Release VA42A / 2024-12-11 / Revision 10515

syngo.share

HL7 Conformance Statement

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1   Introduction

syngo.share provides both HL7 v2 and HL7 FHIR interfaces for communicating and synchronizing with third-party systems within healthcare settings (henceforth referred to as HL7 and FHIR, respectively).

The *syngo*.share HL7 interface is designed according to the following specifications:

- HL7 Messaging Standard version 2.8.1
- IHE IT Infrastructure Technical Framework revision 11.0
- IHE Radiology Technical Framework revision 13.0

The *syngo*.share FHIR interface is designed according to the following specifications:

- FHIR Standard version 4.1.0

This Conformance Statement addresses all requirements and particularities of the *syngo*.share HL7 and FHIR interfaces which need to be taken into account in order to establish a successful exchange of data with third-party systems. It provides information about the HL7 communication, the HL7 message syntax, the HL7 inbound and outbound interfaces of *syngo*.share, as well as the layout of the supported HL7 messages and how they are processed or generated.

This Conformance Statement likewise provides information on the FHIR features supported by *syngo*. share, the supported published and proprietary FHIR extensions, as well as *syngo*.share-specific FHIR profiles.

Moreover, this Conformance Statement provides example workflows in which certain HL7 messages and FHIR interactions may occur in order to help contextualize the presented information.

2 HL7 general information

The *syngo*.share HL7 interface is designed according to the HL7 Messaging Standard (version 2.8.1) as well as the IHE IT Infrastructure Technical Framework (revision 11.0) and IHE Radiology Technical Framework (revision 13.0). The primary purpose of the *syngo*.share HL7 interface is the synchronization with third-party systems within healthcare settings. To achieve this goal, *syngo*.share is able to receive and process various kinds of HL7 messages. *syngo*.share also provides the means to generate and send HL7 messages in order to inform third-party system about changes.

Note that HL7 segments, fields, components, and subcomponents which are not mentioned in the following chapters are ignored and hence not evaluated by *syngo*.share.

The HL7 Messaging Standard strictly differentiates between the insertion and update of information. However, since it is generally inconvenient or impossible for systems to decide whether information has to be inserted or updated, *syngo*.share treats HL7 messages which insert or update information depending on the existence of the underlying objects (e.g. patients, visits, orders). This means that if *syngo*.share receives an HL7 message to insert an object which already exists, the information of the object is updated. Conversely, if *syngo*.share receives an HL7 message to update the information of an unknown object, the corresponding object is inserted.

Abbreviations and notation

This document uses the following abbreviations to indicate the mandatoriness of HL7 segments, fields components and subcomponents:

- **R:** required
- **C:** conditionally required
- **O:** optional

For outgoing HL7 messages, R indicates that a given HL7 segment, field, component, or subcomponent is always specified by *syngo*.share. C and O indicate that a given HL7 segment, field, component, or subcomponent is merely specified under certain circumstances or when *syngo*.share possesses the corresponding information.

Length information

For some of the listed HL7 segments, fields, components, or subcomponents, length information is declared. This indicates that the corresponding HL7 segment, etc., is stored in the *syngo*.share database, which limits the number of characters that can be used to define it. If the length of a given HL7 segment, etc., exceeds the defined limit, the provided information cannot be stored and hence the HL7 message cannot be processed successfully. If the length of an HL7 segment, etc., is not stated, the information is not stored by *syngo*.share, although it might be needed to process the HL7 message correctly.

Date and time information

As required by the HL7 Messaging Standard, all date and time information has to be formatted according to the following standardized format:

`YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]]]][+/-ZZZZ].`

Timestamps which do not possess time zone information are assumed to be in local time. To avoid problems with timestamp conversions, all timestamps specified in HL7 messages sent by *syngo*.share are given in local time and hence do not specify any time zone offsets.

2.1   HL7 message syntax

To be able to parse and subsequently process HL7 messages, *syngo*.share requires them to have been generated according to the guidelines of the HL7 Messaging Standard. This entails special attention to the specification of the HL7 message delimiters (HL7 fields `MSH-1` and `MSH-2`), the character sets (HL7 field `MSH-18`), and the alternate character set handling scheme (HL7 field `MSH-20`) as well as the use of the HL7 segment terminator.

2.1.1   HL7 message delimiters

syngo.share automatically detects the message delimiters of an HL7 message, which can be defined individually. To ensure that the detection succeeds, the HL7 field separator must be a `US-ASCII` character and the HL7 component separator, HL7 subcomponent separator, repetition separator, escape character, and truncation character must belong to the default character set of the HL7 message.

> **ℹ Note**
> The following `US-ASCII` characters may not be used as message delimiters because they fulfill other functions:
> - Carriage return (hexadecimal 0d): HL7 segment terminator
> - Escape (hexadecimal 1b): character set escape character (cf. alternate character set handling scheme `ISO 2022-1994`)
> - `"` (hexadecimal 22): null character

Although the HL7 message delimiters can be defined individually, *syngo*.share recommends the use of the default HL7 message delimiters defined by the HL7 Messaging Standard. *syngo*.share requires each HL7 segment, even the last one, to be terminated by the HL7 segment terminator. This ensures that the end of an HL7 segment can be detected. As HL7 segment terminator, *syngo*.share expects a carriage return (hexadecimal 0d).

2.1.2   Character sets

The *syngo*.share HL7 interface is fully internationalized. This means that the character sets used within an HL7 message are detected automatically by extracting the corresponding information from the HL7 field `MSH-18`. The first character set defines the default character set of an HL7 message. All other character sets define so-called alternate character sets, which can be used to specify characters that are not part of the default character set.

If no character set is defined, *syngo*.share assumes – in accordance with the HL7 Messaging Standard – that all characters used within a given HL7 message are part of `US-ASCII`. When alternate character sets are specified, the handling scheme of the alternate character sets (which determines how character set switches are indicated) has to be defined by the HL7 field `MSH-20`. If the character sets or the alternate character set handling scheme of an HL7 message are incomplete or incorrect, *syngo*.share is unable to parse the HL7 message.

Table 1 lists the supported character sets, their MIME names, the alternate character set handling schemes, and the escape sequences of the character sets with respect to the alternate character set handling schemes.

Table 1: Character sets and alternate character set handling schemes

Character set	MIME name	2.3 GL	2.3 GR	ISO 2022-1994 GL	ISO 2022-1994 GR
ASCII	US-ASCII	C2842	-	2842	-
8859/1	ISO-8859-1	C2842	C2D41	2842	2d41
8859/2	ISO-8859-2	C2842	C2D42	2842	2d42
8859/3	ISO-8859-3	C2842	C2D43	2842	2d43
8859/4	ISO-8859-4	C2842	C2D44	2842	2d44
8859/5	ISO-8859-5	C2842	C2D4C	2842	2d4c
8859/6	ISO-8859-6	C2842	C2D47	2842	2d47
8859/7	ISO-8859-6	C2842	C2D46	2842	2d46
8859/8	ISO-8859-8	C2842	C2D48	2842	2d48
8859/9	ISO-8859-9	C2842	C2D4D	2842	2d4d
8859/15	ISO-8859-15	-	-	-	-
ISO IR6	US-ASCII	C2842	-	2842	-
ISO IR14	JIS_X0201	C284A	C2949	284a	2949
ISO IR87	JIS_X0208-1990	M2442	-	2442	-
ISO IR159	JIS_X0212-1990	M242844	-	242844	-
KS X 1001	KS_X_1001-1997	-	M242943	-	242943
CNS 11643-1992	EUC-TW	-	-	-	-
GB 18030-2000	GB18030	-	-	-	-
BIG-5	Big5	-	-	-	-
UNICODE UTF-8	UTF-8	-	-	-	-
UNICODE UTF-16	UTF-16	-	-	-	-
UNICODE UTF-32	UTF-32	-	-	-	-

The character sets `ISO IR87`, `ISO IR159`, and `KS X 1001` only can be used as alternate character sets because they are not based on `US-ASCII`. In contrast, the character sets 8859/15, `CNS 11643-1992`, `GB 18030-2000`, `BIG-5`, `UNICODE UTF-8`, `UNICODE UTF-16`, and `UNICODE UTF-32` cannot be mixed with other character sets due to their lack of escape sequences.

In case of the character sets `GB 18030-2000`, `UNICODE UTF-8`, `UNICODE UTF-16`, and `UNICODE UTF-32`, mixing them with other character sets would also serve no purpose because they can encode all characters of the Unicode Standard.

syngo.share automatically detects the endianness of the character sets `UNICODE UTF-16` and `UNICODE UTF-32`, meaning that both the little-endian and big-endian variants of these two character sets are supported. To allow switches between multiple character sets, *syngo*.share applies the rules defined by the HL7 Messaging Standard as well as ISO/IEC 2022 and ECMA-35. In accordance with these standards, character sets are divided into a GL level (lower bytes between 20 and 7f) and a GR level (higher bytes between a0 and ff). To ensure that the characters of the GL or GR level of a character set can be used, the desired character set switch has to be triggered by specifying the corresponding escape sequence.

Note that the escape sequences of the alternate character set handling scheme `ISO 2022-1994`, mentioned in Table 1, are stated in hexadecimal. Since HL7 message delimiters have to be specified in the default character set, the scope of a character set switch is limited to the HL7 subcomponent in which it occurs. So at the end of each HL7 subcomponent, the character sets defined by the GL and GR level must be switched back to the default character set, if necessary.

2.2   HL7 communication

syngo.share uses TCP/IP connections based on the Minimal Lower Layer Protocol specified by the HL7 Messaging Standard for communication with third-party systems. Within HL7 communications, *syngo*.share can act as either the receiver or sender of HL7 messages.

If *syngo*.share receives HL7 messages, it assumes that the connecting third-party system administrates the HL7 connection. This means that the HL7 connection is not closed by *syngo*.share as long as no irreparable error occurs.

If *syngo*.share sends HL7 messages to a third-party system, it assumes that it administrates the HL7 connection. *syngo*.share is robust against network problems because its HL7 outbound interface only opens an HL7 connection if HL7 messages have to be transmitted to a third-party system and closes an established HL7 connection as soon as all HL7 messages have been sent. To avoid the frequent establishment and termination of HL7 connections, *syngo*.share waits for a configured amount of time before reestablishing an HL7 connection to exchange further HL7 messages.

To receive and send HL7 messages, *syngo*.share follows either the original or the enhanced processing rules specified by the HL7 Messaging Standard. A received HL7 message is processed according to the original processing rules if the accept acknowledgment type (see HL7 field `MSH-15`) and application acknowledgment type (see HL7 field `MSH-16`) are null or not present. If the accept acknowledgment type or application acknowledgment type are specified, the enhanced processing rules are used to process the HL7 message.

In order to act as an HL7 message sender, *syngo*.share has to be configured to use either the original or the enhanced processing rules for the transmission of HL7 messages. In the latter case, *syngo*.share requires the transmission of HL7 accept acknowledgment messages but denies the exchange of HL7 application acknowledgment messages. To complement the two processing modes, *syngo*.share also supports the Sequence Number Protocol defined by the HL7 Messaging Standard.

syngo.share processes the received HL7 messages chronologically by their order of storage. To guarantee the correct processing of HL7 messages, they should always be sent in the correct chronological order. Likewise, when sending HL7 messages to third-party systems, *syngo*.share ensures that HL7 messages which depend on each other are transmitted in chronological order.

2.2.1   Reception of HL7 messages

syngo.share checks each received HL7 message for syntactic and semantic correctness. Syntactically incorrect HL7 messages cannot be parsed and can thus neither be stored nor processed. Since the sending third-party system cannot be informed about syntactic errors even when the transmission of an HL7 accept acknowledgment message has been requested, *syngo*.share closes the HL7 connection.

To validate the HL7 message semantically, *syngo*.share checks whether the HL7 message type can be processed and whether the receiving facility specified by the HL7 field `MSH-6` is related to one of the configured tenants. If the type of the received HL7 message is not supported by *syngo*.share, the message is rejected. If the reception of the HL7 message has to be acknowledged, *syngo*.share sends an HL7 accept acknowledgment message with the acknowledgment code `AR` or `CR` to the sending third-party system. `AR` is used if the original processing rules are applied; `CR` is used if the enhanced processing rules are used.

If *syngo*.share can process the received HL7 message type but the receiving facility does not address any of the configured tenants, the HL7 message is stored in a configured error directory in the file system. If the reception of the HL7 message has to be acknowledged, *syngo*.share sends an HL7 accept acknowledgment message with the acknowledgment code `AE` or `CE` to the sending third-party system. `AE` is used if the original processing rules are applied; `CE` is used if the enhanced processing rules are applied.

If the syntactic and semantic checks succeed, *syngo*.share stores the received HL7 message and schedules it for processing. If the reception of the HL7 message has to be acknowledged, *syngo*. share sends an HL7 accept acknowledgment message with the acknowledgment code AA or CA to the sending third-party system. AA is used if the original processing rules are applied; CA is used if the enhanced processing rules are applied.

If an HL7 message is transferred according to the enhanced processing rules, it might be necessary to exchange further information with the sending third-party system as soon as the HL7 message has been processed. To this end, *syngo*.share is able to send so-called HL7 application acknowledgment messages (see Acknowledgment of processed HL7 messages for further information).

2.2.2   Sending of HL7 messages

When *syngo*.share sends an HL7 message to a third-party system, it always expects that system to acknowledge the reception. For positive acknowledgments, *syngo*.share requires the HL7 accept acknowledgment message to specify the acknowledgment code AA or CA. AA has to be specified if the original processing rules are used to transmit the HL7 message; CA has to be specified if the enhanced processing rules are used to transmit the HL7 message. The processing rules for the transfer of HL7 messages can be individually configured in *syngo*.share.

2.3   Country-specific requirements

syngo.share can meet the legal requirements of a given country and can do so in compliance with the IHE Technical Framework. *syngo*.share applies country-specific changes to HL7 communication at the tenant level, i.e. according to the country set in the tenant settings. This chapter describes how *syngo*. share handles specific countries.

2.3.1   France

French law mandates special requirements for HL7 communication (see the National Extensions chapter of the IHE Technical Framework for details). To fulfil these requirements, *syngo*.share core can automatically modify transmissions. Care has been taken to ensure that these implicit modifications are applied at the correct point in the chain of events to guarantee that forbidden data is never archived or transmitted.

2.3.1.1   Inbound interface

When receiving transmissions, the following HL7 field values are emptied automatically:

- Patient Race `PID-10, NK1-35`
- Patient Religion `PID-17, NK1-25`
- Patient Ethnic Group `PID-22, NK1-28`

2.3.1.2   Outbound interface

When sending transmissions, the following header information is added to indicate that they conform to French law:

```
MSH-12.2 = "FRA"
MSH-12.3 = "2.5"
```

The following fields are emptied automatically:

- Patient race `PID-10, NK1-35`

- Patient religion `PID-17`, `NK1-25`
- Patient ethnic group `PID-22`, `NK1-28`

3   HL7 inbound interface

This chapter covers the purpose of the HL7 inbound interface of *syngo*.share:

- Patient and visit administration
- Order administration
- Archiving of generic files
- Changing the organizational unit of DICOM studies and generic containers
- Sharing of DICOM studies and generic containers
- Deletion of DICOM studies and generic containers
- Administration of HL7 ZPA messages
- HL7 segments

3.1   Patient and visit administration

3.1.1   Operating mode

The primary purpose of the HL7 interface is the synchronization of patient and visit information. For this purpose, *syngo*.share provides an interface that allows the third-party system managing the patient and visit base (e.g., HIS or RIS) to insert, update, delete, and merge patients as well as to insert, update, delete, move, and merge visits by sending HL7 ADT messages. Each HL7 ADT message has to be dedicated to exactly one patient and mostly one visit.

Since *syngo*.share does not support visits on the account level, it assumes that visit information always specifies a visit on the visit level (cf. HL7 Messaging Standard).

Within *syngo*.share, patients and visits are not just inserted via HL7 ADT messages. If a DICOM image or generic file is archived and the corresponding patient or visit does not exist, a new patient or visit is inserted. Similarly, if an order is inserted via HL7 OMI or HL7 ORM message but the specified patient or visit is unknown, it is inserted (see Order administration).

3.1.1.1   Information quality

The patient and visit information associated with DICOM images or generic files usually does not come directly from the third-party system which manages the patient and visit base. This means that such information is of lower quality than that provided by HL7 ADT or HL7 ORM messages. Patient and visit information is flagged as HL7-managed or non-HL7-managed information in order to preserve the origin of a patient and visit as well as to prevent HL7-managed information from being overwritten by non-HL7-managed information. Any patient or visit that is inserted during the processing of an HL7 ADT, HL7 OMI, or HL7 ORM message is marked as HL7-managed. Patients and visits which are inserted during import processes are flagged as non-HL7-managed.

HL7-managed patients are identified by a patient ID, whereas non-HL7-managed patients are identified by so-called identification tuples consisting of a patient ID as well as the last name, first name, birth timestamp, and sex of the patient. The reason for the quite complex identification of non-HL7-managed patients is related to the fact that patient IDs of non-HL7-managed patients may not be correct. So to avoid scenarios wherein non-HL7-managed patients accidentally overwrite each other, the identification tuple is used to uniquely identify non-HL7-managed patients. In the case of visits, the situation is much simpler. Since visits can be identified by just a visit ID, the identification method for HL7-managed visits and non-HL7-managed visits is the same.

3.1.1.2 Patients

syngo.share upholds the rules proposed by the HL7 Messaging Standard to insert, update, delete, and merge patients. This means that if a patient is to be inserted or updated, *syngo*.share first checks if an HL7-managed patient with the specified patient ID or a non-HL7-managed patient with the specified identification tuple exists.

- If no patient is found, an HL7-managed patient with the information specified in the HL7 ADT message is inserted.

- If an HL7-managed patient is found, *syngo*.share first checks whether the last name, first name, birth timestamp, or sex of the patient will be changed. If this is the case, the found patient is invalidated by a newly inserted patient. This newly inserted patient represents an updated version of the found patient.

- If a non-HL7-managed patient is found, it is updated and transformed into an HL7-managed patient. An invalidation tree is not constructed. See Invalidation trees.

- If a patient has to be deleted, *syngo*.share first checks whether the patient exists. If so, this patient is deleted; if not, the HL7 ADT message is ignored.

- Finally, if two patients have to be merged, *syngo*.share first checks whether the new patient exists. If so, the found patient is updated and transformed into an HL7-managed patient if needed. If not, an appropriate HL7-managed patient is inserted. Afterwards, *syngo*.share checks whether the old patient exists. If so, the old patient is invalidated by the new patient in order to maintain a possibly existing invalidation tree (see Invalidation trees).

3.1.1.3 Visits

When inserting, updating, deleting, moving, or merging visits, *syngo*.share proceeds as follows:

- If a visit is to be inserted or updated, *syngo*.share first checks whether an HL7-managed or non-HL7-managed visit with the specified visit ID exists. If no visit is found, an HL7-managed visit with the information specified in the HL7 ADT message is inserted. Otherwise, the found visit is updated and transformed into an HL7-managed visit.

- If a visit has to be deleted, *syngo*.share first checks if it exists. If so, it is deleted; if not, the HL7 ADT message is ignored.

- If a visit has to be moved from one patient to another, *syngo*.share checks whether the visit exists. If this is not the case, an HL7-managed visit belonging to the requested patient is inserted. Otherwise, the found visit is updated, transformed into an HL7-managed visit if necessary, and moved to the requested patient.

- Finally, if two visits have to be merged, *syngo*.share first checks if the new visit exists. If so, the found visit is updated and transformed into an HL7-managed visit if necessary. If not, an appropriate HL7-managed visit is inserted. Afterwards, *syngo*.share checks if the old visit exists. If so, the old visit is invalidated by the new visit in order to maintain a possibly existing invalidation tree (see Invalidation trees).

3.1.1.4 Invalidation trees

Invalidation trees are used to save the history of critical changes. The reason for the construction of invalidation trees is rooted in the fact that patient and visit information of DICOM images and generic files may have become obsolete after they have been archived by *syngo*.share. So if a DICOM image or generic file consists of old patient/visit information, *syngo*.share tries to find a patient/visit by searching

for an invalidated patient/visit with the given identification tuple (visit ID). If the search is successful, the DICOM image or generic file is assigned to the correct patient/visit without further ado.

3.1.2   HL7 ADT message structure

3.1.2.1   HL7 trigger events

To administrate patients and visits via HL7 ADT messages, *syngo*.share supports the following trigger events:

A01 to A04	A28	A42
A06 to A08	A29	A45
A11 to A13	A31	A47
A18	A34	A50
A23	A40	

Other trigger events associated with HL7 ADT messages are currently not supported by *syngo*.share. The listed trigger events are used for the following purposes:

- **A01, A02, A03, A04, A12, and A13**
  These trigger events are used to insert or update a patient and visit. An HL7 ADT message associated with one of these trigger events has to conform to the following structure:
  MSH PID [NK1] PV1 [ROL] [{OBX}] [GT1] [ACC]

- **A06 and A07**
  These trigger events are used to insert or update a patient and visit. If an HL7 MRG segment is defined, the specified visit is merged with the visit specified by the HL7 PV1 segment. The structure of such an HL7 ADT message looks as follows:
  MSH PID [MRG] [NK1] PV1 [ROL] [{OBX}] [GT1] [ACC]

- **A08, A28, and A31**
  These trigger events are used to insert or update a patient without specifying a visit. If a visit is present, however, it is inserted or updated. Trigger event A31 allows the XAD-PID of referenced patients to be set if the message contains one patient ID marked with type GPI as XAD-PID. An HL7 ADT message associated with one of these trigger events has to conform to the following structure:
  MSH PID [NK1] [PV1] [ROL] [{OBX}] [GT1] [ACC]

- **A11 and A23**
  These trigger events are used to delete a visit. An HL7 ADT message associated with one of these trigger events has to provide the following information:
  MSH PID PV1

- **A18, A34, and A40**
  These trigger events are used to merge two patients. To this end, an associated HL7 ADT message has to specify the following HL7 segments:
  MSH PID MRG [NK1] [GT1]

- **A29**
  This trigger event is used to delete a patient. The structure of such an HL7 ADT message looks as follows:
  MSH PID

- **A42**
  This trigger event is used to merge a visit. If the patient associated with the new visit does not exist, it is created. Otherwise, it is updated. An HL7 ADT message associated with this trigger event has to conform to the following structure:

```
MSH PID MRG [NK1] PV1 [ROL] [GT1] [ACC]
```

- **A45**
  This trigger event is used to move a visit specified in the HL7 `MRG` segment. If the patient specified in the HL7 ADT message does not exist, it is created. Otherwise, it is updated. When an HL7 ADT message specifies a visit with a HL7 `PV1` segment, the moved visit is updated if the two visit IDs are identical. Otherwise, the moved visit is merged with the new visit specified by the HL7 `PV1` segment. If no visit exists, a new one is created. The structure of such an HL7 ADT message looks as follows:
  ```
  MSH PID MRG [NK1] [PV1] [ROL] [GT1] [ACC]
  ```

- **A47**
  This trigger event is used to update the patient ID of a patient. To perform this operation, *syngo*.share invalidates the old patient by creating a new patient that represents an updated version of the old patient. HL7 ADT messages of this type have to provide the following information:
  ```
  MSH PID MRG [NK1] [GT1]
  ```

- **A50**
  This trigger event is used to replace the visit ID of a visit. To guarantee a consistent construction of invalidation trees (see Invalidation trees), *syngo*.share invalidates the old visit by creating a new visit that represents an updated version of the old visit. An HL7 ADT message associated with this trigger event has to conform to the following structure:
  ```
  MSH PID MRG [NK1] PV1 [ROL] [GT1] [ACC]
  ```

3.1.2.2 HL7 elements

The following HL7 fields, components and segments have to be specified regardless of the trigger event:

- **`PID-3.1`**
  This HL7 component has to specify the patient ID of the given patient.

- **`PV1-19.1`**
  This HL7 component has to specify the visit ID.

- **`OBX`**
  Repetitions of this segment can be specified whenever the used trigger event might cause the insertion or update of the stated patient. This segment is used to set the body weight and height of the patient.

- **ROL, NK1 and GT1**
  These HL7 segments can be specified whenever the used trigger event might cause the insertion or update of the stated patient or visit. The specification of these segments is not part of the official structure defined by the HL7 Messaging Standard.

3.2 Order administration

3.2.1 Operating mode

The HL7 inbound interface of *syngo*.share allows third-party systems (e.g., HIS or RIS) to insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps by sending HL7 OMI and HL7 ORM messages. Each HL7 OMI message must be dedicated to exactly one order, whereas an HL7 ORM message has to focus on a particular Requested Procedure of an order. HL7 OMI messages should be preferred over HL7 ORM messages since they represent the state of the art and facilitate a more compact and simpler specification of orders, Requested Procedures, and Scheduled Procedure Steps. The processing of multiple orders within an HL7 OMI or HL7 ORM message is not supported.

To uniquely identify an order, *syngo*.share uses either the Placer Order Number or Filler Order Number. Since the Filler Order Number is usually more specific than the Placer Order Number, the Filler Order Number is given preference whenever it is specified. If the Filler Order Number is not given, the Placer Order Number is used. The ID used to identify an order is henceforth simply called order ID.

Each order consists of one or more Requested Procedures. To associate Requested Procedures with DICOM studies, *syngo*.share follows the guidelines proposed by the IHE Radiology Technical Framework. This means that in order to uniquely identify a Requested Procedure, *syngo*.share uses the Study Instance UID of the resulting DICOM study specified by the received HL7 OMI (see HL7 `IPC` segment) or HL7 ORM message (see HL7 `ZDS` segment).

Each Requested Procedure is subdivided into one or more Scheduled Procedure Steps. To identify a Scheduled Procedure Step, *syngo*.share uses the Scheduled Procedure Step ID, which must be unique within a Requested Procedure.

3.2.1.1 Insertions and updates

When *syngo*.share receives an HL7 OMI or HL7 ORM message to insert or update an order, Requested Procedure, or Scheduled Procedure Step, *syngo*.share proceeds as follows:

- First, it checks whether an order with the given order ID exists. If so, the order information is updated. If not, the order is created using the information provided by the HL7 OMI or ORM message.

- If the patient or visit associated with the order does not exist, an HL7-managed patient or visit is inserted. If the patient or visit exists but is non-HL7-managed, it is updated and transformed into an HL7-managed patient or visit (see Patient and visit administration for detailed information).

- Afterwards, *syngo*.share checks for each specified Requested Procedure whether the created or found order possesses a Requested Procedure with the specified Study Instance UID. If so, the corresponding Requested Procedure is updated. If not, the Requested Procedure is created.

- Likewise, for each Scheduled Procedure Step, *syngo*.share checks whether the dedicated Requested Procedure consists of a Scheduled Procedure Step with the stated Scheduled Procedure Step ID. If so, the corresponding Scheduled Procedure Step is updated. If not, the Scheduled Procedure Step is created.

3.2.1.2 Deletions

When *syngo*.share receives an HL7 OMI or HL7 ORM message to delete an order, it proceeds as follows:

- It checks whether the order exists by using the specified order ID. If the order exists, it is deleted, including all associated Requested Procedures and Scheduled Procedure Steps. If not, the HL7 OMI or HL7 ORM message is ignored.

Note that it is not possible to delete individual Requested Procedures or Scheduled Procedure Steps with HL7 OMI or HL7 ORM messages.

3.2.1.3 Metadata updates

syngo.share provides the means to synchronize Requested Procedures and DICOM studies/generic files by configuring metadata updates.

If a metadata update is configured, *syngo*.share proceeds as follows:

- Whenever a Requested Procedure is inserted or updated by an HL7 OMI or HL7 ORM message, *syngo*.share checks if the specified DICOM study or generic file already exists.

- If the specified DICOM study or generic file exists, *syngo*.share synchronizes the following meta-data:

  - For generic files, *syngo*.share updates the patient information (based on the PID segment), visit information (based on the PV1 segment), the Accession Number and the authority of the Accession Number.

  - For DICOM studies, *syngo*.share modifies the DICOM tags listed in Table 2.

- Afterwards, the existing DICOM study/generic file is reallocated to the patient and visit associated with the order, if necessary. This ensures that corrective workflows are compliant with the IHE Radiology Technical Framework and succeed independent of the quality of the patient and visit data of the DICOM study/generic file.

- If `OBR-25` is mapped to an existing document workflow state, the state of an existing DICOM study is updated.

Table 2: DICOM tags modified during synchronization of metadata

Tag	Attribute	Modified by	HL7 part	Message type
(0008,0050)	AccessionNumber	IPC-1.1	component	HL7 OMI
		OBR-18	field	HL7 ORM
(0008,0051)/	IssuerOfAccessionNumberSequence /	IPC-1.2	component	HL7 OMI
(0040,0031)	LocalNamespaceEntityID	OBR-3.2	component	HL7 ORM
(0008,0051)/	IssuerOfAccessionNumberSequence/	IPC-1.3	component	HL7 OMI
(0040,0032)	UniversalEntityID	OBR-3.3	component	HL7 ORM
(0008,0051)/	IssuerOfAccessionNumberSequence/	IPC-1.4	component	HL7 OMI
(0040,0033)	UniversalEntityIDType	OBR-3.4	component	HL7 ORM
(0008,0090)	ReferringPhysiciansName	PV1-8	field	
(0008,1030)	StudyDescription	OBR-44.5	component	
(0010,0010)	PatientName	PID-5	field	
(0010,0020)	PatientID	PID-3.1.1	subcomponent	
(0010,0021)	IssuerOfPatientID	PID-3.4.1	subcomponent	
(0010,0024)/	IssuerOfPatientIDQualifiersSequence/	PID-3.4.2	subcomponent	
(0040,0032)	UniversalEntityID			
(0010,0024)/	IssuerOfPatientIDQualifiersSequence/	PID-3.4.3	subcomponent	
(0040,0033)	UniversalEntityIDType			
(0010,0030)	PatientBirthDate	PID-7.1.1	subcomponent	
(0010,0032)	PatientBirthTime	PID-7.1.1	subcomponent	
(0010,0040)	PatientSex	PID-8.1.1	subcomponent	
(0038,0010)	AdmissionID	PV1-19.1.1	subcomponent	
(0038,0014)/	IssuerOfAdmissionIDSequence/	PV1-19.4.1	subcomponent	
(0040,0031)	LocalNamespaceEntityID			
(0038,0014)/	IssuerOfAdmissionIDSequence/	PV1-19.4.2	subcomponent	
(0040,0032)	UniversalEntityID			
(0038,0014)/	IssuerOfAdmissionIDSequence/	PV1-19.4.3	subcomponent	
(0040,0033)	UniversalEntityIDType			
(0040,1001)	RequestedProcedureID	IPC-2.1	component	HL7 OMI
		OBR-19	field	HL7 ORM

3.2.1.4 DICOM worklists

syngo.share also provides DICOM worklists for the administration of orders. It stores a DICOM worklist for each scheduled station AET that has been addressed by at least one HL7 OMI or HL7 ORM message. When an HL7 OMI or HL7 ORM message specifies an order that is scheduled for processing, its Sched-

uled Procedure Steps are placed on the worklists of the assigned Scheduled Station AETs. A Scheduled Procedure Step is removed from a DICOM worklist when one of the following occurs:

- The corresponding DICOM study is archived. In this case, the Study Instance UID and Scheduled Procedure Step IDs of the DICOM study are used to identify affected Scheduled Procedure Steps.

- The associated order is marked as completed by an order status update via HL7 OMI or HL7 ORM message. In this case, all Scheduled Procedure Steps of the order are removed from the worklist.

Further information about worklists can be found in the *syngo*.share DICOM Conformance Statement.

3.2.2 HL7 OMI message structure

3.2.2.1 HL7 trigger events

To insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps via HL7 OMI messages, *syngo*.share supports the trigger event `O23` as prescribed by the HL7 Messaging Standard.

Other trigger events associated with HL7 OMI messages are neither supported by the HL7 Messaging Standard nor by *syngo*.share. To ensure that *syngo*.share can process HL7 OMI messages, they must adhere to the following structure:

MSH PID [NK1] [PV1] [ROL] [GT1] [ACC] {ORC TQ1 OBR [{PRT}] [OBX] {IPC [ZCO]}}

3.2.2.2 HL7 elements

- **ORC-1**
  To distinguish between HL7 OMI messages which insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps, *syngo*.share relies on the valid specification of the HL7 field `ORC-1`:

  - CA: This value is used to delete an order.

  - NW: This value is used to insert an order, Requested Procedure, or Scheduled Procedure Step.

  - SC: This value is used to modify the document workflow state via `OBR-25.1` or the reporting workflow state via `ORC-25.1`. The order is left untouched.

