

Pathology and Radiology Implementation Guide

HISO 10008.2

To be used in conjunction with HISO
Pathology and Radiology Messaging Standard

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1 SCOPE

This implementation guide is to be used for developing Pathology and Radiology applications compliant with the Messaging Standard. It needs to be read in conjunction with the Messaging Standard.

The documents in the Pathology and Radiology suite are:

Document	Purpose
Messaging Standard	Describes the structure of the messages that are exchanges between sender and receiver over the course of a Pathology and Radiology interaction
Implementation Guide	Designed to provide assistance when implementing systems which utilise the Standards in this suite

Table 1: Related Documents

NOTE: This document does not cover encryption.

This document is based on the HL7 v2.4 New Zealand Pathology and Radiology Messaging Standard. It covers the HL7 message structure, deployment information and how segment fields are used within NZ.

Changes to this guide may be submitted to HISO for committee approval following Sector involvement.

This Standard replaces - though is generally backward compatible with - earlier versions of the Standard. However, it should be noted that the earlier practice of converting message versions to a flat file for onward transmission to primary care practices will no longer be supported.

1.1 Concept of Orders and Results Not Being One

With regard to ordering and testing procedures, New Zealand Medical practices historically group ordered panels into a request.

Consequently, some laboratory procedures and the HealthPAC payments system have evolved along with this pattern.

This means that there is not necessarily a strict one-to-one relationship between the panels that are ordered and the sets of results that are returned. Content-wise, what has been ordered is completed but this may not be so contextually. For example, if four distinct panels are ordered then the results may be rationalised into two or three for reporting purposes.

Therefore, results messages will be generated using a standard methodology that allows for one-to-one matching of results in the receiving system.

2 OVERVIEW OF HL7 MESSAGING

HL7 is a structured methodology, whereby requests are made to a Pathology and/or Radiology system for patient testing and results are returned electronically.

The elements are:

- (a) Structured messages
- (b) Two-way transmission. For example, a message is sent and a response or acknowledgement is received.

Any data passed between the entities is contained in an HL7 message. The major parts of a message are referred to as message segments.

The patient details, request details and result lines are sent as separate segments in the same message. Therefore, software systems must keep links between the patient, request and results and the different components of a result. As different requests give results that have differing numbers and types of component parts, it can require complex data connections.

NOTE: *There is no inherent or implied formatting within the received atomic data. The practice management software is used to re-construct the results into an accurate and meaningful format for display/printing within the surgery.*

The method of communicating between the entities is not part of this specification and users must design their systems to interface with different transmission methodologies.

2.1 Transaction Flow

Messages are sent in response to 'real world' events and demands. The following events lead up to the transmission and receipt of this message.

The following represents the most common sequence of events in which the message is transferred:

A request is made by a practitioner for some service to be performed. This could be either a pathology or radiology test;

The requesting system sends an order message as described in the messaging standard document to the laboratory or radiology system;

The laboratory or radiology system replies;

The patient presents at the laboratory or radiology clinic, where the required test is performed;

The results are sent electronically back to the practitioner in an ORU^R01 message;

The requesting system sends an ACK^R01 acknowledgement message;

The transaction is complete and no further messaging is necessary;

Clean-up processing is performed at both the requestor's site and at the laboratory/radiology site;

Monitoring is performed at both the requestor's site and the laboratory/radiology site to identify incomplete processing.

Variations to this cycle will occur.

For example:

- (a) No orders are placed electronically;
- (b) Orders can be cancelled;
- (c) Corrections can be made to previously sent orders or results.

This process implies that a request has a distinct life cycle, as it is processed by the target. It starts out as an order request and ends when the order has been fulfilled or cancelled. This lifecycle can be represented by a state diagram, which describes the different states of an order/result message, the business processes that can cause a state to change, and what messages are generated as a result of the state change.

The following diagrams illustrate these states and the message flows between placer and filler in laboratory and radiology order processing.

Laboratory message types and status (not including change or cancel requests from the placer):

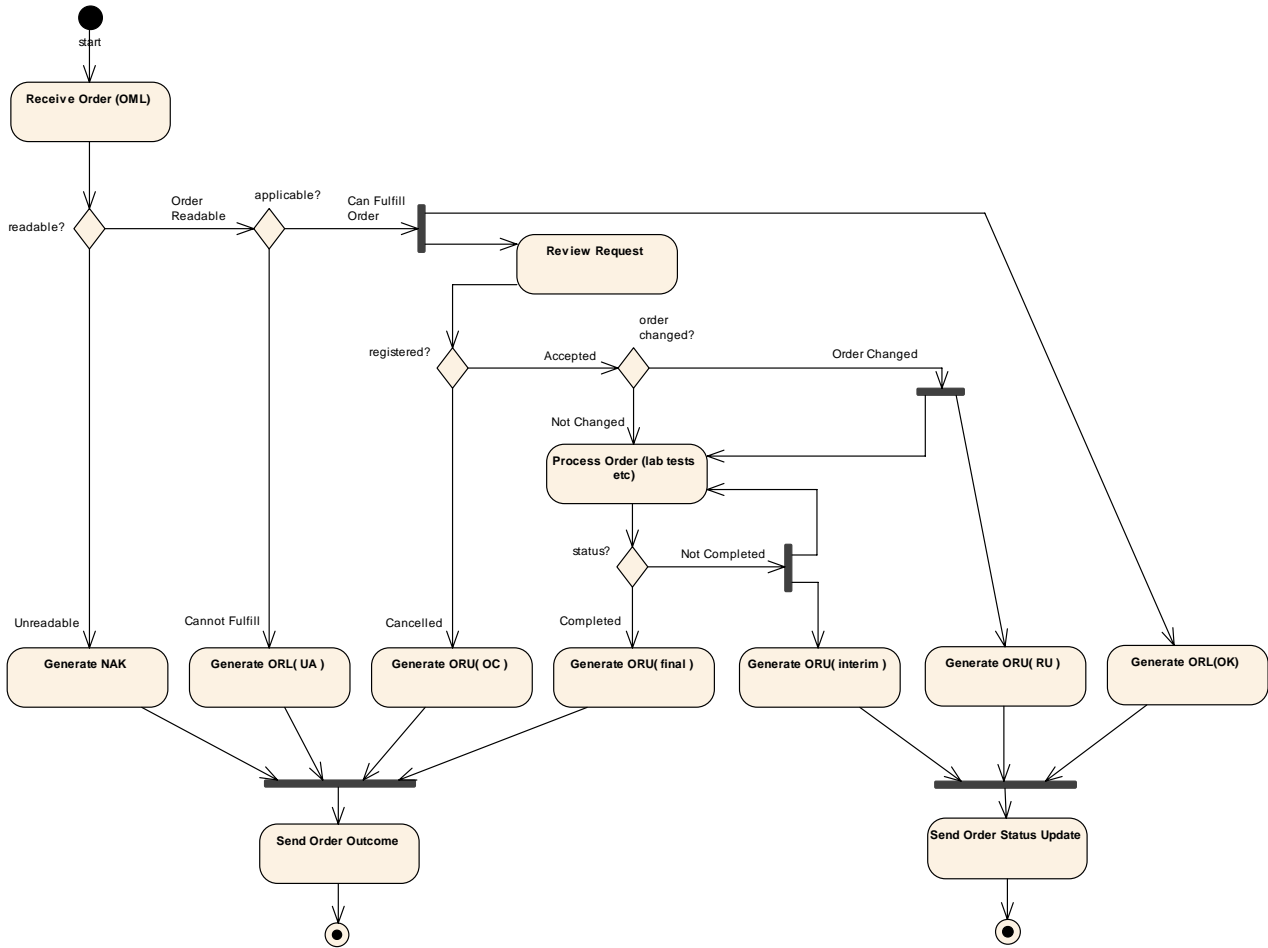


Figure 1: Laboratory Message Type and Status

Laboratory Order Change:

