IHE-International
Integrating the Healthcare Enterprise

Pathology Technical Framework

Volume 2
(PAT TF-2)
Transactions

Version 1.15 — Trial Implementation

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1 Introduction

1.1 Overview of IHE

Integrating the Healthcare Enterprise (IHE) is an initiative designed to stimulate the integration of the information systems that support modern healthcare institutions. Its fundamental objective is to ensure that in the care of patients all required information for medical decisions is both correct and available to healthcare professionals. The IHE initiative is both a process and a forum for encouraging integration efforts. It defines a technical framework for the implementation of established messaging standards to achieve specific clinical goals. It includes a rigorous testing process for the implementation of this framework, organizes educational sessions, exhibits at major meetings of medical professionals to demonstrate the benefits of this framework and encourage its adoption by industry and users.

The approach employed in the IHE initiative is to support the use of existing standards, e.g HL7, ASTM, DICOM, ISO, IETF, OASIS, CLSI and others as appropriate, rather than to define new standards. IHE profiles further constrain configuration choices where necessary in these standards to ensure that they can be used in their respective domains in an integrated manner between different actors. When clarifications or extensions to existing standards are necessary, IHE refers recommendations to the relevant standards bodies.

This initiative has numerous sponsors and supporting organizations in different medical specialty domains and geographical regions. In North America the primary sponsors are the Healthcare Information and Management Systems Society (HIMSS) and the Radiological Society of North America (RSNA) and the American College of Cardiology (ACC).IHE Canada has also been formed. IHE Europe (IHE-EU) is supported by a large coalition of organizations including the European Association of Radiology (EAR) and European Congress of Radiologists (ECR), the Coordination Committee of the Radiological and Electro medical Industries (COCIR), the Groupement pour la Modernisation du Système d'Information Hospitalier (GMSIH), the Société Francaise de Radiologie (SFR), Deutsche Röntgengesellschaft (DRG), the Euro-PACS Association, Società Italiana di Radiologia Medica (SIRM) and the European Institute for Health Records (EuroRec). In Japan IHE-J is sponsored by the Ministry of Economy, Trade, and Industry (METI); the Ministry of Health, Labor, and Welfare; and MEDIS-DC; cooperating organizations include the Japan Industries Association of Radiological Systems (JIRA), the Japan Association of Healthcare Information Systems Industry (JAHIS), Japan Radiological Society (JRS), Japan Society of Radiological Technology (JSRT), and the Japan Association of Medical Informatics (JAMI). The list presented here is not closed and other organizations representing healthcare professionals are invited to join in the expansion of the IHE process across disciplinary and geographic boundaries.

1.2 Overview of the technical framework

This document, the IHE PAT Technical Framework (ITI TF), defines specific implementations of established standards to achieve integration goals that promote appropriate sharing of medical information to support optimal patient care. It is expanded annually, after a period of public review, and maintained regularly through the identification and correction of errata. The current version, Rev. 1.14 for Trial Implementation, specifies the

IHE transactions defined and implemented as of January 2008. The latest version of the document is always available via the Internet at www.ihe.net.

Volume 1 provides the high-level view of this framework, describes the Integration Profiles, defines the Actors and shows the sequencing of transactions between them.

This document, Volume 2, provides the detailed technical description of each transaction used by the pathology Technical Framework: Roles of the actors, trigger events, messages exchanged, standards employed, triggered actions.

These two volumes are consistent and can be used in conjunction with the Integration Profiles of others IHE domains.
The other domains within the IHE initiative also produce Technical Frameworks within their respective areas that together form the IHE Technical Framework. Currently, the following IHE Technical Framework(s) are available:

- IHE IT Infrastructure Technical Framework
- IHE Cardiology Technical Framework
- IHE Laboratory Technical Framework
- IHE Pathology Technical Framework
- IHE Patient Care Coordination Technical Framework
- IHE Radiology Technical Framework

Where applicable, references are made to other technical frameworks. For the conventions on referencing other frameworks, see Section 1.6.3 within this volume.

1.3 Overview of Pathology Technical Framework Volume II

The remainder of Section 1 further describes the general nature, purpose and function of the Technical Framework. Section 2 presents the conventions used in this volume to define IHE transactions.

Section 3 defines transactions in detail, specifying the roles for each Actor, the standards employed, the information exchanged, and in some cases, implementation options for the transaction.

The appendices following the main body of this volume provide technical details associated with the transactions.

1.4 Audience

The intended audience of this document is:

- Technical staff of vendors participating in the IHE initiative
- IT departments of healthcare institutions
- Experts involved in standards development
- Anyone interested in the technical aspects of integrating healthcare information systems.

1.5 Scope introduced in the current year

The IHE Technical Framework is updated annually to reflect new profiles, corrections and new transactions (refer to PAT TF-2) used in those profiles.

This document refers to 2007-2008 cycle of the IHE PAT Infrastructure initiative. It will be the basis for the 2009 Connectathon process and exhibition process associated.

The latest version of the document is available via the Internet at www.gmsih.fr . It has been produced with the help of the following organizations:

- GMSIH (Groupement pour la Modernisation du Système d'Information Hospitalier)
- ADICAP (Association pour le Développement de l'Informatique en Cytologie et Anatomie Pathologique)
- SEIS (Spanish Health Informatics Society)
- SEAP (Spanish Society of Pathology)
- SFP (French Society of Pathology)
- HL7 and its affiliate organizations (HL7 pathology SIG)
- IHE organization in each participating country: IHE-France, IHE-Spain.
- IHE-J (IHE Japan)

1.6 Comments

ADICAP, GMSIH, SEIS, SEAP, SFP welcome comments on this document and the IHE initiative. They should be directed to co-chairs:

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1.7 Relationship to Standards

The IHE Technical Framework identifies functional components of a distributed healthcare environment (referred to as IHE actors), solely from the point of view of their interactions in the healthcare enterprise. At its current level of development, it defines a coordinated set of transactions based on ASTM, DICOM, HL7, IETF, ISO, OASIS and W3C standards. As the scope of the IHE initiative expands, transactions based on other standards may be included as required.

In some cases, IHE recommends selection of specific options supported by these standards; however, IHE does not introduce technical choices that contradict conformance to these standards. If errors in or extensions to existing standards are identified, IHE's policy is to report them to the appropriate standards bodies for resolution within their conformance and standards evolution strategy.

IHE is therefore an implementation framework, not a standard. Conformance claims for products must still be made in direct reference to specific standards. In addition, vendors who have implemented IHE integration capabilities in their products may publish IHE Integration

Statements to communicate their products' capabilities. Vendors publishing IHE Integration Statements accept full responsibility for their content. By comparing the IHE Integration Statements from different products, a user familiar with the IHE concepts of actors and integration profiles can determine the level of integration between them. See Appendix C for the format of IHE Integration Statements.

In Pathology, SNOMED is a de facto terminology standard. In Europe, Technical Committee CEN/TC 251 is dealing with "Health informatics" and two specific working groups have been recently created within DICOM and HL7.

- **DICOM WG26**

The group will be responsible for formulating components of the DICOM standard that relate to imaging for Pathology.

Some pathology-related image formats do not as yet have applicable DICOM Information Object Definitions. Examples include whole-slide images (WSI), high-order multispectral images, flow cytometry, electron microscopy.

- **HL7 Pathology Special Interest Group**

The group will achieve a complementary effort, focusing on the "orders and observations" aspects of the pathology workflow

HL7 Pathology Special Interest Group international mailing list: pathology@lists.hl7.org

- **SNOMED Standard Board**

This group is integrated with internal staff from SNOMED International and external collaborators. They work in the definition of new terms and relationships between accepted terms. There is a need to define the best way to integrate SNOMED Clinical Terms in Pathology Information Systems (SNOMED Pathology subset), and how to exchange information with other clinical departments and other institutions, using a common terminology.

- **CEN TC 251**

The document TC 251 Work Item 130.(Health informatics — Service request and report messages), prepared under mandate M/255 given by the European Commission and the European Free Trade Association, has been prepared by Technical Committee CEN/TC 251 "Health informatics", and has replaced the previous standards ENV 1613 (Medical informatics - Messages for exchange of laboratory information)., ENV 12538 (Medical informatics - Referral and discharge messages), and ENV 12539 (Medical informatics - Request and report messages for medical service departments). The scope of the messages specified by this EN comprises healthcare service requests and reports related to investigations carried out by healthcare service providers on subjects of care. They cover electronic information exchange between computer systems used by healthcare parties requesting the services of, healthcare service providers.

Typical use cases are available by CEN TC251 in prEN 14720-1:2003 (Health informatics — Service request and report messages — Part 1: Basic services including referral and discharge, TC 251 WI 130.1.1:2003 – E. See: http://www.centc251.org/):

- Service to be performed on specimens supplied by the requester

- Services that require scheduling prior to the receipt of the sample collected by the requester (frozen sections, renal biopsy)
- Services performed on samples collected by the service provider (fine needle aspiration)
- Services in which the subject of care is examined by the service provider
- Services involving evaluation of an existing sample or study product (second opinion)
- Modification of an existing request following any of the above scenarios (additional investigations or revised clinical information)
- Cancellation of an existing request following any of the above scenarios

Scheduling: See section B.2.3 Services that require scheduling prior to the receipt of the sample collected by the requester in CEN TC-251 WI 130 Part 1 (examples: frozen section and renal biopsy).

- **Harmonization**

It is important the five parallel efforts - IHE-pathology initiative, DICOM WG 26 and Pathology Special Interest Group being formed for HL7, SNOMED Standard Board, and CEN CT 251 - aligned, yet distinct, each with its own purpose and organizational context.

Clearly there will be overlap in defining the information model for specimens, in standardizing reports including quantitative measurements and assessments made with reference to images, etc.

Information model for specimens and templates for structured reports should be established in common across both standards.
HL7-DICOM interoperation in pathology will be addressed in a HL7-DICOM joint working group (HL7 Pathology SIG / DICOM WG26) defining clauses for harmonization of standards.

1.8 Relationship to Real-world Architectures

The IHE actors and transactions described in the IHE Technical Framework are abstractions of the real-world healthcare information system environment. While some of the transactions are traditionally performed by specific product categories (e.g. HIS, Clinical Data Repository, Radiology Information Systems, Clinical Information Systems or Cardiology Information Systems), the IHE Technical Framework intentionally avoids associating functions or actors with such product categories. For each actor, the IHE Technical Framework defines only those functions associated with integrating information systems. The IHE definition of an actor should therefore not be taken as the complete definition of any product that might implement it, nor should the framework itself be taken to comprehensively describe the architecture of a healthcare information system.
The reason for defining actors and transactions is to provide a basis for defining the interactions among functional components of the healthcare information system environment. In situations where a single physical product implements multiple functions, only the interfaces between the product and external functions in the environment are considered to be significant by the IHE initiative. Therefore, the IHE initiative takes no position as to the relative merits of an integrated environment based on a single, all-encompassing information system versus one based on multiple systems that together achieve the same end. IHE demonstrations emphasize the integration of multiple vendors' systems based on the IHE Technical Framework.

1.9 Copyright Permission

2 Conventions

2.1 The Generic IHE Transaction Model

See the "IHE Radiology Technical Framework" Volume 2, chapter 2.1.

2.2 HL7 Profiling Conventions

The messages used by each transaction are described in this document using static definitions of "HL7 constrainable message profiles". Refer to HL7 v2.5 section 2.12.6. The static definition of each message is represented within tables. At the message level, a table represents the message structure and its definition in terms of segments. At the segment level, a table details one segment and its definition in terms of fields.

2.2.1 Static definition - message level

Tables describing a message contains 5 columns:

- Segment: gives the segment name, and places the segment within the hierarchy of the message, as designed by HL7: i.e. delimiting optional segments with square brackets, and repeatable segments with braces, and using indentation to show the hierarchy.
- Meaning: Meaning of the segment as defined by HL7
- Usage: Coded usage of the segment, as defined by this static definition built for the context of this particular transaction within IHE Laboratory Technical Framework.

  The coded values used in this document are:

  - R: Required: A compliant sending application shall populate all "R" elements with a non-empty value. A compliant receiving application shall process (save/print/archive/etc.) or ignore the information conveyed by required elements. A compliant receiving application shall not raise an error due to the presence of a required element, but may raise an error due to the absence of a required element.
  - RE: Required but may be empty. The element may be missing from the message, but shall be sent by the sending application if there is relevant data. A conformant sending application shall be capable of providing all "RE" elements. If the conformant sending application knows the required values for the element, then it shall send that element. If the conformant sending application does not know the required values, then that element may be omitted.

    Receiving applications will be expected to process (save/print/archive/etc.) or ignore data contained in the element, but shall be able to successfully process the message if the element is omitted (no error message should be generated if the element is missing).

- C: Conditional. This usage has an associated condition predicate. (See HL7 v2.5 section 2.12.6.6 "Condition Predicate").

  If the predicate is satisfied: A compliant sending application shall always send the element. A compliant receiving application shall process or ignore data in the element. It may raise an error if the element is not present. If the predicate is NOT satisfied: A compliant sending application shall NOT send the element. A compliant receiving application shall NOT raise an error if the condition predicate is false and the element is not present, though it may raise an error if the element IS present.

- X: Not supported. For conformant sending applications, the element will not be sent. Conformant receiving applications may ignore the element if it is sent, or may raise an application error.

- Cardinality: Within square brackets, minimum and maximum number of occurrences authorized for this segment, in this static definition of the message, built for the context of this particular transaction within IHE Laboratory Technical Framework.
- HL7 chapter: Reference of the HL7 v2.5 chapter that describes this segment.

Table 2-1: Initial segments of a message

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[	--- PATIENT begin		[1..1]	
PID	Patient Identification	R	[1..1]	3
[	--- PATIENT VISIT begin		[1..1]	
PV1	Patient Visit	RE	[0..1]	3

2.2.2 Static definition - segment level

The table describing a segment and its definition in terms of fields contains 7 columns :

- SEQ: Position (sequence) of the field within the segment.
- LEN: Maximum length of the field
- DT: Field Data Type
- Usage: Usage of the field in this particular context of IHE Laboratory Technical Framework. Same coded values as in the message level: R, RE, C, O, X
- Cardinality: Minimum and maximum number of occurrences for the field in this particular context of IHE Laboratory Technical Framework. Same meaning as in the message level.
- TBL#: Table reference (for fields using a set of defined values)
- ITEM#: HL7 unique reference for this field
- Element Name: Name of the field.

Table 2-2: Description of the MSH segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	1	ST	R	[1..1]		00001	Field Separator

2	4	ST	R	[1..1]		00002	Encoding characters
3	227	HD	R	[1..1]	0361	00003	Sending Application
…							

Simplification:

For a better readability of the table, the usage "X" is not shown at the message level: if a segment is "not supported" by an IHE profile, it simply doesn't appear in the table representing the message structure.

According to HL7 standard, if the value of a field is not present, the receiver shall not change corresponding data in its database. However, if the sender defines the field value to be the explicit NULL value (i.e. two double quotes ""), it shall cause removal of any values for that field in the receiver's database. This convention is fully applied by the Pathology Technical Framework.

2.3 HL7 Implementation Notes

2.3.1 Network Guidelines

The IHE Laboratory Technical Framework makes these recommendations:

Applications shall use the Minimal Lower Layer Protocol defined in appendix C of the HL7 Implementation Guide.

An application that wants to send a message (initiate a transaction) will initiate a network connection to start the transaction. The receiver application will respond with an acknowledgement or response to query but will not initiate new transactions on this network connection.

2.3.2 Message Granularity

A message is generated from one trigger event in the real world. Therefore a message is related to one single order or to one order group:

- A PAT-1 message is related to one placer order or to one placer order group.
- A PAT-2 message is related to one filler order or to one order group.

2.3.3 Acknowledgment Modes

For this cycle of the IHE Pathology Technical Framework, applications that receive HL7 messages shall send acknowledgements using the HL7 original acknowledgement mode as defined in HL7 v2.5 chapter 2, 2.9.2. The enhanced acknowledgement rules are not supported.

2.3.4 ACK: General Acknowledgement Message

This message is defined in HL7 chapter 2.

Table 2-3: ACK - General Acknowledgment message description.

Segment	Meaning	Usage	Card.	HL7 chapter

MSH	Message Header	R	[1..1]	2
MSA	Message Acknowledgement	R	[1..1]	2
[{ERR}]	Error	C	[0..1]	2

Note: for the general acknowledgment (ACK) message, the value of MSH-9-2 trigger event is equal to the value of MSH-9-2 trigger event in the message being acknowledged. The value of MSH-9-3-Message structure for the general acknowledgment message is always ACK. The Condition Predicate for using an ERR segment is specified in the transaction chapters.

2.3.5 Identifier Data Types

This section describes the IHE constraints of the data types.

2.3.5.1 EI Data Type

The constraints below particularly apply to the following fields: placer group number, placer order number, filler order number and specimen number.

Table 2-4: EI Data Type.

SEQ	LEN	DT	Usage	CARD	TBL#	COMPONENT NAME
1	16	ST	R	[1..1]		Entity Identifier
2	20	IS	C	[0..1]	0363	Namespace ID
3	199	ST	C	[0..1]		Universal ID
4	6	ID	C	[0..1]	0301	Universal ID Type

Component 1 is required. Either component 2 or both components 3 and 4 are required. Components 2, 3 and 4 may be all present.

The EI is appropriate for machine or software generated identifiers. The generated identifier goes in the first component. The remaining components, 2 through 4, are known as the assigning authority; they can also identify the machine/system responsible for generating the identifier in component 1.

Example 1: AB12345^RiversideHospital

Example 2: AB12345^^1.2.840.45.67^ISO

Example 3: AB12345^RiversideHospital^1.2.840.45.67^ISO

IHE restrains the length of the first component to 16 characters. National extensions can extend this length up to a maximum of 199.

IHE recommands to fill component 2 “Namespace ID” in all cases. Particularly when there are several concurrent assigning authorities within the healthcare enterprise, this Namespace ID will indicate which assigning authority provided this number.

This happens for instance, when there are several Order Placer actors within the enterprise, each one assigning placer order numbers and placer group numbers.

Example 4: Placer order number 9876543 and placer group number 777 assigned by the Order Placer actor operated by the department of surgery A.

```
ORC|NW|9876543^SurgA||777^SurgA|...
```

Example 5: Placer order number 9876543 and placer group number 555 assigned by the Order Placer actor operated by the department of surgery B.

```
ORC|SC|9876543^SurgB||555^SurgB |...
```

This also commonly happens when there are several Order Filler actors within the enterprise, each one assigning its own filler order numbers and specimen numbers.

Example 6: Filler order number and specimen number assigned by the Order Filler actor operated by the clinical laboratory of pathology.

```
SPM|1|45611^Pathology|...
...
OBR|1|456^Pathology|...
```

2.3.5.2 CX Data Type

The constraints below particularly apply to the Patient Identifiers (PID segment).

Table 2-5: CX Data Type.