  - XO or DC: These values are used to update an order, Requested Procedure, or Scheduled Procedure Step. XO indicates an ordinary modification of an order, etc., whereas DC announces the discontinuation of an order, etc.

- **ORC-5**
  When *syngo*.share is used to provide DICOM worklists, the HL7 field `ORC-5` has to be specified:

  - CM: This value is used to mark an order as completed, thus removing all Scheduled Procedure Steps from worklists.

  - SC: This value is used to ensure that the listed Scheduled Procedure Steps are scheduled for processing.

- **OBR-2.1 and OBR-3.1; ORC-2.1 and ORC-3.1**
  These HL7 components have to specify the Placer Order Number (`OBR-2.1` and `ORC-2.1`) and Filler Order Number (`OBR-3.1` and `ORC-3.1`).

- **PRT**
  This HL7 segment can be used to transmit participation information.

- **OBX**

  This HL7 segment can be used to transmit the Observation Site Identifier via the HL7 component OBX-20.1 which is subsequently used as the Body Site of the associated Requested Procedure.

- **IPC-3.1**

  This HL7 component has to specify the Study Instance UID.

- **IPC-4.1**

  This HL7 component has to define a unique Scheduled Procedure Step ID for each Scheduled Procedure Step.

- **IPC-9**

  This HL7 field has to define the Scheduled Station AET associated with each Scheduled Procedure Step.

- **PV1**

  This HL7 segment should be present if and only if the underlying order belongs to a visit.

- **ROL and NK1**

  The specification of these segments is possible, although it is not part of the official structure defined by the HL7 Messaging Standard.

- **ZCO**

  This HL7 segment can be used to add the ordered DICOM studies to a collection.

Note that each HL7 OMI message is dedicated to exactly one order. To define more than one Requested Procedure, the HL7 ORC/TQ1/OBR/IPC segment group has to be repeated appropriately often. To divide a Requested Procedure into multiple Scheduled Procedure Steps, the HL7 IPC segment has to be repeated the correct number of times within the corresponding HL7 ORC/TQ1/OBR/IPC segment group.

If more than one Requested Procedure (Scheduled Procedure Step) is defined, information related to the order (i.e. order and Requested Procedure) must not vary.

3.2.3   HL7 ORM message structure

3.2.3.1   HL7 trigger events

To insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps via HL7 ORM messages, *syngo*.share supports the trigger event O01 as proposed by the HL7 Messaging Standard.

Other trigger events associated with HL7 ORM messages are neither supported by the HL7 Messaging Standard nor by *syngo*.share. To ensure that *syngo*.share can process HL7 ORM messages they have to adhere to the following structure:

MSH PID [NK1] [PV1] [ROL] [GT1] [ACC] {ORC OBR} [ZDS] [ZCO]

3.2.3.2   HL7 elements

- **ORC-1**

  To distinguish between HL7 ORM messages which insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps, *syngo*.share relies on the valid specification of the HL7 field ORC-1.

  - CA: This value is used to delete an order.

  - NW: This value is used to insert an order, Requested Procedure, or Scheduled Procedure Step.

- SC: This value is used to modify the document workflow state via `OBR-25.1` or the reporting workflow state via `ORC-25.1`. The order is left untouched.

- XO or DC: These values are used to update an order, Requested Procedure, or Scheduled Procedure Step. `XO` indicates an ordinary modification of an order, etc., whereas `DC` announces the discontinuation of an order, etc.

- **`ORC-5`**
  When *syngo*.share is used to provide DICOM worklists, the HL7 field `ORC-5` has to be specified:

  - CM: This value is used to mark an order as completed, thus removing all Scheduled Procedure Steps from worklists.

  - SC: This value is used to ensure that the listed Scheduled Procedure Steps are scheduled for processing.

- **`OBR-2.1` and `OBR-3.1`; `ORC-2.1` and `ORC-3.1`**
  These HL7 components have to specify the Placer Order Number and Filler Order Number.

- **`ZDS-1.1`**
  This HL7 component should specify the Study Instance UID. If the ZDS segment is not given, the Study Instance UID of the Requested Procedure corresponding to `OBR-19` is used if possible; otherwise, a new Study Instance UID is created.

- **`OBR-20`**
  This HL7 field has to define a unique Scheduled Procedure Step ID for each Scheduled Procedure Step.

- **`PV1`**
  This HL7 segment should be used if and only if the underlying order belongs to a visit.

- **`ROL` and HL7 `NK1`**
  The specification of these HL7 segments is possible, although it is not part of the official structure defined by the HL7 Messaging Standard.

- **`ZCO`**
  This HL7 segment can be used to add the ordered DICOM studies to a collection.

Note that each HL7 ORM message is dedicated to exactly one Requested Procedure. To define more than one Scheduled Procedure Step, the HL7 `ORC/OBR` segment group has to be repeated appropriately often.

If more than one Requested Procedure (Scheduled Procedure Step) is defined, information related to the order (i.e. order and Requested Procedure) must not vary.

3.3   Archiving of generic files

3.3.1   Operating mode

syngo.share provides various interfaces for archiving generic files. The most frequently used interface is based on the HL7 Messaging Standard.

In general, any type of generic file can be archived. To allow third-party systems to synchronize their data with *syngo*.share, it is possible to insert, update, and delete generic files.

Both HL7 MDM and HL7 ORU messages can be used to archive generic files via the HL7 interface. However, it is strictly recommended to use HL7 MDM messages instead of HL7 ORU messages. The use of HL7 MDM messages is favored by the HL7 Messaging Standard since they allow for a more fine-grained

specification of generic files. In addition, some functionalities like the XDS registration of a generic file in an Affinity Domain rely on metadata, which can only be specified by an HL7 MDM message.

3.3.1.1 Transmission of the binary data

Each HL7 MDM and HL7 ORU message must be dedicated to exactly one generic file. The binary data of a generic file can be transmitted by either reference or value:

- Transmission by reference requires the generic file to be written to a share and to be referenced by a UNC path that adheres to the following format:

  - Windows: \\<host>\<share>\<path>

  - Linux: //<host>/<share>/<path>

- Transmission by value requires the binary data to be encapsulated in the HL7 MDM or HL7 ORU message. Since transmitting non-printable characters within an HL7 message is not allowed, the binary data must be encoded so that the sent HL7 MDM or HL7 ORU message is syntactically correct and can hence be parsed by *syngo*.share. *syngo*.share supports the following encodings:

  - A: The binary data is encoded as an HL7-escaped string.

  - Base64: The binary data is Base64-encoded. It is recommended to ignore the maximum line length of 76 characters required by RFC 2045. If not, line breaks have to be HL7-escaped.

  - Hex: The binary data has to be encoded as a hexadecimal string.

  - UU: The binary data has to be UU-encoded. Note that non-printable characters have to be HL7-escaped.

3.3.1.2 Identification

syngo.share uses two IDs to uniquely identify generic files: a generic file ID and an application ID. The application ID is needed to identify the third-party system that archives the generic file, whereas the generic file ID is used to identify the generic file among the generic files inserted by the sending third-party system.

Each generic file is archived in *syngo*.share within a so-called generic container. Generic containers are used to group generic files. They are identified by a generic container ID and a coding system ID. Since a generic container might be reused for patients and shared between third-party systems, the combination of generic container ID and coding system ID needs to be unique.

However, to ensure that generic containers can be used in a meaningful way, *syngo*.share ensures that a patient does not possess two generic containers with identical generic container ID and coding system ID related to a particular visit and organizational unit. In other words, the integration of a generic file into a generic container takes places with respect to the associated patient, visit, and organizational unit.

3.3.1.3 Insertion and update

The approach used by *syngo*.share to insert or update a generic file depends on the type of the HL7 message.

HL7 MDM messages

If an HL7 MDM message is used to update a generic file, the HL7 Messaging Standard states that a new generic file ID should be generated which is linked to the original generic file by specifying the old generic file ID.

Since the generation of a new generic file ID might be impossible or inconvenient, *syngo*.share supports the update of generic files without changing the generic file ID. When inserting or updating a file via HL7 MDM message, *syngo*.share primarily checks if a generic file with the specified new generic file ID and application ID or an old generic file ID and application ID already exist.

- If neither the new generic file ID nor the old generic file ID yields a generic file archived by *syngo*. share (the IDs may be undefined), the generic file is stored based on the patient, visit, and organizational unit information specified by the HL7 MDM message.

- If the specified patient or visit does not exist, a non-HL7-managed patient or visit is inserted. An update of an existing patient or visit is not performed (see Patient and visit administration for detailed information).

- If the old generic file ID and application ID reference a generic file stored by *syngo*.share but the new generic file ID and application ID do not, the metadata of the generic file identified by the old generic file ID and application ID are updated and the old generic file ID is replaced by the new generic file ID. If the binary data of the generic file has changed too, a new version of the generic file is stored.

- If the new generic file ID and application ID address a generic file archived by *syngo*.share but the old generic file (which may be undefined) and application ID do not, the generic file identified by the new generic file ID and application ID is updated (metadata and binary data if present).

- If both the new generic file ID and application ID as well as the old generic file ID and application ID refer to a generic file archived by *syngo*.share, an error is reported if the new generic file ID and the old generic file ID are different. If the generic file IDs are identical, the metadata of the found generic file is updated without changing the generic file ID. Furthermore, if the binary data of the generic file has changed too, a new version of the generic file is archived.

HL7 ORU messages

The processing of HL7 ORU messages which insert or update generic files is much easier because generic file IDs cannot be changed via HL7 ORU messages. So to insert or update a generic file via HL7 ORU message, *syngo*.share primarily checks if a generic file with the specified generic file ID and application ID already exists.

- If this is not the case, the generic file is archived based on the patient, visit, and organizational unit information specified by the HL7 ORU message.

- If the specified patient or visit does not exist, a non-HL7-managed patient or visit is inserted. An update of an existing patient or visit is not performed (see Patient and visit administration for detailed information).

- If the generic file exists, the metadata of the generic file are updated. If the binary data of the generic file changed too, a new version of the generic file is stored. Note that if a generic file is updated via HL7 MDM or HL7 ORU message, any specified patient, visit, and organizational unit information are ignored.

3.3.1.4 Deletion

syngo.share uses the same approach to delete generic files, regardless of the type of HL7 message. To delete a generic file, *syngo*.share simply checks whether a generic file with the specified generic file ID and application ID exists.

- If this is the case, the corresponding generic file is deleted. Afterwards, *syngo*.share checks if its corresponding generic container now only consists of deleted generic files. If so, the generic container is deleted too.

- If the generic file to be deleted does not exist, *syngo*.share ignores the sent HL7 MDM or HL7 ORU message.

3.3.2   HL7 MDM message structure

3.3.2.1   HL7 trigger events

To insert, update, and delete generic files via HL7 MDM messages, *syngo*.share supports the following trigger events:

- **T02**
  This trigger event is used to insert a generic file.

- **T09**
  This trigger event is used to update the metadata of a generic file.

- **T10**
  This trigger event is used to update the metadata and binary data of a generic file.

- **T11**
  This trigger event is used to delete a generic file.

Other trigger events associated with HL7 MDM messages are currently not supported by *syngo*.share.

For trigger events `T02` and `T10`, HL7 MDM messages have to comply with the following structure:
`MSH PID [NK1] [PV1] [ROL] [GT1] [ACC] [{ORC OBR}] TXA {OBX [{PRT}]} [ZCO] [{ZRI}]`
For trigger events `T09` and `T11`, HL7 MDM messages have to comply with the following structure:
`MSH PID [NK1] [PV1] [ROL] [GT1] [ACC] [{ORC OBR}] TXA [{OBX [{PRT}]}] [ZCO] [{ZRI}]`

3.3.2.2   HL7 elements

The following HL7 elements have to be present for specific trigger events:

- **OBX**
  This HL7 segment has to be present in order to ensure that *syngo*.share can process HL7 MDM messages associated with trigger events `T02` and `T10`. The `OBX` segment contains the binary data.

  Note that the use of more than one HL7 `OBX` segment for the transmission of the binary data of a generic file is not permitted. This is in accordance with the HL7 Messaging Standard. However, repetitions of the HL7 `OBX` segment can be used to submit referenced Study Instance UIDs.

  HL7 MDM messages associated with trigger events `T09` and `T11` do not need to specify the `OBX` segment since they do not provide any binary data.

Regardless of the trigger event, the following HL7 elements have to be present:

- **TXA-12.1**
  This HL7 component has to specify the generic file ID.

- **MSH-3**

    This HL7 field has to specify the application ID. If the HL7 component MSH-3.1 is specified, it is evaluated. If it has been left blank, MSH-3.2 is used instead.

- **TXA-24.1 and TXA-24.3**

    These components have to define the generic container ID and the coding system ID.

- **PV1**

    This segment should be present if and only if the underlying generic file belongs to a visit.

The following HL7 elements are optional:

- **ROL, NK1, and GT1**

    The specification of these HL7 segments is possible, although it is not part of the official structure defined by the HL7 Messaging Standard.

- **OBX**

    This HL7 segment can be specified for HL7 MDM messages associated with the trigger event T09 in order to update metadata. Its specification is not part of the official structure defined by the HL7 Messaging Standard.

- **PRT**

    This HL7 segment can be used to transmit participation information.

- **ZCO**

    This HL7 segment can be used to add the generic file to a collection.

- **ZRI**

    Repetitions of the proprietary ZRI segment can be specified; these are transmitted as Reference IDs during an XDS registration of the corresponding generic file.

Furthermore, *syngo*.share supports the specification of multiple HL7 ORC/OBR segment pairs for submitting information about linked procedures. If there is only one HL7 OBR segment present, the specification of an HL7 ORC segment (as requested by the HL7 Messaging Standard) is not necessary.

3.3.3 HL7 ORU message structure

3.3.3.1 HL7 trigger events

To insert, update, and delete generic files via HL7 ORU messages, *syngo*.share supports the trigger event R01 as proposed by the HL7 Messaging Standard. Other trigger events associated with HL7 ORU messages are not supported by *syngo*.share.

To ensure that *syngo*.share can process HL7 ORU messages within this context they have to meet the following structure:
MSH PID [NK1] [PV1] [ROL] [GT1] [ACC] [{ORC OBR}] {OBX} [ZCO]

3.3.3.2 HL7 elements

Unlike HL7 MDM messages, HL7 ORU messages do not possess HL7 TXA segments. Hence, the IDs used to identify generic files and generic containers are defined by other HL7 components.

Note that the transmission of the binary data of a generic file by using more than one HL7 OBX segment is not permitted. This is in accordance with the HL7 Messaging Standard. However, repetitions of the HL7 OBX segment can be used to submit referenced Study Instance UIDs.

- **OBR-25 and OBX-11**

    The valid specification of these HL7 fields is necessary to distinguish between HL7 ORU messages which insert or update generic files and HL7 ORU messages which delete generic files:

- F: This value has to be specified in both fields in order to insert or update a generic file.

  - D: This value has to be specified in order to delete a generic file.

- **OBX-3.1**

  The generic file ID has to be defined in this HL7 component.

- **OBX-3.4 and OBX-3.6**

  These components have to define the generic container ID and the coding system ID.

- **MSH-3**

  The application ID has to be defined by this HL7 field.

- **PV1**

  This segment should be present if and only if the underlying generic file belongs to a visit.

- **ROL and GT1**

  The specification of these segments is possible, although it is not part of the official structure defined by the HL7 Messaging Standard.

- **ZCO**

  This HL7 segment can be used to add the generic file to a collection.

Furthermore, *syngo*.share supports the specification of multiple HL7 `ORC`/`OBR` segment pairs for submitting information about linked procedures. If there is only one HL7 `OBR` segment present, the specification of an HL7 `ORC` segment (as requested by the HL7 Messaging Standard) is not necessary.

3.4 Changing the organizational unit of DICOM studies and generic containers

3.4.1 Operating mode

The organizational unit of DICOM studies and generic containers can be changed via the HL7 inbound interface.

HL7 ORU messages can be used to move DICOM studies and generic containers to another organizational unit. Each HL7 ORU message must be dedicated to exactly one DICOM study or generic container.

To ensure that *syngo*.share can uniquely identify the DICOM study or generic container, the reference pointer of the DICOM study or generic container has to be specified. Reference pointers can be automatically obtained from *syngo*.share via HL7 ORU messages (see Referencing of DICOM studies and generic containers for further information).

3.4.2 HL7 ORU message structure

3.4.2.1 HL7 trigger events

To change the organizational unit of DICOM studies and generic containers via HL7 ORU messages, *syngo*.share supports the trigger event R01. The transmitted HL7 ORU messages have to meet the following structure:
MSH OBX ZOU

3.4.2.2 HL7 elements

- **OBX-5.1**
  This HL7 component has to specify the reference pointer which identifies the DICOM study or generic container whose organizational unit should be changed.

- **ZOU**
  This segment should be present to specify the target organizational unit.

3.5 Sharing of DICOM studies and generic containers

3.5.1 Operating mode

DICOM studies and generic containers can be shared via the HL7 inbound interface. This means that they can be accessed by designated users via the **Inbox** in *syngo*.share webview.

HL7 ORU messages have to be used to share DICOM studies and generic containers. To allow third-party systems to administrate shares of DICOM studies and generic containers, it is possible to create and delete shares. Each HL7 ORU message has to be dedicated to exactly one DICOM study or generic container. There are no restrictions on the number of users for which a share is to be created or deleted.

Since each share allows exactly one user to access a specific DICOM study or generic container, each HL7 ORU message has to specify for all listed users whether a share for the referenced DICOM study/-generic container is to be created or whether an existing share is to be deleted. In other words, it is possible to create or delete shares with one HL7 ORU message.

The reference pointer of the DICOM study or generic container has to be specified in order to ensure that *syngo*.share can uniquely identify the DICOM study or generic container which is to be shared or whose share is to be deleted. Reference pointers can be automatically obtained from *syngo*.share via HL7 ORU messages (see Referencing of DICOM studies and generic containers for further information).

To identify a user, *syngo*.share expects the login name of the user to be stated.

3.5.2 HL7 ORU message structure

3.5.2.1 HL7 trigger events

To administrate DICOM study and generic container shares via HL7 ORU messages, *syngo*.share supports the trigger event R01. The transmitted HL7 ORU messages have to meet the following structure:
MSH OBX {PRT}

3.5.2.2 HL7 elements

- **PRT-2**
  The specification of this HL7 field must be valid in order to allow *syngo*.share to distinguish between shares that have to be created and shares which are to be deleted.

    - LI: This value has to be specified when a share is to be created.

    - UN: This value has to be specified when a share is to be deleted.

- **OBX-5.1**
  This HL7 component has to specify the reference pointer which identifies the DICOM study or generic container that is to be shared.

- **PRT-1.1 and PRT-8.1**

  These HL7 components have to define the login name of the user (PRT-1.1) and the domain (PRT-8.1). To specify more than one user, the HL7 PRT segment has to be repeated appropriately often.

3.6 Deletion of DICOM studies and generic containers

3.6.1 Operating mode

DICOM studies and generic containers can be deleted via the HL7 inbound interface. Since this way of deletion is not standardized, it is recommended to use KOS Rejection Notes to delete DICOM images (see the *syngo*.share DICOM Conformance Statement) and HL7 MDM or HL7 ORU messages to delete generic files (as described in Archiving of generic files).

If the standardized deletion is out of the question, HL7 ORU messages can be used to delete DICOM studies and generic containers. Each HL7 ORU message must be dedicated to exactly one DICOM study or generic container.

To ensure that *syngo*.share can uniquely identify the DICOM study or generic container which is to be deleted, the reference pointer of the DICOM study or generic container has to be specified. Reference pointers can be automatically obtained from *syngo*.share via HL7 ORU messages (see Referencing of DICOM studies and generic containers for further information).

3.6.2 HL7 ORU message structure

3.6.2.1 HL7 trigger events

To delete DICOM studies and generic containers via HL7 ORU messages, *syngo*.share supports the trigger event R01. The transmitted HL7 ORU messages have to meet the following structure:
MSH OBX

3.6.2.2 HL7 elements

- **OBX-5.1**

  This HL7 component has to specify the reference pointer which identifies the DICOM study or generic container that is to be deleted.

3.7 Administration of HL7 ZPA messages

3.7.1 Operating mode

The HL7 inbound interface in *syngo*.share allows third-party systems to change the Accession Number and Study Instance UID of DICOM studies and to move DICOM studies from one patient to another via ZPA messages. If two DICOM studies are merged, the resulting DICOM study is assigned to the target patient. The corresponding order is deleted.

This interface should only be used in *syngo*.plaza installations where this kind of messages is important for synchronization. Otherwise, HL7 order messages and DICOM KOS objects should be used to realize this type of workflow.

3.7.2 Limitations

This proprietary interface has the following limitations:

- Changes made via HL7 ZPA messages are not persistent. If the HL7 message is received before the DICOM images, the patient context and the Accession Number of the DICOM images will not be corrected. If a DICOM image is stored for an already corrected DICOM study, the Accession Number is changed back to the original value.

- When a DICOM study is moved to another patient, the visit context is lost in *syngo*.share.

- In case of an error, the messages are skipped and are not added to the error list. Therefore, the intactness of the history of incoming HL7 ZPA messages cannot be guaranteed.

- If the Study Instance UID is changed, the reimport of the DICOM study will cause a UID conflict.

3.7.3 HL7 ZPA message structure

3.7.3.1 HL7 trigger events

syngo.share supports HL7 ZPA messages with the trigger events `I05` and `S05`. `I05` messages use the Accession Number and `S05` the Study Instance UID to identify the DICOM studies.

The transmitted HL7 ZPA messages have to meet the following structure:
`MSH PID [MRG] ZPA`

3.7.3.2 HL7 elements

- **MRG**
  This HL7 segment should be specified if the patient context of the referenced DICOM studies is to be checked. By default, the processor has a modification which allows the processing of ZPA messages intended for *syngo*.plaza. For this purpose, `MRG-4` is mapped to `MRG-1` and, if no `MRG` segment is present, the segment ZSP is mapped to the `MRG` segment.

3.8 HL7 segments

This chapter covers the segments of inbound HL7 messages processed by *syngo*.share in alphabetical order:

- HL7 ACC segment
- HL7 GT1 segment
- HL7 IPC segment
- HL7 MRG segment
- HL7 MSH segment
- HL7 NK1 segment
- HL7 OBR segment
- HL7 OBX segment
- HL7 ORC segment
- HL7 PID segment
- HL7 PRT segment
- HL7 PV1 segment
- HL7 ROL segment
- HL7 TQ1 segment
- HL7 TXA segment
- HL7 ZCO segment

- HL7 ZDS segment
- HL7 ZOU segment
- HL7 ZPA segment
- HL7 ZRI segment

3.8.1 HL7 ACC segment

The HL7 `ACC` segment of an incoming HL7 message can be used to specify accident information of a visit. It consists of the following information:

Table 3: HL7 ACC segment, inbound

Index	Description	Length	Optionality	Repeatable
1	Accident Timestamp		O	-
2	Accident Code	250	O	-

3.8.2 HL7 GT1 segment

The HL7 `GT1` segment of an incoming HL7 message consists of the following information:

Table 4: HL7 GT1 segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 GT1 Segment ID		O	-
3	Guarantor Name	250	O	-
5	Guarantor Address	350	O	-
8	Guarantor Birth Timestamp	24	O	-
12	Guarantor Social Security Number	50	O	-
16	Employer Name	250	O	-
17	Employer Address	350	O	-

- **GT1-1**
  This HL7 field should specify the value 1. Note that *syngo*.share cannot process more than one HL7 GT1 segment.

3.8.3 HL7 IPC segment

Each HL7 `IPC` segment of an incoming HL7 OMI message consists of the following information:

Table 5: HL7 IPC segment, inbound

Index	Description	Length	Optionality	Repeatable
1.1	Accession Number	255	R	-
1.2	Accession Number Assigning Authority Namespace ID	20	C	-
1.3	Accession Number Assigning Authority Universal ID	200	C	-
1.4	Accession Number Assigning Authority Universal ID Type	15	C	-
2.1	Requested Procedure ID	200	R	-
3.1	Study Instance UID	255	R	-
4.1	Scheduled Procedure Step ID	200	R	-

Table 5 ❯

Index	Description	Length	Optionality	Repeatable
5.1	Modality	50	O	-
6.1	Protocol Code	128	O	-
6.2	Protocol Description	128	O	-
6.5	Scheduled Procedure Step Description	128	O	-
9	Scheduled Station AET	255	O	-

- **IPC-1.1**

  This HL7 component has to define the Accession Number of the order.

- **IPC-1.2 to IPC-1.4**

  These HL7 components have to be defined if the assigning authority of the Accession Number differs from the default authority of the site. Otherwise, the default authority is used.

- **IPC-2.1**

  This HL7 component has to specify a unique ID within an order for the Requested Procedure addressed by the HL7 `ORC/TQ1/OBR/IPC` segment group to which the HL7 `IPC` segment belongs. It is used by *syngo*.share as an alternate identifier for the stated Requested Procedure.

- **IPC-3.1**

  This HL7 component has to define the Study Instance UID of the DICOM study to be associated with the Requested Procedure addressed by the underlying HL7 `ORC/TQ1/OBR/IPC` segment group. As mentioned in Order administration, the Study Instance UID is used as a unique identifier for the affected Requested Procedure.

- **IPC-4.1**

  This HL7 component has to define a unique ID within the Requested Procedure for the Scheduled Procedure Step specified by the HL7 `IPC` segment. Note that *syngo*.share links the specified Scheduled Procedure Step with the Requested Procedure addressed by the corresponding HL7 `ORC/TQ1/OBR/IPC` segment group.

3.8.4   HL7 MRG segment

The HL7 `MRG` segment of an incoming HL7 ADT message consists of the following information:

Table 6: HL7 MRG segment, inbound

Index	Description	Length	Optionality	Repeatable
1.1	Prior Patient ID	50	C	-
1.4.1	Prior Patient ID Assigning Authority Namespace ID	20	C	-
1.4.2	Prior Patient ID Assigning Authority Universal ID	200	C	-
1.4.3	Prior Patient ID Assigning Authority Universal ID Type	15	C	-
1.5	Prior Patient ID Type		C	-
5.1	Prior Visit ID	64	C	-
5.4.1	Prior Visit ID Assigning Authority Namespace ID	20	C	-
5.4.2	Prior Visit ID Assigning Authority Universal ID	200	C	-
5.4.3	Prior Visit ID Assigning Authority Universal ID Type	15	C	-
7	Prior Patient Name		O	-

- **MRG-1.1**

  If an HL7 MRG segment is used to merge a patient, the `MRG-1.1` HL7 component has to define the patient ID of the patient that is to be invalidated.

- **MRG-1.4**

  The assigning authority of the prior patient ID has to be defined by the HL7 component `MRG-1.4` if it differs from the default authority of the site. Otherwise, the default authority is used.

- **MRG-1.5**

  This HL7 component has to specify the value `PI` or `PN` to ensure that *syngo*.share detects the patient ID.

- **MRG-5.1**

  If an HL7 MRG segment is used to move or merge a visit, the HL7 component `MRG-5.1` has to specify the visit ID of the visit that is to be moved or invalidated.

- **MRG-5.4**

  The assigning authority of the prior visit ID has to be defined by the HL7 component `MRG-5.4` if it differs from the default authority of the site. Otherwise the default authority is used.

- **MRG-1.1 and MRG-7**

  If an HL7 MRG segment is used in combination with HL7 ZPA messages, the HL7 component `MRG-1.1` and the HL7 field `MRG-7` can be specified to validate the source patient to whom the DICOM study belongs.

3.8.5   HL7 MSH segment

The `MSH` segment of an incoming HL7 message has to provide the following information:

Table 7: HL7 MSH segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 Field Separator		R	-
2	Encoding Characters	4	R	-
3.1	Sending Application Namespace ID	64	C	-
3.2	Sending Application Universal ID	64	C	-
4.1	Sending Facility Namespace ID	50	C	-
4.2	Sending Facility Universal ID	50	C	-
5.1	Receiving Application Namespace ID		O	-
5.2	Receiving Application Universal ID		O	-
6.1	Receiving Facility Namespace ID	100	C	-
6.2	Receiving Facility Universal ID	100	C	-
7	HL7 Message Timestamp		O	-
9.1	HL7 Message Code	3	R	-
9.2	HL7 Message Trigger Event	3	R	-
9.3	HL7 Message Structure	7	O	-
10	HL7 Message Control ID	199	R	-
11.1	Processing ID		O	-
12.1	Version ID		O	-
13	HL7 Message Sequence Number		O	-
15	Accept Acknowledgment Type		C	-
16	Application Acknowledgment Type		C	-
18	Character Set		C	yes
20	Alternate Character Set Handling Scheme		C	-

- **MSH-3.1 and MSH-3.2**

  These HL7 components have to define the sending application of the HL7 message uniquely. *syngo*. share requires at least one of the two HL7 components to be specified. If `MSH-3.1` is left empty, the

value of `MSH-3.2` is used to identify the sending application. In all other cases, `MSH-3.1` is evaluated.

Note that to insert, update, or delete a generic file, the specified sending application is used as application ID to uniquely identify the third-party system responsible for the generic file (cf. Archiving of generic files).

- **`MSH-4.1` and `MSH-4.2`**
  These HL7 components are used to identify the sending facility of the HL7 message. *syngo*.share uses this information to identify the organizational unit affected by the HL7 message. At least one of the two HL7 components has to be specified if generic files are archived. For HL7 order messages, the values only have to be set if the Requested Procedure should be assigned an organizational unit. If `MSH-4.1` is left empty, the value of `MSH-4.2` is used to retrieve the organizational unit. In all other cases, `MSH-4.1` is evaluated.

- **`MSH-5.1` and `MSH-5.2`**
  These HL7 components specify the receiving application. The evaluation of the receiving application is similar to that of the sending application. Since the processing of an HL7 message does not rely on this information, it does not have to be specified.

- **`MSH-6.1` and `MSH-6.2`**
  These HL7 components are used to obtain the receiving facility of the HL7 message. *syngo*.share uses this to identify the tenant affected by the HL7 message. The evaluation of the HL7 components `MSH-6.1` and `MSH-6.2` is similar to that of the sending facility. This means that if `MSH-6.1` is not specified, `MSH-6.2` has to define the receiving facility.

- **`MSH-15` and `MSH-16`**
  These HL7 fields define the following:

  - The processing rules that have to be applied to exchange the HL7 message

  - The conditions under which an HL7 accept acknowledgment message or an HL7 application acknowledgment message has to be sent when the enhanced processing rules are in effect.

  To ensure that the original processing rules are used, both HL7 fields have to be left empty. If the enhanced processing rules are to be applied, at least one of the two HL7 fields has to be defined.

- **`MSH-18` and `MSH-20`**
  The HL7 field `MSH-18` has to specify the character sets used to generate the HL7 message. If more than one character set is in use, the handling scheme of the alternate character sets has to be defined by the HL7 field `MSH-20`. For the possible values of `MSH-18` and `MSH-20`, refer to HL7 message syntax.

3.8.6   HL7 NK1 segment

The HL7 NK1 segment of an incoming HL7 message consists of the following information:

Table 8: HL7 NK1 segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 NK1 Segment ID		O	-
2	Next of Kin Name	250	O	-
3	Relationship	50	O	-
4	Next of Kin Address	350	O	-
40	Next of Kin Telecommunication Information	200	O	-

- **NK1-1**

    This HL7 field should specify the value 1. Note that *syngo*.share cannot process more than one HL7 NK1 segment.

3.8.7   HL7 OBR segment

Like HL7 `ORC` segments, the structure of and information provided by an HL7 `OBR` segment depend on the type of the underlying HL7 message. The HL7 inbound interface of *syngo*.share evaluates HL7 `OBR` segments in combination with HL7 OMI, HL7 ORM, HL7 MDM, and HL7 ORU messages.

3.8.7.1   HL7 OMI and ORM messages

HL7 OMI and ORM messages make use of the information provided by HL7 `OBR` segments to insert and update orders, Requested Procedures, and Scheduled Procedure Steps (see Order administration). Although HL7 OMI and HL7 ORM messages have the same purpose, the structure of their HL7 `OBR` segments is quite different.

