Kingdom of Saudi Arabia
Ministry of Health

National eHealth Strategy and Change Management Office
(SCMO)

Enabling Standards-Based eHealth Interoperability

IS0006
Saudi eHealth Core Interoperability Specification for
Tele-radiology Orders

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Document Revision History

Version	Date	Type of update	Prepared
1.0	February 22, 2015	First release	eHealth Strategy Management Office – eHealth Standards Department

1. INTRODUCTION

1.1 DOCUMENT PURPOSE

The purpose of this document is to address the Saudi eHealth Core Interoperability Specification for Tele-radiology Orders. It forms a set of requirements that complements the set of HL7 and SNOMED Standards required by this specification with Saudi eHealth specific constraints. It also aligns with the Saudi e-Government Interoperability Standards (YEFI) to expedite national adoption.

This Core Interoperability Specification is applicable to existing and new information systems to be connected to the national Saudi eHealth Exchange (SeHE) platform.

1.2 DESCRIPTION

This Core Interoperability Specification establishes the submission of a Tele-radiology Order to a remote Tele-radiology Service via the SeHE System. Orders are created by Health IT systems (e.g. hospital RIS/PACS or National RIS/PACS) that manage the fulfillment of an imaging procedure ordered for local patients (such as within a hospital). However, since no radiologists are available to perform the reading of the acquired imaging study, a Tele-radiology Order is issued.

The images acquired need to have been communicated for performing a diagnosis by the Tele-radiology Service. A radiologist working with the Tele-radiology Service reads the images and creates an imaging report and publishes it on the SeHE Document Repository. Then the Tele-radiology Service updates the order to the status "completed" and transmits the order completed message to the source of the Tele-radiology Order (e.g. hospital RIS/PACS or National RIS/PACS).

The images and reports resulting from tele-radiology are made accessible via the actors/services defined in the Saudi eHealth Core Interoperability Specification for the Sharing Images and Imaging Reports document. This sharing of images and reports is used by performers of Tele-radiology Orders as well as other healthcare providers interested in imaging studies and reports such as submitters of Tele-radiology Orders and primary health care physician.

1.3 SCOPE

In Scope:

The scope of this document is the specification of how various Healthcare Provider and/or Organization Heath IT systems order tele-radiology services for generating imaging reports. This specification supports the Saudi eHealth Tele-radiology Orders Use Case.

The following topics are in scope for this Interoperability Specification:

- Use of HL7 V2.5.1 Imaging Order Message (OMI) to create and manage Tele-radiology Orders for remote interpretation.

Out of Scope:

The following is a list of content and specifications that are specifically out of scope for this Interoperability Specification:

- Local Healthcare Provider and/or Organization imaging workflow (i.e., imaging orders, imaging acquisition, etc.) is outside the scope of this Interoperability Specification.

- The interface for sending the acquired patient images (i.e. DICOM Storage Service) to the Tele-radiology Service is outside the scope of the Core Interoperability Specification.

- The way the creation of a Tele-radiology Order is integrated with a local or national RIS/PACS workflow is outside the scope of this Core Interoperability Specification.

- The workflow for generating the report by the Tele-radiology Service is outside the scope of this Core Interoperability Specification.

- How local Health IT systems reconcile their local patient IDs and local imaging coded data elements (such as radiology imaging procedure codes, accession numbers, etc.) with the KSA-Wide codes and identifiers are outside the scope of this Interoperability Specification.

1.4 METHODOLOGY

This Interoperability Specification has been developed with input from various Saudi stakeholders collected during several months through workshops and teleconferences.

The development of a Core Interoperability Specification relies on the high-level requirements set by the associated use case. These high-level requirements are not restated in this specification and readers may consider reviewing the related Use Case document.

1.5 HOW TO READ THIS DOCUMENT

1.5.1 Where to Find Information

This document contains four normative sections, as well as informative appendices for the reader's convenience. The document is structured as follows:

Section 1: Contains an introduction to the Interoperability Specification (IS). This section contains a summary of the IS purpose and scope, as well as other content to help orient the first time reader to the topic of the IS and how it relates to other specifications in the SeHE System.

Section 2: Summarizes the use case, including design constraints and assumptions and the flows of information that will be specified in this IS. Section 2 also introduces scenarios that describe how the specified flows may be used in the Saudi eHealth context.

Section 3: Establishes the Core Interoperability Requirements for the Interoperability Specification.

Section 4: Establishes the Conformance Requirements for the Interoperability Specification.

Section 5: Establishes the Saudi eHealth Constraints on the HL7 V2.5.1 Imaging Order Message (OMI) used for the Tele-radiology order.

Section 6: Lists the Saudi eHealth reference documents, as well as the international standards which underpin the Interoperability Specification.
Appendix A: Provides a HL7 V2.5.1 OMI sample message.

1.5.2   Related Documents

The Saudi eHealth Core Interoperability Specification (IS) is the sole entry point for the technology developers, the compliance assessment testing and certification, and the purchaser of IT systems in term of technical requirements.

It references a number of supporting Interoperability Specifications:

- IS0001 *Saudi eHealth Core Interoperability Specification for KSA-Wide Patient Demographic Query*
- IS0005 *Saudi eHealth Core Interoperability Speciation for the Sharing of Images and Imaging Report*
- IS0101 *Saudi eHealth Security and Privacy Interoperability Specification*
- IS0102 *Saudi eHealth Document Sharing Interoperability Specification*
- IS0200 Saudi eHealth Terminology Repository.

The above Saudi eHealth Interoperability Specifications include precise references to internationally adopted profiles and standards as well as Saudi specific constraints.

This document fits into an overall specification framework described in

Related Core Interoperability Specifications	Interoperability Use Case
Saudi eHealth Core Interoperability Specification for KSA-Wide Patient Demographics Query	*Saudi eHealth Tele-Radiology Orders Use Case*

Interoperability Specifications	
Saudi eHealth Terminology Repository	

Interoperability Specifications	Core Interoperability Specifications
Sharing Images and Imaging Reports	*Saudi eHealth Core Interoperability Specification for Tele-radiology Orders*

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1-n

Interoperability Specifications
Saudi eHealth Document Sharing

Interoperability Specifications
Saudi eHealth Security and Privacy

Implementation Conformance Statement
Products conform to Use Case Actors For Tele-radiology Orders

Figure 1.5.2-1 Tele-radiology Order Document Organization. Further descriptions and references for the documents identified above are provided in Section 6.

Implementations are required to conform to the requirements stated in Section 4 within this Core Interoperability Specification, including all other referenced Saudi eHealth Interoperability Specifications, and the standards and profiles they specify.
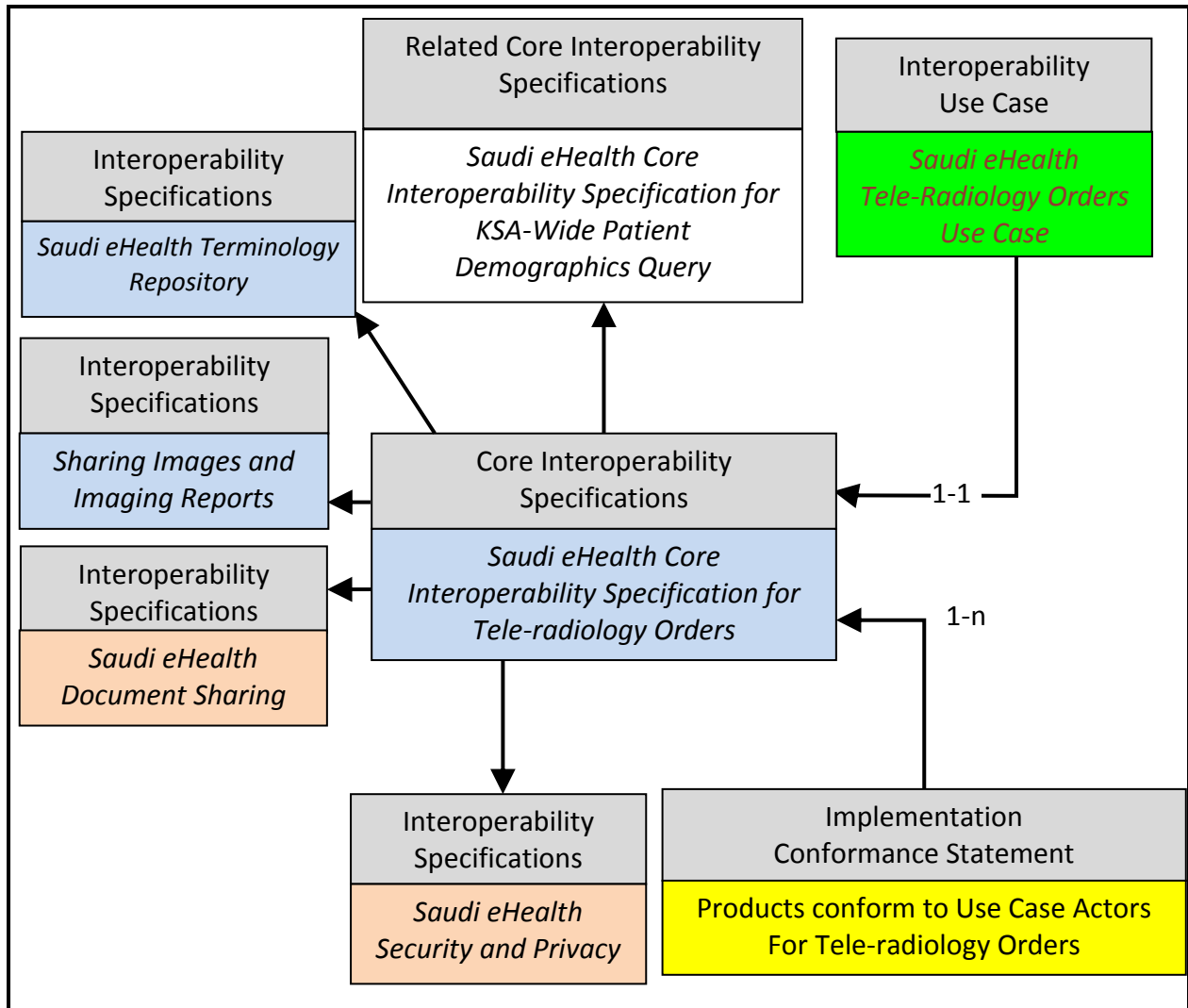
FIGURE 1.5.2-1 TELE-RADIOLOGY ORDER DOCUMENT ORGANIZATION

1.5.3   Document Conventions

1.5.3.1   REQUIREMENTS NUMBERING CONVENTIONS:

All Saudi eHealth Interoperability Specifications contain numbered requirements that follow this format:

- [ABCD-###], where ABCD is a three or four letter acronym unique to that Interoperability Specification for convenient purposes, and ### is the unique number for that requirement within the Interoperability Specification.
- Where a specific value set or code is required to be used, it can be found in the "IS0200 Saudi eHealth Terminology Repository". The location and process to access the terminology repository will be specified in mechanisms external to this document.

Saudi eHealth numbered requirements are the elements of the Interoperability Specification that the system conforms to. In other words, in order to implement a system that fully supports the Use Case and Interoperability Specification, the system shall be able to demonstrate that it conforms to every numbered requirement for the system actors to which it is claiming conformance.

Please note that all Saudi eHealth numbered requirements are numbered uniquely, however numbered requirements are not always sequential.

1.5.3.2 REQUIREMENTS LANGUAGE

Throughout this document the following conventions[1] are used to specify requirement levels:

SHALL: the definition is an absolute requirement of the specification. (Note: "SHALL …… IF KNOWN" means that the tag must be sent. However, if there were no information, then this tag should be sent with a <nullflavor>).

SHALL NOT: the definition is an absolute prohibition of the specification.

SHOULD: there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

SHOULD NOT: there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.

MAY or **OPTIONAL**: means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item.

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[1] Definitions based upon RFC 2119

2. USE CASE

2.1 USE CASE ACTORS AND SERVICES

The Use Case Actors and the Services that are used by this core interoperability specification are described at a functional level in the Saudi eHealth Interoperability Tele-radiology Orders Use Case. Readers that wish to understand the mapping of Use Case Actors to real world products are recommended to read this Saudi eHealth Interoperability Use Case document. Brief descriptions are provided in the following tables.