SEQ	LEN	DT	Usage	CARD	TBL#	COMPONENT NAME
1	15	ST	R	[1..1]		ID Number
2	1	ST	O	[0..1]		Check Digit
3	3	ID	O	[0..1]	0061	Check Digit Scheme
4	227	HD	R	[1..1]	0363	Assigning Authority
5	5	ID	RE	[0..1]	0203	Identifier Type Code
6	227	HD	O	[0..1]		Assigning Facility
7	8	DT	O	[0..1]		Effective Date
8	8	DT	O	[0..1]		Expiration Date
9	705	CWE	O	[0..1]		Assigning Jurisdiction
10	705	CWE	O	[0..1]		Assigning Agency or Department

The data type has been constrained because the Assigning Authority and the Identifier Type Code as essential components. The most common value for the Identifier Type Code in PID-3 is “PI”. Other values are defined in Table 0203 of HL7 2.5 section 2.A.14.5.

Example: 12345^^^Saint-John Hospital^PI

2.4 DICOM Usage Conventions

For some DICOM transactions described in this document, IHE has strengthened the requirements on the use of selected Type 2 and Type 3 attributes. These situations are explicitly documented in section 4 and in the appendices.

IHE specifically emphasizes that DICOM Type 2 attributes (for instance, Patient Name, Patient ID) shall be transmitted with zero length if the source system does not possess valid values for such attributes; in other words, the source system shall not assign default values to such attributes. The receiving system must be able to handle zero-length values for such attributes.

IHE has also defined requirements related to the support for and use of matching and return keys in DICOM queries by both Service Class Users (SCUs) and Service Class Providers (SCPs). Matching keys are used to select instances for inclusion in the response by the query SCP to the SCU, whereas return keys only return specific data and are not used for matching.

- Required matching key SCU:

  A key that the Query SCU shall have the ability to offer to its user as a selection criterion. The definition of the means offered to the user of the Query SCU to trigger the sending of a matching key in the Query request is beyond the scope of IHE (e.g. enter a value, select an entry).

- Required matching key SCP:

An IHE required matching key is processed by the Query SCP just as if it were a DICOM-required matching key. In most cases, IHE-required matching keys are also DICOM-required matching keys.

- Required return key SCU:

  A key that the Query SCU requests from the Query SCP, receives in the query responses, and displays for the user, if required. The definition of the means offered to the user of the Query SCU to request a return key (e.g. by default, check a box) and to make it visible to the user is beyond the scope of IHE.

- Required return key SCP:

  IHE-required return keys specified within DICOM as type 1 or type 2 return keys are processed according to their DICOM type. IHE-required return keys specified within DICOM as type 3 will be processed as if they were type 2.

Query Key Requirement Tables in the framework use the following legend to specify requirements for SCUs and SCPs:

R Required

O Optional

The following modifiers are also used:

R+ The Requirement is an IHE extension of the DICOM requirements

R* The attribute is not required to be displayed

R+* The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed

Table 2-6 provides an example table defining matching and return keys. Note that sequence attributes are used as a structuring header in these matching and return key tables, and requirements are given for individual sequence items.

Table 2-6: Images Query Matching and Return Keys.

Attributes Name	Tag	Query Keys Matching		Query Keys Return		Notes
		SCU	SCP	SCU	SCP	
Scheduled Human Performers Sequence	(0040,4034)					
>Human Performer Code Sequence	(0040,4009)					
>>Code Value	(0008,0100)	R+	R	R+*	R	
>>Coding Scheme Designator	(0008,0102)	R+	R	R+*	R	
>>Code Meaning	(0008,0104)	-	-	R+	R	Query Keys Matching SCU or SCP do not use the Code Meaning values ("-").
>Human Performer's Name	(0040,4037)	R+	R+	R+	R+	
>Human Performer's Organization	(0040,4036)	O	O	O	R+	
Input Information	(0040,4021)					

Sequence						
>Study Instance UID	(0020,000D)	O	O	R+*	R	
…	…	…	…	…	…	…

OPEN ISSUES

Volume 2:

1. Examples of transactions corresponding to use cases will be further provided.
2. Vocabulary tables for HL7 SPM-Specimen segment (SPM-4 Specimen Type (table 0487), SPM-8 Specimen Source Site, etc) and DICOM Specimen Module ((Coded Specimen Type (context ID ccc5), Specimen ("general") type (context ID ccc3), "general" specimen collection procedure (context ID cc10)) should be aligned (defined with SNOMED and/or LOINC codes?
3. Instance availability notification
   Add a new transaction from the Image Imager to the Order Filler to notify that a DICOM instance has been stored. It may enable the Order Filler to include such information in the transaction to the Order Result Tracker. Additionally it may be used by the Order Filler to update the Worklist contents for the Modality which produced the instance for the particular specimen, considering the modality no longer needs this entry in the worklist.

3 Common Message Segments

This section describes the common message segments used by the transactions PAT-1, PAT-2, PAT-3 and PAT-4.

Each table represents a segment. The fields for which IHE Pathology Technical Framework brings some precision of usage are commented only. The optional fields are not shown in the tables, unless they require a particular comment within the context of the IHE Framework.

3.1 MSH – Message Header segment

HL7 v2.5: chapter 2 (2.15 Message control)

This segment defines the intent, source, destination, and some specifics of the syntax of a message.

Table 3-1: MSH - Message Header segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	1	SI	R	[1..1]		00001	Field Separator
2	4	ST	R	[1..1]		00002	Encoding Characters
3	227	HD	R	[1..1]		00003	Sending Application
4	227	HD	R	[1..1]		00004	Sending Facility
5	227	HD	R	[1..1]		00005	Receiving Application
6	227	HD	R	[1..1]		00006	Receiving Facility
7	26	TS	R	[1..1]		00007	Date/Time of Message
8	40	ST	X	[0..0]		00008	Security
9	15	MSG	R	[1..1]		00009	Message Type
10	20	ST	R	[1..1]		00010	Message Control Id

11	3	PT	R	[1..1]		00011	Processing Id
12	60	VID	R	[1..1]		00012	Version ID
14	180	ST	X	[0..0]		00014	Continuation Pointer
15	2	ID	X	[0..0]	0155	00015	Accept Acknowledgement Type
16	2	ID	X	[0..0]	0155	00016	Application Acknowledgement Type
17	3	ID	RE	[1..1]	0399	00017	Country Code
18	16	ID	C	[0..1]	0211	00692	Character Set
19	250	CE	RE	[1..1]		00693	Principal Language of Message
21	427	EI	RE	[0..*]		01598	Message Profile Identifier

MSH-1 Field Separator, required: The IHE Pathology Technical Framework requires that applications support HL7-recommended value that is | (ASCII 124).

MSH-2 Encoding Characters, required: This field contains the four characters in the following order: the component separator, repetition separator, escape character, and subcomponent separator. The IHE Pathology Technical Framework requires that applications support HL7-recommended values ^~\& (ASCII 94, 126, 92, and 38, respectively).

MSH-4 Sending Facility (HD), required:

Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>

The IHE Pathology Technical Framework requires that this field be populated with:

First component (required): Namespace ID, the name of the organizational entity responsible for the sending application.

Second component (optional): The URI (OID) of the organizational entity responsible for the sending application.

Third component (optional): The type of identification URI provided in the second component of this field. The codification of these three components is entirely site-defined. It may be detailed in the national extensions of this framework.

MSH-6 Receiving Facility (HD), required:

Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>

The IHE Pathology Technical Framework requires that this field be populated with:

First component (required): Namespace ID, the name of the organizational entity responsible for the receiving application.

Second component (optional): The URI (e.g. OID) of the organizational entity responsible for the receiving application.

Third component (optional): The type of identification URI provided in the second component of this field. The codification of these three components is entirely site-defined. It may be detailed in the national extensions of this framework.

MSH-9 Message Type (MSG), required:

Components: <Message Code (ID)> ^ <Trigger Event (ID)> ^ <Message Structure (ID)>

Definition: This field contains the message type, trigger event, and the message structure ID for the message. All three components are required.

Its content is defined within each transaction-specific section of this document.

MSH-10 Message Control Id (ST), required:

Definition: This field contains a number or other identifier that uniquely identifies the message. Each message should be given a unique identifier by the sending system. The receiving system will echo this ID back to the sending system in the Message Acknowledgment segment (MSA). The combination of this identifier and the name of the sending application (MSH-3) should be unique across the Healthcare Enterprise.

MSH-12 Version ID (VID), required:

Components: <Version ID (ID)> ^ <Internationalisation Code (CE)> ^ <International Version ID (CE)>

Definition: This field is matched by the receiving system to its own version to be sure the message will be interpreted correctly.

The IHE Pathology Technical framework requires the first component to be populated with the value "2.5" representing HL7 release 2.5.

MSH-17 Country Code (ID), required if available.

Definition: This field contains the country of origin for the message. The values to be used are those of ISO 3166, with the 3-character (alphabetic form). Refer to HL7 2.5 Table 0399 - Country code chapter 2.15.9.17.

Examples of valid values:
JPN = Japan, USA = United States, GBR = United Kingdom, ITA = Italy, FRA = France, NLD = Netherlands.

MSH-18 Character Set (ID), conditional.

Definition: This field contains the character set for the entire message. Refer to HL7 table 0211 - Alternate character sets for valid values.

Examples of valid values:

ASCII: The printable 7-bit ASCII character set.

8859/1: The printable characters from the ISO 8859/1 Character set used by Western Europe. This character set can still be used, but 8859/15 should be used by preference. This character set is the forward-compatible version of 8859/1 and includes new characters such as the Euro currency symbol.

ISO IR87: Code for the Japanese Graphic Character set for information interchange (JIS X 0208-1990).

UNICODE UTF-8: UCS Transformation Format, 8-bit form.

Condition predicate: This field shall only be valued if the message uses a character set other than the 7-bit ASCII character set. Though the field is repeatable in HL7, IHE authorizes only one occurrence (i.e. one character set). The character set specified in this field is used for the encoding of all of the characters within the message.

MSH-19 Principal Language of Message (CE), required if available. Coded from ISO 639.

Examples: DE = German, EN = English, ES=Spanish, JA = Japanese, FR = French, NL = Dutch, IT = Italian

MSH-21 Message Profile Identifier (EI), required if available.

For IHE Pathology Technical Framework, this field shall only be valued in the messages for which a Message Profile has been officially defined and identified. When multiple message profiles are listed in this field, they should be (vendor specific, country specific) constraints of the IHE Pathology Profile. Note that the overriding of IHE Pathology Profile constraints is only allowed in national extensions to this framework.

3.2 MSA - Message Acknowledgement segment

HL7 v2.5: chapter 2 (2.15 Message control)

This segment contains information sent while acknowledging another message.

Table 3-2: MSA - Message Acknowledgement segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	2	ID	R	[1..1]	0008	00018	Acknowledgement code
2	20	ST	R	[1..1]		00010	Message Control Id
5			X	[0..0]		00022	Delayed Acknowledgment Type
6	250	CE	X	[0..0]	0357	00023	Error Condition

MSA-1 Acknowledgment Code (ID), required.

The IHE Pathology Technical Framework authorizes only one of the three values below, taken from HL7 *table 0008 - Acknowledgement code*:

Table 3-3: Acknowledgement codes (HL7 table 0008).

Value	Description	Comment
AA	Original mode: Application Accept	The message has been accepted and integrated by the receiving application
AE	Original mode: Application Error	The sender should try again to send the message later
AR	Original mode: Application Reject	The message has been rejected by the receiving application

MSA-2 Message Control ID (ST), required.

Definition: This field contains the message control ID from the MSH-10 - Message Control ID of the incoming message for which the acknowledgement is sent.

3.3 ERR - Error segment

HL7 v2.5: chapter 2 (2.15 Message control)

This segment is used to add error comments to acknowledgment messages.

Table 3-4: ERR - Error segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	493	ELD	X	[0..0]		00024	Error Code and Location
3	705	CWE	R	[1..1]	0357	01813	HL7 Error Code
4	2	ID	R	[1..1]	0516	01814	Severity

Note: ERR-1 is included in HL7 v2.5 for backward compatibility only. Within the context of Pathology, this field shall not be used. ERR-3 and ERR-4 are required by HL7 v2.5

3.4 NTE - Notes and Comment segment

HL7 v2.5: chapter 2 (2.15 Message control)

This segment is used for sending notes and comments.

The IHE Pathology Technical Framework limits the use of this segment to only one purpose: to comment the observations and the orders. Therefore, in the messages of this Integration Profile, NTE segments appear only below OBR or OBX segments.

Information that can be coded in OBX segments or OBR segments shall not be sent in a NTE segment.

Table 3-5: NTE - Notes and Comment segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	4	SI	R	[1..1]		00096	Set ID – NTE
2	8	ID	RE	[0..1]		00097	Source of Comment
3	65536	FT	RE	[0..1]		00098	Comment
4	250	CE	RE	[0..1]		01318	Comment Type

NTE-1 Set ID - NTE (SI), required.

NTE-2 Source of Comment (ID), required but may be empty.

IHE Pathology Technical Framework populates this field with one of these values:

Table 3-6: Source of Comment.

Value	Meaning	Comment
L	Order Filler is the source of the comment	
P	Order Placer is the source of the comment	
O	Other System is the source of the comment	

NTE-3 Comment (FT), required but may be empty: This field contains the text of the comment. This text may be formatted. In order to delete an existing comment, the field shall contain empty quotation marks: "".

Comment text of identical type and source shall be included in the same occurrence of an NTE segment, and not be split over multiple segments.

NTE-4 Comment Type (CE), required if known.

The IHE Pathology Technical Framework populates this field with one of these values:

Table 3-7: Comment Type.

Value	Meaning	Comment
I	Internal remark, that shall not be sent outside of the Pathology	Shall not be sent to the Order Result Tracker

3.5 PID - Patient Identification segment

HL7 v2.5: chapter 3 (3.4.2)

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently.

Table 3-8: PID - Patient Identification segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	4	SI	O	[1..1]		00104	Set ID - PID
2	20	CX	X	[0..1]		00105	Patient ID
3	250	CX	R	[1..*]		00106	Patient Identifier List
4	20	CX	X	[0..1]		00107	Alternate Patient ID - PID
5	250	XPN	R	[1..*]		00108	Patient Name
6	250	XPN	O	[0..1]		00109	Mother’s Maiden Name
7	26	TS	RE	[0..1]		00110	Date/Time of Birth
8	1	IS	R	[1..1]	0001	00111	Administrative Sex
9	250	XPN	X	[0..1]		00112	Patient Alias
10	250	CE	O	[0..1]	0005	00113	Race
11	250	XAD	RE	[0..*]		00114	Patient Address
12	4	IS	X	[0..1]	0289	00115	County Code
13	250	XTN	O	[0..*]		00116	Phone Number - Home
14	250	XTN	O	[0..*]		00117	Phone Number - Business
15	250	CE	O	[0..1]	0296	00118	Primary Language
16	250	CE	O	[0..1]	0002	00119	Marital Status
17	250	CE	O	[0..1]	0006	00120	Religion
18	250	CX	O	[0..1]		00121	Patient Account Number
19	16	ST	X	[0..1]		00122	SSN Number - Patient
20	25	DLN	X	[0..1]		00123	Driver's License Number - Patient
21	250	CX	O	[0..*]		00124	Mother's Identifier
22	250	CE	O	[0..1]	0189	00125	Ethnic Group
23	250	ST	O	[0..1]		00126	Birth Place
24	1	ID	O	[0..1]	0136	00127	Multiple Birth Indicator
25	2	NM	O	[0..1]		00128	Birth Order
26	250	CE	O	[0..1]	0171	00129	Citizenship
27	250	CE	O	[0..1]	0172	00130	Veterans Military Status
28	250	CE	X	[0..0]	0212	00739	Nationality
29	26	TS	O	[0..1]		00740	Patient Death Date and Time
30	1	ID	O	[0..1]	0136	00741	Patient Death Indicator
31	1	ID	RE	[0..1]	0136	01535	Identity Unknown Indicator
32	20	IS	RE	[0..1]	0445	01536	Identity Reliability Code
35	250	CE	C	[0..1]	0446	01539	Species Code
36	250	CE	C	[0..1]	0447	01540	Breed Code

The specific usage of these fields, especially those fields with usage "O" (optional) in the table above, is explained in the national extensions.

PID-7, Date/Time of Birth (TS). If the exact date of birth is not known, the second component of this field can be used to describe the degree of precision of the information entered in the first component.

PID-10, Race (CE). This field may be further constrained in national extensions of this PAM profile. For instance, it will be required if available (usage code RE) in the US extension, but will not be supported (usage code X) in the French extension.

PID-18, Patient Account Number (CX).

HL7 Definition: this field contains the patient account number assigned by accounting to which all charges, payments, etc., are recorded. It is used to identify the patient's account.

Relationship to encounter: A patient account can span more than one enterprise encounter. At least one of the fields PID-18 "Patient Account Number" or PV1-19 "Visit Number" shall be valued in the messages of transaction ITI-31 that use the PV1 segment. Additional requirements for the presence of value in these fields may be documented in national extensions of this profile.

PID-35, Species Code (CE).

Condition predicate: shall be used if the test subject is a non-human living subject.

PID-36, Breed Code (CE).

Condition predicate: shall be used if the test subject is a non-human living subject.

3.6 PV1 - Patient Visit segment

HL7 v2.5: chapter 3 (3.4.3)

The PV1 segment is used by Registration/Patient Administration applications to communicate information on an account or visit-specific basis.

Table 3-9: PV1 - Patient Visit segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
2	1	IS	R	[1..1]	0004	00132	Patient Class
3	80	PL	RE	[0..1]		00133	Assigned Patient Location
9	250	XCN	X	[0..0]	0010	00139	Consulting Doctor
19	250	CX	O	[0..1]		00149	Visit Number
40	1	IS	X	[0..0]	0116	00170	Bed Status
51	1	IS	C	[0..1]	0326	01226	Visit Indicator
52	250	XCN	X	[0..0]	0010	01274	Other Healthcare Provider

The specific usage of these fields may be elaborated upon in the national extensions.

PV1-19, Visit Number (CX). This field contains the unique identifier assigned to the encounter. At least one of the fields PID-18 "Patient Account Number" or PV1-19 "Visit Number" shall be valued in the messages of transaction ITI-31 that use the PV1 segment. Additional requirements for the presence of values in these fields may be documented in national extensions of this profile.

PV1-51, Visit Indicator (IS). Shall be valued with value 'V' if the field PV1-19 is present. The field may be omitted otherwise.

The PV1 segment doesn't entirely cover the data model as defined in this framework. In some countries (especially in Europe), national extensions will define new segment to manage issues like 'functional units'.

The use of the PV1 segment shall be clarified in each national extension.

3.7 ORC Common Order segment

HL7 v2.5: chapter 4 (4.5.1). The ORC and OBR segments contain a number of duplicate fields. The Pathology Technical Framework is defined is such a way that fields in the OBR segment will be used in prevalence over their equivalents in ORC. If a field is listed as being optional in ORC, its equivalent in OBR may well be mandatory.