HL7 OBR segment in inbound HL7 OMI messages

In incoming HL7 OMI messages, each HL7 `OBR` segment has to provide the following information:

Table 9: HL7 OBR segment (HL7 OMI message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBR Segment ID		O	-
2.1	Placer Order Number	200	C	-
2.2	Placer Order Number Assigning Authority Namespace ID	20	C	-
2.3	Placer Order Number Assigning Authority Universal ID	200	C	-
2.4	Placer Order Number Assigning Authority Universal ID Type	15	C	-
3.1	Filler Order Number	200	C	-
3.2	Filler Order Number Assigning Authority Namespace ID	20	C	-
3.3	Filler Order Number Assigning Authority Universal ID	200	C	-
3.4	Filler Order Number Assigning Authority Universal ID Type	15	C	-
4.1	Universal Service ID	128	O	-
4.2	Universal Service Description	128	O	-
5.1	Priority	2	O	-
12	Danger Code	60	O	-
13	Relevant Clinical Information	999	O	-
16	Order Provider	255	O	-
17	Order Call Back Phone Number	250	O	-
25.1	Result Status		O	-
30	Transportation Mode	50	O	-
31	Reason For Study	300	O	-
34	Technician	200	O	-
44.1	Procedure Code	128	O	-
44.2	Procedure Description	128	O	-
44.5	Requested Procedure Description	128	O	-
46	Placer Supplemental Service Information		O	yes
47	Filler Supplemental Service Information		O	yes

- **OBR-1**

This HL7 field should specify a consecutive number. Note that HL7 OMI messages might contain more than one HL7 `OBR` segment.

- **`OBR-2.1` and `OBR-3.1`**
  These HL7 components have to define the Placer Order Number (`OBR-2.1`) and Filler Order Number (`OBR-3.1`) of the order. Since *syngo*.share uses the two IDs to identify orders, at least one of the two IDs has to be specified.

- **`OBR-2.2` to `OBR-2.4` and `OBR-3.2` to `OBR-3.4`**
  The assigning authority of the Placer Order Number has to be defined by the HL7 components `OBR-2.2` to `OBR-2.4` if it differs from the default authority of the site. Otherwise, the default authority is used. The same applies to the assigning authority of the Filler Order Number, defined by `OBR-3.2` to `OBR-3.4`.

- **`OBR-4.1`**
  This HL7 component specifies the universal service ID, which is an identifier for the order that usually comes from an industry standard such as SNOMED or LOINC.

- **`OBR-25.1`**
  This HL7 component is used to set the document workflow state of the related DICOM studies if `ORC-1` contains the value `SC`.

- **`OBR-46`**
  All repetitions of this HL7 field are stored, and it is possible to configure which one contains the LR indicator (see Table 10). If a DICOM study is registered in an Affinity Domain, some of the repetitions will be transmitted as event codes. For this, the Requested Procedure must be linked to the DICOM study. The repetitions are defined by specifying coding system names.

- **`OBR-47`**
  A repetition of this HL7 field can be used to submit the subspecialty (see Table 11). Therefore, the first repetition containing a configured coding system name is considered.

Table 10: HL7 OBR-46 field (HL7 OMI message), LR indicator, inbound

Index	Description	Length	Optionality	Repeatable
46	LR Indicator	250	O	-

Table 11: HL7 OBR-47 field (HL7 OMI message), subspecialty, inbound

Index	Description	Length	Optionality	Repeatable
47.1	Subspecialty Identifier	256	O	-
47.2	Subspecialty Description	256	O	-
47.3	Subspecialty Coding System Name	256	C	-

`OBR-47.3` is used to find the repetition of `OBR-47` containing the subspecialty and should therefore be present if a subspecialty is sent.

> **ℹ Note**
> The HL7 components and HL7 fields `OBR-2.1`, `OBR-3.1`, `OBR-16`, and `ORC-17` should specify the same values as the HL7 components and HL7 fields of the associated HL7 `ORC` segment, i.e. `ORC-2.1`, `ORC-3.1`, `ORC-12`, and `ORC-14`.

HL7 OBR segment in inbound HL7 ORM messages

In incoming HL7 ORM messages, the HL7 OBR segment has to provide the following information:

Table 12: HL7 OBR segment (HL7 ORM message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBR Segment ID		O	-
2.1	Placer Order Number	200	C	-
2.2	Placer Order Number Assigning Authority Namespace ID	20	C	-
2.3	Placer Order Number Assigning Authority Universal ID	200	C	-
2.4	Placer Order Number Assigning Authority Universal ID Type	15	C	-
3.1	Filler Order Number	200	C	-
3.2	Filler Order Number Assigning Authority Namespace ID	20	C	-
3.3	Filler Order Number Assigning Authority Universal ID	200	C	-
3.4	Filler Order Number Assigning Authority Universal ID Type	15	C	-
4.1	Universal Service ID	128	O	-
4.2	Universal Service Description	128	O	-
4.4	Protocol Code	128	O	-
4.5	Protocol Description	128	O	-
4.11	Scheduled Procedure Step Description	128	O	-
5.1	Priority	2	O	-
12	Danger Code	60	O	-
13	Relevant Clinical Information	999	O	-
15.4	Body Site	250	O	-
15.5	LR Indicator	250	O	-
16	Order Provider	255	O	-
17	Order Call Back Phone Number	250	O	-
18	Accession Number	255	O	-
19	Requested Procedure ID	200	R	-
20	Scheduled Procedure Step ID	200	R	-
21	Scheduled Station AET	255	C	-
24	Modality	50	O	-
25.1	Result Status		O	-
27.4	Start Timestamp	24	R	-
30	Transportation Mode	50	O	-
31	Reason For Study	300	O	-
34	Technician	200	O	-
44.1	Procedure Code	128	O	-
44.2	Procedure Description	128	O	-
44.5	Requested Procedure Description	128	O	-
46	Placer Supplemental Service Information		O	yes
47	Filler Supplemental Service Information		O	yes

- **OBR-1, OBR-2.1 to OBR-2.4, OBR-3.1 to OBR-3.4, and OBR-4.1**
  These HL7 fields and HL7 components have to be specified in the same way as described for HL7 OMI messages (see HL7 OBR segment in inbound HL7 OMI messages).

- **OBR-18**
  This HL7 field is evaluated to obtain the Accession Number of the order. If the Accession Number is not specified, *syngo*.share automatically generates an appropriate ID. The assigning authority of

the Accession Number should be either the assigning authority of the Filler Order Number or the assigning authority of the Placer Order Number (if the Filler Order Number is not defined).

- **OBR-19**

  This HL7 field has to specify a unique ID within an order for the Requested Procedure addressed by the HL7 ORM message. *syngo*.share uses it as an alternate identifier for the stated Requested Procedure.

- **OBR-20**

  This HL7 field has to define a unique ID within a Requested Procedure for the Scheduled Procedure Step specified by the HL7 `ORC/OBR` segment group to which the HL7 `OBR` segment belongs.

- **OBR-21**

  This HL7 field specifies the scheduled station AET and should be present if the order is used for a DICOM worklist.

- **OBR-25.1**

  This HL7 component is used to set the document workflow state of the related DICOM studies if `ORC-1` contains the value `SC`.

- **OBR-27.4**

  This HL7 component specifies the start timestamp of the listed Scheduled Procedure Steps. For this reason, the specification of the HL7 component `ORC-7.4` is mandatory.

- **OBR-46**

  All repetitions of this HL7 field are stored. If a DICOM study is registered in an Affinity Domain, some of the repetitions will be transmitted as event codes. For this, the Requested Procedure must be linked to the DICOM study. The repetitions are defined by specifying coding system names.

- **OBR-47**

  A repetition of this HL7 field can be used to submit the subspecialty (see Table 13). Therefor the first repetition containing a configured coding system name is considered.

Table 13: HL7 OBR-47 field (HL7 ORM message), subspecialty, inbound

Index	Description	Length	Optionality	Repeatable
47.1	Subspecialty Identifier	256	O	-
47.2	Subspecialty Description	256	O	-
47.3	Subspecialty Coding System Name	256	C	-

- **OBR-47.3**

  This HL7 field is used to find the repetition of `OBR-47` containing the subspecialty and should therefore be present if a subspecialty is sent.

ℹ️ **Note**

The HL7 components and HL7 fields `OBR-2.1`, `OBR-3.1`, `OBR-27.4`, `OBR-16`, and `OBR-17` should specify the same values as the HL7 components and HL7 fields `ORC-2.1`, `ORC-3.1`, `ORC-7.4`, `ORC-12`, and `ORC-14` of the associated HL7 `ORC` segment.

3.8.7.2 HL7 MDM and ORU messages

Within HL7 MDM and HL7 ORU messages, the information provided by HL7 `OBR` segments is only used for informational purposes (see Archiving of generic files).

General structure of the HL7 OBR segment in MDM and ORU messages

If an HL7 OBR segment is part of an incoming HL7 MDM or HL7 ORU message which inserts, updates, or deletes a generic file, it has to possess the following structure:

Table 14: HL7 OBR segment (HL7 MDM and ORU message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBR Segment ID		O	-
2.1	Placer Order Number	200	O	-
2.2	Placer Order Number Assigning Authority Namespace ID	20	C	-
2.3	Placer Order Number Assigning Authority Universal ID	200	C	-
2.4	Placer Order Number Assigning Authority Universal ID Type	15	C	-
3.1	Filler Order Number	200	O	-
3.2	Filler Order Number Assigning Authority Namespace ID	20	C	-
3.3	Filler Order Number Assigning Authority Universal ID	200	C	-
3.4	Filler Order Number Assigning Authority Universal ID Type	15	C	-
18.1	Accession Number	255	O	-
19	Requested Procedure ID	200	O	-
24	Practice Setting Code	256	C	-
25.1	Result Status		O	-
31	Reason For Study	300	O	yes

- **OBR-1**
  This HL7 field should specify a consecutive number. Note that HL7 MDM and HL7 ORU messages might contain more than one HL7 OBR segment.

- **OBR-2.1 and OBR-3.1**
  These HL7 components define the Placer Order Number (OBR-2.1) and Filler Order Number (OBR-3.1) of the order. Since *syngo*.share uses the two IDs to identify orders, at least one of the two IDs has to be specified if the metadata update of generic files is used.

- **OBR-2.2 to OBR-2.4 or OBR-3.2 to OBR-3.4**
  These HL7 components should be defined if the assigning authority of the placer/Filler Order Number differs from the default authority of the site. Otherwise, the default authority is used.

- **OBR-18**
  This HL7 field is evaluated to obtain the Accession Number of the generic file. The assigning authority of the Accession Number is taken either from the assigning authority of the Filler Order Number (OBR-3) or, if OBR-3 is empty, from the assigning authority of the Placer Order Number. Otherwise, the default authority is used.

- **OBR-24**
  This HL7 field is used to specify the Practice Setting Code of the generic file referenced by the HL7 message:

  ○ **HL7 MDM message**
    In an incoming HL7 MDM message which inserts or updates a generic file, the Practice Setting Code must be specified if the generic file is to be registered in an Affinity Domain (see IHE IT Infrastructure Technical Framework for further information). To this end, the following HL7 components have to be defined:

Table 15: HL7 OBR-24 field, inbound

Index	Description	Length	Optionality
24.1	Practice Setting Code ID		R
24.2	Practice Setting Code Display Name	256	O
24.3	Practice Setting Code Coding Scheme		R

○ **HL7 ORU message**
In an incoming HL7 ORU message, the specification of the Practice Setting Code is optional because HL7 ORU messages do not provide enough information to register generic files in Affinity Domains.

- **OBR-25.1**
This HL7 component is used to set the document workflow state of the specified generic container.

- **OBR-31**
All repetitions of this HL7 field are stored. If the corresponding generic file is registered in an Affinity Domain, they are transmitted as event codes.

HL7 OBR segment with additional linking information in MDM and ORU messages

If the HL7 OBR segment specifies additional linking information, indicated by the value CN in the HL7 field ORC-1, the OBR segment has to possess the following structure:

Table 16: Optional HL7 OBR segment (HL7 MDM and ORU message), referenced Accession Number/Requested Procedure ID, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBR Segment ID		O	-
2.2	Placer Order Number Assigning Authority Namespace ID	20	C	-
2.3	Placer Order Number Assigning Authority Universal ID	200	C	-
2.4	Placer Order Number Assigning Authority Universal ID Type	15	C	-
3.2	Filler Order Number Assigning Authority Namespace ID	20	C	-
3.3	Filler Order Number Assigning Authority Universal ID	200	C	-
3.4	Filler Order Number Assigning Authority Universal ID Type	15	C	-
18.1	Accession Number	255	O	-
18.2	Accession Number Assigning Authority Namespace ID	20	C	-
18.3	Accession Number Assigning Authority Universal ID	200	C	-
18.4	Accession Number Assigning Authority Universal ID Type	15	C	-
19	Requested Procedure ID	200	O	-

- **OBR-2.2 to OBR-2.4 or OBR-3.2 to OBR-3.4**
These HL7 components should be defined if the assigning authority of the placer/Filler Order Number differs from the default authority of the site. Otherwise, the default authority is used.

- **OBR-18**
This HL7 field contains the referenced Accession Number. The assigning authority of the Accession Number is taken either from the assigning authority of the Filler Order Number (OBR-3) or, if OBR-3 is empty, from the assigning authority of the Placer Order Number.

3.8.8 HL7 OBX segment

The structure of and information provided by an HL7 `OBX` segment depend on the type of object or observation that is addressed by the HL7 `OBX` segment.

The HL7 inbound interface of *syngo*.share evaluates HL7 `OBX` segments in combination with HL7 ADT, HL7 MDM, HL7 OMI and HL7 ORU messages.

3.8.8.1 HL7 ADT messages

An HL7 `OBX` segment belonging to an incoming HL7 ADT message which is used to insert or update patients can be provided containing the following information:

Table 17: Optional HL7 OBX segment (HL7 ADT message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
3.2	Observation Identifier Text		C	-
5.1	Observation Value	16	O	-
6.1	Units		C	-

- **OBX-3.2**
  This HL7 component distinguishes different observations. For the weight of the patient `BODY WEIGHT` and for the height `BODY HEIGHT` has to be specified.

  > **i** **Note**
  > The body weight and body height must only be sent if they are kept up to date by the sending system. The values might be outdated if the patient's weight or height has changed since the last transmitted measurement.

- **OBX-6.1**
  This HL7 component specifies the unit of the observation. For the weight of the patient `kg` and for the height `m` has to be specified. Otherwise, the observation gets ignored. If the value in `OBX-5.1` gets deleted the unit might be empty.

3.8.8.2 HL7 MDM messages

An HL7 `OBX` segment belonging to an incoming HL7 MDM message which is used to insert or update a generic file has to provide the following information:

Table 18: HL7 OBX segment (HL7 MDM message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
2	Value Type		R	-
4	HL7 OBX Segment Sub-ID		O	-
5	Value		R	-
8	Generic File Interpretation Code	1000	C	-
11	Generic File Result Status	50	O	-
14	Generic File Creation Timestamp		O	-

- **OBX-1 and OBX-4**

  These HL7 fields should specify the value 1. Note that *syngo*.share cannot process multiple OBX segments containing binary data or a UNC path.

- **OBX-2**

  This HL7 field has to specify the value type of the HL7 field OBX-5, in particular ED or RP:

  - ED: Indicates that the binary data of the generic file addressed by the HL7 OBX segment is encapsulated in the HL7 MDM message.

  - RP: Indicates that the binary data of the generic file is referenced using a UNC path.

- **OBX-5**

  syngo.share interprets the value of the HL7 field OBX-5 by using the value type information specified by OBX-2. The structure of OBX-5 varies depending on the value type:

  - **Binary Data (Value Type ED)**

    If the value type defined in OBX-2 is ED, the HL7 field OBX-5 has to contain the following information:

    Table 19: HL7 OBX-5 field (binary data), inbound

Index	Description	Content	Optionality
5.2	Mime Type	100	R
5.3	Mime Subtype	100	O
5.4	Encoding		R
5.5	Binary Data		R

  - **OBX-5.2 and OBX-5.3**

    These HL7 components specify the MIME type and MIME subtype of the generic file. Valid values can be obtained from the website of the Internet Assigned Number Authority. Since it is not allowed to transmit non-printable characters within an HL7 message, the binary data of the generic file has to be encoded. The binary data is specified by the HL7 component OBX-5.5.

  - **OBX-5.4**

    This HL7 component has to specify the used encoding in order to ensure that *syngo*.share can decode the binary data. See Archiving of generic files for possible values.

  - **OBX-5.5**

    This HL7 component specifies the binary data of the generic file.

  - **UNC Path (value type RP)**

    If the value type defined in OBX-2 is RP, OBX-5 has to contain the following information:

    Table 20: HL7 OBX-5 field (UNC path), inbound

Index	Description	Content	Optionality
5.1	UNC Path		R
5.3	Mime Type	100	R
5.4	Mime Subtype	100	O

- **OBX-8**

This HL7 field defines an interpretation code. If the generic file is to be registered in an Affinity Domain, *syngo*.share requires the specified interpretation code to define the content type code of the generic file (see IHE IT Infrastructure Technical Framework for further information). Table 21 shows the HL7 components that have to be defined in this case. Otherwise, `OBX-8` can be left empty.

Table 21: HL7 OBX-8 field, inbound, when registering a generic file in an Affinity Domain

Index	Description	Length	Optionality
8.1	Content Type Code ID		R
8.2	Content Type Code Display Name	1000	O
8.3	Content Type Code Coding Scheme		R

- **OBX-11**

  This HL7 field should specify the value F, R or X. The visibility restriction type of the generic file is set as follows:

    - F is mapped to `None`,

    - R is mapped to `Restricted`,

    - X is mapped to `Private`.

  Specifying F is recommended.

- **OBX-14**

  This HL7 field should specify the same value as the HL7 field `TXA-6` (see HL7 TXA segment).

3.8.8.3   HL7 OMI messages

An HL7 `OBX` segment belonging to an incoming HL7 OMI message which is used to insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps can be provided containing the following information:

Table 22: Optional HL7 OBX segment (HL7 OMI message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
20.1	Observation Site Identifier	250	O	-

- **OBX-20.1**

  This HL7 component specifies the Observation Site Identifier which is used as the Body Site of the associated Requested Procedure.

3.8.8.4   HL7 ORU messages

An HL7 `OBX` segment belonging to an incoming HL7 ORU message which is used to insert, update, or delete a generic file has to provide the following information:

Table 23: HL7 OBX segment (HL7 ORU message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
2	Value Type		C	-
3.1	Generic File ID	256	R	-
3.2	Generic File Description	250	O	-
3.4	Generic Container ID	256	R	-
3.5	Generic Container Description	250	O	-
3.6	Generic Container Coding System ID	64	O	-
3.9	Generic Filename	256	C	-
4	HL7 OBX Segment Sub-ID		O	-
5	Value		C	-
8	Generic File Interpretation Code	1000	O	-
11	Generic File Result Status	50	R	-
14	Generic File Creation Timestamp	24	O	-

- **OBX-1 and OBX-4**

  These HL7 fields should specify the value 1. Note that *syngo*.share cannot process more than one HL7 OBX segment.

- **OBX-2**

  This HL7 field specifies the value type of the HL7 field OBX-5.

    - ED: Indicates that the binary data of the generic file is contained in OBX-5.

    - RP: Indicates that the binary data of the generic file is referenced using a UNC path.

  If no binary data is given – for example, in case of a pure metadata update – OBX-2 should be left empty.

- **OBX-3.1**

  This HL7 component has to specify the generic file ID. This generic file ID is used together with the application ID to uniquely identify the generic file. (The application ID is specified by either MSH-3.1 or MSH-3.2, see HL7 MSH segment for details.)

- **OBX-3.4 and OBX-3.4**

  These HL7 components define the generic container ID and coding system ID of the generic container which contains the referenced generic file.

- **OBX-3.9**

  This HL7 component defines the name of the generic file, including its file extension. Its specification is mandatory if the generic file is to be inserted or updated by a new version with a different file extension.

- **OBX-5**

  syngo.share interprets the value of the HL7 field OBX-5 by using the value type information specified by OBX-2. The structure of OBX-5 varies depending on the given value type. For detailed information on these structures, see the description of OBX-5 for incoming HL7 MDM messages (Section • **OBX-5**).

- **OBX-8**

  This HL7 field defines an interpretation code. Unlike HL7 MDM messages (see Section • **OBX-8**), HL7 ORU messages do not provide enough information to register generic files in Affinity Domains. This means that the specification of the HL7 field OBX-8 is unregulated for HL7 ORU messages.

- **OBX-11**

This HL7 field is used to differentiate between HL7 ORU messages which insert or update generic files and HL7 ORU messages which delete generic files:

- F, R, X: One of these values has to be specified in order to insert or update a generic file. The visibility restriction type of the generic file is set or updated as follows: F is mapped to `None`, R is mapped to `Restricted`, X is mapped to `Private`. Specifying F is recommended.

- D: This value has to be specified in order to delete a generic file.

- **OBX-14**

  This HL7 field defines the creation timestamp of the generic file. It should be defined whenever a generic file is inserted or the binary data of a generic file is updated.

  > **ℹ Note**
  >
  > The HL7 fields OBX-11 and OBX-14 should specify the same values as the HL7 fields OBR-25 and OBR-7.

Declaration of DICOM study references (HL7 MDM and HL7 ORU messages)

To declare Study Instance UIDs referenced by the transmitted document, additional HL7 `OBX` segments containing the following information can be specified in HL7 MDM and HL7 ORU messages.

Table 24: Optional HL7 OBX segment (HL7 MDM and ORU message), referenced DICOM Study Instance UID, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
2	Value Type		O	-
3	Observation Identifier		R	-
5.1	Study Instance UID	250	R	-
11	Document Result Status	50	R	-

- **OBX-2**

  If specified, the HL7 field OBX-2 has to contain the value HD.

- **OBX-3**

  This HL7 field has to specify the value `113014^DICOM Study^DCM`, thus indicating that the HL7 component `OBX-5.1` contains a referenced Study Instance UID.

- **OBX-11**

  This HL7 field should contain the value O for order detail description.

Referencing of documents via reference pointer (HL7 ORU messages)

If an HL7 `OBX` segment is used to reference a document (DICOM study or generic container) via reference pointer, it has to specify the following information:

Table 25: HL7 OBX segment, referencing documents, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
2	Value Type		R	-

Table 25 ⌄

Index	Description	Length	Optionality	Repeatable
4	HL7 OBX Segment Sub-ID		O	-
5.1	Reference Pointer		R	-
11	Document Result Status	50	O	-
14	Document Creation Timestamp		O	-

- **OBX-1 and OBX-4**

  These HL7 fields should specify the value 1. Note that *syngo*.share cannot process more than one HL7 OBX segment.

- **OBX-2**

  This HL7 field specifies the value type of the HL7 field OBX-5. Since the document addressed by the HL7 OBX segment is identified by a reference pointer, the value RP has to be stated.

- **OBX-5.1**

  This HL7 component has to specify the reference pointer which identifies the affected document.

- **OBX-11**

  This HL7 field describes the status of the referenced document and should specify one of the following values:

  - D: This value has to be specified if the referenced document has been deleted.

  - F: If the document has any other status, this value should be used.

ℹ **Note**

The HL7 fields OBX-11 and OBX-14 should specify the same values as the HL7 fields OBR-25 and OBR-7.

3.8.9 HL7 ORC segment

The structure of and information provided by an HL7 ORC segment depend on the type of the underlying HL7 message. The HL7 inbound interface of *syngo*.share evaluates HL7 ORC segments in combination with HL7 OMI, HL7 ORM, HL7 ORU and HL7 MDM messages.

3.8.9.1 HL7 OMI and ORM messages

HL7 OMI and HL7 ORM messages use HL7 ORC segments to insert, update, and delete orders, Requested Procedures, and Scheduled Procedure Steps (see Order administration). For this purpose, each HL7 ORC segment of an incoming HL7 OMI and HL7 ORM message has to provide the following information:

Table 26: HL7 ORC segment (HL7 OMI and ORM message), inbound

Index	Description	Length	Optionality	Repeatable
1	Order Control Code		R	-
2.1	Placer Order Number	200	C	-
2.2	Placer Order Number Assigning Authority Namespace ID	20	C	-
2.3	Placer Order Number Assigning Authority Universal ID	200	C	-
2.4	Placer Order Number Assigning Authority Universal ID Type	15	C	-

---

Index	Description	Length	Optionality	Repeatable
3.1	Filler Order Number	200	C	-
3.2	Filler Order Number Assigning Authority Namespace ID	20	C	-
3.3	Filler Order Number Assigning Authority Universal ID	200	C	-
3.4	Filler Order Number Assigning Authority Universal ID Type	15	C	-
5	Order Status	128	C	-
7.4	Start Timestamp	24	C	-
10	Order Enterer	255	O	-
12	Order Provider	255	O	-
13	Enterers Location	80	O	-
14	Order Call Back Phone Number	250	O	-
16	Order Control Code Reason	250	O	-
17	Entering Organization	128	O	-
21	Facility	255	O	-
25.1	Order Status Modifier Identifier	256	O	-
25.3	Order Status Modifier Name of Coding System	256	O	-
28	Confidentiality Code	250	O	-

- **ORC-1**

    This HL7 field determines the function of the order specified by the HL7 `ORC` segment:

    - CA requests the deletion of the order.

    - DC requests the discontinuation of the order.

    - NW requests the insertion of the order.

    - SC updates the reporting workflow state if it is specified via `ORC-25.1`.

    - XO requests the update of the order.

- **ORC-2.1 and ORC-3.1**

    These HL7 components define the Placer Order Number (`ORC-2.1`) and Filler Order Number (`ORC-3.1`) and are used by *syngo*.share to uniquely identify the order. Hence, at least one of the two IDs has to be specified.

- **ORC-2.2 to ORC-2.4 and ORC-3.2 to ORC-3.4**

    The assigning authority of the Placer Order Number has to be defined by the HL7 components `ORC-2.2` to `ORC-2.4` if it differs from the default authority of the site. Otherwise, the default authority is used. The same applies to the assigning authority of the Filler Order Number, defined by `ORC-3.2` to `ORC-3.4`.

- **ORC-5**

    This HL7 field defines the status of the order. The following values are possible:

    - CM has to be used to mark the Scheduled Procedure Steps associated with the order as completed.

    - RP in combination with the value DC in the HL7 field `ORC-1` requests the deletion of the order.

    - SC has to be used if the Scheduled Procedure Steps of the order have been scheduled for processing.

- **ORC-7.4**

    In HL7 ORM messages, this HL7 component specifies the start timestamp of the listed Scheduled Procedure Steps and is thus mandatory. In HL7 OMI messages, the `ORC-7.4` should not be specified

because the start timestamp of the Scheduled Procedure Steps is defined by a separate HL7 `TQ1` segment.

- **`ORC-25.1` and `ORC-25.3`**

  These HL7 components are used to specify the reporting workflow state of a Requested Procedure/Scheduled Procedure Step in HL7 OMI and ORM messages. If identifier and coding system name match a configured reporting workflow state, the change is accepted. Else, it is ignored.

> **ℹ Note**
>
> The HL7 components and HL7 fields `ORC-2.1`, `ORC-3.1`, `ORC-7.4`, `ORC-12`, and `ORC-14` should specify the same values as the HL7 components and HL7 fields of the associated HL7 `OBR` segment, i.e. `OBR-2.1`, `OBR-3.1`, `OBR-27.4`, `OBR-16`, and `OBR-17`.

3.8.9.2 HL7 MDM and ORU messages

If HL7 MDM and HL7 ORU messages have multiple HL7 `OBR` segments, the HL7 `ORC` segment should be present to indicate which HL7 `OBR` segment contains information about the observation and which HL7 `OBR` segments are used for linking information.

Incoming HL7 MDM and HL7 ORU messages have to provide the following information in the HL7 `ORC` segment:

Table 27: HL7 ORC segment (HL7 MDM and ORU message), inbound

Index	Description	Length	Optionality	Repeatable
1	Order Control Code		C	-

- **`ORC-1`**

  The HL7 field `ORC-1` determines which information is contained in the subsequent HL7 `OBR` segment:

  - CN: The HL7 `OBR` segment contains linking information.

  - RE: The HL7 `OBR` segment contains information concerning the observation.

3.8.10 HL7 PID segment

The HL7 `PID` segment of an incoming HL7 message has to provide the following information:

Table 28: HL7 PID segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 PID Segment ID		O	-
3.1	Patient ID	50	R	
3.4.1	Patient ID Assigning Authority Namespace ID	20	C	
3.4.2	Patient ID Assigning Authority Universal ID	200	C	yes
3.4.3	Patient ID Assigning Authority Universal ID Type	15	C	
3.5	Patient ID Type		R	
5.1	Patient Last Name	64	O	
5.2	Patient First Name	64	O	
5.3	Patient Middle Name	64	O	

Table 28 ❯

Index	Description	Length	Optionality	Repeatable
5.4	Patient Name Suffix	64	O	yes
5.5	Patient Name Prefix	64	O	
5.7	Patient Name Type		C	
5.8	Patient Name Representation		C	
6	Mothers Maiden Name	150	O	-
7	Patient Birth Timestamp	24	O	-
8.1	Patient Sex	1	O	-
10	Patient Race	50	O	-
11	Patient Address	350	O	-
16	Patient Marital Status	50	O	-
17	Patient Religion	20	O	-
18	Patient Account Number	250	O	-
23	Patient Birth Place	350	O	-
24	Multiple Birth Indicator	1	O	-
26	Patient Citizenship	50	O	-
27	Patient Profession	100	O	-
29	Patient Death Timestamp	24	O	-
40	Patient Telecommunication Information	200	O	-

- **PID-1**
  This HL7 field should specify the value 1. Note that *syngo*.share cannot process more than one HL7 `PID` segment.

- **PID-3.1** and **PID-3.5**
  These HL7 components have to be used to specify the patient ID as well as alternate patient ID of the patient addressed by the HL7 `PID` segment. The specification of the patient ID is mandatory, whereas the specification of an alternate patient ID is optional. To differentiate between the two IDs, the HL7 component `PID-3.5` has to specify one of the following values:

  - PI or PN: Used when `PID-3.1` specifies the patient ID.

  - NH, NI, or SS: Used when `PID-3.1` specifies an alternate patient ID.

    ○ NI indicates that the alternate patient ID represents a unique national identifier.

    ○ NH indicates that the alternate patient ID represents a national health service number.

    ○ SS indicates that the alternate patient ID represents a social security number.

  If `PID-3.5` contains the value GPI, `PID-3.1` contains the XAD-PID, and all patient IDs of the message are linked with this XAD-PID.

- **PID-3.4**
  This HL7 component defines the assigning authority of the patient ID and alternate patient ID. For the patient ID, the assigning authority should be specified if it differs from the default authority of the site. Otherwise the default authority is used. For the alternate patient ID, one of the following HL7 subcomponents is evaluated:

  - `PID-3.4.1` is evaluated if it is specified.

  - `PID-3.4.2` is used if `PID-3.4.1` has been left empty.

- **PID-5.1** to **PID-5.8**
  These HL7 components are evaluated to obtain the names of the patient. If `PID-5.7` contains a B, the repetition specifies the birth name. Otherwise, *syngo*.share assumes that the specified name

is the legal name; this could also be indicated by the value L. Because *syngo*.share is able to store the alphabetic, ideographic, and phonetic name of a patient, the HL7 component `PID-5.8` has to specify one of the following:

- A for alphabetic,
- `I` for ideographic,
- P for phonetic.

3.8.11 HL7 PRT segment

The structure of and information provided by an HL7 PRT segment depend on the type of the underlying HL7 message.

The HL7 inbound interface of *syngo*.share evaluates HL7 PRT segments in combination with HL7 MDM, HL7 OMI and HL7 ORU messages.

3.8.11.1 HL7 MDM messages

The HL7 PRT segment of an incoming HL7 MDM message consists of the following information:

Table 29: HL7 PRT segment (HL7 MDM message), inbound

Index	Description	Length	Optionality	Repeatable
4.1.1	Participation Type Identifier	256	C	-
4.2.1	Participation Type Description	256	O	-
4.3.1	Participation Type Coding System Name	256	O	-
5.1.1	Participation Person Identifier	256	C	-
5.2.1	Participation Person Family Name	256	O	-
5.3.1	Participation Person Given Name	256	O	-
5.9	Participation Person Assigning Authority	256	O	-
5.13.1	Participation Person Identifier Type Code	5	O	-
8.1.1	Participation Organization Name	256	O	-
8.6	Participation Organization Assigning Authority	256	O	-
8.7.1	Participation Organization Identifier Type Code	5	O	-
8.10.1	Participation Organization Identifier	256	C	-

- **PRT-4.1**
  The participation type must be present if the participant should get processed. Otherwise, the PRT segment gets ignored.

- **PRT-5.1.1**
  The person information gets only stored, if this identifier is present.

- **PRT-8.10.1**
  The organization information gets only stored, if this identifier is present.

3.8.11.2 HL7 OMI messages

If a DICOM study is registered in an Affinity Domain, the information from the PRT segments will be transmitted as intended recipients. For this, the Requested Procedure must be linked to the DICOM study.