TABLE 2.1-1 USE CASE ACTORS

USE CASE ACTOR NAME	DESCRIPTION
Tele-radiology Order Creator	This Actor is responsible for the creation of coded Tele-radiology Orders and transmitting the orders to the Tele-radiology Order Forwarder. It is also responsible to manage the order status updates such as "new order" and "cancelled".
Tele-radiology Order Fulfiller	This Actor is responsible for receiving a coded Tele-radiology Order from the Tele-radiology Order Forwarder for the reading and reporting of images of a patient for which the Tele-radiology Order Creator is requesting interpretation. It is also responsible to provide updates to the order, such as "in progress", "completed" or "aborted".
Tele-radiology Order Forwarder	This Actor is used to forward Tele-radiology Orders and status updates between the Tele-radiology Order Creator and Tele-radiology Order Fulfiller Actors. This Actor is only performing a store and forward of the messages to the target destination.

TABLE 2.1-2 USE CASE SERVICES

USE CASE SERVICE NAME	DESCRIPTION
Manage Order	Manage Order is used to create and manage the Tele-radiology Order along with its status change ("cancelled", "in-progress", "completed", "aborted").

2.2 DESIGN CONSTRAINTS AND ASSUMPTIONS

The following design principles underlie this interoperability specification:

- It is expected that all services initiated or provided by these Actors operate in accordance to the Saudi Health Information Exchange Polices.

- An authorized provider and/or organization determine that an imaging study locally acquired needs to be interpreted for a patient.

- The Tele-radiology Service implements the Tele-radiology Order Fulfiller Use Case Actor to perform interpretations upon imaging studies acquired in remote sites and to generate imaging reports.

- The Use Case Flow of Events and the additional scenarios provided in Section 2.3 provide workflow assumptions.

- The Tele-radiology Order workflow specified within this document reflects the Saudi eHealth tele-radiology requirements captured during various stakeholder workshops. The workflow is modeled after the IHE Scheduled Workflow (RAD TF-1 Section 2.1.1). IHE Scheduled Workflow is not completely applicable as it only describes the sharing of radiology orders inside a healthcare institution and not cross-organizational remote Tele-radiology Orders. Both the profile and this Core Interoperability Specification are based upon HL7 V2 Message Standards.

2.3 USE CASE FLOW OF EVENTS

The Saudi eHealth Interoperability Tele-radiology Use Case describes the key workflows that are supported by this Core Interoperability Specification. A brief summary of the Use Case flows are provided below. For an in-depth understanding of the Use Case flows, it is recommended to read the Use Case document.

Main Flow: A patient visits a hospital and it is determined that an imaging procedure is required and performed. The hospital radiologists are not available to read the imaging study so the hospital transmits the images to the Tele-radiology Service using the DICOM storage service (how this is accomplished is outside the scope of this Interoperability Specification). The hospital's Tele-radiology Order Creator issues a Tele-radiology Order to the Tele-radiology Order Forwarder. The Tele-radiology Order references the imaging study that was performed for the patient. The Tele-radiology Order Forwarder forwards the Tele-radiology Order to the remote Tele-radiology Service.

The Tele-radiology Service receives the Tele-radiology Order, access the received images (how this is accomplished is outside the scope of this Interoperability Specification) and supports the radiologist engaged in tele-radiology in creating the Imaging Diagnostic Report. The Tele-radiology Service also retrieves any relevant prior images/reports for the patient from the SeHE Document Repository (using the services as defined in the Saudi eHealth Core Interoperability Specification for Sharing of Images and Imaging Reports document). The radiologist using the Tele-radiology Service generates an Imaging Diagnostic Report and stores it on the SeHE platform (also using the services defined by the Saudi eHealth Core Interoperability Specification for Sharing of Images and Reports document). When the radiologist completes the interpretation the status of the Tele-radiology Order is updated to "completed" and communicated to the Tele-radiology Order Forwarder and then forwarded to the Tele-radiology Order Creator.

Upon receipt of the "completed" status to the Tele-radiology Order Creator, the Imaging Diagnostic Report is available to be accessed, reviewed and used to deliver patient care.

Exception Flow: The hospital that issued the Tele-radiology Order may decide to cancel the previously issued Tele-radiology Order. The Tele-radiology Order Creator sends a "cancelled" order status to the Tele-radiology Service via the Tele-radiology Order Forwarder. The Tele-radiology Service receives the updated Tele-radiology Order and changes the Tele-radiology Order status to "cancelled".

2.3.1   Specific Workflow Scenarios

The following sections provide various scenarios that complement the use case flow of events by using the defined transactions in specific ways. Some of these scenarios highlight variants to the use case main flow of events while others describe interactions with local workflow situations that are beyond the scope of the use case but consistent with it. These workflow scenarios are not intended to be an exhaustive list.

2.3.1.1   SCENARIO 1: TELE-RADIOLOGY SERVICE PROCESSES A SUCCESSFUL ORDER

A Tele-radiology Order Creator issues a Tele-radiology Order to the Tele-radiology Order Forwarder which references the imaging study that was already acquired for a patient. The Tele-radiology Order Forwarder forwards the Tele-radiology Order to the remote Tele-radiology Service. When the Tele-radiology Order is selected on the Tele-radiology Service, the Tele-radiology Order Fulfiller sends an order message with an updated status set to "in progress" to Tele-radiology Order Forwarder. The Tele-radiology Order Forwarder forwards the Tele-radiology Order message to the Tele-radiology Order Creator. This allows the Order Creator to let its users know that the Tele-radiology Order issued to the Tele-radiology Service has been processed by a radiologist. The Tele-radiology Service accesses the images from the study (how these images have been transmitted is outside the scope of this Interoperability Specification) and also may retrieve the relevant prior images/reports from SeHE using the KSA-Wide Accession Number conveyed in the Tele-radiology Order (using the services defined by the Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports document).

The radiologist performs the requested imaging interpretation and the Imaging Diagnostic Report and interpreted images are stored to the SeHE Document Repository by the Tele-radiology Service. The Tele-radiology Order Fulfiller sends a Tele-radiology Order message with the Tele-radiology Order status set to "completed" to the Tele-radiology Order Forwarder. The Tele-radiology Order Forwarder forwards the Tele-radiology Order updated status to the Tele-radiology Order Creator. At this time, the Imaging Diagnostic Report is available and may be retrieved, reviewed and used to deliver patient care.

This scenario is a sub-set of the main flow of events.

2.3.1.2   SCENARIO 2: A TELE-RADIOLOGY ORDER IS CANCELLED BEFORE IT IS BEEN PROCESSED BY THE TELE-RADIOLOGY SERVICE

A Tele-radiology Order message was previously created and received by the Tele-radiology Service, but yet to be selected for processing (i.e., the order is waiting to be accepted by a radiologist within the Tele-radiology Service). A hospital radiologist becomes available at the ordering facility. The Tele-radiology Order Creator sends an order message with the status of "cancelled". The message is sent to the Tele-radiology Order Forwarder and forwarded to the Tele-radiology Service. The Tele-radiology Service cancels the order and does not perform the interpretation. The radiologist at the local hospital interprets the imaging study and creates an Imaging Diagnostic Report. The Imaging Diagnostic Reports and the images are stored on the SeHE Document Repository.

This scenario is a sub-set of the use case Exception Flow of events.

2.3.1.3 SCENARIO 3: A TELE-RADIOLOGY ORDER IS PROCESSED BY THE TELE-RADIOLOGY SERVICE AND IS ABORTED

The Tele-radiology Service receives an order message for a Tele-radiology Order that has been created for a patient (as described in previous scenarios). When the order is selected on the Tele-radiology Service, the Tele-radiology Order Fulfiller sends an order message with an updated status set to "in progress" and the order message is forwarded to the Tele-radiology Order Creator via the Tele-radiology Order Forwarder. The Tele-radiology Service accesses the images from the study and also may retrieve the relevant prior images/reports from SeHE using the services defined by the Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports document).

The radiologist on the Tele-radiology Service reviews the requested imaging study and determines the images are not sufficient to perform the interpretation. The Tele-radiology Order Fulfiller updates the order status to "aborted" and the aborted order message is sent to Tele-radiology Order Forwarder. The Tele-radiology Order Forwarder forwards the Order updated status to the Tele-radiology Order Creator.

Note: the above scenario may be enhanced, such as:
1. After the Tele-radiology Order is aborted the radiologist that was attempting to create the report, calls the ordering organization, communicates the issues and additional images are taken. A new Tele-radiology Order message is sent and workflow continues as described in scenario 1.
2. After the hospital receives the "aborted" order message, additional images are taken and the hospital Tele-radiology Order Creator generates a new Tele-radiology Order (following scenario 1).

2.3.1.4 SCENARIO 4: A TELE-RADIOLOGY ORDER IS CANCELLED BUT IT HAS ALREADY BEEN PROCESSED BY THE TELE-RADIOLOGY SERVICE

There is a race condition that exists where a radiologist is attempting to cancel an order after the processing has already been started by the Tele-radiology Service. The Tele-radiology Service receives an order message that a Tele-radiology Order has been created for a patient. When the order is selected on the Tele-radiology Service the Tele-radiology Order Fulfiller sends an order message with an updated status set to "in progress" to the Tele-radiology Order Forwarder. Before the Tele-radiology Order Creator receives the order message with the status of "in progress", it had initiated an order message to "cancel" the order. When the Tele-radiology Order Creator receives the status message of "in progress" it knows the "cancel" was received after the "in progress" was sent and the "cancel" will not be accepted. Since the Tele-radiology Service has already selected the Tele-radiology Order, the radiologist performs the interpretation and generates the imaging report. The report is stored on SeHE and the Tele-radiology Order Fulfiller generates a Tele -radiology Order message with the status "completed". See Scenario 1 for the workflow.

This scenario is a sub-set of the use case Exception Flow of events.

3. INTEROPERABILITY SPECIFICATION REQUIREMENTS

3.1 ACTOR MAPPING TO INTEROPERABILITY SPECIFICATIONS

A system conforming to this core interoperability specification shall claim conformance at the level of a Use Case Actor. A system may claim conformance to one or more Use Case Actors. Multiple systems may fulfill a Use Case Actor.

The Use Case Actors and the Services they support are described at a functional level in the Saudi eHealth Interoperability Use Case document. Services may be required, conditional or optional. The Use Case Actor, Service(s) and Optionality are conveyed in the first three columns of Interoperability Conformance Requirement tables shown below.

The second part of the table (columns 4-7) provides the mapping for the Use Case Actor to the detailed specifications (such as IHE Profiles, Technical Actors, Optionality) that systems shall implement to exchange healthcare information in the context of this Use Case.

For a selected Use Case Actor (a single row in the table), all the requirements listed in the second part of the table (columns 4-7) shall be implemented. This includes the referenced profiles and the standards specified (terminology or other). For each Technical Actor (whether required or optional), the last column references the detailed specification that constrain and extend of the implementation of this profile for KSA specific requirements. These specifications may be found in Appendices to this core specification or in other referenced Saudi eHealth Interoperability Specifications (e.g. IS0101 *Saudi eHealth Security and Privacy Interoperability Specification*, etc.).

Readers that wish to understand the mapping of Use Case Actors to real world products are recommended to read the Saudi eHealth Interoperability Use Case document.

TABLE 3.1-1 INTEROPERABILITY CONFORMANCE REQUIREMENTS FOR TELE-RADIOLOGY ORDER CREATOR

TELE-RADIOLOGY ORDERS			MAPPING TO TECHNICAL DOCUMENTS OF SAUDI EHEALTH INTEROPERABILITY SPECIFICATIONS			
USE CASE ACTOR	SERVICE SUPPORTED	OPT	TECHNICAL ACTOR	OPT	PROFILE/ STANDARD	REFERENCED SPECIFICATION
Tele-radiology Order Creator	Manage Order	R	Tele-radiology Order Placer	R	Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI)	IS0006 *Saudi eHealth Core Interoperability Specification for Tele-radiology Orders* - Section 5.4. IS0200 Saudi eHealth Terminology Repository.
			Secure Node	R	IHE Audit Trail and Node Authentication (ATNA)	IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.2 and 3.3.2.