Table 3-10: ORC - Common Order segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	2	ID	R	[1..1]	0119	00215	Order Control
2	22	EI	C	[0..1]		00216	Placer Order Number
3	22	EI	C	[0..1]		00217	Filler Order Number
4	22	EI	RE	[0..1]		00218	Placer Group Number
5	2	ID	C	[0..1]	0038	00219	Order Status
7	200	TQ	X	[0..0]		00221	Quantity/Timing
8	200	EIP	X	[0..0]		00222	Parent
9	26	TS	R	[1..1]		00223	Date/Time of Transaction
10	250	XCN	RE	[0..*]		00224	Entered By
11	250	XCN	RE	[0..*]		00225	Verified By
12	250	XCN	RE	[0..*]		00226	Ordering Provider
14	250	XCN	RE	[0..*]		00228	Call Back Phone Number
16	250	CE	RE			00230	Order Control Code Reason
17	250	CE	RE	[0..1]		00231	Entering Organization
18	250	CE	X			00232	Entering Device
19	250	XCN	X	Y		00233	Action By
20	250	CE	X	[0..0]	0339	01310	Advanced Beneficiary Notice Code
21	250	XON	RE	[0..1]		01311	Ordering Facility Name
25	250	CWE	X	[0..0]		01473	Order Status Modifier
26	60	CWE	X	[0..0]	0552	01641	Advanced Beneficiary Notice Override Reason
27	26	TS	C	[0..1]		01642	Filler's Expected Availability Date/Time
30	250	CNE	X		0483	01644	Enterer Authorization Mode

ORC-1 Order Control (ID), required. This field may be considered the "trigger event" identifier for orders. Many order control codes are defined in the *HL7 table 0119 – Order Control Codes*. The IHE Pathology Technical Framework allows only the following subset:

Table 3-11: Supported Order Control codes.

Value	Description of use
NW	"New Order". Event request in OML message sent by the Order Placer in transaction PAT-1.
OK	"Notification or request accepted". Event notification in OML message. Event acknowledgement in ORL message.
UA	"Unable to accept order/service". Event notification in OML message. Event acknowledgement in ORL message sent by the Order Filler in transaction PAT-1.
SC	"Status changed". Event notification in OML.
XO	"Change order/service request". Event request in OML message sent by the Order Filler in PAT-4.
CA	"Cancel order/ service request". Event request in OML message sent by the Order Placer in PAT-1.
CR	"Canceled as requested". Event acknowledgement in ORL message responding to OML (CA).
UC	"Unable to cancel". Event acknowledgement in ORL message responding to OML (CA).
OC	"Order service canceled". Event notification in OML message sent by the Order Filler in transaction PAT-1 and in ORU message sent by the Order Result Tracker in transaction PAT-3.
SN	"Send order/service number". Event request in OML message sent by the Order Filler in transaction PAT-2
NA	"Number assigned". Event acknowledgement in ORL message sent by the Order Placer in PAT-2, responding to OML (SN)

ORC-2 Placer Order Number (EI), conditional.

Condition predicate: This field shall be valued in all OML/ORL messages sent by the Order Placer.

If the field is valued then its value shall match the value of the required field OBR-2. Please refer to section 2.3.5.1 for the details of the data type.

ORC-3 Filler Order Number (EI), conditional.

Condition predicate: This field shall be valued in all OML/ORL messages sent by the Order Filler and in all ORL messages sent by the Order Placer

If the field is valued then its value shall match the value of the required field OBR-3. Please refer to section **2.3.5.1** for the details of the data type.

ORC-4 Placer Group Number (EI), required if known to the sender.

The Placer Group Number represents an identification of a set of closely related orders, i.e. the whole list of specimen ordered by the placer to the Pathology for one subject. Please refer to section **2.3.5.1** for the details of the data type.

ORC-5 Order Status (ID), conditional.

Condition predicate: This field shall be valued in all OML messages sent by the Order Filler. It represents the status of the order. This field shall not be valued in OML messages sent by the Order Placer.

The allowed values for this field within IHE Pathology Technical Framework are a subset of *HL7 table 0038 - Order Status:*

Table 3-12: IHE subset of Order Status for all transactions.

Value	Description	Comment
A	Some, but not all, results available	
CA	Order was canceled	
CM	Order is completed	
IP	In process, unspecified	
DC	Order was discontinued	
RP	Order has been replaced	

ORC-9 Date/Time of Transaction (TS), required

HL7 Definition: This field contains the date and time of the event that initiated the current transaction as reflected in ORC-1 Order Control Code. This field is not equivalent to MSH-7 Date and Time of Message that reflects the date/time of the creation of the physical message.

In OML messages "Status changed" sent by the Order Filler, this field contains the date/time of the last status change of the order (ORC-5) or one of the requested procedure (identified in the following OBR).

ORC-10 Entered By (XCN), optional. This field contains the identity of the person who actually keyed the request into the application.

ORC-11 Verified By (XCN), optional. This field contains the identity of the person who verified the accuracy of the entered request.

Difference with ORC 10 Entered By and ORC 11 Verified By:
Field ORC10 identifies the person who enters the information in the information system, and ORC11 identify the person who verify the accuracy of the information entered if the enterer is a technician, for example.

ORC-12 Ordering Provider (XCN), optional. If the field is valued then its value has to match the value of the required field OBR-16.

This field contains the person (physician) who prescribed this order. See the data model in volume 1.

ORC-14 Callback Phone Number (XTN), optional. If the field is valued then its value has to match the value of the required field OBR-17.

ORC-17 Entering Organization (CE) identify the organization that enterer (ORC10) belongs to when the information is entered to the information system.

ORC-21 Ordering Facility Name (XON), required but may be empty.

This field contains the facility (care unit) placing this order. These three components shall be valued: 1st = Organization name. 7th = Identifier Type Code with the value “FI”, which means “Facility ID” as stated by HL7 table n° 0203. 10th = Organization Identifier. Example: SurgA^^^^^^FI^^^UR01.

The fields ORC-17 and ORC-21 will be specified in the national extensions.

ORC-27 Fillers Expectable Availability Date/Time (TS), conditional.

This field contains the date/time when the Pathology results are expected to be available.

Condition predicate: This field may be valued only in OML messages sent by the Order Filler

3.8 TQ1 - Timing Quantity segment

HL7 v2.5: chapter 4 (4.5.4)

Table 3-13: TQ1 - Timing Quantity segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
9	250	CWE	R	[1..1]	0485	01635	Priority
12	10	ID	C	[0..1]	0427	01638	Conjunction

This cycle of IHE Pathology Technical Framework does not use TQ2 segment, and uses only one occurrence of TQ1 segment, with a single field required in it: TQ1-9 Priority (CWE). This field defines the priority of the order. The authorized values for this field are listed in HL7 table 0485 - Priority codes. Only 3 priority codes are allowed by IHE Pathology:

Table 3-14: Priority codes.

Value	Description	Comment
S	Stat	With highest priority for extemporaneous orders
A	ASAP	As soon as possible. Fulfills after S orders.
R	Routine	Default

All the other fields of TQ1 segment are left optional in this release of the framework.

TQ1-12 Conjunction (ID), conditional.

Condition predicate: this field shall only be used when the TQ1 segment occurs several times. In this Framework, TQ1 segment may occur only once. Therefore, this field shall never be filled.

3.9 SPM - Specimen Segment

HL7 v2.5: chapter 7 (7.4.3).

For specimen definition, specimen types, relationship between specimen and container and examples of specimen identification, see Pathology TF-1, Appendix B, section 5.2.

The Specimen segment (SPM) is used in PAT-1, PAT-2, PAT-3 and PAT-4. In PAT-1, PAT-2 and PAT-3, the specimen is a part (uniquely identified tissue or material collected from the patient and delivered to the pathology department for examination). In PAT-4, the specimen can be a physical object (or a collection of objects) the laboratory considers it a single discrete, uniquely identified unit that is the subject of one or more steps in the laboratory (diagnostic) workflow (tissue item, tissue section, tissue core, tissue spot, smear sample, touch preparation, dispersion, etc).

Table 3-15: SPM - Specimen segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
2	80	EIP	C	[0..1]		01755	Specimen ID (is usually the Container ID)
3	80	EIP	RE	[0..*]		01756	Specimen Parent IDs
4	250	CWE	RE	[1..1]	0487	01900	Specimen Type
6	250	CWE	RE	[0..1]	0371	01758	Specimen Additives
11	250	CWE	X	[0..*]	0369	01762	Specimen Role
14	250	ST	RE	[0..1]		01764	Specimen Description
17	26	DR	RE	[0..1]		01765	Specimen Collection Date/Time
18	26	TS	C	[0..1]		00248	Specimen Received Date/Time
20	1	ID	C	[0..1]	0136	01766	Specimen Availability
21	250	CWE	C	[0..*]	0490	01767	Specimen Reject Reason
26	4	NM	RE	[0..1]		01772	Number of Specimen Containers

SPM-2 Specimen ID (EIP), conditional.

This field contains a unique identifier for the specimen, enterprise-wide. For specimen identification, see Pathology TF-1, Appendix B, section 5.2.
In many laboratories where there is one specimen per container, the value of the specimen ID and container ID will be same. However, there are use cases in which there is more than one specimen in a container. In those situations, the value of the container ID and the specimen IDs will be different.

Condition predicate: This field shall be populated in OML messages of transaction PAT-1 and PAT2.

SPM-3 Specimen Parent ID (EIP), not required

Specimens are sampled and processed during a laboratory's (diagnostic) workflow. Child specimens are created from existing specimens by sampling. The Specimen Parent ID field contains the identifiers of the specimen or specimens from which the child specimen is sampled.

If the Specimen is a Part, the Specimen Parent is the Patient. If the Specimen is a Tissue item in a block, the Specimen Parent is Patient\Part. If the Specimen is a Tissue item on a slide, the Specimen Parent is Patient\Part\Block Tissue Item.

In case of more than one specimen in or on a container:

If the Specimen is a collection of undistinguishable Tissue items in a block, the Specimen Parent is Patient\1…n Part. If the Specimen is an identified Tissue item in a block the Specimen Parent is Patient\Part.

If the Specimen is a collection of undistinguishable Tissue items on a slide, the Specimen Parent is Patient\1…n (Part\Block Tissue Item). If the Specimen is an identified Tissue item on a slide the Specimen Parent is Patient\Part\ Block Tissue Item.

If the Specimen is a Tissue core in a TMA block, the Specimen Parent is Patient\Part\DonorBlock Tissue Item. If the Specimen is a Tissue spot on a TMA slide, the Specimen Parent is Patient\Part\DonorBlock Tissue Item\Tissue core in the TMA block.

SPM-4 Specimen Type (CWE), required if available.

This field describes the precise nature of the physical object (or collection of objects) is that is the subject of one or more steps in the laboratory (diagnostic) workflow. The Specimen Type is a coded precise description of the specimen type (DICOM context ID ccc5), i.e “breast tumorectomy”. This coded description is consistent with the specimen “general” type (DICOM context ID ccc3) (part, tissue item, tissue section, tissue core, etc) and the general specimen collection procedure (DICOM context ID cc10) (aspiration, biopsy, excision, etc).

The authorized values for this field are those of HL7 table 0487 - Specimen type. See HL7 v2.5 chapter 7 (7.18.4). HL7 doesn’t suggest values for this table. The following table provides the DICOM values of the Context ID ccc5 (Specimen Description Codes).

Table 3-16: DICOM Specimen Description codes.

DICOM Value	Description
x05050a	Lung Lobe Resection
x05050b	Prostate Resection
x05050c	Skin Biopsy
x05050d	Colon Biopsy

SPM-14 Specimen Handling Code (CWE), Optionnal

This is a text field that allows additional information specifically about the specimen to be sent in the message.

SPM-17 Specimen Collection Date/Time (DR), required if available.

Definition: The date and time when the specimen was acquired from the source. The use of the Date Range data type allows for description of specimens collected over a period of time, for example, 24-hour urine collection. For specimens collected at a point in time, only the first component (start date/time) will be populated

SPM-18 Specimen Received Date/Time (TS), conditional.

The time the specimen is received at the Pathology laboratory.

Condition predicate: This field shall be populated in OML and ORU messages sent by the Order Filler, within transactions PAT-1 (all use cases), PAT-2 and PAT-3, if the specimen has been received by the Pathology. In other words this field is RE for the order filler actor in both transactions PAT-1, PAT-2 and PAT-3.

SPM-20 Specimen Availability (ID), conditional.

This describes whether the specimen, as it exists, is currently available to use in an analysis. The two authorized values are "Y" (yes) or "N" (no).

Condition predicate: This field shall be populated in OML messages sent by the Order Filler, within transactions PAT-1 (all use cases) and PAT-2. The value 'N' indicates either that the Pathology hasn't received the specimen yet, or that it has rejected the received specimen. In other words this field is RE for the order filler actor. The value of this field can be implicitly derived from ORC-5 (e.g. ORC-5 = ‘IP’ implicitly means that the specimen has arrived, otherwise the test could not be in progress).

This field is pointless in messages sent by the Order Placer.

SPM-21 Specimen Reject Reason (CWE), conditional.

This describes one or more reasons the specimen is rejected for the ordered batteries

Condition predicate: This field shall be populated in OML messages sent by the Order Filler in transaction PAT-1, whenever the Pathology rejects a specimen.

Refer to HL7 Table 0490 - Specimen Reject Reason for valid values.

Table 3-17: Values for Specimen Reject Reason.

Value	Description	Comment
EX	Expired	
QS	Quantity not sufficient	
RB	broken container	
RD	missing collection date	
R	missing patient ID number	
RE	missing patient name	
RI	Identification problem	
RL	Improper labeling	
RM	Labeling	
RR	improper storage	
RS	name misspelling	

SPM-26 Number of Specimen Containers (NM), required if available.

HL7 Definition: This field identifies the number of containers for a given specimen. For sample receipt verification purposes; may be different from the total number of specimens that accompany the order.

3.10 SAC Container Detail segment

HL7 v2.5: chapter 13

The IHE Pathology Technical Framework defines the usage of 2 SAC fields; it allows all other fields to be optionally used.

Table 3-18: SAC - Container Detail segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	80	EI	O	[1..1]		01329	External Accession Identifier
2	80	EI	O	[1..1]		01330	Accession Identifier
3	80	EI	R	[1..1]		01331	Container Identifier
4	80	EI	C	[0..1]		01332	Primary (parent) Container Identifier
6	300	SPS	X	[0..0]		00249	Specimen Source

Condition for the use of the SAC segment: The SAC segment should be used only if the number of containers differs from the number of specimens (e.g. a specimen is split in several containers or multiple specimens placed in or on the same container). Otherwise, when there is one container for one specimen the SPM segment is sufficient and the SPM-2 Specimen ID provides both the specimen/container identifier.

In case of multiple specimens placed in or on the same container, the message will contain as many SPM segment as specimens. All SPM segments will have the same Container ID but

different Specimen ID. In case of a specimen split between several containers, the SPM segments will include multiple SAC segments with different Container ID.

SAC-3 – Container Identifier (EI), required.

SAC-3 field identifies the container. This field is the container's unique identifier assigned by the Order Placer. A container may contain the primary (original) specimen or an aliquot (secondary sample) of that specimen. For primary sample this field contains Primary Container ID; for bar-coded aliquot samples this field contains Aliquot Container ID.

SAC-4 – Primary (parent) Container Identifier (EI), conditional.

Condition predicate: This field is used only in transactions PAT-1 and PAT-2 when dealing with a specimen that is split between several containers. In this case, SAC-3 and SAC-4 are used simultaneously as described below:

If SAC-4 field is filled in, it identifies the primary container from which this specimen came. For primary samples this field is empty; for aliquot samples this field should contain the identifier of primary container.

3.11 Correlations of status between ORC, OBR, OBX

Semantics of the main status code associations

In HL7 version 2.5 a change in the status of an observation is identified by a combination of the Trigger Event field contained in segment MSH, the ORC-5 (Filler Order status) field, the OBR-25 (Order Result Status) field and the OBX.11 (Observation Result Status) field. OBX-11 contains the status of an individual test, OBR-25 the status of the entire request.

Table 3-19: Correlation of status.

Order Table 0038 (ORC-5)	Request Table 0123 (OBR-25)	Result Table 0085 (OBX-11)	Description (combined from 3 tables)
	O	O	Order received; specimen not yet received. Order detail description only (OBX contains no result). This value should only be used in ORL event acknowledgment messages. It should not be used in OML messages.
SC	S		No results available; procedure scheduled, but not done. The specimen may not have arrived at the laboratory. No OBX is present
IP	I	I	In process; The specimen is available in the laboratory; results are pending; the procedure is incomplete
		D	Deletes the OBX record
A	R	R	(Some) results entered -- not yet verified
A	P	P	(Some) preliminary verified results. The final results are not yet obtained
CM	F	F	Final results; results stored and verified. Can only be changed with a corrected result.
(CM)	C	C	Record coming over is a correction and thus replaces a final result
CA	X	X	(OBX) Results cannot be obtained for this observation. (ORC/OBR) No results available; Order canceled.

Note: the status codes used in ORC-5 are less 'atomic' than those used in OBR-25/OBX-11. If there is no direct 'semantic match' the ORC-5 column lists the closest equivalent between braces.

The table shown above contains a description of the semantics of the code values used by these fields. Please note that this table does not identify all possible relationships of the various status fields. The relationship between the various statuses fields are described below.

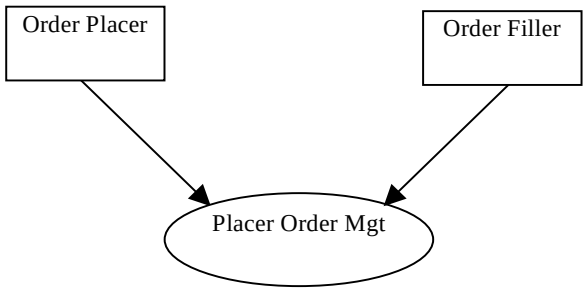
4 Transaction PAT-1: Placer Order Management

4.1 Scope

Transaction PAT-1 is used by the Order Placer to place a new order to the Order Filler. Macroscopic and microscopic examinations of specimen(s) collected from a patient are ordered by a Physician or Surgeon. Each specimen is collected and placed in a container that is labeled with the specimen ID (possibly in a barcode format).

The main goal of the Placer Order Management Transaction is to allow consistent management of the content and status of the order between the Order Placer and Order Filler actors.

4.2 Use Case Roles



Actor: Order Placer

Roles: Places orders. Updates orders, cancels orders and receives acceptance or rejection from the Order Filler. Receives order related changes from the Order Filler.

Actor: Order Filler

Roles: Receives orders, checks the specimens required and notifies the Order Placer of acceptance or refusal. Receives order related changes from the Order Placer. Notifies content updates (removed procedures) to the Order Placer. Notifies the progression (scheduled, started, cancelled, completed) to the Order Placer.

