

NoemaLife HL7 Integration Policy

Use Cases and Integration Scenarios

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NoemaLife HL7 Integration Policy: Use Cases and Integration Scenarios

by Davide Musiani and Francesco Masotti

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Chapter 1. Preface

1. Purpose of this document

The aim of this document is to describe the integration scenarios managed by the NoemaLife HL7 Integration Policy. Use Cases will be described in terms of participating Actors and their cooperation.

Just like any software artifact, this document will be fixed, updated and tested as needed. Any feedback is welcome.

2. How to read this document

Aside the first sections, this document leans to a double purpose of giving all the informations that are needed at the first time and, subsequently, be accessed as a reference manual. To this sake, we will follow a bottom-up approach, which also allows to jump back and forth in the document, examining specific subjects once at a time.

The document *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] is meant to add to this one all of the technical informations and specifications related to HL7 2.5 messages formatting, and must be considered an integral part of the NoemaLife HL7 Integration Policy.

3. Intended audience

This document should be read by anyone having some role within:

- the software production and maintenance process (analysts and developers), in order to have a common basis between all NoemaLife products for "internal" legacy integrations amongst products
- the cutomers' projects deployment of internal legacy integrations, to understand their logics and features.

4. Compliance against this document

As of this writing a wide variety of projects is in progress within the NoemaLife group. This document is binding for all the projects started from the final release of this document; projects that are already active are expected to tend to this specification and possibly schedule converging activities.

5. Future directions

At the date of release of this document, the following issues and items are *not supported* and identified as possible future document's enhancements and extensions:

- Additional transaction in Emergency Scenario to manage bed/room transfer inside the ER department (ADT^A02 message as possible choice)
- Update of Pre-Admission (ADT^A05) events (possibly using ADT^A08 messages)
- Management of Filler Order Management transaction (*IHE Laboratory Technical Framework* [IHE-ITI-LTF], transaction LAB-2)
- Enhancement of Laboratory Order Result Management transaction to manage "Deletion of Battery/Test in a Filler Order"
- Use of additional OBX or NTE segments for carrying comments to Laboratory results (at present are inserted in OBX-17, not compliant with HL7 but simpler to manage)
- Management of comments/notes to the Laboratory Order and to the requested Tests (Elementary or Complex)

- Structured Radiology Report export ([IHE-RAD-TF]), transaction RAD-28 (ORU^R01)
- Appointment Notification ([IHE-RAD-TF]), transaction RAD-48 (SIU messages)
- Schedules of appointments (HL7 Chapter 10)
- Financial Management (HL7 Chapter 6), Update Diagnosis/Procedures (BAR^P12)

Loc IT

- Notifica prestazioni erogate

6. Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, and “MAY” in this document are to be interpreted as described in *RFC 2119* [RFC-2119].

7. Changes log

Revision History

Revision 0.5.1

14 May 2013

Davide Musiani

- The use of segment BLG is now recommended in all messages where is has been included (OML^O21, OML^O33, OMG^O19)
- Document Management part:
 - Structure of messages MDM^T02 in "Original Document Content Notification" and consequently MDM^T10 in "Replacement Document Content Notification" now requires segment OBR if segment ORC is used (that is, OBR segment is no more optional if segment ORC is used, as per HL7 2.5 standard)
 - Optional segment ORC has been removed from messages MDM^T11 in "Cancel Document Notification" and MDM^T03 in "Document Status Change Notification". Essential informations previously transmitted in ORC segment (mainly Filler Order Number and Placer Order/Group Number) are now managed in TXA segment (TXA-14 and TXA-15).
 - A complete "Common Order Group", including ORC, TQ1 and OBR segments, has been introduced in messages MDM^T01 for use case "Original Document Link Notification" and MDM^T09 for use case "Replacement Document Link Notification"

Revision 0.5.0

14 March 2013

Davide Musiani Francesco Masotti

- Patient Encounter Management: introduced the use of ADT^A08 messages to update/modify previously sent events.

Revision 0.4.0

11 January 2013

Davide Musiani , Francesco Masotti

- Document Management part: the "Document Link" use case has been split in "Original Document Link Notification" and "Replacement Document Link Notification", in order to better describe expected actions for participating actors.
- Document Management part: use case "Original Document Notification" has been renamed in "Original Document *Content* Notification"; use case "Replacement Document Notification" has been renamed in "Replacement Document *Content* Notification".
- Patient Identity Management part: optional segment PV2 has been removed from the messages for the Create, Update and Merge person use cases.
- Laboratory Placer Order Management: in the "Laboratory Order Status Changed" use case message OML^O33, previously used to transmit LIS order status updates, has been replaced by message OML^O21

Revision 0.3.0

28 September 2012

Davide Musiani , Francesco Masotti

- Enhancements and fixes in HL7 acknowledgement logics (on Order Entry messages, in particular) to have a better compliance to standards and an easier implementation
- Rework of General Clinical Order Management part, now inspired by IHE Radiology Framework v.11 transactions
- Enhanced structure of messages OMG^O19, OML^O21 and OML^O33 to introduce optional "dummy" segment in case of ambiguous parsing of ORDER_PRIOR segments group at the receiver

Revision **0.2.0**

28 June 2012

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FIRST OFFICIAL RELEASE

Revision **0.1.0**

21 May 2012

Davide Musiani , Francesco Masotti

RequestForComment version (RFC)

Part I. Patient Administration Management

Use cases

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Chapter 2. Patient Administration Management overview

The Patient Administration Management establishes the continuity and integrity of patient data, and additional information such as related persons (primary caregiver, guarantor, next of kin, etc.). It coordinates the exchange of patient registration and update information among systems that need to be able to provide current information regarding a patient's encounter status and location. This profile supports ambulatory and acute care use cases including patient identity feed, admission, discharge, transfer and encounter management.

1. Use cases transactions in Patient Administration

According to the *IHE IT Infrastructure Integration Framework* [IHE-ITI-TF], use cases included in Patient Administration Management can be divided into two main "categories", or transactions:

- **Patient Identity Management**, that is related to the management and exchange of demographic information only. This category relates to Transaction ITI-30, "Patient Identity Management" of the IHE IT Infrastructure Technical Framework.
- **Patient Encounter Management**, that involves the management and exchange of both demographic data and encounter data. This category relates to Transaction ITI-31 "Patient Encounter Management" of the IHE IT Infrastructure Technical Framework.

2. Actors

Several actors are involved in Patient Administrator Management, interacting each other in a supplier-consumer model.

In the case of Patient Identity Management transaction, they are:

Patient Demographic Supplier (or Source) The Patient Demographic Supplier role is to add and modify patient demographics.

Patient Demographic Consumer Is the consumer (receiver) of patient demographics data added or modified by Patient Demographic Supplier.

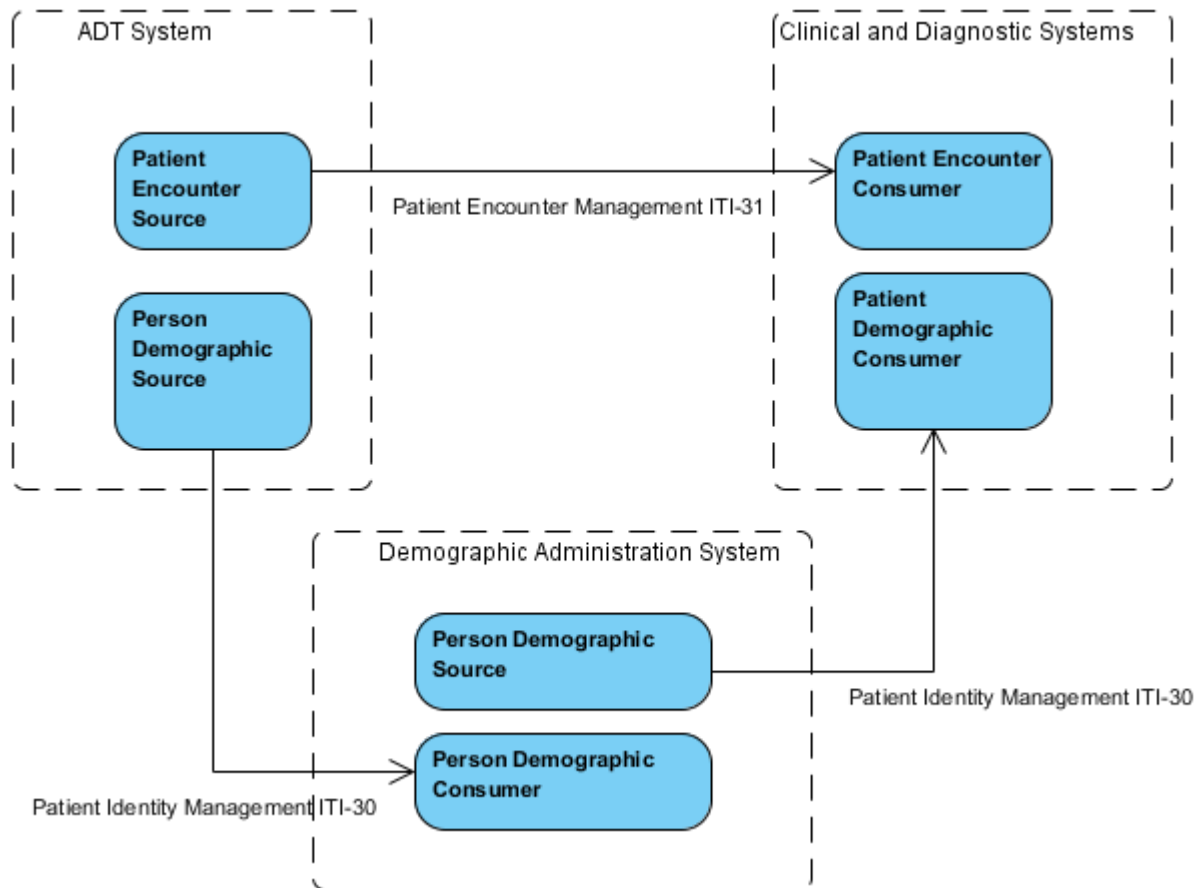
For Patient Encounter Management transaction, the participating actors are:

Patient Encounter Supplier (or Source) The Patient Encounter Supplier adds and modifies both patient demographics and patient encounter information.

Patient Encounter Consumer Patient Encounter Consumer receives adds and modifications of demographic and encounter data managed by Patient Encounter Supplier

3. Process Flow

The following schema shows systems that may be involved in Patient Administration Management, the transactions that may take place and the participating actors.



4. Communication implementation

The IHE directives are taken into account, thus the use cases described in the following chapters will be implemented by using **HL7 2.5 messages, pipe-separated format**.

For the sake of clarity and easiness of reading, only the segments structure of messages will be described, leaving the detailed specifications of segments and fields contents to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG]. The HL7 messages structure will be described using the syntax explained in Messages Description Conventions section.

In the following, the description of the use cases will be given from a functional point of view only; details on the low-level HL7 protocol communication issues (e.g. acknowledgments, TCP/IP communication, messages envelopes, etc.) will be covered in section MLLP Communication Protocol.

5. Future directions

At the date of release of this document, the following issues and items are *not supported* and identified as possible future document's enhancements and extensions:

- Additional transaction in Emergency Scenario to manage bed/room transfer inside the ER department (ADT^A02 message as possible choice)
- Update of Pre-Admission (ADT^A05) events (possibly using ADT^A08 messages)

Chapter 3. Patient Identity Management

This transaction transmits patient demographics in a patient identification domain (i.e., patient identifiers assigned by the same assigning authority).

The term “patient demographics” is intended to convey the patient identification and full identity and also information on persons related to this patient, such as primary caregiver, family doctor, guarantor, next of kin, etc., as well as clinical or administrative information. The transaction contains events for creating, updating and merging persons; other possible use cases (e.g. cancel, link, unlink, unmerge) are not managed at present.

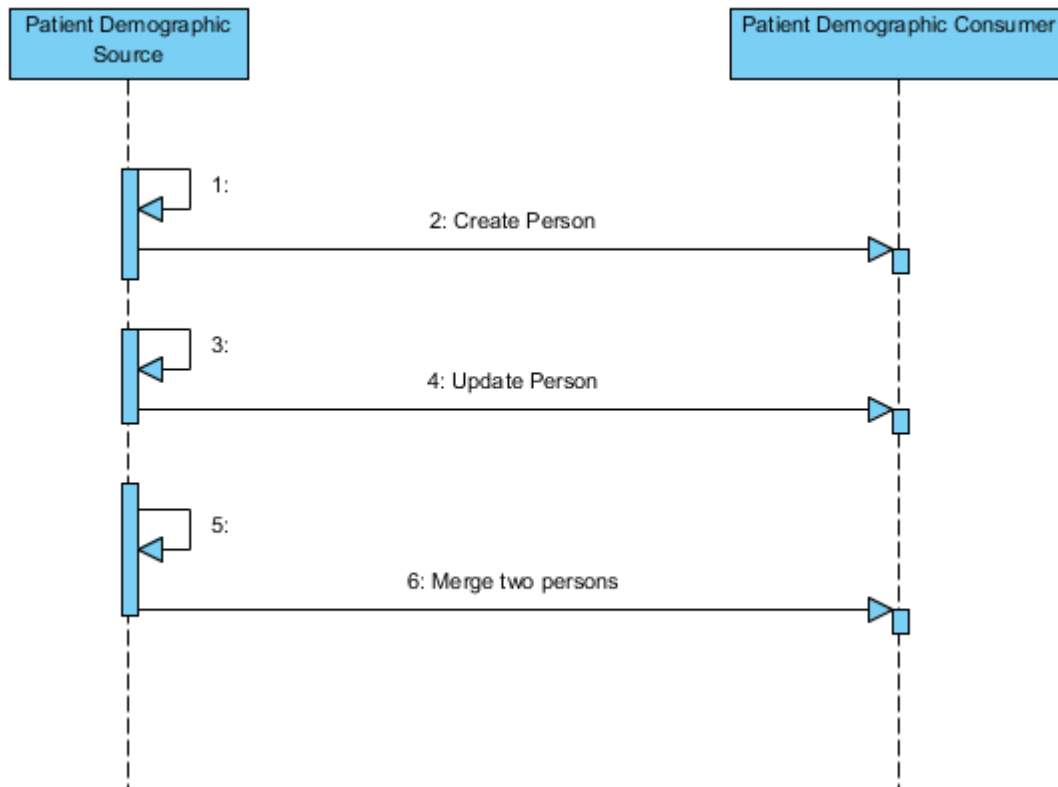
The transaction has general purpose scope, and can be used in all patient scenarios: inpatients (i.e., those who are assigned a bed at the facility), outpatients (i.e., those who are not assigned a bed at the facility), emergency rooms and acute care, ambulatory, day hospital, etc.

Actors involved in the transaction are the Patient Demographic Source (or Supplier) and the Patient Demographic Consumer:



Only some of the use cases described in IHE ITI-30 transaction will be considered and managed, and more specifically:

- Create Person
- Update Person Information
- Merge two persons



HL7 2.5 messages are used to transmit information from Patient Demographic Source to Patient Demographic Consumer.

1. Use Cases

1.1. Create Person

The message communicates a new person's demographic information. Contains person's identifiers and any demographic information that is known about a person, including primary caregiver, family doctor, guarantor, next of kin,

1.1.1. Trigger Event

This message is sent by a Patient Demographics Supplier to a Patient Demographics Consumer to communicate the demographics of a new patient, as well as related information.

1.1.2. Expected Actions

Important

The following Expected Actions are valid under the assumption that the Patient Demographics Supplier is a "reliable" data source (e.g. the enterprise Master Patient index). Under different conditions rules **MAY** be changed by local agreement, pursuing the goal of a reliable and secure patient data exchange.

Patient Demographics Supplier:

- after insertion of a new patient's record, **MUST** compose and send an HL7 2.5 **ADT^A28** message
- **MUST** include in the message **all** the available demographic information about the person.
- Special care shall be put in defining and sending the person identifiers available, and especially:

- All the available person identifiers **MUST** be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer;
- All the person identifiers sent **MUST** be completely and clearly qualified, using the standard NoemaLife qualifiers

Patient Demographics Consumer:

- **MUST**, if patient record is not already present in the Patient Demographics Consumer database, process the message and import/add **all** of the patient's data it's able to manage;
- **SHOULD**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out accordingly to the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements.

1.1.3. HL7 message structure

Table 3.1. Create Person - ADT^A28 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.2. Update Person Information

The message is used to communicate changes in a person's demographic data. The message can be used to update anything that is known about a person, including his health care information (doctor,...) and other related information (ex. relatives, etc.).

1.2.1. Trigger Event

This message is sent by a Patient Demographics Supplier to a Patient Demographics Consumer to update the demographics of an existing patient.

1.2.2. Expected Actions

Important

The following Expected Actions are valid under the assumption that the Patient Demographics Supplier is a "reliable" data source (e.g. the enterprise Master Patient index). Under different conditions rules **MAY** be changed by local agreement, pursuing the goal of a reliable and secure patient data exchange.

