shall contain codes applicable to this specific Observation. The codes may differ between OBX segments, based on the interpretation of each individual observation. See Section 4.145.4.1.2.1.1.
	Note: In this transaction, OBX-8 uses the CWE datatype as described in HL7 V2.7.
940	Field <i>OBX-9 Probability</i> shall be populated if provided by the originating algorithm. The value is a decimal number between 0 and 1, inclusive, encoded as an ASCII string, however the specific semantics of the value are defined by the algorithm, and may convey a probability or confidence level of the observation value, or a strength of signal.
	Notes: 1. The meaning of these values may differ across different originating algorithms. It is up to the Receiver to interpret this value in the context of the originating algorithm, which may be inferred from the contents of fields such as OBX-18 Equipment Instance Identifier and OBX-17 Observation Method. The Receiver would need to obtain (by some configuration or method not specified here) the semantics associated with this field by the originating algorithm.
945	2. This field does not encode a confidence interval or uncertainty range for a quantitative finding. Such information can be very useful but is not addressed here.
	Field <i>OBX-10 Nature of Abnormal Test</i> may identify the sub-group (age, sex, race, species, etc.) for whom the observation value is considered abnormal.
950	Field <i>OBX-11 Observation Result Status</i> shall be populated with the value of R, indicating that the results have not been verified by a Radiologist. While a value of P indicates preliminary results which also might not have been verified by a Radiologist, it is not used here since it implies the existence of a qualified submitting person of some sort.
955	Field <i>OBX-14 Date Time of the Observation</i> , if present, shall be populated with the physiologically relevant date and time, i.e., when the images on which the observation is based were acquired.
	Field <i>OBX-15.1 - OBX-15.3 Producer's ID</i> shall identify the responsible service (e.g., the radiology department) that produced the result. DICOM PS3.16 <u>CID 7030</u> "Institutional Department/Unit/Service" provides a list of recommended codes. In the U.S., the Medicare number of the producing service might be used.

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Notes: 1. In the original Trial Implementation version of the AIW-I Profile, OBX-15.1 – OBX-15.3 contained ACR Actionable Finding Codes which are now located in *OBX-8* (see above).

2. In versions of HL7 after V2.7, these details are included in PRT segments associated with the Observation.

Field *OBX-16 Responsible Observer*, if present, identifies the individual directly responsible for the observation. For an observation that was generated by a device and verified by a person, that person can be recorded here. For a manual observation, this might record the person who performed the observation, the person who verified it, or both.

Field *OBX-17 Observation Method* shall be populated with a code indicating the analysis method or procedure by which the observation was obtained. For observations generated by an algorithm, such as an AI inference model or a clinical application, the code shall indicate the

- 970 name of the algorithm/software. The code may also indicate the version of the algorithm, but for frequently or continuously updated algorithms, that might not be feasible. The Name of Coding System component value shall indicate the vendor, likely using the 99-prefix convention. This field is intended to facilitate tracking the provenance of the observation. For observations received in DICOM SR, the algorithm details can be obtained from fields as shown in examples
- 975 in Appendix A Example Analysis Result Encodings in the <u>AI Results</u> (AIR) Supplement.

Notes: 1. This code identifies the analysis method by which the observation was generated, not the imaging procedure from which the underlying images were generated.

2. This code may be used to differentiate two observations that performed the same assessment but used different methods.

- 980 Field *OBX-18 Equipment Instance Identifier* shall be populated with an ID that uniquely identifies the specific instance of equipment that produced the observation. The equipment may be a piece of software, such as an AI Model. Some acceptable IDs include a Device UDI or a Device UID, both of which are universally unique, or a departmental equipment ID that is unique within the department identified in OBX-15. For observations that are obtained from DICOM
- 985 instances, the Device UID may be obtained from Device UID (0018,1002) in the Contributing Equipment Sequence (0018,A001). See RAD TF-3: 6.5.3.1 (currently in the <u>AI Results</u> (AIR) Supplement).

Field *OBX-19 Date/Time of the Analysis* shall be populated with the date and time when the analysis was performed, i.e., when the algorithm or person generated the observation.

990 Field *OBX-20 Observation Site* may be populated with the coded anatomical location(s) at which this observation was made.

4.145.4.1.2.1.1 Interpretation Codes

The *OBX-8 Interpretation Codes* field can convey one or more categorical assessments of the observation value. Three assessments specifically addressed here are the abnormality, the Actionable Finding Category, and the Intended Interpretation of the observed value.

These codes are selected by the Sender based on transcoding information encoded in the data on which this observation is based. It is not expected that the Sender will make its own assessments

of the abnormality, actionability or intended interpretation, independent of information in the original result.