4.3 Referenced standards

HL7 version 2.5:

- Chapter 2: "Control" --> generic segments and data types
- Chapter 3: "ADT" --> PID and PV1 segments
- Chapter 4: "Order Entry" --> OML and ORL messages
- Chapter 7: "Observation Reporting" --> SPM segment
- Chapter 13: "Clinical Pathology Automation" --> SAC segment
-

4.4 Interaction diagrams

Since Pathology request can involve several specimens and a specimen may be divided in several pieces that need to be clearly identified and transported in distinct containers, the most appropriate message for Pathology orders is the OML^O21 message. This message contains:

- a list of ordered procedures;
- a list of specimens underneath each procedure;
- a list of containers underneath each procedure.

Observation result segments may be added after each procedure for providing the Order Filler with all additional details that are necessary for performing the fulfilling the order.

In all interaction diagrams below, the initiator transmits an OML^O21 message, the responder SHALL respond with an application acknowledgement message ORL^O22.

4.4.1 Normal process of a placer order

The figure below shows the flow of messages in the normal process of a placer order, from placing of the order by the Order Placer, to the "order completed" event notified by the Order Filler.

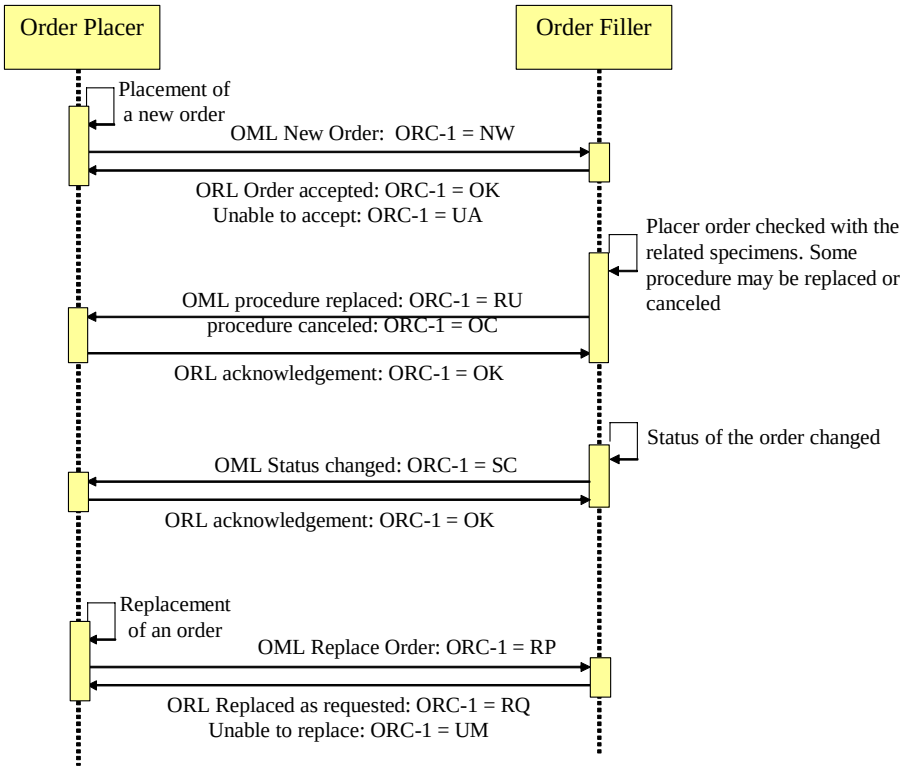


Figure 4-1: Normal process of a placer order.

4.4.2 Cancellation of an order by the Order Placer

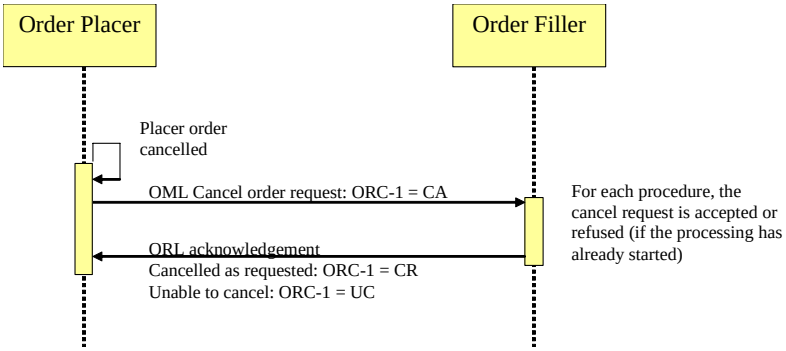


Figure 4-2: Cancellation of an order by the Order Placer.

The Order Filler accepts the cancellation only if the processing has not started yet.

4.4.3 Cancellation of an order initiated by the Order Filler

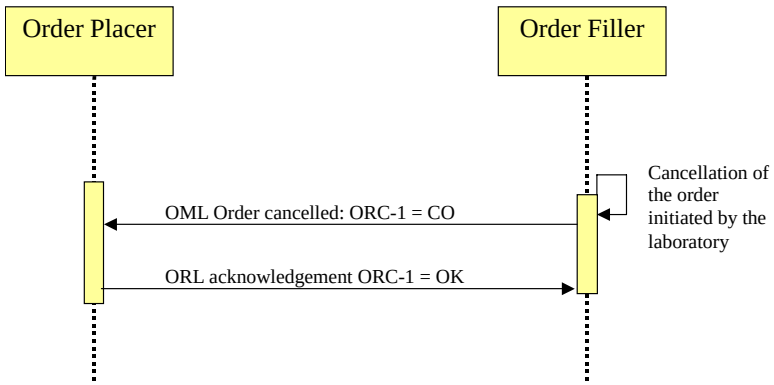


Figure 4-3: Cancellation by the Order Filler.

4.5 Messages static definitions

4.5.1 Restrictions on OML^O21 message for transaction PAT-1

This cycle of Pathology Technical Framework makes the following restrictions for transaction PAT-1:

- PAT-1 carries all clinical observations provided by the Care Unit, such as medical information, specific ordering questionnaires, within observation segments (OBX) that accompany the order. This choice has been made to simplify the building and parsing of the messages. All these specific patient observations are sent in the OML message, in OBX segments.
- PAT-1 restrains timing/quantity to one execution per order.

4.5.2 OML^O21 – static definition

Table 4-1: OML^O21 message description.

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[	--- PATIENT begin	RE	[0..1]	
PID	Patient Identification	R	[1..1]	3
[PV1]	Patient Visit	RE	[0..1]	3
]	--- PATIENT end			
{	--- ORDER begin	R	[1..*]	
ORC	Common Order (for one battery)	R	[1..1]	4
[TQ1]	Timing Quantity	RE	[0..1]	4
	--- OBSERVATION REQUEST begin	R	[1..1]	
OBR	Observation Request	R	[1..1]	4
{[NTE]}	Notes and Comments	O	[0..*]	2
[{	--- OBSERVATION begin	O	[0..*]	
OBX	Observation Result	R	[1..1]	7
[{NTE}]	Comment of the result	C	[0..*]	2

}]	--- OBSERVATION end			
[{	--- SPECIMEN begin	O	[0..*]	
SPM	Specimen	R	[1..1]	7
[{SAC}]	Container	C	[2..*]	13
}]	--- SPECIMEN end			
	--- OBSERVATION REQUEST end			
}	--- ORDER end			

Field MSH-9 - Message Type (MSG) shall have its three components respectively valued to "OML", "O21" and "OML_O21".

The triplet (ORC, TQ1, OBR) represents the order (i.e. an ordered battery/test). This triplet is repeated as many times as the number of batteries/procedure contained in the order group.

The OBSERVATION (OBX) repeatable segment group carries the observations provided by the order placer.

Condition predicate for the SAC segment: See the common definition of the SAC segment in section 3.10.

4.5.3 ORL^O22 static definition

Table 4-2: ORL^O22 message description.

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
MSA	Message Acknowledgment	R	[1..1]	2
[{ERR}]	Error	C	[0..*]	2
[PID]	Patient Identification	O	[0..1]	3
{	--- ORDER begin	R	[1..*]	
ORC	Common Order	R	[1..1]	4
[{TQ1}]	Timing Quantity	RE	[0..1]	4
	--- OBSERVATION REQUEST begin	R	[1..1]	
OBR	Observation Request	R	[1..1]	4
[{	--- SPECIMEN begin	O	[0..*]	
SPM	Specimen	R	[1..1]	7
[{SAC}]	Container	C	[2..*]	13
}]	--- SPECIMEN end			
	--- OBSERVATION REQUEST end			
}	--- ORDER end			

MSH-9 - Message Type (MSG) shall have its three components respectively valued to "ORL", "O22" and "ORL_O22".

The ERR segment shall be used in case of negative acknowledgement (when MSA-1 = AE or AR).

4.5.4 Specific segments description for transaction PAT-1

4.5.4.1 OBR - Observation Request segment

HL7 v2.5: chapter 4 (4.5.3)

1050 **Table 4-3: OBR - Observation Request segment.**

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
2	22	EI	R	[1..1]		00216	Placer Order Number
3	22	EI	RE	[0..1]		00217	Filler Order Number
4	250	CE	R	[1..1]		00238	Universal Service Identifier
5	2	ID	X	[0..0]		00239	Priority – OBR
6	26	TS	X	[0..0]		00240	Requested Date/Time
7	26	TS	X	[0..0]		00241	Observation Date/Time #
8	26	TS	X	[0..0]		00242	Observation End Date/Time #
9	20	CQ	X	[0..0]		00243	Collection Volume *
10	250	XCN	RE	[0..*]		00244	Collector Identifier *
11	1	ID	RE	[0..1]	0065	00245	Specimen Action Code *
12	250	CE	X	[0..0]		00246	Danger Code
13	300	ST	X	[0..0]		00247	Relevant Clinical Information
14	26	TS	X	[0..0]		00248	Specimen Received Date/Time *
15	300	SPS	X	[0..0]		00249	Specimen Source
16	250	XCN	R	[1..1]		00226	Ordering Provider
17	250	XTN	RE	[0..2]		00250	Order Callback Phone Number
18	60	ST	X	[0..0]		00251	Placer Field 1
19	60	ST	X	[0..0]		00252	Placer Field 2
20	60	ST	X	[0..0]		00253	Filler Field 1 +
21	60	ST	X	[0..0]		00254	Filler Field 2 +
22	26	TS	X	[0..0]		00255	Results Rpt/Status Chng - Date/Time +
23	40	MOC	X	[0..0]		00256	Charge to Practice +
24	10	ID	C	[0..1]	0074	00257	Diagnostic Serv Sect ID
25	1	ID	C	[0..1]	0123	00258	Result Status +
26	400	PRL	X	[0..0]		00259	Parent Result +
27	200	TQ	X	[0..0]		00221	Quantity/Timing
28	250	XCN	C	[0..*]		00260	Result Copies To
29	200	EIP	X	[0..0]		00261	Parent
30	20	ID	X	[0..0]	0124	00262	Transportation Mode
37	4	NM	X	[0..1]		01028	Number of Sample Containers *
40	250	CE	X	[0..0]		01031	Transport Arrangement Responsibility

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
41	30	ID	X	[0..0]	0224	01032	Transport Arranged
42	1	ID	X	[0..0]	0225	01033	Escort Required
43	250	CE	X	[0..0]		01034	Planned Patient Transport Comment
48	250	CWE	X	[0..0]	0476	01646	Medically Necessary Duplicate Procedure Reason.

OBR-2 Placer Order Number (EI), required in transaction PAT-1.

Note that all batteries/procedure contained in the order should be assigned a unique Placer Order Number. The same identifier will never be used twice by the Order Placer. The Placer Order Number is generated by the Order Placer actor and should be unique across all OBR segments across all messages.

OBR-3 Filler Order Number (EI), required if available.

Note that all batteries/procedure contained in the filler order should be assigned a unique Filler Order Number. The same identifier will never be used twice by the Order Filler. The filler order number is generated by the Order Filler actor and should be unique across all OBR segments across all messages.

OBR-4 Universal Service Identifier (CE), required.

This field contains one ordered battery or procedure.

OBR-5 Priority and OBR-6 Requested Date/Time

These two fields are not supported. See TQ1 segment.

OBR-7, OBR-8, OBR-12, OBR-14, and OBR-15 These fields are not supported. See SPM segment that supersedes them.

OBR-10 Collector Identifier, required if available.

This repeatable field contains the specimen collectors' identification.

OBR-11 Specimen Action Code (ID), required if available.

The value of this field is dependent on the use case as described in Volume 1.

The field identifies the action to be taken with respect to the specimens that accompany or precede this order. The purpose of this field is to further qualify (when appropriate) the general action indicated by the order control code contained in the accompanying ORC segment. HL7 Table 0065 - Specimen Action Code gives the valid values:

Table 4-4: Specimen Action Code.

Value	Description	Comment
A	Add ordered tests to the existing specimen	
G	Generated order; reflex order	
L	Lab to obtain specimen from patient	
O	Specimen obtained by service other than Lab	
P	Pending specimen; Order sent prior to delivery	
R	Revised order	
S	Schedule the tests specified below	

OBR-13 Relevant Clinical information (ST), not supported.

Transaction PAT-1 uses OBX segment to carry relevant clinical information, or a NTE segment below the OBR for more comment orientated information.

OBR-16 Ordering Provider (XCN), required.

This field identifies the provider who ordered the test. Either the ID code or the name, or both, may be present. This is the same as ORC-12-ordering provider.

OBR-17 Order Callback Phone Number (XTN), required if available; contains one or two phone numbers.

OBR-22 Results Rpt/Status Chng - Date/Time (TS), not used in PAT-1.

OBR-22 is related to the RESULT, not to the ORDER. OBR-22 is related to OBR-25. ORC-9 contains the date/time of the latest status change of the ORDER.

OBR-24 Diagnostic Serv Sect ID (ID), conditional

Condition predicate: This field may be valued in OML messages sent by the Order Filler. In other words this field is RE for the order filler actor. The valid values are defined in HL7 Table 0074 - Diagnostic Service Section ID. The only values applicable for Pathology Technical Framework are listed below.

Table 4-5: Diagnostic Service Section ID (subset).

Value	Description	Addressed by Pathology TF
CP	Cytopathology	Yes
OSL	Outside Lab	Yes

OBR-25 Order Result Status (ID), conditional

Condition predicate: This field shall not be filled in messages sent by the Order Placer. This field shall be filled in messages sent by the Order Filler, according to HL7 Table 0123 described in Chapter 7 of HL7. In this version of the Pathology Technical Version, the possible values for this field are a subset of this table:

Table 4-6: Result Status.

Value	Description	Comment
O	Order received; specimen not yet received	
I	No results available; specimen received, procedure incomplete	
S	No results available; procedure scheduled, but not done	
R	Results stored; not yet verified	
P	Preliminary: A verified early result is available, final results not yet obtained	
F	Final results; results stored and verified. Can only be changed with a corrected result.	
C	Correction to results	
X	No results available. Order canceled	

Note: for the conditions of use of these values, please read section 3.11 "Correlations of status between ORC, OBR and OBX".

OBR-28 Result Copies To (XCN), conditional.

HL7 Definition: This field identifies the people who are to receive copies of the results. By local convention, either the ID number or the name may be absent.

Condition predicate: The Order Placer shall fill this field when it sends a new order for which there are persons or care units declared for receiving a copy of the results.

4.5.4.2 OBX - Observation/Result segment

HL7 v2.5: chapter 7 (7.4.2)

Table 4-7: OBX – Observation/Result segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	4	SI	R	[1..1]		00569	Set ID – OBX
2	2	ID	C	[0..1]	0125	00570	Value Type
3	250	CE	R	[1..1]		00571	Observation Identifier
4	20	ST	C	[0..1]		00572	Observation Sub-ID
5	99999	Varies	C	[0..1]		00573	Observation Value
11	1	ID	R	[1..1]	0085	00579	Observation Result Status
14	26	TS	RE	[0..1]		00582	Date/Time of the Observation
15	250	CE	RE	[0..1]		00583	Producer's ID
16	250	XCN	RE	[0..1]		00584	Responsible Observer
17	250	CE	C	[0..1]		00936	Observation Method

OBX-1 Set ID - OBX (SI), **required**.

This field contains the sequence number of the OBX.

OBX-2 Value Type (ID), **required**.

This field contains the format of the observation value in OBX. It must be valued if OBX-11-Observation Result Status is not valued with an "X".

The Value Type field should be filled according to HL7 Version 2.5 standard (table 0125).

OBX-3 Observation Identifier (CE), required

The usage of LOINC(r) test codes for the identification of tests is strongly recommended. Details of this free vocabulary can be found at http://www.loinc.org .

The first and third sub-fields "Identifier", and "Name of Coding System" are required in all transactions. The value of the "Name of Coding System" in the case of LOINC is "LN".

In transaction PAT-3 the second sub-field "Text" is mandatory, which allows the Order Result Tracker to manage the results without the help of a Test Master File.

The last three sub-fields are optional in all transactions.

OBX-4 Observation Sub-ID (ST), conditional.

Condition predicate: This field shall be used to distinguish between multiple OBX segments with the same observation ID organized under one OBR.

See HL7 V2.5 (7.4.2) for details and examples.

OBX-5 Observation Value (varies), conditional.

Condition predicate: This field is required unless the Observation Result Status field (OBX-11) is valued either with "D", or "I" or "X". The Observation Value field shall be valued accordingly to the definition made in Chapter 7 of HL7 2.5 version.

OBX-11 Observation Result Status (ID), required.

This field contains the observation result status. Refer to HL7 table 0085 - Observation result status codes interpretation for valid values. This field reflects the current completion status of the results for one Observation Identifier. The only values applicable for transaction PAT-1 of Pathology Technical Framework are listed below:

Table 4-8: Observation result status codes for PAT-1.

Value	Description
F	Final results; Can only be changed with a corrected result.

OBX-14 Date/Time of the Observation (TS), required if available.

This field should be valued when the OBX-5 field (Value field) is also valued.

OBX-15 Producer's ID (CE), required if available.

This field is required in case the observation was not produced by the sending organization.

OBX-16 Responsible Observer (XCN), required if available.

This field is required when the observation result status (OBX-11) is valued with "D" or "R" or "P" or "F" or "C" or "X" and the Producer's ID field is not valued. It should contain the identity of the observer that causes the change of the observation result status. Only the first component (ID number) of this field is necessary, provided that it is possible to retrieve the full identity of responsible person in the Order Filler system with only this ID number.

OBX-17 Observation Method (CE), conditional.

Condition predicate: This field is required when the value of the result may be dependant of the Observation Method and the Observation Identifier does not permit to identify the Method. With some Observation Identifiers such as LOINC(r) Codes, the identifier also identifies the Method, in which case this field does not need to be valued.