Patient Demographics Supplier:

- after update to a patient's record, **MUST** compose and send an HL7 2.5 **ADT^A31** message
- the message **MUST** include **all** of the available demographic information about the person
- Special care shall be put in defining and sending the person identifiers available, and especially:

- All the available person identifiers **MUST** be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer;
- All the person identifiers sent **MUST** be completely and clearly qualified, using the standard NoemaLife qualifiers

Patient Demographics Consumer:

- **MUST**, if patient record is already present in the Patient Demographics Consumer database, process the message and update **all** of the patient's data it's able to manage;
- **SHOULD**, in case the person data is not already stored in the database, create a new demographic record, following the rules of the Create Person use case. Nevertheless this may not apply under specific circumstances or by local project agreements.

1.2.3. HL7 message structure

Table 3.2. Update Person Information - ADT^A31 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	
[PD1]	Additional demographic	O	
[{NK1}]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.3. Merge two persons

The message is used to communicate that a 'deprecated' demographic record must be joined to a correct demographic record.

1.3.1. Trigger Event

The Patient Demographics Supplier notifies to a Patient Demographics Consumer, the merge of records for a patient that was incorrectly filed under two different identifiers.

1.3.2. Expected Actions

Important

The following Expected Actions are valid under the assumption that the Patient Demographics Supplier is a "reliable" data source (e.g. the enterprise Master Patient index). Under different conditions rules **MAY** be changed by local agreement, pursuing the goal of a reliable and secure patient data exchange.

Patient Demographics Supplier:

- after merge operation, **MUST** compose and send an HL7 2.5 **ADT^A40** message
- message **MUST** include **all** the available demographic information about the "master record" person
- message **MUST** include **all** the available patient identifiers for the "deprecated record" person.

- Special care shall be put in defining and sending the person identifiers available, both for "master record" and for "deprecated record":
 - All the available person identifiers **MUST** be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer;
 - All the person identifiers sent **MUST** be completely and clearly qualified, using the standard NoemaLife qualifiers

Patient Demographics Consumer:

- **SHOULD** process the message accordingly to the following implementation options:
 - The **RECOMMENDED** merge mode is the "logical" one, where both database records continue to exist and a link is created between them, making the deprecated one an invisible, unusable "slave" of the master one. This allows better traceability and facilitates the possibility to recover to the pre-merge condition, in case of errors.
 - Another possibility is to operate a full, "physical" merge, where the old deprecated record is deleted from the database and all related information is moved (or re-linked) to the master, living record.
 - A third possibility is to ignore the merge notification at all, but it should be considered only under specific functional requirements or local projects agreements; whenever possible, this approach is **NOT RECOMMENDED**.
- In all cases, a comprehensive and durable tracing of the operations **REQUIRED**, in order to guarantee the possibility to analyze problems and errors that may arise from the merge operation, that may sometime have serious consequences.
- Moreover, when the merge operation takes place there still is the possibility that other data is sent to the Patient Demographics Consumer actors referencing the "deprecated" patient (e.g. observation or clinical data required before the merge operation); in such cases, the Patient Demographics Consumer **MUST** be able to accept the data and link it to the "master" record of the person.
- There may exist special cases, that happens when at the Patient Demographics Consumer one or both of the records are not present on the database.
 - if the master record is available in the database but the deprecated record is not, then the merge notification **MUST** be processed according to the rules of the Update Person Information use case.
 - if the deprecated record is available in the database but the master record is not, then the master record **MUST** be inserted first, like in the Create Person use case, and then the merge operation can take place.
 - if both master and deprecated records are not available, the merge operation **MUST** be processed like the Create Person use case.

1.3.3. HL7 Message structure

Table 3.3. Merge two persons - ADT^A40 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	
[PD1]	Additional demographic	O	
MRG	Merge Information	R	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Chapter 4. Patient Encounter Management

This transaction enables systems to share encounter information within acute care settings for both inpatients (i.e., those who are assigned an inpatient bed at the facility) and outpatients (i.e., those who are not assigned an inpatient bed at the facility). The transaction carries events for creating, updating, and canceling patient encounters as well as the movements that take place within these encounters.

Inside clinical organizations, several different type of encounter may take place:

- Inpatient encounters
- Outpatient / Ambulatory encounter
- Emergency encounter
- Short-stay encounter (e.g. Day Hospital, Day Surgery, etc.)
- Pre-admission encounters
- Follow-up / Post-admission encounter

Each one of this encounter types can be seen as a "**scenario**", composed in turn by many single use cases and messages. For the most of the scenarios, the actors involved are the Patient Encounter Supplier (or Source) and the Patient Encounter Consumer, relating each other as described in the generic use case diagram below:



Usually, the Patient Encounter Supplier role is played by an ADT or similar Hospital Registration system, while the Patient Encounter Consumer role is played by the other hospital systems needing to know about patient encounters and movements (e.g. EMR, specific diagnostic systems, etc.).

Nonetheless, in some scenarios there are also other actors or interactions that may come into play; specific use cases diagrams and actors will be described when needed in each scenario chapter.

Patient Encounter Supplier goal SHALL be to transmit **all** the administrative and clinical information that is available in its database, in order to give the highest level of detail to the receiver, allowing it to precisely record the patient's movement and status (both administrative and clinical).

Patient Encounter Consumer will process incoming messages with different objectives, depending on its characteristics:

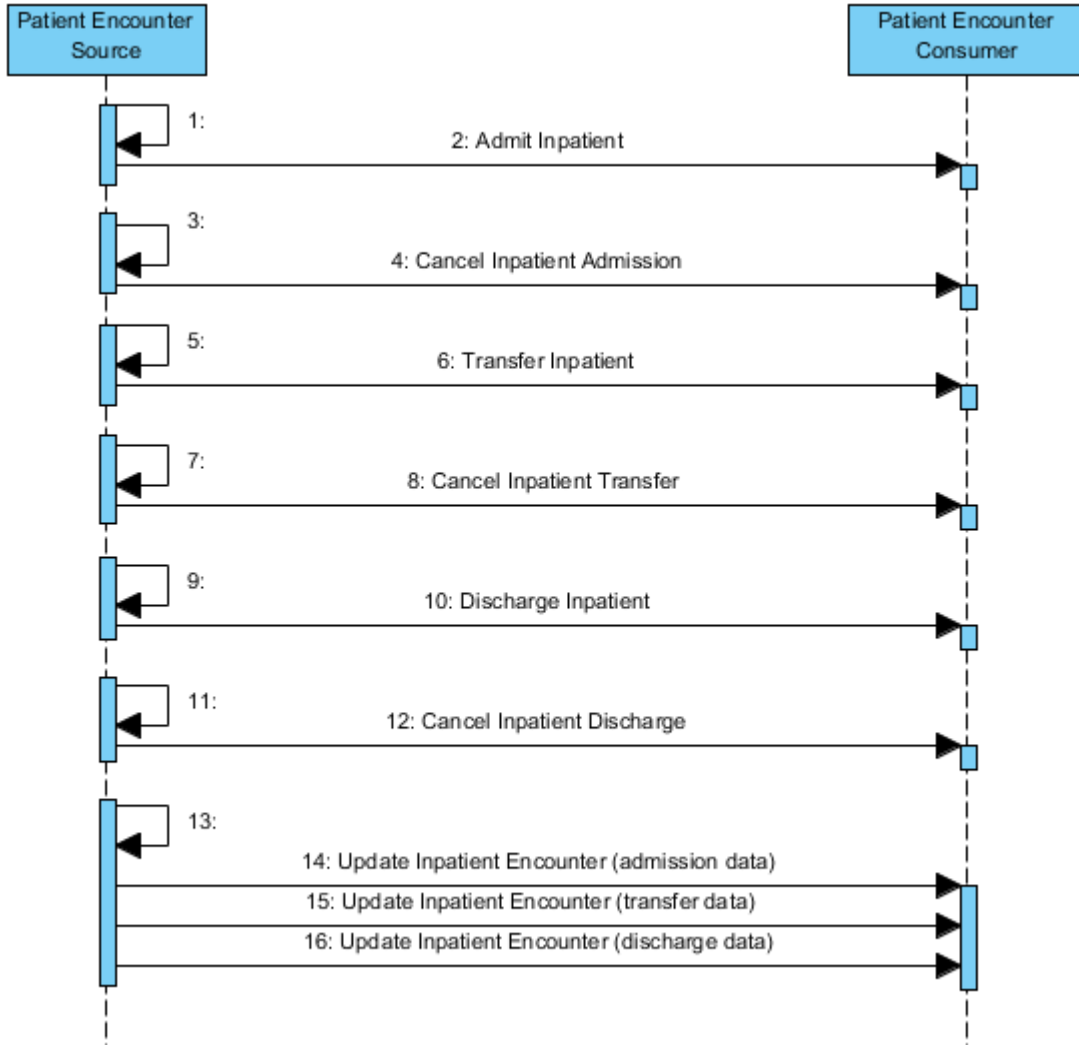
- if the Patient Encounter Consumer implements "repository-like" functions, then it SHOULD import and process **all** the information that is able to store in its database, allowing the final user to have a wider and more detailed view on patients
- if the Patient Encounter Consumer implements "diagnostic service-like" functions, then it SHOULD import and process **at least** the information that allows a correct, complete and unambiguous communication of the data produced to the main hospital stakeholders (Order Placers, Repository, etc.)

In the following, each scenario will be analysed and explained in detail.

1. Inpatient scenario

This scenario is related to any encounter where a patient is admitted by a hospital or equivalent facility, assigned to a location where patients generally stay at least overnight and provided with room, bed, board and continuous nursing service. Such a scenario is commonly referred to as “inpatient” care.

Use cases managed in this scenario are represented in the following sequence diagram:



1.1. Admit Inpatient

1.1.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient has arrived at a healthcare facility for an episode of care in which the patient is assigned to bed.

1.1.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient admission, **MUST** compose and send an HL7 2.5 **ADT^A01** message.
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included, and has to be guaranteed its uniqueness within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment) • Admit date/time MUST be included, at least with minute-level detail • Patient Class MUST be included, stating that the encounter is related to an Inpatient • Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name, bed and room are recommended) • If the encounter were generated as a consequence of previous encounter (e.g. pre-admission, ER encounter, etc.), then Preadmit Number SHOULD be included, to allow linking of encounters for clinical traceability • It is REQUIRED to include an unique identifier of the admission event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis, Allergies and Relatives (Next of Kin)

Patient Encounter Consumer:

- **SHOULD** change patient's status to reflect the admission operation. An Inpatient encounter **SHOULD** always have higher relevance related to other types of encounter (e.g. short-stay, outpatient, etc.), thus an inpatient admission should change the patient status to "admitted as inpatient" even if other encounters of different types was already open for the same patient.
- **MUST** discard the message, ad raise an error, if the same encounter is already recorded in the database but associated to another patient, and no merge operations have been previously notified between the two patients
- **MUST** use the unique identifier sent by the Patient Encounter Supplier for the admission event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- **SHOULD** link the admission to the previous encounter (typically pre-admission o ER encounter) if the Preadmit Number was sent by the Patient Encounter Supplier. Two options can be considered:
 - merging the previous encounter into the inpatient admission, thus hiding the previous encounter and letting the inpatient encounter to "inherit" all its data (ex. clinical orders, results, etc.);
 - leaving both the encounters visible and independent each others, but allowing functionalities to see data of one encounter from the other.

As a rule of thumb, the first option is suitable for linking Pre-admission encounters, while the second is for ER and Follow-up encounters.

In both cases, a logical linking/merging operation is RECOMMENDED; traceability and reversibility of the operation are REQUIRED.

1.1.3. HL7 Message definition

Table 4.1. Admit Inpatient - ADT^A01 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the admission event)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.2. Cancel Inpatient Admission

1.2.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify to a Patient Encounter Consumer the cancellation of a previously sent inpatient admission.

1.2.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient admission cancellation, MUST compose and send an HL7 2.5 **ADT^A11** message.
- MUST allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
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Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Inpatient • It is REQUIRED to include the unique identifier of the admission event (e.g. Patient Encounter Supplier internal identifier) sent during the admission
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Patient Encounter Consumer: .

- **MUST** change patient's status to reflect the cancellation of the admission, which means it should be restored to the value prior to patient admission.
- **SHOULD** discard the message, raising at most a warning or a non blocking error, in case the cancellation is inconsistent with the current situation for the patient (e.g. the patient admission event or the whole encounter is not existing)
- **SHOULD** manage the admission event cancellation as a logical operation, letting the admission not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the cancellation, whether the operation is logical or physical.
- The cancellation operation **SHOULD** entail the complete cancellation of the visit and all of the related data (e.g. clinical info already attached to the visit).
- There may be cases where, after cancellation of an admission, the same Visit Number can be reused and re-assigned to another patient; for this reason it is also **REQUIRED** the Patient Encounter Consumer to allow such a possibility, by properly managing the cancelled data and excluding it from data consistency checks.

1.2.3. HL7 Message structure

Table 4.2. Cancel Admit Inpatient - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the admission event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.3. Transfer Inpatient

1.3.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient is being transferred from one location to another.

It must be remarked that, in the case of inpatients, the location of patient is ultimately the bed; thus, this event will be normally used to notify a change in the ward the patient is assigned to, but taking to an extreme it could be also be used to notify changes of room or even bed within the same ward, if needed.

1.3.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient admission cancellation, **MUST** compose and send an HL7 2.5 **ADT^A02** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, encounter and transfer; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is REQUIRED to include in the message all the available demographic information about the person.
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Inpatient • Transfer date/time MUST be included, at least with minute-level detail • New Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name, bed and room are recommended) • It is REQUIRED to include an unique identifier of the transfer event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit

Patient Encounter Consumer:

- **MUST** change patient's status to reflect the new location.
- In case the transfer conflicts with the current situation for the patient, due to visit or patient missing, the message **SHOULD** be processed anyway applying the same rules of the Admit Inpatient use case, except for the creation of the admission event; this will mean the creation of patient or visit, if one or both does not exist, or the message discard, in case of mismatches in the patient-visit relation.
- **MUST** use the unique identifier sent by the Patient Encounter Supplier for the transfer event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates or cancellation).

1.3.3. HL7 Message structure

Table 4.3. Transfer Inpatient - ADT^A02 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Transfer date/time)

Segment	Meaning	Usage	Notes
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the transfer event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.4. Cancel Inpatient Transfer

1.4.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to a Patient Encounter Consumer to cancel a previous notification that a patient was being moved from one location to another.

1.4.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient admission cancellation, **MUST** compose and send an HL7 2.5 **ADT^A12** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, encounter and transfer; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Inpatient • Transfer date/time MUST be included, at least with minute-level detail • It is REQUIRED to include the unique identifier of the transfer event previously sent (e.g. Patient Encounter Supplier internal identifier), in order to allow the Patient Encounter Consumer to reliably find the event to be cancelled.

Patient Encounter Consumer:

- **MUST** use the unique event identifier sent by the Patient Encounter Supplier to reliably locate the event to be deleted
- In case the cancellation points to a non-existing previous transfer event, the message **SHOULD** be discarded but no error condition is required to be raised at the Patient Encounter Consumer.
- **MUST** change patient's status to reflect the cancellation of the transfer, which means the patient location should be restored to the value prior to the patient transfer
- **SHOULD** manage the transfer event cancellation as a logical operation, letting the event not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the cancellation, whether the operation is logical or physical.

1.4.3. HL7 Message structure

Table 4.4. Cancel Inpatient Transfer - ADT^A12 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Transfer date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the transfer event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.5. Discharge Inpatient

1.5.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient stay at a healthcare facility has ended.

1.5.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient discharge, **MUST** compose and send an HL7 2.5 **ADT^A03** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail • Patient Class MUST be included, stating that the encounter is related to an Inpatient • It is REQUIRED to include an unique identifier of the discharge event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit.
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis and Procedures

Patient Encounter Consumer:

- **MUST** change patient's status to reflect the discharge operation

- **MUST** use the Patient Encounter Supplier unique event identifier as its internal identifier (or at least use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- In case the discharge conflicts with current patient status (e.g. encounter is not existing):
 - If the Patient Encounter Consumer implements "diagnostic service-like" functions, it **SHOULD** discard the message, raising at most a warning or a non blocking error,
 - If the Patient Encounter Consumer implements "repository-like" functions, it **SHOULD** process the message anyway, creating patient and encounter if needed and then recording the discharge event.
- **SHOULD** process Diagnosis and Procedures information included in the message

1.5.3. HL7 Message structure

Table 4.5. Discharge inpatient - ADT^A03 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the discharge event)
[[DG1]]	Diagnosis information	O..*	
[[PR1]]	Procedure information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.6. Cancel Inpatient Discharge

1.6.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to a Patient Encounter Consumer to cancel a previous notification that a patient stay at a healthcare facility had ended.

1.6.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient discharge, **MUST** compose and send an HL7 2.5 **ADT^A13** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
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Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail • Patient Class MUST be included, stating that the encounter is related to an Inpatient • It is REQUIRED to include the unique identifier of the discharge event previously sent (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled
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Patient Encounter Consumer:

- **SHOULD** restore the patient's status to "admitted"
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing discharge
- **SHOULD** manage the discharge event cancellation as a logical operation, letting the event not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the cancellation, whether the operation is logical or physical.