The HL7 PRT segment of an incoming HL7 OMI message consists of the following information:

Table 30: HL7 PRT segment (HL7 OMI message), inbound

Index	Description	Length	Optionality	Repeatable
4.1.1	Participation Type Identifier	256	C	-
4.2.1	Participation Type Description	256	O	-
4.3.1	Participation Type Coding System Name	256	O	-
5.1.1	Participation Person Identifier	256	C	-
5.2.1	Participation Person Family Name	256	O	-
5.3.1	Participation Person Given Name	256	O	-
5.9	Participation Person Assigning Authority	256	O	-
5.13.1	Participation Person Identifier Type Code	5	O	-
8.1.1	Participation Organization Name	256	O	-
8.6	Participation Organization Assigning Authority	256	O	-
8.7.1	Participation Organization Identifier Type Code	5	O	-
8.10.1	Participation Organization Identifier	256	C	-

- **PRT-4.1**
  The participation type must be present if the participant should get processed. Otherwise, the PRT segment gets ignored.

- **PRT-5.1.1**
  The person information gets only stored, if this identifier is present.

- **PRT-8.10.1**
  The organization information gets only stored, if this identifier is present.

3.8.11.3 HL7 ORU messages

The HL7 PRT segment of an incoming HL7 ORU message consists of the following information:

Table 31: HL7 PRT segment (HL7 ORU message), inbound

Index	Description	Length	Optionality	Repeatable
1.1	Login Name	255	R	-
2	Action Code		R	-
4	Participation		O	-
5	Person		O	-
8.1	User Domain	255	C	-
9	Location		O	-
10	Device		O	-

- **PRT-1.1**
  This HL7 component has to specify the login name of the addressed user.

- **PRT-2**
  This HL7 field has to define one of the values specified in Sharing of DICOM studies and generic containers as action code.

- **PRT-8.1**
  This HL7 component should contain the domain of the user. If no domain is specified, *syngo*.share tries to uniquely identify the user with the login name.

3.8.12 HL7 PV1 segment

The HL7 PV1 segment of an incoming HL7 message consists of the following information:

Table 32: HL7 PV1 segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 PV1 Segment ID		O	-
2.1	Patient Class Identifier	256	O	-
2.2	Patient Class Description	256	O	-
2.3	Patient Class Coding System Name	256	C	-
3	Assigned Patient Location	128	O	-
6	Prior Patient Location	80	O	-
7	Attending Doctor	150	O	-
8	Referring Doctor	150	O	-
9	Consulting Doctor	250	O	-
10	Hospital Service	50	O	-
11	Temporary Patient Location	80	O	-
15	Ambulatory Status	50	O	-
16	VIP Indicator	50	O	-
17	Admitting Doctor	150	O	-
19.1	Visit ID	64	R	-
19.4.1	Visit ID Assigning Authority Namespace ID	20	C	-
19.4.2	Visit ID Assigning Authority Universal ID	200	C	-
19.4.3	Visit ID Assigning Authority Universal ID Type	15	C	-
36	Discharge Disposition	50	O	-
37	Discharge Patient Location	50	O	-
39	Servicing Facility	100	O	-
44	Admit Timestamp	24	O	-
45	Discharge Timestamp	24	O	-
50.1	Alternate Visit ID	64	O	-
50.4	Alternate Visit ID Assigning Authority	50	O	-
51.1	Visit Indicator		O	-

- **PV1-1**
  This HL7 field should specify the value 1. Note that *syngo*.share cannot process more than one HL7 PV1 segment.

- **PV1-2.1 to 2.3**
  The PV1-2 field is used to categorize patients by site. It is comprised of the components 2.1, 2.2 and 2.3. If the PV1 segment is present in the HL7 message but not required for the given HL7 message type, the PV1 segment can be transferred without a visit ID by specifying the value N (Not Applicable) and leaving the Coding System Name value empty.

- **PV1-9**
  This HL7 field should not be defined. Rather, an HL7 ROL segment should be added to the HL7 message to specify the consulting doctor.

  Nevertheless, if the consulting doctor is defined by the HL7 field PV1-9 but not by an HL7 ROL segment, the HL7 field PV1-9 is evaluated.

- **PV1-19.1 and PV1-51.1**
  The HL7 component PV1-19.1 has to define the visit ID. The HL7 component PV1-51.1 should specify the value V to indicate that the information provided by the HL7 PV1 segment is dedicated to the visit level. Note that *syngo*.share does not support visits related to the account level.

- **PV1-19.4**
  The assigning authority of the visit ID has to be defined by the HL7 component PV1-19.4. The assigning authority should only be specified if it differs from the default authority of the site. Otherwise, the default is used.

- **PV1-50.4**
  To specify the assigning authority of an alternate visit ID, PV1-50.4 should be used. If specified, the HL7 subcomponent PV1-50.4.1 is evaluated; the HL7 subcomponent PV1-50.4.2 is used if PV1-50.4.1 is left empty.

3.8.13 HL7 ROL segment

The HL7 ROL segment of an incoming HL7 message consists of the following information:

Table 33: HL7 ROL segment, inbound

Index	Description	Length	Optionality	Repeatable
2	Action Code		R	-
3.1	Role		R	-
4	Person	250	O	-

- **ROL-3.1**
  This HL7 component has to specify the value CP if the HL7 ROL segment states the consulting doctor. If ROL-3.1 is used, the HL7 field PV1-9 should not be defined.

3.8.14 HL7 TQ1 segment

Each HL7 TQ1 segment of an incoming HL7 OMI message consists of the following information:

Table 34: HL7 TQ1 segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 TQ1 Segment ID		O	-
7	Start Timestamp	24	R	-

- **TQ1-1**
  This HL7 field should specify a consecutive number. Note that HL7 OMI messages may contain more than one HL7 TQ1 segment.

- **TQ1-7**
  This HL7 field specifies the start timestamp of the Scheduled Procedure Steps that are part of the HL7 ORC/TQ1/OBR/IPC segment group to which the HL7 TQ1 segment belongs.

3.8.15 HL7 TXA segment

The HL7 TXA segment of an incoming HL7 MDM message consists of the following information:

Table 35: HL7 TXA segment (HL7 MDM message), inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 TXA Segment ID		O	-
2.1	Generic File Type ID	64	C	-
2.2	Generic File Type Description	100	C	-
2.3	Generic File Type Coding System ID	64	C	-
2.4	Generic File Class Code ID	64	C	-
2.5	Generic File Class Code Description	100	C	-
2.6	Generic File Class Code Coding System ID	64	C	-
3	Generic File Content Presentation	256	C	-
6	Generic File Creation Timestamp	24	C	-
9	Generic File Originator	1000	C	-
12.1	Generic File ID	256	R	-
13.1	Prior Generic File ID		C	-
16	Generic Filename	256	C	-
17	Generic File Completion Status	50	O	-
18	Generic File Confidentiality Status	256	C	-
22	Generic File Authenticator	1000	C	-
24.1	Generic Container ID	256	R	-
24.2	Generic Container Description	250	O	-
24.3	Generic Container Coding System ID	64	R	-
25	Generic File Description	250	C	-

- **TXA-1**

   This HL7 field should specify the value 1. Note that *syngo*.share cannot process more than one HL7 TXA segment.

- **TXA-2.1, TXA-2.2, TXA-2.3, TXA-2.4, TXA-2.5, TXA-2.6, TXA-3, TXA-9, TXA-18 and TXA-22**

   The information stated by these HL7 components and fields is primarily needed to register the generic file specified by the HL7 TXA segment in an Affinity Domain:

   ○ **TXA-2.1, TXA-2.2, and TXA-2.3**

      These HL7 components specify the type code of the generic file.

   ○ **TXA-2.4, TXA-2.5, and TXA-2.6**

      These HL7 components specify the class code of the generic file.

   ○ **TXA-3**

      This HL7 field specifies the format code of the generic file.

   ○ **TXA-9**

      This HL7 field specifies the author, healthcare facility type code and institution of the generic file.

   ○ **TXA-18**

      This HL7 field specifies the confidentiality code of the generic file.

   ○ **TXA-22**

      This HL7 field specifies the authenticator of the generic file.

   Table 36 shows the information provided by these HL7 components and fields in detail.

- **TXA-6**

This HL7 field should always be specified. However, *syngo*.share only requires the specification of the creation timestamp if the generic file has to be registered in an Affinity Domain. TXA-6 should specify the same value as the HL7 fields OBR-7 and OBX-14.

- **TXA-12.1**

  This HL7 component has to specify the ID of the referenced generic file which is used together with the application ID specified by the HL7 component MSH-3.1 or MSH-3.2 to uniquely identify the generic file (see HL7 MSH segment).

- **TXA-13.1**

  If the generic file ID is changed, the HL7 component TXA-13.1 has to specify the old generic file ID in order to guarantee that updates can be performed correctly.

- **TXA-16**

  This HL7 field provides the name of the generic file, including its file extension. The specification of TXA-16 is mandatory if the generic file is to be inserted or updated by a new version which possesses a different file extension.

- **TXA-24.1 and TXA-24.3**

  These HL7 components define the generic container ID and coding system ID of the generic container that contains the generic file.

- **TXA-25**

  The specification of this field is mandatory if the generic file is to be registered in an Affinity Domain.

Table 36: HL7 TXA segment (HL7 MDM message), additional fields, inbound

Index	Description	Length	Optionality
2.1	Type Code ID	64	R
2.2	Type Code Display Name	100	O
2.3	Type Code Coding Scheme	64	R
2.4	Class Code ID	64	R
2.5	Class Code Display Name	100	O
2.6	Class Code Coding Scheme	64	R
3.1	Format Code ID		R
3.2	Format Code Display Name	256	O
3.3	Format Code Coding Scheme		R
9.1	Originator Person ID		O
9.2	Originator Last Name		R
9.3	Originator First Name		R
9.4	Originator Middle Name		O
9.5	Originator Name Suffix		O
9.6	Originator Name Prefix	1000	O
9.14.1	Healthcare Facility Type Code ID		R
9.14.2	Healthcare Facility Type Code Display Name		O
9.14.3	Healthcare Facility Type Code Coding Scheme		R
9.23.1	Institution OID		R
9.23.2	Institution Name		R
18.1	Confidentiality Code ID		R
18.2	Confidentiality Display Name	256	O
18.3	Confidentiality Code Coding Scheme		R
22.1	Authenticator Person ID		O
22.2	Authenticator Last Name		R

Table 36 ⌄

Index	Description	Length	Optionality
22.3	Authenticator First Name	1000	R
22.4	Authenticator Middle Name		O
22.5	Authenticator Name Suffix		O
22.6	Authenticator Name Prefix		O

3.8.16 HL7 ZCO segment

The HL7 `ZCO` segment of an incoming HL7 message consists of the following information:

Table 37: HL7 ZCO segment, inbound

Index	Description	Length	Optionality	Repeatable
1	Collection Container UID	64	R	-
2	Date Not Before	24	O	-

- **ZCO-1**
  This HL7 field identifies the collection container into whose collection a DICOM study or generic file is added.

- **ZCO-2**
  This HL7 field can be optionally specified. The chosen collection is the first one after this date. If no date is given the next scheduled collection is used.

> **ℹ Note**
> The `ZCO` segment is currently in experimental state, the design of the usage may change.
> Future compatibility of solutions using the `ZCO` segment is not guaranteed.

3.8.17 HL7 ZDS segment

The HL7 ZDS segment of an incoming HL7 ORM message consists of the following information:

Table 38: HL7 ZDS segment, inbound

Index	Description	Length	Optionality	Repeatable
1.1	Study Instance UID	250	R	-

- **ZDS-1.1**
  This HL7 component has to define the Study Instance UID of the DICOM study that is to be associated with the Requested Procedure addressed by the HL7 ORM message. As mentioned in Order administration, the Study Instance UID is used as unique identifier for the affected Requested Procedure.

3.8.18 HL7 ZOU segment

The HL7 `ZOU` segment of an incoming HL7 ORU message consists of the following information:

Table 39: HL7 ZOU segment, inbound

Index	Description	Length	Optionality	Repeatable
1	Action	1	R	-
2	Target Organizational Unit	50	R	-

- **ZOU-1**
  This HL7 field should specify the value M to move the document.

- **ZOU-2**
  This HL7 field should contain the name of the target organizational unit.

3.8.19   HL7 ZPA segment

3.8.19.1   HL7 ZPA I05 messages

The HL7 ZPA segment of an incoming HL7 ZPA I05 message consists of the following information:

Table 40: HL7 ZPA segment (HL7 ZPA I05 message), inbound

Index	Description	Length	Optionality	Repeatable
2.1.1	Source Accession Number	1000	R	-
2.1.2	Source Accession Number Assigning Authority Namespace ID	20	C	-
2.1.3	Source Accession Number Assigning Authority Universal ID	200	C	-
2.1.4	Source Accession Number Assigning Authority Universal ID Type	15	C	-
2.2.1	Target Accession Number	1000	O	-
2.2.2	Target Accession Number Assigning Authority Namespace ID	20	C	-
2.2.3	Target Accession Number Assigning Authority Universal ID	200	C	-
2.2.4	Target Accession Number Assigning Authority Universal ID Type	15	C	-

- **ZPA-2.1.1**
  This HL7 subcomponent has to define the source Accession Number of the DICOM studies that are to be processed.

- **ZPA-2.2.1**
  This HL7 subcomponent can be set in order to change the Accession Number of the given DICOM studies.

- **ZPA-2.1.2 to ZPA-2.1.4**
  These HL7 subcomponents have to define the assigning authority of the source Accession Number if it differs from the default authority of the site is meant. Otherwise, the default authority is used.

- **ZPA-2.2.2 to ZPA-2.2.4**
  These HL7 subcomponents have to define the assigning authority of the target Accession Number if it differs from the default authority of the site. Otherwise, the default authority is used.

3.8.19.2 HL7 ZPA S05 messages

The HL7 ZPA segment of an incoming HL7 ZPA S05 message consists of the following information:

Table 41: HL7 ZPA segment (HL7 ZPA S05 message), inbound

Index	Description	Length	Optionality	Repeatable
1.1	Source Study Instance UID	250	R	-
1.2	Target Study Instance UID	250	O	-
2.2.1	Target Accession Number	1000	O	-
2.2.2	Target Accession Number Assigning Authority Namespace ID	20	C	-
2.2.3	Target Accession Number Assigning Authority Universal ID	200	C	-
2.2.4	Target Accession Number Assigning Authority Universal ID Type	15	C	-

- **ZPA-1.1**
  This HL7 component has to define the source Study Instance UID of the DICOM study that is to be processed.

- **ZPA-1.2**
  This HL7 component can be set in order to change the Study Instance UID.

- **ZPA-2.2.1**
  This HL7 subcomponent can be set in order to change the Accession Number of the DICOM study.

- **ZPA-2.2.2 to ZPA-2.2.4**
  These HL7 subcomponents have to define the assigning authority of the target Accession Number if it differs from the default authority of the site. Otherwise, the default authority is used.

3.8.20   HL7 ZRI segment

The HL7 ZRI segment of an incoming HL7 MDM message consists of the following information:

Table 42: HL7 ZRI segment, inbound

Index	Description	Length	Optionality	Repeatable
1	HL7 ZRI Segment ID		O	-
2.1	Reference ID		R	-
2.4.1	Assigning Authority Namespace ID	64	C	-
2.4.2	Assigning Authority Universal ID	200	C	-
2.4.3	Assigning Authority Universal ID Type	15	C	-
3.1	Identifier Type Code		R	-

- **ZRI-1**
  This HL7 field should specify a consecutive number since HL7 MDM messages may contain more than one HL7 ZRI segment.

- **ZRI-2.1**
  This HL7 component has to define the Reference ID.

- **ZRI-2.4.1 to ZRI-2.4.3**
  These HL7 subcomponents have to define the assigning authority.

- **ZRI-3.1**
  This HL7 component has to define the Identifier Type Code.

4 HL7 outbound interface

This chapter covers the purpose of the HL7 outbound interface of *syngo*.share:

- Routing of generic files
- Referencing of DICOM studies and generic containers
- Query messages
- Acknowledgment of processed HL7 messages
- HL7 segments

4.1 Routing of generic files

4.1.1 Operating mode

In some workflows, it might be necessary to route generic files that have been archived by *syngo*.share to third-party systems. To make use of this feature, an action of the type `GenericRouter` has to be configured (see the *syngo*.share core Online Help for more information).

Once a `GenericRouter` has been created, it automatically routes generic files via HL7 MDM messages to a configured third-party system. If an already routed generic file is modified, the routing is repeated to ensure that the receiving third-party system is up to date.

4.1.1.1 Transmission

In general, all types of generic files can be routed. Each HL7 MDM message is dedicated to exactly one generic file. The binary data of a generic file is transmitted either by reference or by value:

- If the binary data is transmitted by reference, the generic file is written to a share and referenced by a UNC path which adheres to the following format:

    - Windows: `\\<host>\<share>\<path>`

    - Linux: `//<host>/<share>/<path>`

- If the binary data is transmitted by value, it is encapsulated in the HL7 MDM message. Since it is not allowed to transmit non-printable characters within an HL7 message, *syngo*.share encodes binary data as a Base64 string.

4.1.1.2 Identification

To ensure that the receiving third-party system can uniquely identify a generic file, *syngo*.share specifies two IDs: a generic file ID and an application ID. The application ID is defined to ensure that the receiving third-party system can uniquely identify *syngo*.share, whereas the generic file ID is stated to allow the third-party system to identify the generic file among the routed generic files.

> **i** **Note**
> These IDs are not identical with the original IDs used by *syngo*.share to identify the generic file.

Each generic file is archived in *syngo*.share within a so-called generic container. *syngo*.share uses these generic containers to group generic files. The containers are identified by a generic container ID and a coding system ID. For routing, *syngo*.share uses the generic container ID and coding system ID to inform the third-party system about the container to which the routed generic file belongs.

Since generic containers might be reused for patients and shared between third-party systems, the combination of generic container ID and coding system ID needs to be unique. However, to ensure that generic containers can be used in a meaningful way, *syngo*.share ensures that a patient does not possess two generic containers with identical generic container ID and coding system ID related to a particular visit and organizational unit.

4.1.1.3   Routing events

In general, *syngo*.share routes a generic file when one of the following events occurs:

- Import, undeletion or update (metadata or binary data) of a generic file

- Update of a patient associated with a generic file

- Change of a patient associated with a generic file from non-HL7-managed to HL7-managed

- Update of a visit associated with a generic file

- Change of the organizational unit of a document associated with a generic file

- Change of the workflow state of a document associated with a generic file

- Change of the visibility restriction type of a generic file

4.1.2   HL7 MDM message structure

4.1.2.1   HL7 trigger events

To route generic files via HL7 MDM messages, *syngo*.share uses the trigger event T02 as proposed by the HL7 Messaging Standard.

The transmitted HL7 MDM messages adhere to the following structure:

MSH PID [PV1] {[ORC] OBR} TXA {OBX}

4.1.2.2   HL7 elements

- **TXA-12.1**
  This HL7 component specifies the generic file ID.

- **MSH-3.1**
  This HL7 component specifies the application ID.

- **OBX-3.1** and **OBX-3.3**
  These HL7 components are used to define the original generic file ID and the original application ID. However, according to the HL7 Messaging Standard, they should not be used to identify the routed generic file.

- **OBX-3.4** and **OBX-3.6**
  These HL7 components identify the original generic container.

- **TXA-24.1** and **TXA-24.3**
  These HL7 components specify the generic container ID and the coding system ID.

- **PV1 and ORC**
  These segments are present if and only if the underlying generic file consists of visit and order information.

- **ORC and OBR**

DICOM studies linked by their Accession Number and/or the Requested Procedure ID are specified by additional `ORC` and `OBR` segment pairs.

- **OBX**
  DICOM studies linked by their Study Instance UID are specified by additional `OBX` segments.

4.2 Referencing of DICOM studies and generic containers

4.2.1 Operating mode

In *syngo*.share, a reference pointer is a string which refers either to a DICOM study or to a generic container. It can be used by third-party systems (e.g., HIS, RIS) to access, share, or delete a DICOM study or generic container without holding the actual data.

To send reference pointers, an action of the type `ReferencePointerNotifier` has to be configured (see the *syngo*.share core Online Help for more information). Once a `ReferencePointerNotifier` has been created, it automatically sends reference pointers via HL7 ORU messages to a configured third-party system.

4.2.1.1 Transmission

Each HL7 ORU message is dedicated to exactly one reference pointer. If a DICOM study or generic container is modified in such a way that the changes influence the operational reliability of a previously sent reference pointer (for example, when a DICOM study or generic container is deleted), *syngo*.share informs the third-party system about those changes.

To this end, *syngo*.share transmits an HL7 ORU message which either updates or deletes the affected reference pointer. Note that there is no difference between HL7 ORU messages which insert reference pointers and HL7 ORU messages which update existing reference pointers.

If a third-party system cannot deal with HL7 ORU messages which update reference pointers, *syngo*.share offers the possibility to delete reference pointers before they are updated. In this case, *syngo*.share first sends an HL7 ORU message which deletes a reference pointer before it transmits the actual HL7 ORU message that updates the affected reference pointer.

The HL7 ORU message is not sent if the Authorities contained therein conflict with the assigning authority settings of the receiving application. Further details about reference pointers can be found in the *syngo*.share core Online Help.

4.2.1.2 Reference pointer events

In general, *syngo*.share inserts, updates, or deletes a reference pointer if one of the following events occurs:

- Import, deletion, undeletion or update (metadata or binary data) of a DICOM study or generic container
- Import, deletion or undeletion of a DICOM image or generic file (resulting in a change to the number of instances of the corresponding DICOM study or generic container)
- Keyword changes to a DICOM study or generic container
- Change of the composition of a DICOM study (i.e. the modalities of the DICOM series) or generic container (i.e. the file extensions of all associated generic files)
- Change of the organizational unit of a DICOM study or generic container
- Update of a patient associated with a DICOM study or generic container

- Change of a patient associated with a DICOM study or generic container from non-HL7-managed to HL7-managed

- Update of a visit associated with a DICOM study or generic container

In addition, reference pointers are also deleted when their DICOM studies or generic containers no longer satisfy the conditions specified by the configured `ReferencePointerNotifier`.

4.2.2 HL7 ORU message structure

4.2.2.1 HL7 trigger events

To insert, update, and delete reference pointers via HL7 ORU messages, *syngo*.share uses the trigger event `R01`. The transmitted HL7 ORU messages exhibit the following structure:

`MSH PID [PV1] {[ORC] OBR} OBX`

4.2.2.2 HL7 elements

- **OBR and ORC**
  If the DICOM study, generic container, or generic file is not associated with an order, only `OBR` is given. Otherwise, the pair `ORC` and `OBR` is given per associated order. For a generic container or generic file, this can be multiple times.

- **OBR-25 and OBX-11**
  These HL7 fields are used to distinguish between HL7 ORU messages which insert or update reference pointers and HL7 ORU messages which delete reference pointers by setting one of the following values:

  - F: This value is specified when inserting and updating reference pointers
  - D: This value is specified when deleting reference pointers.

- **PV1 and ORC**
  These HL7 segments are present if and only if the underlying document consists of visit or order information.

4.3 Query messages

4.3.1 Operating mode

4.3.1.1 *ScanImportServer*

The *ScanImportServer* component of *syngo*.share, which is designed to import PDF files generated by a mass scanning device, uses data from a generated index file to map an imported PDF file to a patient/visit combination known to *syngo*.share.

If the patient/visit combination is not known to *syngo*.share or the data read from the index file is not sufficient, an HL7 QRY message can be configured to be sent to a third-party system, typically a HIS or RIS.

The response messages are not evaluated directly by *syngo*.share but can be forwarded to an arbitrary third-party system.

4.3.1.2 *syngo*.share import

syngo.share import is designed to import DICOM and generic files to *syngo*.share.

In order to reconcile the patient ID or patient demographics information with data managed by a third--party system, *syngo*.share import can send HL7 query messages as defined in the IHE IT Infrastructure Technical Framework as ITI-9 (PIX Query) or ITI-21 (PDQ Query). These are HL7 QBP messages. Their response data is presented to the user in a graphical interface, where the correct data can be chosen.

4.3.2 HL7 QRY message structure

The *ScanImportServer* uses original-mode HL7 QRY messages. The supported trigger events of HL7 QRY are A19, indicating that an HL7 ADR response is expected, and Q01, indicating that an HL7 DSR response is expected.

The messages have the following structure:

MSH QRD

4.3.3 HL7 QBP message structure

syngo.share import supports HL7 QBP messages with the trigger events Q23 for PIX queries and Q22 for PDQ queries. The HL7 Message Structure component MSH-9.3 is set as QBP_Q21 for both queries.

The messages have the following structure:

MSH QPD RCP

4.4   Acknowledgment of processed HL7 messages

4.4.1   Operating mode

If HL7 messages are received by *syngo*.share according to the enhanced processing rules, it might be necessary to exchange further information regarding the processing of these HL7 messages via so--called HL7 application acknowledgment messages.

To this end, an action of the type Hl7MessageProcessingNotifier has to be configured (see *syngo*.share core Online Help for more information). Once an Hl7MessageProcessingNotifier has been created, an HL7 application acknowledgment message is automatically transmitted as soon as an HL7 message which requires the exchange of further information has been processed.

syngo.share is able to generate and transmit HL7 application acknowledgment messages for all processable HL7 messages. Each HL7 application acknowledgment message is dedicated to exactly one HL7 message and specifies the processing status. The control ID of the initial HL7 message is specified in order to ensure that a third-party system knows which HL7 message has been acknowledged.

4.4.1.1   Application acknowledgment message events

In general, an HL7 application acknowledgment message is transmitted when the following event occurs:

- Processing of an HL7 message

4.4.1.2 Special conditions

The application acknowledgment type specified in the original HL7 message (see HL7 field `MSH-16`) must be compatible with its processing status:

- SU: If the original HL7 message specifies the application acknowledgment type SU, an HL7 application acknowledgment message is sent if and only if the processing of the HL7 message succeeded.

- ER: If the original HL7 message specifies the application acknowledgment type ER, an HL7 application acknowledgment message is sent if and only if the processing of the HL7 message failed.

- AL: If the original HL7 message specifies the application acknowledgment type AL, an HL7 application acknowledgment message is sent regardless of whether the processing of the HL7 message succeeded or failed.

4.4.2 HL7 application acknowledgment message structure

4.4.2.1 HL7 trigger events

syngo.share supports the transmission of HL7 application acknowledgment messages for the following HL7 messages with the following associated trigger events:

- **HL7 ADT messages**

A01 to A04	A28	A42
A06 to A08	A29	A45
A11 to A13	A31	A47
A18	A34	A50
A23	A40	

- **HL7 OMI messages**

    O23

- **HL7 ORM messages**

    O01

- **HL7 MDM messages**

T02	T10
T09	T11

- **HL7 ORU messages**

    R01

The transmitted HL7 application acknowledgment messages have the following structure:
MSH MSA

The trigger event specified by an HL7 application acknowledgment message depends on the trigger event specified by the acknowledged HL7 message.

4.4.2.2 HL7 elements

- **MSA-1**
    This HL7 field specifies the status of the processed HL7 message.

4.5　HL7 segments

This chapter covers the segments of outbound HL7 messages sent by *syngo*.share in the following order:

- HL7 MSA segment
- HL7 MSH segment
- HL7 OBR segment
- HL7 OBX segment
- HL7 ORC segment
- HL7 PID segment
- HL7 PV1 segment
- HL7 QPD segment
- HL7 QRD segment
- HL7 RCP segment
- HL7 TXA segment

4.5.1　HL7 MSA segment

The HL7 `MSA` segment of an outgoing HL7 application acknowledgment message consists of the following information:

Table 43: HL7 MSA segment, outbound

Index	Description	Content	Optionality	Repeatable
1	Acknowledgment Code		R	-
2	HL7 Message Control ID		R	-

- **MSA-1**

    This HL7 field defines the status of the processed HL7 message:

    - AA: This value is used when the HL7 message was successfully processed.

    - AR: This value is used if an error occurred during processing.

- **MSA-2**

    This HL7 field defines the control ID of the acknowledged HL7 message.

4.5.2　HL7 MSH segment

The HL7 `MSH` segment of an outgoing HL7 message consists of the following information:

Table 44: HL7 MSH segment, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 Field Separator	|	R	-
2	Encoding Characters	^~\&	R	-
3.1	Sending Application		R	-
4.1	Sending Facility Namespace ID		C	-
4.2	Sending Facility Universal ID		R	-
4.3	Sending Facility Universal ID Type	L	R	-
5.1	Receiving Application		R	-
6.1	Receiving Facility		R	-

Table 44 ❤

Index	Description	Content	Optionality	Repeatable
7	Timestamp of HL7 Message		R	-
9.1	HL7 Message Code		R	-
9.2	HL7 Message Trigger Event		R	-
9.3	HL7 Message Structure		R	-
10	HL7 Message Control ID		R	-
11.1	Processing ID	P	R	-
12.1	Version ID	2.8.1	R	-
13	HL7 Message Sequence Number		R	-
15	Accept Acknowledgment Type		C	-
16	Application Acknowledgment Type		C	-
18	Character Set		R	yes
20	Alternate Character Set Handling Scheme		C	-

- **MSH-3.1**

  By default, this HL7 component specifies the project name of the server which transmits the HL7 message. If the default value is not adequate, the sending application can be configured.

- **MSH-4.1**

  This HL7 component specifies the organizational unit of the underlying DICOM study, generic container, or generic file if the HL7 message is used to administrate a reference pointer or route a generic file. Similar to `MSH-3.1`, the default value of `MSH-4.1` can be changed by configuring an adequate value.

- **MSH-4.2**

  This HL7 component specifies the default receiving facility of the affected tenant and cannot be configured.

- **MSH-5.1 and MSH-6.1**

  The values used to specify these HL7 components have to be configured.

- **MSH-18 and MSH-20**

  The values used to specify these HL7 fields have to be configured. Note that `MSH-20` is always given if `MSH-18` specifies more than one character set.

- **MSH-15 and MSH-16**

  The values of these HL7 fields depend on the processing rules that have been configured:

  - If the original processing rules are applied to exchange the HL7 message, both `MSH-15` and `MSH-16` are left empty.

  - If the enhanced processing rules are used, the transmission of an HL7 accept acknowledgment message is required but the exchange of an HL7 application acknowledgment message is denied. To this end, `MSH-15` specifies the value `AL` and `MSH-16` defines the value `NE`.

4.5.3   HL7 OBR segment

The HL7 `OBR` segment of an outgoing HL7 message consists of the following information:

Table 45: HL7 OBR segment, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 OBR Segment ID	1	R	-

Index	Description	Content	Optionality	Repeatable
2.1	Placer Order Number		C	-
2.2	Placer Order Number Assigning Authority Namespace ID		C	-
2.3	Placer Order Number Assigning Authority Universal ID		C	-
2.4	Placer Order Number Assigning Authority Universal ID Type		C	-
3.1	Filler Order Number		C	-
3.2	Filler Order Number Assigning Authority Namespace ID		C	-
3.3	Filler Order Number Assigning Authority Universal ID		C	-
3.4	Filler Order Number Assigning Authority Universal ID Type		C	-
4.1	Universal Service ID		C	-
4.2	Universal Service Description		O	-
7	Observation Creation Timestamp		O	-
18	Accession Number		R	-
19	Requested Procedure ID		C	-
22	Observation Insertion Timestamp		R	-
24	Practice Setting Code		O	-
25	Result Status		R	-
31	Reason For Study		C	-
47	Filler Supplemental Service Information		O	yes

- **OBR-2.1 and OBR-3.1**

  These HL7 components define the Placer Order Number (OBR-2.1) and Filler Order Number (OBR-3.1) of the order that is associated with the referenced DICOM study, generic container, or generic file. If an appropriate order exists, *syngo*.share guarantees that at least one of the two HL7 components is specified since it needs at least one of the two IDs to store an order. Otherwise, both HL7 components are left empty.

- **OBR-2.2 to OBR-2.4**

  These HL7 components specify the assigning authority of the Placer Order Number. The assigning authority information is only present if the corresponding ID exists.

- **OBR-3.2 to OBR-3.4**

  These HL7 components specify the assigning authority of the Filler Order Number. The assigning authority information is only present if the corresponding ID exists.

- **OBR-4.1**

  This HL7 component is specified if and only if the referenced DICOM study, generic container, or generic file is associated with an order.

- **OBR-19 and OBR-31**

  These HL7 fields are specified if and only if the referenced DICOM study or generic container is associated with an order and if a reference pointer is sent via HL7 ORU message.

- **OBR-24**

  This HL7 field defines the Practice Setting Code of the generic file if the generic file is routed via HL7 MDM message.

- **OBR-25**

  This HL7 field is used to indicate the status of the referenced DICOM study, generic container, or generic file:

  - D: This value is specified if the object has been deleted.

- F: This value is specified for all other statuses.