TELE-RADIOLOGY ORDERS			MAPPING TO TECHNICAL DOCUMENTS OF SAUDI EHEALTH INTEROPERABILITY SPECIFICATIONS			
USE CASE ACTOR	SERVICE SUPPORTED	OPT	TECHNICAL ACTOR	OPT	PROFILE/ STANDARD	REFERENCED SPECIFICATION
			Time Client	R	IHE Consistent Time (CT)	IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.1.2

R=Required, O = Optional, C= Conditional

TABLE 3.1-2 INTEROPERABILITY CONFORMANCE REQUIREMENTS FOR TELE-RADIOLOGY ORDER FULFILLER

TELE-RADIOLOGY ORDERS			MAPPING TO TECHNICAL DOCUMENTS OF SAUDI EHEALTH INTEROPERABILITY SPECIFICATIONS			
USE CASE ACTOR	SERVICE SUPPORTED	OPT	TECHNICAL ACTOR	OPT	PROFILE/ STANDARD	REFERENCED SPECIFICATION
Tele-radiology Order Fulfiller	Manage Order	R	Tele-radiology Order Fulfiller	R	Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI)	IS0006 *Saudi eHealth Core Interoperability Specification for Tele-radiology* Orders - Section 5.5. IS0200 Saudi eHealth Terminology Repository.
			Secure Node	R	IHE Audit Trail and Node Authentication (ATNA)	*IS0101 Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.2 and 3.3.2
			Time Client	R	IHE Consistent Time (CT)	*IS0101 Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.1.2

R=Required, O = Optional, C= Conditional

TABLE 3.1-3 INTEROPERABILITY CONFORMANCE REQUIREMENTS FOR TELE-RADIOLOGY ORDER FORWARDER

TELE-RADIOLOGY ORDERS			MAPPING TO TECHNICAL DOCUMENTS OF SAUDI EHEALTH INTEROPERABILITY SPECIFICATIONS			
USE CASE ACTOR	SERVICE SUPPORTED	OPT	TECHNICAL ACTOR	OPT	PROFILE/ STANDARD	REFERENCED SPECIFICATION
Tele-radiology Order Forwarder	Manage Order	R	Tele-radiology Order Forwarder	R	Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI)	*IS0006 Saudi eHealth Core Interoperability Specification for Tele-radiology Orders* - Section 5.6.
			Secure Node	R	IHE Audit Trail and Node Authentication	IS0101 *Saudi eHealth Security and Privacy Interoperability*

TELE-RADIOLOGY ORDERS			MAPPING TO TECHNICAL DOCUMENTS OF SAUDI EHEALTH INTEROPERABILITY SPECIFICATIONS			
USE CASE ACTOR	SERVICE SUPPORTED	OPT	TECHNICAL ACTOR	OPT	PROFILE/ STANDARD	REFERENCED SPECIFICATION
					(ATNA)	*Specification* – Section 3.2 and 3.3.1.
			Time Client	R	IHE Consistent Time (CT)	IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.1.2

R=Required, O = Optional, C= Conditional

3.2   INTEROPERABILITY SEQUENCE DIAGRAMS

The following Sequence diagrams provide an overview of the combined flow of transactions resulting from the above selected profiles and standards. The Main Flow Sequence Diagram illustrates a very common (i.e., typical) workflow and other sequence diagrams are shown to provide an alternative to the main flow. Other sequence diagrams are possible but they cover the same key transactions with only slight variants of information exchange between the Use Case Actors, therefore, are not shown. Reference the appropriate sections of Section 2.3 for more information of possible workflow scenarios. Examples are provided below.

The Tele-radiology Order sequence diagrams provide a high level sequence of events for the management of a Tele-radiology Order from a local system, such as a hospital RIS/PACS and the Saudi Tele-radiology Service. It also illustrates typical security exchanges for authorized network communications and audit trail of patient information access.

3.2.1   Main Flow Sequence Diagram

The main flow sequence diagram is a scenario where a local hospital creates a Tele-radiology Order and Tele-radiology Service receives the Tele-radiology Order for processing. This figure depicts a number of transactions between Technical Actors specified in the tables in Section 3.1.

> Note: The Use Case Services are actually implemented using the underlying transaction(s) defined by the Profiles or Standards selected. Therefore, the Use Case Services are not depicted directly in the sequence diagrams.

Steps 1 – 4 are shown in Figure 3.2-1 Tele-radiology Order Sequence Diagram (1).

1.   Time synchronization occurs independently. These transactions may take place at any time and are shown at the beginning of the sequence diagram [IHE CT Profile: Maintain Time ITI-1].

2.   The patient visits a hospital for an imaging procedure and images are acquired for the patient. The hospital radiologists are not available to read the imaging study so the images are transferred to the Tele-radiology Service (using DICOM storage services that are outside the scope of this Core Interoperability Specification and not shown in the diagram). The Tele-radiology Order Creator Use Case Actor issues a Tele-radiology

Order (which references the imaging study using the Study UID and the KSA-Wide Accession Number) to the Tele-radiology Order Forwarder. Before the exchange can take place, an authentication process between the Tele-radiology Order Placer/Secure Node Actor and the Tele-radiology Order Forwarder/Secure Node Actor occurs [IHE ATNA Profile: Authenticate Node ITI-19].

Note: The requirements on how to obtain a patient's KSA-Wide Health ID and key patient demographics are defined in IS0001 *Saudi eHealth Core Interoperability Specification for KSA-Wide Patient Demographic Query* document. The Health ID and key patient demographics attributes are used to identify the patient within the Tele-radiology Order. This ensures KSA-Wide identification of the patient in health records. This is not shown in the diagram and details to accomplish this are defined in IS0001 *Saudi eHealth Core Interoperability Specification for KSA-Wide Patient Demographic Query* document.

3. Following node authentication, the Tele-radiology Order Placer transmits the Tele-radiology Order message to the Tele-radiology Order Forwarder [HL7 Imaging Order Message - OMI].

4. The Tele-radiology Order Placer/Secure Node generates a local audit record of the access to patient health information [using the data content as defined by IHE ATNA Profile and Section 5.7].

FIGURE 3.2-1 TELE-RADIOLOGY ORDER SEQUENCE DIAGRAM (1)

Steps 5 – 10 are shown in Figure 3.2-2 Tele-radiology Order Sequence Diagram (2).

5.   The Tele-radiology Order Forwarder forwards the order to the Tele-radiology Order Fulfiller. Before the exchange can take place, an authentication process between the Tele-radiology Order Forwarder Actor/Secure Node Actor and the Tele-radiology Order Fulfiller/Secure Node Actor occurs [IHE ATNA Profile: Authenticate Node ITI-19].

6.   Following node authentication, the Tele-radiology Order Forwarder transmits the Tele-radiology Order message to Tele-radiology Order Fulfiller [HL7 Imaging Order Message - OMI].

  Note: When the Tele-radiology Order Fulfiller receives the OMI order, the order will be handled by the tele-radiology service. The Tele-radiology Service would then create an internal order which mirrors the OMI message. The processing of the Tele-radiology Order and its transformation within the Tele-radiology Service into an internal order is outside the scope of this Core Interoperability Specification.

7.   The Tele-radiology Order Forwarder/Secure Node generates an audit record of the access to patient health information [IHE ATNA Profile: Record Audit Event ITI-20].

8.   When the internal order is selected on the Tele-radiology Service the Tele-radiology Order Fulfiller sends an order message with an updated status set to "in progress" to Tele-radiology Order Forwarder. The Tele-radiology Order Forwarder forwards the order message to the Tele-radiology Order Placer. This is accomplished using the three actors and workflow steps as when creating the new order:

    o   Establish secure connection - [IHE ATNA Profile: Authenticate Node ITI-19]

    o   Transmit the Message - [HL7 Imaging Order Message – OMI "in progress"]

    o   Generate local audit record – [using the data content as defined by IHE ATNA Profile and Section 5.7]

9.   The tele-radiology service accesses the images from the study and also may retrieve the relevant prior images/reports from SeHE. The interactions are not shown in the diagram but are accomplished as defined in IS0005 *Saudi eHealth Core Interoperability Speciation for the Sharing of Images and Imaging Report* document.

10.   The radiologist performs the requested imaging interpretation and the Imaging Diagnostic Report is stored to the SeHE Document Repository by the Tele-radiology Service. After storing the report, the Tele-radiology Order Fulfiller updates the order status to "completed". This is accomplished using the three actors and workflow steps as when creating the new order:

    o   Establish secure connection - [IHE ATNA Profile: Authenticate Node ITI-19]

    o   Transmit the Message - [HL7 Imaging Order Message – OMI "completed"]

    o   Generate a local audit record – [using the data content as defined by IHE ATNA Profile and Section 5.7]

Please note that Time Client and Time Server Actors have been omitted due to limited space on the diagram. The systems need to perform on-going time synchronization [IHE CT Profile: Maintain Time ITI-1] as shown in Step 1.
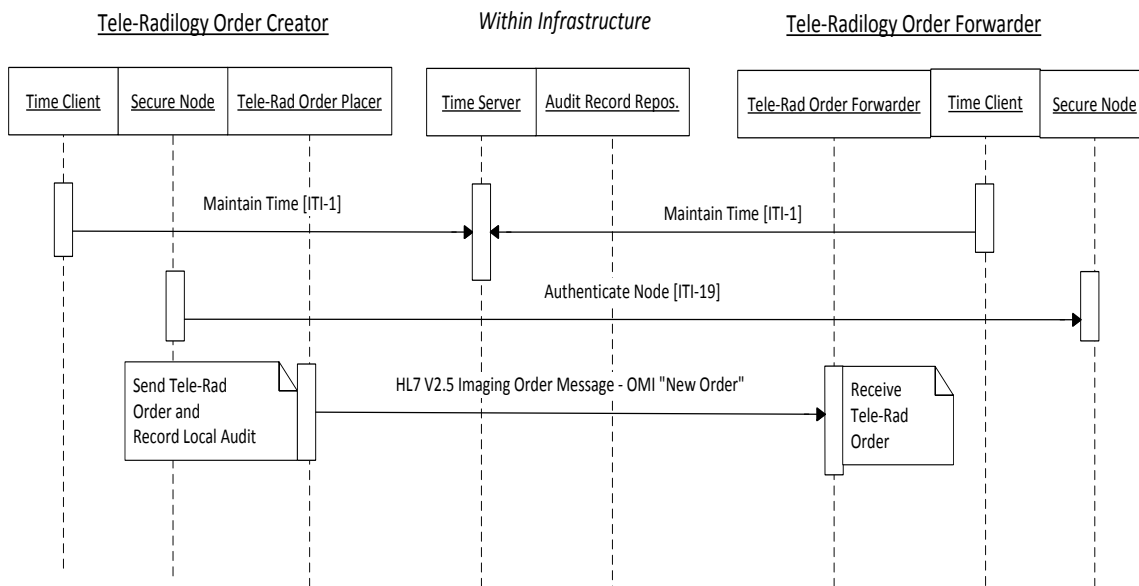

FIGURE 3.2-2 TELE-RADIOLOGY ORDER SEQUENCE DIAGRAM (2)

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Step 11 is shown in Figure 3.2-3 Tele-radiology Order Sequence Diagram (3).

11. The Tele-radiology Order Creator Use Case Actor receives the "completed" status. At this time, the Imaging Diagnostic Report is available and may be retrieved, reviewed and used to deliver patient care.

Please note that Time Client and Time Server Actors have been omitted due to limited space on the diagram. The systems need to perform on-going time synchronization [IHE CT Profile: Maintain Time ITI-1] as shown in Step 1.

FIGURE 3.2-3 TELE-RADIOLOGY ORDER SEQUENCE DIAGRAM (3)

3.2.2 Cancel Tele-radiology Order Sequence Diagram

The cancel order sequence diagram is the scenario when a Tele-radiology Order has been cancelled by the Tele-radiology Order Creator Use Case Actor. The main flow sequence diagram is a pre-condition as the original Tele-radiology Order must be created before being cancelled (the original order creation is not repeated in this diagram). This figure depicts a number of transactions between Technical Actors specified in the tables of Section 3.

Note: The Use Case Services are actually implemented using the underlying transaction(s) defined by the Profiles or Standards selected. Therefore, the Use Case Services are not depicted directly in the sequence diagrams.