1.6.3. HL7 Message structure

Table 4.6. Cancel Inpatient Discharge - ADT^A13 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the discharge event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.7. Update Inpatient Encounter

1.7.1. Trigger Event

The Update Inpatient Encounter use case is actually composed by three sub-cases. Different messages will be sent by a Patient Encounter Supplier to notify a Patient Encounter Consumer that some information has changed for the admit, transfer or discharge events (such as admit date or ward, discharge date, etc.) and, in case, for the patient (such as address, date of birth, etc.).

Changes related to patient demographic data only **SHOULD NOT** be addressed by this use case but rather with the Update Person Information use case.

Important

The changes notified via this events and messages **MUST NOT alter the assignment of a visit to a patient**. To alter the patient-visit assignment, the Patient Encounter Supplier :

- **SHOULD** apply the Move Visit use case (RECOMMENDED choice)

- MAY, as an alternative, cancel completely the "old" encounter and insert a "new" one with the new patient-visit assignment

1.7.2. Expected Actions and messages

Patient Encounter Supplier:

- after registration of update, MUST compose and send an HL7 2.5 ADT^A08 message;
- The structure and content of A08 message is strictly related to the type of event it aims to update.
 - Updates to an Admit Inpatient event are notified using an ADT^A08 having the same structure of the original ADT^A01 message (see [Admit Inpatient](#)), except for field **EVN-4 that will contain value "A01"**;
 - Updates to a Transfer Inpatient event are notified using an ADT^A08 having the same structure of the original ADT^A02 message (see [Transfer Inpatient](#)), except for field **EVN-4 that will contain value "A02"**;
 - Updates to a Discharge Inpatient event are notified using an ADT^A08 having the same structure of the original ADT^A03 message (see [Discharge Inpatient](#)), except for field **EVN-4 that will contain value "A03"**;

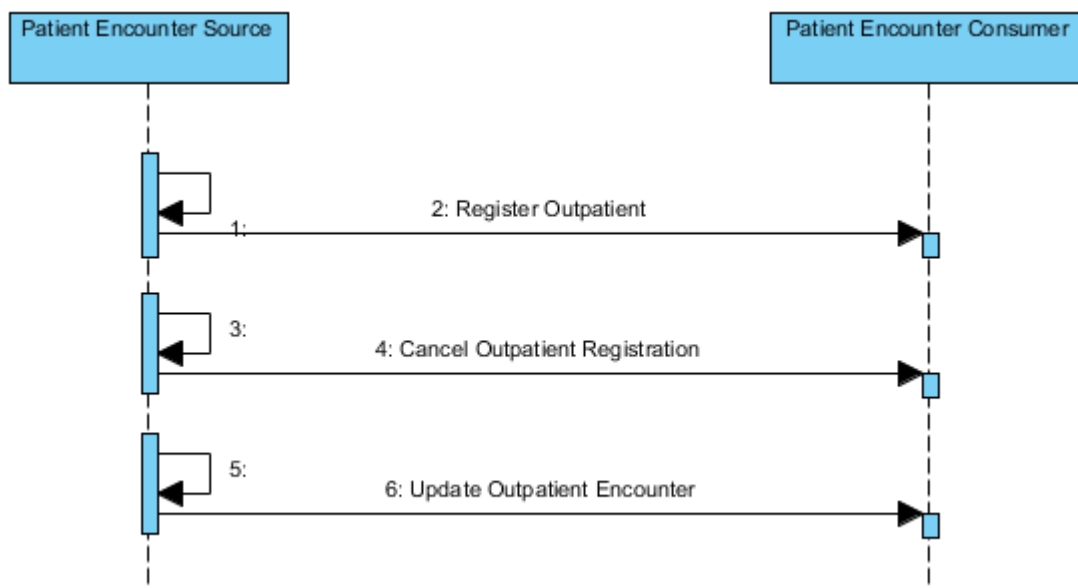
Patient Encounter Consumer:

- MUST process A08 messages related to inpatient admission (EVN-4="A01") using the same logics and rules described in [Admit Inpatient](#);
- MUST process A08 messages related to inpatient transfer (EVN-4="A02") using the same logics and rules described in [Transfer Inpatient](#);
- MUST process A08 messages related to inpatient discharge (EVN-4="A03") using the same logics and rules described in [Discharge Inpatient](#);

2. Outpatient scenario

The term "outpatient" is related to an encounter where the patient has come to a facility where health care is provided on a non-emergency basis, including diagnostic, therapeutic and health maintenance services, and patient's stay does not requires the assignment to a bed. Sometimes is referred to as an "Ambulatory encounter".

Use cases managed in this scenario are represented in the following sequence diagram:



It must be noted that an "outpatient encounter closure" is not considered in this scenario, since does not seem to be a significant event and frequently is not recorded/managed at the Patient Encounter Supplier.

2.1. Register Outpatient

2.1.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient has arrived at a healthcare facility for an episode of care in which the patient is not assigned to a bed. Examples of such episodes include outpatient visits and ambulatory care encounters.

2.1.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient arrival, **MUST** compose and send an HL7 2.5 ADT^A04 message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter

Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the outpatient encounter. It has to be unique within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment) • Admit date/time MUST be included, at least with minute-level detail, to transmit the date of arrival/visit start • Patient Class MUST be included, stating that the encounter is related to an Outpatient • Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name is also recommended). In this scenario, will represent the unit/ambulatory that will provide "ambulatory" health care. • It is REQUIRED to include an unique identifier of the registration event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit

Patient Encounter Consumer:

- **MAY** change the patient's status to reflect the registration operation. An Outpatient encounter has low priority related to Inpatient, Emergency and Short-Stay, thus the outpatient opening **MUST NOT** alter patient status in case such encounters are still open.
- **MUST** use the Patient Encounter Supplier unique event identifier as its internal identifier (or at least use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- Outpatient registrations does not usually conflict with other patient movements (e.g. inpatient movements or other outpatient movements), thus the Patient Encounter Consumer **SHOULD** in all cases manage the event; **MUST** discard the message, ad raise an error, only if the same encounter is already recorded in the database but associated to another patient, and no merge operations have been previously notified between the two patients.

- **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

2.1.3. HL7 Message definition

Table 4.7. Register Outpatient - ADT^A04 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2.2. Cancel Outpatient Registration

2.2.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify to a Patient Encounter Consumer the cancellation of a previously sent outpatient registration.

2.2.2. Expected Actions

Patient Encounter Supplier:

- after cancellation of outpatient registration, **MUST** compose and send an HL7 2.5 **ADT^A11** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the outpatient encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Outpatient

	<ul style="list-style-type: none"> • Admit date/time MUST be included, at least with minute-level detail, to transmit the date of arrival/visit start • It is REQUIRED to include the unique identifier of the registration event previously sent (e.g. Patient Encounter Supplier internal identifier), in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled
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Patient Encounter Consumer:

- **SHOULD** change the patient's status to reflect the cancellation of the registration, which means it should be restored to the value prior to the fake registration.
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing discharge
- **MUST** use the Patient Encounter Supplier unique event identifier to locate the event to delete
- **SHOULD** cancel the outpatient event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical
- **SHOULD** perform a complete cancellation of the visit and all of the related data (e.g. clinical info already attached to the visit).
- There may be cases where, after cancellation of a registration, the same Visit Number can be reused and re-assigned to another patient; for this reason it is also **REQUIRED** the Patient Encounter Consumer to allow such a possibility, by properly managing the cancelled data and excluding it from data consistency checks.

2.2.3. HL7 Message structure

Table 4.8. Cancel Outpatient Registration - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2.3. Update Outpatient Encounter

2.3.1. Trigger Event

The Update Outpatient Encounter use case applies when a Patient Encounter Supplier need to notify a Patient Encounter Consumer that some information has changed for the outpatient registration event (such as registration

date, unit/ward, etc.) and, in case, for the patient (such as address, date of birth, etc.). Changes related to patient demographic data only **SHOULD NOT** be addressed by this use case but rather with the [Update Person Information](#) use case.

Important

The changes notified via this events and messages **MUST NOT alter the assignment of a visit to a patient**. To alter the patient-visit assignment, the Patient Encounter Supplier :

- SHOULD apply the [Move Visit](#) use case (RECOMMENDED choice)
- MAY, as an alternative, cancel completely the "old" encounter and insert a "new" one with the new patient-visit assignment

2.3.2. Expected Actions and messages

Patient Encounter Supplier:

- after registration of update, **MUST** compose and send an HL7 2.5 **ADT^A08** message;
- The structure and content of A08 message is the same of the A04 it aims to update (see [Register Outpatient](#)), except for field **EVN-4 that will contain value "A04"**;

Patient Encounter Consumer:

- **MUST** process A08 messages related to outpatient registration (EVN-4="A04") using the same logics and rules described in [Register Outpatient](#).

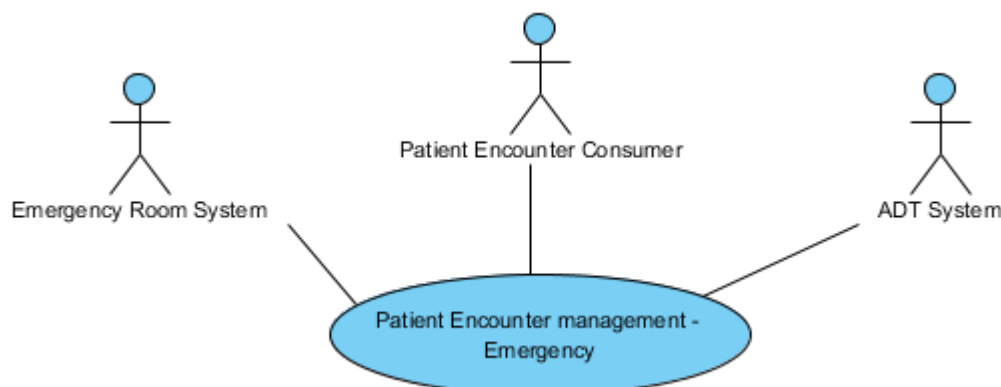
3. Emergency scenario

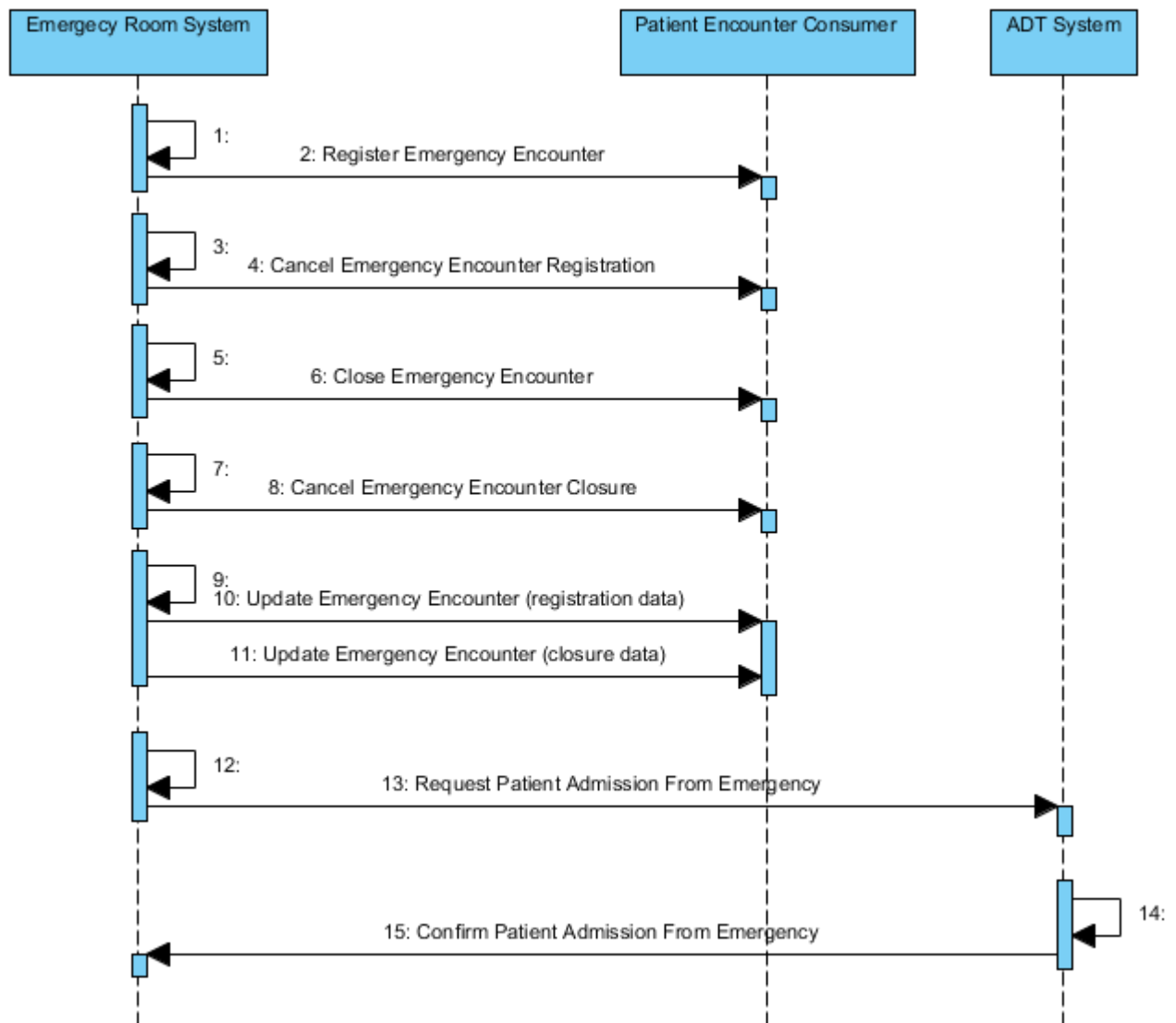
The Emergency scenario is related to a patient encounter that takes place at a dedicated healthcare service delivery location where the patient receives immediate evaluation and treatment, provided until the patient can be discharged or responsibility for the patient's care is transferred elsewhere (for example, the patient could be admitted as an inpatient or transferred to another facility).

The Emergency encounter scenario normally involves more than the two "usual" actors, Patient Encounter Supplier and Consumer, and the roles of the actors are not strictly fixed but vary in time.

The Emergency Room System (in the following ER System) is of course the main Supplier, but also acts as a Consumer under some circumstances, while the ADT System also plays both Supplier and Consumer role related to the ER System. A general Patient Encounter Consumer still exists, in the use cases, to represent all the other systems needing to be notified about the Emergency Room patient's movements.

The following pictures represent the use case diagram and the sequence diagram of this scenario:





Important

It must be remarked that, for the sake of completeness and effective management of ER events in NoemaLife applications, **this scenario does not fully comply with IHE ITI-31 directives.**

3.1. Register Emergency Encounter

3.1.1. Trigger Event

This use case is triggered by ER System, playing the role of Patient Encounter Supplier, to notify a Patient Encounter Consumer that a patient has arrived at an emergency healthcare facility for an episode of care. The patient may or may not be assigned to a bed.

3.1.2. Expected Actions

ER System:

- after registration of patient admission, **MUST** compose and send an HL7 2.5 **ADT^A01** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> It is REQUIRED to include in the message all the available demographic information about the person. For the sake of security and data consistency, in case of unknown patients it is REQUIRED to generate brand new person demographic record and data; previously used "unknown" demographic data MUST NOT be reused All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> Visit Number (the ER visit hospital identifier) MUST be included, and has to be guaranteed its uniqueness within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment) Admit (registration) date/time MUST be included, at least with minute-level detail Patient Class MUST be included, stating that the encounter is related to an Emergency Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name is recommended, as well as bed and room if applies) It is REQUIRED to include an unique identifier of the admission event (e.g. ER System internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit
Other information	<ul style="list-style-type: none"> It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis, Allergies, Relatives (Next of Kin) and Accident.

Patient Encounter Consumer:

- SHOULD** change patient's status to reflect the admission to the ER facility. An Emergency encounter **SHOULD** always have higher relevance related to all other types of encounter (e.g. short-stay, outpatient, etc.), thus an ER admission should change the patient status to "admitted in ER facility" even if other encounters of different types was already open for the same patient.
- MUST** discard the message, and raise an error, if the same encounter is already recorded in the database but associated to another patient, and no merge operations have been previously notified between the two patients
- MUST** use the ER System unique event identifier as its internal identifier (or at least use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

3.1.3. HL7 Message definition

Table 4.9. Register Emergency Encounter - ADT^A01 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)

Segment	Meaning	Usage	Notes
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the admission event)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	
[ACC]	Accident information	O	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3.2. Cancel Emergency Encounter Registration

3.2.1. Trigger Event

This use case is triggered by the ER System, playing the role of Patient Encounter Supplier, to notify to a Patient Encounter Consumer the cancellation of a previously sent Emergency Room admission/registration.