- **OBR-47**

  When sending a reference pointer for a DICOM study via HL7 ORU message, repetitions of the HL7 field `OBR-47` (Filler Supplemental Service Information) are used to transmit all distinct values of the DICOM series level tag `Manufacturer's Model Name (0008,1090)`. For each repetition, the following is specified:

  - **OBR-47.1**

    Gives the corresponding DICOM tag keyword `ManufacturerModelName` as an identifier.

  - **OBR-47.2**

    Gives the actual name of the manufacturer model.

  > **ℹ Note**
  >
  > The HL7 components and HL7 fields `OBR-2.1`, `OBR-3.1`, `OBR-7`, and `OBR-25` specify the same values as the HL7 components and HL7 fields `ORC-2.1`, `ORC-3.1`, `OBX-14`, and `OBX-11`.

Additional linking information

When routing generic files, for each DICOM study linked by their Accession Number and/or the Requested Procedure ID an additional `ORC` and `OBR` segment pair is specified in the HL7 MDM message. In this case, the value `CN` is specified in the HL7 field `ORC-1` and the `OBR` segment has the following structure:

Table 46: HL7 OBR segment (HL7 MDM message), linked Accession Number/Requested Procedure ID, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 OBR Segment ID		O	-
3.2	Filler Order Number Assigning Authority Namespace ID		O	-
3.3	Filler Order Number Assigning Authority Universal ID		O	-
3.4	Filler Order Number Assigning Authority Universal ID Type		O	-
18	Accession Number		O	-
19	Requested Procedure ID		O	-

- **OBR-3.2 to OBR-3.4**

  These HL7 components specify the assigning authority of the Filler Order Number, which denotes the assigning authority of the Accession Number.

4.5.4 HL7 OBX segment

The structure of and information provided by an HL7 `OBX` segment depend on the type of the object or observation that is addressed by the HL7 `OBX` segment. *syngo*.share uses HL7 `OBX` segments in combination with HL7 MDM messages to route generic files and in combination with HL7 ORU messages to send reference pointers which link to DICOM studies or generic containers to third-party systems.

4.5.4.1 HL7 MDM messages

The HL7 `OBX` segment of an outgoing HL7 MDM message consists of the following information:

Table 47: HL7 OBX segment (HL7 MDM message), outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 OBX Segment ID	1	R	-
2	Value Type		R	-
3.1	Generic File ID		R	-
3.2	Generic File Description		O	-
3.3	Generic File System ID		R	-
3.4	Generic Container ID		R	-
3.5	Generic Container Description		O	-
3.6	Generic Container Coding System ID		O	-
4	HL7 OBX Segment Sub-ID	1	R	-
5	Value		R	-
8	Generic File Interpretation Codes		O	-
11	Generic File Result Status	F	R	-
14	Generic File Creation Timestamp		O	-

- **OBX-2**
  This HL7 field specifies the value of the HL7 field `OBX-5` and is required in order to interpret it:

  - ED: Indicates that the binary data of the generic file addressed by the HL7 `OBX` segment is encapsulated in the HL7 MDM message.

  - RP: Indicates that the binary data of the generic file is referenced using a UNC path.

- **OBX-3.1 and OBX-3.3**
  These HL7 components specify the original IDs of the addressed generic file. *syngo*.share uses them to uniquely identify the generic file, hence it ensures that the combination of both IDs occurs exactly once.

- **OBX-3.4 and OBX-3.6**
  These HL7 components identify the (original) generic container which contains the referenced generic file.

  Since *syngo*.share uses generic containers to group generic files, the combination of both IDs needs to be unique (see Archiving of generic files for further information).

- **OBX-5**
  syngo.share interprets the value of the HL7 field `OBX-5` by using the value type information specified by `OBX-2`. The structure of `OBX-5` varies depending on the value type:

  ○ **Value type ED**
    If the value type defined in `OBX-2` is ED, the HL7 field `OBX-5` contains the following information:

Table 48: HL7 OBX-5 field (binary data), outbound

Index	Description	Content	Optionality
5.2	Mime Type		R
5.3	Mime Subtype		O
5.4	Encoding	Base64	R
5.5	Binary Data		R

  ○ **OBX-5.4**

This HL7 field always specifies the value `Base64` since *syngo*.share encodes the binary data of a generic file as a Base64 string.

◦ **Value type RP**
If the value type defined in `OBX-2` is `RP`, the HL7 field `OBX-5` contains the following information:

Table 49: HL7 OBX-5 field (UNC path), outbound

Index	Description	Content	Optionality
5.1	UNC Path		R
5.3	Mime Type		R
5.4	Mime Subtype		O

i **Note**

The HL7 field `OBX-11` defines the same value as the HL7 field `OBR-25`, and the HL7 field `OBX-14` specifies the same value as the HL7 fields `OBR-7` and `TXA-6`.

Additional linking information

When routing generic files, for each DICOM study linked by their Study Instance UID an additional `OBX` segment is specified, adhering to the following structure:

Table 50: HL7 OBX segment (HL7 MDM message), linked study instance ID, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 OBX Segment ID		O	-
2	Value Type	HD	R	-
3	Observation Identifier	113014 ^DICOM Study ^DCM	R	-
5.1	Study Instance UID		R	-
11	Document Result Status	O	R	-

4.5.4.2 HL7 ORU messages

If an HL7 `OBX` segment is used in an outgoing HL7 ORU message which inserts, updates, or deletes a reference pointer of a document (DICOM study or generic container), it consists of the following information:

Table 51: HL7 OBX segment (HL7 ORU message), outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 OBX Segment ID	1	R	-
2	Value Type	RP	R	-
3.1	Document Instance UID		R	-
3.2	Document Description		O	-
3.4	Document ID		R	-
4	HL7 OBX Segment Sub-ID	1	R	-

Table 51 ⌄

Index	Description	Content	Optionality	Repeatable
5.1	Reference Pointer		R	-
5.3	Generic File IDs		O	-
5.5	Document Instance Number		R	-
8.1	Document Composition		R	-
11	Document Result Status		R	-
14	Document Creation Timestamp		O	-
15.1	Organizational Unit Name		R	-
15.2	Organizational Unit Description		R	-
15.4	Alternate Organizational Unit Name		O	-
15.5	Alternate Organizational Unit Description		O	-

- **OBX-3.1**

  This HL7 component specifies the UID of the referenced document. *syngo*.share uses this UID to uniquely identify documents. If the document represents a DICOM study, the UID is identical to the Study Instance UID. In case of a generic container, it specifies an internal UID generated by *syngo*.share.

- **OBX-3.4**

  This HL7 component specifies an alternate ID of the referenced document which *syngo*.share uses internally to uniquely identify the document.

- **OBX-5.3**

  If the referenced document represents a generic container, the HL7 subcomponents of the HL7 component OBX-5.3 specify the generic file IDs of the generic files belonging to said document. Otherwise, the HL7 component is left empty. Note that the generic file IDs have been generated by the third-party systems which have archived the generic files.

- **OBX-5.5**

  This HL7 component defines the number of DICOM images in a DICOM study or the number of generic files in a generic container.

- **OBX-8.1**

  This HL7 component is used to define some interpretation codes. In case of a DICOM study, it lists the modalities of the DICOM series. If the reference pointer is concerned with a generic container, it specifies the file extensions of all associated generic files.

- **OBX-11**

  This HL7 field is used to differentiate between HL7 ORU messages which insert or update generic files and HL7 ORU messages which delete generic files:

  - F: This value has to be specified in order to insert or update a generic file.

  - D: This value has to be specified in order to delete a generic file.

  ℹ **Note**

  The HL7 fields OBX-11 and OBX-14 specify the same values as the HL7 fields OBR-25 and OBR-7.

4.5.5 HL7 ORC segment

The HL7 `ORC` segment of an outgoing HL7 message consists of the following information:

Table 52: HL7 ORC segment, outbound

Index	Description	Content	Optionality	Repeatable
1	Order Control Code	OP	R	-
2.1	Placer Order Number		C	-
2.2	Placer Order Number Assigning Authority Namespace ID		C	-
2.3	Placer Order Number Assigning Authority Universal ID		C	-
2.4	Placer Order Number Assigning Authority Universal ID Type		C	-
3.1	Filler Order Number		C	-
3.2	Filler Order Number Assigning Authority Namespace ID		C	-
3.3	Filler Order Number Assigning Authority Universal ID		C	-
3.4	Filler Order Number Assigning Authority Universal ID Type		C	-
5	Order Status		O	-

- **ORC-2.1 and ORC-3.1**
  These HL7 components define the Placer Order Number (`ORC-2.1`) and Filler Order Number (`ORC-3.1`) of the order that is associated with the referenced DICOM study, generic container, or generic file. *syngo*.share guarantees that at least one of the two HL7 components is specified since it needs at least one of the two IDs to store an order.

- **ORC-2.2 to ORC-2.4**
  These HL7 components specify the assigning authority of the Placer Order Number. The assigning authority information is only present if the corresponding ID exists. Note that `ORC-2.1` to `ORC-2.4` specify the same values as the HL7 components `OBR-2.1` to `OBR-2.4` (see HL7 OBR segment).

- **ORC-3.2 to ORC-3.4**
  These HL7 components specify the assigning authority of the Filler Order Number. The assigning authority information is only present if the corresponding ID exists. Note that `ORC-3.1` to `ORC-3.4` specify the same values as the HL7 components `OBR-3.1` to `OBR-3.4` (see HL7 OBR segment).

4.5.6 HL7 PID segment

The HL7 `PID` segment of an outgoing HL7 message consists of the following information:

Table 53: HL7 PID segment, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 PID Segment ID	1	O	-
3.1	Patient ID		R	
3.4.1	Patient ID Assigning Authority Namespace ID		R	
3.4.2	Patient ID Assigning Authority Universal ID		R	yes
3.4.3	Patient ID Assigning Authority Universal ID Type		R	
3.5	Patient ID Type		R	
5.1	Patient Last Name		O	
5.2	Patient First Name		O	yes
5.3	Patient Middle Name		O	

Table 53 ⌄

Index	Description	Content	Optionality	Repeatable
5.4	Patient Name Suffix		O	
5.5	Patient Name Prefix		O	
5.7	Patient Name Type		R	
5.8	Patient Name Representation	A	R	
7	Patient Birth Timestamp		O	-
8.1	Patient Sex		O	-
10	Patient Race		O	-
11	Patient Address		O	-
18	Patient Account Number		O	-
26	Patient Citizenship		O	-

- **PID-3.1 and PID-3.5**

  These HL7 components are used to specify the patient ID as well as the alternate patient ID of the referenced patient. The value specified by `PID-3.5` is used to differentiate between the two IDs:

    - `PI` indicates that `PID-3.1` specifies the patient ID.

    - `NH`, `NI` or `SS` indicates that `PID-3.1` specifies an alternate patient ID:

        ○ `NH` states that the alternate patient ID defines a national health service number.

        ○ `NI` states that the alternate patient ID represents a unique national identifier.

        ○ `SS` states that the alternate patient ID identifies a social security number.

- **PID-3.4 and PID-3.4.1**

  `PID-3.4` is used to specify the assigning authority of the patient ID. `PID-3.4.1` is used to specify the assigning authority of the alternate patient ID.

- **PID-5.1 to PID-5.5**

  These HL7 components define the alphabetic name of the patient. The ideographic and phonetic names of the patient are not stated.

- **PID-5.7**

  This HL7 component indicates the patient name type:

    - `L`: The patient's legal name, contained in the first repetition of the `PID-5` field.

    - `B`: The patient's birth name, contained in a further repetition of the `PID-5` field.

- **PID-5.8**

  This HL7 component indicates the alphabetic nature of the patient name by specifying the value A. The ideographic and phonetic names of the patient are not stated.

4.5.7 HL7 PV1 segment

The HL7 PV1 segment of an outgoing HL7 message consists of the following information:

Table 54: HL7 PV1 segment, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 PV1 Segment ID	1	O	-
2	Patient Class		O	-
3	Assigned Patient Location		O	-

Table 54 ⌄

Index	Description	Content	Optionality	Repeatable
19.1	Visit ID		R	-
19.4.1	Visit ID Assigning Authority Namespace ID		O	-
19.4.2	Visit ID Assigning Authority Universal ID		O	-
19.4.3	Visit ID Assigning Authority Universal ID Type		O	-
50.1	Alternate Visit ID		O	-
50.4	Alternate Visit ID Assigning Authority		O	-
51.1	Visit Indicator	V	R	-

- **PV1-19.4**

  This HL7 component specifies the assigning authority of the visit ID.

- **PV1-50.4**

  This HL7 component specifies the assigning authority of the alternate visit ID.

- **PV1-51.1**

  This HL7 component specifies the value V to indicate that the information provided by the HL7 PV1 segment is dedicated to the visit level. Note that *syngo*.share does not support visits related to the account level.

4.5.8   HL7 QPD segment

The HL7 QPD segment of an outgoing HL7 QBP query message consists of the following information:

Table 55: HL7 QPD segment, outbound

Index	Description	Content	Optionality	Repeatable
1	Message Query Name	IHE PIX Query or IHE PDQ Query	R	-
2	Query Tag	IHE PIX Query or IHE PDQ Query	R	-
3	User Parameters		R	yes
4.4	Assigning Authorities (PIX)		C	yes
8.4	Assigning Authorities (PDQ)		C	yes

- **QPD-3.1 for PIX queries**

  contains the patient ID to be queried.

- **QPD-3.1 for PDQ queries**

  references the subcomponent of the PID segment to be searched for, e.g. @PID.3.1 for the patient ID, @PID.3.4.1 to @PID.3.4.3 for its issuer information (either from the patient context set in the application or from the default authority of the assigned site), @PID.5.1.1 to @PID.5.5.1 for the patient alphabetic name, @PID.7 for the patient birth timestamp or @PID.8 for the patient sex. Multiple search parameters are set by means of repetitions of the field.

- **QPD-3.2 for PDQ queries**

  is used to pass the data referenced in QPD-3.1.

- **QPD-3.4 for PIX queries**

  contains the issuer information of the patient ID to be queried, either from the patient context set in the application or from the default authority of the assigned site.

- **QPD-4.4 for PIX queries / QPD-8.4 for PDQ queries**
  is used to pass all available issuer information of type patient ID configured for the respective site. The field is repeated if more than one issuer is configured.

4.5.9   HL7 QRD segment

The structure of the query description provided in an HL7 QRD segment varies slightly depending on the chosen trigger event type.

4.5.9.1   HL7 QRY A19 messages

In an outgoing QRY A19 message, the segment has the following structure:

Table 56: HL7 QRD segment (HL7 QRY A19 message), outbound

Index	Description	Content	Optionality	Repeatable
1	Query Date/Time		R	-
2	Query Format Code	D	R	-
3	Query Priority	I	R	-
4	Query ID		R	-
7.1	Quantity Limited Request	1	R	-
7.2	Quantity Limited Request Unit	RD	R	-
8	Visit ID		O	-
9	What Subject Filter	APN	R	-

- **QRD-1**
  This HL7 field uses the generation time of the outgoing message.
- **QRD-4**
  The ID given in QRD-4 corresponds to the one of MSH-10 (see HL7 MSH segment).

4.5.9.2   HL7 QRY Q01 messages

In an outgoing QRY Q01 message, the segment has the following structure:

Table 57: HL7 QRD segment (HL7 QRY Q01 message), outbound

Index	Description	Content	Optionality	Repeatable
1	Query Date/Time		R	-
2	Query Format Code	R	R	-
3	Query Priority	I	R	-
4	Query ID		R	-
7.1	Quantity Limited Request	30	R	-
7.2	Quantity Limited Request Unit	RD	R	-
8.2	Visit ID		O	-
9	What Subject Filter	APA	R	-
10	What Department Data Code	ALL	R	-
12	Query Results Level	T	R	-

- **QRD-1**
  This HL7 field uses the generation time of the outgoing message.

- **QRD-4**
  The ID given in QRD-4 corresponds to the one of MSH-10 (see HL7 MSH segment).

4.5.10   HL7 RCP segment

The HL7 RCP segment of an outgoing HL7 QBP query message consists of the following information:

Table 58: HL7 RCP segment, outbound

Index	Description	Content	Optionality	Repeatable
1	Query Priority	I	R	-

4.5.11   HL7 TXA segment

The HL7 TXA segment of an outgoing HL7 MDM message consists of the following information:

Table 59: HL7 TXA segment, outbound

Index	Description	Content	Optionality	Repeatable
1	HL7 TXA Segment ID	1	R	-
2.1	Generic File Type ID		O	-
2.2	Generic File Type Description		O	-
2.3	Generic File Type Coding System ID		O	-
2.4	Generic File Class Code ID		O	-
2.5	Generic File Class Code Description		O	-
2.6	Generic File Class Code Coding System ID		O	-
3	Generic File Content Presentation		O	-
6	Generic File Creation Timestamp		R	-
9	Generic File Originator		O	-
12.1	Generic File ID		R	-
16	Generic Filename		R	-
17	Generic File Completion Status		O	-
18	Generic File Confidentiality Status		O	-
22	Generic File Authenticator		O	-
24.1	Generic Container ID		R	-
24.2	Generic Container Description		O	-
24.3	Generic Container Coding System ID		R	-
25	Generic File Description		O	-

- **TXA-2, TXA-3, TXA-9, TXA-18, and TXA-22**
  These HL7 fields define the following aspects of the generic file addressed by the HL7 TXA statement:

  - TXA-2.1, TXA-2.2 and TXA-2.3: define the file type

  - TXA-2.4, TXA-2.5 and TXA-2.6: define the class code

  - TXA-3: defines the content

  - TXA-9: defines the originator

  - TXA-18: defines the confidentiality status

  - TXA-22: defines the authenticator

If a generic file is registered in an affinity domain, *syngo*.share uses this information as type code, class code, format code, author, healthcare facility type code, institution, confidentiality code, and authenticator (see Archiving of generic files and the IHE IT Infrastructure Technical Framework for further information).

- **TXA-6**
  This HL7 field specifies the creation timestamp of the generic file. Note that TXA-6 specifies the same value as the HL7 fields OBR-7 (see HL7 OBR segment) and OBX-14 (see HL7 OBX segment).

- **TXA-12.1**
  This HL7 component defines the ID of the generic file. This (internal) generic file ID is used together with the application ID, specified by the HL7 component MSH-3.1, to identify the generic file uniquely.

- **TXA-16**
  This HL7 field specifies the name of the referenced generic file, including its file extension.

- **TXA-24.1 and TXA-24.3**
  These HL7 components define the (internal) generic container ID and coding system ID of the generic container which contains the generic file.

5 FHIR interface

syngo.share provides a FHIR RESTful interface for specific FHIR features. This interface is compliant with the HL7 FHIR standard version 4.1.0. (see FHIR Specification 🔗).

Table 60 shows the RESTful interfaces supported by *syngo*.share.

Table 60: Supported RESTful interfaces

Resource element	create	update	patch	delete	search	read
DiagnosticReport	✔	✔	✔	✔	✔	✔
List	✔	✔		✔	✔	✔
DocumentReference	✔	✔		✔	✔	✔
Binary						✔
Patient*					✔	✔
Encounter*					✔	✔

∗ May only be created when sending a bundle

Note that *syngo*.share supports FHIR resources in JSON format only. XML and RDF formats are not supported. For more information, please see the *syngo*.share FHIR Capability Statement. You can access the FHIR Capability Statement as follows:

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/metadata
```

5.1 FHIR extensions

syngo.share supports both published and proprietary FHIR extensions:

- FHIR core-defined extensions
- Proprietary extensions

5.1.1 FHIR core-defined extensions

syngo.share supports the following published FHIR extensions:

- birthTime
- Name Representation

5.1.1.1 birthTime

This extension allows the specification of the time of the patient's birth. For more information, see the FHIR Specification chapter Extension: birthTime 🔗 .

5.1.1.2 Name Representation

This extension allows the specification of alphabetic, ideographic and phonetic names. For more information, see the FHIR Specification chapter Extension: ISO 21090 EN-representation 🔗 .

The *MetaServer* supports the storing of alphabetic names and ignores ideographic and phonetic name parts, as patients created by FHIR are supposed to be non-HL7-managed. When searching for patients, results contain alphabetic (ABC), ideographic (IDE) and phonetic (SYL) names as defined by the FHIR Specification chapter Value Set Name Representation 🔗 .

5.1.2 Proprietary extensions

syngo.share provides the following proprietary extensions for its FHIR interface:

- Extension for organizational units
- Coding system URL

5.1.2.1 Extension for organizational units

This internal extension allows the specification of a single organizational unit as part of `Resource.meta` when storing resources (see the FHIR Specification chapter Resource Definitions 🗗 for details). This extension has the following URL and definition:

```
http://ith-structuredefinition-for-ou.at
{ // organizational unit
// from Element: extension
  "extension" : [ //  sliced by value:url  in the specified order, Open ]
  "url" : "http://ith-structuredefinition-for-ou.at",
  "valueString" : "<string>" // Organizational Unit Name
}
```

This extension is to be used on the element ID `DiagnosticReport.meta` (see Section 5.2).

5.1.2.2 Coding system URL

The defined base URL http://ith-coding-system.at 🗗 is used to encapsulate internally used coding systems. This is necessary to allow correct FHIR validation of coding system urls.

5.2 *syngo*.share-specific FHIR profiles

syngo.share supports the following profiles:

- DiagnosticReport
- List
- DocumentReference
- Binary
- Patient
- Encounter

5.2.1 DiagnosticReport

Table 61 shows the DiagnosticReport attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource DiagnosticReport 🗗).

Table 61: *syngo*.share-specific DiagnosticReport profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the DiagnosticReport, provided by the FHIR server. If provided by the client, *syngo*.share ignores this information and provides its own value.
meta.source	1..1	Element	URI that identifies the source system of the DiagnosticReport (as configured in *syngo*.share Configuration). Thus, one element must be provided.
meta.extension	1..1	Element	The *syngo*.share organizational unit information is provided via the proprietary extension for organizational units.
text	0..1	Element	Can be used to provide text summaries in XHTML

Table 61 ⌄

Resource element	Cardinality	Type	Description & constraints
identifier	1..1	Identifier	Business identifier of the DiagnosticReport, provided by the sub-system. An identifierSystem and identifierValue must be provided.
basedOn	0..n	Reference	The logical reference of the ServiceRequest resource can be used to provide the Accession Number as an identifier.
status	1..1	code	Conveys the status of the DiagnosticReport. *syngo*.share can map the DiagnosticReport status to the document workflow state (configurable in *syngo*.share Configuration).
code	1..1	CodeableConcept	Name/code used to classify the DiagnosticReport (see LOINC DiagnosticReport Codes ↗). *syngo*.share can map the code to the generic file type, configurable in *syngo*.share Configuration.
subject	1..1	Reference	The Patient resource (see Table 66) must be referenced in the DiagnosticReport. The patient information can later on be used for queries as well.
encounter	0..1	Reference	The logical reference of the Encounter resource can be used to provide the Visit ID / Alternate Visit ID and Visit ID authority to refer to the healthcare event associated with the DiagnosticReport.
issued	0..1	dateTime	The date and time that this version of the DiagnosticReport was made available to providers. *syngo*.share takes this date as the creation date of the DiagnosticReport.
result	0..n	Reference	*syngo*.share allows the provision of the independent FHIR resource Observation ↗ as a reference contained in the DiagnosticReport.
imagingStudy	0..n	Reference	The logical reference of the imagingStudy resource can be used to link the DiagnosticReport with related DICOM studies. Only one Study Instance UID may be present per imagingStudy reference (1..1).
presentedForm	0..n	Attachment	Contains the entire base64-encoded DiagnosticReport as PDF or CDA. The contentType (1..1) must provide the MIME type for proper validation in *syngo*.share. The title (0..1) can be provided; it is used as a description for the DiagnosticReport.

5.2.2 List

Table 62 shows the List resource attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource List ↗).

Table 62: *syngo*.share-specific List profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the List, provided by the FHIR server and mapped to the generic container UID. If provided by the client, *syngo*.share ignores this information and provides its own value.
identifier	1..n	Identifier	Business identifier which is mapped to the coding system ID and container ID. Additionally, an Accession Number using the coding system identifierType ↗ ACSN is supported.
date	0..1	date	The creation date of the List
title	0..1	string	Description of the List
patient	0..1	Reference	Reference to the Patient
encounter	0..1	Reference	Reference to the Encounter
entry	0..n	Reference	Reference to the DocumentReference
status	1..1	code	*syngo*.share expects "current". If another value is set, it will be ignored.
mode	1..1	code	*syngo*.share expects "working". If another value is set, it will be ignored.

5.2.3 DocumentReference

Table 63 shows the DocumentReference resource attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource DocumentReference ☑).

Table 63: *syngo*.share-specific DocumentReference profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the DocumentReference, provided by the FHIR server and mapped to generic file UID. If provided by the client, *syngo*.share ignores this information and provides its own value.
identifier	1..n	Identifier	Business identifier which is mapped to application ID and file ID
date	0..1	date	The creation date of the DocumentReference
description	0..1	string	Description of the DocumentReference
type	0..1	CodeableConcept	Codeable concept containing the type coding system ID, type ID and type description which will be mapped to generic file type configurable in *syngo*.share
status	1..1	code	*syngo*.share expects "current". If another value is set, it will be ignored.
docStatus	0..1	code	Code will be mapped using configurable FhirDocumentWorkflow-StateMapping in **Tenant settings**
category	0..1	CodeableConcept	Codeable concept containing the class code coding system ID, class code ID and class code description
securityLabel	0..1	CodeableConcept	Codeable concept containing the confidentiality status
subject	0..1	Reference	Reference to the Patient
context	0..1	BackboneElement	Context containing information about the Encounter, facility type and practice settings
content	2..2	BackboneElement	Contains two attachments referring to Binary resources. One resource contains a link to the base64-encoded data and one provides a direct download link using the Binary operation $download.

5.2.4 Binary

Table 64 shows the Binary resource attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource Binary ☑).

Table 64: *syngo*.share-specific Binary profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the referenced generic file, provided by the FHIR server
contentType	1..1	code	MimeType of the binary content
data	1..1	base64Binary	Base64-encoded binary data

The Binary resource supports additional operations on specified IDs.

Table 65: *syngo*.share Binary operations

Operation	Description
$upload	Upload a binary file to the FHIR server and get a $downloadUploaded URL for retrieval. Used to transfer large data not suitable for base64 encoding.

Table 65 ⌄

Operation	Description
$download	Download a DocumentReference as binary stream.
$downloadUploaded	Download an uploaded temporary file from the FHIR server.

5.2.5 Patient

Table 66 shows the `Patient` resource attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource Patient ☑).

Table 66: *syngo*.share-specific Patient profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the Patient, provided by the FHIR server. If provided by the client, *syngo*.share ignores this information and provides its own value.
identifier	1..n	Identifier	Identifier for the patient. *syngo*.share considers the first identifier with the identifierType "PI" or "PN". If identifierSystem does not provide any assigning authority information, *syngo*.share automatically considers the default authority. At least one identifier of the type "PI" or "PN" must be given.
name	0..n	HumanName	Provides the patient's alphabetic family name, given name, prefix and suffix. *syngo*.share considers the first name element of "official" in the Value Set Name Use ☑ . *syngo*.share considers the first instance of the given name as the patient's first name, subsequent names as the middle name. Ideographic and phonetic names can be provided via FHIR extension (see Section 5.1.1).
gender	0..1	code	Uses the Value Set Administrative Gender ☑ .
birthDate	0..1	date	The patient's date of birth has to have the format "YYYY-MM-DD". The time of birth can be provided via the FHIR extension birthTime (see Section 5.1.1.1).

5.2.6 Encounter

Table 67 shows the Encounter resource attributes supported and handled by *syngo*.share (cf. FHIR Specification chapter Resource Encounter ☑).

Table 67: *syngo*.share-specific Encounter profile

Resource element	Cardinality	Type	Description & constraints
id	0..1	Element	Logical identifier of the Encounter, provided by the FHIR server. If provided by the client, *syngo*.share ignores this information and provides its own value.
identifier	1..n	Identifier	Identifier for the encounter. If identifierSystem does not provide any assigning authority information, *syngo*.share automatically considers the default authority.
period	0..1	date	The period from admission to discharge
class	0..0	Coding	Class is not supported by FHIR server.
status	0..0	Coding	Status is not supported by FHIR server.

5.3 RESTful interactions

syngo.share supports the following HTTP headers:

- **Content-Type headers:**
    - application/fhir+json
    - application/json-patch+json
- **Prefer headers:**
    - return=minimal
    - return=representation
    - return=OperationOutcome

Detailed information about the interpretation can be found in the FHIR Specification chapter RESTful API ⬀ . For searches using `POST`, the Content-Type `application/x-www-form-urlencoded` is supported as defined in Introduction to Search ⬀ .

5.3.1 General RESTful interactions

syngo.share supports the following general RESTful interactions:

5.3.1.1 capabilities

Get FHIR Capability Statement:

💡 **Example 1: Capabilities**

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/metadata
```

5.3.1.2 batch/transaction

This endpoint expects a batch/transaction bundle with a single DiagnosticReport containing observations or a List containing DocumentReferences. At least a related Patient or Encounter must be specified. Patients may only be created using `request.method POST`. Lists, DocumentReferences and DiagnosticReports may be created using `request.method POST` and updated using `request.method PUT`.

💡 **Example 2: batch/transaction**

```
POST https://<server>/webfhir/tenants/<tenant>/fhir/r4
```

See Example 53 for a batch/transaction bundle that stores a DiagnosticReport for a patient. See Example 54 for a batch/transaction bundle that stores a List for a patient.

5.3.2 Resource RESTful interactions

5.3.2.1 search

Searching is supported for Patients, Encounters, Lists, DocumentReferences and DiagnosticReports using the following case-sensitive parameters in GET and POST requests. To prevent undefined behavior, parameters may only be specified once, with the exception of date ranges. Also, the specifications of the `subject` and `patient` parameters are mutually exclusive. For a more comprehensive definition of parameters and searching, see the FHIR Specification chapters Type Level Interaction: search ⬈ and Search ⬈ .

Table 68: Supported common search parameters

Name	Value	Description
_format	application/fhir json application/fhir+json application/json text/json	Response format
_count	number	Return only the first _count results. Paging is not supported.
_summary	true|false	Return only summary as defined by FHIR
_pretty	true|false	Return result pretty-printed or minified

Table 69: Supported DiagnosticReport parameters

Name	Type	Description
subject:identifier	token	Search for system containing assigning authority URI and value containing patient ID
subject:Patient.identifier	token	Search for system containing assigning authority URI and value containing patient ID
subject:Patient.family	string	Search for alphabetic family name
subject:Patient.given	string	Search for alphabetic given name
subject:Patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
patient.family	string	Search for alphabetic family name
patient.given	string	Search for alphabetic given name
patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
issued	date	Search issued date, stored as creation date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: - ap - ne - sa - eb
code	token	Search for type coding system ID and type ID
imagingStudy:identifier	token	Search for system containing urn:dicom:uid and value containing Study Instance UID
_id	token	Resource ID (not a full URL)

Table 69 ⌄

Name	Type	Description
_lastUpdated	date	Date and time last updated, stored as modification date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: • ap • ne • sa • eb

Table 70: Supported List parameters

Name	Type	Description
identifier	token	Search for container ID
subject:identifier	token	Search for system containing assigning authority URI and value containing patient ID
subject:Patient.identifier	token	Search for system containing assigning authority URI and value containing patient ID
subject:Patient.family	string	Search for alphabetic family name
subject:Patient.given	string	Search for alphabetic given name
subject:Patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
patient.family	string	Search for alphabetic family name
patient.given	string	Search for alphabetic given name
patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
issued	date	Search for issued date, stored as creation date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: • ap • ne • sa • eb
code	token	Search for Type Coding System ID and Type ID
title	string	Search for description
_id	token	Resource ID (not a full URL)
_lastUpdated	date	Date and time last updated, stored as modification date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: • ap • ne • sa • eb

See Example 55 for a search for List using GET.

Table 71: Supported DocumentReference parameters

Name	Type	Description
identifier	token	Search for application ID and file ID

Name	Type	Description
subject:identifier	token	Search for system containing assigning authority URI and value containing patient ID
sub-ject:Patient.identifier	token	Search for system containing assigning authority URI and value containing patient ID
subject:Patient.family	string	Search for alphabetic family name
subject:Patient.given	string	Search for alphabetic given name
subject:Patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
patient.family	string	Search for alphabetic family name
patient.given	string	Search for alphabetic given name
patient.gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
issued	date	Search for issued date, stored as creation date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: - ap - ne - sa - eb
code	token	Search for type coding system ID and type ID
description	string	Search for description
_id	token	Resource ID (not a full URL)
_lastUpdated	date	Date and time last updated, stored as modification date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix Searching with the following prefixes and fractions of seconds is not supported: - ap - ne - sa - eb
_list	string	Search for DocumentReferences in Lists with given logical IDs. This parameter may be defined multiple times. https://www.hl7.org/fhir/search.html#list

See Example 56 for a search for DocumentReference using GET.