5 Transaction PAT-2 - Filler Order Management

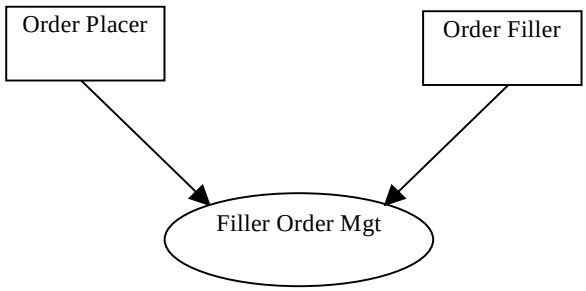
5.1 Scope

This transaction is used by the general use case "*Filler order with specimens identified by third party or collected by the laboratory*" described in the Volume 1 of this technical framework. It corresponds to transaction PAT-2 of the IHE Pathology Framework. It is used by the Order Filler (Laboratory Information System) and the Order Placer.

This transaction is used when a new order or a new battery is placed at the Order Filler level in order to require the Order Placer to allocate a Placer Order Number to this new order. The order contains the list of batteries or tests for which the Order Placer should allocate an order number

The main goal of the Filler Order Management Transaction is to allow consistent management of the order, (content and status), between the Order Filler and Order Placer actors, this allowing the Order Placer to manage invoicing.

5.2 Use Case Roles



Actor: Order Placer

Roles: Receives filler orders. Notifies the Order Filler of acceptance or refusal. Notifies the Order Filler of the placer order number if the filler order was accepted.

Actor: Order Filler

Roles: Places filler orders by sending them to the Order Placer. Receives acceptance or rejection from the Order Placer. Receives the placer order reference number from the Order Placer if the Order Placer accepts the order. Receives order related changes from the Order Placer.

5.3 Referenced Standards

HL7 version 2.5:

- Chapter 2: "Control" --> generic segments and data types
- Chapter 3: "ADT" --> PID and PV1 segments
- Chapter 4: "Order Entry" --> OML and ORL messages
- Chapter 7: "Observation Reporting" --> SPM segment
- Chapter 13: "Clinical Laboratory Automation" --> SAC segment

5.4 Interaction Diagrams

For the same reasons exposed in § 4.4, in all interaction diagrams below, the initiator transmits an OML^O21 message, the responder SHALL respond with an Application acknowledgement message ORL^O22.

5.5 Messages Static Definition

The figure below shows the flow of messages in the normal process of a Filler Order. A Filler Order is placed, and responded to by either a rejection or acceptance.

Note that the creation of a Filler Order may be triggered by a prior Placer Order, e.g. if the results of one of the previously ordered tests triggers the laboratory to perform additional tests. The creation of a Filler Order could also happen during the control performed by the laboratory on a new order received from the Order Placer: the laboratory may then decide that some extra battery that was not ordered should be added, e.g. regarding the pathology context.

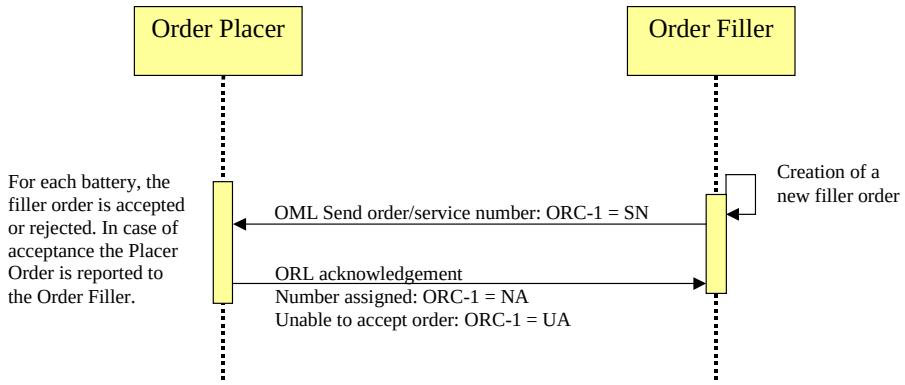


Figure 5-1: Process of a filler order.

Since the purpose of this transaction is to require a Placer Order Number to the Order Placer for orders that are placed or added at the Order Filler level, there is no real need to support the SPM and SAC segments in the messages associated to this transaction.

The SPM and SAC segments should then be considered as optional in the transaction PAT-2.

For requesting a Placer Order number the Order Filler will transmit an OML^O21 message in which the ORC-1 field (Order Control ID) will contain "SN" (Send Number). In this message the Placer Order Number fields in ORC-2 and OBR-2 should be empty.

The Order Placer will acknowledge with an ORL message in which the ORC-1 field will contain the value "NA" (Number Assigned). The Order Placer should supply the Placer Order Number assigned to this order in the ORC-2 and OBR-2 fields.

6 Transaction PAT-3 – Order Results Management

This section corresponds to Transaction 3 of the IHE Pathology Technical Framework. It is used by the Order Filler and the Order Result Tracker.

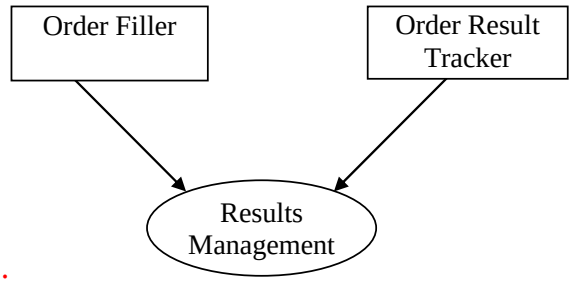
6.1 Scope

This transaction notifies the Order Result Tracker of requested tests upon creation of an order or reception of a specimen in the laboratory. It transmits the observation results and reports from the Order Filler to the Order Result Tracker, when a result is acquired, clinically validated, modified or deleted at the Order Filler level. Another goal of this transaction is to provide the Order Result Tracker with the complete sorted set of results related to a placer order or a placer order group. The Order Result Tracker shall store these results in the sorting order given by the Order Filler.

In order to maintain consistency between order and result messages, the result messages of transaction PAT-3 should refer to primary specimen even in the case where some of the observations are performed on secondary samples that are derived from primary specimen after specific preparation.

This transaction is also used by the Order Filler to send structured or non-structured documents to the Order Result Tracker. Reports can be an unstructured document (RTF, GIF image, PDF) or a structured document (for example: HL7 CDA). The document is not transmitted in the message itself. The HL7 message contains a link to the document (repository, ftp site ...).

6.2 Use Case Roles



Actor: Order Filler

Roles: Provides notification to the Order Result Tracker for specimen arrival, acquisition of technically validated results, clinical validation of results, changing/cancellation of results. Provides the complete sorted set of results related to a placer order or a placer order groups. Results can be provided as a report.

Actor: Order Result Tracker

Roles: Receives test order, results and reports from the Order Filler, gives access to this order and results to the healthcare enterprise, respects the sorting order of the results as received from the Order Filler.

6.3 Referenced Standards

HL7 version 2.5:

- Chapter 2: "Control" --> generic segments and data types
- Chapter 3: "ADT" --> PID and PV1 segments

- Chapter 7: "Observation Reporting" --> ORU^R01

6.4 Interaction Diagram

Since Pathology request can involve several specimens and a specimen may be divided in several pieces that need to be clearly identified and transported in distinct containers, the most appropriate message for Pathology results is the ORU^R01 message. This message is a battery-centric structure.

6.4.1 Normal process for management of results of a filler order

The figures below show the flow of messages that occurs during normal process of a filler order, from the reception of specimen or entry of the order in the laboratory, up to the completion of this order and visualization of results by an end user on the Order Result Tracker. For each triggering event of an ORU message, the value of the result status of the OBR (OBR-25) is indicated.

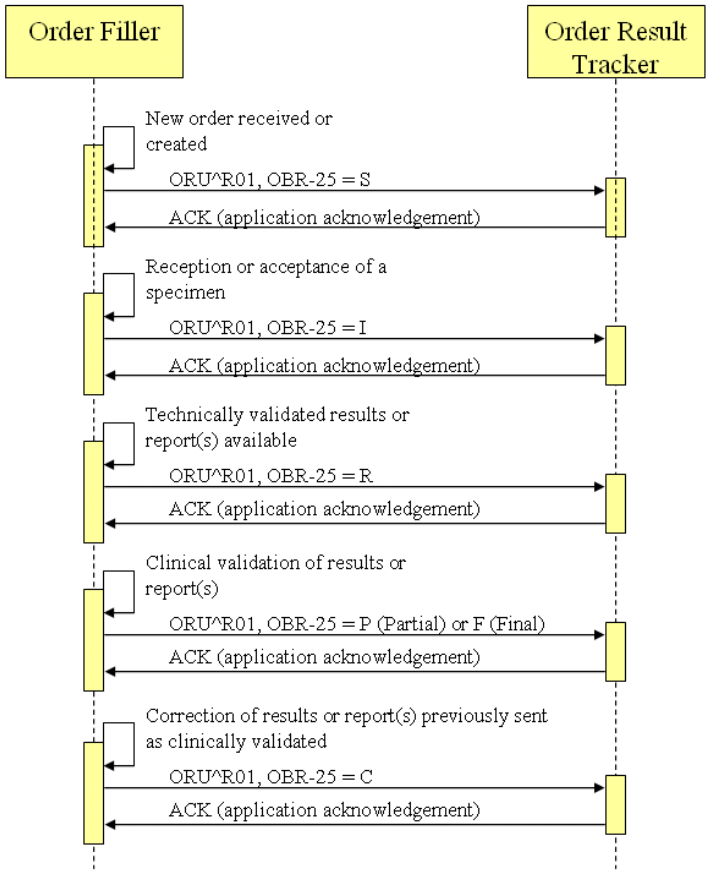


Figure 6-1: Interaction diagram of the PAT-3 transaction.

An Order Filler will trigger an Unsolicited Observation Message when the following events occur:

- entry of an order at the Laboratory level for a collected specimen;
- reception and acceptance of a specimen;
- intermediate results or reports;
- clinically validated results or reports;
- modification of an existing transmitted validated result or report;
- cancellation of a result or a report.

6.5 Message Static Definition

6.5.1 ORU^R01 - Unsolicited Observation Message

Table 6-1: ORU^R01 message description.

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[	--- PATIENT begin	O	[0..1]	
PID	Patient Identification	R	[1..1]	3
[PV1]	Patient Visit	RE	[0..1]	3
]	--- PATIENT end			
{	--- ORDER_OBSERVATION begin	R	[1..*]	
ORC	Common Order (for one battery)	R	[1..1]	4
OBR	Observation Request	R	[1..1]	4
[{TQ1}]	Timing Quantity	RE	[0..1]	4
[{	--- OBSERVATION begin	O	[0..*]	
OBX	Observation Result	R	[1..1]	7
[{NTE}]	Comment of the result	C	[0..*]	2
}]	--- OBSERVATION end			
[{	--- SPECIMEN begin	O	[0..*]	
SPM	Specimen	R	[1..1]	7
[{OBX}]	Observation related to specimen	C	[2..*]	13
}]	--- SPECIMEN end			
}	--- ORDER_OBSERVATION end			

Field MSH-9 – Message Type shall have its three components valued as follows: ORU^R01^ORU_R01.

Following the ORC/OBR, the Order Filler should systematically transmit in the message, all OBX and SPM segments related to this ORC/OBR. This systematic transmission of all observations linked to an OBR and their respective status may help the Order Result Tracker to recover from error situations.

For the same reason the "U" value should not be used in the Observation Result Status field of an OBX segment (see description of this segment earlier in this document).

For multi-specimen orders, each specimen of the order is described in an SPM segment. The tests performed on that specimen shall have their observations reported in OBX segments following the SPM.

Links to report are sent as a result in OBX segments. If a report is related to an individual specimen, it shall be sent in an OBX segment following the SPM. If a report is global to the order, it shall be sent in an OBX segment following the ORC/OBR segments.

In case an observation previously transmitted is deleted, the Order Filler should transmit all OBX segments linked to the OBR to which the deleted observation relates to; and it should indicate the current status of each OBX segment. The Observation Result Status field of theOBX that correspond to the deleted observation should be valued with a "D".

6.5.2 Specific segments description for transaction PAT-3

6.5.2.1 OBR - Observation Request segment

HL7 v2.5: chapter 4 (4.5.3).

The ORU message shall contain only one OBR segment corresponding to the analysis of a specimen or a group of related specimen. The OBR segment is described in Table 4-3 for transaction PAT-1. The following table shows the difference with PAT-3 only.

Table 6-2: OBR - Observation Request segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
2	22	EI	RE	[0..1]		00216	Placer Order Number
3	22	EI	R	[1..1]		00217	Filler Order Number
4	250	CE	R	[1..1]		00238	Universal Service Identifier

OBR-2 Placer Order Number (EI)

This field is required if the value is known to the sender.

OBR-3 Filler Order Number (EI), required.

This field is required. It allows the Order Filler to link all the observations and reports of a request together. It also identifies the order at the Order Filler level.

OBR-4 Universal Service Identifier (CE), required.

The first three sub-fields “Identifier”, “Text” and “Name of Coding System” are required. The second sub-field “Text” allows the Order Result Tracker to manage the observations and reports without the help of an Order Master File.

6.5.2.2 OBX - Observation/Result segment

HL7 v2.5: chapter 7 (7.4.2).

The OBX segment contains the observations and the links to the Pathology reports. The following table shows the difference with PAT-1 only.

Table 6-3: OBX - Observation/Result segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
2	2	ID	C	[0..1]	0125	00570	Value Type
3	250	CE	R	[1..1]		00571	Observation Identifier
5	99999	ST	R	[0..1]		00573	Observation Value
11	1	ID	R	[1..1]	0085	00579	Observation Result Status
13	20	ST	C	[0..1]		00581	User Defined Access Checks

OBX-2 Value Type (ID), conditional.

Condition predicate: this field shall be valued if OBX-5 (Observation Value) is populated. When a report is attached to the message, OBX-2.1 is valued with RP (Reference Pointer) and OBX-2.4 is valued with the format of the document. Valid values are listed in HL7 Table 0291 - Subtype of referenced data.

Table 6-4: Exemple of subtypes.

Value	Description	Comment
HTML	Hypertext Markup Language	
RTF	Rich Text Format	
x-hl7-cda-level-one	HL7 Clinical Document Architecture Level One document	
x-hl7-cda-level-two	HL7 Clinical Document Architecture Level Two document	This value is not listed in HL7 Table 0291.
PDF		This value is not listed in HL7 Table 0291.
WAV		This value is not listed in HL7 Table 0291.

OBX-3 Observation Identifier (CE), required.

The usage of LOINC(r) test codes for the identification of tests is strongly recommended. Details of this free vocabulary can be found at http://www.loinc.org. For example, the LOINC codes for Gross Pathology and Microscopic Pathology are 22634-0 and 22637-5, respectively.

OBX-5 Observation Value (ST), required.

This field contains the URL to the document. The syntax of the URL must follow the RFC 1738 and 1808. Example: file://machine/c:/report.pdf.

OBX-11 Observation Result Status (ID), required.

This field should be filled according to HL7 Table 0085 described in Chapter 7 of HL7. In this version of the Pathology Technical Framework, the possible values for this field are a subset of the following table.

Table 6-5: Observation result status.

Value	Description	Comment
D	Deletes the observation or the report	This status should be used when the Order Filler wants to cancel a false observation or report transmitted in a former message, in the situation where the right observation or report is still pending. The report should never be shown to clinical users.
P	Preliminary observation or report	The observation or the report is clinically validated but it can still change.
F	Final observation or report	The observation or the report can only be changed with a corrected value.
C	The observation or the report coming over is a correction and thus replace a final observation or report	This status may be used only after a F or a C status.
X	Observation or report cannot be obtained	

OBX-13 User Defined Access Checks (ST), conditional.

Condition predicate: the Order Filler should value this field with a "P" when it wants to inform the Order Result Tracker of restricted access on the observations and reports to privileged users.

6.6 Acknowledgement of OUL and ORU messages

OUL and ORU messages received by the Order Result Tracker shall generate a logical acknowledgement message from the Order Result Tracker to the Order Filler. This General Acknowledgement Message 'ACK' shall be built according to HL7 V2.5 standard.

7 Transaction PAT-4: Procedure Scheduled and Update

This transaction is very similar to the RAD-4 and RAD-13 transaction of the Radiology Technical Framework. The main differences are:

- PAT-4 combines the scheduling and the update of a procedure in one transaction;
- PAT-4 uses OML messages instead of ORM messages.
- PAT-4 handles specimen information.

IHE implementers can refer to the Radiology Technical Framework for miscellaneous information.

7.1 Scope

This transaction specifies a message from the Order Filler to the Image Manager notifying them that a procedure has been scheduled. This transaction also involves changes to procedure information communicated from the Order Filler to the Image Manager.

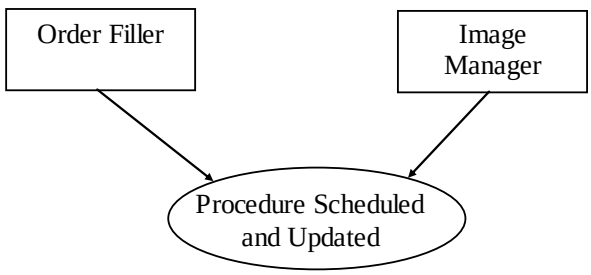
Scheduling does not necessarily mean precise time assignment for the particular procedures. However, the Order Filler shall handle all orders in such a way that it is capable of informing the Image about procedure timing and resources used to perform a procedure.

This message serves as a trigger event for the Image Manager, informing it to obtain necessary information and apply rules to ensure the availability of relevant information to the technician. The Image Manager may need the information to create the Requested Procedure context for its purposes. The Procedure Scheduled transaction includes the initial scheduling message.

The Order Filler will need to communicate with multiple Image Managers. The Order Filler shall broadcast these scheduling messages to all Image Managers. An Image Manager shall be able to receive and process these messages with the understanding that the images and MPPS events for these procedures may be sent to a different Image Manager.

Unlike the order OML message sent between the Order Placer and Order Filler, the OML message from the Order Filler and Image Manager may reference a previously scheduled Requested Procedure identified by a Study Instance UID.

7.2 Use Case Roles



Actor: Order Filler

Role: Enters, modifies and stores information about patients, receives orders, schedules Procedures (exams), modifies information about them (rescheduling, cancellations, code changes, etc.).

Actor: Image Manager

Role: Receives information about Patients, Orders, and schedules, and uses this information to assist in image management.

7.3 Referenced standards

HL7 version 2.5:

- Chapter 2: "Control" --> generic segments and data types
- Chapter 3: "ADT" --> PID and PV1 segments
- Chapter 4: "Order Entry" --> OML and ORL messages
- Chapter 7: "Observation Reporting" --> SPM segment
- Chapter 13: "Clinical Pathology Automation" --> SAC segment

7.4 Interaction diagrams

Since Pathology request can involve several specimens and a specimen may be divided in several pieces that need to be clearly identified and transported in distinct containers, the most appropriate message for Pathology procedures is the OML^O21 message. This message is a battery-centric structure. It contains:

- a list of ordered batteries/procedure;
- a list of specimens underneath each battery/procedure;
- a list of containers underneath each specimen.

Observation result segments may be added after each battery/procedure for providing the Order Filler with all additional details that are necessary for performing the fulfilling the order.

In all interaction diagrams below, the initiator transmits an OML^O21 message, the responder SHALL respond with an Application acknowledgement message ORL^O22.