3.2.2. Expected Actions

ER System:

- after registration of ER admission cancellation, **MUST** compose and send an HL7 2.5 **ADT^A11** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the ER visit hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Emergency • It is REQUIRED to include the unique identifier of the admission event previously sent (e.g. ER System internal identifier), in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled

Patient Encounter Consumer:

- **SHOULD** change patient's status to reflect the cancellation of the admission, which means it should be restored to the value prior to patient admission in ER
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing admission in ER

- **MUST** use the ER System unique event identifier to locate the event to delete
- **SHOULD** cancel the admission event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical
- **SHOULD** perform a complete cancellation of the visit and all of the related data (e.g. clinical info already attached to the visit).
- There may be cases where, after cancellation of a registration, the same Visit Number can be reused and re-assigned to another patient; for this reason it is also **REQUIRED** the Patient Encounter Consumer to allow such a possibility, by properly managing the cancelled data and excluding it from data consistency checks.

3.2.3. HL7 Message structure

Table 4.10. Cancel Emergency Encounter Registration - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the admission event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3.3. Close Emergency Encounter

3.3.1. Trigger Event

This use case is triggered by the ER system, playing the role of Patient Encounter Supplier, to notify a Patient Encounter Consumer that a patient stay at a ER facility has ended.

3.3.2. Expected Actions

ER System:

- after registration of patient discharge from ER, **MUST** compose and send an HL7 2.5 **ADT^A03** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the ER visit hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail

	<ul style="list-style-type: none"> • Patient Class MUST be included, stating that the encounter is related to an Emergency • It is REQUIRED to include an unique identifier of the discharge event (e.g. ER System internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis and Procedures

Patient Encounter Consumer:

- **MUST** change patient's status to reflect the closure operation
- **MUST** use the ER System unique event identifier as its internal identifier (or at least use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- In case the closure conflicts with current patient status (e.g. encounter is not existing):
 - If the Patient Encounter Consumer implements "diagnostic service-like" functions, it **SHOULD** discard the message, raising at most a warning or a non blocking error
 - If the Patient Encounter Consumer implements "repository-like" functions, it **SHOULD** process the message anyway, creating patient and encounter if needed and then recording the discharge event.
- **SHOULD** process Diagnosis and Procedures information included in the message, if available

3.3.3. HL7 Message structure

Table 4.11. Close Emergency Encounter - ADT^A03 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the discharge event)
[[DG1]]	Diagnosis information	O..*	
[[PR1]]	Procedure information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3.4. Cancel Emergency Encounter Closure

3.4.1. Trigger Event

This use case is triggered by the ER System, playing the role of Patient Encounter Supplier, to a Patient Encounter Consumer to cancel a previous notification that a patient stay at a ER facility had ended.

3.4.2. Expected Actions

ER System:

- after registration of patient admission, **MUST** compose and send an HL7 2.5 **ADT^A13** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the ER visit hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail • Patient Class MUST be included, stating that the encounter is related to an Inpatient • It is REQUIRED to include the unique identifier of the discharge event previously sent (e.g. ER System internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled

Patient Encounter Consumer:

- **SHOULD** change patient's status to reflect the cancellation of the discharge, thus showing the patient is still present at the ER facility
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing discharge in ER
- **MUST** use the ER System unique event identifier to locate the event to delete
- **SHOULD** cancel the discharge event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical

3.4.3. HL7 Message structure

Table 4.12. Cancel Emergency Encounter Closure - ADT^A13 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time)
[PV2]	Patient Visit - Additional Info	O	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the discharge event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3.5. Update Emergency Encounter

3.5.1. Trigger Event

For the Update Emergency Encounter use case, the business logics that apply are similar to the ones in [Update Inpatient Encounter](#) use case.

Update Emergency Encounter is actually composed by two sub-cases. Different messages will be sent by the ER System to notify a Patient Encounter Consumer that some information has changed for the admit or discharge events (such as admit date or ward, discharge date, etc.) and, in case, for the patient (such as address, date of birth, etc.). Changes related to patient demographic data only **SHOULD NOT** be addressed by this use case but rather with the [Update Person Information](#) use case.

Important

The changes notified via this events and messages **MUST NOT alter the assignment of a visit to a patient**. To alter the patient-visit assignment, the Patient Encounter Supplier :

- SHOULD apply the [Move Visit](#) use case (RECOMMENDED choice)
- MAY, as an alternative, cancel completely the "old" encounter and insert a "new" one with the new patient-visit assignment

3.5.2. Expected Actions and messages

Patient Encounter Supplier:

- after registration of update, **MUST** compose and send an HL7 2.5 **ADT^A08** message;
- The structure and content of A08 message is strictly related to the type of event it aims to update. In greater detail:
 - Updates to a Register Emergency Encounter event are notified using an ADT^A08 having the same structure of the original ADT^A01 message (see [Register Emergency Encounter](#)), except for field **EVN-4 that will contain value "A01"**;
 - Updates to a Close Emergency Encounter event are notified using an ADT^A08 having the same structure of the original ADT^A03 message (see [Close Emergency Encounter](#)), except for field **EVN-4 that will contain value "A03"**;

Patient Encounter Consumer:

- **MUST** process A08 messages related to emergency admission (EVN-4="A01") using the same logics and rules described in [Register Emergency Encounter](#);
- **MUST** process A08 messages related to emergency discharge (EVN-4="A03") using the same logics and rules described in [Close Emergency Encounter](#);

3.6. Request Patient Admission from Emergency

3.6.1. Trigger Event

This use case is triggered by the ER System, playing the role of Patient Encounter Supplier, to notify an ADT system, playing the role of Patient Encounter Consumer, that it has been decided to transfer a patient to an "inpatient" location right after the discharging from ER facility. This notification will be considered, at the ADT System, as a *proposal* to admit the patient.

It must be remarked that this use case is not an alternative to the [Close Emergency Encounter](#) use case, but is a completely distinct use case that may follow it.

3.6.2. Expected Actions

ER System:

- upon the registration of the admission proposal, **MUST** compose and send an HL7 2.5 **ADT^A06** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the previous ER encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the ADT System; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Preadmit Number (the previous ER visit hospital identifier) MUST be included • Admit date/time MUST be included, at least with minute-level detail; as this timestamp is the proposed admission date, it will coincide with the discharge date/time from ER. • Patient Class MUST be included, to propose an Inpatient encounter admission • Assigned Patient Location MUST be included, to propose the admission ward/unit (ward/unit code MUST be included; ward/unit name is recommended, as well as bed and room if applies)
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis, Procedures, Allergies, Relatives (Next of Kin) and Accident.

ADT System:

- **MUST** consider the message as an *admission proposal*. This means that, on a local agreement basis, two different strategies may apply to the message management:
 - the admission proposal data is stored in the ADT System database, but the admission is actually done manually by ADT operators in a later stage
 - the admission proposal automatically generates the admission.
- Whatever the case is, the ADT System **SHOULD** use the data sent by the ER System to carry out the admission
- **MUST** store among the admission data also the previous ER visit identifier, thus allowing possible future links between the ER encounter and the Inpatient Encounter that followed
- **MAY** use the ER encounter discharge Date/time as admission date for the Inpatient encounter.
- About all the other data, the ADT System **SHOULD** behave as a Patient Encounter Consumer in the Admit Inpatient use case.

3.6.3. HL7 Message definition

Table 4.13. Request Patient Admission from Emergency - ADT^A06 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	

Segment	Meaning	Usage	Notes
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.44 (Admit date/time)
[PV2]	Patient Visit - Additional Info	O	
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	
[ACC]	Accident information	O	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3.7. Confirm Patient Admission from Emergency

3.7.1. Trigger Event

This use case is triggered by an ADT System, playing the role of Patient Encounter Supplier, to notify an ER System, playing the role of Patient Encounter Consumer, that a patient has been admitted as a consequence of a previous admission proposal from an ER facility.

The goal is to confirm the inpatient admission and to transmit the ER System the main information about the event.

3.7.2. Expected Actions

ADT System:

- MUST behave as in the Admit Inpatient use case, by composing the **ADT^A01** message as usual and sending *italso* to ER System.
- MUST allow, setting properly the message content, to uniquely identify the patient and the previous ER encounter; for this sake, as stated in the Admit Inpatient use case, the Pre-admit Number becomes a REQUIRED information.

ER System:

- SHOULD process the message importing the useful information related to the admission and storing it among the ER encounter data.
- SHOULD discard the message, raising an error, in case the Pre-Admit Number in the message points to a non-existing ER encounter

4. Short-stay scenario

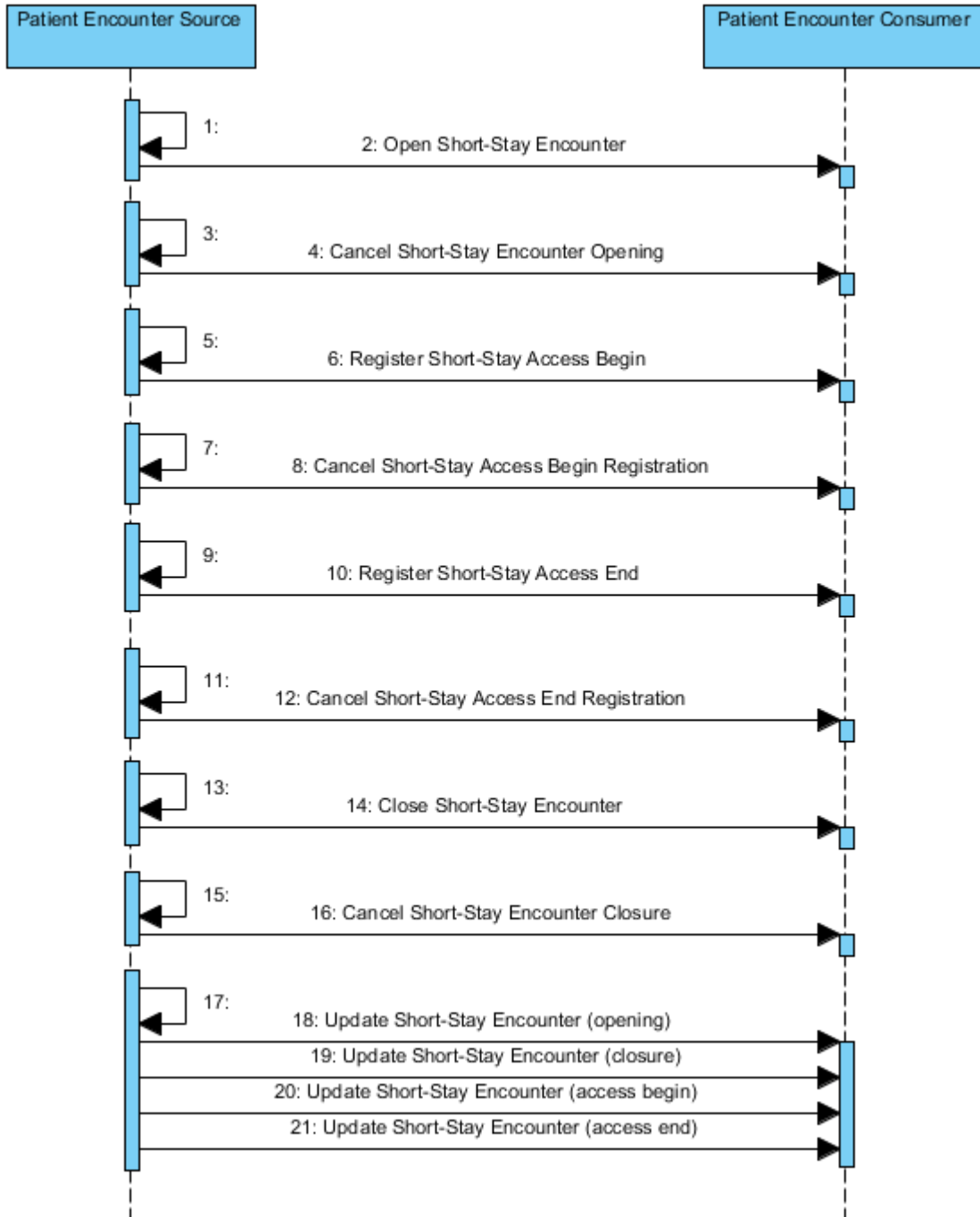
The Short-Stay scenario is one of the most complex and peculiar, and merges together characteristics from both the inpatient and the outpatient encounter. The key features are:

- the patient receives treatment and accommodation in a way that is similar to the inpatients (may include room and bed assignment, board, nursing service, etc.), except for the overnight stay; patient usually stays at the hospital during daytime, and leaves the facility for nighttime.

- the encounter may feature one only moment in time when the patient receives treatments at a facility (e.g. one-day stay only for a simple intervention/procedure) but may also be composed by several distinct moments in time for treatments (ex. a patient regularly receiving dialysis treatment every three days); this is sometimes called "recurring" short-stay. In the following, this kind of "sub-encounter" moments will be referred to as *access*.

Frequently, the short-stay encounters are also called "Day Hospital", while the short-stay encounters with single access related to an intervention may be called "Day Surgery".

Use cases managed in this scenario are represented in the following sequence diagram:



Important

It must be remarked that, for the sake of completeness and effective management of Short-Stay events in NoemaLife applications, **this scenario does not fully comply with IHE ITI-31 directives.**

4.1. Open Short-Stay Encounter

4.1.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a new short-stay encounter has been opened for a patient. The opening must be meant just as an "administrative" event; a corresponding treatment access may or may not occur concurrently. Opening goal is just to notify the data of the patient, the visit/encounter identifier and the organization unit/facility in charge of the patient treatments.

In case the opening of the short-stay encounter also coincide with the real access of the patient to the facility for treatments, then a [Register Short-Stay Access Begin](#) use case **MUST** be explicitly triggered and notified **in addition to, and following**, the short-stay encounter opening.

4.1.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient arrival, **MUST** compose and send an HL7 2.5 **ADT^A01** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the short-stay encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the Short-Stay encounter. It has to be unique within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment) • Admit date/time MUST be included, at least with minute-level detail, to transmit the Short-Stay "administrative" opening date/time • Patient Class MUST be included, stating that the encounter is related to a Short-Stay (Day Hospital) • Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name is also recommended). In this scenario, will represent the facility/unit that is <i>responsible</i> for the clinical activities (the "attending facility/unit"; could differ from the facility/unit <i>performing</i> the clinical treatments from time to time) • It is REQUIRED to include an unique identifier of the opening event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit • The Recurring Service Code MUST be specified stating that the event is related to a Short-Stay encounter opening. This is necessary to avoid possible errors in data while managing other events of this scenario or to allow special management of the event at some customized installations.
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis, Allergies and Relatives (Next of Kin)

Patient Encounter Supplier:

- SHOULD change patient's status to reflect the short-stay administrative opening operation. A Short-Stay encounter SHOULD always have lower relevance related to Inpatient and Emergency, but higher relevance related to the other types of encounter (e.g. outpatient, etc.); thus a short-stay opening should change the patient status to "admitted as short-stay" only if no other inpatient or emergency encounters are still open.
- MUST discard the message, and raise an error, if the same encounter is already recorded in the database but associated to another patient, and no merge operations have been previously notified between the two patients.
- MUST use the unique identifier sent by the Patient Encounter Supplier for the opening event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- MUST store the information of the Recurring Service Code (Short-Stay opening, in this case) in order to allow a better management of events under special circumstances.
- MUST, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. SHOULD NOT, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

4.1.3. HL7 Message definition

Table 4.14. Open Short-Stay Encounter - ADT^A01 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Short-Stay opening date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the opening event), PV2.31 (Recurring Service Code)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.2. Cancel Short-Stay Encounter Opening

4.2.1. Trigger Event

When a Short-Stay encounter has been erroneously opened, then the Patient Encounter Supplier will trigger this use case to notify to a Patient Encounter Consumer about its cancellation.

4.2.2. Expected Actions

Patient Encounter Supplier:

- after cancelling the Short-Stay opening, **MUST** compose and send an HL7 2.5 **ADT^A11** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, the encounter and the type of cancellation to be carried out, since the same HL7 message is used throughout the scenario to cancel different types of events; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the Short-Stay encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • It is REQUIRED to include the unique identifier of the opening event previously sent (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled • The Recurring Service Code MUST be specified stating that the event is related to the cancellation of a Short-Stay encounter opening.

Patient Encounter Consumer:

- **SHOULD** change patient's status to reflect the cancellation of the short-stay opening, which means it should be restored to the prior value
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing short-stay opening event
- **MUST** use the Patient Encounter Supplier unique event identifier to locate the event to delete
- **SHOULD** cancel the opening event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical
- **SHOULD** perform a complete cancellation of the visit and all of the related data (e.g. clinical info already attached to the visit).
- There may be cases where, after cancellation of a registration, the same Visit Number can be reused and re-assigned to another patient; for this reason it is also **REQUIRED** the Patient Encounter Consumer to allow such a possibility, by properly managing the cancelled data and excluding it from data consistency checks.

4.2.3. HL7 Message structure

Table 4.15. Cancel Short-Stay Encounter Opening - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)

Segment	Meaning	Usage	Notes
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the opening event), PV2.31 (Recurring Service Code)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.3. Register Short-Stay Access Begin

4.3.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient has arrived at a healthcare facility for an episode of care that is part of a Short-Stay encounter (a so called "access"). This may happen or not at the same time of the Short-Stay opening, and in case of "recurring" Short-Stay encounters it may happen several times during the lifetime of the encounter.