Table 72: Supported patient parameters

Name	Type	Description
_id	string	Resource ID (not a full URL)
family	string	Search for alphabetic family name
given	string	Search for alphabetic given name
gender	token	Search for administrative gender http://hl7.org/fhir/valueset-administrative-gender.html
birthDate	date	Search for birth date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix. Searching with the following prefixes and fractions of seconds is not supported: - ap - ne - sa - eb

Table 72 ⌄

Name	Type	Description
identifier	token	Search for system containing assigning authority URI and value containing patient ID

See Example 58 for a search for patients using GET.

Table 73: Supported Encounter parameters

Name	Type	Description
_id	string	Resource ID (not a full URL)
period	date	Search for birth date. Prefixes are defined in http://hl7.org/fhir/search.html#prefix. Searching with the following prefixes and fractions of seconds is not supported: • ap • ne • sa • eb
identifier	token	Search for system containing assigning authority URI and value containing visit ID

See Example 59 for a search for visits using GET.

5.3.3   Instance RESTful interactions

5.3.3.1   read

Reading using logical IDs is supported for Patients, Encounters, Lists, DocumentReferences, Binaries and DiagnosticReports using the logical "_id". See the FHIR Specification chapter Instance Level Interactions: read ☑ for more information.

> 💡 **Example 3: read**
>
> ```
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/Patient/_id
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/Encounter/_id
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/List/_id
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/DocumentReference/
> _id
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/Binary/_id
> GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/DiagnosticReport/
> _id
> ```

5.3.3.2   update

Updating is only supported for DiagnosticReports and DocumentReferences using the generic file UUID as "_id". The updated data is expected to be sent in the request body. See the FHIR Specification chapter Instance Level Interactions: update ☑ for more information.

```
PUT https://<server>/webfhir/tenants/<tenant>/fhir/r4/DiagnosticReport/
_id
PUT https://<server>/webfhir/tenants/<tenant>/fhir/r4/DocumentReference/
_id
```

5.3.3.3 patch

Patching using JSON Patch format is only supported for DiagnosticReports using the generic file UUID as "_id". The JSON Patch 🗗 is expected to be sent in the request body and the Content-Type header must be set to "application/fhir-patch+json". See the FHIR Specification chapter Instance Level Interactions: patch 🗗 for more information. See Example 60 for an example of how to change the status of a DiagnosticReport from "registered" to "final".

```
PATCH https://<server>/webfhir/tenants/<tenant>/fhir/r4/DiagnosticReport
/_id
```

5.3.3.4 delete

Deleting is supported for Lists, DocumentReferences and DiagnosticReports using "_id". See the FHIR Specification chapter Instance Level Interactions: delete 🗗 for more information.

```
DELETE https://<server>/webfhir/tenants/<tenant>/fhir/r4/List/_id
DELETE https://<server>/webfhir/tenants/<tenant>/fhir/r4/
DocumentReference/_id
DELETE https://<server>/webfhir/tenants/<tenant>/fhir/r4/
DiagnosticReport/_id
```

A   HL7 example workflows

This appendix contains example workflows for the following:

- Ordering of DICOM studies
- Archiving of generic files
- Referencing of DICOM studies and generic containers
- Changing the organizational unit of DICOM studies and generic containers

A.1   Ordering of DICOM studies

One of the major tasks of *syngo*.share is the archiving of DICOM images. To guarantee the integrity and consistency of the stored DICOM images, *syngo*.share fulfills all requirements of the following IHE profiles: Scheduled Workflow, Patient Information Reconciliation, and Scheduled Workflow.b. In this context, the HL7 inbound interface is responsible for a correct and continuous update and propagation of patient, visit, and order information, as illustrated in Figure 1.

Figure 1: Ordering workflow
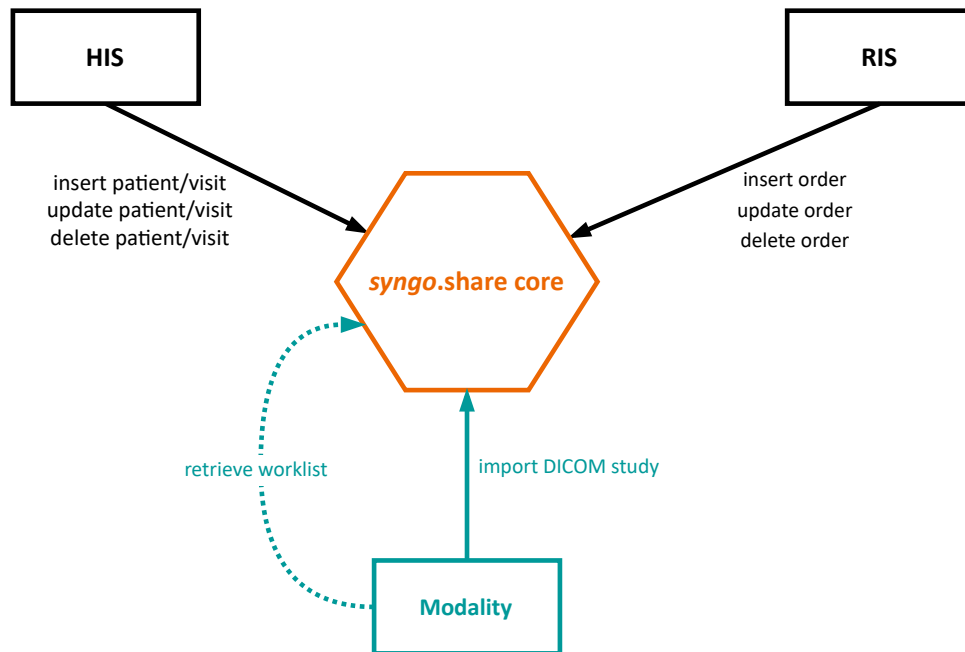
To ensure that stored patient and visit information is up to date, *syngo*.share receives HL7 ADT messages. To ensure that the ordering information of DICOM images is updated and DICOM images are associated with the intended patients, *syngo*.share receives HL7 OMI or HL7 ORM messages. Usually, patients and visits are administrated by an HIS, whereas orders are managed by a RIS. To allow for the fine-grained modification of patient, visit and order information, *syngo*.share supports various kinds of HL7 ADT, HL7 OMI, and HL7 ORM messages.

The following sections show HL7 sample messages for a typical patient encounter which involves the registration of a patient, the placement of an order, as well as the update and deletion of order, visit, and patient information.

A.1.1   Patient registration

If a patient arrives at a healthcare facility, the personal data of the patient is stored and forwarded to *syngo*.share. To this end, an HL7 ADT A04 message similar to the one shown in Example 7 is sent to *syngo*.share.

> 💡 **Example 7: HL7 ADT 04 insert patient/visit message**
>
> The following HL7 ADT A04 message inserts a patient with patient ID `patientId` and a visit with visit ID `visitId`.
>
> ```
>     MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
>         |receivingFacility|20000102030405.1234||ADT^A04^ADT_A01|1|P|2.8.1
>         ||||||UNICODE UTF-8
>     PID|1||patientId^^^assigningAuthority^PI~patientSsn^^^
> assigningAuthority
>         ^SS||lastName^firstName^middleName^suffix^prefix^^^A
>         |mothersMaidenLastName^mothersMaidenFirstName^
> mothersMaidenMiddleName
>         ^mothersMaidenSuffix^mothersMaidenPrefix^^^A|20000102030405.1234
>         |M||race^raceDescription|patientStreet^^patientCity^patientState
> ^1234
>         ^patientCountry|||||M^Married|CHR^Christian|accountNumber^^
>         ^assigningAuthority|||||birthPlace|Y|1|A^austrian|profession
>         ^professionDescription|||||||||||||^PRN^CP^
> patientCommunicationAddress
>         ^0043^0512^89059^^^^^+4351289059
>     NK1|1|nextKinLastName^nextKinFirstName^nextKinMiddleName^nextKinSuffix
>         ^nextKinPrefix^^^A|PAR^parent|nextKinStreet^^nextKinCity^
> nextKinState
>         ^1234^nextKinCountry||||||||||||||||||||||||||||||||||||^PRN^CP
>         ^nextKinCommunicationAddress^0043^0512^89060^^^^^+4351289060
>     PV1|1|I^inpatient|^room^bed^facility|||^priorRoom^priorBed^
> priorFacility
>         |attendingDoctor^attendingDoctorLastName^attendingDoctorFirstName
>         ^attendingDoctorMiddleName^attendingDoctorSuffix^
> attendingDoctorPrefix
>         ^^^^^^^^^A|referringDoctor^referringDoctorLastName
>         ^referringDoctorFirstName^referringDoctorMiddleName
>         ^referringDoctorSuffix^referringDoctorPrefix^^^^^^^^^A||MED
>         ^medicalService|^temporaryRoom^temporaryBed^temporaryFacility||||A4
>         ^disoriented|vipIndicator^vipIndicatorDescription|admittingDoctor
>         ^admittingDoctorLastName^admittingDoctorFirstName
>         ^admittingDoctorMiddleName^admittingDoctorSuffix^
> admittingDoctorPrefix
>         ^^^^^^^^^A||visitId^^^assigningAuthority||||||||||||||||||
>         |servicingFacility^servicingFacilityDescription||||
>         |20000102030405.1234||||||alternateVisitId^^^assigningAuthority|V
>     ROL||LI|CP|consultingDoctor^consultingDoctorLastName
>         ^consultingDoctorFirstName^consultingDoctorMiddleName
>         ^consultingDoctorSuffix^consultingDoctorPrefix^^^^^^^^^A
>     GT1|1||guarantorLastName^guarantorFirstName^guarantorMiddleName
>         ^guarantorSuffix^guarantorPrefix^^^A||guarantorStreet^^
> guarantorCity
>         ^guarantorState^1234^guarantorCountry|||19900102030405.1234|||
>         |guarantorSsn||||guarantorEmployerLastName^
> guarantorEmployerFirstName
>         ^guarantorEmployerMiddleName^guarantorEmployerSuffix
>         ^guarantorEmployerPrefix^^^A|guarantorEmployerStreet^
>         ^guarantorEmployerCity^guarantorEmployerState^1234
>         ^guarantorEmployerCountry
> ```

A.1.2 Order placement

Treating a patient may require DICOM images of a specific part of their body. To schedule the creation of the necessary DICOM images, the HIS instructs the RIS to schedule an appropriate order. The information of the created order is sent to *syngo*.share via HL7 OMI O23 or HL7 ORM O01 message, as shown by Example 8 and Example 9.

> 💡 **Example 8: HL7 OMI O23 insert order message**
>
> The following HL7 OMI O23 message inserts an order with Placer Order Number `placerOrderNumber` and Filler Order Number `fillerOrderNumber`. It is scheduled for a patient with patient ID `patientId` during a visit with visit ID `visitId` and consists of a Requested Procedure with Study Instance UID `1.2.3.4.5.6.7.8.9` and Requested Procedure ID `requestedProcedureId`. The Requested Procedure in turn consists of a single Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:
>
> ```
>     MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
>         |receivingFacility|20000102030405.1234||OMI^O23^OMI_O23|1|P
> |2.8.1|||||
>         |UNICODE UTF-8
>   PID|...
>   NK1|...
>   PV1|...
>   ROL|...
>   GT1|...
>   ORC|NW|placerOrderNumber|fillerOrderNumber||SC|||||enterer
>       ^entererLastName^entererFirstName^entererMiddleName^entererSuffix
>       ^entererPrefix^^^^^^^^^A||provider^providerLastName^
> providerFirstName
>       ^providerMiddleName^providerSuffix^providerPrefix^^^^^^^^^A|
>       ^^^facility|^PRN^CP^callBackCommunicationAddress
> ^0043^0512^89059^^^^
>       ^+4351289059||controlCodeReasonId^controlCodeReasonDescription
>       |enteringOrganizationId^enteringOrganizationDescription|||
>       |facilityName^facilityNameTypeCode
>   TQ1|1|quantity|||||duration|20000102030405.1234||priority
>   OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
>       ^universalServiceDescription|||||||||dangerCodeId^
> dangerCodeDescription
>       |relevantClinicalInformationId^
> relevantClinicalInformationDescription|
>       |specimenSourceName^specimenSourceDescription|provider
>       ^providerLastName^providerFirstName^providerMiddleName^
> providerSuffix
>       ^providerPrefix^^^^^^^^^A|^PRN^CP^callBackCommunicationAddress^0043
>       ^0512^89059^^^^^+4351289059||||||||||||||transportationMode
>       |reasonForStudyId^reasonForStudyDescription|||technician
>       &technicianLastName&technicianFirstName&technicianMiddleName
>       &technicianSuffix&technicianPrefix||||||||||procedureCodeId
>       ^procedureCodeDescription^^^requestedProcedureDescription
>   IPC|accessionNumber|requestedProcedureId|1.2.3.4.5.6.7.8.9
>       |scheduledProcedureStepId|CT|protocolCode^protocolDescription^^
>       ^scheduledProcedureStepDescription|||aet
> ```
>
> The HL7 `PID`, HL7 `NK1`, HL7 `PV1`, HL7 `ROL`, and HL7 `GT1` segments are identical to the ones defined in Example 7.

The following HL7 ORM O01 message inserts an order with Placer Order Number `placerO rderNumber` and Filler Order Number `fillerOrderNumber`. It is scheduled for a patient with patient ID `patientId` during a visit with visit ID `visitId` and consists of a Requested Procedure with Study Instance UID `1.2.3.4.5.6.7.8.9` and Requested Procedure ID `r equestedProcedureId`. The Requested Procedure in turn consists of a single Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ORM^O01^ORM_O01|1|P
|2.8.1|||||
        |UNICODE UTF-8
    PID|...
    NK1|...
    PV1|...
    ROL|...
    GT1|...
    ORC|NW|placerOrderNumber|fillerOrderNumber||SC||quantity^interval
        ^duration^20000102030405.1234^^priority|||enterer^entererLastName
        ^entererFirstName^entererMiddleName^entererSuffix^entererPrefix
^^^^^^^
        ^^A||provider^providerLastName^providerFirstName^providerMiddleName
        ^providerSuffix^providerPrefix^^^^^^^^^A|^^^facility|^PRN^CP
        ^callBackCommunicationAddress^0043^0512^89059^^^^^+4351289059|
        |controlCodeReasonId^controlCodeReasonDescription
        |enteringOrganizationId^enteringOrganizationDescription|||
        |facilityName^facilityNameTypeCode
    OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
        ^universalServiceDescription^^protocolCode^protocolDescription^^^^^
        ^scheduledProcedureStepDescription||||||||dangerCodeId
        ^dangerCodeDescription|relevantClinicalInformationId
        ^relevantClinicalInformationDescription||specimenSourceName
        ^specimenSourceDescription|provider^providerLastName^
providerFirstName
        ^providerMiddleName^providerSuffix^providerPrefix^^^^^^^^^A|^PRN^CP
        ^callBackCommunicationAddress^0043^0512^89059^^^^^+4351289059
        |accessionNumber|requestedProcedureId|scheduledProcedureStepId|aet
||
        |CT|||quantity^interval^duration^20000102030405.1234^^priority||
        |transportationMode|reasonForStudyId^reasonForStudyDescription||
        |technician&technicianLastName&technicianFirstName
        &technicianMiddleName&technicianSuffix&technicianPrefix|||||||||
        |procedureCodeId^procedureCodeDescription^^
        ^requestedProcedureDescription
    ZDS|1.2.3.4.5.6.7.8.9
```

The HL7 `PID`, HL7 `NK1`, HL7 `PV1`, HL7 `ROL`, and HL7 `GT1` segments are identical to the ones defined in Example 7.

A.1.3 Order updates

Once placed, the order is processed by a modality which sends the created DICOM images to *syngo*.share. If that order information changes during the creation of the DICOM images or after the completion of the order, the RIS updates the transmitted order information by sending an HL7 OMI O23 or HL7 ORM O01 message as shown in Example 10 and Example 11.

To ensure that the order information of the archived DICOM images (Accession Number, referring physician, DICOM study description, and Requested Procedure ID) are updated by *syngo*.share too, the metadata update has to be activated.

Example 10: HL7 OMI O23 update order message

The following HL7 OMI O23 message updates an order with Placer Order Number `placerO rderNumber` and Filler Order Number `fillerOrderNumber`, a Requested Procedure with Study Instance UID `1.2.3.4.5.6.7.8.9`, and a Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||OMI^O23^OMI_O23|1|P
|2.8.1|||||
        |UNICODE UTF-8
  PID|...
  NK1|...
  PV1|...
  ROL|...
  GT1|...
  ORC|XO|placerOrderNumber|fillerOrderNumber||CM|||||updatedEnterer
        ^updatedEntererLastName^updatedEntererFirstName
        ^updatedEntererMiddleName^updatedEntererSuffix^updatedEntererPrefix
^^^
        ^^^^^^A||updatedProvider^updatedProviderLastName
        ^updatedProviderFirstName^updatedProviderMiddleName
        ^updatedProviderSuffix^updatedProviderPrefix^^^^^^^^A|^^
        ^updatedFacility|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512
        ^89059^^^^^+4351289059||updatedControlCodeReasonId
        ^updatedControlCodeReasonDescription|updatedEnteringOrganizationId
        ^updatedEnteringOrganizationDescription||||updatedFacilityName
        ^updatedFacilityNameTypeCode
  TQ1|1|updatedQuantity|||||updatedDuration|20000102030405.1234|
        |updatedPriority
  OBR|1|placerOrderNumber|fillerOrderNumber|updatedUniversalServiceId
        ^updatedUniversalServiceDescription|||||||||updatedDangerCodeId
        ^updatedDangerCodeDescription|updatedRelevantClinicalInformationId
        ^updatedRelevantClinicalInformationDescription|
        |updatedSpecimenSourceName^updatedSpecimenSourceDescription
        |updatedProvider^updatedProviderLastName^updatedProviderFirstName
        ^updatedProviderMiddleName^updatedProviderSuffix^
updatedProviderPrefix
        ^^^^^^^^^A|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512^89059
        ^^^^^+4351289059||||||||||||||updatedTransportationMode
        |updatedReasonForStudyId^updatedReasonForStudyDescription||
        |updatedTechnician&updatedTechnicianLastName
        &updatedTechnicianFirstName&updatedTechnicianMiddleName
        &updatedTechnicianSuffix&updatedTechnicianPrefix|||||||||
        |updatedProcedureCodeId^updatedProcedureCodeDescription^^
        ^updatedRequestedProcedureDescription
  IPC|updatedAccessionNumber|updatedRequestedProcedureId
|1.2.3.4.5.6.7.8.9
        |scheduledProcedureStepId|MR|updatedProtocolCode
        ^updatedProtocolDescription^^^
updatedScheduledProcedureStepDescription
        |||updatedAet
```

The HL7 `PID`, HL7 `NK1`, HL7 `PV1`, HL7 `ROL`, and HL7 `GT1` segments are identical to the ones defined in Example 7.

Example 11: HL7 ORM O01 update order message

The following HL7 ORM O01 message updates an order with Placer Order Number `placerO rderNumber` and Filler Order Number `fillerOrderNumber`, a Requested Procedure with

Study Instance UID `1.2.3.4.5.6.7.8.9`, and a Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:

```
     MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ORM^O01^ORM_O01|1|P
|2.8.1|||||
        |UNICODE UTF-8
  PID|...
  NK1|...
  PV1|...
  ROL|...
  GT1|...
  ORC|XO|placerOrderNumber|fillerOrderNumber||CM||updatedQuantity
        ^updatedInterval^updatedDuration^20000102030405.1234^^
updatedPriority
        |||updatedEnterer^updatedEntererLastName^updatedEntererFirstName
        ^updatedEntererMiddleName^updatedEntererSuffix^updatedEntererPrefix
^^^
        ^^^^^^A||updatedProvider^updatedProviderLastName
        ^updatedProviderFirstName^updatedProviderMiddleName
        ^updatedProviderSuffix^updatedProviderPrefix^^^^^^^^^A|^^
        ^updatedFacility|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512
        ^89059^^^^^+4351289059||updatedControlCodeReasonId
        ^updatedControlCodeReasonDescription|updatedEnteringOrganizationId
        ^updatedEnteringOrganizationDescription||||updatedFacilityName
        ^updatedFacilityNameTypeCode
  OBR|1|placerOrderNumber|fillerOrderNumber|updatedUniversalServiceId
        ^updatedUniversalServiceDescription^^updatedProtocolCode
        ^updatedProtocolDescription^^^^^
        ^updatedScheduledProcedureStepDescription||||||||
updatedDangerCodeId
        ^updatedDangerCodeDescription|updatedRelevantClinicalInformationId
        ^updatedRelevantClinicalInformationDescription|
        |updatedSpecimenSourceName^updatedSpecimenSourceDescription
        |updatedProvider^updatedProviderLastName^updatedProviderFirstName
        ^updatedProviderMiddleName^updatedProviderSuffix^
updatedProviderPrefix
        ^^^^^^^^^A|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512^89059
        ^^^^^+4351289059|updatedAccessionNumber|updatedRequestedProcedureId
        |scheduledProcedureStepId|updatedAet|||MR|||updatedQuantity
        ^updatedInterval^updatedDuration^20000102030405.1234^^
updatedPriority
        |||updatedTransportationMode|updatedReasonForStudyId
        ^updatedReasonForStudyDescription|||updatedTechnician
        &updatedTechnicianLastName&updatedTechnicianFirstName
        &updatedTechnicianMiddleName&updatedTechnicianSuffix
        &updatedTechnicianPrefix|||||||||||updatedProcedureCodeId
        ^updatedProcedureCodeDescription^^
        ^updatedRequestedProcedureDescription
  ZDS|1.2.3.4.5.6.7.8.9
```

The HL7 `PID`, HL7 `NK1`, HL7 `PV1`, HL7 `ROL`, and HL7 `GT1` segments are identical to the ones defined in Example 7.

A.1.4   Correction of patient and visit information

During the further medication of the patient it might happen that patient and visit information are completed or corrected. If personal data is modified, the HIS informs *syngo*.share about the changes made by sending an HL7 ADT A08 message similar to the one shown in Example 12.

If the identification of the patient or visit changes for one of the following reasons, the HIS sends a corresponding message to *syngo*.share:

- The patient ID is replaced by another patient ID. The HIS sends an HL7 ADT A47 message as shown in Example 13.

- The visit ID is replaced by another visit ID. The HIS sends an HL7 ADT A50 message as shown in Example 14.

- The visit is moved to another patient. The HIS sends an HL7 ADT A45 message as shown in Example 15.

- The patient is merged with another patient. The HIS sends an HL7 ADT A40 message as shown in Example 16.

- The visit is merged with another visit. The HIS sends an HL7 ADT A42 message as shown in Example 17.

Note that all these changes also affect the metadata of the DICOM images which are associated with the altered patient and visit.

💡 **Example 12: HL7 ADT A08 update patient and visit message**

The following HL7 ADT A08 message updates a patient with patient ID `patientId` and a visit with visit ID `visitId`:

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ADT^A08^ADT_A01|1|P
|2.8.1|||||
        |UNICODE UTF-8
    PID|1||patientId^^^assigningAuthority^PI~updatedPatientSsn^^
        ^updatedAssigningAuthority^SS||updatedLastName^updatedFirstName
        ^updatedMiddleName^updatedSuffix^updatedPrefix^^^A
        |updatedMothersMaidenLastName^updatedMothersMaidenFirstName
        ^updatedMothersMaidenMiddleName^updatedMothersMaidenSuffix
        ^updatedMothersMaidenPrefix^^^A|20000102030405.1234|M||updatedRace
        ^updatedRaceDescription|updatedPatientStreet^^updatedPatientCity
        ^updatedPatientState^1234^updatedPatientCountry|||||M^Married|CHR
        ^Christian|updatedAccountNumber^^^updatedAssigningAuthority||||
        |updatedBirthPlace|Y|1|A^austrian|updatedProfession
        ^updatedProfessionDescription||||||||||||||^PRN^CP
        ^updatedPatientCommunicationAddress^0043^0512^89059^^^^^+4351289059
    NK1|1|updatedNextKinLastName^updatedNextKinFirstName
        ^updatedNextKinMiddleName^updatedNextKinSuffix^updatedNextKinPrefix
^^
        ^A|PAR^parent|updatedNextKinStreet^^updatedNextKinCity
        ^updatedNextKinState^1234^updatedNextKinCountry
||||||||||||||||||||||||
        |||||||||||||^PRN^CP^updatedNextKinCommunicationAddress^0043^0512
        ^89060^^^^^+4351289060
    PV1|1|I^inpatient|^updatedRoom^updatedBed^updatedFacility|||
        ^updatedPriorRoom^updatedPriorBed^updatedPriorFacility
        |updatedAttendingDoctor^updatedAttendingDoctorLastName
        ^updatedAttendingDoctorFirstName^updatedAttendingDoctorMiddleName
        ^updatedAttendingDoctorSuffix^updatedAttendingDoctorPrefix^^^^^^^^
A
        |updatedReferringDoctor^updatedReferringDoctorLastName
        ^updatedReferringDoctorFirstName^updatedReferringDoctorMiddleName
        ^updatedReferringDoctorSuffix^updatedReferringDoctorPrefix^^^^^^^^
A|
        |MED^medicalService|^updatedTemporaryRoom^updatedTemporaryBed
        ^updatedTemporaryFacility||||A4^disoriented|updatedVipIndicator
        ^updatedVipIndicatorDescription|updatedAdmittingDoctor
        ^updatedAdmittingDoctorLastName^updatedAdmittingDoctorFirstName
```

```
          ^updatedAdmittingDoctorMiddleName^updatedAdmittingDoctorSuffix
          ^updatedAdmittingDoctorPrefix^^^^^^^^^^A||visitId^^^
assigningAuthority
          |||||||||||||||||||updatedServicingFacility
          ^updatedServicingFacilityDescription|||||20000102030405.1234|||||
          |updatedAlternateVisitId^^^updatedAssigningAuthority|V
   ROL||LI|CP|updatedConsultingDoctor^updatedConsultingDoctorLastName
          ^updatedConsultingDoctorFirstName^updatedConsultingDoctorMiddleName
          ^updatedConsultingDoctorSuffix^updatedConsultingDoctorPrefix
^^^^^^^^^A
   GT1|1||updatedGuarantorLastName^updatedGuarantorFirstName
          ^updatedGuarantorMiddleName^updatedGuarantorSuffix
          ^updatedGuarantorPrefix^^^A||updatedGuarantorStreet^
          ^updatedGuarantorCity^updatedGuarantorState^1234
          ^updatedGuarantorCountry|||19900102030405.1234||||
updatedGuarantorSsn|
          |||updatedGuarantorEmployerLastName^
updatedGuarantorEmployerFirstName
          ^updatedGuarantorEmployerMiddleName^updatedGuarantorEmployerSuffix
          ^updatedGuarantorEmployerPrefix^^^A|updatedGuarantorEmployerStreet^
          ^updatedGuarantorEmployerCity^updatedGuarantorEmployerState^1234
          ^updatedGuarantorEmployerCountry
```

💡 Example 13: HL7 ADT A47 replace patient ID message

The following HL7 ADT A47 message updates the patient ID of a patient. The prior patient ID `patientId` is defined by the HL7 `MRG` segment, whereas the new patient ID `updatedPatientId` is defined by the HL7 `PID` segment:

```
   MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
      |receivingFacility|20000102030405.1234||ADT^A47^ADT_A44|1|P
|2.8.1|||||
      |UNICODE UTF-8
   PID|1||updatedPatientId^^^updatedAssigningAuthority^PI~
updatedPatientSsn^
      ^^updatedAssigningAuthority^SS||updatedLastName^updatedFirstName
      ^updatedMiddleName^updatedSuffix^updatedPrefix^^^A
      |updatedMothersMaidenLastName^updatedMothersMaidenFirstName
      ^updatedMothersMaidenMiddleName^updatedMothersMaidenSuffix
      ^updatedMothersMaidenPrefix^^^A|20000102030405.1234|M||updatedRace
      ^updatedRaceDescription|updatedPatientStreet^^updatedPatientCity
      ^updatedPatientState^1234^updatedPatientCountry|||||M^Married|CHR
      ^Christian|updatedAccountNumber^^^updatedAssigningAuthority||||
      |updatedBirthPlace|Y|1|A^austrian|updatedProfession
      ^updatedProfessionDescription|||||||||||||^PRN^CP
      ^updatedPatientCommunicationAddress^0043^0512^89059^^^^^+4351289059
   MRG|patientId^^^assigningAuthority^PI
   NK1|...
   GT1|...
```

The HL7 `NK1` and HL7 `GT1` segments are identical to the ones defined in Example 12.

💡 Example 14: HL7 ADT A50 replace visit ID message

The following HL7 ADT A50 message updates the visit ID of a visit. The prior visit ID `visitId` is defined by the HL7 `MRG` segment, whereas the new visit ID `updatedVisitId` is defined by the HL7 `PV1` segment:

```
   MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
```

```
        |receivingFacility|20000102030405.1234||ADT^A50^ADT_A50|1|P
|2.8.1|||||
        |UNICODE UTF-8
  PID|...
  MRG|||||visitId^^^assigningAuthority
  NK1|...
  PV1|1|I^inpatient|^updatedRoom^updatedBed^updatedFacility|||
      ^updatedPriorRoom^updatedPriorBed^updatedPriorFacility
      |updatedAttendingDoctor^updatedAttendingDoctorLastName
      ^updatedAttendingDoctorFirstName^updatedAttendingDoctorMiddleName
      ^updatedAttendingDoctorSuffix^updatedAttendingDoctorPrefix^^^^^^^^^
A
      |updatedReferringDoctor^updatedReferringDoctorLastName
      ^updatedReferringDoctorFirstName^updatedReferringDoctorMiddleName
      ^updatedReferringDoctorSuffix^updatedReferringDoctorPrefix^^^^^^^^^
A|
      |MED^medicalService|^updatedTemporaryRoom^updatedTemporaryBed
      ^updatedTemporaryFacility||||A4^disoriented|updatedVipIndicator
      ^updatedVipIndicatorDescription|updatedAdmittingDoctor
      ^updatedAdmittingDoctorLastName^updatedAdmittingDoctorFirstName
      ^updatedAdmittingDoctorMiddleName^updatedAdmittingDoctorSuffix
      ^updatedAdmittingDoctorPrefix^^^^^^^^^A||updatedVisitId^^
      ^updatedAssigningAuthority|||||||||||||||||||
updatedServicingFacility
      ^updatedServicingFacilityDescription|||||20000102030405.1234|||||
      |updatedAlternateVisitId^^^updatedAssigningAuthority|V
  ROL||LI|CP|updatedConsultingDoctor^updatedConsultingDoctorLastName
      ^updatedConsultingDoctorFirstName^updatedConsultingDoctorMiddleName
      ^updatedConsultingDoctorSuffix^updatedConsultingDoctorPrefix
^^^^^^^^^A
  GT1|...
```

The HL7 PID, HL7 NK1, and HL7 GT1 segments are identical to the ones defined in Example 13.

Example 15: HL7 ADT A45 move visit message

The following HL7 ADT A45 moves a visit with visit ID `updatedVisitID` to a patient with patient ID `differentPatientId`.

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
      |receivingFacility|20000102030405.1234||ADT^A45^ADT_A45|1|P
|2.8.1|||||
      |UNICODE UTF-8
  PID|1||differentPatientId^^^differentAssigningAuthority^PI
    ~differentPatientSsn^^^differentAssigningAuthority^SS|
    |differentLastName^differentFirstName^differentMiddleName
    ^differentSuffix^differentPrefix^^^A|differentMothersMaidenLastName
    ^differentMothersMaidenFirstName^differentMothersMaidenMiddleName
    ^differentMothersMaidenSuffix^differentMothersMaidenPrefix^^^A
    |20000102030405.1234|M||differentRace^differentRaceDescription
    |differentPatientStreet^^differentPatientCity^differentPatientState
    ^1234^differentPatientCountry|||||M^Married|CHR^Christian
    |differentAccountNumber^^^differentAssigningAuthority||||
    |differentBirthPlace|Y|1|A^austrian|differentProfession
    ^differentProfessionDescription|||||||||||||^PRN^CP
    ^differentPatientCommunicationAddress
^0043^0512^89059^^^^^+4351289059
  MRG|||||updatedVisitId^^^updatedAssigningAuthority
  NK1|1|differentNextKinLastName^differentNextKinFirstName
    ^differentNextKinMiddleName^differentNextKinSuffix
    ^differentNextKinPrefix^^^A|PAR^parent|differentNextKinStreet^
    ^differentNextKinCity^differentNextKinState^1234
```

```
      ^differentNextKinCountry|||||||||||||||||||||||||||||||||||||||||^PRN^CP
      ^differentNextKinCommunicationAddress
^0043^0512^89060^^^^^+4351289060
   GT1|1||differentGuarantorLastName^differentGuarantorFirstName
      ^differentGuarantorMiddleName^differentGuarantorSuffix
      ^differentGuarantorPrefix^^^A||differentGuarantorStreet^
      ^differentGuarantorCity^differentGuarantorState^1234
      ^differentGuarantorCountry|||19900102030405.1234|||
      |differentGuarantorSsn||||differentGuarantorEmployerLastName
      ^differentGuarantorEmployerFirstName
      ^differentGuarantorEmployerMiddleName^
differentGuarantorEmployerSuffix
      ^differentGuarantorEmployerPrefix^^^A|
differentGuarantorEmployerStreet
      ^^differentGuarantorEmployerCity^differentGuarantorEmployerState
^1234
      ^differentGuarantorEmployerCountry
```

Moving the visit also entails moving the documents that are associated with the visit.