7.4.1 Normal process of a procedure

The figure below shows the flow of messages in the normal process of a procedure, from creating of the procedure by the Order Filler, to the "procedure completed" event notified by the Image Manager.

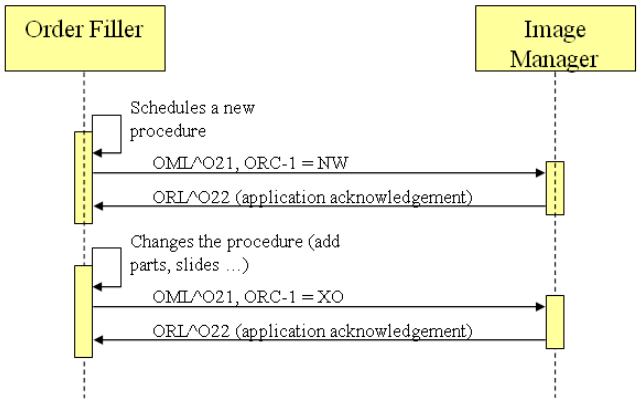


Figure 7-1: Normal process of a procedure.

7.4.2 Cancellation of a procedure by the Order Filler

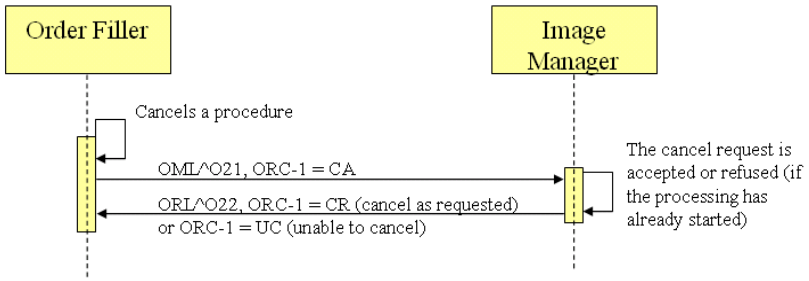


Figure 7-2: Cancellation of procedure.

7.5 Messages static definitions

7.5.1 OML^O21 – static definition

The Order Filler uses an OML^O21 message to convey necessary procedure information. The Procedure Scheduled and Updated Transaction will perform the additional task of providing Patient Demographic information to the Image Manager. The Image Manager shall obtain the Patient Demographic information from the OML^O21 message, specifically the PID and PV1 segments. For this reason, the Order Filler must complete these segments.

The Order Filler uses the OML message in a context different from the context existing between Order Placer and Order Filler. The Order Filler shall send as many OML messages as there are Requested Procedures identified to fill a single order. Each OML message shall contain as many ORC/OBR pairs as there are Protocol Codes in all Scheduled Procedure Steps for that Requested Procedure.

It is actually common for the Order Filler to receive a single OML from the Order Placer system, but choose to expand that order into multiple Requested Procedures, therefore sending multiple OMLs to the Image Manager. Taking this into account, the Order Filler will consider itself an “order placer” in relation to the Image Manager.

Table 7-1: OML^O21 message description for PAT-4.

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[	--- PATIENT begin	RE	[0..1]	
PID	Patient Identification	R	[1..1]	3
[PV1]	Patient Visit	RE	[0..1]	3
]	--- PATIENT end			
{	--- ORDER begin	R	[1..*]	
ORC	Common Order (for one battery)	R	[1..1]	4
[TQ1]	Timing Quantity	RE	[0..1]	4
	--- OBSERVATION REQUEST begin	R	[1..1]	
OBR	Observation Request	R	[1..1]	4
{[NTE]}	Notes and Comments	O	[0..*]	2
[{	--- OBSERVATION begin	O	[0..*]	
OBX	Observation Result	R	[1..1]	7
[{NTE}]	Comment of the result	C	[0..*]	2
}]	--- OBSERVATION end			
[{	--- SPECIMEN begin	O	[0..*]	
SPM	Specimen	R	[1..1]	7
[{SAC}]	Container	C	[2..*]	13
}]	--- SPECIMEN end			
	--- OBSERVATION REQUEST end			
}	--- ORDER end			
ZDS	Additional identification information	R	[1..1]	

Field MSH-9 - Message Type (MSG) shall have its three components respectively valued to "OML", "O21" and "OML_O21".

The triplet (ORC, TQ1, OBR) represents the order (i.e. an ordered battery/test). This triplet is repeated as many times as the number of batteries/procedure contained in the order group.

The OBSERVATION (OBX) repeatable segment group carries the observations provided by the order placer.

Condition predicate for the SAC segment: See the common definition of the SAC segment in section 3.10.

The ZDS segment is specific to IHE. It contains additional identification information such as the Study Instance UID.

7.5.2 ORL^O22 static definition

The static definition of this message is already described in paragraph 4.5.3.

7.5.3 Specific segments description for transaction PAT-4

7.5.3.1 ORC – Common Order segment

HL7 v2.5: chapter 4 (4.5.3)

ORC-1 Order Control (ID), required. This field may be considered the "trigger event" identifier for orders. Many order control codes are defined in the *HL7 table 0119 – Order Control Codes*. For transaction PAT-4, the IHE Pathology Technical Framework allows only the following subset:

Table 7-2: Supported order control codes for PAT-4.

Value	Description of use
NW	“New Order”.
OK	“Notification or request accepted”. Event notification in OML message. Event acknowledgement in ORL message.
XO	“Change order/service request”.
CA	“Cancel order/ service request”.
CR	“Canceled as requested”. Event acknowledgement in ORL message responding to OML (CA)
UC	“Unable to cancel”. Event acknowledgement in ORL message responding to OML (CA)

7.5.3.2 ZDS - Observation/Result segment

IHE Radiology Technical Framework: vol 2 (4.4.4.1.2.5).

Table 7-3: ZDS – ZDS segment.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM#	Element name
1	200	RP	R	[1..1]		Z0001	Study Instance UID

Components of the Study Instance UID field shall be encoded as given in the following table.

Table 7-4: ZDS segment Study Instance UID description.

Component Number	Component Name	Shall Contain:
1	Reference Pointer	DICOM compliant Study Instance UID value
2	Application ID	Implementation specific
3	Type of Data	“Application”
4	Subtype	“DICOM”

7.5.4 Expected Actions

The Image Manager is expected to perform the following actions based on the value of the field *ORC-1 Order Control Code*:

CA – Procedure has been cancelled, usually due to the cancellation of the underlying order; the Image Manager shall inactivate corresponding procedure information using Study Instance UID as a unique key of the Requested Procedure in question. Information from PID and PV1 segments shall not be used to update patient or visit information.

XO – Procedure-related information (including scheduled date/time and/or resource) has been changed. The Image Manager shall modify corresponding procedure information using the Study Instance UID as a unique key of the procedure in question. Information from PID and PV1 segments shall not be used to update patient or visit information.

8 Transaction PAT-5 – Query Modality Worklist

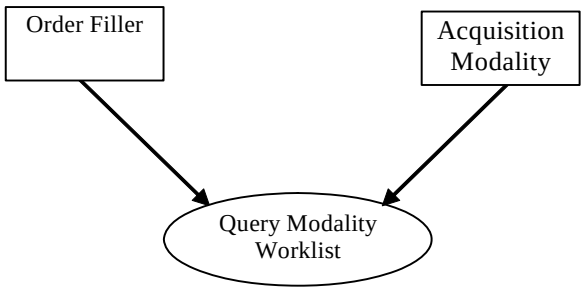
This section corresponds to Transaction PAT-5 of the IHE Technical Framework. Transaction PAT-5 is used by the Order Filler and Acquisition Modalities.

It is essentially based on similar transaction RAD-5 designed for Radiology. The main addition in PAT-5 is the introduction of the Specimen Identification which is required to unambiguously identify the objects of the real world (i.e. a physical object [part, tissue samples, tissue section, smears, etc]) subject of the imaging procedure. By convention, a specimen in DICOM is identified by its container identifier when there is only one specimen in the container.

8.1 Scope

This transaction takes place at the Acquisition Modality at the point of scan/acquisition by a personal of the pathology department or office. When a patient set of specimen(s) is received for the scheduled procedure, the personal performing the procedure must examine key information elements as they relate to the procedure, the correctness of the procedure that has been ordered, and comments that may have been entered by the referring physician and/or pathologist, among others. The procedure will be mostly scheduled only at the reception of the specimen. The personal at the Acquisition Modality uses the DICOM Modality Worklist (MWL) to query the Order Filler for Scheduled Procedure Steps which correspond to the necessary image acquisitions. The list is downloaded to the Acquisition Modality and the personal verifies the information on the Acquisition Modality console. In the Modality Images Stored transaction this information will be included in the header of the generated images (See Appendix B).

8.2 Use Case Roles



Actor: Acquisition Modality

Role: Responsible for requesting and receiving data from the Order Filler, with the ability to validate the data and correct some discrepancies.

Actor: Order Filler

Role: Responsible for accepting requests for MWL from an acquisition modality, performing the query, and sending the response back..

8.3 Referenced Standards

DICOM 2003 PS 3.4: Modality Worklist SOP Class

Supplement 122: Specimen Identification and Revised Pathology SOP Classes

Revision: 12 – 2007/05/05

8.4 Interaction Diagrams

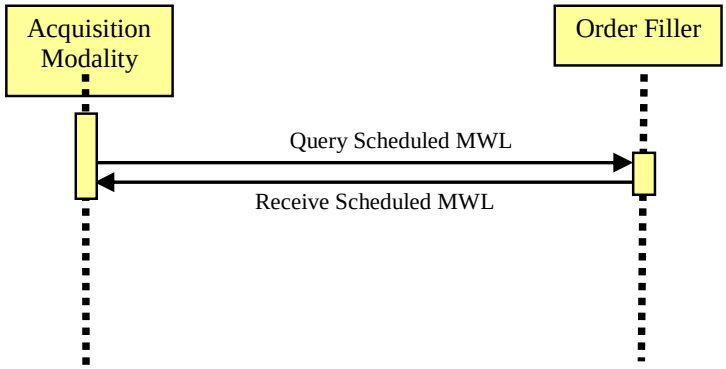


Figure 8-1: Interaction diagram of the PAT-5 transaction.

8.5 Query Scheduled MWL Message

This is the Worklist query message sent to the Order Filler.

8.5.1 Trigger Events

The specimen arrives at the Acquisition Modality for a procedure.

8.5.2 Message Semantics

The Acquisition Modality uses the C-FIND Request of the DICOM Modality Worklist SOP Class to query for the worklist from the DSS/Order Filler. The Acquisition Modality performs the SCU role and the Order Filler the SCP role.

Acquisition Modalities shall support individually each one of the required query keys listed in Table 6.3 - Matching and Return Keys for Modality Worklist. In addition, at least one of the following two combinations of keys shall be supported by the Acquisition Modality:

1. The Patient Based Query: query for a worklist specific for a particular patient or a particular specimen. The SCU shall support all (15) combinations of the matching key attributes listed in table 1.5-1 by including 1 or more keys.

Table 8-1: MWL keys for Query by Patient.

Matching Key Attributes	Tag
Patient's Name	(0010,0010)
Patient ID	(0010,0020)
Accession Number	(0008,0050)
Requested Procedure ID	(0040,1001)
Specimen Container Identifier	(0040,x512)
Specimen Identifier	(0040,x551)

2. The Broad Query: query for a broad worklist, based on the scheduled procedures. The schedule of the procedure has been either done when the specimen has been sent

by the prescriber, or done when it has been received by the pathology facility. The SCU shall support all (7) combinations of the matching key attributes listed in table 4.5-2 by including 1 or more keys.

Table 8-2: MWL keys for the board worklist queries.

Matching Key Attributes	Tag
Scheduled Procedure Step Start Date	(0040,0002)
Modality	(0008,0060)
Scheduled Station AE-Title	(0040,0001)

8.5.2.1 Examples for the Use of Matching Key Attributes

- Using the Scheduled Procedure Step Start Date: query for all the procedures in my department that are scheduled for the start date specified.
- Using the Modality key: query for all the procedures that are scheduled on this type of modality (e.g., all GM, SM, XC exams).
- Using AE Title key: query for all the procedures that are scheduled on the modality with the specified AE Title.
- Using the Scheduled Procedure Step Start Date and Modality keys: query for all the VL (GM, SM, XC) procedures that are scheduled for today

Note 1: DICOM defines that dates and times are matched by their meaning, not as literal strings. If an application is concerned about how a single value matching of dates and times is performed by another application, it may consider using range matching instead (e.g. "<today>-<today>"), which is always performed by meaning.

Note 2: Applications are recommended to append a wildcard "", if one was not previously entered by the user, at the end of each component of the structured Patient Name.*

8.5.2.2 Matching Keys and Return Keys for Display

The Modality (GM, SM, XC) is required to query for specific attributes (return keys) that will be inserted into the image objects. The requirements for the attributes in the stored images are defined in sec. Appendix B. There are additional attributes that may be queried for use on the Acquisition Modality but might not be inserted into the composite image object.

Table 8-3 summarizes the matching key requirements and lists the optional and required attributes that may be requested and is expected to be returned in order to make these available to the user at the Acquisition Modality. All display requirements are an addition to the DICOM Standard requirements for the Modality Worklist SOP Class.

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Table 8-3: Return and matching keys for modality worklist.

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)			[IHE-1]	[IHE-2]
>Scheduled Station AE Title	(0040,0001)	R+	R	R+*	R
>Scheduled Procedure Step Start Date	(0040,0002)	R+	R	R+	R
>Scheduled Procedure Step Start Time	(0040,0003)	O	R	R+	R
> Scheduled Procedure Step Location	(0040,0011)	O	O	O	O
>Modality	(0008,0060)	R+	R	R+	R
>Scheduled Performing Physician's Name	(0040,0006)	O	R	O	R
>Scheduled Procedure Step ID	(0040,0009)	O	O	R+*	R
>Scheduled Protocol Code Sequence	(0040,0008)				
>>Code Value	(0008,0100)	O	O	R+*	R
>>Coding Scheme Version	(0008,0103)	O	O	O	O
>>Coding Scheme Designator	(0008,0102)	O	O	R+*	R
>>Code Meaning	(0008,0104)	O	O	R+	R+
>Scheduled Procedure Step Description	(0040,0007)	O	O	R+	R
Scheduled Specimen Sequence	(0040,x500)	[IHE-4]			
>Specimen Container Identifier	(0040,x512)	O	R+	R+*	R+
>Specimen Container Type Code Sequence	(0040,x518)	[IHE-5]			
>>Code Value	(0008,0100)	O	O	R+*	R+
>>Coding Scheme Designator	(0008,0102)	O	O	R+*	R+
>>Coding Scheme Version	(0008,0103)	O	O	O	O
>>Code Meaning	(0008,0104)	O	O	R+	R+
>Specimen Sequence	(0040,0550)	[IHE-6]			
>>Specimen Identifier	(0040,0551)	O	O	R+*	R+
>>Specimen UID	(0040,x554)	O	O	R+*	R+
Requested Procedure					
Requested Procedure Comments	(0040,1400)	O	O	O	O
Requested Procedure Description	(0032,1060)	O	O	R+	R
Requested Procedure Code Sequence	(0032,1064)				
>Code Value	(0008,0100)	O	O	R+*	R
>Coding Scheme Version	(0008,0103)	O	O	O	O
>Coding Scheme Designator	(0008,0102)	O	O	R+*	R
>Code Meaning	(0008,0104)	O	O	R+	R+

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Requested Procedure ID	(0040,1001)	R+ (Note 1)	R+ (Note 1)	R+	R
Names of Intended recipients of results	(0040,1010)	O	O	O	O
Study Instance UID	(0020,000D)	O	O	R+*	R
Referenced Study Sequence	(0008,1110)				
>Referenced SOP Class UID	(0008,1150)	O	O	R+*	R [IHE-3]
>Referenced SOP Instance UID	(0008,1155)	O	O	R+*	R [IHE-3]
Imaging Service Request					
Imaging Service Request Comments	(0040,2400)	O	O	O	O
Accession Number	(0008,0050)	R+ (Note 1)	R+ (Note 1)	R+	R+
Requesting Physician	(0032,1032)	O	O	O	R
Requesting Service	(0032,1033)	R+	R+	R+	R+
Referring Physician's Name	(0008,0090)	O	O	R+	R
Admission ID	(0038,00100	O	O	O	R
Visit Status					
Current Patient Location	(0038,0300)	O	O	O	R
Visit Relationship					
Referenced Patient Sequence	(0008,1120)				
>Referenced SOP Class UID	(0008,1150)	O	O	O	R
>Referenced SOP Instance UID	(0008,1155)	O	O	O	R
Patient Identification					
Patient's Name	(0010,0010)	R+	R	R+	R
Patient ID	(0010,0020)	R+	R	R+	R
Other Patient ID's	(0010,1000)	O	O	O	O
Patient Demographic					
Patients Birth Date	(0010,0030)	O	O	R+	R
Patient's Sex	(0010,0040)	O	O	R+	R
Confidentiality constraint on patient data	(0040,3001)	O	O	O	R
Ethnic Group [IHE-7]	(0010,2160)	O	O	O	O
Patient Comment	(0010,4000)	O	O	O	O
Patient Medical					
Patient State	(0038,0500)	O	O	O	R
Pregnancy Status	(0010,21C0)	O	O	O	R
Medical Alerts	(0010,2000)	O	O	O	R
Additional Patient History	(0010,21B0)	O	O	O	O
Contrast Allergies	(0010,2110)	O	O	O	R
Patient Weight	(0010,1030)	O	O	O	R
Special Needs	(0038,0050)	O	O	O	R

Note 1: The matching performed by the SCP for the Requested Procedure ID and Accession Number attributes shall be single value (SV) matching.

(IHE-1): SCU implementations may choose to obtain the values contained in attributes that are part of the Scheduled Procedure Step sequence in either one of three ways. The first one is to request a universal match on the sequence attribute (zero length attribute). The second one is a universal sequence match (zero length item) for all attributes of the Scheduled Procedure Step sequence. The third one is to request a universal attribute match for selected attributes contained in the Scheduled Procedure Step sequence.

(IHE-2): SCP implementations shall support, per the DICOM Standard, three ways to let the Query SCU obtain the values contained in attributes that are part of the Scheduled Procedure Step sequence. The first one is to support a universal match on the sequence attribute (zero length attribute), and all managed attributes will be returned. The second one is to support a universal sequence match (zero length item) for all attributes of the Scheduled Procedure Step sequence, and all managed attributes will be returned. The third one is to support a universal attribute match for selected attributes contained in the Scheduled Procedure Step sequence, and the managed attributes that were selected will be returned.

(IHE-3): In the Query Modality Worklist provided by an Order Filler, the Referenced Study Sequence shall contain only one item. Furthermore, the Referenced SOP Instance UID contained in the Referenced Study Sequence shall contain the same UID value as the Study Instance UID for a Requested Procedure. This UID value is also conveyed to the Image Manager in the Study UID field of the Procedure Scheduled transaction.