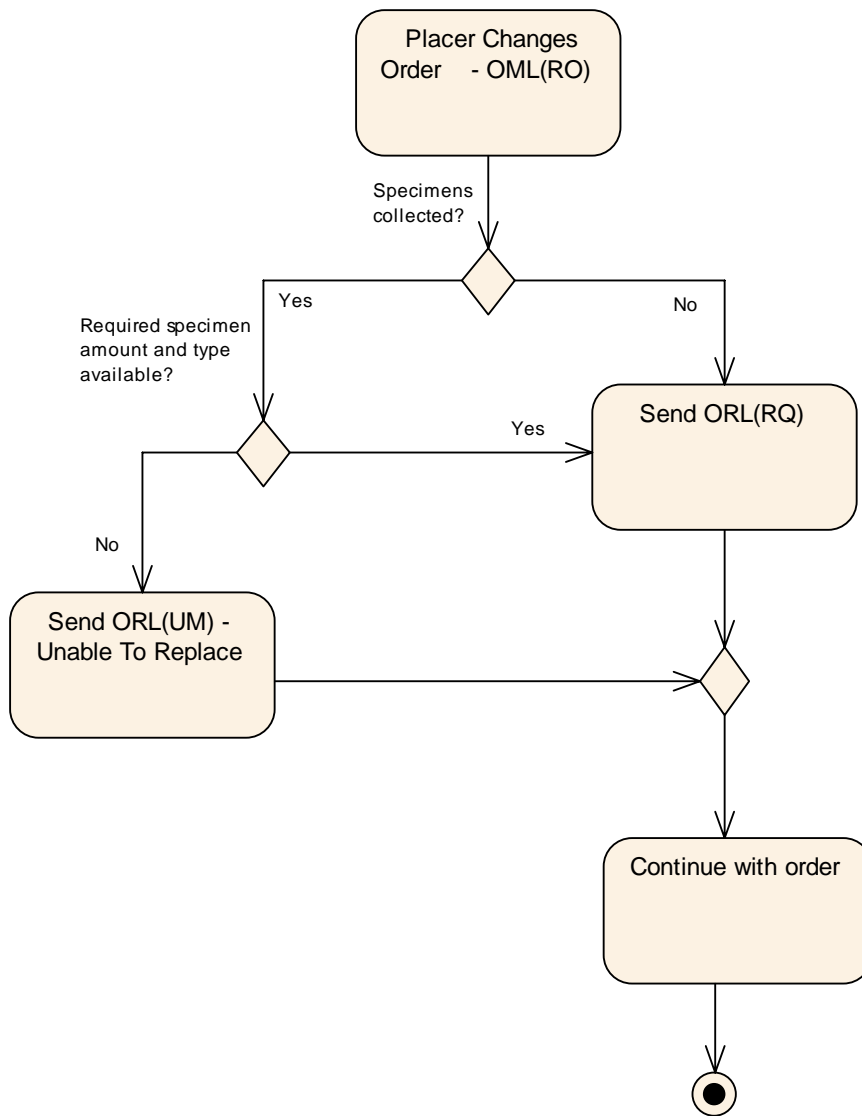


Figure 2: Laboratory Order Change

Laboratory Order Cancel:

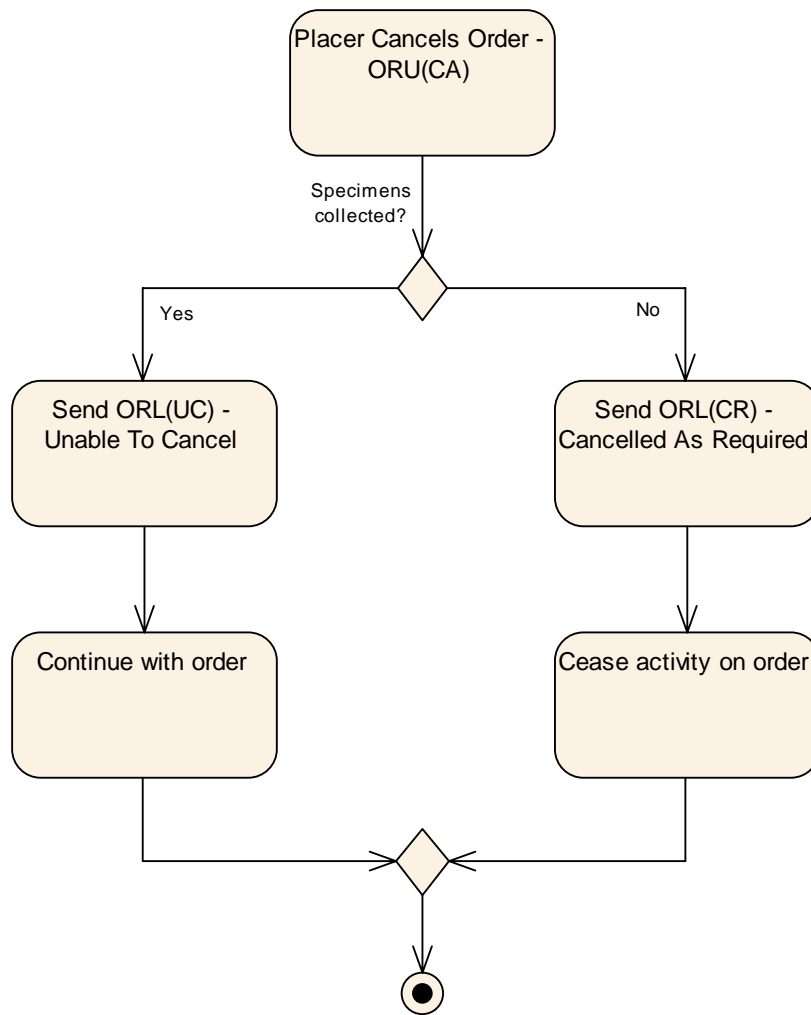


Figure 3: Laboratory Order Cancellation

Radiology message types and status (not including change or cancel requests from placer):

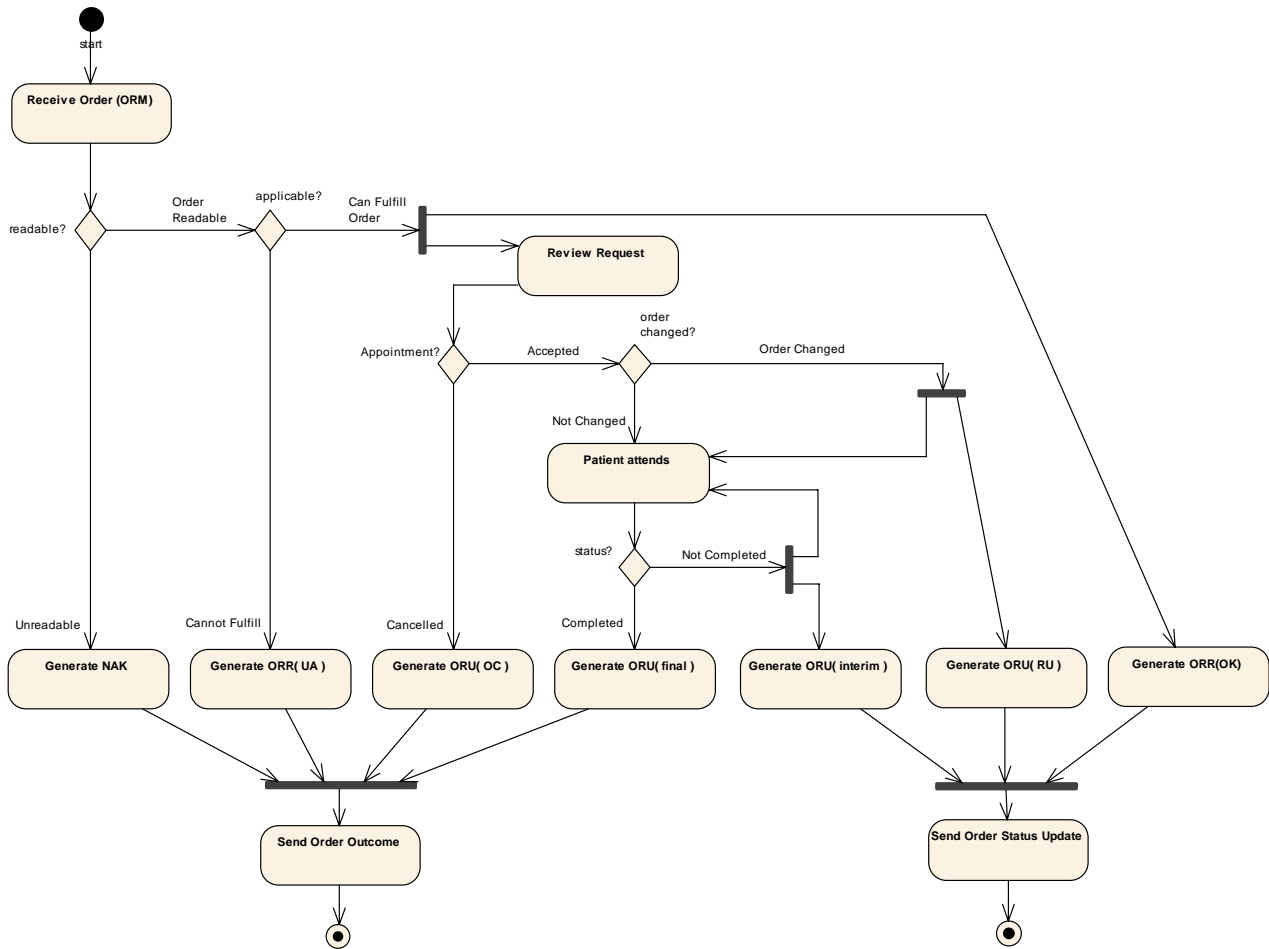


Figure 4: Radiology Message Types and Status

Radiology Order Change:

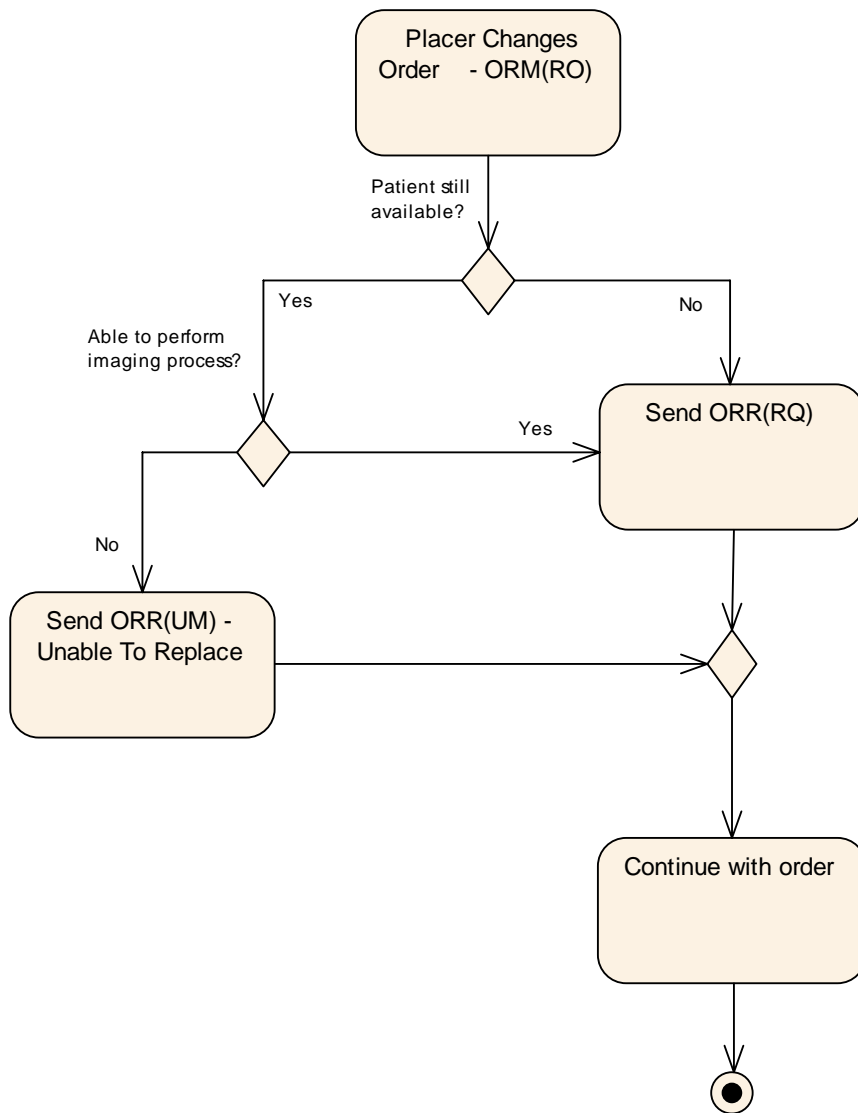


Figure 5: Radiology Order Change

Radiology Order Cancel:

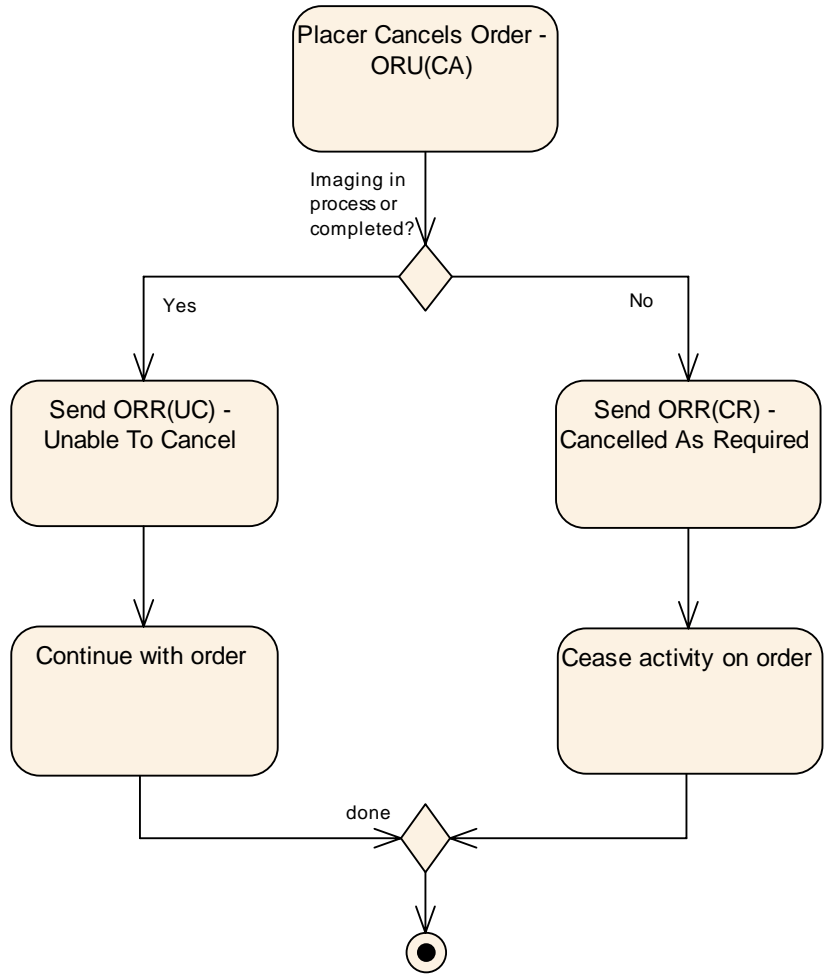


Figure 6: Radiology Order Cancel

3 HL7 MESSAGE STRUCTURE

An HL7 message consists of several segments used to carry information for a specific purpose.

For example, an ORU^R01 message will contain result information. The HL7 standard provides for the batching of messages, but this is not supported in New Zealand, as it requires the rejecting of complete batches in the event of an error. However, in New Zealand, a number of messages may be concatenated together in a message queue or file.

3.1 Message Types

The message type is defined in the MSH header by a three-character code. These cannot be altered.

The required message type codes are:

Type	Description
OML	Laboratory Order Message
ORL	Laboratory Order Response
ORM	General Order Message
ORR	General Order Response
ORU	Unsolicited Observation Result
ACK	General Acknowledgment
QBP	Query by Parameter
RSP	Segment Pattern Response

Table 2: HL7 Message Types

NOTES:

1. "Unsolicited" refers to information being sent without a direct request.
2. User defined segments are not permitted, e.g. "Z" segments.

3.2 Segments

Messages are constructed from a pre-defined order of segments. Each segment is identified by a unique three capital letter code, known as a segment ID, e.g. MSH (message header).

Segments can be defined as required or optional and may be permitted to repeat. Optional segments can be suppressed in the message. Required segments must always be present.

Segments are terminated using a carriage return.

NOTES:

1. Each order message requires an ORC/OBR pair.
2. Each OBX segment relates to an individual atomic result.
3. There is no limit to the number of OBXs that can be used to report a result.