1000 The Sender is permitted to send additional codes. For example, a Sender might append an additional code to indicate that the measurement in OBX-5, such as a stenosis percentage, was interpreted by the source as mild, moderate, or severe. Alternatively, that could be encoded as an additional OBX segment with a qualitative observation.

2. Per HL7, multiple codes are separated by a repeat delimiter "~".

3. The order of codes is not significant.

Abnormality shall be encoded using a value from the following list from HL7 v2.5.1 Table 0078:

- N^Normal^HL70078
- 1010 A^Abnormal^HL70078

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• AA^Critical abnormal^HL70078

Actionable Finding Category shall be encoded with a value from the following list (which correspond to the identified RadLex codes):

- RID50261^Non-actionable^RadLex
- 1015 RID49482^Category 3 Non-critical Actionable Finding^RadLex
 - RID49481[^]Category 2 Urgent Actionable Finding[^]RadLex
 - RID49480[^]Category 1 Emergent Actionable Finding[^]RadLex
 - Notes: 1. Actionable and non-actionable findings are discussed extensively in the <u>Results Distribution</u> (RD) Profile; see RAD TF-1: 45.4.1.5. The encoding follows the guidelines introduced by the RD Profile in RAD TF-2: 4.128.4.1.2.1.
- 1020 2. The Actionable Finding Category codes profiled here may be considered as local additions to HL7 Table 0078

3. Typically, a Category 1 or Category 2 Actionable Finding will be paired with an Abnormality code of Critical Abnormal. A Non-actionable Finding might be paired with either a Normal or Abnormal result.

Intended Interpretation shall be encoded using the following values:

• TR^Triage^99IHE

The observation is a triage analysis result. Using this observation as a clinical finding is outside the intended use of the system that generated it.

• PF^Preliminary Finding^99IHE

The observation is a preliminary finding. It may or may not have been verified.

Note: The Intended Interpretation codes profiled here may be considered as local additions to HL7 Table 0078

1030 **4.145.4.1.3 Expected Actions**

The Receiver processes the received information according to its business logic.

Notes: 1. The *OBX-8* field was named Abnormal Flag in earlier versions of the HL7 specification, but the name and usage have been broadened.

If the HL7 OMI was invalid, the Receiver shall send an error message indicating that the received OMI message was invalid. Otherwise, the Receiver shall respond with valid acknowledgment message.

1035 4.145.4.2 Acknowledge Observation Message

The Receiver acknowledges to the Sender the receipt of the Send Observation Message.

4.145.4.2.1 Trigger Events

The Receiver receives and processes a Send Observation Message.

4.145.4.2.2 Message Semantics

1040 The message is an HL7 2.5.1 MSA-1 Original Mode Acknowledgement message. The Receiver is the HL7 acknowledgment sender. The Sender is the HL7 acknowledgment recipient.

The Receiver is not required to send any attributes within the MSA segment beyond what is specified in the HL7 standard. See <u>ITI TF-2x: C.2.3</u> for the list of all required and optional fields within the MSA segment.

1045 **4.145.4.2.3 Expected Actions**

The Sender processes the acknowledgement according to its business logic.

4.145.5 Protocol Requirements

NA

4.145.6 Security Considerations

1050 The patient and observation details provided in the OMI constitute personal health information.

4.145.6.1 Security Audit Considerations

This transaction is associated with a Procedure Record Event ATNA Trigger Event.

Update RAD TF-2: 4.1.2 in Patient Registration [RAD-1] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.

4.1.2 Actor Roles

•••

Actor: Prioritizer

Role: Receives and stores patient and encounter information for use in prioritization.

Update RAD TF-2: 4.2.2 in Placer Order Management [RAD-2] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.

4.2.2 Actor Roles

•••

1065 Actor: Prioritizer

Role: Receives and stores order information for use in prioritization.

Update RAD TF-2: 4.3.2 in Filler Order Management [RAD-3] to dd Prioritizer to Actor Roles as shown, and Interaction Diagram.

1070 **4.3.2 Actor Roles**

•••

Actor: Prioritizer

Role: Receives and stores order information for use in prioritization.

1075 *Update RAD TF-2: 4.4.2 in Procedure Scheduled [RAD-4] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.*

4.4.2 Actor Roles

•••

<u>Actor: Prioritizer</u>

1080 **Role: Receives and stores patient, order, and schedule information for use in prioritization.**

Update RAD TF-2: 4.12.2 in Patient Update [RAD-12] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.