Example 16: HL7 ADT A40 merge patient message

The following HL7 ADT A40 message merges two patients. The patient ID `updatedPatientId` of the invalidated patient is defined by the HL7 `MRG` segment, whereas the patient ID `differentPatientId` of the remaining patient is defined by the HL7 `PID` segment:

```
      MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
      |receivingFacility|20000102030405.1234||ADT^A40^ADT_A39|1|P
|2.8.1|||||
      |UNICODE UTF-8
   PID|...
   MRG|updatedPatientId^^^updatedAssigningAuthority^PI
   NK1|...
   GT1|...
```

The HL7 `PID`, HL7 `NK1`, and HL7 `GT1` segments are identical to the ones defined in Example 15.

Example 17: HL7 ADT A42 merge visit message

The following HL7 ADT A42 message merges two visits. The visit ID `updatedVisitId` of the invalidated visit is defined by the HL7 `MRG` segment, whereas the visit ID `differentVisitId` of the remaining visit is defined by the HL7 `PV1` segment:

```
      MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
      |receivingFacility|20000102030405.1234||ADT^A42^ADT_A39|1|P
|2.8.1|||||
      |UNICODE UTF-8
   PID|...
   MRG|||||updatedVisitId^^^updatedAssigningAuthority
   NK1|...
   PV1|1|I^inpatient|^differentRoom^differentBed^differentFacility|||
      ^differentPriorRoom^differentPriorBed^differentPriorFacility
      |differentAttendingDoctor^differentAttendingDoctorLastName
      ^differentAttendingDoctorFirstName^
differentAttendingDoctorMiddleName
      ^differentAttendingDoctorSuffix^differentAttendingDoctorPrefix
^^^^^^^^
      ^A|differentReferringDoctor^differentReferringDoctorLastName
```

```
     ^differentReferringDoctorFirstName^
differentReferringDoctorMiddleName
     ^differentReferringDoctorSuffix^differentReferringDoctorPrefix
^^^^^^^
     ^A||MED^medicalService|^differentTemporaryRoom^
differentTemporaryBed
     ^differentTemporaryFacility||||A4^disoriented|differentVipIndicator
     ^differentVipIndicatorDescription|differentAdmittingDoctor
     ^differentAdmittingDoctorLastName^differentAdmittingDoctorFirstName
     ^differentAdmittingDoctorMiddleName^differentAdmittingDoctorSuffix
     ^differentAdmittingDoctorPrefix^^^^^^^^^A||differentVisitId^^
     ^differentAssigningAuthority||||||||||||||||||||
     |differentServicingFacility^differentServicingFacilityDescription
||||
     |20000102030405.1234|||||||differentAlternateVisitId^^
     ^differentAssigningAuthority|V
  ROL||LI|CP|differentConsultingDoctor^differentConsultingDoctorLastName
     ^differentConsultingDoctorFirstName
     ^differentConsultingDoctorMiddleName^
differentConsultingDoctorSuffix
     ^differentConsultingDoctorPrefix^^^^^^^^^A
  GT1|...
```

The HL7 PID, HL7 NK1, and HL7 GT1 segments are identical to the ones defined in .

A.1.5   Deletion of an order, visit or patient

If an order, visit, or patient has been created by mistake, it can be deleted. If an order is deleted by the HIS, the RIS sends an HL7 OMI O23 or HL7 ORM O01 message to *syngo*.share. HL7 messages of this kind are illustrated in Example 18 and Example 19.

If a visit or patient is deleted by the HIS, the RIS sends an appropriate HL7 ADT A23 or HL7 ADT A29 message to *syngo*.share, as shown in Example 20 and Example 21.

💡 **Example 18: HL7 OMI O23 delete order message**

The following HL7 OMI O23 message deletes an order with Placer Order Number `placerO rderNumber` and Filler Order Number `fillerOrderNumber`, a Requested Procedure with Study Instance UID `1.2.3.4.5.6.7.8.9`, and a Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:

```
     MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
     |receivingFacility|20000102030405.1234||OMI^O23^OMI_O23|1|P
|2.8.1|||||
     |UNICODE UTF-8
  PID|...
  NK1|...
  PV1|...
  ROL|...
  GT1|...
  ORC|CA|placerOrderNumber|fillerOrderNumber||CA|||||updatedEnterer
     ^updatedEntererLastName^updatedEntererFirstName
     ^updatedEntererMiddleName^updatedEntererSuffix^updatedEntererPrefix
^^^
     ^^^^^^A||updatedProvider^updatedProviderLastName
     ^updatedProviderFirstName^updatedProviderMiddleName
     ^updatedProviderSuffix^updatedProviderPrefix^^^^^^^^^A|^^
     ^updatedFacility|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512
     ^89059^^^^^+4351289059||updatedControlCodeReasonId
```

```
         ^updatedControlCodeReasonDescription|updatedEnteringOrganizationId
         ^updatedEnteringOrganizationDescription||||updatedFacilityName
         ^updatedFacilityNameTypeCode
   TQ1|1|updatedQuantity||||updatedDuration|20000102030405.1234|
       |updatedPriority
   OBR|1|placerOrderNumber|fillerOrderNumber|updatedUniversalServiceId
       ^updatedUniversalServiceDescription||||||||updatedDangerCodeId
       ^updatedDangerCodeDescription|updatedRelevantClinicalInformationId
       ^updatedRelevantClinicalInformationDescription|
       |updatedSpecimenSourceName^updatedSpecimenSourceDescription
       |updatedProvider^updatedProviderLastName^updatedProviderFirstName
       ^updatedProviderMiddleName^updatedProviderSuffix^
updatedProviderPrefix
       ^^^^^^^^^A|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512^89059
       ^^^^^+4351289059|||||||||||||updatedTransportationMode
       |updatedReasonForStudyId^updatedReasonForStudyDescription||
       |updatedTechnician&updatedTechnicianLastName
       &updatedTechnicianFirstName&updatedTechnicianMiddleName
       &updatedTechnicianSuffix&updatedTechnicianPrefix|||||||||
       |updatedProcedureCodeId^updatedProcedureCodeDescription^^
       ^updatedRequestedProcedureDescription
   IPC|updatedAccessionNumber|updatedRequestedProcedureId
|1.2.3.4.5.6.7.8.9
       |scheduledProcedureStepId|MR|updatedProtocolCode
       ^updatedProtocolDescription^^^
updatedScheduledProcedureStepDescription
       |||updatedAet
```

The HL7 PID, HL7 NK1, HL7 PV1, HL7 ROL, and HL7 GT1 segments are identical to the ones defined in Example 17.

Example 19: HL7 ORM O01 delete order message

The following HL7 ORM O01 message deletes an order with Placer Order Number `placerOrderNumber` and Filler Order Number `fillerOrderNumber`, a Requested Procedure with Study Instance UID `1.2.3.4.5.6.7.8.9`, and a Scheduled Procedure Step with Scheduled Procedure Step ID `scheduledProcedureStepId`:

```
   MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
       |receivingFacility|20000102030405.1234||ORM^O01^ORM_O01|1|P
|2.8.1|||||
       |UNICODE UTF-8
   PID|...
   NK1|...
   PV1|...
   ROL|...
   GT1|...
   ORC|CA|placerOrderNumber|fillerOrderNumber||CA||updatedQuantity
       ^updatedInterval^updatedDuration^20000102030405.1234^^
updatedPriority
       |||updatedEnterer^updatedEntererLastName^updatedEntererFirstName
       ^updatedEntererMiddleName^updatedEntererSuffix^updatedEntererPrefix
^^^
       ^^^^^^A||updatedProvider^updatedProviderLastName
       ^updatedProviderFirstName^updatedProviderMiddleName
       ^updatedProviderSuffix^updatedProviderPrefix^^^^^^^^^A|^^
       ^updatedFacility|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512
       ^89059^^^^^+4351289059||updatedControlCodeReasonId
       ^updatedControlCodeReasonDescription|updatedEnteringOrganizationId
       ^updatedEnteringOrganizationDescription||||updatedFacilityName
       ^updatedFacilityNameTypeCode
```

```
    OBR|1|placerOrderNumber|fillerOrderNumber|updatedUniversalServiceId
        ^updatedUniversalServiceDescription^^updatedProtocolCode
        ^updatedProtocolDescription^^^^^
        ^updatedScheduledProcedureStepDescription|||||||||
updatedDangerCodeId
        ^updatedDangerCodeDescription|updatedRelevantClinicalInformationId
        ^updatedRelevantClinicalInformationDescription|
        ||updatedSpecimenSourceName^updatedSpecimenSourceDescription
        |updatedProvider^updatedProviderLastName^updatedProviderFirstName
        ^updatedProviderMiddleName^updatedProviderSuffix^
updatedProviderPrefix
        ^^^^^^^^^A|^PRN^CP^updatedCallBackCommunicationAddress
^0043^0512^89059
        ^^^^^+4351289059|updatedAccessionNumber|updatedRequestedProcedureId
        |scheduledProcedureStepId|updatedAet|||MR|||updatedQuantity
        ^updatedInterval^updatedDuration^20000102030405.1234^^
updatedPriority
        |||updatedTransportationMode|updatedReasonForStudyId
        ^updatedReasonForStudyDescription|||updatedTechnician
        &updatedTechnicianLastName&updatedTechnicianFirstName
        &updatedTechnicianMiddleName&updatedTechnicianSuffix
        &updatedTechnicianPrefix|||||||||||updatedProcedureCodeId
        ^updatedProcedureCodeDescription^^
        ^updatedRequestedProcedureDescription
    ZDS|1.2.3.4.5.6.7.8.9
```

The HL7 PID, HL7 NK1, HL7 PV1, HL7 ROL, and HL7 GT1 segments are identical to the ones defined in Example 17.

Example 20: HL7 ADT A23 delete visit message

The following HL7 ADT A23 message deletes a visit with visit ID differentVisitId:

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ADT^A23^ADT_A21|1|P
|2.8.1|||||
        |UNICODE UTF-8
    PID|...
    PV1|...
```

The deletion of the visit also entails the deletion of the documents that are associated with the visit. Furthermore, the HL7 PID and HL7 PV1 segments are identical to the ones defined in Example 17.

Example 21: HL7 ADT A29 delete patient message

The following HL7 ADT A29 message deletes a patient with patient ID differentPatient Id:

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ADT^A29^ADT_A21|1|P
|2.8.1|||||
        |UNICODE UTF-8
    PID|...
```

The deletion of the patient also entails the deletion of all visits and documents that are associated with the patient. Furthermore, the HL7 PID and HL7 PV1 segments are identical to the ones defined in Example 17.

A.2 Archiving of generic files

The HL7 interface is one of the most frequently used interfaces for handling generic files. *syngo*.share supports various kinds of HL7 MDM and HL7 ORU messages that are used to insert, update, and delete generic files. If generic files are routed to third-party systems, *syngo*.share guarantees that updates are relayed by sending adequate HL7 MDM messages. The archiving workflow of generic files is illustrated in Figure 2.

Figure 2: Generic file archiving workflow
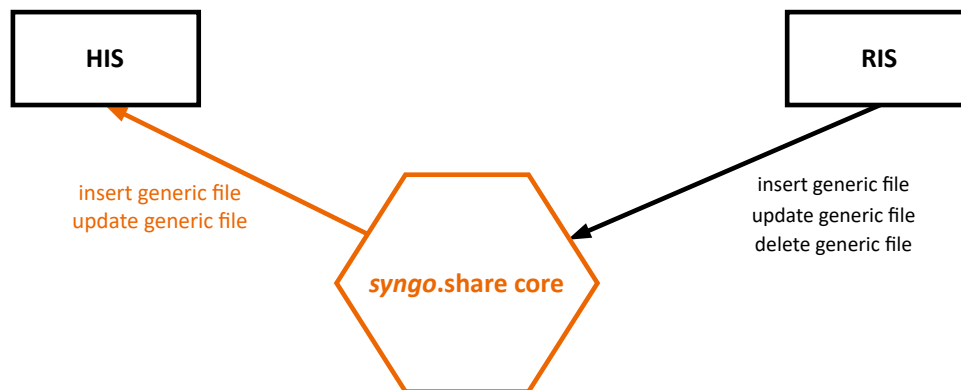
The following sections show HL7 sample messages for a typical patient encounter which reflects the creation, routing, update and deletion of a report. They concern HL7 MDM and HL7 ORU messages used by third-party systems to insert, update, and delete generic files as well as the HL7 MDM messages used by *syngo*.share to route and synchronize generic files.

A.2.1 Insertion of a generic file

Assume that a patient has arrived at a healthcare facility, the personal data of the patient has been stored and forwarded to *syngo*.share, and an order has been scheduled by the RIS, relayed to *syngo*.share, and performed by a modality in order to be able to proceed with the patient's treatment.

Next, the DICOM study is analyzed by a radiologist, who creates a report. The RIS sends this report to *syngo*.share via HL7 MDM T02 or HL7 ORU R01 message to ensure that it is archived; see Example 22 and Example 23, as well as Example 24 and Example 25.

> 💡 **Example 22: HL7 MDM T02 insert generic file message**
>
> The following HL7 MDM T02 message inserts a generic file with generic file ID `genericF ileId` and application ID `sendingApplication`. The generic file is stored in a generic container with a generic container ID `genericContainerId` and a coding system ID `gene ricContainerCodingSystemId`. It has been created during a visit with visit ID `visitId` belonging to a patient with patient ID `patientId` and belongs to the organizational unit `or ganizationalUnit`. The data of the generic file is embedded as a Base64-encoded string in the HL7 MDM T02 message:
>
> ```
>     MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
>       |receivingFacility|20000102030405.1234||MDM^T02^MDM_T02|1|P
> |2.8.1|||||
>       |UNICODE UTF-8
>   PID|1||patientId^^^assigningAuthority^PI||lastName^firstName^
> middleName
>       ^suffix^prefix^^^A||20000102030405.1234|M
>   PV1|1||||||||||||||||||||||visitId^^^assigningAuthority
> |||||||||||||||||||||||
> ```

```
          ||||||||||V
       OBR|1||||||20000102030405.1234||||||||||||accessionNumber|||||
          |diagnosticServiceSectionId^diagnosticServiceSectionDisplayName
          ^diagnosticServiceSectionDescription
       TXA|1|typeId^typeDisplayName^typeCodingScheme|contentPresentationId
          ^contentPresentationDisplayName^contentPresentationCodingScheme||
          |20000102030405.1234|||originator^originatorLastName
          ^originatorFirstName^originatorMiddleName^originatorSuffix
          ^originatorPrefix^^^^^^^^facilityTypeCodeId
          &facilityTypeCodeDisplayName&facilityTypeCodeCodingScheme^A||
          |genericFileId||||genericFilename.txt|completionStatus
          |confidentialityStatusId^confidentialityStatusDisplayName
          ^confidentialityStatusCodingScheme||||authenticator
          ^authenticatorLastName^authenticatorFirstName^
   authenticatorMiddleName
          ^authenticatorSuffix^authenticatorPrefix^^^^^^^^^^A|
          |genericContainerId^genericContainerDescription
          ^genericContainerCodingSystemId|genericFileDescription
       OBX|1|ED||1|^text^plain^Base64^RXhhbXBsZQo=|||interpretationCodeId
          ^interpretationCodeDescription||||||20000102030405.1234
```

Example 23: HL7 MDM T02 insert generic file message (UNC path)

Since HL7 messages are not designed to transport data of big generic files, it is also possible to equip an HL7 MDM T02 message with a UNC path which points to the generic file to be archived. In this case, the HL7 MDM T02 message specifies the following information:

```
       MSH|...
       PID|...
       PV1|...
       OBR|...
       TXA|...
       OBX|1|RP||1|\E\\E\host\E\share\E\path^^application^pdf||
          |interpretationCodeId^interpretationCodeDescription|||||
          |20000102030405.1234
```

The HL7 MSH, HL7 PID, HL7 PV1, HL7 OBR, and HL7 TXA segments are identical to those in the previously defined in Example 22.

Example 24: HL7 ORU R01 insert generic file message

The following HL7 ORU R01 message inserts a generic file with generic file ID `genericF`
`ileId` and application ID `sendingApplication`. The generic file is stored in a generic container with generic container ID `genericContainerId` and coding system ID `generic`
`ContainerCodingSystemId`. The generic file has been created during a visit (with a visit ID `visitId`) of a patient (with a patient ID `patientId`) and belongs to the organizational unit `organizationalUnit`.

The data of the generic file is embedded as a Base64-encoded string in the HL7 ORU R01 message.

```
       MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
          |receivingFacility|20000102030405.1234||ORU^R01^ORU_R01|1|P
   |2.8.1|||||
          |UNICODE UTF-8
       PID|...
       PV1|...
       OBR|1||||||20000102030405.1234||||F|||||||accessionNumber|||||
          |diagnosticServiceSectionId^diagnosticServiceSectionDisplayName
```

```
                ^diagnosticServiceSectionDescription
        OBX|1|ED|genericFileId^genericFileDescription^^genericContainerId
            ^genericContainerDescription^genericContainerCodingSystemId^^
            ^genericFilename.txt|1|^text^plain^Base64^RXhhbXBsZQo=||
            |interpretationCodeId^interpretationCodeDescription|||F||
            |20000102030405.1234
```

The HL7 `PID` and HL7 `PV1` segments are identical to the ones defined in Example 22.

Example 25: HL7 ORU R01 insert generic file message (UNC path)

Since HL7 messages are not designed to transport data of big generic files, it is also possible to equip an HL7 ORU R01 message with a UNC path which points to the generic file to be archived. In this case, the HL7 ORU R01 message specifies the following information:

```
        MSH|...
        PID|...
        PV1|...
        OBR|...
        OBX|1|RP|genericFileId^genericFileDescription^^genericContainerId
            ^genericContainerDescription^genericContainerCodingSystemId^^
            ^genericFilename.txt|1|\E\\E\host\E\share\E\path^^application^pdf||
            |interpretationCodeId^interpretationCodeDescription|||F||
            |20000102030405.1234
```

The HL7 `MSH`, HL7 `PID`, HL7 `PV1`, and HL7 `OBR` segments are identical to the ones of the previously defined HL7 ORU R01 message.

A.2.2   Routing of a generic file

As soon as the report has been stored, *syngo*.share forwards it to the HIS via HL7 MDM T02 message similar to the one shown in Example 26 and Example 27. Also note that the TXA segment varies depending on the method used to originally archive the generic file (see Section A.2.2.1).

Example 26: HL7 MDM T02 route inserted generic file message

The following HL7 MDM T02 message routes a generic file which has been archived by a third-party system using the generic file ID `genericFileId` and the application ID `sendingApplication`.

The generic file is contained in a generic container with generic container ID `genericContainerId` and coding system ID `genericContainerCodingSystemId`. It belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visitId` belonging to a patient with patient ID `patientId`. The data of the generic file is embedded as a Base64-encoded string in the HL7 MDM T02 message:

```
    MSH|^~\&|EventServer|organizationalUnit^configuredSendingFacility^L
        |configuredReceivingApplication|configuredReceivingFacility
        |20000102030405.1234||MDM^T02^MDM_T02|1|P|2.8.1|1|||||UNICODE UTF-8
    PID|1||patientId^^^assigningAuthority^PI~patientSsn^^^
assigningAuthority
        ^SS||lastName^firstName^middleName^suffix^prefix^^^A|
        |20000102030405.1234|M||race^raceDescription|patientStreet^
        ^patientCity^patientState^1234^patientCountry|||||||accountNumber^^
        ^assigningAuthority||||||||A^austrian
    PV1|1|I^inpatient||||||||||||||||||||visitId^^^assigningAuthority
||||||||||||
        ||||||||||||||||||||||alternateVisitId^^^assigningAuthority|V
    ORC|OP|placerOrderNumber|fillerOrderNumber||CM
```

```
OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
    ^universalServiceDescription|||20000102030405.1234||||||||||
    |accessionNumber||||20000102030405.1234||diagnosticServiceSectionId
    ^diagnosticServiceSectionDisplayName
    ^diagnosticServiceSectionDescription|F
TXA|1|typeId^typeDisplayName^typeCodingScheme|contentPresentationId
    ^contentPresentationDisplayName^contentPresentationCodingScheme||
    |20000102030405.1234|||originator^originatorLastName
    ^originatorFirstName^originatorMiddleName^originatorSuffix
    ^originatorPrefix^^^^^^^facilityTypeCodeId
    &facilityTypeCodeDisplayName&facilityTypeCodeCodingScheme^A||
    |1.2.3.4.2|||||genericFilename.txt|completionStatus
    |confidentialityStatusId^confidentialityStatusDisplayName
    ^confidentialityStatusCodingScheme||||authenticator
    ^authenticatorLastName^authenticatorFirstName^
authenticatorMiddleName
    ^authenticatorSuffix^authenticatorPrefix^^^^^^^^^^A|
    |1.2.3.4.1^genericContainerDescription^EventServer
    |genericFileDescription
OBX|1|ED|genericFileId^genericFileDescription^sendingApplication
    ^genericContainerId^genericContainerDescription
    ^genericContainerCodingSystemId|1|^text^plain^Base64^RXhhbXBsZQo=||
    |interpretationCodeId^interpretationCodeDescription|||F||
    |20000102030405.1234
```

Example 27: HL7 MDM T02 route inserted generic file message (UNC path)

Since HL7 messages are not designed to transport data of big generic files, it is also possible
to equip an HL7 MDM T02 message with an UNC path which points to the generic file that
is to be routed. In this particular case, the HL7 MDM T02 message specifies the following
information:

```
MSH|...
PID|...
PV1|...
ORC|...
OBR|...
TXA|...
OBX|1|RP|genericFileId^genericFileDescription^sendingApplication
    ^genericContainerId^genericContainerDescription
    ^genericContainerCodingSystemId|1
    |//configuredHost/configuredShare/path^^application^pdf||
    |interpretationCodeId^interpretationCodeDescription|||F||
    |20000102030405.1234
```

The HL7 MSH, HL7 PID, HL7 PV1, HL7 ORC, HL7 OBR, and HL7 TXA segments are identical to
those defined in Example 26.

A.2.2.1 TXA segment variations

The information provided by the HL7 TXA segment depends on the method used to originally archive
the generic file that is to be routed.

Example 28: TXA segment when routing a file archived via HL7 MDM T02 message

If the file has been archived via HL7 MDM T02 message (see Example 22), the TXA segment consists of the following information:

```
TXA|1|typeId^typeDisplayName^typeCodingScheme|contentPresentationId
    ^contentPresentationDisplayName^contentPresentationCodingScheme||
    |20000102030405.1234|||originator^originatorLastName
    ^originatorFirstName^originatorMiddleName^originatorSuffix
    ^originatorPrefix^^^^^^^^facilityTypeCodeId
    &facilityTypeCodeDisplayName&facilityTypeCodeCodingScheme^A||
    |1.2.3.4.2||||genericFilename.txt|completionStatus
    |confidentialityStatusId^confidentialityStatusDisplayName
    ^confidentialityStatusCodingScheme||||authenticator
    ^authenticatorLastName^authenticatorFirstName^
authenticatorMiddleName
    ^authenticatorSuffix^authenticatorPrefix^^^^^^^^^^A|
    |1.2.3.4.1^genericContainerDescription^EventServer
    |genericFileDescription
```

Example 29: TXA segment when routing a file archived via HL7 ORU R01 message

If an HL7 ORU R01 message similar to the one in Example 24 was used to originally archive the generic file, the HL7 TXA segment consists of the following information:

```
TXA|1|||||20000102030405.1234|||||||1.2.3.4.2||||genericFilename.txt|F
||||
    |||1.2.3.4.1^genericContainerDescription^EventServer
    |genericFileDescription
```

A.2.3   Update of a generic file

It may happen that the radiologist observes and corrects some mistakes in the report. To synchronize the changes, the RIS updates the previously transmitted generic file by sending an HL7 MDM T09, HL7 MDM T10, or HL7 ORU R01 message as illustrated by Example 30, Example 31, Example 32, and Example 33.

Example 30: HL7 MDM T09 update generic file metadata message

The following HL7 MDM T09 message updates the metadata of a generic file with generic file ID `genericFileId` and application ID `sendingApplication` as well as a generic container with generic container ID `genericContainerId` and coding system ID `genericContainerCodingSystemId`. Since only the metadata of a generic file are updated, no generic file is embedded or referenced in the HL7 MDM T09 message:

```
MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
    |receivingFacility|20000102030405.1234||MDM^T09^MDM_T01|1|P
|2.8.1|||||
    |UNICODE UTF-8
PID|...
PV1|...
OBR|1||||||20000102030405.1234|||||||||||updatedAccessionNumber|||||
    |updatedDiagnosticServiceSectionId
    ^updatedDiagnosticServiceSectionDisplayName
    ^updatedDiagnosticServiceSectionDescription
TXA|1|updatedTypeId^updatedTypeDisplayName^updatedTypeCodingScheme
    |updatedContentPresentationId^updatedContentPresentationDisplayName
```

```
                  ^updatedContentPresentationCodingScheme|||20000102030405.1234||
              |updatedOriginator^updatedOriginatorLastName
              ^updatedOriginatorFirstName^updatedOriginatorMiddleName
              ^updatedOriginatorSuffix^updatedOriginatorPrefix^^^^^^^
              ^updatedFacilityTypeCodeId&facilityTypeCodeDisplayName
              &updatedFacilityTypeCodeCodingScheme^A|||genericFileId|||
              |updatedGenericFilename.txt|updatedCompletionStatus
              |updatedConfidentialityStatusId
              ^updatedConfidentialityStatusDisplayName
              ^updatedConfidentialityStatusCodingScheme||||updatedAuthenticator
              ^updatedAuthenticatorLastName^updatedAuthenticatorFirstName
              ^updatedAuthenticatorMiddleName^updatedAuthenticatorSuffix
              ^updatedAuthenticatorPrefix^^^^^^^^^^A||genericContainerId
              ^updatedGenericContainerDescription^genericContainerCodingSystemId
              |updatedGenericFileDescription
         OBX|1|||1||||updatedInterpretationCodeId
              ^updatedInterpretationCodeDescription|||||||20000102030405.1234
```

The HL7 `PID` and HL7 `PV1` segments are identical to those defined in Example 22.

Example 31: HL7 MDM T10 update generic file message

The following HL7 MDM T10 message updates a generic file with generic file ID `generi cFileId` and application ID `sendingApplication` as well as a generic container with generic container ID `genericContainerId` and coding system ID `genericContainer CodingSystemId`. The new version of the generic file is referenced by a UNC path; it is also possible to embed the new version of the generic file in the HL7 MDM T10 message.

```
      MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
         |receivingFacility|20000102030405.1234||MDM^T10^MDM_T02|1|P
   |2.8.1|||||
         |UNICODE UTF-8
      PID|...
      PV1|...
      OBR|...
      TXA|...
      OBX|1|RP||1|\E\\E\host\E\share\E\updatedPath^^application^pdf||
         |updatedInterpretationCodeId^updatedInterpretationCodeDescription
   |||||
         |20000102030405.1234
```

The HL7 `PID`, HL7 `PV1`, HL7 `OBR`, and HL7 `TXA` segments are identical to those defined in Example 30.

Example 32: HL7 ORU R01 update generic file metadata message

The following HL7 ORU R01 message updates the metadata of a generic file with generic file ID `genericFileId` and application ID `sendingApplication` as well as a generic container with generic container ID `genericContainerId` and coding system ID `gener icContainerCodingSystemId`. Since only the metadata of a generic file is updated, no generic file is embedded or referenced in the HL7 ORU R01 message.

```
      MSH|...
      PID|...
      PV1|...
      OBR|1||||||20000102030405.1234||||F|||||||updatedAccessionNumber|||||
         |updatedDiagnosticServiceSectionId
         ^updatedDiagnosticServiceSectionDisplayName
         ^updatedDiagnosticServiceSectionDescription
      OBX|1||genericFileId^updatedGenericFileDescription^^genericContainerId
```

```
        ^updatedGenericContainerDescription^genericContainerCodingSystemId
^^
        ^updatedGenericFilename.txt|1||||updatedInterpretationCodeId
        ^updatedInterpretationCodeDescription|||F|||20000102030405.1234
```

The HL7 MSH, HL7 PID, and HL7 PV1 segments are identical to the ones defined in .

💡 **Example 33: HL7 ORU R01 update generic file message**

The following HL7 ORU R01 message updates a generic file with generic file ID `genericFi leId` and application ID `sendingApplication` as well as a generic container with generic container ID `genericContainerId` and coding system ID `genericContainerCodingS ystemId`. The new version of the generic file is referenced by a UNC path; it is also possible to embed the new version of the generic file in the HL7 ORU R01 message.

```
    MSH|...
    PID|...
    PV1|...
    OBR|...
    OBX|1|RP|genericFileId^updatedGenericFileDescription^^
genericContainerId
        ^updatedGenericContainerDescription^genericContainerCodingSystemId
^^
        ^updatedGenericFilename.txt|1|\E\\E\host\E\share\E\updatedPath^
        ^application^pdf|||updatedInterpretationCodeId
        ^updatedInterpretationCodeDescription|||F|||20000102030405.1234
```

The HL7 MSH, HL7 PID, HL7 PV1, and HL7 OBR segments are identical to the ones defined in .

A.2.4 Routing of an updated generic file

Once the update has been conducted, *syngo*.share informs the HIS about the made changes by sending a further HL7 MDM T02 message like the one of .

💡 **Example 34: HL7 MDM T02 route generic file message**

The following HL7 MDM T02 message routes a generic file which has been updated by a third-party system using the generic file ID `genericFileId` and the application ID `sendin gApplication`. The generic file is contained in a generic container with generic container ID `genericContainerId` and coding system ID `genericContainerCodingSystemId`. It belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visitId` belonging to a patient with patient ID `patientId`. The data of the generic file is embedded as a Base64-encoded string in the HL7 MDM T02 message; it is also possible to reference the new version of the generic file via UNC path.

```
    MSH|...
    PID|...
    PV1|...
    ORC|...
    OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
        ^universalServiceDescription|||20000102030405.1234||||||||||||
        |updatedAccessionNumber||||20000102030405.1234|
        |updatedDiagnosticServiceSectionId
        ^updatedDiagnosticServiceSectionDisplayName
        ^updatedDiagnosticServiceSectionDescription|F
    TXA|1|updatedTypeId^updatedTypeDisplayName^updatedTypeCodingScheme
```

```
        |updatedContentPresentationId^updatedContentPresentationDisplayName
        ^updatedContentPresentationCodingScheme|||20000102030405.1234||
        |updatedOriginator^updatedOriginatorLastName
        ^updatedOriginatorFirstName^updatedOriginatorMiddleName
        ^updatedOriginatorSuffix^updatedOriginatorPrefix^^^^^^^
        ^updatedFacilityTypeCodeId&facilityTypeCodeDisplayName
        &updatedFacilityTypeCodeCodingScheme^A|||1.2.3.4.2|||
        |updatedGenericFilename.txt|updatedCompletionStatus
        |updatedConfidentialityStatusId
        ^updatedConfidentialityStatusDisplayName
        ^updatedConfidentialityStatusCodingScheme||||updatedAuthenticator
        ^updatedAuthenticatorLastName^updatedAuthenticatorFirstName
        ^updatedAuthenticatorMiddleName^updatedAuthenticatorSuffix
        ^updatedAuthenticatorPrefix^^^^^^^^^^A||1.2.3.4.1
        ^updatedGenericContainerDescription^EventServer
        |updatedGenericFileDescription
    OBX|1|ED|genericFileId^updatedGenericFileDescription^
  sendingApplication
        ^genericContainerId^updatedGenericContainerDescription
        ^genericContainerCodingSystemId|1|^text^plain^Base64
        ^VXBkYXRlZCBFeGFtcGxlCg==|||updatedInterpretationCodeId
        ^updatedInterpretationCodeDescription|||F|||20000102030405.1234
```

The HL7 MSH, HL7 PID, and HL7 PV1 segments are identical to those defined in Example 32.