Steps 1 – 4 are shown in Figure 3.2-4 Cancelled Tele-radiology Order Sequence Diagram (1)

1. Time synchronization is not shown but occurs as shown in other diagrams [IHE CT Profile: Maintain Time ITI-1].

2. A local radiologist becomes available to generate an imaging report. The Tele-radiology Order Creator Use Case Actor sends a message to cancel the order to the Tele-radiology Order Forwarder. Before the exchange can take place, an authentication process between the Tele-radiology Order Placer/Secure Node Actor and the Tele-radiology Order Forwarder/Secure Node Actor occurs [IHE ATNA Profile: Authenticate Node ITI-19].

3. Following node authentication, the Tele-radiology Order Placer transmits the "cancelled" Tele-radiology Order message to the Tele-radiology Order Forwarder [HL7 Imaging Order Message - OMI].

4. The Tele-radiology Order Placer/Secure Node generates a local audit record of the access to patient health information [using the data content as defined by IHE ATNA Profile and Section 5.7].
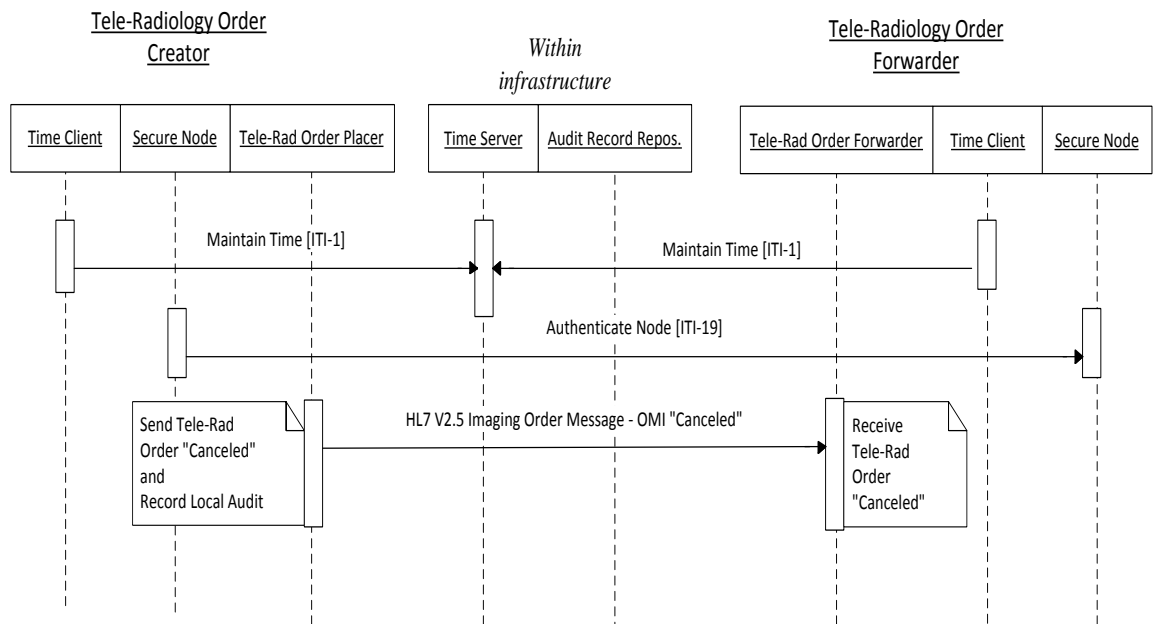
FIGURE 3.2-4 CANCELLED TELE-RADIOLOGY ORDER SEQUENCE DIAGRAM (1)

Steps 5-8 are shown in Figure 3.2-5 Cancelled Tele-radiology Order Sequence Diagram (2).

5. The Tele-radiology Order Forwarder Actor forwards the "cancelled" order to the Tele-radiology Order Fulfiller. Before the exchange can take place, an authentication process between the Tele-radiology Order Forwarder/Secure Node Actor and the Tele-

radiology Order Fulfiller/Secure Node Actor occurs [IHE ATNA Profile: Authenticate Node ITI-19].

6. Following node authentication, the Tele-radiology Order Forwarder transmits the "cancelled" Tele-radiology Order message to Tele-radiology Order Fulfiller [HL7 Imaging Order Message - OMI].

7. The Tele-radiology Order Forwarder/Secure Node generates an audit record of the access to patient health information [IHE ATNA Profile: Record Audit Event ITI-20].

8. The Tele-radiology Order Fulfiller processes the "cancelled" order. Therefore, no report is generated.

Please note that Time Client and Time Server Actors have been omitted due to limited space on the diagram. The systems need to perform on-going time synchronization [IHE CT Profile: Maintain Time ITI-1] as shown in Step 1.
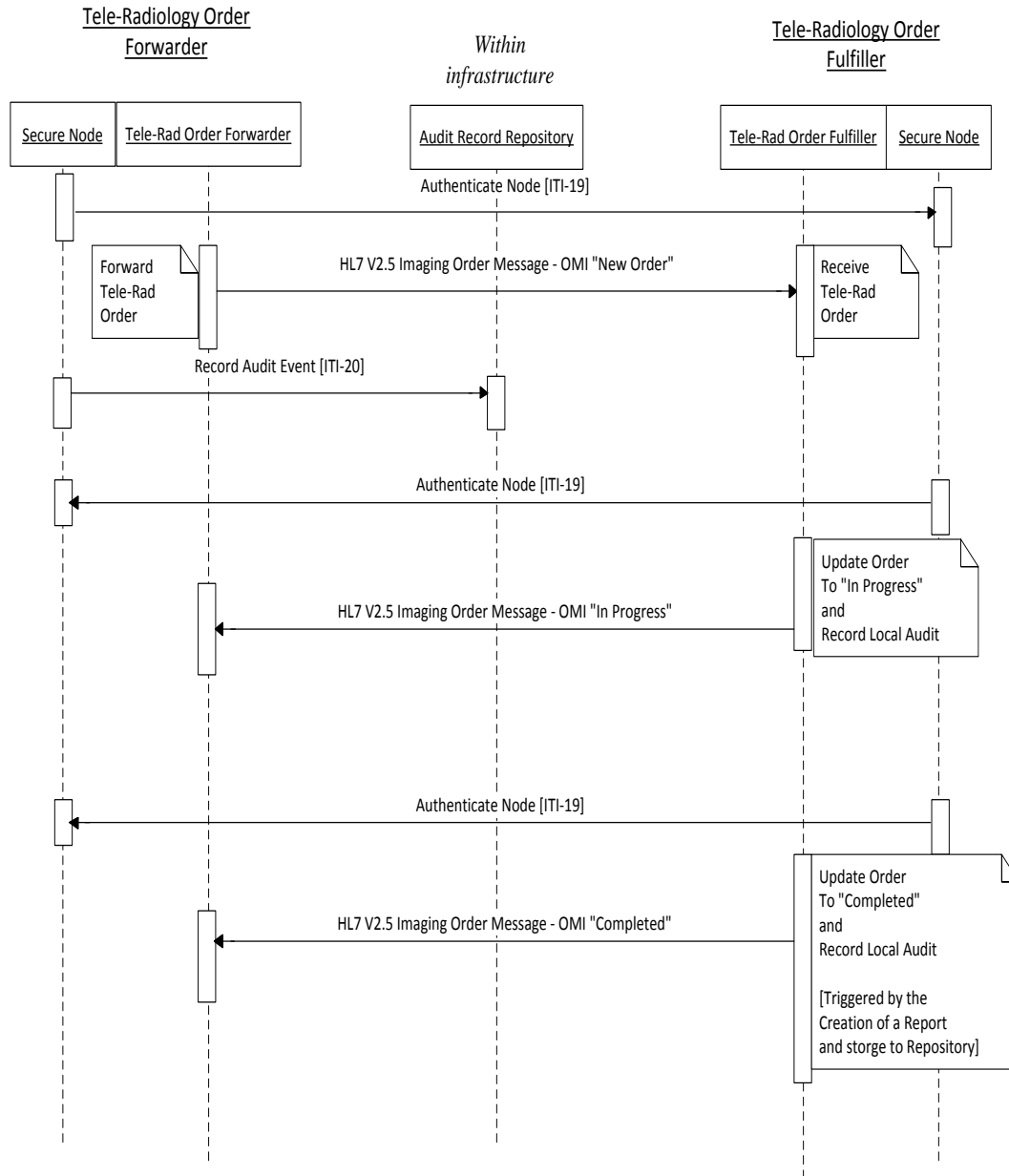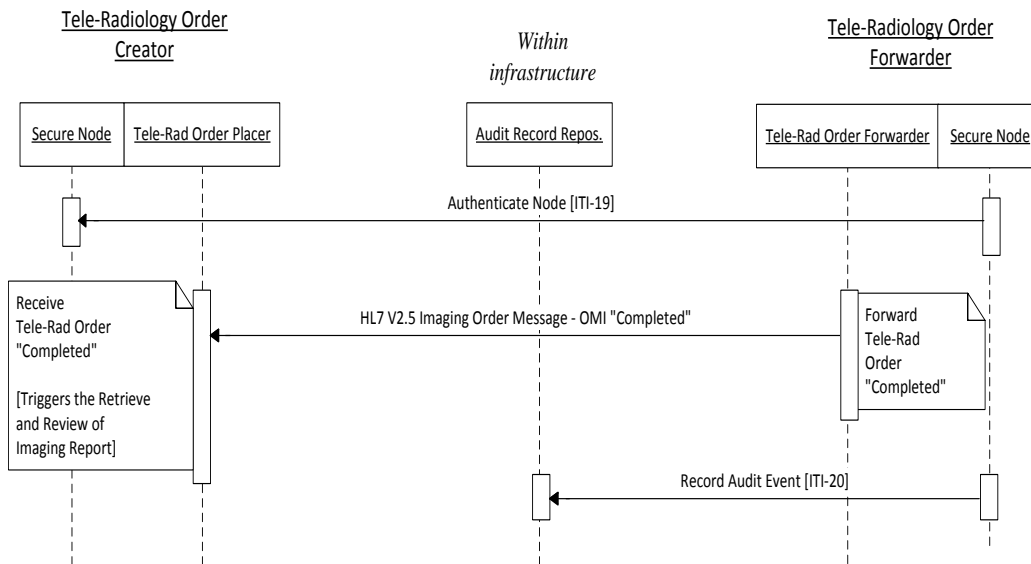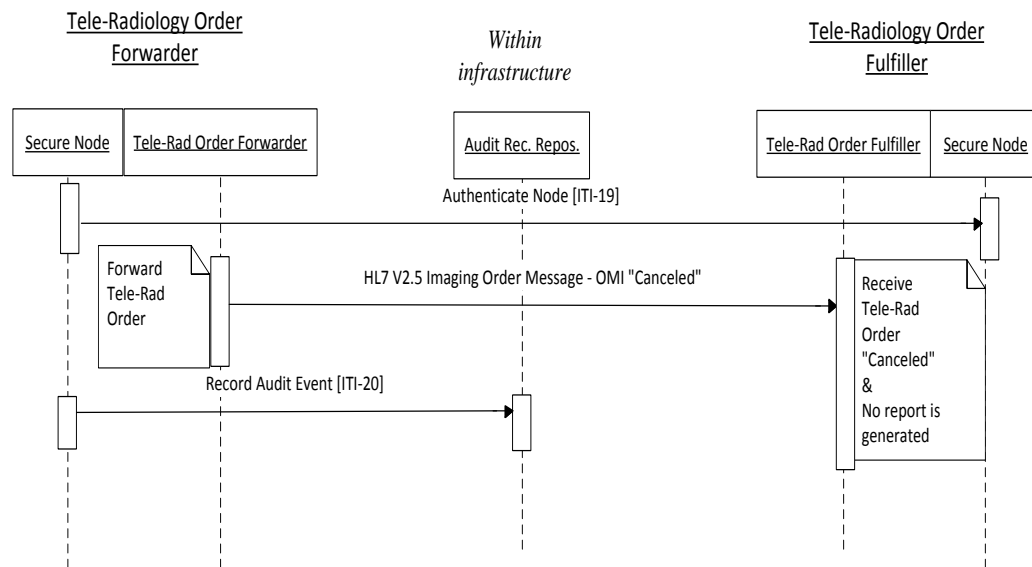

FIGURE 3.2-5 CANCELLED TELE-RADIOLOGY ORDER SEQUENCE DIAGRAM (2)

4. CONFORMANCE TO THE TELE-RADIOLOGY ORDERS SPECIFICATION

4.1.1 Tele-radiology Order Creator Conformance

Systems may claim conformance to the Tele-radiology Order Interoperability Specification as a Tele-radiology Order Creator as follows:

"Tele-radiology Order as a Tele-radiology Order Creator Use Case Actor"

This requires:

➢ to support the Manage Order Service by conforming to:

- [TRO-001] - Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI) as a Tele-radiology Order Placer Actor with the additional constraints specified in:

   o IS0006 *Saudi eHealth Core Interoperability Specification for Tele-radiology Orders* - Section 5.4

   o IS0200 Saudi eHealth Terminology Repository.