4.3.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient arrival, **MUST** compose and send an HL7 2.5 **ADT^A04** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, the encounter and the access; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the Short-Stay encounter. • Admit date/time MUST be included, at least with minute-level detail, to transmit the date of arrival/access start • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name is also recommended). • It is REQUIRED to include an unique identifier of the event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit • The Recurring Service Code MUST be specified stating that the event is related to the registration of the beginning of a Short-Stay access.

Patient Encounter Consumer:

- **MAY** change patient's status to reflect the access has begun. Patient status of "admitted as inpatient" or "admitted as emergency" **MUST NOT** be modified by this event

- MUST use the unique identifier sent by the Patient Encounter Supplier for the access begin event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- In case the access begin event conflicts with the current situation for the patient, due to visit or patient missing, the message SHOULD be processed anyway applying the same rules of the Open Short Stay Encounter use case, except for the creation of the opening event; this will mean the creation of patient or visit, if one or both does not exist, or the message discard, in case of mismatches in the patient-visit relation.
- MUST store the information of the Recurring Service Code (Short-Stay Access Begin, in this case) in order to allow the management of event.

4.3.3. HL7 Message definition

Table 4.16. Register Short-Stay Access Begin - ADT^A04 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event), PV2.31 (Recurring Service Code)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.4. Cancel Short-Stay Access Begin Registration

4.4.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify to a Patient Encounter Consumer the cancellation of a previously sent registration of Short-Stay access begin.

4.4.2. Expected Actions

Patient Encounter Supplier:

- after cancellation of outpatient registration, MUST compose and send an HL7 2.5 **ADT^A11** message
- MUST allow, setting properly the message content, to uniquely identify the patient, the encounter and the access; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
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Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the Short-Stay encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • Admit date/time MUST be included, at least with minute-level detail, to transmit the date of arrival/access begin previously sent • It is REQUIRED to include the unique identifier of the access begin registration event previously sent, in order to allow the Patient Encounter Consumer to easily reference the event to be cancelled • The Recurring Service Code MUST be specified stating that the event is related to the cancellation of a Short-Stay access beginning registration.
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Patient Encounter Consumer:

- MAY change patient's status to reflect the cancellation operation
- MUST use the Patient Encounter Supplier unique event identifier, and in case the Recurring Service Code (Short-Stay Access Begin, in this case), to locate the event to delete
- SHOULD discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing short-stay access begin event
- SHOULD cancel the access begin event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- MUST guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical

4.4.3. HL7 Message structure

Table 4.17. Cancel Short-Stay Access Begin Registration - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event), PV2.31 (Recurring Service Code)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.5. Register Short-Stay Access End

4.5.1. Trigger Event

As the patient has terminated treatment and leaves the facility, a Short-Stay access is meant to end. This use case is triggered to notify access end from Patient Encounter Supplier to the Patient Encounter Consumer.

The use case may or may not apply and be used, and should be considered as an "optional" use case, since the access end registration is frequently not required.

4.5.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient arrival, **MUST** compose and send an HL7 2.5 **ADT^A04** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, the encounter and the access; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the Short-Stay encounter. • Discharge date/time MUST be included, at least with minute-level detail, to transmit the date of access end • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • It is REQUIRED to include an unique identifier of the event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit • The Recurring Service Code MUST be specified stating that the event is related to the registration of the end of a Short-Stay access.

Patient Encounter Consumer:

- **MAY** change patient's status to reflect the access has ended. Patient status of "admitted as inpatient" or "admitted as emergency" **MUST NOT** be modified by this event
- **MUST** use the unique identifier sent by the Patient Encounter Supplier for the access end event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- In case the access end event conflicts with the current situation for the patient, due to visit or patient missing, the message **SHOULD** be processed anyway applying the same rules of the Open Short Stay Encounter use case, except for the creation of the opening event; this will mean the creation of patient or visit, if one or both does not exist, or the message discard, in case of mismatches in the patient-visit relation.
- **MUST** store the information of the Recurring Service Code (Short-Stay Access End, in this case) in order to allow the management of event.

4.5.3. HL7 Message definition

Table 4.18. Register Short-Stay Access End - ADT^A04 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	

Segment	Meaning	Usage	Notes
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event), PV2.31 (Recurring Service Code)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.6. Cancel Short-Stay Access End Registration

4.6.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify to a Patient Encounter Consumer the cancellation of a previously sent registration of Short-Stay access end.

4.6.2. Expected Actions

Patient Encounter Supplier:

- after cancellation of outpatient registration, **MUST** compose and send an HL7 2.5 **ADT^A11** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient, the encounter and the access; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the Short-Stay encounter. • Discharge date/time MUST be included, at least with minute-level detail, to transmit the date of access end • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • It is REQUIRED to include the unique identifier of the access end registration event previously sent, in order to allow the Patient Encounter Consumer to easily reference the event to be cancelled • The Recurring Service Code MUST be specified stating that the event is related to the cancellation of the registration of the end of a Short-Stay access.

Patient Encounter Consumer:

- **MAY** change patient's status to reflect the cancellation operation
- **MUST** use the Patient Encounter Supplier unique event identifier, and in case the Recurring Service Code (Short-Stay Access End, in this case), to locate the event to delete
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing short-stay access begin event
- **SHOULD** cancel the access begin event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).

- MUST guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical

4.6.3. HL7 Message structure

Table 4.19. Cancel Short-Stay Access End Registration - ADT^A11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Registration date/time)
[PV2]	Patient Visit - Additional Info	O	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the event), PV2.31 (Recurring Service Code)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.7. Close Short-Stay Encounter

4.7.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a Short-Stay encounter has been closed, from an "administrative" point of view.

4.7.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient discharge, MUST compose and send an HL7 2.5 **ADT^A03** message
- MUST allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail, stating the Short-Stay closure date/time • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • It is REQUIRED to include an unique identifier of the close event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. The identifier MUST be unique among all the other events in the visit

	<ul style="list-style-type: none"> The Recurring Service Code MUST be specified stating that the event is related to the closure of a Short-Stay access.
Other information	<ul style="list-style-type: none"> It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis and Procedures

Patient Encounter Consumer:

- MUST** change patient's status to reflect the closure operation
- In case the event conflicts with current patient status (e.g. encounter is not existing):
 - If the Patient Encounter Consumer implements "diagnostic service-like" functions, it **SHOULD** discard the message, raising at most a warning or a non blocking error,
 - If the Patient Encounter Consumer implements "repository-like" functions, it **SHOULD** process the message anyway, creating patient and encounter if needed and then recording the discharge event.
- MUST** use the unique identifier sent by the Patient Encounter Supplier for the closure event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- MUST** store the information of the Recurring Service Code (Short-Stay Closure, in this case) in order to allow the management of event.
- SHOULD** process Diagnosis and Procedures information included in the message

4.7.3. HL7 Message structure

Table 4.20. Close Short-Stay Encounter - ADT^A03 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time, used for closure date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the closure event), PV2.31 (Recurring Service Code)
[[DG1]]	Diagnosis information	O..*	
[[PR1]]	Procedure information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.8. Cancel Short-Stay Encounter Closure

4.8.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to a Patient Encounter Consumer to cancel a previous notification that a patient Short-Stay has been closed.

4.8.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient admission, **MUST** compose and send an HL7 2.5 **ADT^A13** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • Discharge date/time MUST be included, at least with minute-level detail, stating the Short-Stay closure date/time • Patient Class MUST be included, stating that the encounter is related to a Short-Stay • It is REQUIRED to include the unique identifier of the closure event previously sent (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to easily reference the event to be cancelled • The Recurring Service Code MUST be specified stating that the event is related to the closure of a Short-Stay access.

Patient Encounter Consumer:

- **SHOULD** restore the patient's status in order to state that the short-stay encounter is still open (from an administrative point of view)
- **MUST** use the Patient Encounter Supplier unique event identifier, and in case the Recurring Service Code (Short-Stay encounter End, in this case), to locate the event to delete
- **SHOULD** discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing closure
- **SHOULD** manage the event cancellation as a logical operation, letting the event not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- **MUST** guarantee traceability and reversibility of the cancellation, whether the operation is logical or physical.

4.8.3. HL7 Message structure

Table 4.21. Cancel Short-Stay Encounter Closure - ADT^A13 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.45 (Discharge date/time, used as Short_Stay closure date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier)

Segment	Meaning	Usage	Notes
			for the closure event), PV2.31 (Recurring Service Code)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4.9. Update Short-Stay Encounter

4.9.1. Trigger Event

For the Update Short-Stay Encounter use case, since it is some kind of combination of inpatient and outpatient, the business logics that apply are similar to the ones in the [Update Inpatient Encounter](#) and [Update Outpatient Encounter](#) use cases.

Update Short-Stay Encounter is actually composed by four sub-cases. Different messages will be sent by the Patient Encounter Supplier to notify a Patient Encounter Consumer that some information has changed for the open, close or access related events (such as opening date or ward, access date, etc.) and, in case, for the patient (such as address, date of birth, etc.). Changes related to patient demographic data only **SHOULD NOT** be addressed by this use case but rather with the [Update Person Information](#) use case.

Important

The changes notified via this events and messages **MUST NOT alter the assignment of a visit to a patient**. To alter the patient-visit assignment, the Patient Encounter Supplier :

- SHOULD apply the [Move Visit](#) use case (RECOMMENDED choice)
- MAY, as an alternative, cancel completely the "old" encounter and insert a "new" one with the new patient-visit assignment

4.9.2. Expected Actions and messages

Patient Encounter Supplier:

- after registration of update, **MUST** compose and send an HL7 2.5 **ADT^A08** message;
- The structure and content of A08 message is strictly related to the type of event it aims to update. In greater detail:
 - Updates to a Open Short-Stay Encounter event are notified using an ADT^A08 having the same structure of the original ADT^A01 message (see [Open Short-Stay Encounter](#)), except for field **EVN-4 that will contain value "A01"**;
 - Updates to a Register Short-Stay Access Begin event are notified using an ADT^A08 having the same structure of the original ADT^A04 message (see [Register Short-Stay Access Begin](#)), except for field **EVN-4 that will contain value "A04"**;
 - Updates to a Register Short-Stay Access End event are notified using an ADT^A08 having the same structure of the original ADT^A04 message (see [Register Short-Stay Access End](#)), except for field **EVN-4 that will contain value "A04"**;
 - Updates to a Close Short-Stay Encounter event are notified using an ADT^A08 having the same structure of the original ADT^A03 message (see [Close Short-Stay Encounter](#)), except for field **EVN-4 that will contain value "A03"**;

Patient Encounter Consumer:

- **MUST** process A08 messages related to Open Short-Stay Encounter event (EVN-4="A01", PV2-31="DHO") using the same logics and rules described in [Open Short-Stay Encounter](#);

- MUST process A08 messages related to Register Short-Stay Access Begin event (EVN-4="A04", PV2-31="DHAB") using the same logics and rules described in [Register Short-Stay Access Begin](#);
- MUST process A08 messages related to Register Short-Stay Access End event (EVN-4="A04", PV2-31="DHAE") using the same logics and rules described in [Register Short-Stay Access End](#);
- MUST process A08 messages related to Close Short-Stay Encounter event (EVN-4="A03", PV2-31="DHC") using the same logics and rules described in [Close Short-Stay Encounter](#);

5. Pre-admission scenario

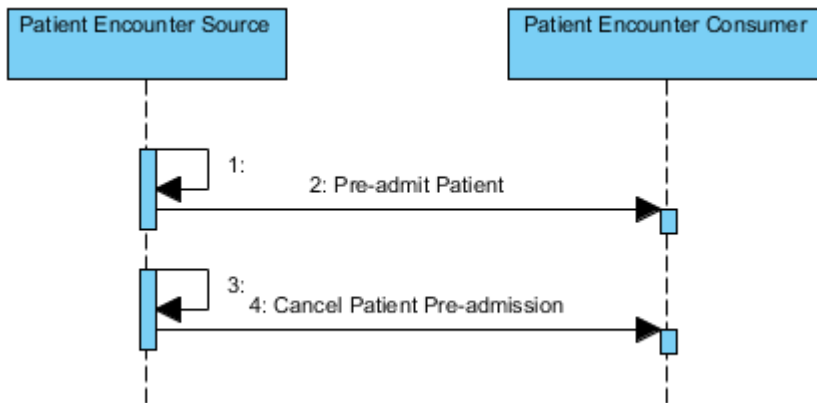
The pre-admission encounter scenarios involves all the activities that a patient undergoes before being actually admitted. Typically, they include tests and clinical procedures that are required for preparing the patient for the admission (e.g. pre-intervention laboratory tests) or to assess whether the admission is viable or not.

Management of a pre-admission encounter is composed by two different phases or moments.

- The Pre-admission itself, as a stand-alone encounter, characterized by its own "open" event and possibly by a "cancel" event (e.g. due to errors). To be noted that no specific transaction will be used to notify the "closure" of pre-admission, in case a real admission does not follow.
- If the pre-admission outcome allows it, then an Inpatient admission event is triggered, and also occurs the linking of the Pre-admission encounter information to Inpatient admission encounter. Before this operation, Pre-admission and Inpatient are two independent encounters; after, the encounters are linked in order to get access to the clinical and administrative data of one encounter from the other one.

The Inpatient admission notification and the linking of the Pre-admission are out of the scope of this scenario, and are described in details in the [Admit Inpatient](#) use case.

Use cases managed in this scenario are represented in the following sequence diagram:



5.1. Pre-Admit Patient

5.1.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a patient has arrived, or is planned to arrive, at a healthcare facility for a pre-admission episode of care, in which the patient is not assigned to a bed and will undergo to clinical evaluations to assess viability of specific encounters at a later time (e.g. surgery).

5.1.2. Expected Actions

Patient Encounter Supplier:

- after registration of patient arrival, MUST compose and send an HL7 2.5 ADT^A05 message

- MUST allow, setting properly the message content, to uniquely identify the patient and the pre-admit encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • A Visit Number MUST be included, representing the pre-admit encounter. It has to be unique within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment) • Admit date/time MUST be included, at least with minute-level detail, to transmit the pre-admission date/time • Patient Class MUST be included, stating that the encounter is related to a Pre-admission • Assigned Patient Location MUST be included (at least the ward/unit code; ward/unit name is also recommended). In this scenario, will represent the facility/unit that is responsible for the pre-admission clinical activities. • It is REQUIRED to include an unique identifier of the pre-admission event (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event in the future. Since the Pre-admission Encounter is frequently suitable for merging with the following Inpatient Encounter, the identifier MUST be unique within the data scope (e.g. within the whole hospital, in a single-hospital installation, or among all hospitals, in a multi-hospital environment)
Other information	<ul style="list-style-type: none"> • It is RECOMMENDED to include all the available clinical and administrative information, with a special mention for Diagnosis, Allergies and Relatives (Next of Kin)

Patient Encounter Consumer:

- MAY change patient's status to reflect the pre-admit operation. A Pre-Admission encounter has lower relevance related to Inpatient, Emergency and Short-Stay, thus the patient status MUST NOT be changed in case still exists such encounters for the patient s in open state.
- MUST use the unique identifier sent by the Patient Encounter Supplier for the pre-admit event as internal event identifier (or at least to use it to compose the internal event identifier); this way, it should be easier to point to the specific event if needed (e.g. for updates).
- MUST, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. SHOULD NOT, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

5.1.3. HL7 Message definition

Table 4.22. Pre-Admit patient - ADT^A05 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	

Segment	Meaning	Usage	Notes
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
[[NK1]]	Next of Kin/ Associated parties	O..*	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Pre-admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the pre-admission event)
[[OBX]]	Observation/Result	O..*	May be present to carry clinical information useful for the encounter (e.g. previous observations results, patient weight or height, etc.).
[[AL1]]	Allergy information	O..*	
[[DG1]]	Diagnosis Information	O..*	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

5.2. Cancel Patient Pre-Admission

5.2.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify to a Patient Encounter Consumer the cancellation of a previously sent Pre-admission registration.

5.2.2. Expected Actions

Patient Encounter Supplier:

- after cancellation of outpatient registration, **MUST** compose and send an HL7 2.5 **ADT^A38** message
- **MUST** allow, setting properly the message content, to uniquely identify the patient and the pre-admit encounter; for this sake, it is necessary to take special care to the information listed hereafter.

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Encounter and Event information	<ul style="list-style-type: none"> • Visit Number (the Pre-admit encounter hospital identifier) MUST be included • Patient Class MUST be included, stating that the encounter is related to an Outpatient • Admit date/time MUST be included, at least with minute-level detail, to transmit the pre-admission date/time • It is REQUIRED to include the unique identifier of the registration event previously sent (e.g. Patient Encounter Supplier internal identifier) in order to allow the Patient Encounter Consumer to create a reliable key for referencing the event to be cancelled

Patient Encounter Consumer:

- **SHOULD** change patient's status to reflect the cancellation of the pre-admission, which means patient should no more be seen as "pre-admitted"

- SHOULD discard the message, raising at most a warning or a non blocking error, if the cancellation is related to a non-existing pre-admission event
- MUST use the Patient Encounter Supplier unique event identifier to locate the event to delete
- SHOULD cancel the pre-admission event logically, letting the registration not to be visible anymore to the final user but to be still present as database record (e.g. using a "cancelled" flag or status).
- MUST guarantee traceability and reversibility of the operation, whether the cancellation of data is logical or physical
- SHOULD perform a complete cancellation of the visit and all of the related data (e.g. clinical info already attached to the visit).
- There may be cases where, after cancellation, the same Visit Number can be reused and re-assigned to another patient; for this reason it is also REQUIRED the Patient Encounter Consumer to allow such a possibility, by properly managing the cancelled data and excluding it from data consistency checks.