A.2.4.1   TXA segment variations

The information provided by the HL7 TXA segment depends on the method used to archive and update the generic file to be routed.

> 💡 **Example 35: TXA segment when routing a file archived and updated via HL7 MDM messages**
>
> If the generic file has been archived and updated via HL7 MDM messages (see Example 22, 30 and Example 31), the following information is provided (see Example 34):
>
> ```
> TXA|1|updatedTypeId^updatedTypeDisplayName^updatedTypeCodingScheme
>     |updatedContentPresentationId^updatedContentPresentationDisplayName
>     ^updatedContentPresentationCodingScheme|||20000102030405.1234||
>     |updatedOriginator^updatedOriginatorLastName
>     ^updatedOriginatorFirstName^updatedOriginatorMiddleName
>     ^updatedOriginatorSuffix^updatedOriginatorPrefix^^^^^^^
>     ^updatedFacilityTypeCodeId&facilityTypeCodeDisplayName
>     &updatedFacilityTypeCodeCodingScheme^A|||1.2.3.4.2|||
>     |updatedGenericFilename.txt|updatedCompletionStatus
>     |updatedConfidentialityStatusId
>     ^updatedConfidentialityStatusDisplayName
>     ^updatedConfidentialityStatusCodingScheme||||updatedAuthenticator
>     ^updatedAuthenticatorLastName^updatedAuthenticatorFirstName
>     ^updatedAuthenticatorMiddleName^updatedAuthenticatorSuffix
>     ^updatedAuthenticatorPrefix^^^^^^^^^^A||1.2.3.4.1
>     ^updatedGenericContainerDescription^EventServer
>         |updatedGenericFileDescription
> ```

Example 36: TXA segment when routing a file archived and updated via HL7 ORU messages

If the generic file has been archived and updated via HL7 ORU messages (see Example 24, Example 32 and Example 33), the HL7 TXA segment consists of the following information (see Example 34):

```
TXA|1|||||20000102030405.1234|||||||1.2.3.4.2|||
    |updatedGenericFilename.txt|F|||||||||1.2.3.4.1
    ^updatedGenericContainerDescription^EventServer
    |updatedGenericFileDescription
```

A.2.5 Deletion of a generic file

Finally, to delete a generic file after a certain amount of time, the RIS sends a specific HL7 MDM T11 or HL7 ORU R01 message like the ones shown in Example 37 and Example 38 to *syngo*.share.

💡 **Example 37: HL7 MDM T11 delete generic file message**

The following HL7 MDM T11 message deletes a generic file with generic file ID `genericFileId` and application ID `sendingApplication`:

```
MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
    |receivingFacility|20000102030405.1234||MDM^T11^MDM_T01|1|P
|2.8.1|||||
    |UNICODE UTF-8
PID|...
PV1|...
OBR|...
TXA|...
```

The HL7 `PID`, HL7 `PV1`, HL7 `OBR`, and HL7 `TXA` segments are identical to those defined in Example 30.

💡 **Example 38: HL7 ORU R01 delete generic file message**

The following HL7 ORU R01 message deletes a generic file with generic file ID `genericFileId` and application ID `sendingApplication`:

```
MSH|...
PID|...
PV1|...
OBR|1|||||20000102030405.1234||||D|||||||updatedAccessionNumber|||||
    |updatedDiagnosticServiceSectionId
    ^updatedDiagnosticServiceSectionDisplayName
    ^updatedDiagnosticServiceSectionDescription
OBX|1||genericFileId^updatedGenericFileDescription^^genericContainerId
    ^updatedGenericContainerDescription^genericContainerCodingSystemId
^^
    ^updatedGenericFilename.txt|1||||updatedInterpretationCodeId
    ^updatedInterpretationCodeDescription|||D|||20000102030405.1234
```

A.3   Referencing of DICOM studies and generic containers

Some of the most frequently used methods for accessing, sharing, and deleting DICOM studies and generic containers are based on reference pointers. To ensure that third-party systems can use these methods to meet their requirements, *syngo*.share automatically transmits reference pointers to third--party systems via HL7 ORU messages.

Since the modification of DICOM studies and generic containers might influence the operational relia-bility of reference pointers, *syngo*.share updates and deletes reference pointers automatically by trans-mitting appropriate HL7 ORU messages. The functionalities based on reference pointers are illustrated in Figure 3.

Figure 3: Reference pointer workflow
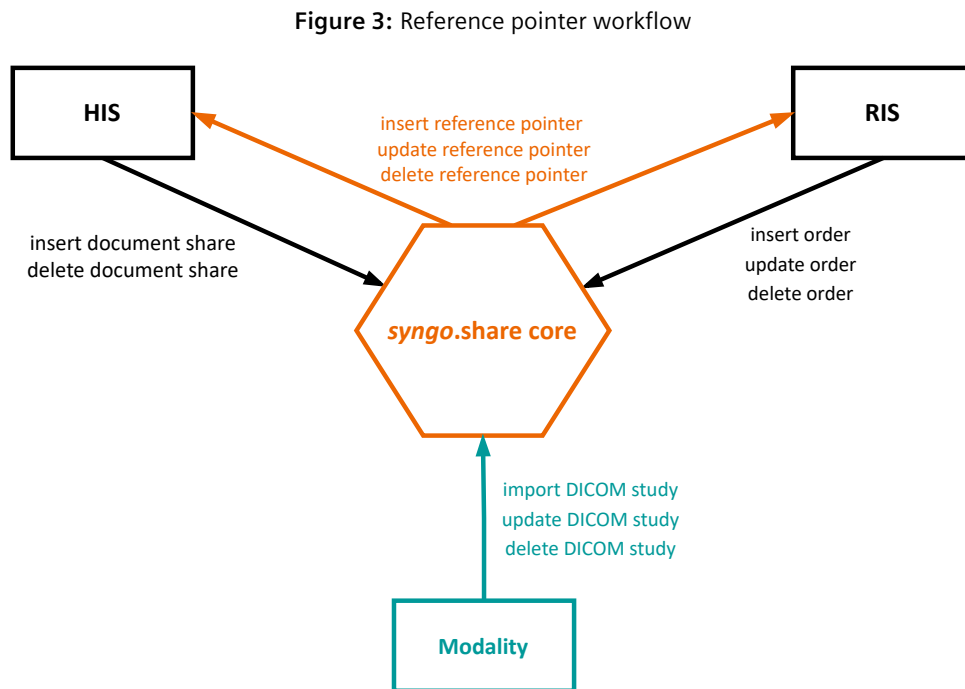
The following sections shows HL7 ORU sample messages for a typical patient encounter. The examples cover HL7 ORU messages which are used by third-party systems to share and delete DICOM studies and generic containers, as well as HL7 ORU messages used by *syngo*.share to transmit and synchronize ref-erence pointers during the creation, update, sharing and deletion of a DICOM study and report.

A.3.1   Creation of a reference pointer (DICOM study)

The following scenario assumes that a patient has arrived at a healthcare facility, their personal data has been stored and forwarded to *syngo*.share, and an order has been scheduled by the RIS and trans-mitted to *syngo*.share in order to proceed with the patient's treatment.

This order is then processed by a modality which sends the created DICOM images to *syngo*.share. As soon as all DICOM images have been archived, a reference pointer addressing the corresponding DI-COM study is sent to the dedicated third-party systems, in this particular example the HIS and RIS, via HL7 ORU R01 messages similar to the one shown in Example 39.

> 💡 **Example 39: HL7 ORU R01 insert DICOM study reference pointer message**
> The following HL7 ORU R01 message inserts a reference pointer to a DICOM study with
> Study Instance UID `1.2.3.4.5.6.7.8.9`. The referenced DICOM study belongs to the

organizational unit `organizationalUnit` and is associated with a visit with visit ID `visit Id` belonging to a patient with patient ID `patientId`.

```
MSH|^~\&|EventServer|organizationalUnit^configuredSendingFacility^L
    |configuredReceivingApplication|configuredReceivingFacility
    |20000102030405.1234||ORU^R01^ORU_R01|1|P|2.8.1|1|||||UNICODE UTF-8
PID|1||patientId^^^assigningAuthority^PI~patientSsn^^^assigningAuthority
    ^SS||lastName^firstName^middleName^suffix^prefix^^^A|
    |20000102030405.1234|M||race^raceDescription|patientStreet^
    ^patientCity^patientState^1234^patientCountry|||||||accountNumber^^
    ^assigningAuthority|||||||||A^austrian
PV1|1|I^inpatient|||||||||||||||||||||visitId^^^assigningAuthority
|||||||||||
    ||||||||||||||||||||alternateVisitId^^^assigningAuthority|V
ORC|OP|placerOrderNumber|fillerOrderNumber||CM
OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
    ^universalServiceDescription|||20000102030405.1234|||||||||||
    |accessionNumber|||||20000102030405.1234|||F
OBX|1|RP|1.2.3.4.5.6.7.8.9^dicomStudyDescription^^dicomStudyId|1
    |RP:2:TENANT_NAME:DICOM_STUDY:1.2.3.4.5.6.7.8.9^^^^100|||CT|||F||
    |20000102030405.1234|organizationalUnit^organizationalUnitDescription
```

A.3.2   Update of a reference pointer (DICOM study)

Afterwards, the DICOM study is analyzed by a radiologist. During the appraisal, the radiologist realizes that some metadata of the created DICOM study are incorrect. To correct these mistakes, the RIS updates the performed order and thus the corresponding DICOM study by sending an appropriate HL7 message. To ensure that *syngo*.share updates the order information of the DICOM study, the metadata update has to be activated.

Once the metadata update is complete, the previously inserted reference pointer is updated via HL7 ORU R01 message, as shown in Example 40.

> 💡 **Example 40: HL7 ORU R01 Update DICOM study reference pointer message**
>
> The following HL7 ORU R01 message updates a reference pointer to a DICOM study with Study Instance UID `1.2.3.4.5.6.7.8.9`. The referenced DICOM study belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visit Id` belonging to a patient with patient ID `patientId`.
>
> ```
> MSH|...
> PID|...
> PV1|...
> ORC|...
> OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
>     ^universalServiceDescription|||20000102030405.1234|||||||||||
>     |updatedAccessionNumber|||||20000102030405.1234|||F
> OBX|1|RP|1.2.3.4.5.6.7.8.9^updatedDicomStudyDescription^^dicomStudyId
> |1
>     |RP:2:TENANT_NAME:DICOM_STUDY:1.2.3.4.5.6.7.8.9^^^^100|||MR|||F||
>     |20000102030405.1234|organizationalUnit^
> organizationalUnitDescription
> ```
>
> The HL7 `MSH`, HL7 `PID`, HL7 `PV1` and HL7 `ORC` segments are identical to those defined in Example 39.

A.3.3　Creation of a reference pointer (generic container)

Next, the radiologist creates a report, which is archived by *syngo*.share. As before, a reference pointer addressing the stored document is sent to the HIS and RIS via HL7 ORU R01 message, similar to the one specified by Example 41.

> 💡 **Example 41: HL7 ORU R01 insert generic container reference pointer message**
>
> The following HL7 ORU R01 message inserts a reference pointer to a generic container with generic container UID `1.2.3.4.5`. The referenced generic container belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visitId` belonging to a patient with patient ID `patientId`.
>
> ```
> MSH|...
> PID|...
> PV1|...
> ORC|...
> OBR|...
> OBX|1|RP|1.2.3.4.5^genericContainerDescription^^genericContainerId|1
>     |RP:2:TENANT_NAME:GENERIC_CONTAINER:1.2.3.4.5^^genericFileId^^1|||.
> pdf
>     |||F|||20000102030405.1234|organizationalUnit
>     ^organizationalUnitDescription
> ```
>
> The HL7 `MSH`, HL7 `PID`, HL7 `PV1`, HL7 `ORC`, and HL7 `OBR` segments are identical to those defined in Example 39.

A.3.4　Update of a reference Pointer (generic container)

If the report is updated, *syngo*.share sends an additional HL7 ORU RO01 to the HIS and RIS to update the inserted reference pointer, as illustrated by Example 42:

> 💡 **Example 42: HL/ ORU R01 update generic container reference pointer message**
>
> The following HL7 ORU R01 message updates a reference pointer to a generic container with generic container UID `1.2.3.4.5`. The referenced generic container belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visitId` belonging to a patient with patient ID `patientId`.
>
> ```
> MSH|...
> PID|...
> PV1|...
> ORC|...
> OBR|...
> OBX|1|RP|1.2.3.4.5^updatedGenericContainerDescription^^
> genericContainerId
>     |1|RP:2:TENANT_NAME:GENERIC_CONTAINER:1.2.3.4.5^^genericFileId^^1||
>     |.pdf|||F|||20000102030405.1234|organizationalUnit
>     ^organizationalUnitDescription
> ```
>
> The HL7 `MSH`, HL7 `PID`, HL7 `PV1`, HL7 `ORC`, and HL7 `OBR` segments are identical to those defined in Example 40.

A.3.5 Sharing of a DICOM study or generic file

The HIS then shares the DICOM study and report to inform the attending doctor about the availability of the two documents as well as to ensure that the attending doctor can access the provided information. To this end, the HIS sends two HL7 ORU RO1 messages to *syngo*.share (see Example 43 and Example 44).

> **Example 43: HL7 ORU R01 insert DICOM study share message**
>
> The following HL7 ORU R01 message creates a share for a DICOM study with Study Instance UID `1.2.3.4.5.6.7.8.9` so that it can be accessed by a user with login name `user`:
>
> ```
> MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
>     |receivingFacility|20000102030405.1234||ORU^R01^ORU_R01|1|P
> |2.8.1|||||
>     |UNICODE UTF-8
> OBX|1|RP||1|RP:2:TENANT_NAME:DICOM_STUDY:1.2.3.4.5.6.7.8.9||||||F||
>     |20000102030405.1234
> PRT|user|LI||PI|user^userLastName^userFirstName^userMiddleName^
> userSuffix
>     ^userPrefix^^^^^^^^^A|||userDomain|^
>     room^^facility|deviceId
> ```

> **Example 44: HL7 ORU R01 insert generic container share message**
>
> The following HL7 ORU R01 message creates a share for a generic container with generic container UID `1.2.3.4.5` so that it can be accessed by a user with login name `user`:
>
> ```
> MSH|...
> OBX|1|RP||1|RP:2:TENANT_NAME:GENERIC_CONTAINER:1.2.3.4.5||||||F||
>     |20000102030405.1234
> PRT|...
> ```
>
> The HL7 MSH and HL7 PRT segments are identical to those defined in Example 43.

A.3.6 Revoking a share

Once the treatment of the patient is finished, the HIS might revoke the created shares by sending HL7 ORU R01 messages like those shown in Example 45 and Example 46.

> **Example 45: HL7 ORU R01 delete DICOM study share message**
>
> The following HL7 ORU R01 message deletes a share for a DICOM study with Study Instance UID `1.2.3.4.5.6.7.8.9` so that it can not longer be accessed by a user with login name `user`.
>
> ```
> MSH|...
> OBX|...
> PRT|user|UN||PI|user^userLastName^userFirstName^userMiddleName^
> userSuffix
>     ^userPrefix^^^^^^^^^A|||userDomain|
>     ^room^^facility|deviceId
> ```
>
> The HL7 MSH and HL7 OBX segments are identical to those defined in Example 43.

A.3.7 Deletion of a DICOM study or generic file

Finally, to delete the DICOM study and report after a certain amount of time, the RIS sends specific HL7 ORU R01 messages like those shown in Example 47 and Example 48.

A.3.8 Deletion of a reference pointer

Since the two documents are no longer accessible, *syngo*.share instructs the HIS and RIS to delete the associated reference pointers by sending HL7 ORU messages similar those shown in Example 49 and Example 50.

```
PV1|...
ORC|...
OBR|1|placerOrderNumber|fillerOrderNumber|universalServiceId
    ^universalServiceDescription|||20000102030405.1234|||||||||||
    |updatedAccessionNumber||||20000102030405.1234|||D
OBX|1|RP|1.2.3.4.5.6.7.8.9^updatedDicomStudyDescription^^dicomStudyId
|1
    |RP:2:TENANT_NAME:DICOM_STUDY:1.2.3.4.5.6.7.8.9^^^^100|||MR|||D||
    |20000102030405.1234|organizationalUnit^
organizationalUnitDescription
```

The HL7 `MSH`, HL7 `PID`, HL7 `PV1` and HL7 `ORC` segments are identical to those defined in
Example 39.

💡 **Example 50: HL7 ORU R01 delete generic container reference pointer message**

The following HL7 ORU R01 message deletes a reference pointer pointing to a generic container with generic container UID `1.2.3.4.5`. The referenced generic container belongs to the organizational unit `organizationalUnit` and is associated with a visit with visit ID `visitId` belonging to a patient with patient ID `patientId`.

```
MSH|...
PID|...
PV1|...
ORC|...
OBR|...
OBX|1|RP|1.2.3.4.5^updatedGenericContainerDescription^^
genericContainerId
    |1|RP:2:TENANT_NAME:GENERIC_CONTAINER:1.2.3.4.5^^genericFileId^^1||
    |.pdf|||D|||20000102030405.1234|organizationalUnit
    ^organizationalUnitDescription
```

The HL7 `MSH`, HL7 `PID`, HL7 `PV1`, HL7 `ORC`, and HL7 `OBR` segments are identical to those defined in Example 49.

A.4 Changing the organizational unit of DICOM studies and generic containers

The HL7 interface can be used to change the organizational unit of DICOM studies and generic containers by HL7 ORU messages.

A.4.1 Changing the organizational unit of a DICOM study

💡 **Example 51: HL7 ORU R01 DICOM study changes organizational unit message**

The following HL7 ORU R01 message changes the organizational unit of DICOM study with Study Instance UID `1.2.3.4.5.6.7.8.9`, identified by the reference pointer. The target organizational unit is `targetOrganizationalUnit`.

```
MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
    |receivingFacility|20000102030405.1234||ORU^R01^ORU_R01|1|P
|2.8.1|||||
    |UNICODE UTF-8
OBX|1|RP|||RP:2:TENANT_NAME:DICOM_STUDY:1.2.3.4.5.6.7.8.9|||||||F
|||20130102030405
ZOU|M|targetOrganizationalUnit
```

A.4.2 Changing the organizational unit of a generic container

💡 **Example 52: HL7 ORU R01 generic container changes organizational unit message**

The following HL7 ORU R01 message changes the organizational unit of generic container with generic container UID `1.2.3.4.5`, identified by the reference pointer. The target organizational unit is `targetOrganizationalUnit`.

```
    MSH|^~\&|sendingApplication|organizationalUnit|receivingApplication
        |receivingFacility|20000102030405.1234||ORU^R01^ORU_R01|1|P
|2.8.1|||||
        |UNICODE UTF-8
  OBX|1|RP|||RP:2:TENANT_NAME:GENERIC_CONTAINER:1.2.3.4.5||||||F
|||20130102030405
  ZOU|M|targetOrganizationalUnit
```

B FHIR example workflows

This appendix contains example workflows for the following:

- FHIR batch/transaction interactions
- FHIR List search
- FHIR DocumentReference search
- FHIR DiagnosticReport search
- FHIR Patient search
- FHIR Encounter search
- FHIR JSON Patch

B.1 FHIR batch/transaction interactions

💡 **Example 53: FHIR batch/transaction Post DiagnosticReport**

```
{
    "resourceType": "Bundle",
    "type": "transaction",
    "entry": [
        {
            "fullUrl": "urn:uuid:05efabf0-4be2-4561-91ce-51548425acd9",
            "resource": {
                "resourceType": "Patient",
                "identifier": [
                    {
                        "type": {
                            "coding": [
                                {
                                    "system": "http://terminology.hl7.org/
CodeSystem/v2-0203",
                                    "code": "PI",
                                    "display": "Patient internal identifier"
                                }
                            ]
                        },
                        "system": "urn:oid
:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                        "value": "fhir_patient_id"
                    }
                ],
                "name": [
                    {
                        "use": "official",
                        "family": "Family",
                        "given": [
                            "Given",
                            "Middle"
                        ],
                        "extension": [
                            {
                                "url": "http://hl7.org/fhir/
StructureDefinition/iso21090-EN-representation",
                                "valueCode": "ABC"
                            }
                        ]
                    }
                ],
                "gender": "male",
```

```
                        "birthDate": "2022-08-29",
                        "_birthDate": {
                            "extension": [
                                {
                                    "url": "http://hl7.org/fhir/StructureDefinition/
patient-birthTime",
                                    "valueDateTime": "2022-08-29T11
:04:05.5678+02:00"
                                }
                            ]
                        }
                },
                "request": {
                    "method": "POST",
                    "url": "Patient"
                }
        },
        {
            "fullUrl": "DiagnosticReport/dr1",
            "resource": {
                "resourceType": "DiagnosticReport",
                "contained": [
                    {
                        "resourceType": "Observation",
                        "id": "observation-001",
                        "status": "final",
                        "code": {
                            "coding": [
                                {
                                    "system": "http://www.radlex.org",
                                    "code": "RID50295",
                                    "display": "PI-RADS Lesion Assessment
Category"
                                }
                            ]
                        },
                        "valueCodeableConcept": {
                            "coding": [
                                {
                                    "system": "http://www.radlex.org",
                                    "code": "RID50323",
                                    "display": "PI-RADS X - Inadequate or
absent (Lesion)"
                                }
                            ],
                            "text": "PI-RADS X - Inadequate or absent"
                        },
                        "component": [
                            {
                                "code": {
                                    "coding": [
                                        {
                                            "system": "http://loinc.org",
                                            "code": "RID11517",
                                            "display": "Index tumor"
                                        }
                                    ]
                                },
                                "valueBoolean": false
                            }
                        ]
                    }
                ],
                "meta": {
                    "source": "urn:FhirSource:ICO",
```

```
                    "extension": [
                        {
                            "url": "http://ith-structuredefinition-for-ou.at
",
                            "valueString": "RADIOLOGY"
                        }
                    ]
                },
                "text": {
                    "status": "generated",
                    "div": "<div xmlns=\"http://www.w3.org/1999/xhtml\">Text
 narrative of DiagnosticReport</div>"
                },
                "identifier": [
                    {
                        "system": "urn:FhirSource:ICO",
                        "value": "20"
                    }
                ],
                "basedOn": [
                    {
                        "type": "ServiceRequest",
                        "identifier": {
                            "type": {
                                "coding": [
                                    {
                                        "system": "http://terminology.hl7.
org/CodeSystem/v2-0203",
                                        "code": "ACSN"
                                    }
                                ]
                            },
                            "system": "urn:oid
:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                            "value": "fhir_accession_number"
                        }
                    }
                ],
                "status": "final",
                "code": {
                    "coding": [
                        {
                            "system": "http://loinc.org",
                            "code": "30675-3",
                            "display": "MR Prostate"
                        }
                    ]
                },
                "subject": {
                    "reference": "urn:uuid:05efabf0-4be2-4561-91ce-51548425
acd9"
                },
                "encounter": {
                    "identifier": {
                        "system": "urn:oid
:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                        "value": "fhir_visit_id"
                    }
                },
                "issued": "2021-12-11T10:28:00+01:00",
                "result": [
                    {
                        "reference": "\#observation-001"
                    }
                ],
```

```
                "imagingStudy": [
                    {
                        "identifier": {
                            "system": "urn:dicom:uid",
                            "value": "urn:oid:1.2.3.4.5.6.77.888.9999"
                        }
                    }
                ],
                "presentedForm": [
                    {
                        "contentType": "pdf",
                        "data": "base64Data",
                        "title": "DR Description"
                    }
                ]
            },
            "request": {
                "method": "POST",
                "url": "DiagnosticReport"
            }
        }
    ]
}
```

Example 54: FHIR batch/transaction Post List

A file may be sent as base64 encoded `Attachment.data` or `Attachment.url`. To provide an url, use operation Binary/$upload to upload a binary body using `request.method` POST.

```
POST https://<server>/webfhir/tenants/<tenant>/fhir/r4/Binary/$upload
result: https://<server>/webfhir/tenants/<tenant>/fhir/r4/Binary/<
createdFileName>/$downloadUploaded
```

Replace `{{binary_upload_url}}` with Binary/$upload result and `{{placeholders}}` with suitable values.

```
{
  "resourceType": "Bundle",
  "type": "transaction",
  "entry": [
      {
          "fullUrl": "urn:uuid:05efabf0-4be2-4561-91ce-51548425acb9",
          "resource": {
              "resourceType": "Patient",
              "identifier": [
                  {
                      "system": "urn:oid:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                      "value": "{{patient_id}}"
                  }
              ],
              "name": [
                  {
                      "family": "{{patient_family}}",
                      "given": [
                          "{{patient_given}}"
                      ]
                  }
              ],
              "gender": "male",
              "birthDate": "{{patient_birth_date}}",
              "_birthDate": {
```

```json
                    "extension": [
                        {
                            "url": "http://hl7.org/fhir/StructureDefinition/
patient-birthTime",
                            "valueDateTime": "{{patient_birth_time}}"
                        }
                    ]
                }
            },
            "request": {
                "method": "POST",
                "url": "Patient"
            }
        },
        {
            "fullUrl": "urn:uuid:bf8d2956-0fb8-4c9a-afaa-c21db7e52a76",
            "resource": {
                "resourceType": "Encounter",
                "identifier": [
                    {
                        "system": "urn:oid:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                        "value": "{{visit_id}}"
                    }
                ],
                "status": "arrived",
                "class": {
                    "system": "https://terminology.hl7.org/3.1.0/CodeSystem-v3
-ActCode.html",
                    "code": "AMB"
                }
            },
            "request": {
                "method": "POST",
                "url": "Encounter"
            }
        },
        {
            "fullUrl": "urn:uuid:4333f3da-f71e-4eee-bb15-464b2b08fbbc",
            "resource": {
                "resourceType": "List",
                "meta": {
                    "extension": [
                        {
                            "url": "http://ith-structuredefinition-for-ou.at",
                            "valueString": "{{organizational_unit}}"
                        }
                    ],
                    "source": "urn:FhirSource:ICO"
                },
                "identifier": [
                    {
                        "system": "http://ith-coding-system.at/{{
generic_container_coding_system_id}}",
                        "value": "{{generic_container_container_id}}-{{$guid
}}"
                    }
                ],
                "status": "current",
                "mode": "working",
                "title": "XDS.b",
                "subject": {
                    "reference": "urn:uuid:05efabf0-4be2-4561-91ce-51548425
acb9"
                },
                "encounter": {
```

```json
                    "reference": "urn:uuid:bf8d2956-0fb8-4c9a-afaa-
c21db7e52a76"
                },
                "date": "{{import_date}}",
                "entry": [
                    {
                        "date": "{{import_date}}",
                        "item": {
                            "reference": "urn:uuid:b096ebdc-a859-46ed-9932-
dcc8450dbfc6",
                            "type": "DocumentReference",
                            "display": "documentReference"
                        }
                    }
                ]
            },
        "request": {
            "method": "POST",
            "url": "List"
        }
    },
    {
        "fullUrl": "urn:uuid:b096ebdc-a859-46ed-9932-dcc8450dbfc6",
        "resource": {
            "resourceType": "DocumentReference",
            "id": "documentReference1",
            "status": "current",
            "type": {
                "coding": [
                    {
                        "system": "http://ith-coding-system.at/FHIR_SYSTEM
",
                        "code": "FHIR_PN"
                    }
                ],
                "text": "FHIR Procedure Note"
            },
            "identifier": [
                {
                    "system": "{{generic_file_application_id}}",
                    "value": "{{generic_file_file_id}}-{{$guid}}"
                }
            ],
            "category": [
                {
                    "coding": [
                        {
                            "code": "delete"
                        }
                    ],
                    "text": "delete"
                }
            ],
            "subject": {
                "identifier": {
                    "system": "urn:oid:1.3.6.1.4.1.9784.10.1.4.1.1000.0",
                    "value": "{{patient_id}}"
                }
            },
            "date": "2023-01-23T09:30:00.000+01:00",
            "securityLabel": [
                {
                    "coding": [
                        {
```

```json
                                    "system": "http://ith-coding-system.at/
    aim_confidentialityCodes",
                                    "code": "N"
                                }
                            ],
                            "text": "Normal Documents"
                        }
                    ],
                    "content": [
                        {
                            "attachment": {
                                "contentType": "application/pdf",
                                "title": "fhir_test.pdf",
                                "creation": "2023-01-23T09:30:00+01:00",
                                "url": "{{binary_upload_url}}"
                            },
                            "format": {
                                "system": "http://ith-coding-system.at/
    aim_formatCodes",
                                "code": "ScanPDF/IHE 1.x"
                            }
                        }
                    ],
                    "context": {
                        "facilityType": {
                            "coding": [
                                {
                                    "system": "http://ith-coding-system.at/
    aim_healthCareFacilityTypeCode",
                                    "code": "1.1.5.1"
                                }
                            ],
                            "text": "Innrain Hospital"
                        },
                        "practiceSetting": {
                            "coding": [
                                {
                                    "system": "http://ith-coding-system.at/
    aim_PracticeSettingCodes",
                                    "code": "0100"
                                }
                            ],
                            "text": "Innere Medizin"
                        }
                    }
                },
                "request": {
                    "method": "POST",
                    "url": "DocumentReference"
                }
            }
        }
    ]
}
```

B.2   FHIR List search

💡 **Example 55: FHIR List search**

This example searches for a List related to a patient with the alphabetic last name "family", title "description" created on "2023-01-01". This search can also be formulated as a POST to `https://<server>/webfhir/tenants/<tenant>/fhir/r4/List/_search`, which would eliminate the need to escape `|` as `%7C`.

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/List?subject:
Patient.family=familyName&issued=eq2023-01-01&title=description
```

B.3   FHIR DocumentReference search

💡 **Example 56: FHIR DocumentReference search**

This example searches for a DocumentReference belonging to List "1.1.1.1" with logical id "1.1.1.1.1" and description "description". This search can also be formulated as a POST to `https://<server>/webfhir/tenants/<tenant>/fhir/r4/DocumentReference/_search`, which would eliminate the need to escape `|` as `%7C`.

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/DocumentReference?
_list=1.1.1.1&description=description&_id=1.1.1.1.1
```

B.4   FHIR DiagnosticReport search

💡 **Example 57: FHIR DiagnosticReport search**

This example searches for a DiagnosticReport related to a patient with the alphabetic last name "family", gender "female", related DICOM Study Instance UID, assigning patient ID authority "system" and patient ID "value". This search can also be formulated as a POST to `https://<server>/webfhir/tenants/<tenant>/fhir/r4/DiagnosticReport/_search`, which would eliminate the need to escape `|` as `%7C`.

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/DiagnosticReport?
subject:identifier=urn:oid:system%7Cvalue&subject:Patient.family=family
&subject:Patient.gender=female&imagingStudy:identifier=urn:dicom:uid%7
Curn:oid:1.2.3.4.5.6.77.888.9999
```

B.5 FHIR Patient search

💡 **Example 58: FHIR Patient search**

This example searches for a patient with the alphabetic last name "family", gender "female", a birth date between 2021-01-01 and 2022-01-01, assigning patient ID authority "system" and patient ID "value". This search can also be formulated as a POST to `https://<server>/webfhir/tenants/<tenant>/fhir/r4/Patient/_search`, which would eliminate the need to escape `|` as `%7C`.

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/Patient?family=
family&gender=female&birthDate=lt2022-01-01&birthDate=gt2021-01-01&
identifier=system%7Cvalue
```

B.6 FHIR Encounter search

💡 **Example 59: FHIR Encounter search**

This example searches for an encounter with admission date greater than "2022-01-01", discharge date less than "2023-01-01", assigning encounter ID authority "system" and ID "value". This search can also be formulated as a POST to `https://<server>/webfhir/tenants/<tenant>/fhir/r4/Encounter/_search`, which would eliminate the need to escape `|` as `%7C`.

```
GET https://<server>/webfhir/tenants/<tenant>/fhir/r4/Encounter?date=
gt2022-01-01&date=lt2023-01-01&identifier=system%7Cvalue
```

B.7 FHIR JSON Patch

💡 **Example 60: FHIR JSON Patch test**

This example tests for a status of "registered" and changes it to "final" if the test succeeds.

```
[
    {
        "op": "test",
        "path": "/status",
        "value": "registered"
    },
    {
        "op": "replace",
        "path": "/status",
        "value": "final"
    }
]
```

Made in Austria