- [TRO-002] - IHE Audit Trail and Node Authentication (ATNA) Integration Profile as a Secure Node Actor with the additional constraints specified in:

   o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.2 and 3.3.2.

- [TRO-003] – IHE Consistent Time (CT) Integration Profile as a Time Client Actor with the additional constraints specified in:

   o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 3.1.2

4.1.2 Tele-radiology Order Fulfiller Conformance

Systems may claim conformance to the Tele-radiology Orders Interoperability Specification as a Tele-radiology Order Fulfiller as follows:

"Tele-radiology Orders as a Tele-radiology Order Fulfiller Use Case Actor"

This requires:

➢ To support the Manage Order Service by conforming to:

- [TRO-004] - Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI) as a Tele-radiology Order Fulfiller Actor with the additional constraints specified in:

   o IS0006 *Saudi eHealth Core Interoperability Specification for Tele-radiology Orders* - Section 5.5.

   o IS0200 Saudi eHealth Terminology Repository.

- [TRO-005] - IHE Audit Trail and Node Authentication (ATNA) Integration Profile as a Secure Node Actor with the additional constraints specified in:
  - o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification –* Section 3.2 and 3.3.2

- [TRO-006] – IHE Consistent Time (CT) Integration Profile as a Time Client Actor with the additional constraints specified in:
  - o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification –* Section 3.1.2

4.1.3 Tele-radiology Order Forwarder Conformance

Systems may claim conformance to the Tele-radiology Orders Interoperability Specification as a Tele-radiology Order Forwarder as follows:

"Tele-radiology Orders as a Tele-radiology Order Forwarder Use Case Actor"

This requires:

- ➢ To support the Manage Order Service by conforming to:
  - [TRO-007] - Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI)as a Tele-radiology Order Forwarder Actor with the additional constraints specified in:
    - o IS0006 *Saudi eHealth Core Interoperability Specification for Tele-radiology Orders -* Section 5.6.

  - [TRO-008] - IHE Audit Trail and Node Authentication (ATNA) Integration Profile as a Secure Node Actor with the additional constraints specified in:
    - o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification –* Section 3.2 and 3.3.1

  - [TRO-009] – IHE Consistent Time (CT) Integration Profile as a Time Client Actor with the additional constraints specified in:
    - o IS0101 *Saudi eHealth Security and Privacy Interoperability Specification –* Section 3.1.2

5. SAUDI EHEALTH CONSTRAINTS ON THE HL7 V2.5.1 IMAGING ORDER (OMI) TELE-RADIOLOGY ORDER MESSAGE

This Appendix specifies Saudi eHealth extensions and constraints to the HL7 V2.5.1 Imaging Order Message (OMI). The reader not familiar with the OMI message should review the HL7 V2.5.1 Standard, Chapter 4.

This section defines required behavior rules for Use Case Actors defined in this Core Interoperability Specification.

5.1 TELE-RADIOLOGY ORDER STATES AND DATA ELEMENT OVERVIEW

5.1.1 Tele-Radiology Order Status Overview

Tele-radiology orders transition through several states, including "in progress", "completed", "cancelled" and "aborted". An order enters the "in progress, unspecified" state when an OMI messages for a new order is sent by the Tele-radiology Order Creator Actor. If the Tele-radiology Order Creator Actor cancels the Tele-radiology Order with an OMI message, the order moves to the "cancelled" state.

When the "internal" order is selected on the Tele-radiology Service the Tele-radiology Order Fulfiller sends an OMI message with an updated status set to "in progress, scheduled".

Note: The "in progress, scheduled" status needs to be shown by the Tele-radiology Order Creator to its users, how this is accomplished is outside the scope of this Core Interoperability Specification.

When an Imaging Diagnostic Report has been generated and stored, the Tele-radiology Order Fulfiller Actor sends an OMI message with an updated status set to "completed".

If it is determined that the Imaging Diagnostic Report cannot be generated (e.g., acquired images not sufficient for interpretations), the Tele-radiology Order Fulfiller Actor sends an OMI message with an updated status set to "aborted".

These states are shown below in Figure 5.1-1 Tele-radiology Order Status Transitions. Only the state transitions shown in the diagram are allowed.
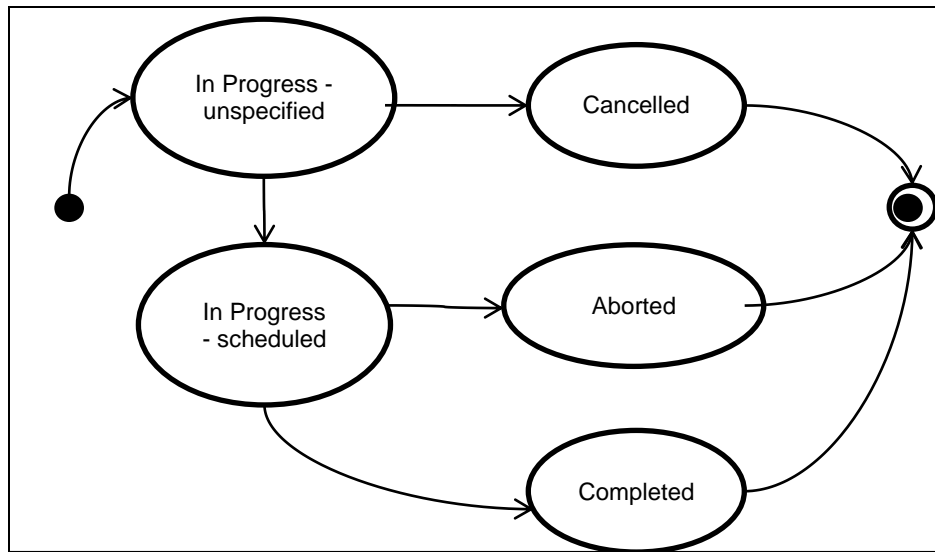
FIGURE 5.1-1 TELE-RADIOLOGY ORDER STATUS TRANSITIONS

5.1.2 Tele-Radiology Order Data Elements Overview

The following table provides a high-level overview of the data elements from the Core Interoperability Specification for Tele-radiology Orders Request and Response.

In addition to providing information on the data elements, this table also provides information on whether the data elements include terminology constraints. Some of these data elements are used only for Order Requests while other are only used for Order Responses and other are used both in Requests and Responses.

The table focusses only on the user visible Data Elements. Some elements used for the transmission and encoding of Order Request have been omitted. In case of inconsistency between this table and the constraints specified in the remainder of Section 5, the later prevails. In particular the optionality for these data elements is specified in details in Sections 5.3, 5.4, 5.5 and 5.6.

TABLE 5.1-1 TELE-RADIOLOGY ORDER DATA ELEMENTS OVERVIEW

ATTRIBUTE NAME	ATTRIBUTE DEFINITION	FOR-MAT	CONSTRAINT SUMMARY	GENERAL TERMINO-LOGY
Health ID	The Unique ID for the individual client entry that will be used to communicate health information	Text	Populated with the unique Health Identification using MOH as the issuing authority: MOH:ID (see [TRO-41])	N/A

ATTRIBUTE NAME	ATTRIBUTE DEFINITION	FOR-MAT	CONSTRAINT SUMMARY	GENERAL TERMINO-LOGY
Patient Name	Given name(s) of the client	Text	Includes names in both Arabic and English, if known, for all nationalities (see [TRO-42])	N/A
Date of Birth	The date of birth of the client	Date	Reflects the date of birth of the client. (see [TRO-043])	N/A
Gender	The gender of the client	Coded	Populated using the KSA Gender Value Set (see [TRO-044])	KSA Gender
Patient Class	In-patient, out-patient, emergency, etc.	Coded	[TRO-054]	HL7 Patient Class
Ambulatory Status	Indicates certain conditions such as pregnancy.	Text	[TRO-055]	N/A
Order Control and Status	Control: New order, Status Change. Order Status: In-progress, scheduled, completed, aborted, cancelled	Text	Action message to change the order stats. [TRO-067], [TRO-116] [TRO-068], [TRO-063], [TRO-133], [TRO-119]	N/A
Placer Order Number	Local number identifier which resulted in the new Tele-radiology Ordered being issued	Text	[TRO-069]	N/A
Filler Order Number	Uniquely identify each Tele-radiology Order	Text	Number generated internally by the Tele-radiology Order Creator [TRO-070]	N/A
Start Date/Time	Date and time of the imaging study (acquisition of images) using the Gregorian calendar	Date	[TRO-076]	N/A
Priority	Priority expressing the urgency to provide the radiology report	Coded	[TRO-077]	KSA Order Priority
Ordering Provider	Healthcare Provider that placed the order	Text	Convey the ID Number (Component 1) of the Healthcare Provider [Practitioner ID given from SCHS] and Family Name and Given Name (Components 2 and 3). [TRO-082]	N/A
Procedure Code	Requested Procedure Code and Description.	Coded	[TRO-084]	Radiology Procedure Name
Relevant Clinical Info	Relevant Clinical Info about the patient	Text	Used to communicate a suspected diagnosis and relevant clinical findings for requested diagnostic studies. [TRO-085]	N/A
Placer Supplemental Service Information	A specific radiology sub-specialty selected for the reading of the imaging study	Coded	[TRO-175]	Radiology Sub-Specialty
Placer Field 2	Location for where the images may be obtained (Order_Creator or Shared_Repository)	Text	[TRO-178], [TRO-177]	N/A

ATTRIBUTE NAME	ATTRIBUTE DEFINITION	FOR-MAT	CONSTRAINT SUMMARY	GENERAL TERMINO-LOGY
Filler Field 1	Convey textual information to describe the radiology "views" that were performed during image acquisition	Text	[TRO-088]	N/A
Comment	Textual information that allows the acquisition technician and/or radiologist to provide further explanation to how the procedure was performed.	Text	It could be simple text stating "acquisition completed normally" or a more detailed explanation of the procedure. [TRO-0097]	N/A
Accession Identifier	KSA-Wide unique Identifier for the Requesting Clinician Request	Text	Allows to collects all imaging studies (if more than one) and reports associated to an order (if more than one). [TRO-0091], [TRO-0126]	N/A
Study UID	Machine Globally Unique ID for the imaging study (set of images)	Text	One or more study UID may be conveyed to be reported together). [TRO-0092], [TRO-0126], [TRO-177]	N/A
Modality	The imaging modality used to generate the imaging study.	Coded	[TRO-094]	Modalities
Related Prior Studies	Identify Accession Numbers for related prior imaging studies	Text	[TRO-180]	N/A

5.2 HL7 MESSAGE CONVENTIONS

The HL7 tables OPT (Optionality) column in this document have been modified from the HL7 2.5.1 standard document. The following terms refer to the OPT (Optionality) column.

R   = Required
R2 = this is a Saudi eHealth extension. If the sending application has data for the field, it is required to populate the field. If the value is not known, the field may not be sent.
R+ = this is a Saudi eHealth extension. This is a field that this specification requires that was listed as optional within the HL7 standard.

O   = Optional
C = Conditional
X = Not supported. For conformant sending applications, the element will not be sent. Conformant receiving applications may ignore the element if it is sent.

5.3 MESSAGE HEADER SEGMENT (MSH) FOR ALL OMI MESSAGES

5.3.1.1 MSH SEGMENT

[TRO-015] – For all OMI messages, Table 5.3-1 and the requirements listed below apply. All fields in the MSH segment are optional, except those listed in Table 5.3-1 OMI – MSH Segment.