5.2.3. HL7 Message structure

Table 4.23. Cancel Patient Pre-Admission - ADT^A38 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number), PV1.44 (Admit date/time, used for Pre-admit date/time)
PV2	Patient Visit - Additional Info	R	Highlights: PV2.7 (Visit User Code, used for Patient Encounter Supplier unique identifier for the pre-admission event)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

6. Follow-up / Post-admission scenario

The Follow-up/Post-admission encounter scenario involves all the activities that a patient undergoes after being discharged from an Inpatient encounter, but still are strictly related to the Inpatient encounter.

Typically, they include tests and clinical procedures that are required for assessing patient's status and the clinical outcome of the Inpatient encounter, as well as clinical procedures completing the Inpatient encounter activity and not requiring the patient to be assigned at a bed.

The use cases of this scenario completely overlap with the ones of the Outpatient Scenario, since in facts follow-ups are managed as outpatient encounters.

Only a few differences need to be remarked:

- The Patient Class of the messages used MUST state that the encounter is a Follow-up /post-admission one;
- It is RECOMMENDED to use the Pre-admit Number to transmit the Visit Number of the preceding Inpatient encounter;
- The Patient Encounter Consumer SHOULD link, by using the Pre-admit Number, the Follow-up encounter to its preceding Inpatient Encounter, allowing the possibility to navigate data from one encounter to the other. For linking rules and policies please refer to the ones expressed in the Admit Inpatient use case.

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

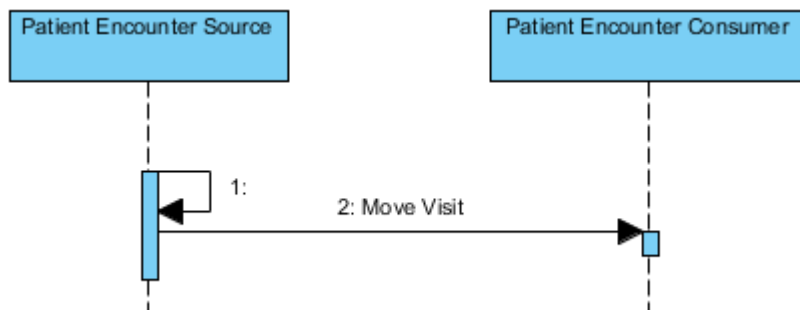
7. Move visit scenario

The Move Visit scenario does not involve a specific patient class and clinical/administrative pathway but rather is a "general purpose" scenario that may apply along with all the other scenarios.

Its goal is giving the possibility to change patient-to-encounter relationship, allowing to move a visit (encounter) and all its content from one patient to another. The main reasons why this may be needed are related to the correction of errors or the assignment of the visit to the "final" patient record (frequent, for example, in Emergency Room when patient is registered as "unknown" and only later on the real identity is defined).

This scenario is the one allowing all the changes in patient-visit assignment that were forbidden in all the previously described "update" use cases.

The only use case managed in this scenario is represented in the following sequence diagram:



7.1. Move Visit

7.1.1. Trigger Event

This use case is triggered by a Patient Encounter Supplier to notify a Patient Encounter Consumer that a previously defined patient-visit association has changed, and thus the visit and all its data need to be moved from one patient to another.

7.1.2. Expected Actions

Patient Encounter Supplier:

- after registration of visit move, **MUST** compose and send an HL7 2.5 **ADT^A45** message
- **MUST** allow, setting properly the message content, to uniquely identify the "new" patient, the "old" patient and the encounter to be moved; for this sake, it is necessary to take special care to the information listed hereafter.

"New" Patient information	<ul style="list-style-type: none"> • It is REQUIRED to include in the message all the available demographic information about the person. • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
"Old" Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Prior Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer;

	<ul style="list-style-type: none"> All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
"New" and "Old" Visit information	<ul style="list-style-type: none"> The Prior Visit Number MUST be included, pointing to the encounter to be moved. The Visit Number MUST be included, pointing to the encounter to be moved (that is, same value of Prior Visit Number) <p>A special remark must be given about the possibility to change the visit information and key data during its move, as per HL7 standard specifications; for example, the possibility to change the visit number during the move from one patient to another. For the sake of simplicity and data consistency, this kind of option MUST NOT be applied; thus, the information named as "New visit" in the message MUST reflect and replicate the one of the "Old" visit.</p> <ul style="list-style-type: none"> Patient Class MUST be included

Patient Encounter Consumer:

- SHOULD** process the message and apply data to its database, accordingly to the role played.
 - If the Patient Encounter Consumer implements "repository-like" functions, storing and linking clinical (or other) data to the encounter, then it **MUST** detach the visit from the "old" patient record and assign it to the "new" patient record. The move operation **MUST** entail the move of all of the data linked to the visit (e.g. orders, results, other clinical or administrative data).

In case the Patient Encounter Consumer receives new data after the visit move, then it **MUST** be able accept it and guarantee it to be linked to the correct ("new") position even if it is notified using the "old" patient-visit association.

- If the Patient Encounter Consumer implements "diagnostic service-like" functions, and holds patient-visit relation mainly to satisfy the external requesters' needs, then is **RECOMMENDED** it to update the patient-visit assignment and guarantee that the data is returned to the requester includes the "new" patient-visit relation.
- SHOULD** manage the move event logically, rather than physically.
- MUST** guarantee traceability and reversibility of the operation, whether it is logical or physical
- In case the "new" person demographic data is not available in its database, **MUST** register it as in the Create Person use case before the visit move, in order to guarantee data consistency.
- In case the person data is somehow already stored in the database, demographic data **SHOULD NOT** be updated; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- In case the "old" patient-visit association stated in the message conflicts with the one in the Patient Encounter Consumer, then the message **MUST** be discarded and an error raised.
- In case the "old" patient-visit association is not registered in the Patient Encounter Consumer database, then the operation **SHOULD** be processed as an "initial" event of the scenario identified by the Patient Class.

7.1.3. HL7 Message definition

Table 4.24. Move Visit - ADT^A45 message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	

Patient Encounter Management

Segment	Meaning	Usage	Notes
EVN	Event Type	R	
PID	Patient Identification	R	"New" patient data. Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	"New" patient data.
MRG	Merge Information	R	"Old" patient and visit data. Highlights: MRG.1 (Prior Patient Identifier List). MRG.5 (Prior Visit number)
PV1	Patient Visit	R	"New" visit data. Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.19 (Visit Number)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Part II. Document Management

Use cases

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Chapter 5. Document Management overview

The Document Management scenario is about publishing medical documents produced by different applications inside the enterprise (i.e. laboratory reports by LIS, discharge letters by ADT, etc.), to a central Document Repository that feeds the electronic patient record.

According to IHE, which inspires current specifications, document management typically includes the following scenarios:

- Document Registration
- Document Query
- Document Retrieval

Current specifications will cover only the "Document Registration" scenario.

For more informations concerning localizations for CRS-SISS regional project, refer to CRS-SISS technical documentation [CRS-SISS-HL7]

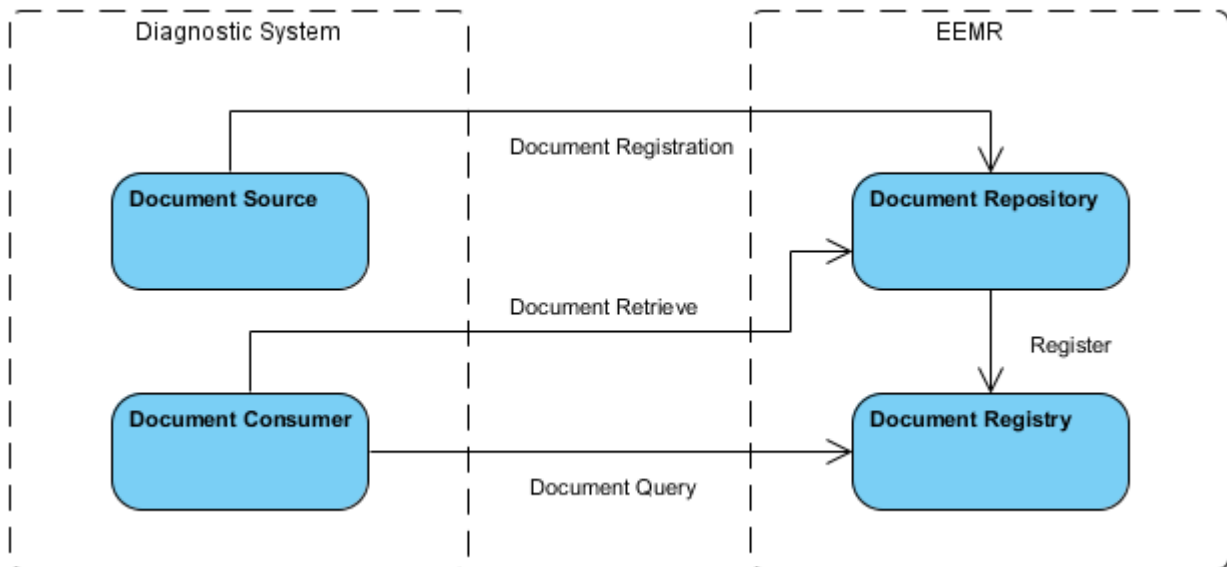
1. Actors

The following actors are involved in Document Management, and interact each other in a supplier-consumer model.

Document Source	The document source is the producer of the medical document.
Document Repository	The Document Repository actor persistently stores documents. It assigns and maintains a unique identifier for each document, to allow Document Consumers to retrieve them.
Document Registry	The Document Registry actor maintains meta-data about each registered document in a document entry. This includes a link to the Document Repository where the actual document is stored. The Document Registry responds to queries from Document Consumer actors about documents meeting specific criteria
Document Consumer	The Document Consumer actor queries a Document Registry actor for documents meeting certain criteria, and retrieves selected documents from one or more Document Repository actors.

2. Process Flow

The following schema shows a general process flow in Document Management; as we said before, current specifications will cover only the "Document Registration" scenario.



All of the Actors **are assumed to be provided with up-to-date patient demographic and encounter data**, thus no specific patient or encounter management transactions will be covered. Such functionalities SHOULD be achieved by "grouping" actors in current integration profile with appropriate actors of the Patient Administration Management integration profile, and applying its rules. Nonetheless, basic specifications for patient identity and encounter management will be also given as a workaround in case this is not possible.

3. Communication implementation

The IHE directives are taken into account, thus the use cases described in the following chapters will be implemented by using **HL7 2.5 messages, pipe-separated format**.

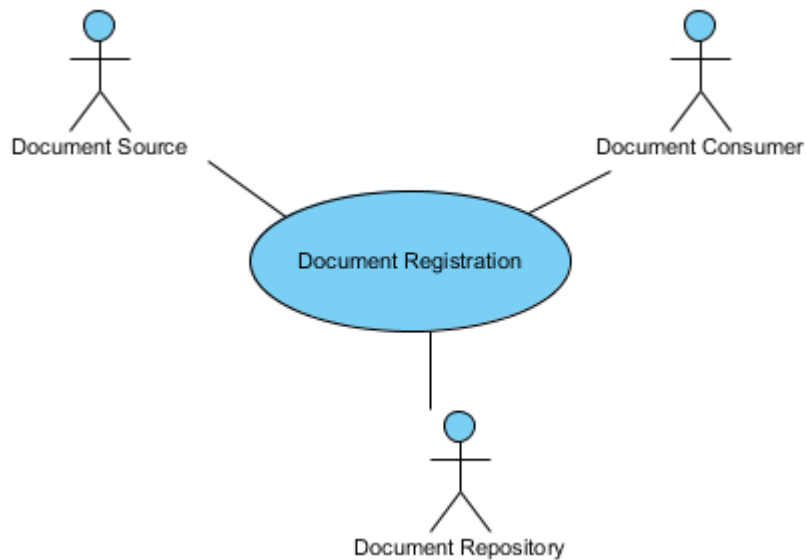
For the sake of clarity and easiness of reading, only the segments structure of messages will be described, leaving the detailed specifications of segments and fields contents to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG]. The HL7 messages structure will be described using the syntax explained in Messages Description Conventions section.

In the following, the description of the use cases will be given from a functional point of view only; details on the low-level HL7 protocol communication issues (e.g. acknowledgments, TCP/IP communication, messages envelopes, etc.) will be covered in section MLLP Communication Protocol.

Chapter 6. Document Registration

Document Registration is about sharing clinical documents, produced in the enterprise, inside a common document repository.

The document registration scenario involve the Document Source and Document Repository actors.



The Document Source role can be played by any system producing clinical documents that have to be shared within the organization; it can be an ADT system publishing Discharge Letters, a LIS producing Laboratory Reports and so on.

The Document Repository is any system that is able to receive the clinical document itself and associated classification data, linking the document to the right context (e.g. patient, visit and order information). Among NoemaLife applications, the role of the Document Repository is played by Galileo.

The Document Consumer is any system that is interested in getting notifications when documents, meeting some matching criteria, are available in the Document Repository. For example, when the Emergency Room places an order to an Order Filler (LIS, RIS,..), then it may play the role of Document Consumer when the report created by the Order Filler is stored in the Repository.

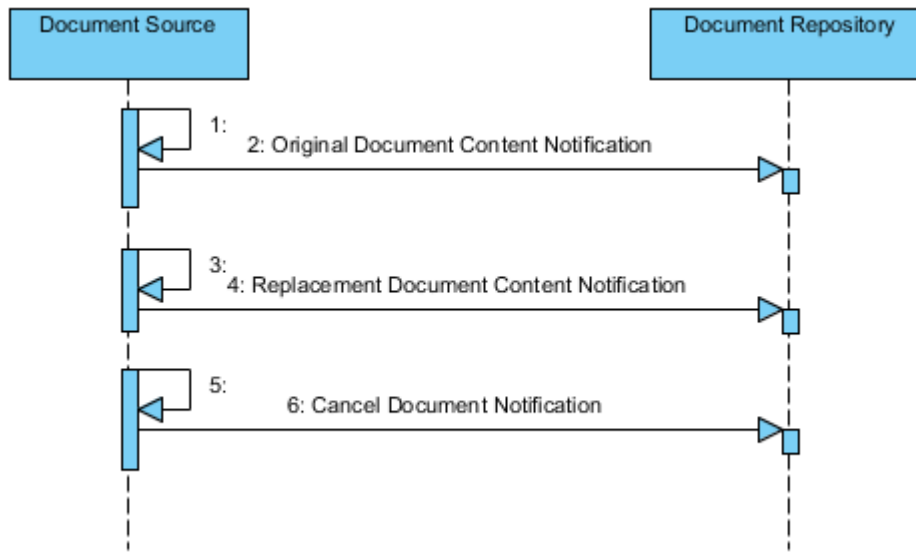
The following use cases will be considered and managed for the document registration scenario:

- Original Document Content Notification
- Replacement Document Content Notification
- Cancel Document Notification
- Original Document Link Notification
- Replacement Document Link Notification
- Document Status Change Notification

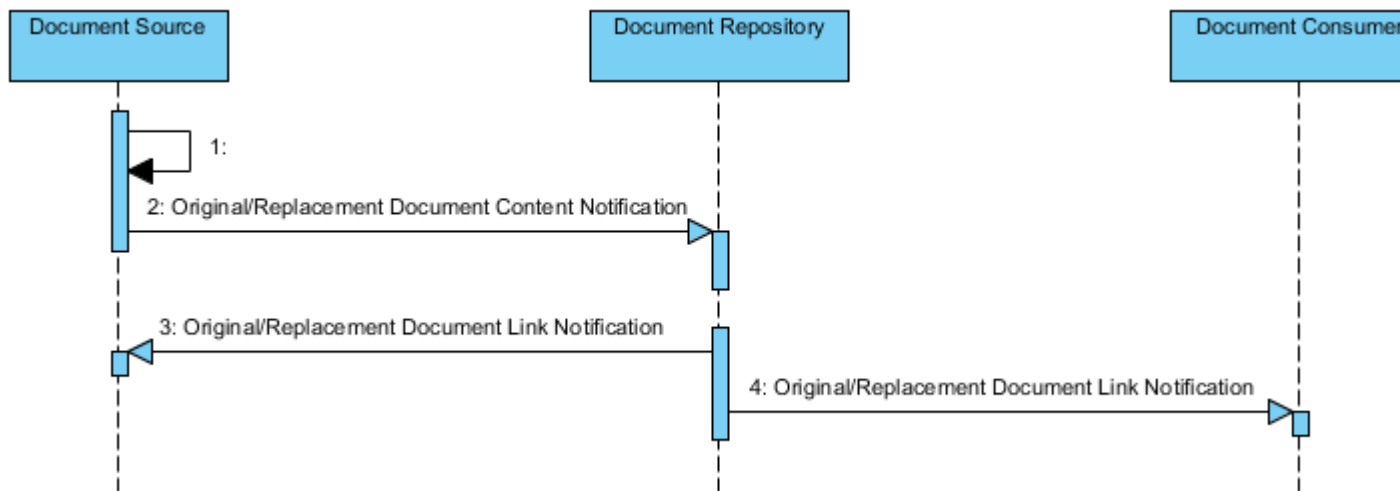
Note: current specifications do not include the Addendum Document Content Notification use case, because it is not managed by NoemaLife applications.