The following HL7 segments can be used:

Segment Name	Description
AL1	Patient Allergy Information Segment
CT1	Clinical Trial Identification Segment
DG1	Diagnosis
DSC	Continuation Pointer

Segment Name	Description
ERR	Error Segment
IN1	Insurance Segment
MSA	Message Acknowledgement
MSH	Message Header
NTE	Notes and Comments
OBR	Observation Request
OBX	Observation Result
ORC	Order Control
PD1	Patient Additional Demographics
PID	Patient ID
PV1	Patient Visit
PV2	Patient Visit – additional information
QAK	Query Acknowledgment
QPD	Query Parameter Definition
RCP	Response Control Parameter
SAC	Specimen and Container Details

Table 3: HL7 Segment Name

3.3 Message Composition

The HL7 Message concept is:

- A message consists of multiple segments;
- Segments consist of one or more fields;
- Fields can be divided into components and sub components.

HL7 allows for considerable flexibility in the selection of separator characters to be used for the generation and parsing of the messages. The carriage return character <cr>, (ASCII Hex 0D₁₆), is reserved by HL7 for the segment terminator and must not be altered by any implementation.

It is a common problem for segments to be separated by both a carriage return character and a line feed character. This is incorrect HL7 usage and must be avoided.

HL7 practices 'trimming' of separators. That is, after the last field containing data in a segment, the carriage return character will occur to indicate the segment is complete. Thus the last character of a segment should never be a field separator.

Example 1 Correct usage of a hypothetical HL7 segment:

```
SEG|Field1|Field2|This is the last field<cr>
```

Example 2 Incorrect usage of the same hypothetical HL7 segment:

```
SEG|Field1|Field2|This is the last field|<cr>
```

It is strongly recommended that the standard HL7 characters for delimiting are used, as it cannot be guaranteed that all sites will be able to process messages with different separators.

When constructing HL7 messages, special characters are used to indicate:

Description	Character	Symbol	ASCII Hex
Field separator	"Vertical bar" or "Pipe"	' '	7C ₁₆
Component separator	"Hat" or "caret"	'^'	5E ₁₆
Sub-component separator	"Ampersand"	'&'	26 ₁₆
Repetition separator	"Tilde"	'~'	7E ₁₆
Escape character	"Back-slash"	'\'	5C ₁₆

Table 4: Delimiters

These separators are used in the example messages throughout this document.

Field separators

```
|Field 1|Field 2|Field 3|....
```

For example:

```
PID|||ABC1234||TEST.....
```

Components

```
|Component 1^Component 2^Component 3....|
```

For example:

```
PID|||ABC1234||TEST^PATIENT^M||20060504|F
```

Sub component

```
|Sub component 1 & Sub component 2^ Component 2 ...|
```

For example:

```
|SMI&SMITH (DR)&JOHN^200605030900^200605040904...|
```

Repeating data

```
|Component 1^Component 2~Component 1^Component 2...|
```

For example:

```
|DR1^Smith^John~DR2^Smith^Mary|
```

3.4 Message Definitions

For relevant message definitions, refer to Chapter 4 in the Pathology and Radiology Messaging Standard.

3.5 Segment Definitions

For relevant segment definitions, refer to Chapter 7 in the Pathology and Radiology Messaging Standard.

3.6 Data Types

For relevant data types, refer to Chapter 7.1.6 in the Pathology and Radiology Messaging Standard.

3.7 Tables

For relevant table information refer to the tables in the Pathology and Radiology Messaging Standard (and/or the Table of Figures).

4 MESSAGES

There are two distinct types of messages:

- (a) Business related:
These are the messages described in the Standard documents. They contain information (administrative and clinical) that relate to the processing of the message.
- (b) Transport level:
These are generated automatically by a receiving application and returned to the sender to indicate that the message has been successfully transmitted. Similar in concept to an e-mail receipt, it simply indicates that the message arrived at the receiver's application, not that it has necessarily been seen by any person or otherwise processed.

4.1 Business-Related Level messages

These are:

Name	Used for	Message Code
General Order Message	Radiology	ORM^O01
General Order Response	Radiology	ORL^O22
Laboratory Order Message	Laboratory	OML^O21
Laboratory Order Response	Laboratory	ORL^O22
Observation Message	Radiology and Laboratory	ORU^R01
General Acknowledgement	Radiology and Laboratory	ACK^R01
Query to a Provider	Radiology and Laboratory	QBP^Q11
Response to a Query	Radiology and Laboratory	RSP^K11

Table 5: Business-Related Level Messages

4.2 Transport Level Messages

Every business-related message that is sent will have an associated transport acknowledgement:

	<p>It is the responsibility of the sender to ensure receipt of a transport acknowledgement message. If an acknowledgement is not received within a reasonable time frame, then the message should be resent.</p> <p>If no acknowledgement is received after a number of re-tries, then an error should be raised to the person (or system) who created the message, to inform them that the message has not been successfully received by the recipient and that manual intervention is required to determine the cause of the error. This responsibility implies that the sending application needs to maintain a log of message events, including a copy of the original message.</p>
	<p>It is the responsibility of the receiving application to generate and return the acknowledgement message for any business message it receives.</p> <p>This responsibility implies that the receiving application should also maintain a log of message events, including a copy of the original message, in the event that it needs to demonstrate correct operation in the event of an error.</p>

Table 6: Transport Level Messages

The structure of the transport messages is given in chapter 2.13 of the HL7 Message Standard. New Zealand has adopted non-deferred Original Mode.

4.3 Receiving a Message

The message is first examined to see if it is a valid HL7 message. If it cannot be recognised, or it is an invalid version, it will be rejected. The message is then further examined to check that it is semantically correct, e.g. data types are correct and appropriate code tables are used. A semantic error will result in an error message being returned.

In both cases the entire message (i.e. from one MSH to the next) will be rejected and will need to be resent. The status of the message is not a correction as the message was never processed.

If a message contains, e.g. two results (OBR) and one is rejected, then the whole message is rejected and the ERR segment will indicate which segment(s) and location(s) within the message are in error.

Both results will have to be re-sent to the recipient, maybe with other results, or separately. The filler ID and the test code will identify the re-sent result. As the result was never acknowledged, it should be re-sent with the original result status. As some organisations may incorrectly re-send a result as a change, the receiving system should accept a change, even if a final result has not been processed.

4.4 Retrieving a Message from a Order Broker

If an order has been sent to an orders brokering system then it will be held on that system until it is queried for download. When the patient presents to the practitioner of the diagnostic service, an inquiry will be sent with the ordering practitioner (placer) and the placer order number, to the broker service(s). It is envisaged that the patient will present with a request that has this information available in the form of a bar code. The format of the query message (QBP) is specified in Section 6

If a valid request is received, the brokering system will send the original message to the filler without altering the message. That is, the original placer identifiers will remain and not be replaced with those of the broker.

4.5 Referring a Request to Another Practitioner

If an observation request is referred to another practitioner for a second opinion, then this request is treated as a new request from the first practitioner to the second. It is the responsibility of the first practitioner to maintain the original request details, so that the results from the second practitioner can be amalgamated with any other results or opinions and reported back to the original placer. Under normal circumstances the practitioner to whom the request for a second opinion is made would report back to the original practitioner and not the placer directly.

4.6 Sending Copies of a Message

If a copy of a message is sent to other recipients, then it is essential that OBR-46 (placer supplemental service information) and OBR-47 (filler supplemental service information) fields are completed with HPI facility codes as the original recipient will be lost from the message header (MSH).

4.7 Logging

In order to meet the business requirements of reliable messaging and to support an audit trail, it is important that systems that send and receive messages should implement a messaging log.

The message log should contain the:

- Message ID;
- Copy of the message;
- Date/Time sent;
- Address sent to;
- Date/time of receipt acknowledgement.

The system should also implement the ability to re-send a message.

4.8 Batching

The batching of messages, as described in HL7 Chapter 2, is not supported in New Zealand.

4.9 Units of Measure

New Zealand uses SI units. Refer to Table B 12 Common ISO derived units and ISO+ extensions in Pathology and Radiology Messaging Standard.

5 MESSAGE CONTEXT AND CONTENT

This section contains important information regarding the content and context of the messages used for pathology and radiology messaging within the New Zealand environment. To maintain a consistent approach, fields, data and values are specified where possible.

For example:

- (a) Messages are received and sent from facilities (which are defined as HPI codes);
- (b) A facility has an address;
- (c) People work in facilities;
- (d) Organisations run facilities;
- (e) Messages should be delivered to facilities and addressed to people;
- (f) Therefore, the placer facility and filler facility are populated with HPI facility references.

5.1 User Interface

The specification does not cover the user interface, as this is the responsibility of the individual implementation.

5.2 Creating a Message

A primary purpose of the electronic messaging standard is to create structured messages so that the receiving systems are able to incorporate the data into their own systems.