TABLE 5.3-1 OMI – 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]		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
17	3	ID	R+	[1..1]	0399	00017	Country Code
18	16	ID	R+	[0..1]	0211	00692	Character Set
19	250	CE	R2	[0..1]		00693	Principal Language of Message
20	20	ID	X	[0..0]	0356	01317	Alternate Character Set Handling Scheme

[TRO-016] -MSH-1 Field Separator: SHALL be implemented as the recommended value specified in the HL7 standard, which is | (ASCII 124).

[TRO-017] - MSH-2 Encoding Characters: This field contains the four characters in the following order: the component separator, repetition separator, escape character, and subcomponent separator. These SHALL be implemented as the recommended values specified in the HL7 standard. The values are ^~\&(ASCII 94, 126, 92, and 38, respectively).

[TRO-018] - MSH-3 Sending Application SHALL convey the [Sending Application Service End Point] (i.e., the application that supports the Tele-radiology Order Creator or the Tele-radiology Order Fulfiller Actor).

[TRO-019] - MSH-5 Receiving Application SHALL convey the [Receiving Application Service End Point] (i.e., the application that supports the Tele-radiology Order Fulfiller or the Tele-radiology Order Creator Actor).

Note: **MSH-3 Sending Application** and **MSH-5 Receiving Application** fields are used to forward the message between the appropriate Tele-radiology Order Creator and Tele-radiology Order Fulfiller. The actual HL7 messages are sent using the transport URL to the Tele-radiology Order Forwarder, who forwards the messages to the appropriate Receiving Application using its transport URL.   See [TRO-151] and [TRO-152] for details.

Note: **MSH-4 Sending Facility** and **MSH-6 Receiving Facility** fields are for informational purposes only.

[TRO-020] - MSH-9 Message Type: SHALL be Components: OMI ^ O23 ^ OMI_O23

[TRO-021] - MSH-17 Country Code: SHALL be set to the ISO 3166 3-character code for Saudi Arabia "SAU".

[TRO-022] - MSH-18 Character Set: SHALL be set to the value "UNICODE UTF-8"

[TRO-023] - MSH-19 Principal Language of Message: The code **SHALL** have a value from the Language Value Set (1.0.639.1). The default value is "en" for English.

5.4 REQUIREMENTS FOR TELE-RADIOLOGY ORDER CREATOR ACTOR

The following rules shall be supported for the conformance to the Tele-radiology Order Creator Actor:

[TRO-024] - The Tele-radiology Order Creator Actor **SHALL** send new orders as specified by the HL7 V2.5.1 Imaging Order Message (OMI) Standard with the additional constraints specified in Section 5.3 (MSH segment) and in Section 5.4.1.

[TRO-025] - The Tele-radiology Order Creator Actor **SHALL** send new orders only after all the images of the study (or studies) referenced by the order have been successfully sent (e.g. by using the DICOM Storage Service Class(es)), when the **OBR-19 Placer Field 2** is set to "Order_Creator".

[TRO-176] - The Tele-radiology Order Creator Actor **SHALL** send new orders with the **OBR-19 Placer Field 2** set to "Shared_Repository" only if all the images of the study (or studies) referenced by the order are available for retrieve from the Imaging Repository Actor

[TRO-026] - The Tele-radiology Order Creator Actor **SHALL** send cancelled orders as specified by the HL7 V2.5.1 Imaging Order Message (OMI) Standard with the additional constraints specified in Section 5.4.2.

[TRO-027] –The Tele-radiology Order Creator **SHALL NOT** issue a cancel for an order that has already been started, e.g., one for which Tele-radiology Order Fulfiller has transmitted an "in-progress, scheduled" status in the Order Status.

[TRO-028] - The Tele-radiology Order Creator Actor **SHALL** process acknowledge messages (both original and enhanced HL7 ACKs) received from the Tele-radiology Order Fulfiller for each of the OMI messages sent. A timeout and retry mechanism **SHALL** be implemented to ensure a configurable number of retransmissions of any message sent, if the HL7 original ACK is not received within a configurable time.

[TRO-173] - The Tele-radiology Order Creator Technical Actor SHALL support the receipt of an original HL7 ACK message with the following ERR Segment for content validation errors..

TABLE 5.5-1 ACK – ERR SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	705	CWE	R	0357	01813	HL7 Error Code
4	2	ID	R	0516	01814	Severity
5	705	CWE	R		01815	Application Error Code
7	2048	TX	R		01817	Diagnostic Information

The elements of the ERR Segment contain the following information about each validation error found:

- • HL7 Error Code: "207"
- • Severity: "E" or "W"
- • Application Error Code: a specific value, with the value: "KSAContentValidation"
- • Diagnostic Information: the textual representation of the error, which includes three concatenated attributes (separated by an underscore delimiter):
  - a. Sub-error code: An optional value that represents the exact validation error code (produced by the content validation: e.g. assertion IF that failed the test
  - b. Location: The location is the tag at which the error took place
  - c. Text Message: The text message returned by the Health Information Exchange (HIE)

[TRO-029] - The Tele-radiology Order Creator Actor **SHALL** acknowledge each OMI message (i.e. "in progress, scheduled", "completed", "aborted" status updates) received from the Tele-radiology Order Fulfiller with an original HL7 ACK message. An enhanced HL7 ACK **MAY** be sent.

[TRO-172] - The Tele-radiology Order Creator Actor **SHALL** support the HL7 HTTP transport protocol and the XML encoded message format for the HL7 V2.5.1 messages.

5.4.1 OMI Segments for the Tele-radiology Order Creator Actor – New Order

[TRO-033] – The segments listed in Table 5.4-1 OMI Segments are required with the exception that the ZDS segment is **REQUIRED IF KNOWN**. All other segments are **OPTIONAL**.

TABLE 5.4-1 OMI SEGMENTS FOR NEW ORDER

OMI SEGMENT	SEGMENT NAME	CHAPTER IN HL7 V2.5.1
MSH	Message Header	2
PID	Patient Identification	3
PV1	Patient Visit	3
{ORC	Common Order	4
TQ1	Timing/Quantity	4
OBR	Order Detail	4
{NTE}	Notes and Comments (for Detail)	2
{IPC}}	Imaging Procedure Control	4
ZPS	Identify Related Prior Studies	

5.4.1.1 MSH SEGMENT

See [TRO-015] for requirements.

5.4.1.2 PID SEGMENT

[TRO-040] –All fields in the PID segment are optional, except those listed in Table 5.4-2 OMI – PID Segment.

TABLE 5.4-2 OMI – PID SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List
5	250	XPN	R		00108	Patient Name
7	26	TS	R2		00110	Date/Time of Birth
8	1	IS	R	0001	00111	Sex

[TRO-041] –PID-3 Patient Identifier List: the first value in this list **SHALL** be set to the National Health ID of the patient. The Assigning Authority (Component 4) **SHALL** be set to the OID value [2.16.840.1.113883.3.3731.1.1.100.1] which identifies the MOH as the Health ID assigning authority.

[TRO-042] –PID-5 Patient Name: SHALL provide values (at a minimum) for the "family" and "given" name components. **SHALL** be able to convey the names in both Arabic and Western languages in the same message.

[TRO-043] –PID-7 Date/Time of Birth: SHALL be conveyed using the Gregorian calendar.

[TRO-044] –PID-8 Sex: SHALL convey a code value from the KSA Gender Value Set.

5.4.1.3   PV1 SEGMENT

[TRO-050] –All fields in the PV1 segment are **OPTIONAL**, except those listed in Table 5.4-3 OMI – PVI Segment.

TABLE 5.4-3 OMI – PVI SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
2	1	IS	R	0004	00132	Patient Class
15	2	IS	C	0009	00145	Ambulatory Status

[TRO-160] –PV1- 2 Patient Class: MAY take one of the following values: E (Emergency), I (inpatient), O (outpatient), B (obstetrics).

[TRO-054] –PV1- 15 Ambulatory Status: SHALL be valued when patient status indicates certain conditions such as pregnancy. It may be omitted if none of the defined statuses are applicable to a patient. It may take any of the values defined by HL7 V2.5.1 (e.g. Pregnant).

5.4.1.4   ORC SEGMENT

[TRO-065] –All fields in the ORC segment are **OPTIONAL**, except those listed in Table 5.4-4 OMI- ORC Segment.

TABLE 5.4-4 OMI- ORC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	2	ID	R	0119	00215	Order Control
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
5	2	ID	R	0038	00219	Order Status
7	200	TQ	X		00221	Quantity/Timing

10	250	XCN	R2		00224	Entered By
12	250	XCN	R2		00226	Ordering Provider
17	250	CE	R		00231	Entering Organization

[TRO-067] –ORC-1 Order Control SHALL convey the value "NW" (i.e. "new order").

[TRO-068] –ORC-5 Order Status SHALL convey the value "IP" (i.e. "in progress, unspecified").

[TRO-069] –ORC-2 Placer Order Number SHALL convey the local number identifier which resulted in the new Tele-radiology Ordered being issued (i.e., HIS or RIS).

[TRO-070] –ORC-3 Filler Order Number: Component 1 **SHALL** convey the number generated internally by the Tele-radiology Order Creator and **SHALL** uniquely identify each Tele-radiology Order. Component 3 **SHALL** be set to the OID value which identifies the Filler Order Number Assigning Authority supported by the Tele-radiology Order Creator.

Note: this OID value is to be provided by SeHE for each site configuration.

[TRO-071] – ORC-7 Quality/Timing: SHALL NOT be conveyed: Date and time of the Scheduled Procedure Step are conveyed in the immediately following TQ1 segment.

5.4.1.5   TQ1 SEGMENT

[TRO-075] –All fields in the TQ1 segment are **OPTIONAL**, except those listed in Table 5.4-5 OMI-TQ1 Segment.

Note: Deprecated components ORC-7.4-Start Date/Time or OBR-27.4-Start Date/Time should not be populated but instead the TQ1 segment is to be used to carry the start date and time of the procedure.

TABLE 5.4-5 OMI- TQ1 SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
7	26	TS	R		01633	Start Date/Time
9	250	CWE	R	0485	01635	Priority
12	10	ID	C	0427	01638	Conjunction

[TRO-076] –TQ1-7 Start Date/Time SHALL convey the date and time of the imaging study (acquisition of images) using the Gregorian calendar.

[TRO-077] – TQ1-9 Priority Component 1 **SHALL** convey a code value from the KSA Order Priority Value Set. Note: Service level agreements with the Tele-radiology Service may assign further priority constraints for each value.

5.4.1.6 OBR SEGMENT

[TRO-080] –All fields in the OBR segment are **OPTIONAL**, except those listed in Table 5.4-6 OMI- OBR Segment.

TABLE 5.4-6 OMI- OBR SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	R		00237	Set ID – OBR
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
4	200	CE	R		00238	Universal Service ID
12	60	CE	R2		00246	Danger Code
13	300	ST	R2		00247	Relevant Clinical Info.
16	120	XCN	R2		00226	Ordering Provider
17	40	XTN	R2		00250	Order Callback Phone Number
19	60	ST	R		00252	Placer Field 2
20	60	ST	R2		00253	Filler Field 1 +
27	200	TQ	X		00221	Quantity/Timing
31	300	CE	R2		00263	Reason for Study
44	80	CE	R	0088	00393	Procedure Code
46	250	CE	R2	0411	01474	Placer Supplemental Service Information

[TRO-081] –**Fields –OBR-2 Placer Order Number, OBR-3 Filler Order Number SHALL** convey the same values as in the ORC segment.

[TRO-082] –If known the **OBR-16 Ordering Provider SHALL** convey the Healthcare Provider that placed the order. If known, it **SHALL** convey the ID Number (Component 1) of the Healthcare Provider [Practitioner ID given from SCHS] and Family Name and Given Name (Components 2 and 3).

[TRO-083] –The **OBR-4 Universal Service ID** Components 1-3 **SHALL** contain a Universal Service ID as used by the local Tele-radiology Creator Actor (e.g., be copied from the Components 1-3 of internal OBR-4 conveyed by the local HIS).

Note: If the Tele-radiology Order is based upon a local HIS generated ORM or OBR order, the Universal Service ID is copied from ORM/OBR message into the OMI Universal Service ID.