(IHE-4): One or more Items may be returned in this Sequence.

(IHE-5): Only one Item shall be returned in this Sequence. The coded section refinning the specimen identification are detailed in the Sup. 22.

(IHE-6): Zero or more Items may be returned in this Sequence.

(IHE-7): This field is presented as optional, but depending of the regulations, it may be either forbidden (e.g. European Union), or required (e.g. USA), or optional.

Specimen container and specimen code sequence identification and description are described in the DICOM supp 122 DICOM code definitions table.

8.5.3 Expected Actions

The Order Filler performs the query and sends the DICOM Modality Worklist to the Acquisition Modality.

8.6 Receive Scheduled MWL Message

This is the message that the Order Filler sends to the modality as a reply containing DICOM Modality Worklist information.

8.6.1 Trigger Events

The Order Filler had received a query for a MWL.

8.6.2 Message Semantics

C-FIND Response from the DICOM Modality Worklist SOP Class will be used for this message. Some of the attributes queried through the MWL SOP class originate with the Order

Placer, while other attributes are managed internally by the Order Filler. The Order Filler will determine the Requested Procedures needed to fulfill the Order, and decompose the Requested Procedures in Scheduled Procedure Steps, assigning proper Protocol Codes. The DSS/Order Filler shall support the definition of multiple Protocol Codes in a Scheduled Protocol Code Sequence contained in the Scheduled Procedure Steps for any Requested Procedure. Coded Values shall be used to specify exactly what actions are to be performed at the Acquisition Modality. In addition to these Coded Values additional instructions for the technologist may be specified. It is recommended to use the Scheduled Procedure Step Description and the Requested Procedure Description attributes for these additional specific instructions.

Appendix C defines the origin and mappings of the attributes returned in a MWL query.

The details of the C-FIND Response from the DICOM MWL SOP Class are depicted in the previous tables and appendix B. At the time images are being created/generated, these attributes will be stored into the DICOM image instance headers. The Acquisition Modality may need additional information; however this is beyond the scope of this document. Refer to RAD TF-1, Appendix A for a discussion of Accession Number and Procedure ID.

An Order may be cancelled after the corresponding Requested Procedure(s) and Scheduled Procedure Steps have been scheduled, and possibly even after a Performed Procedure Step has been started. In this case the Order Filler shall remove the Scheduled Procedure Steps of the Order from its worklist, and the absence of these Scheduled Procedure Steps in the next C-FIND response to the Acquisition Modality will indicate that the procedure has been cancelled. In this way the technologist recognizes that the previously scheduled steps no longer need to be performed.

It is the responsibility of the Order Filler to ensure that the patient and procedure information is current in the Modality Worklist response. The Order Filler receives patient and procedure updates through Transactions PAT-1, PAT-2 and RAD-12.

8.6.3 Expected Actions

The technologist checks for the existence of the Scheduled Procedure Steps, validates the displayed patient and procedure information, and checks the given instructions.

A: Attribute Consistency between Modality Worklist, Composite IODs and Evidence Documents

This appendix is an integral part of the Pathology IHE Technical Framework. It reflects IHE's adoption of DICOM-defined attribute consistency (Annex J, PS.3.17, since DICOM 2006; before: Annex M, PS3.4). It includes four sections:

- The first section contains the IHE clarifications, additions and a summary of DICOM, PS.3.17, Annex J that relate to *image acquisition*. IHE requires that Modality Actors support the Attribute mapping defined in this table as they implement MWL and various IOD Storage SOP Classes for Transactions PAT-3 and RAD-8. IHE restates or extends some of the DICOM requirements as well as select some of the choices offered or enforce some of the recommendations of DICOM. A few additional IHE recommendations are also specified.
- The second section defines attribute mappings for consistency in DICOM SR-based *evidence objects* generated by the Evidence Creator and Acquisition Modality. The DICOM SR objects are created based on existing images that provide values to be filled into the new evidence documents.
- The third section defines additional IHE requirements for *consistency of DICOM C-FIND Return Key* Attributes.
- The fourth section introduces a *real-world data model* of the entities and their Attributes related to consistency. Readers are advised to use this data model along with the information presented in PAT TF-1: Appendices A to D. This data model is provided only for ease of understanding and does not introduce any additional IHE requirements.

A.1: Image Acquisition Integration-critical Attributes

The tables below describe requirements, recommendations or explanations on integration-critical attributes for image acquisition cases. They define which integration-critical attributes need to be equal (copied or generated locally), in order to correctly relate scheduled and performed procedure steps for the use cases described in PAT TF-1: 4.

General table structure:

- The 1st column denotes the DICOM attributes whose values shall be mapped between the DICOM objects (equal values in the same table row). The DICOM attribute tag is indicated for clarity.
- The 2nd to 4th columns define where attribute values come from: all defined attribute values of one table row are equal.
  These columns read left to right: MWL return values (2nd column), if existing, shall be used as the source for copies to Image/ Standalone IODs.
- The MWL column is omitted if the described case does not include any MWL return values, or to simplify the table.

Cell content conventions:

- "**Source**" in a table cell means that the DICOM object defined in the table column (e.g. MWL) and created by one actor shall be the source of this value for the DICOM attribute for *another* actor to fill in this value for their own objects (e.g. Image).

- "**Copy**" in a table cell means that the value shall be copied from a corresponding source attribute of another DICOM object, as defined by the table column.
- "**Copy from: <DICOM attribute>**" means that, instead of using the DICOM attribute of the same row as the source, the source as specified in the referenced DICOM attribute shall be used.
- "**Equal**" in a table cell means that an actor already knows the value, e.g. from some previously performed action. Thus, the circumstances of value generation do not matter.
- "**Equal (internally generated)**" in a table cell means that an actor has internally generated a value that may be used in more than one DICOM object, without having obtained this value from another actor (i.e. no copy).
- "**Equal (copied from MWL)**" in a table cell means that the actor shall use a value that it already knows from an MWL query result obtained for the same SPS in the append case.
- "**Source-1**", "**Copy-1**" or "**Equal-1**" etc. are corresponding mapping attribute values, if several sources appear in one table row.
- "**See (IHE-X)**" in a table cell denotes additional requirements, recommendations or explanations for the attribute value, as described in the table's note "(IHE-X)". Otherwise, brief text that fits into a table cell is presented in the cell.
- "**n.a.**" in a table cell means that such an attribute or value shall not exist. Either the attribute is not defined by the DICOM standard for this object, or the particular sequence attribute is a DICOM type 3 attribute, and DICOM requires at least one sequence item to be present.

Actor behavior:

- An attribute from the column "Modality Worklist" shall be requested by a MWL SCU (Acquisition Modality) as a return key in its C-FIND Requests. The Order Filler shall return attribute values in the Modality Worklist C-FIND response (for a complete description, see

Table 8-3).

- The MWL return attribute values, if available as a source, shall be used by the Acquisition Modality in filling the attribute shown on the corresponding rows both for Composite Instances and MPPS Instances.
- If the MWL value is not existing ("n.a."), then the Modality shall generate certain values internally.

Table A.1-1: Simple Case – required mapping of corresponding attributes.

In the simple normal case, a Procedure Step is performed

- exactly as scheduled, or
- different than scheduled, but without being rescheduled.

DICOM attribute	Modality Worklist (return attribute values)	Image/ Standalone IOD
Study Instance UID (0020,000D)	Source	Copy
Referenced Study Sequence (0008,1110)	Source	Copy
Accession number (0008,0050)	Source	Copy See (IHE-B.1.1)
Requested Procedure ID (0040,1001)	Source	**Request Attributes Sequence** (0040,0275): Copy
Requested Procedure Description (0032,1060)	Source	**Request Attributes Sequence** (0040,0275): Copy Note: extended attribute
Scheduled Procedure Step ID (0040,0009)	Source	**Request Attributes Sequence** (0040,0275): Copy
Scheduled Procedure Step Description (0040,0007)	Source	**Request Attributes Sequence** (0040,0275): Copy
Scheduled Protocol Code Sequence (0040,0008)	Source	**Request Attributes Sequence** (0040,0275): Copy
Performed Protocol Code Sequence (0040,0260)	n.a.	Equal (internally generated). Recommendation: Absent if the value is not known.
Study ID (0020,0010)	n.a.	Equal (internally generated). Recommendation: use Requested Procedure ID.
Performed Procedure Step ID (0040,0253)	n.a.	Equal (internally generated). See (IHE-B.1.2)
Performed Procedure Step Start Date (0040,0244)	n.a.	Equal (internally generated). Recommendation: use

DICOM attribute	Modality Worklist (return attribute values)	Image/ Standalone IOD	
		the same value for Study Date.	
Performed Procedure Step Start Time (0040,0245)	n.a.	Equal (internally generated). Recommendation: use the same value for Study Time.	
Performed Procedure Step Description (0040,0254)	n.a.	Equal (internally generated). Recommendation: use the same value for Study Description.	
Requested Procedure Code Sequence (0032,1064)	Value shall be used for Procedure Code Sequence as specified below.	n.a.	
Procedure Code Sequence (0008,1032)	n.a.	Copy from: Requested Procedure Code Sequence (0032,1064).- Recommendation: absent, if empty in MWL or performed acquisition is different to what was scheduled.	
Referenced SOP Class UID (0008,1150)	n.a.	**Referenced PPS Sequence**	1.2.840.10008.3.1.2.3.3
Referenced SOP Instance UID (0008,1155)	n.a.		Equal to SOP Instance of the associated MPPS. See (IHE-B.1.3)
Protocol Name (0018,1030)	n.a.	Recommendation: equal (internally generated)	

(IHE-B.1.1) A Zero Length Accession Number (One of the options proposed by DICOM PS3.17 Annex J) shall be created when no reliable value for this attribute is available. Reliable values are those that can be conveyed by means other than manual data entry such as a value received from the Order Filler via a Modality Worklist including an Accession Number or received through a bar code reader.

(IHE-B.1.2) Performed Procedure Step ID is generated by the modality arbitrarily and is not necessarily unique: Two different Performed Procedure Steps may share the same ID (e.g. may have been generated by different modalities). This ID may not enable a receiving system to reliably relate the PPS to the associated Requested Procedure and SPS. It is not reliable to assume that two PPSs with the same PPS ID value fulfill the same SPS/Requested Procedure, without checking the content of Scheduled Attributes Step Sequence.

(IHE-B.1.3) In MPPS, SOP Instance UID is sent in the Affected SOP Instance UID (0000,1000) of the PPS N-Create message and in Requested SOP Instance UID (0000,1001) for the PPS N-Set message. SOP Instance UID (0008,0018) shall not be used.

Table A.1-2: Append to a Simple/ Normal Case - required mapping of corresponding attributes.

Similar to the simple case, the first PPS is generated in response to an SPS. Other PPSes are added at a later time, for instance due to unacceptable quality of certain images.

DICOM attribute	Filling values for:	
	Original Image/ Standalone IOD	Append Image/ Stand-alone IOD
Study Instance UID (0020,000D)	Equal (copied from MWL)	Equal (copied from MWL)
Referenced Study Sequence (0008,1110)	Equal (copied from MWL)	Equal (copied from MWL)
Accession number (0008,0050)	Equal (copied from MWL). See (IHE-B.2.1).	Equal (copied from MWL). See (IHE-B.2.1).
Requested Procedure ID (0040,1001)	**Request Attributes Sequence** (0040,0275): Equal (copied from MWL)	**Request Attributes Sequence** (0040,0275): Equal (copied from MWL)
Requested Procedure Description (0032,1060)	Equal (copied from MWL)	Equal (copied from MWL)
Scheduled Procedure Step ID (0040,0009)	Equal (copied from MWL)	Equal (copied from MWL)
Scheduled Procedure Step Description (0040,0007)	Equal (copied from MWL)	Equal (copied from MWL)
Scheduled Protocol Code Sequence (0040,0008)	Equal (copied from MWL)	Equal (copied from MWL)
Performed Protocol	Note: Values may	Equal (internally

DICOM attribute	Filling values for:	
	Original Image/ Standalone IOD	Append Image/ Stand-alone IOD
Code Sequence (0040,0260)	not be relevant for the appended image and associated MPPS, e.g. due to adding images from an adjacent body region or from doing measurements.	generated). Recommendation: Absent if the value is not known.
Study ID (0020,0010)	Equal (internally generated) Recommendation: use Requested Procedure ID.	Equal (internally generated) Recommendation: use Requested Procedure ID.
Performed Procedure Step ID (0040,0253)	Note: Values not relevant for the appended image and associated MPPS.	Equal (internally generated). See (IHE-B.2.2)
Performed Procedure Step Start Date (0040,0244)	Note: Values not relevant for the appended image and associated MPPS.	Equal (internally generated). See (IHE-B.2.3)
Performed Procedure Step Start Time (0040,0245)	Note: Values not relevant for the appended image and associated MPPS.	Equal (internally generated). See (IHE-B.2.3)
Performed Procedure Step Description (0040,0254)	Note: Values not relevant for the appended image and associated MPPS.	Equal (internally generated). See (IHE-B.2.3)
Requested Procedure Code Sequence (0032,1064)	n.a.	n.a.
Procedure Code Sequence (0008,1032)	Equal. Note: May be absent (see Table B.1-1)	Equal. If absent in original image, shall be absent here. Recommendation: absent, if performed acquisition is different from the original image's procedure.
Referenced SOP Class UID (0008,1150)	**ced PPS Se-quence** (0008,1 Note: Values not relevant	**Refere nced PPS Se-** 1.2.840.10008.3.1.2.3.3

DICOM attribute	Filling values for:	
	Original Image/ Standalone IOD	Append Image/ Stand-alone IOD
Referenced SOP Instance UID (0008,1155)	for the appended image.	Equal to SOP Instance of the associated MPPS when exists.
Protocol Name (0018,1030)	Note: Values not relevant for the appended image.	Recommendation: equal (internally generated).

(IHE-B.2.1) A Zero Length Accession Number (One of the options proposed by DICOM PS3.17 Annex J) needs to be created when no reliable value for this attribute is available. Reliable values are those that can be conveyed by means other than manual data entry such as a value received from the Order Filler via a Modality Worklist including an Accession Number or received through a bar code reader.

(IHE-B.2.2) Performed Procedure Step ID is generated by the modality arbitrarily and is not necessarily unique: Two different Performed Procedure Steps may share the same ID (e.g. may have been generated by different modalities). This ID may not enable a receiving system to reliably relate the PPS to the associated Requested Procedure and SPS. It is not reliable to assume that two PPSs with the same PPS ID value fulfill the same SPS/Requested Procedure, without checking the content of Scheduled Attributes Step Sequence.

(IHE-B.2.3) In the Image IODs created in Append Case, the Study Date, Study Time and Study Description shall re-use the corresponding values from the original images to which they are appended.

A.2: Evidence Documents Integration - critical Attributes

The table in this section is analogous to the tables in the previous section, where the Acquisition Modality uses certain attributes from the Modality Worklist in order to fill in related image values in a consistent manner. Similarly, the Evidence Creator or Acquisition Modality in the Evidence Documents Integration Profile, which do not get a Modality Worklist, use relevant data from images that originate from a scheduled acquisition as input for consistently filling in corresponding values in DICOM SR Evidence Documents.

Note: In the Pathology Scheduled Workflow Integration Profile, the Evidence Creator creates images. This case can be considered an image acquisition append case (see table B.1-2).

General table structure:

- The 1st column denotes the DICOM attributes whose values shall be mapped between the DICOM objects (equal values in the same table row). The DICOM attribute tag is indicated for clarity.
- The 2nd and 3rd columns define for each attribute how the attribute values are filled for the different IODs.

These columns read left to right within the same row: Image/ Standalone IOD (2nd column) shall be used as the source for copies to Evidence Documents (DICOM SR IOD).

Cell content conventions:

- These are the same as defined in the corresponding paragraph of B.1.

Actor behavior:

- The values from the Image/ Standalone IOD, if available as a source, shall be used by the Evidence Creator or Acquisition Modality to fill in the attribute shown on the corresponding rows for Evidence Document instances.

Table A.2-1: Evidence Document attribute mapping.

This table defines how to use values from Image or Standalone IODs that were previously generated by a *different* actor in order to fill in values into newly generated Evidence Documents created by an Evidence Creator or Acquisition Modality in the Evidence Documents Integration Profile.

Note that this mapping table is most relevant for cases where evidence is created based on images that originate from a scheduled acquisition, otherwise most of the workflow integration-critical attributes will be absent or empty in the originating Image/ Standalone IODs.

<table>
<tr><th>DICOM attribute</th><th colspan="2">Image/ Standalone IOD</th><th colspan="2">Filling values for Evidence Documents</th></tr>
<tr><td>Study Instance UID (0020,000D)</td><td colspan="2">Source</td><td colspan="2">Copy
(IHE-B.2-1.1)</td></tr>
<tr><td>Referenced Study Sequence (0008,1110)</td><td colspan="2">Source.
(IHE-B.2-1.2)</td><td colspan="2">Copy, if not absent in Image/ Standalone IOD.
(IHE-B.2-1.1)</td></tr>
<tr><td>Accession number (0008,0050)</td><td colspan="2">Source</td><td colspan="2">Copy
(IHE-B.2-1.1)</td></tr>
<tr><td>Requested Procedure ID (0040,1001)</td><td rowspan="3">Request Attributes Sequence (0040,0275)</td><td>Source (IHE-B.2-1.2)</td><td rowspan="3">Referenced Request Sequence (0040,A370)</td><td>Copy, if not absent in Image/ Standalone IOD.</td></tr>
<tr><td>Requested Procedure Description (0032,1060)</td><td>Source (IHE-B.2-1.2)</td><td>Copy, if not absent in Image/ Standalone IOD.</td></tr>
<tr><td>Requested Procedure Code Sequence (0032,1064)</td><td>Source (IHE-B.2-1.2)</td><td>Copy, if not absent in Image/ Standalone IOD.</td></tr>
<tr><td>Procedure Code Sequence (0008,1032)</td><td colspan="2">Source.
Note: May be absent.</td><td colspan="2">Recommendation:
Copy, if not absent in Image/ Standalone IOD.</td></tr>
</table>

(IHE-B.2-1.1) If the creation of evidence relates to a Requested Procedure, it is required per DICOM to also fill this information in the Referenced Request Sequence (0040,A370).

(IHE-B.2-1.2) May be absent in case of an unscheduled image acquisition.

A.3: Context-critical Attributes

This section extends the above table with additional IHE Requirements based on a number of context-critical attributes (Type 2 in DICOM) common to most images and standalone IODs when provided in response to a C-FIND Request in Return Key Attributes. The content of this table is strictly consistent with PS 3.17 Annex J of DICOM.

Modality Worklist	Images and Standalone IOD
Patient Name	Patient Name (note 1)
Patient ID	Patient ID (note 1)
Patient's Birth Date	Patient's Birth Date (note 2)
Patient's Sex	Patient's Sex (note 2)
Referring Physician's Name	Referring Physician's Name (note 2)
Specimen ID	Specimen ID

Note 1: This Attribute may be zero length when the Order Filler/Order Filler providing the Modality Worklist service is not accessible. Pre-registered values for Patient ID and Patient Name will be used in the Unidentified Patient cases defined in the IHE Technical Framework.