5.3 Message Control ID

In order for messages to be linked together, there needs to be a common identifier. This identifier should be globally unique, i.e. 'in the whole world', the number will not be re-used.

There are a number of ways of creating such a number, e.g. a central registry, using either a date/time combination, or a GUID (Globally Unique Identifier), that can be electronically created on any machine.

The former makes implementation much more complex while the latter results in a 40 character letter that is difficult for a person to understand.

For example:

```
MSH|^~\&|LABSYSTEM|LAB|||200605040836||ORU^R01|947158|P|2.3
```

5.4 Scheduled Date/Time

For radiology orders, this field will contain the booking date/time.

5.5 Deleted Results

When deleting a test result, the OBX observation result status (OBX-11) **must** be defined as "D" and the observation value defined as ":". The test code (OBX-3) is used to identify the original result to be deleted.

For example:

```
OBX|1|ST|1001^ANA||" "|||D
```

In deleting a complete observation request, an OBR is sent with a status of "X" (OBR-25). This status overrides the status in ORC-5, if present. It is strongly recommended that the complete OBR is deleted and the remaining correct results re-sent, rather than trying to identify individual results in a complex message. This is especially true for microbiology facilities.

5.6 Corrected results

Occasionally radiology and laboratory systems will amend an earlier result. When this happens, the relevant field (OBX-11) will be flagged as a "C". As recommended above, for deleted results, it is strongly recommended that the complete observation is deleted and all the corrected and unchanged results re-sent.

Recipient systems should not delete or replace previous results. All results should be archived.

5.7 Date and Time Fields

The following date/time fields can be used in order and/or result messages:

Field	Description
PID-7	Date of birth
ORC-9	Date/time the order was created
ORC-15	Date/time that the changes to the order took effect
OBR-6	Not supported
OBR-7	Specimen collection date/time
OBR-14	Specimen received date/time
OBR-22	Not supported
OBR-36	Scheduled date/time

Table 7: Date and Time Fields

OBR-7 will only be sent with an order if the party responsible for placing the order has collected the sample, otherwise this field can be empty.

5.8 Patient Identifiers

Where possible, the National Health Index (NHI) should be used in PID-3. If unavailable, a local patient identifier may be used. It is strongly recommended that the patient's NHI number is used as the identifier.

PID-2 is no longer supported.

There are several items that can be used to attempt to uniquely identify the patient, e.g. name, date of birth, sex, etc. This implementation guide excludes details on how to perform patient matching, as this is an issue for individual implementations.

The following components in PID-3 are available for use:

Sub Component	Type	Notes
<ID>^	ST	This field shall contain data
<Check digit>^	ST	
<Code identifying the check digit scheme employed>^	ID	
<Assigning authority>^	HD	The assigning authority is the system, application, or body that actually generates the ID number. If this field is blank then the value in the first component is assumed to be the NHI number. In this case the assigning authority is the Ministry of Health (NZLMOH). If another identifier is being messaged, then this field shall be filled in.
<Identifier type code>^	ID	

Sub Component	Type	Notes
<Assigning facility>^	HD	Identifies the facility that 'owns' the identifier

Table 8: PID – 3 Components

For example:

PID || |ABC1234^^^NHI | |TEST^PATIENT |... .

Or:

PID || |TP12345^^^LOCAL | |TEST^PATIENT |... .

Or:

PID || |ABC1234^^^NZLMOH~TP12345^^^LOCAL | |TEST^PATIENT |... .

5.9 Practitioner

All references to doctor/provider have been updated in the Pathology and Radiology Messaging Standard to use the term 'Practitioner'.

For example

OBR-16 Previously Ordering Practitioner;
 ORC-12 Previously Ordering Practitioner;
 PV1-7 Previously Attending Practitioner;
 PV1-8 Previously Referring Practitioner.

Where possible, the HPI number should be output in all practitioner fields. If this information is not available, the New Zealand Medical Council number should be used.

The following components in the XCN data type are available for use:

Sub Component	Type	Notes
<ID number>^		HPI number
<Family name>^		Practitioner Name
<Middle name>^		Practitioner Name
<Suffix>^		
<Prefix>^		
<Degree>^		
<Source Table>^		
<Assigning Authority>^		The assigning authority is the system, application, or body that actually generates the ID number, e.g. HPI.

Table 9: Practitioner Sub Component

For example:

PV1 | | I | ED | | | SMI^Smith^John^^^^^^HPI | ...

5.10 Placer Group Number

A placer group is a series of observations that result from a consultation. It is synonymous with the manual pad used to order tests. This number is unique to the facility and has no relevance to the filler.

5.11 Placer Order Number

A set of one or more observations is identified by a single name and code number and treated as a shorthand unit for ordering or retrieving results of the constituent observations. In keeping with the mathematical conventions about set, a battery can be a single observation. Vital signs, electrolytes, routine admission tests and obstetrical ultrasound are all examples.

Vital signs (conventionally) consist of diastolic and systolic blood pressure, pulse and respiratory rate. Electrolytes usually consist of Na⁺, K⁺, Cl⁻ and HCO₃⁻. Routine admission tests might contain CBC, Electrolytes, SMA12, and Urinalysis. Note that, for our purposes, the elements of a battery may also be batteries. Obstetrical ultrasound is a battery made up of traditional component measurements and the impression, all of which would be returned as separate results when returned to the requestor. A test involving waveform recording, such as an EKG, can be represented as a battery comprised of results of many categories, including digital waveform data, labels and annotations to the data, measurements and the impression.

The word 'battery' is used synonymously with the word 'profile' or 'panel'. The individual observation elements within a battery may be characteristic of a physiologic system (e.g. liver function tests), or many different physiologic systems.

The placer order number consists of a unique number for that facility. This number combined with the facility code for the placer establishes an unique identifier for the order. If there is no number, due to a manual order, then the fillers order number is used as the unique sequence number. In this case the fact that the number was allocated by the filler can be highlighted by the use of the last three components of this field.

If observations are added to an order by the filler, then the placer order number of the observation that gave rise to the further test will be used for subsequent observations.

The filler must retain this number and return it on all observation results.

5.12 Filler Order Number

The filler order number is determined by the laboratory to acknowledge that an order has been registered. In most situations, it is the laboratory request number assigned to the specimen when they are collected.

The filler order number consists of a unique number for that facility. This number combined with the facility code for the filler establishes a unique identifier for the order.

The field may be populated during an order response message. It must be populated when creating observation results messages. For example:

Order message:

```
OBR|1|0001^ORDERS||LFT||200603040128|200603040308|||22^Ward
22|||^^200603040308^^R
```

Result message:

```
OBR|1|0001^ORDERS|LAB-01|LFT||200603040128|200603040308|||22^Ward
22|||^^200603040308^^R
```

5.13 Sendaways

When a test is carried out by a laboratory other than the laboratory reporting the results, the facility number (HPI) of the laboratory doing the test must be recorded in OBX-15. If this field is null the receiving system assumes that the observations were produced by the sending or reporting organisation.

5.14 Repeating Orders

When a diagnostic procedure is to be repeated, then the timing information is described in field 7 of the ORC segment. This structure covers situations such as “carry out the observation every week from [a start date] to [finish date]”. The following situations are not covered and would require multiple orders to be placed:

- (a) “Cardiac enzymes STAT and then q 4 hours”;
- (b) “Streptokinase studies, draw 1st Stat and run Stat, then draw q 4 hours and run Stat”.

5.15 Special field items

Field 20 of the OBR segment is available for user defined information, e.g. free text information.

Fields 19 and 21 of the OBR segments are not supported.

5.16 NTE comments

Comments can be output in NTE segments after the PID, OBR or OBX segment. A comment can provide additional information regarding the patient, report or test result.

NTE comment(s) will be appended to any preceding OBX result.

5.17 Results Copies To

All copy to information should be output in OBR-28. Up to 5 ‘copy to practitioners’ can be present.

The first practitioner in the ‘copy to’ field is the recipient of the report.

Where possible, the HPI number should be output in all practitioner fields. If this information is not available, the New Zealand Medical Council number should be used.

The following components in the XCN data type are available for use:

Sub Component	Type	Notes
<ID number>^		HPI number
<Family name>^		Practitioner Name
<Middle name>^		Practitioner Name
<Suffix>^		
<Prefix>^		
<Degree>^		
<Source Table>^		
<Assigning Authority>^		The assigning authority is the system, application, or body that actually generates the ID number, e.g. HPI.