[TRO-089] –If the Tele-radiology Order Creator expands a single local order into multiple Requested Procedures, multiple Tele-radiology Orders are sent (i.e. each with an OMI message). The Components 1-3 of OBR-4 in all OBR segments of the OMIs **SHALL** have the same value.

[TRO-084] –**OBR-44 Procedure Code** Components 1-3 **SHALL** convey the Radiology Procedure Code and component 5 **MAY** contain the Requested Procedure Description. This Radiology Procedure Code shall be one of the values from the Procedure Name Code Value Set.

[TRO-085] –If entered by the Ordering Provider or the imaging professional (i.e. radiologist or technician), the **OBR-13 Relevant Clinical Info SHALL** convey additional clinical information about the patient.

Note: This field is used to communicate a suspected diagnosis and relevant clinical findings for requested diagnostic studies.

[TRO-086] –*Retired*

[TRO-175] – If the Tele-radiology Order Creator choses to select a specific radiology sub-specialty for the reading of the imaging study by the Tele-radiology Service, **OBR-46 Placer Supplemental Service Information** Components 1-3 **SHALL** convey the Radiology Subspecialty Code. This Radiology Sub-specialty Code **SHALL** be one of the values from the Radiology Sub-Specialty Value Set.

[TRO-087] – *Retired*

[TRO-088] –If known, the **OBR-20 Filler Field 1 SHALL** convey textual information to describe the radiology "views" that were performed during image acquisition.

5.4.1.7 NTE SEGMENT

[TRO-096] –All fields in the NTE segment are **OPTIONAL**, except those listed in Table 5.4-7 OMI-NTE Segment.

TABLE 5.4-7 OMI- NTE SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	65536	FT	R2		00217	Comment

[TRO-097] – Field **NTE-3 Comment SHALL** convey textual information that allows the acquisition technician and/or radiologist to provide further explanation to how the procedure was performed. It could be simple text stating "acquisition completed normally" or a more detailed explanation of the procedure.

5.4.1.8 IPC SEGMENT

[TRO-090] –All fields in the IPC segment are **OPTIONAL**, except those listed in Table 5.4-8 OMI-IPC Segment.

TABLE 5.4-8 OMI- IPC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	80	EI	R		00237	Accession Identifier
2	22	EI	R		00216	Requested Procedure ID
3	70	EI	R		00217	Study Instance UID
4	22	EI	R		00238	Scheduled Procedure Step ID
5	16	CE	R+		00239	Modality
6	250	CE	R2		00246	Protocol Code

[TRO-091] –**IPC-1 Accession Identifier SHALL** convey the KSA-Wide Accession Number for the imaging order. Component 1 **SHALL** convey the locally generated unique identifier and Component 3 **SHALL** be set to the OID value which identifies the Accession Number Assigning Authority supported by the Tele-radiology Order Creator.

Note: this OID value is to be provided by SeHE for each site configuration.

[TRO-092] –IPC-2 Requested Procedure ID is a local unique identifier of the requested procedure and is a [1..1] relationship with **IPC-3 Study Instance UID**.

[TRO-093] –IPC-4 Scheduled Procedure Step ID is not an important field for the Tele-radiology Order, therefore it **SHOULD** be set to 1

[TRO-094] –IPC-5 Modality Components 1-3 **SHALL** convey a Modality code. This Modality code **SHALL** be one of the values from the Modalities Value Set.

[TRO-177] –IPC-3 Study Instance UID is a globally unique identifier of the imaging study to be interpreted. This imaging study **SHALL** either have been sent prior to the sending of the Tele-radiology Order message or be available from the Imaging Repository to which the Tele-radiology Service is connected (See IS0005 *Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports*). The source of the imaging Study whose Study Instance UID is conveyed is indicated by the **OBR-19 Placer Field 2** (See TRO-178)

[TRO-178] – Field **OBR-19 Placer Field 2 SHALL** be set to the value "Order_Creator" if the imaging study has been sent prior to the sending of the Tele-radiology Order message or **SHALL** be set to the value "Shared_Repository" if the imaging study is available from the Imaging Repository to which the Tele-radiology Service is connected (See IS0005 *Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports*).

5.4.1.9   ZPS SEGMENT – IDENTIFY RELATED PRIOR STUDIES

The ZPS Segment is defined to convey one or more Accession Numbers that identify one or more related prior studies to the new tele-radiology order.   These Accession Numbers may be used to obtain the related images and imaging reports. The ZPS Segment is **REQUIRED IF KNOWN.**

[TRO-180] –All fields in the ZPS segment are **REQUIRED**. When the ZPS segment is absent relevant prior studies may still exist but none are listed explicitly by the user of the Tele-radiology Order Creator. The ultimate responsibility remains with the user of the Tele-radiology Order Fulfiller to evaluate potential relevant prior studies.

TABLE 5.4.1.9-9 OMI- ZPS SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	80	EI	R			Related Studies Accession Identifier List

[TRO-181] –ZPS-1 Related Studies Accession Identifier List SHALL convey the KSA-Wide Accession Number(s) which identify one or more imaging studies/image reports that are related to this new imaging order. Component 1 **SHALL** convey the locally generated unique identifier and Component 3 **SHALL** be set to the OID value which identifies the Accession Number Assigning Authority supported by the Tele-radiology Order Creator.

Note: this OID value is to be provided by the Health Information Exchange Platform for each site configuration.

Note: Relevant priors listed need to be available from the Imaging Repository to which the Tele-radiology Service is connected (See IS0005 Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports).

5.4.2 OMI Segments for the Tele-radiology Order Creator Actor - Cancel Order

[TRO-100] –All segments are **OPTIONAL** except those listed in Table 5.4-10 OMI Segments

TABLE 5.4-10 OMI SEGMENTS FOR CANCEL ORDER

OMI SEGMENT	SEGMENT NAME	CHAPTER IN HL7 V2.5.1
MSH	Message Header	2
PID	Patient Identification	3
{ORC	Common Order	4
OBR	Order Detail	4
{IPC}}	Imaging Procedure Control	4

5.4.2.1 MSH SEGMENT

See [TRO-015] for requirements.

[TRO-0104] - *Retired*

5.4.2.2 PID SEGMENT

[TRO-105] –All fields in the PID segment are **OPTIONAL**, except those listed in Table 5.4-11 OMI – PID Segment.

TABLE 5.4-11 OMI – PID SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List
5	250	XPN	R		00108	Patient Name

[TRO-170] – **PID-3 Patient Identifier List SHALL** be the same as the **PID-3 Patient Identifier List** in the OMI "new order" message, see Section 5.4.1.2.

[TRO-171] – **PID-5 Patient Name SHALL** be the same as the **PID-5 Patient Name** in the OMI "new order" message, see Section 5.4.1.2.

5.4.2.3 ORC SEGMENT

[TRO-115] –All fields in the ORC segment are **OPTIONAL**, except those listed in Table 5.4-12 OMI- ORC Segment.

TABLE 5.4-12 OMI- ORC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	2	ID	R	0119	00215	Order Control
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number

[TRO-116] – **ORC-1 Order Control** SHALL convey the value "OC" (i.e. Order Cancelled).

[TRO-117] –**ORC-2 Placer Order Number** SHALL be the same as the **ORC-2 Placer Order Number** in the OMI "new order" message, see Section 5.4.1.4.

[TRO-118] –**ORC-3 Filler Order Number** SHALL be the same as the **ORC-3 Filler Order Number** in the OMI "new order" message, see Section 5.4.1.4.

5.4.2.4 OBR SEGMENT

[TRO-120] –All fields in the OBR segment are OPTIONAL, except those listed in Table 5.4-6 OMI- OBR Segment.

TABLE 5.4-13 OMI- OBR SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	R		00237	Set ID – OBR
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number

[TRO-165] –**Fields – OBR-2 Placer Order Number, OBR-3 Filler Order Number** SHALL convey the same values as in the ORC segment, see Section 5.4.1.6.

5.4.2.5 IPC SEGMENT

[TRO-125] –All fields in the IPC segment are OPTIONAL, except those listed in Table 5.4-6 OMI-OBR Segment.

TABLE 5.4-14 OMI- IPC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	80	EI	R		00237	Accession Identifier
2	22	EI	R		00216	Requested Procedure ID
3	70	EI	R		00217	Study Instance UID
4	22	EI	R		00238	Scheduled Procedure Step ID

[TRO-126] –Fields **IPC-1 – Accession Identifier**, **IPC-2 Requested Procedure ID**, **IPC-2 Study Instance UID** and **IPC-4 Scheduled Procedure Step ID** SHALL be the same as the corresponding fields in the OMI "new order" message, see Section 5.4.1.7.

5.5 REQUIREMENTS FOR TELE-RADIOLOGY ORDER FULFILLER ACTOR

The following rules SHALL be supported for the conformance to the Tele-radiology Order Fulfiller Actor:

[TRO-130] –The Tele-radiology Order Fulfiller SHALL accept and process "new orders" and "cancelled" orders messages as specified by the HL7 V2.5.1 Imaging Order Message (OMI)

Standard with the additional constraints specified in Sections 5.4.1 and 5.4.2. All fields with the OPT types of "R", "R2" and "C" **SHALL** be consumed. If error in data prevents it from fulfilling the order, it **SHALL** notify the Tele-radiology Order Creator by creating an OMI order with the status of "Aborted" as defined in Section 5.5.1.

Note - The Tele-radiology Order Fulfiller Actor uses fields **PID-3 Patient Identifier List** (i.e., KSA-Wide Health ID) and **IPC-5 Accession Identifier** (i.e., KSA-Wide Accession Number) to populate the radiology report CDA Header and XDS meta-data attributes for the report and imaging manifest. See the IS0102 *Saudi eHealth Document Sharing Interoperability Specification* and IS0005 *Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports*.

[TRO-133] – The Tele-radiology Order Fulfiller Actor **SHALL** provide updated order statuses as specified by the HL7 V2.5.1 Imaging Order Message (OMI) Standard. The following OMI messages with the following status **SHALL** be supported, others may be sent:

- In Progress, scheduled – when the Tele-radiology Service has the order selected by a radiologist ready to start the interpretation, an OMI message with the status of "in progress, scheduled" **SHALL** be sent.

- Completed – when the complete, verified report is available for the given order, an OMI message with the status of "completed" **SHALL** be sent.

- Aborted – when the Tele-radiology Service determines it cannot perform the order interpretation, an OMI message with the status of "aborted" **SHALL** be sent.

[TRO-134] - The Tele-radiology Order Fulfiller Actor **SHALL** process acknowledge messages (both original and enhanced HL7 ACKs) received from the Tele-radiology Order Creator for each of the OMI messages sent. A timeout and retry mechanism **SHALL** be implemented to ensure a configurable number of retransmissions of any message sent, if the HL7 original ACK is not received within a configurable time.

[TRO-135] - The Tele-radiology Order Fulfiller Actor **SHALL** acknowledge each OMI message (i.e. "new order", "cancelled") received from the Tele-radiology Order Creator with an original HL7 ACK message. An enhanced HL7 ACK **MAY** be sent.

[TRO-174] - The Tele-radiology Order Fulfiller Technical Actor MAY validate transaction content. To report such attribute content validation errors, it SHALL support the return of errors in the ERR Segment of an original HL7 ACK message.

TABLE 5.5-1 ACK – ERR SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	705	CWE	R	0357	01813	HL7 Error Code
4	2	ID	R	0516	01814	Severity
5	705	CWE	R		01815	Application Error Code
7	2048	TX	R		01817	Diagnostic Information

The elements of the ERR Segment SHALL contain the following information about each validation error found:

- HL7 Error Code: "207"
- Severity: "E" or "W"
- Application Error Code: a specific value, with the value: "KSAContentValidation"
- Diagnostic Information: the textual representation of the error, which includes three concatenated attributes (separated by an underscore delimiter):
    a. Sub-error code: An optional value that represents the exact validation error code (produced by the content validation: e.g. assertion IF that failed the test
    b. Location: The location is the tag at which the error took place
    c. Text Message: The text message returned by the Health Information Exchange (HIE)

[TRO-136] –Upon receipt of an OMI "cancelled" message before the Tele-radiology Order Fulfiller has sent an OMI message with the status of "in progress, scheduled", the Tele-radiology Order Fulfiller **SHALL** cancel the order and not perform the interpretation. The field **ORC-3 Filler Order Number SHALL** be used as the unique field to link the "cancel" message to the original "new order" message.