The first three use cases, **Original, Replacement and Cancel Document Notification**, deal with the notification and content delivery, from the document source to the document repository, of new documents as well as any

changes in the content of previously notified documents. Such use cases are represented in the following sequence diagram:

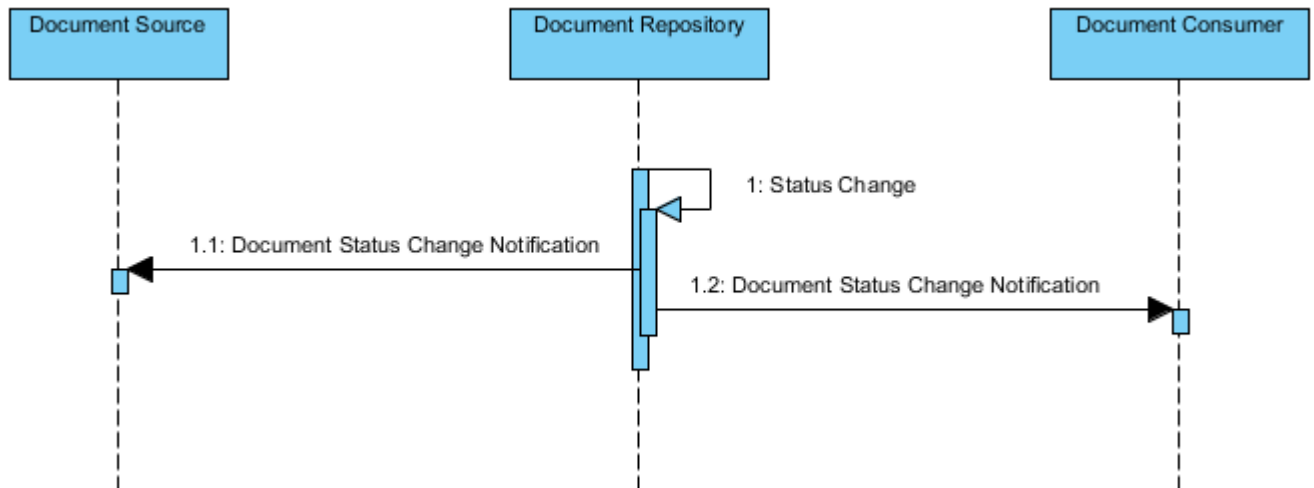


The **Original/Replacement Document Link Notification** use cases are about the notification (without any content delivery), from the Document Repository to the Document Source and to any Document Consumer that may have interest in the document, of the unique document identifier assigned to the documents by the Document Repository, so that the Document Source/Consumer can store this information for later retrieval of the document¹. This use case is represented in the following sequence diagram:



The **Document Status Change Notification** use case is about the notification (without any content delivery), from the Document Repository to the Document Source and to any Document Consumer that may have interest in it, of relevant events occurred to the document (e.g.: assignment of TimeStamp [IT: Marca Temporale], Notification to external Repository,..). This use case is represented in the following sequence diagram:

¹Document Retrieval scenario is not covered by current specifications



1. Glossary

- **Original Document:** it is the clinical document that is first published by the Document Source as the result of a clinical process (e.g. Report in case of a Laboratory Order, Discharge letter for an Encounter, etc.). Notification of the original document requires the use of the "Original Document Content Notification" message.
- **Replacement Document:** it is a document containing clinical informations that is sent by the Document Source with the purpose to replace a previous document, referred to as '*parent document*'. The Replacing Document supersedes the parent document. The parent document may be either an Original document or another Replacement Document, thus creating a '*chain*' of documents, with the last document of the chain being the sole having valid clinical content. The replaced parent document becomes '*obsolete*'. Notification of the Replacement document requires the use of the "Replacement Document Content Notification" message.
- **Invalidating Document** [IT: Documento annullativo]: it is a document that does not contain any clinical information, that is sent by the document source in order to notify document consumers that a previous delivered document is no longer valid. This event should be limited to the case when a clinical document has been erroneously created or associated to the wrong patient: when this happens, the document source must create an invalidating document, possibly containing an explanation for the invalidation, replacing the parent document. The parent document to be invalidated must be the last document in a document chain (see above), so it can be both an Original or Replacing document; as a consequence the parent document becomes '*cancelled*'. Notification of the Invalidating document requires the use of the "Replacement Document Content Notification" use case, where a specific field of the message, TXA-21, stores information about the document nature. An invalidating Document should be visible to end users.
- **Cancelled Document:** with this term we refer to the status of an Original or Replacement document that has been made invalid, as a result of the delivery of an Invalidating Document or a Cancel document notification. A cancelled document has no more clinical validity, but must still be retained in the system for historical reference; it should not be visible to end users.
- **Obsolete Document:** with this term we refer to the status of an Original or Replacement document that has been replaced, as a result of a Replacement Document Content Notification. An obsolete document has no more clinical validity, but must still be retained in the system for historical reference; it may or may not be visible to end users, according to site-specific policies.
- **Parent Document:** with this term we refer to the document that is preceding a given document it in a document chain.
- **Secondary Document:** with this term we refer to the attachments to a valid Original or Replacing document. Such attachments may be link to clinical images related to the main document, or may contain metadata about the main document. An example of secondary document is, in the CRS-SISS regional project, the DAO document, containing information about document authorization, privacy and consent.

2. Original Document Content Notification

2.1. Trigger Event

A new clinical document has been created by the Document Source and is available for delivery to the Document Repository. The use case is used to deliver an Original Document [63]

2.2. Expected Actions

Document Source:

- After creation of a new clinical document, **MUST** compose and send an HL7 2.5 **MDM^T02** message, including the original document and, when needed, any secondary documents
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it RECOMMENDED to include the Placer Order Number/Placer Group Number if available. • The values in Filler Order Number, Placer Order Number and Placer Group Number MUST be the same used in any other message and transaction related to the same order.
Document information	<ul style="list-style-type: none"> • Document Source's document identifier MUST be provided, and MUST be unique within the sending application

Document Repository:

- **MUST** process the message and apply data to its database, according to following rules:
 - **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- **MUST** store the document, linking it to the context provided in the message (e.g. Patient, Visit and Order).

2.3. HL7 message structure

Table 6.1. Original Document - MDM^T02 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
EVN	Event Type	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)	
Table 6.2. Common Order Group				
[Group]	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.3 (Filler Order Number), ORC.2 (Placer order Number), ORC.4 (Placer Group Number)
	[TQ1]	Timing/Quantity Segment	O	Quantity of required observations
	OBR	Observation Request Segment	R	Highlights: OBR.4 (Universal Service Identifier)
TXA	Document Notification	R	Highlights: TXA.12 (Unique Document Number), TXA.13 (Parent Document Number), TXA.17 (Document Completion Status), TXA.21 (Document Change Reason), TXA.22 (Authentication Person)	
Table 6.3. Document Content and Informations Group				
{Group}	Segment	Meaning	Usage	Notes
	OBX	Observation/Result	R	Highlights: OBX.3 (Observation identifier), OBX.5 (Observation value) Repetitions of the segment allow for delivery of a main clinical document and secondary documents. Loc CRS-SISS: Primo OBX: documento DCE Secondo OBX (opzionale): documento DAO
	{ [NTE] }	Notes and comments about the observation	R..*	Loc CRS-SISS: Ripetizioni del segmento utilizzate per notificare gli attributi relativi al DCE e al DAO; devono seguire l'OBX di pertinenza.

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3. Replacement Document Content Notification

3.1. Trigger Event

It is possible to distinguish between two sub-use cases:

- The clinical content of a document already delivered to the Document Repository must be changed: the Document Source creates a new version of the document with updated clinical content, named Replacement Document [63], and delivers it to the Document Repository to replace the previous document, which then becomes *obsolete*.
- A document has been erroneously created or associated to the wrong patient and already delivered to the Document Repository: the Document Source creates an Invalidating Document [63] containing an explanation for the invalidation and without any clinical content, and delivers it to the Document Repository to replace the previous document, which then becomes *cancelled*.

3.2. Expected Actions

Document Source:

- After creation of a new clinical document, **MUST** compose and send an HL7 2.5 **MDM^T10** message, including the replacement document and, when needed, any secondary documents.
- The message content **MUST** allow to uniquely identify the context (e.g.. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it RECOMMENDED to include the external order (Placer Order Number/Placer Group Number) if available. • The values in Filler Order Number, Placer Order Number and Placer Group Number MUST be the same used in any other message and transaction related to the same order
Document information	<ul style="list-style-type: none"> • Document identifier MUST be provided, and MUST be unique within the sending application • The Document Source's identifier of the parent document [63] to be replaced MUST be provided

Document Repository:

- **MUST** process the message and apply data to its database, according to following rules:
 - **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances

or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

- **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- **MUST** store the document, linking it to the context provided in the message (e.g.. Patient, Visit, Order and parent document).
- **MUST**, in case the parent document [63] is not available in the database, register the document as an Original document.
- **MUST** make the parent document an obsolete document [63] when TXA.21=RP, or a cancelled document [63] when TXA.21=CA, but must still retain it for historical reference.

3.3. HL7 message structure

The structure of MDM^T10 message is the same of MDM^T02 message.

4. Cancel Document Notification

4.1. Trigger Event

A document already delivered to the Document Repository must be changed due to incorrect clinical content. This is normally the use case for a Replacement Document Content Notification, but occasionally it may happen that the clinical process required to correct the mistake takes too much time; in this case, it is important to give an immediate notification to the Document Repository that the document is no longer valid. The Document Source sends a Cancel Document Notification to the Document Repository to make invalid the document with incorrect content, which then becomes *cancelled*. Note that in this case no documents are included in the message.

4.2. Expected Actions

Document Source:

- After creation of a correct clinical document, **MUST** compose and send an HL7 2.5 **MDM^T11** message
- The message content **MUST** allow to uniquely identify the context (e.g.. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it is RECOMMENDED to include the external order number (Placer Order Number or Placer Group Number) when available. Since under some circumstances there may be differences between Placer Order Number and Placer Group Number, in those cases it is REQUIRED to transmit the Placer Group Number (having higher relevance). • The values in Filler Order Number and Placer Order Number / Placer Group Number MUST be the same used in any other message and transaction related to the same order

Document information	<ul style="list-style-type: none"> The Document Source's identifier of the parent document [63] that has to be cancelled MUST be provided
----------------------	--

Document Repository:

- MUST then process the message and apply data to its database, according to following rules:
 - SHOULD NOT insert a new Patient, a new Visit and a new Order, if not existent
 - SHOULD NOT update Patient, Visit or Order informations, if already existent
 - In case the parent document [63] is not existent in the database, the message SHOULD be discarded raising at most a warning or a non blocking error
 - MUST make the parent document a cancelled document [63], retaining it in the system for historical reference.

4.3. HL7 message structure

Table 6.4. Cancel Document - MDM^T11 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)
TXA	Document Notification	R	TXA.13 (Parent Document Number), TXA.14 (Placer Order Number), TXA.15 (Filler Order Number), TXA.17 (Document Completion Status), TXA.21 (Document Change Reason), TXA.22 (Authentication Person)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

5. Original Document Link Notification

5.1. Trigger Event

After receiving a document from the Document Source via an Original Document Content Notification, the Document Repository assigns a unique identifier to the document and stores it. Later on, the Document Repository communicates the unique identifier to the Document Source and to any Document Consumer that may be interested in the document.

The Original Document Link Notification message MUST NOT be intended, by the Document Source, as an Application Acknowledge.

5.2. Expected Actions

Document Repository:

- MUST compose and send an HL7 2.5 **MDM^T01** message, in order to notify a link to an Original Document [63]

- The message content **MUST** allow to uniquely identify the context (e.g.. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it RECOMMENDED to include the Placer Order Number/Placer Group Number if available. • The values in Filler Order Number, Placer Order Number and Placer Group Number MUST be the same used in any other message and transaction related to the same order.
Document information	<ul style="list-style-type: none"> • The identifier of the Document assigned by the Document Source MUST be provided • The identifier of the Document assigned by the Document Repository MUST be provided

Document Source

- **MUST** save the Repository Document Identifier inside the document record identified by the Document Source Identifier, according to following rules:
 - In case no document exists in the database matching the Document Source identifier, the message **SHOULD** be discarded raising at most a warning or a non blocking error.
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order information, if already existent

Document Consumer

- If a Document Consumer is interested in receiving the document (i.e. the message satisfies some filtering criteria defined by local project) then it **MUST** create a new document record with Document information, linking it to the Patient, Visit and Order context described in the message, according to following rules:
 - **SHOULD** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order information, if already existent

5.3. HL7 message structure

Table 6.5. Original Document Link Notification - MDM^T01

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
EVN	Event Type	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
PV1	Patient Visit	R	Highlights: PV1.19 (Visit Number)	
[<i>Group</i>]]	Table 6.6. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.3 (Filler Order Number), ORC.2 (Placer order Number), ORC.4 (Placer Group Number)
[TQ1]	Timing/Quantity Segment	O	Quantity of required observations	

Segment	Meaning	Usage	Notes
	Segment	Meaning	Usage Notes
	OBR	Observation Request Segment	R Highlights: OBR.4 (Universal Service Identifier)
TXA	Document Notification	R	Highlights: TXA.12 (Unique Document Number)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

6. Replacement Document Link Notification

6.1. Trigger Event

After receiving a document from the Document Source via a Replace Document Content Notification, the Document Repository assigns a unique identifier to the new document and stores it. Later on, the Document Repository communicates the unique identifier to the Document Source and to any Document Consumer that may be interested in the document.

The Replacement Document Link Notification message **MUST NOT** be intended, by the Document Source, as an Application Acknowledge.

6.2. Expected Actions

Document Repository:

- **MUST** compose and send an HL7 2.5 **MDM^T09** message, in order to notify a link to a Replacement Document [63]
- The message content **MUST** allow to uniquely identify the context (e.g.. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it RECOMMENDED to include the Placer Order Number/Placer Group Number if available. • The values in Filler Order Number, Placer Order Number and Placer Group Number MUST be the same used in any other message and transaction related to the same order.
Document information	<ul style="list-style-type: none"> • The identifier of the Document assigned by the Document Source MUST be provided • The identifier of the Document assigned by the Document Repository MUST be provided • The parent document identifiers assigned by Document Source and Document Repository must be provided

Document Source

- **MUST** save, and in case replace, the Repository Document Identifier inside the document record identified by the Document Source Identifier, according to following rules
- In case no document exists in the database matching the Document Source identifier, the message **SHOULD** be discarded raising at most a warning or a non blocking error.

- SHOULD NOT insert a new Patient, a new Visit and a new Order, if not existent
- SHOULD NOT update Patient, Visit or Order informations, if already existent

Document Consumer

If a Document Consumer is interested in receiving the document, then:

- If the document record matching the Repository Parent Document identifier is found, MUST create a new document record linked to the same Patient, Visit and Order context of the *parent document*, with following rules:
 - MUST flag the parent document as "*obsolete*". The obsolete document may or may not be visible to end users, according to site-specific policies.
 - SHOULD NOT update Patient, Visit or Order informations.
- If the document record matching the Repository Parent Document identifier is NOT found, MUST create a new document record linked to the same Patient, Visit and Order context of the message, with following rules:
 - SHOULD insert a new Patient, a new Visit and a new Order, if not existent;
 - SHOULD NOT update Patient, Visit or Order informations, if already existent.

6.3. HL7 message structure

Table 6.7. Replacement Document Link Notification - MDM^T09 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
EVN	Event Type	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
PV1	Patient Visit	R	Highlights: PV1.19 (Visit Number)	
[<i>{Group}</i>]	Table 6.8. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.3 (Filler Order Number), ORC.2 (Placer order Number), ORC.4 (Placer Group Number)
	[TQ1]	Timing/Quantity Segment	O	Quantity of required observations
OBR	Observation Request Segment	R	Highlights: OBR.4 (Universal Service Identifier)	
TXA	Document Notification	R	Highlights: TXA.12 (Unique Document Number), TXA.13 (Parent Document Number)	

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

7. Document Status Change Notification

7.1. Trigger Event

An event occurred on a document stored at the Document Repository that must be notified to the Document Source or Document Consumer actors.

Examples of events can be:

- The Document Repository publishes the Document to an external Regional or National Document Registry (e.g.. CRS-SISS Document Registry);
- The Document Repository assigns a Legal TimeStamp (IT: Marca Temporale) to the Document.

The list of relevant events that must be notified is subject to local project agreements.