Table 10: XCN Components

For example:

“Copies of this report are to be sent to C1 and C2. The copy of this report is for Practitioner C1.”

```
OBR|0001||06/17|5401^Complete Blood
Count^L||200605010810|200605010815|200605010820|||200605010825||06974^C
ook^B|||200605010830||F|^R|C1^Cole^Mark^^^^HPI~C2^Smith^Mary^^^^
^HPI|||
```

5.18 Sending Facility

This field identifies the facility that sent/produces the message.

Where possible, the HPI code or EDI account number should be used.

For example:

Component	Output
<Namespace ID>^	
<Universal ID>^	HPI facility number
<Universal ID Type>^	N

Or:

Component	Output
<Namespace ID>^	EDI account number
<Universal ID>^	
<Universal ID Type>^	

Or:

Component	Output
<Namespace ID>^	EDI account number
<Universal ID>^	HPI Facility number
<Universal ID Type>^	N

5.19 Universal service ID/Observation identifier

This field is used to describe requested radiology and laboratory test codes.

The universal service ID is OBR-4 and the observation identifier is OBX-3

New Zealand has adopted a subset of the coding standard 'LOINC' known as the New Zealand Pathology Observation Code Sets (NZOCS)

If the LOINC is not available, a local identifier code can be used.

For example:

```
OBX|0001||2157-6^CK plasma^LN||""|U/L|30-180|||I
```

5.20 Species Code

This field can be empty if the order or result message relates to a human, otherwise the living organism SNOMED code can be inserted.

For example:

```
PID|||ABC1234||TEST^ANIMAL|||||||||||||||||||||||||||||||||L-80700^Canine,NOS
```

5.21 Breed Code

This field can be empty if the order or result message relates to a human, otherwise the specific breed code can be inserted.

For example:

```
PID|||ABC1234||TEST^ANIMAL|||||||||||||||||||||||||||||||||L-  
80700^Canine,NOS|L-80700^Staffordshire bull terrier|
```

5.22 Query Tags (QPD)

It is not necessary to value this field in implementations where the only return message on the socket will be the response to the query that was just sent. Conversely, in an 'asynchronous' implementation, where many queries, responses, and other messages may be communicated bi-directionally over the same socket, it is essential that this field be valued so that the client knows to which query the server is responding

6 QUERY TO ORDER BROKER REQUESTING AN ORDER

The use of an order broker is optional in New Zealand.

6.1 Order Retrieval

Requests for an order are submitted using a query by parameter (QBP) message. The response is a segment pattern response (RSP), containing the original order.

The names of the input and output fields are not specified in the query message, but according to the Conformance Statement, are identified by QPD-1(message query name). The MSH-9-2 (trigger event) and the QPD-1 (message query name) are this query's only distinguishing elements. The requesting system must refer to this query's Conformance Statement to learn more about the input and output fields.

There is a separate Conformance Statement for each of the different query types.

6.2 Laboratory Order Retrieval Conformance Statement

The order retrieval query returns the original laboratory order. The brokering systems will accept single-person queries only. Batch mode queries will not be supported.

Segment Name	Description
Query Statement ID (Query ID=Z80):	Z80
Type:	Query
Query Name:	Laboratory Order Retrieval
Query Trigger (= MSH-9):	QBP^Z80^QBP_Q11
Query Mode:	Both
Response Trigger (= MSH-9):	RSP^Z81^RSP_Z81
Query Characteristics:	Patient name and date of birth must be supplied and supported by NHI if available. Placer order number must be supplied.
Purpose:	To retrieve diagnostic order from order repository
Response Characteristics:	
Based on Segment Pattern:	OML_O21

Table 11: Conformance Statement

Segment Name	Description
QBP^Z80^QBP_Q11	Query Grammar: QBS Message
MSH	Message Header Segment
QPD	Query Parameter Definition
RCP	Response Control Parameter
[DSC]	Continuation Pointer

Table 12: QPB^Z80 Query Message

RSP^Z81^RSP_Z81	Response Grammar:	Group Control	Comment	Support Indicator
MSH	Message Header			
MSA	Message Acknowledgement			
[ERR]	Error			
QAK	Query Acknowledgement			
QPD	Query Parameter Definition			
{			Query Result cluster	
[PIDG	Begin PID group	
PID	Patient Identification			
]			End PID group	
		ORCG	Begin ORC group	
ORC	Common Order		Each ORC/OBR combination constitutes a "hit"	
OBR	Observations Report ID			
{		OBXG	Begin OBX group	
[OBX]	Observation/Result			
}			End OBX group	
			End ORC group	
}			End Query Results	
DSC	Continuation Pointer			

Table 13: Response Message

QPD Input Parameter Specification

Field Seq (Query ID=Z80)	Name	Key/ Search	Len	Type	Opt	Rep	Element Name
1	MessageQuery Name		60	CE	C		
2	QueryTag		32	ST	R		
3	Patient Id	S	250	CX	R		PID-3 (Patient Identifier)
4	Patient Name	S	250	XPN	R		PID-5 (Patient Name)
5	DOB	S	26	TS	R		PID-8

Field Seq (Query ID=Z80)	Name	Key/ Search	Len	Type	Opt	Rep	Element Name
6	Placer Order Number	S	250	ST	R		ORC-2 (Placer order number)

Table 14: QPD Input Parameter Specification

QPD Input Parameter Field Description and Commentary

Input Parameter (Query ID=Z80)	Component Name	Data Type	Description
MessageQueryName		CE	Must be valued Z80^ Laboratory Order Retrieval^ HISO
QueryTag		ST	Unique to each query message instance. Suggest Identifier for patient concatenated with a date/time stamp.
PatientId		CX	The patient for who this order is to be retrieved. Should be NHI but could be any local scheme.
Patient Name		XPN	The full name of the patient presenting for this order
DOB		TS	Date of birth of the patient
Placer Group Number		ST	The identifier of this order on the brokering server – and attached to the patients order form, or the specimens

Table 15: QPD Input Parameter Field Description and Commentary

RCP Response Control Parameter Field Description and Commentary

Field Seq (Query ID=Z80)	Name	Component Name	Len	Data Type	Description
1	Query Priority		1	ID	(D) eferred or (I) mmediate. Default is I .
2	Quantity Limited Request		10	CQ	
		Quantity		NM	Number of units (specified by the following component) that will be returned in each increment of the response. If no value is given, the entire response will be returned in a single increment.
		Units		CE	CH aracters, LI nes, PaGe s, or RecoR Ds. Default is LI .
3	Response Modality		60	CE	R eal time or B atch. Default is R .
7	Segment group inclusion		256	ID	What segment group(s) are to be included. If this field is not valued, all segment groups will be included.

Table 16: RCP Response Control Parameter Field Description and Commentary

6.2.1 New Zealand parameters

The broker will process a query for laboratory order, in immediate mode only. The response will be provided as a segmented OML message. Therefore, the valid parameters in the RCP segment will be:

- (a) RCP-1 = I (Immediate); and
- (b) RCP-3 = R (Real Time)

Other values will be ignored and extra parameters such as RCP-7 (segment group) will not be processed. If given incorrect or extra values, the system will assume the default values, or reject the query if the query contents are insufficient.

Example message:

```
MSH|^~\&|Sample Lab System|Sample Lab|DEPOSIT|BROKER|200607121633
|QBP^Z80|msgID|P|2.4
QPD|Z80^ Laboratory Order Retrieval^HISO|SMIT010102006101010845
|DZA7937^^^NZLMOH|SMITH^SUSAN|19581023|1234.5678
RCP|I||R|
```

Or if NHI is not known:

```
MSH|^~\&|Sample Lab System|Sample Lab|DEPOSIT|BROKER|200607121633
|QBP^Z80|msgID|P|2.4
QPD|Z80^ Laboratory Order Retrieval^HISO|SMIT010102006101010845
|SMIT010102^^^L|SMITH^SUSAN|19581023|1234.5678
RCP|I||R|

MSH|^~\&|Sample Lab System|Sample Lab|DEPOSIT|BROKER|200607121633|
|RSP^Z81|msgID|P|2.4
MSA|AA|msgID|
QAK|SMIT010102006101010845|OK| Laboratory Order Retrieval ||
QPD|Z80^ Laboratory Order Retrieval^HISO|SMIT010102006101010845
|DZA7937^^^NZLMOH|SMITH^SUSAN|19581023|1234.5678
PID|||DZA7937^^^NZLMOH||SMITH^SUSAN^M||19581023|F
ORC|...
```

6.3 Radiology Order Retrieval Conformance Statement

The order retrieval query returns the original radiology order. The brokering systems will accept single-person queries only. Batch mode queries will not be supported.