[TRO-176] – Upon completing the interpretation, the complete, verified report is available for a given order, The Tele-radiology Order Fulfiller **SHALL** coordinate with the Tele-radiology Service to ensure that the report is shared in the Imaging Repository as specified by IS0102 *Saudi eHealth Document Sharing Interoperability Specification* and IS0005 *Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports*. If th**e OBR-19 Placer Field 2** was set to "Order_Creator" the images of the study **SHALL** be also shared in the Imaging Repository. If the **OBR-19 Placer Field 2** was set to "Shared_Repository", the study imaging manifest **SHALL** be replaced with an identical study imaging manifest where the new KSA-Wide Accession Number associated with the Tele-radiology Order is added in the XDS Metadata.

5.5.1 OMI Segments for the Tele-radiology Order Fulfiller Actor – Updated Statuses

[TRO-140] – The segments listed in Table 5.5-1 OMI Segments are **REQUIRED**. All other segments are **OPTIONAL**.

TABLE 5.5-1 OMI SEGMENTS FOR UPDATED STATUSES

OMI SEGMENT	SEGMENT NAME	CHAPTER IN HL7 V2.5.1
MSH	Message Header	2
PID	Patient Identification	3
{ORC	Common Order	4
OBR	Order Detail	4
{IPC}}	Imaging Procedure Control	4

5.5.1.1 MSH SEGMENT

See [TRO-015] for requirements.

5.5.1.2 PID SEGMENT

[TRO-141] –All fields in the PID segment are **OPTIONAL**, except those listed in Table 5.5-2 OMI – PID Segment.

TABLE 5.5-2 OMI – PID SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List
5	250	XPN	R		00108	Patient Name

[TRO-106] – PID-3 Patient Identifier List: SHALL be the same as the **PID-3 Patient Identifier List** in the OMI "new order" message, see Section 5.4.1.2.

[TRO-107] – PID-5 Patient Name SHALL be the same as the **PID-5 Patient Name** in the OMI "new order" message, see Section 5.4.1.2.

5.5.1.3 ORC SEGMENT

[TRO-161] –All fields in the ORC segment are **OPTIONAL**, except those listed in Table 5.5-3 OMI- ORC Segment.

TABLE 5.5-3 OMI- ORC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	2	ID	R	0119	00215	Order Control
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
5	2	ID	R	0038	00219	Order Status

[TRO-162] – ORC-1 Order Control SHALL convey the value "SC" (i.e. Status Change).

[TRO-163] –ORC-2 Placer Order Number **SHALL** be the same as the **ORC-2 Placer Order Number** in the OMI "new order" message, see Section 5.4.1.4.

[TRO-164] –ORC-3 Filler Order Number **SHALL** be the same as the **ORC-3 Filler Order Number** in the OMI "new order" message, see Section 5.4.1.4.

[TRO-119] – ORC-5 Order Status SHALL convey one of the following values:
"SC" (i.e., in process, scheduled)
"CM" (i.e., Order is completed)
"DC" (i.e., Order was aborted)

5.5.1.4 OBR SEGMENT

[TRO-122] –All fields in the OBR segment are **OPTIONAL**, except those listed in Table 5.5-4 OMI- OBR Segment.

TABLE 5.5-4 OMI- OBR SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	R		00237	Set ID – OBR
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
20	60	ST	C		00253	Filler Field 1 +

[TRO-123] –**Fields – OBR-2 Placer Order Number, OBR-3 Filler Order Number** SHALL convey the same values as in the ORC segment, see Section 5.4.2.3.

[TRO-124] –If the field **ORC-5 Order Status** conveys **t**he value "DC" (i.e., aborted), the **OBR-20 Filler Field 1** SHALL convey a coded value from a list of typical reasons to describe the reason the order was aborted. These typical reasons are specified in the KSA TRO Abort Reasons value set.

5.5.1.5 IPC SEGMENT

[TRO-127] –All fields in the IPC segment are OPTIONAL, except those listed in Table 5.5-5 OMI-IPC Segment

TABLE 5.5-5 OMI- IPC SEGMENT

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	80	EI	R		00237	Accession Identifier
2	22	EI	R		00216	Requested Procedure ID
3	70	EI	R		00217	Study Instance UID
4	22	EI	R		00238	Scheduled Procedure Step ID

[TRO-128] –Fields **IPC-1 – Accession Identifier**, **IPC-2 Requested Procedure ID**, **IPC-2 Study Instance UID** and **IPC-4 Scheduled Procedure Step ID** SHALL be the same as the corresponding fields in the OMI "new order" message, see Section 5.4.1.7.

5.6   REQUIREMENTS FOR TELE-RADIOLOGY ORDER FORWARDER ACTOR

The following rules shall be supported for the conformance to the Tele-radiology Order Fulfiller Actor:

[TRO-150] – Retired

[TRO-151] - The Tele-radiology Order Forwarder Actor SHALL process all HL7 messages received from the Tele-radiology Order Creator. It SHALL use the **MSH-5 Receiving Application** [Receiving Application Service End Point] to route the messages to the Tele-radiology Order Fulfiller Actor. No retry mechanism SHALL be implemented by the Tele-radiology Order Forwarder Actor (e.g., it is the responsibility of the Tele-radiology Order Creator Actor to retry messages that are not acknowledged).

[TRO-152] - The Tele-radiology Order Forwarder Actor SHALL process all HL7 messages received from the Tele-radiology Order Fulfiller. It SHALL use the **MSH-5 Receiving Application** [Receiving Application Service End Point] to route the messages to the Tele-radiology Order Creator Actor. No retry mechanism SHALL be implemented by the Tele-radiology Order Forwarder Actor (e.g., it is the responsibility of the Tele-radiology Order Fulfiller Actor to retry messages that are not acknowledged).

5.7 AUDIT TRAIL REQUIREMENTS FOR THE OMI MESSAGE

[TRO-155]- When the Tele-Radiology Order Creator successfully sends an OMI message with the ORC-1 Order Control set to "NW" (i.e. new order) a local audit trail **SHALL** be generated. The Tele-Radiology Order Creator **MAY** send a local audit for successfully sending OMI messages with any other Order Control value. The content of the data is based upon the Audit trail events as specified in the IHE ATNA Integration Profile and Table 5.7-1. See the IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 2.3.2 for more details.

[TRO-156]- When the Tele-Radiology Order Fulfiller successfully sends an OMI message (such as a status of In Progress, Completed, etc.) a local audit trail **MAY** be generated. The content of the data is based upon the Audit trail events as specified in the IHE ATNA Integration Profile. See IS0101 *Saudi eHealth Security and Privacy Interoperability Specification* – Section 2.3.2 for more details.

TABLE 5.7-1 ATNA DATA REQUIREMENTS FOR SUCCESSFUL TRANSMISSION OF OMI MESSAGES

	FIELD NAME	**OPT**	**VALUE CONSTRAINTS**
Event AuditMessage/ EventIdentification	EventID	M	EV (110109, DCM, "Order Record")
	EventActionCode	M	C = (create) such as Placning an Order U = (update) such as updating an Order
	EventDateTime	M	Shall be the time when the transfer has completed
	EventOutcomeIndicator	M	not specialized
	EventTypeCode	U	not specialized
Active Participant (Process that sent the data) (1)			
Active Participant (Process that received the data) (1)			
Participating Object (Order) (1)			
Participating Object (Patient) (1)			

Where:

Process that sent the data (1) AuditMessage/ ActiveParticipant	UserID	M	not specialized
	AlternativeUserID	U	not specialized
	UserName	U	not specialized
	UserIsRequestor	M	not specialized
	RoleIDCode	M	EV(110153, DCM, "Source Role ID")
	NetworkAccessPointTypeCode	U	not specialized
	NetworkAccessPointID	U	not specialized

Process that received the data (1) AuditMessage/ ActiveParticipant	UserID	M	not specialized
	AlternativeUserID	U	not specialized
	UserName	U	not specialized
	UserIsRequestor	U	not specialized
	RoleIDCode	M	EV(110152, DCM, "Destination Role ID")

	NetworkAccessPointTypeCode	U	not specialized
	NetworkAccessPointID	U	not specialized

Order AuditMessage/ ParticipantObjectIdentific ation)	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCode Role	M	"20" (Job)
	ParticipantObjectDataLifeCy cle	U	not specialized
	ParticipantObjectIDTypeCod e	M	EV (9, RFC-3881, "Report Number")
	ParticipantObjectSensitivity	U	not specialized
	ParticipantObjectID	M	the Filler Order Number from ORC-3
	ParticipantObjectName	U	not specialized
	ParticipantObjectQuery	U	not specialized
	ParticipantObjectDetail	U	not specialized
	ParticipantObjectDescription	U	not specialized
	Accession	M	The KSA-Wide Accession Number
Patient (1) (AuditMessage/ ParticipantObjectIdentific ation)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCode Role	M	"1" (Patient)
	ParticipantObjectDataLifeCy cle	U	not specialized
	ParticipantObjectIDTypeCod e	M	"2" = patient ID
	ParticipantObjectSensitivity	U	not specialized
	ParticipantObjectID	M	The Health ID of the patient
	ParticipantObjectName	U	The patient name
	ParticipantObjectQuery	U	not specialized
	ParticipantObjectDetail	U	not specialized
	ParticipantObjectDescription	U	not specialized

6. REFERENCED DOCUMENTS AND STANDARDS

The following documents and standards are referenced by this interoperability specification.

TABLE 6-1 INTERNAL REFERENCES

MOH DOCUMENT	DESCRIPTION
IS0001 Saudi eHealth Core Interoperability Specification for KSA-Wide Patient Demographic Query	Documents the specifications required to obtain patient IDs and demographic information for the patient. It is used to ensure that the nationwide Health ID is used to register laboratory orders for the correct patient.
IS0005 Saudi eHealth Core Interoperability Specification for Sharing Images and Imaging Reports	Describes the technical requirements for the interface to share imaging reports and images via the Saudi eHealth Exchange (SeHE). This includes reports and images acquired on a broad range of imaging modalities. Two common examples are to store images and reports about a patient's current imaging procedure and the ability to access images/reports from imaging studies previously performed for that patient.
IS0101 Saudi eHealth Security and Privacy Interoperability Specification	Specifies the interoperability standards and profiles along with the Saudi specific constraints that are required to provide the technical security measures, data protection, and privacy management that will facilitate the implementation of the Saudi eHealth Policies for Health Information Exchange in the Kingdom of Saudi Arabia among communicating IT systems.
IS0102 Saudi eHealth Document Sharing Interoperability Specification	Forms a "container" for set of requirements that complements the IHE XDS Profile with Saudi eHealth specific constraints when it is called upon by any of the Core Interoperability Specifications.
IS0106 Saudi eHealth Clinical Documents Constrains Interoperability Specifications	Specifies common constraints for clinical documents such as data elements of document headers that are common across the Saudi eHealth Project.
UC0005 Saudi eHealth Imaging Interoperability Use Case	Specifies the Saudi eHealth Interoperability Use Case applicable to existing and new information systems to be connected to the national Saudi Health Information Exchange (HIE) Platform. The Imaging Use Case describes the capability to share imaging reports and images and also supports the submission of a tele-radiology order to a remote tele-radiology service via the national Saudi Health Information Exchange (HIE) platform.
IS0200 Saudi eHealth Terminology Repository	Specifies the terminology concepts and associated coded value sets for data elements used throughout the Saudi eHealth Interoperability Specifications.

TABLE 6-2 EXTERNAL REFERENCES

DOCUMENT OR STANDARD	DESCRIPTION
Health Level Seven (HL7) Version 2.5.1, Imaging Order Message (OMI), Chapter 4	The HL7 Version 2.5.1 Messaging Standard is an application protocol for electronic data exchange in healthcare. Message formats and value sets / code tables are contained in the standard. Of particular focus is for message format described in Chapters 2, 3, 4, 6 and 7 supporting the OMI message. For more information See www.hl7.org

7. APPENDIX A – EXAMPLE MESSAGES

EXAMPLES WILL BE PROVIDED AS PART OF THE IS SPECIFICATION VALIDATION PROCESS. UNTIL THEN THIS SECTION WILL REMAIN BLANK.