Note 2: This Attribute may be zero length when the Order Filler/Order Filler providing Modality Worklist service is not accessible or the Attributes returned by MWL are zero length.

A.4: Consistency Data Model

The section introduces a data model of the entities and their Attributes related to Consistency. Readers are advised to use this data model along with the table presented in section 1 of this appendix. This data model is provided only for ease of understanding and does not introduce any additional IHE requirements.

Entities are shown by solid line rectangular boxes.

A relationship between two entities is shown by an arrow or a straight line. In the case of straight lines the Attributes used to define this relationship are not described by this model (they are generally well understood). In the case an arrow is used:

- The attribute in the referencing entity used to define this relationship is shown within the entity in a box next to the origin of the arrow (e.g. Ref. St. Seq. in the Requested Procedure Entity is used to link this entity with the Conceptual Study Management entity).
- The referenced attribute is shown at the tip of the arrow also in a rectangular box but with curly brackets (e.g. {Study Instance UID}). In some cases the referencing Attribute has a different name than this referenced Attribute. This reflects the way DICOM has elected to name and or encode those Attributes. The number shown between square brackets is the Data Type as defined by DICOM.

The cardinality of relationship is defined both along straight lines and arrows:

- Cardinality of the relationship between the entities is shown along the arrow/lines. The direction of the arrow has no influence on the cardinality definition. This

cardinality reflects the cardinality between entities in a real-world data model (used as defined by DICOM). This cardinality may be slightly different in the DICOM Information Object Definition data models as this data-model reflects entity relationship supported in the context of information communication. For example "I-Series to I-Composite" has a 1 to 0-n relationship to reflect that a PPS may contain a series with no Composite Instances (e.g. images). However in the context of the DICOM Storage Service Class, a Series must contain at least one Composite Instance (e.g. image). In other terms series with no images cannot be stored but can be defined by DICOM Performed Procedure Steps.

Arrows with thick lines reflect the fact that the referencing Attributes are UID (broad uniqueness), as opposed to simple IDs, which are shown by thin line arrows.

In this Data Model, two dotted-line boxes are shown:

- The first one groups 4 entities: I-Patient, I-Study, I-Series, and I-Composite. This is intended to reflect the fact that Composite Instances are transferred (Storage Service Class) by grouping these four entities. These 4 entities are those defined by DICOM Composite Image Information Model (See PS 3.3, section A.1.2)
- The second one groups 2 entities: Requested Procedure and Conceptual Study Management. This reflects that those two entities are always in a one-to-one relationship. The Requested Procedure entity as well as those associated with it (Patient, Imaging Service Request, Schedule Procedure Step and Performed Procedure Step) are defined by the DICOM Model of the Real World for the purpose of the Modality-IS Interface (See PS3.3, section 7.3). The "Conceptual Study Management" entity is special in that its only attribute in the context of this version of the IHE Technical Framework is the Referenced SOP Instance UID (found in Reference Study Sequence). This Conceptual Study Detached Study entity (without the Detached Management Study SOP Class being used) is defined by DICOM in PS3.4 section M.2.

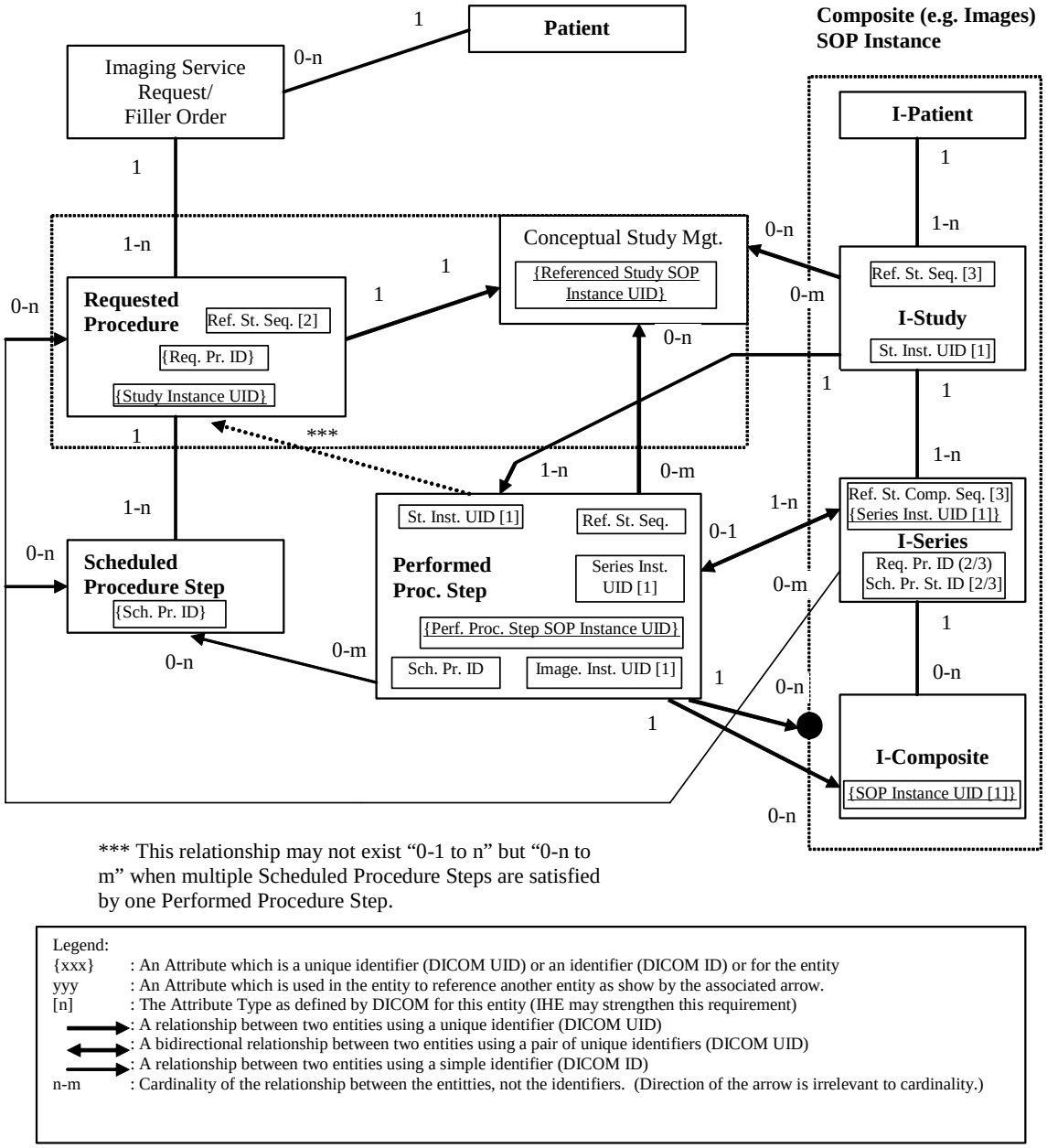

Figure A-1. Data Consistency Model: Modality Worklist Information Model, Composite IODs and Modality Performed Procedure Step IOD.

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B: HL7 Order Mapping to DICOM MWL

This appendix defines the mapping of the HL7 ADT and OML messages to the DICOM Modality Worklist. Note that the HL7 messages address information regarding the order, not scheduling or resource management information. The scheduling and resource management is internal to the Order Filler.

Note also that this mapping does not apply to Procedure Scheduled Transaction (message from Order Scheduler to Image Manager). Also see the IHE ER Model and the HL7 Implementation Notes in section 2 for a more thorough definition of field lengths, value representations, and attribute types. See paragraph **Erreur ! Source du renvoi introuvable.** for the Procedure Scheduled and Update transaction description.

Mappings between HL7 and DICOM are illustrated in the following manner:

- Element Name (HL7 item_number.component #/ DICOM (group, element))
- The component value is not listed if the HL7 element does not contain multiple components.

Table B-1: HL7 Order mapping to DICOM MWL.

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 Item #	HL7 Segment	Notes
SOP Common							
Specific Character Set	(0008,0005)	O	1C	Principal Language of Message	00693	OML MSH:18	
Scheduled Procedure Step							
Scheduled Procedure Step Sequence	(0040,0100)	R	1				
>Scheduled station AE title	(0040,0001)	R	1				Generated by the Order Filler
>Scheduled Procedure Step Start Date	(0040,0002)	R	1				Generated by the Order Filler
>Scheduled Procedure Step Start Time	(0040,0003)	R	1				Generated by the Order Filler
>Modality	(0008,0060)	R	1				Generated by the Order Filler (note 3)
>Scheduled Performing	(0040,0006)	R	2	Technician	00266	OML OBR:34	See note 9

Physician's Name							
>Scheduled Procedure Step Description	(0040,0007)	O	1C				Generated by the Order Filler
>Scheduled Station Name	(0040,0010)	O	2				Generated by the Order Filler
>Scheduled Procedure Step Location	(0040,0011)	O	2				Generated by the Order Filler
>Scheduled Protocol Code Sequence	(0040,0008)	O	1C				
>>Code Value	(0008,0100)	O	1C				Generated by the Order Filler
>>Coding Scheme Designator	(0008,0102)	O	1C				Generated by the Order Filler
>>Code Meaning	(0008,0104)	O	3				Generated by the Order Filler
>Pre-Medication	(0040,0012)	O	2C				
>Scheduled Procedure Step ID	(0040,0009)	O	1	N/A			Generated by the Order Filler
>Requested Contrast Agent	(0032,1070)	O	2C	N/A			Generated by the Order Filler
>Scheduled Procedure Step Status	(0040,0020)	O	3	N/A			Generated by the Order Filler
>All other Attributes from the Scheduled Procedure Step Module		O	3				
Scheduled Specimen Sequence							
Requested Procedure							
Requested Procedure ID	(0040,1001)	O	1				Generated by the Order Filler
Requested Procedure Description	(0032,1060)	O	1C				Generated by the Order Filler. See

							note 1
Requested Procedure Code Sequence	(0032,1064)	O	1C				
>Code Value	(0008,0100)	O	1C				Generated by the Order Filler. See note 1
>Coding Scheme Designator	(0008,0102)	O	1C				Generated by the Order Filler. See note 1
>Code Meaning	(0008,0104)	O	3				Generated by the Order Filler. See note 1
Study Instance UID	(0020,000D)	O	1				Generated by the Order Filler
Referenced Study Sequence	(0008,1110)	O	2				
>Referenced SOP Class UID	(0008,1150)	O	1C				
>Referenced SOP Instance UID	(0008,1155)	O	1C				
Requested Procedure Priority	(0040,1003)	O	2	Quantity/ Timing	00221.6	OML ORC:7	See note 2
Patient Transport Arrangements	(0040,1004)	O	2	Transport Arrangement Response.	01031.1-3	OML OBR:30	
All other Attributes from the Requested Procedure Module		O	3				
Imaging Service Request							
Accession Number	(0008,0050)	O	2				Generated by the Order Filler
Requesting Physician	(0032,1032)	O	2	Ordering Provider	00226.1-7	OML OBR:16	
Referring Physician's Name	(0008,0090)	O	2	Referring Doctor	00138.1-7	OML PV1:8	
Placer Issuer and Number	(0040,2016)	O	2	Placer Order #	00216.1-2	OML ORC:2	See note 4

Filler Issuer and Number	(0040,2017)	O	2	Filler Order #	00217.1-2	OML ORC:3	See note 4
Reason for Imaging Service Request	(0040,2001)	O	2	Reason for Study	00263	OML OBR:31	
Entered by….	(0040,2008)	O	3	Entered by….	00224.2-6	OML ORC:10	
Order Entering Location	(0040,2009)	O	3	Entering Organization	00231.2	OML ORC:17	
Order Callback Phone Number	(0040,2010)	O	3	Order Callback Phone Number	00228	OML ORC:14	
All other Attributes from the Scheduled Procedure Step Module		O	3				
Visit Identification							
Admission ID	(0038,0010)	O	2	Patient Account Number or Visit Number	00121.1 or 00149.1	OML PID: 18 or PV1:19	See note 6
Issuer of Admission ID	(0038,0011)	O	2	Patient Account Number or Visit Number	00121.4 or 00149.4	OML PID:18 or PV1-19	See note 6
All other Attributes from the Visit Identification Module		O	3				
Visit Status							
Current Patient Location	(0038,0300)	O	2	Assigned Pat. Loc.	00133	OML PV1:3	
All other Attributes from the Visit Status Module		O	3				
Visit Relationship							
Referenced Patient Sequence	(0008,1120)	O	2				
>Referenced SOP Class UID	(0008,1150)	O	2				
>Referenced SOP Instance UID	(0008,1155)	O	2				

All other Attributes from the Visit Relationship Module		O	3				
Visit Admission							
All Attributes from the Visit Admission Module		O	3				
Patient Relationship							
All Attributes from the Patient Relationship Module		O	3				
Patient Identification							
Patient's Name	(0010,0010)	R	1	Patient Name	00108	OML PID:5	See note 10
Patient ID	(0010,0020)	R	1	External Patient ID	00105.1	OML PID:2	See note 5
Issuer of Patient ID	(0010,0021)	O	3	External Patient ID	00105.4	OML PID:2	See note 5
Ethnic Group	(0010,2160)	O	3	Ethnic Group	00125	OML PID:22	
All other Attributes from the Patient Identification Module		O	3				
Patient Demographic							
Patients Birth Date	(0010,0030)	O	2	Date/ Time of Birth	00110.1	OML PID:7	
Patient's Sex	(0010,0040)	O	2	Sex	00111	OML PID:8	See Note 11
Patient's Weight	(0010,1030)	O	2	Observation Value	00573 when 00571.2 = "Body Weight" and 00574.1 = "kg"	ADT OBX:5	See note 7
Patient's Size	(0010,1020)	O	2	Observation Value	00573 when 00571.2 = "Body Height"	ADT OBX:5	See note 7

					and 00574.1 = "m"		
Confidentiality constraint on patient data	(0040,3001)	O	2	VIP Indicator	146	OML PV1:16	
Region of Residence	(0010,2152)	O	3	Citizenship	00129	OML PID:26	
Military Rank	(0010,1080)	O	3	Veterans Military Status	00130	OML PID:27	
All other Attributes from the Patient Demographic Module		O	3				
Patient Medical							
Patient State	(0038,0500)	O	2	Danger Code	00246	OML OBR:12	
Pregnancy Status	(0010,21C0)	O	2	Ambulatory Status	00145	OML PV1:15	"B6" must be mapped to DICOM enumerated value "3" (definitely pregnant).
Medical Alerts	(0010,2000)	O	2	Relevant Clinical Info	00247	OML OBR:13	
Contrast Allergies	(0010,2110)	O	2	Allergy Code	00205	ADT AL1:3	
Special Needs	(0038,0050)	O	2				
All other Attributes from the Patient Medical Module		O	3				

Adapted from DICOM PS 3.4

Note 1: Universal Service ID and Specimen Source decoding:

In order to fulfill an accepted order, the Order Filler generates one or more Requested procedures, to which it assigns IDs and proper codes, taken from either local or universal coding scheme (such as CPT-4 or LOINC)".

If laterality is not specified in the Universal Service ID then it is recommended to use Specimen Source (00249) to further clarify the free format text descriptions of the Order.

Note 2: Only the suggested values of the HL7 Priority component of Quantity/Timing shall be used for IHE. These values shall be mapped to the DICOM enumerated fields for Priority as:

HL7 Status	DICOM Status
S - STAT	STAT
A - ASAP	HIGH
R - Routine	ROUTINE
P - Pre-op	HIGH
C - Callback	HIGH
T - Timing	MEDIUM

Note 3: Order Filler/Order Filler shall determine the value of DICOM Modality (0008,0060) attribute based on the content of the order. The DICOM defined terms must be used for the MWL response as listed in DICOM PS 3.3.

Note 4: Attributes (0040,2016) and (0040, 2017) are designed to incorporate the HL7 components of Placer Issuer and Number, and Filler Issuer and Number. In a healthcare enterprise with multiple issuers of patient identifiers, both the issuer name and number are required to guarantee uniqueness.

Note 5: As discussed in sec. 4.1.4.1.2.4, either field PID-18 Patient Account Number or field PV1-19 Visit Number or both may be valued depending on the specific national requirements. Whenever field PV1-19 Visit Number in an order message is valued, its components shall be used to populate Admission ID (0038,0010) and Issuer of Admission ID (0038,0011) attributes in the MWL responses. In the case where field PV1-19 Visit Number is not valued, these attributes shall be valued from components of field PID-18 Patient Account Number. This requires that Visit Numbers be unique across all account numbers.

Note 6: Patient's Weight and Patient's Size are two observations from multiple OBX segments. A coding scheme is not specified by IHE, but rather, the text values of "Body Weight" and "Body Height", respectively, are required to differentiate the two measurements. Note that DICOM specifies the use of "kg" and "m", respectively, for these measurements. An example of this HL7 encoding is:

OBX||ST|^BODY WEIGHT||62|kg|||||F

OBX||ST|^BODY HEIGHT||1.90|m|||||F

Note 7: The DICOM attribute (0038, 0050) Special Needs is listed in table D-1 with no specific mapping from an HL7 message. In the IHE demonstration, this value is to be provided by the DSS/Order Filler. The prospect of mapping this attribute to an HL7 value will be examined in the future.

Note 8: Field OBR-34 *Technician* in OML message is repeatable. Its data type is CM, with the following components: <name (CN)> ^ <start date/time (TS)> ^ <end date/time (TS)> ^ <point of care (IS)> ^ <room (IS)> ^ <bed (IS)> ^ <facility (HD)> ^ <location status (IS)> ^ <patient location type (IS)> ^ <building (IS)> ^ <floor (IS)>

Thus, in mapping value to the DICOM attribute Scheduled Performing Physician (0040,0006), only sub-components of the first component of the first repetition of that field shall be used.

Note 9: The encoding of the patient's name in the HL7 OML PID:5 components is mapped without changes into the DICOM components in the Patient's Name (0010,0010) attribute as follows:

HL7 DICOM

<family_name&last_name_prefix>	=>	<family_name_complex>
<given_name>	=>	<given_name_complex>
<middle_initial_or_name>	=>	<middle_name>
<suffix><degree>	=>	<name_suffix>
<prefix>	=>	<name_prefix>

The HL7 “degree” component is absorbed as a second element in the “name_suffix” component in DICOM.

Note 10: The DICOM Patient’s Sex (0010,0040) attribute can have only the values M, F or O (for other), or be zero length if unknown. These are enumerated values and hence any other values would be illegal. The HL7 V2.5 description also uses M, F and O, but suggests a value of U for unknown, which needs to be mapped to zero length. In HL7 these are only suggested values however, and care should be taken to map any other values encountered to valid DICOM values. Note also that in HL7 V2.5.1, the additional suggested values of A meaning Ambiguous and N meaning Not applicable, are present, and again, these would be illegal in DICOM and need to be mapped to O.