Conformance Statement

Segment Name	Description
Query Statement ID (Query ID=Z82):	Z82
Type:	Query
Query Name:	Radiology Order Retrieval
Query Trigger (= MSH-9):	QBP^Z82^QBP_Q11
Query Mode:	Both
Response Trigger (= MSH-9):	RSP^Z83^RSP_Z83
Query Characteristics:	Patient name and date of birth must be supplied and supported by NHI if available. Placer order number

Segment Name	Description
	must be supplied.
Purpose:	To retrieve diagnostic order from order repository
Response Characteristics:	
Based on Segment Pattern:	ORM_O01

Table 17: Radiology Order Retrieval Conformance Statement

QBP^Z82^QBP_Q11	Query Grammar: QBS Message
MSH	Message Header Segment
QPD	Query Parameter Definition
RCP	Response Control Parameter
[DSC]	Continuation Pointer

Table 18: Query Statement ID

RSP^Z83^RSP_Z83	Response Grammar:	Group Control	Comment	Support Indicator
MSH	Message Header			
MSA	Message Acknowledgement			
[ERR]	Error			
QAK	Query Acknowledgement			
QPD	Query Parameter Definition			
{			Query Result cluster	
[PIDG	Begin PID group	
PID	Patient Identification			
]			End PID group	
		ORCG	Begin ORC group	
ORC	Common Order		Each ORC/OBR combination constitutes a "hit"	
OBR	Observations Report ID			
{		OBXG	Begin OBX group	
[OBX]	Observation/Result			

RSP^Z83^RSP_Z83	Response Grammar:	Group Control	Comment	Support Indicator
}			End OBX group	
			End ORC group	
}			End Query Results	
DSC	Continuation Pointer			

Table 19: Response Query ID

QPD Input Parameter Specification

Field Seq (Query ID=Z80)	Name	Key/Search	Len	Data Type	Opt	Element Name
1	MessageQueryName		60	CE	R	
2	QueryTag		32	ST	C	
3	Patient Id	S	250	CX	R	PID-3 (Patient Identifier)
4	Patient Name	S	250	XPN	R	PID-5 (Patient Name)
5	DOB	S	26	TS	R	PID-8
6	Placer Order Number	S	250	ST	R	ORC-2 (Placer order number)

Table 20: QPD Input Parameter Specification

QPD Input Parameter Field Description and Commentary

Input Parameter (Query ID=Z80)	Component Name	Data Type	Description
MessageQueryName		CE	Must be valued Z82^Radiology Order Retrieval^HISO .
QueryTag		ST	Unique to each query message instance. Suggest Identifier for patient concatenated with a date/time stamp.
Patient ID		CX	The patient for who this order is to be retrieved. Should be NHI, but could be any local scheme.
Patient Name		XPN	The full name of the patient presenting for this order
DOB		TS	Date of birth of the patient
Placer Group Number		ST	The identifier of this order on the brokering server – and attached to the patients order form, or the specimens

Table 21: QPD Input Parameter Field Description and Commentary

RCP Response Control Parameter Field Description and Commentary

Field Seq (Query ID=Z82)	Name	Component Name	Len	Data Type	Description
1	Query Priority		1	ID	(D) eferred or (I) mmEDIATE. Default is I .
2	Quantity Limited Request		10	CQ	
		Quantity		NM	Number of units (specified by the following component) that will be returned in each increment of the response. If no value is given, the entire response will be returned in a single increment.
		Units		CE	CH aracters, L ines, Pa Ges, or Reco Rs. Default is LI .
3	Response Modality		60	CE	Real time or B atch. Default is R .
7	Segment group inclusion		256	ID	What segment group(s) are to be included. If this field is not valued, all segment groups will be included.

Table 22: RCP Response Control Parameter Field Description and Commentary

6.3.1 New Zealand parameters

The broker will process a query for radiology order, in immediate mode only. The response will be provided as a segmented ORM message. The valid parameters in the RCP segment will be:

- (a) RCP-1 = I (Immediate); and
- (b) RCP-3 = R (Real Time)

Other values will be ignored and extra parameters, such as RCP-7 (segment group) will not be processed. If given incorrect or extra values, the system will assume the default values, or reject the query if the query contents are insufficient.

Example Message:

```
MSH|^~\&|Sample Radiology System|Sample Rad
Service|DEPOSIT|BROKER|200607121633
||QBP^Z81|msgID|P|2.4
QPD|Z82^Radiology Order Retrieval^HISO|SMIT010102006101010845
|DZA7937^^^NZLMOH|SMITH^SUSAN|19581023|1234.5678
RCP|I||R|
```

Or if NHI is not known:

```
MSH|^~\&|Sample Radiology System| Sample Rad Service
|DEPOSIT|BROKER|200607121633
||QBP^Z81|msgID|P|2.4
QPD|Z82^Radiology Order Retrieval^HISO|SMIT010102006101010845
|SMIT010102^^^L|SMITH^SUSAN|19581023|1234.5678
RCP|I||R|

MSH|^~\&|Sample Rad System|Sample Rad|DEPOSIT|BROKER|200607121633|
```

```
RSP^Z83| msgID |P|2.4
MSA|AA| msgID |
QAK|query42|OKRadiology Order Retrieval ||
QPD|Z82^ RadiologyOrder Retrieval^HISO|SMIT010102006101010845
|DZA7937^^^NZLMOH|SMITH^SUSAN|19581023|1234.5678
PID|||DZA7937^^^NZLMOH||SMITH^SUSAN^M||19581023|F
ORC|...
```

7 VARIANCES TO HL7

The New Zealand standard is based on the HL7 standard, version 2.4. Appendix C of the 10008 Pathology and Radiology Messaging Standard has the complete list of the variances.

Appendix A: Laboratory Scenario

High level clinical scenario:

Patient with chronic renal failure presents to General Practitioner (GP) for regular assessment. GP decides on regular batch of laboratory tests to assess renal failure. Particularly in this case what is required is the latest creatinine. The wish of the GP is to display the latest creatinine graphically alongside creatinine results available in the GP PMS from several different laboratories.

There is also a batch of renal failure tests the GP will be performing, including the electrolytes. The latter test is specific, in that the blood must be taken and analysed quickly, or the result will be affected by the time between venesection and analysis. There has been a change in the laboratory procedure and the latest creatinine result will have a new normal value. The PMS will need to be aware of the normal value range for this test and the normal range for results from the already stored laboratory results to enable the intended graphical display to be meaningful.

High level construction of laboratory referral:

The GP calls up the specific patient in the PMS software and selects an order template for a particular laboratory. The template is pre-populated with patient demographics from the PMS and it will need to be aware of the particular address of the required laboratory for send purposes. There will be several templates to select from. This list of templates may be long, so there needs to be a systematic way to select the required template.

For example, there may be a laboratory form that is complete with the tests ordered for specific disease situations. If the GP regularly sees patients for whom a certain batch of tests are required, there should be a utility where the practitioner can make a standard laboratory form for each situation. The tests on the batch form will need to be easily changed (additions, deletions, etc). There will need to be several areas on the laboratory template for extraction of classification information, alert information, previous laboratory results, clinical letters, or medication information from the PMS. In the PMS, this information will be rich, i.e. it will be coded rather than free text. This richness needs to be preserved through to the laboratory if possible. All options will not be required in each case, so several buttons to automatically insert information will be required, one for each data set. There will need to be a free text area for entering the clinical question the practitioner wishes to be addressed. When complete with this clinical free text and data, the order can be sent to the laboratory for completion.

Lower level detail of referral letter:

Laboratory Services
54 Any Street
Christchurch
Ph 3** 0***

Date 16 Nov 2005

Name: Mr T**** H****
Address: 2/45 V***** Ave CHCH 6
DOB: ** Feb 19**
NHI No: A**8***

Please perform the following Laboratory tests:

Creatinine electrolytes.