4.12.2 Actor Roles

1085

Actor: Prioritizer

Role: Receives and stores patient and encounter information for use in prioritization.

1090

Update RAD TF-2: 4.13.2 in Patient Update [RAD-13] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.

4.13.2 Actor Roles

•••

Actor: Prioritizer

Role: May use the scheduling, resource, procedure, and other information to perform1095prioritization tasks.

Update RAD TF-2: 4.49.2 in Instance Availability Notification [RAD-49] to add Prioritizer to Actor Roles as shown, and Interaction Diagram.

4.49.2 Actor Roles

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<u>Actor: Prioritizer</u>

Role: Receive an Instance Availability Notification message and internally process it.

Update RAD TF-2: 4.107.2 in WADO-RS Retrieve [RAD-107] to add Prioritizer to the list of Requesters.

4.107.2 Actor Roles

The Roles in this transaction are defined in the following table and may be played by the actors shown here:

Role:	Requester:	
	Submit retrieve DICOM object requests	
Actor(s):	The following actors may play the role of Requester:	
	Imaging Document Consumer	
	<u>Prioritizer</u>	

Table 4.107.2-1: Actor Roles

Update RAD TF-2: 4.129.2 in QIDO-RS Query [RAD-129] to add Prioritizer to the list of Requesters.

4.129.2 Use Case Roles

The Roles for this transaction are defined in the following table and may be played by the actors shown here:

Role:	Requester:	
	Queries for study metadata	
Actor(s):	The following actors may play the role of Requester:	
	Imaging Document Consumer	
	<u>Prioritizer</u>	

Table	4.129.2	-1: Ac	ctor R	loles

Volume 2x - Appendices

1120 This is shown here as a Vol 2 Annex, but as the RAD Technical Committee discussed, this content will likely be in auxiliary files, not formally part of the TF so we don't have to do CPs to tweak, add, fix. Once we work out more details, we can decide how to show such things in Public Comment or Trial Implementation supplements in the future since it is useful.

A.B.1 RAD-145 OBX segment examples

1125 The following are examples of OBX segments as defined in Section 4.145.4.1.2.1 OBX segments – Observations. These two pneumothorax-related segments might appear in two Observations inside a single OMI Message.

OBX|1|CE|36118008^Pneumothorax^SCT||52101004^Present^SCT||| A^Abnormal^HL70078^RID49482^Category 3 Actionable

1130 Finding^RadLex^TR^Triage^99IHE|.9||R|||202302021139|309964003^Radiolog y^SCT|| 47500^LungCheck4^99ACME|1.2.840.99999.1234|202302021152| 72481006^Middle Lobe of Right Lung^SCT

OBX|2|NM|RDE422^Pleural Separation^RadElement||10.5|mm^mm^UCUM|| AA^Critical abnormal^HL70078^RID49480^Category 1 Emergent Actionable

1135 Finding^RadLex^TR^Triage^99IHE|||R|||202302021139|309964003^Radiology^ SCT|| 47500^LungCheck4^99ACME|1.2.840.99999.1234|202302021154| 72481006^Middle Lobe of Right Lung^SCT

Table A.B.1-1 presents the above three example segments using labelled rows to make it easier to map to the specification.

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Table A.B.1-1: OBX Segment Examples

SEQ	ELEMENT NAME	Example 1	Example 2
1	Set ID – OBX	1	2
2	Value Type	CE	NM
3	Observation Identifier	36118008^Pneumothorax^SCT	RDE422^Pleural Separation^RadElement
4	Observation Sub-ID		
5	Observation Value	52101004^Present^SCT	10.5
6	Units		mm^mm^UCUM
7	Reference Range		
8	Interpretation Codes	A^Abnormal^HL70078^RID49482^ Category 3 Actionable Finding^RadLex^TR^Triage^99IHE	AA^Critical abnormal^HL70078^RID49480^ Category 1 Emergent Actionable Finding^RadLex^TR^Triage^99IHE
9	Probability	.9	
10	Nature of Abnormal Test		

SEQ	ELEMENT NAME	Example 1	Example 2
11	Observation Result Status	R	R
14	Date/Time of the Observation	202302021139	202302021139
15	Producer's ID	309964003^Radiology^SCT	309964003^Radiology^SCT
16	Responsible Observer		
17	Observation Method	47500^LungCheck4^99ACME	47500^LungCheck4^99ACME
18	Equipment Instance Identifier	1.2.840.99999.1234	1.2.840.99999.1234
19	Date/Time of the Analysis	202302021152	202302021154
20	Observation Site	72481006^Middle Lobe of Right Lung^SCT	72481006^Middle Lobe of Right Lung^SCT