Clinical History: Chronic renal failure

Long Term Medications:

01-Sep-2005
Fludrocortisone Acetate 100Mcg Tab
SIGS : 100mcg mane

• Related classifications

Chronic renal failure (K05.00)
Essential hypertension (G20.00), 1970 s also ANGINA
Left ventricular failure (G581.00), dilated
Postural hypotension (G870.11), 2003

• Unrelated classifications

Nocturia (1A13.00), 1995
Tremor symptom (1B22.11), 1997

• Medical Warnings

Elastoplast swelling and rash
PERM NON-WVN SURG ADHES TAPE

• Most recent testing

29 Mar 2005, Renal Function Master
CREATININE: 0.11 mmol/L (0.05 - 0.11)

Ordered by: A. Doctor
Lab Test Results Interpreted by:
Laboratory: Gordon
Observation date: 29/03/05 08:05:00
Observation collected by:

Tests marked * urgent. Please phone 3** 5*** or fax 3** 5***

Dr A Doctor
50 Practice Street
Christchurch City
NZMC No:01234.

High level detail of returning lab data:

The result returns, matched into the patient chart. It is notified to the GP via a separate process and is called up for comparison. The outcome for creatinine will now be examined as part of a graph compared with previous results from the patient's PMS. The software will need to make adjustments for the normal ranges. In the theoretical situation where the normal has shifted by a power of ten, then the software will need to use the test's normal information to make appropriate adjustments to the outcome figure for comparison. If the standard deviation is different from different laboratories, the display should show this. All laboratory results will need to be information rich, not only text.

Options:

- (a) The test is for an insurance company and they need to be billed for the test;
- (b) The template needs to display current costs for the laboratory test;
- (c) Patient may need an appointment for the specific test. The template will need to display this information and any related data such as appointments, e.g. "Thursdays between 1300 and 1400", etc;
- (d) The template must have a facility for urgency and what the practitioner wants done with the result as soon as it is completed;
- (e) Patient may have venesection at the GP rooms. The laboratory form should have the ability to display this information. In the example above, the patient would need to have the venesection in a place where the analysis of the blood can be done immediately. This would usually be the laboratory venesection room.
- (f) Patient may have venesection at the laboratory;
- (g) The laboratory result may not return after the test result and notification of this is imperative;
- (h) The patient may not present at the laboratory;
- (i) The patient may go to a different laboratory and the result returns from there;
- (j) The result may be needed urgently;
- (k) The result may be needed in due course;
- (l) The laboratory test is unexpectedly seriously abnormal and the laboratory needs to contact the practitioner urgently;
- (m) A copy of the laboratory 'result to' needs to be addressed to another practitioner;
- (n) The PMS will need to recognise the returning result as a response to a particular order;
- (o) Alerts in the PMS need to be placed for some, if not all, of the above;
- (p) The PMS needs to be able to file the result appropriately under laboratory results and not just in an Inbox.

Appendix B: Radiology Scenario

High level radiology referral scenario:

Patient with an enlarged kidney presents to GP for assessment

GP decides on a radiology service to assess this. The wish of the GP is to rule out a cancer.

High level construction of radiology referral:

The GP calls up the specific patient in the PMS software and selects an order template for a particular radiology service facility. The template is pre-populated with patient demographics from the PMS and it will need to be aware of the particular address of the required radiology service facility for send purposes. There will probably be only one template for radiology. There will need to be several areas on the radiology template for extraction of classification information, alert information, previous radiology service results, clinical letters, or medication information from the PMS. As much as is possible, this information will be rich, i.e. it will be coded rather than free text. All options will not be required in each case, so several buttons to automatically insert information will be required, one for each data set. There will need to be a free text area for entering the clinical question the GP wishes to be addressed. When complete with this clinical free text and data, the order can be sent to the radiology service facility for consideration.

Lower level detail of radiology referral:

The result returns and is called up for viewing. The outcome for the radiology service will now be viewed. It may contain descriptive text and a conclusion. The PMS will need to recognise the returning result as a response to a particular order and that it is a radiology service. The result may contain images and free text and a conclusion in recognisable positions. The PMS needs to be able to file the result appropriately under radiology services and not just in an Inbox with other items.

Lower level construction of referral letter:

To: Canterbury Area Health Board
X-ray Consultation
Hospital: Christchurch Public

Date: 16 Nov 2005

Dr A Doctor
50 Practice Street
Christchurch City
NZMC No:01234.

Name: Mr T***** H*****
Address: 2/45 V***** Ave CHCH 6
DOB: ** Feb 19**
NHI No: A**8***

Copy To Nil.

- **Last X-RAY:**
25 Oct 2005, X-Ray CHEST

X-RAY: This report is for: Dr A Doctor
Referred By: Dr E. Emergency Dept

Copies: Dr A Doctor

CHEST 25/10/2005 Reference: 2056422

The heart size and contour is within normal limits. No acute lung lesion seen. Some blurring of the left costophrenic angle is unchanged from a film done on 19/07/05.

Dr D**** Smith Radiologist

Ordered by: ED EMERGENCY DEPT
Lab Test Results Interpreted by: D**** Smith
Laboratory: X-Ray consultation
Observation date: 25/10/05 15:11:00
Observation collected by:

- **Examination required:**

Renal CT.

- **Clinical Details:**

For the last 6 weeks Mr H has suffered renal failure and an enlarging L kidney

- **Long Term Medications:**

03-Nov-2005

Levodopa;Benserazide Hydrochloride 125Mg Cap (25 Mg/100 Mg)

SIGS : 125mg qid started hospital

03-Nov-2005

Perhexiline Maleate 100Mg Tab

SIGS : 50mg bd

- **Related classifications**

Essential hypertension (G20.00), 1970 s also ANGINA

Angina pectoris (G33.00), diffuse atheroma Hypertension

Transient ischaemic attack (G65.12), Hospital Dx 2001

Aortic aneurysm (G71.00), Abdo.Aortic Aneurism on W/L for repair 60mm diameter 2003 repaired 2004

Intermittent claudication (G73z0.00), femoral clearance

Left ventricular failure (G581.00), dilated

Lower resp tract infection (H06z1.00)

MI - acute myocardial infarct (G30.15), angioplasty 2004 Occluded circumflex, and R coronary arty 2003

Lateral MI 1995

Postural hypotension (G870.11), 2003

- **Unrelated classifications**

Gastritis and duodenitis (J15.00), on gastroscopy 2003

H/O: prostatism (14E1.00), Nocturia x3 1998

Other trachea disease (H5y1.12), Floppy trachea

Other/unspecif.back disorder (N14.00), back surgery 35yrs

- **Medical Warnings**

Morphine, ??? swelling and GI upset

Dihydrocodeine bitartrate, intense nausea and vomiting

Atenolol, Nightmares

Dipyridamole, Headaches

Propranolol hydrochloride, nightmares

PERM NON-WVN SURG ADHES TAPE

Prazosin hydrochloride, unwell

Labetalol hydrochloride, itch head

29 Mar 2005, Renal Function Master

CREATININE: 0.11 mmol/L (0.05 - 0.11)

Ordered by: Dr A Doctor
Lab Test Results Interpreted by:
Laboratory: Gordon
Observation date: 29/03/05 08:05:00

Observation collected by:

Referring GP: Dr A Doctor
50 Practice Street
Christchurch City
NZMC No:01234.

Appointment Date:

At AM / PM

NUMBER: _____

No of Films: _____

Cubicle: _____

Radiographer: _____

Radiologist: _____

Electronic transmission without signature direct faxed from Dr PC.

Options

- (a) The test is for an insurance company and they need to be billed for the test;
- (b) The template needs to display current costs for the radiology service;
- (c) Patient will need an appointment for the specific test. The template will need to display this information and any related data such as appointments, e.g. "Thursdays between 1300 and 1400", etc;
- (d) The template must have a facility for urgency and what the GP wants done with the result as soon as it is completed;
- (e) There may be a radiology service at the GP rooms. The referral form should have the ability to display this information;
- (f) The radiology result may not return after the procedure and notification of this is imperative;
- (g) The patient may not present at the radiology service;
- (h) The patient may go to a different radiology service and the result returns from there;
- (i) The result may be needed urgently;
- (j) The result may be needed in due course;
- (k) The radiology service is unexpectedly seriously abnormal and the radiologist needs to contact the GP urgently;
- (l) A copy of the radiology 'result to' needs to be addressed to another practitioner;
- (m) The PMS will need to recognise the returning result as a response to a particular order;
- (n) Alerts in the PMS need to be placed for some, if not all, of the above;
- (o) The PMS needs to be able to file the result appropriately under laboratory results and not just in an Inbox;
- (p) The GP may decide to add a test after the sending of the radiology service message;
- (q) The radiologist may suggest another service as more appropriate.