7.2. Expected Actions

Document Repository:

- **MUST** compose and send an HL7 2.5 **MDM^T03** message, in order to notify a status change event occurred on a document.
- The message content **MUST** allow to uniquely identify the context (e.g.. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • In case of clinical documents from diagnostic systems, it is REQUIRED to specify the Filler Order Number, and it is RECOMMENDED to include the external order number (Placer Order Number or Placer Group Number) when available. Since under some circumstances there may be differences between Placer Order Number and Placer Group Number, in those cases it is REQUIRED to transmit the Placer Group Number (having higher relevance). • The values in Filler Order Number and Placer Order Number / Placer Group Number MUST be the same used in any other message and transaction related to the same order
Document information	<ul style="list-style-type: none"> • The identifier of the Document assigned by the Document Source MUST be provided • The identifier of the Document assigned by the Document Repository MUST be provided
Event Information	<ul style="list-style-type: none"> • The Notification Type MUST be provided in EVN.4 (e.g.. SISS_NOTIFY) • External link to the document, when applicable, MUST be transmitted in TXA-16 • TXA-20 MUST be used to carry the Document Storage Status, or the result/outcome of the notification/status change (e.g. SISS-OK if notification was OK; SISS-<errorCode> if there was an error) • TXA-21 SHOULD be used for error description, if any

Document Source & Document Consumer

- **SHOULD** save event related data in the database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
- In case the Document is not existing in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error.

7.3. HL7 message structure

Table 6.9. Document Status Change Notification - MDM^T03 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
EVN	Event Type	R	Highlights: EVN.4 (Event Reason Code)
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.19 (Visit Number)
TXA	Document Notification	R	Highlights: TXA.12 (Unique Document Number), TXA.14 (Placer Order Number), TXA.15 (Filler Order Number), TXA.16 (Unique Document File Name), TXA.20 (Document Storage Status), TXA.21 (Document Change Reason)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Part III. Laboratory Testing Management

Use cases

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Chapter 7. Laboratory Testing Management overview

Laboratory Testing Management is inspired, and adheres the more is possible, to the IHE "**Laboratory Testing Workflow**" integration profile of the *IHE Laboratory Technical Framework* [IHE-ITI-LTF].

It establishes the continuity and integrity of clinical laboratory testing and observation data inside a healthcare institution, and covers the workflow related to tests performed by the clinical laboratories of the institution, for both identified orders and unknown orders, related to both identified patients and unidentified or misidentified patients. The profile involves a set of transactions, to maintain the consistency of ordering and patient information, to track the specimen collection and specimen acceptance and to deliver the laboratory results and reports at various steps of validation.

1. Actors

Several actors are involved in IHE Laboratory Testing Workflow, interacting each other in a supplier-consumer model.

Order Placer The Order Placer is a system that generates test orders for various clinical laboratories, places each of these to the correct laboratory, and appropriately manages all state changes.

Order Filler The Order Filler is a system used by a laboratory, that receives test orders from Order Placer actors, collects or controls the related specimens, accepts or rejects the order, schedules work orders, and sends them to one or more Automation Managers, receives the results from each Automation Manager, performs the clinical validation, appropriately manages all state changes of the order and sends the results to the Order Result Tracker(s).

Order Result Tracker The Order Result Tracker is a system that stores laboratory observations obtained for the patients of the healthcare institution, registers all state changes in the results notified by Order Fillers.

Automation Manager Automation Manager is any system or component that manages the automation in the laboratory, or a part of it. Automation involves the integration or interfacing of automated or robotic transport systems, analytical instruments, and pre- or post-analytical process equipment such as automated centrifuges and aliquoters, decappers, recappers, sorters, and specimen storage and retrieval systems.

In the Noemalife applications scenario, this role is grouped together with the Order Filler, thus it is mentioned for completeness but will not be considered in use cases.

2. Laboratory Testing Workflow transactions

Use cases included in IHE Laboratory Testing Workflow can be divided into several transactions; only the following ones will be considered.

- **Placer Order Management**, used by the Order Placer to place an order to the Order Filler. Relates to Transaction LAB-1 of the IHE Laboratory Technical Framework.
- **Order Results Management**, used to notify the Order Result Tracker of requested tests upon creation of an order, reception of a specimen in the laboratory and observation results when a result is acquired, clinically validated, modified or deleted. Relates to Transaction LAB-3 of the IHE Laboratory Technical Framework.

Aside from this "standard" transactions, one more will be added:

- **Order Report Management**, used to transmit to the Order Result Tracker the report (partial or final) related to an order, in human readable/printable format (e.g. PDF).

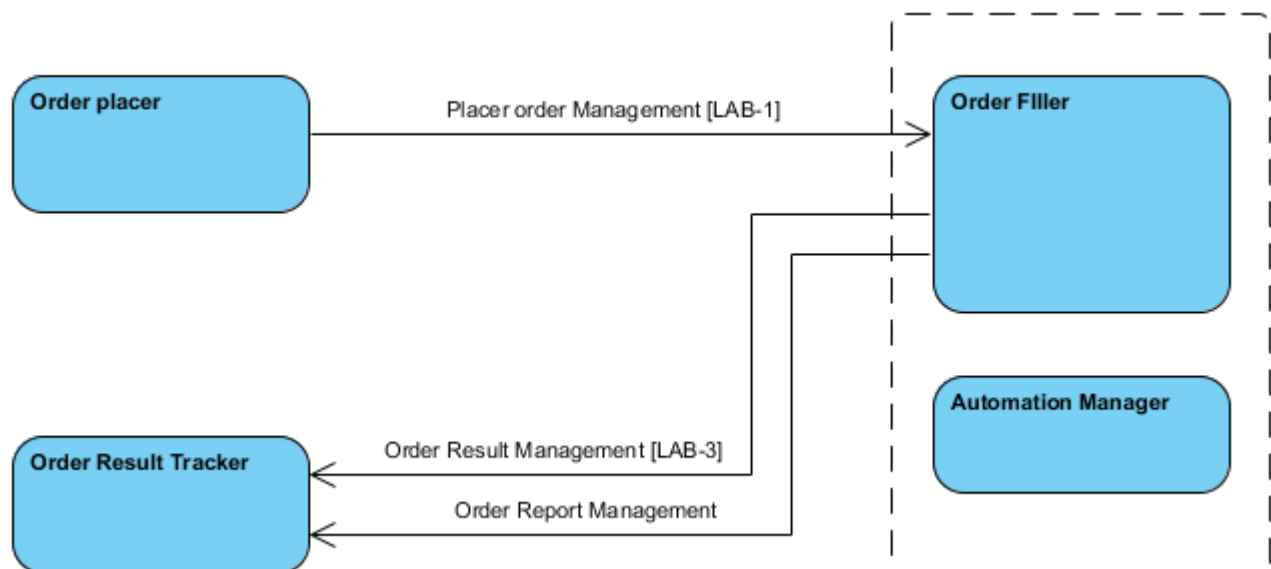
Despite this **"non-standard" transaction is not specifically included in IHE Laboratory Technical Framework**, it is somehow **related to the "Report Fac-simile For Order Group Option"**, giving the possibility to transmit to the Order Result Tracker a *link* to a report fac-simile including the results transmitted during the Order Result Management.

In our implementation, the main difference will be the transmission of the *content* of the document, and not just the link. The report content transmission will be achieved applying the Document Management integration profile.

All of the Actors **are assumed to be provided with up-to-date patient demographic and encounter data**, thus no specific patient or encounter management transactions will be covered. Such functionalities SHOULD be achieved by "grouping" actors in current integration profile with appropriate actors of the Patient Administration Management integration profile, and applying its rules. Nonetheless, basic specifications for patient identity and encounter management will be also given as a workaround in case this is not possible.

3. Process Flow

The following schema shows systems that may be involved in Laboratory Testing Workflow, the transactions that will be implemented and the participating actors.



4. Laboratory testing glossary and definitions

Prescription

Is defined as the paper that originates the order and identifies the required services. Prescriptions are strictly related with billing, but they have also legal implications, as they may indicate that the prescriber takes responsibility for the clinical care of the patient. Every order can be associated to zero, one or more prescriptions, and each prescription can generate one or more orders.

Prescriptions may have a unique identifier; in Italy the identifier of prescriptions filled by general practitioners is called Codice RUR (identificativo ricetta); in CRS-SISS project electronic prescriptions filled by general practitioners are assigned a unique identifier called IUP (Identificativo Univoco della Prescrizione).

Order Group

Set of Orders to be tested together for a patient. An Order Group is identified by a number or code in the placer system (Placer Group Number)

Order	An order is a request for the execution of a battery or a single test. The order has always a unique requesting organization unit (placer) and a unique receiver organization unit (designated filler). An order is identified by a number or code in a placer system (Placer Order Number) by another number or code in a filler system (Filler Order Number). Both these identifiers must unequivocally identify the order in the scope of the placer and filler respectively.
Test	An operation performed in laboratory or on the point of care, manually or on an analyzer or with the help of a device, instrument or system, to produce one or more observations (i.e. results).
Observation	A measurement of a single variable or a single value derived logically and/or algebraically from other measured or derived values. A test result is an observation.
Battery	A set of one or more laboratory tests, identified by a single name and code, that can be ordered to a laboratory. A battery can be an elementary laboratory test, like Potassium, or a set of laboratory tests or complex test, like the Complete Blood Count.
Elementary test	<p>Is a single, atomic test that may be requested alone or as a part of set of elementary tests (complex test).</p> <p>A single result (numeric, coded, textual, etc.) may be assigned to an elementary test.</p> <p>Loc DNLAB: In DNLAB, refers to "analisi singola"</p>
Complex test	<p>Is a set of elementary tests.</p> <p>No results are directly associated to a complex test, but only to the elementary test composing the complex test.</p> <p>Loc DNLAB: In DNLAB, refers to "analisi multipla"</p>
Loc: CRS-SISS	
Prestazione Aggiuntiva	Prestazione che può essere erogata direttamente dall'Order Filler senza che questa sia indicata sulla ricetta (prescription) e dipendentemente dal risultato che si ottiene dall'esame iniziale richiesto. Ad esempio l'antibiogramma è da considerarsi una prestazione aggiuntiva.

5. Communication implementation

The IHE directives are taken into account, thus the use cases described in the following chapters will be implemented by using **HL7 2.5 messages, pipe-separated format**.

For the sake of clarity and easiness of reading, only the segments structure of messages will be described, leaving the detailed specifications of segments and fields contents to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG]. The HL7 messages structure will be described using the syntax explained in Messages Description Conventions section.

In the following, the description of the use cases will be given from a functional point of view only; details on the low-level HL7 protocol communication issues (e.g. acknowledgments, TCP/IP communication, messages envelopes, etc.) will be covered in section MLLP Communication Protocol.

6. Future directions

At the date of release of this document, the following issues and items are *not supported* and identified as possible future document's enhancements and extensions:

- Management of Filler Order Management transaction (*IHE Laboratory Technical Framework* [IHE-ITI-LTF], transaction LAB-2)

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- Enhancement of Laboratory Order Result Management transaction to manage "Deletion of Battery/Test in a Filler Order"
- Use of additional OBX or NTE segments for carrying comments to Laboratory results (at present are inserted in OBX-17, not compliant with HL7 but simpler to manage)
- Management of comments/notes to the Laboratory Order and to the requested Tests (Elementary or Complex)

Chapter 8. Laboratory Placer Order Management

Laboratory Placer Order Management is a **partial** implementation of LAB-1 transaction of the *IHE Laboratory Integration Framework* [IHE-ITI-LTF].

This scenario allows an Order Placer to place an Order Group (i.e. a set of Orders to be tested together for a patient) or a standalone Order to the Order Filler. The Order Placer is allowed to notify the Order Filler subsequent modifications to the Order Group (new Orders or Order cancellations) until the Order Filler starts processing of the Order Group. The Order Filler notifies the Order Placer about status changes of the Orders.



We assume that an Order Group placed by the Order Placer will be fulfilled by a unique Order Filler, that is services for different Order Fillers will be placed into separate Orders Groups.

The following use cases will be considered and managed for the Placer Order Management scenario:

- Request Laboratory Order
- Cancel Laboratory Order
- Update Laboratory Order
- Laboratory Order Status changed

1. Request Laboratory Order

1.1. Trigger Event

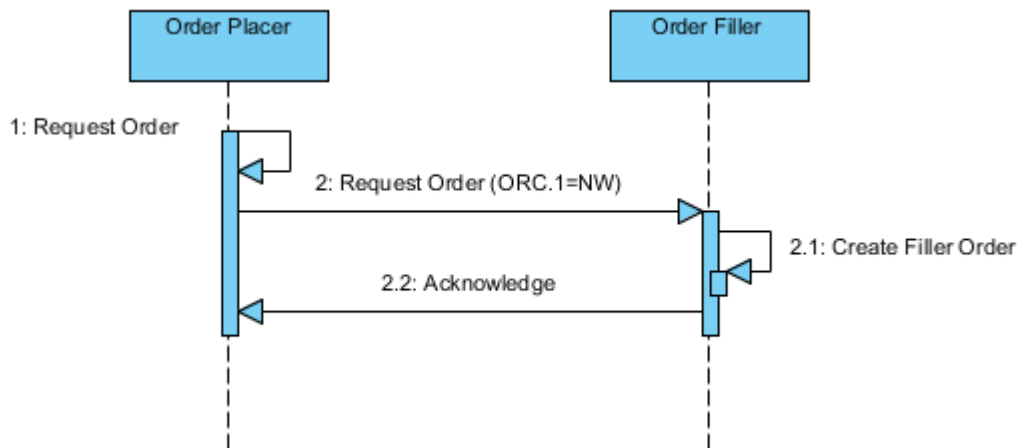
An application playing the role of Order Placer, places a single Order or an Order Group to the LIS for execution of tests that are to be performed on one or more specimens collected from the patient.

Since in some cases the order message might be the only source of patient's demographic and visit data for the order filler, it is important that the Order Placer fills both PID and PV1 segments.

Option:

The Order Filler generates specimen's identifiers and required labelling informations, that are transmitted to the Order Placer via the acknowledge message inside ZET segments.

The use case is represented in the following diagram:



1.2. Expected Actions

Order Placer:

- After creation of a new Order (Placer Order), **MUST** compose and send an HL7 2.5 **OML^O21** or **OML^O33** message with following rules:
 - An Order in the message (ORC segment) **MUST** contain a single Battery or Test (OBR segment), and *ORC.1=NW*
 - In case more than one Battery or Test are required, an Order **MUST** be created for each Battery/Test, with distinct Placer Order Number and the same Placer Group Number
 - The message content **MUST** uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.

- **MUST** receive an HL7 2.5 **ORL^O22 (matching a OML^O21)** or **ORL^O34 (matching a OML^O33)** *Synchronous application acknowledge* message from the Order Filler, informing about the result of the request (ORC.1=OK: request accepted; ORC.1=UA: unable to accept request).
- When the result is successful (ORC.1=OK), **SHOULD** store the Filler Order Number in the record of the order for later reference (e.g. for Cancel Laboratory Order request).
- If ZET segments are included in the message, **SHOULD** be able to print labels to be attached to the specimen containers.

Order Filler:

- **MUST** process the message and apply data to its database, according to following rules:

- **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- If the Placer Order is valid (e.g. all required tests are valid,...), **MUST** create one Filler Order (matching the Placer Order Group) or many Filler Orders (matching each Placer Order), linking them to the context provided in the message (e.g. Patient, Visit, Placer Order).
- If the Placer Order is **NOT** valid (e.g. some required services are unknown to the Filler system,...), **MUST** discard the order and raise an error condition.
- **MUST** compose and send a *Synchronous application acknowledge* using the HL7 2.5 **ORL^O22 (matching a OML^O21) or ORL^O34 (matching a OML^O33)** message, including the result for the Order creation request (ORC.1=OK: request accepted; ORC.1=UA: unable to accept request) and, when result is successful, the Filler Order Number/s.
- **SHOULD** be able to include labelling informations in ZET segments inside the *application acknowledge* message.

1.3. HL7 message structure

Table 8.1. Request Laboratory Order - OML^O21 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)
[PV2]	Patient Visit – Additional Info	O	
{Group}	Table 8.2. Common Order Group		
	Segment	Meaning	Usage Notes
	ORC	Common Order Segment	R Highlights: ORC.1 (Order Control)=NW, ORC.2 (Placer order Number), ORC.4 (Order Group Number)
	[TQ1]	Quantity/Timing	O
	OBR	Observation Request Segment	R Highlights: OBR.2 (Placer order Number), OBR.4 (Universal Service Identifier)
	[[SPM]]	Specimen	O

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Segment	Meaning	Usage	Notes
	Segment	Meaning	Usage Notes
	[BLG]	Billing Segment	O Used as "dummy" segment to avoid parsing errors (see segment description for details). Its use is RECOMMENDED.

Table 8.3. Request Laboratory Order - OML^O33 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
[PD1]	Additional demographic	O	
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)
[PV2]	Patient Visit – Additional Info	O	

Table 8.4. Specimen Group				
Segment	Meaning	Usage	Notes	
SPM	Specimen	O		
{ Group }	Table 8.5. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=NW, ORC.2 (Placer order Number), , ORC.4 (Order Group Number)
	[TQ1]	Quantity/Timing	O	
	OBR	Observation Request Segment	R	Highlights: OBR.2 (Placer order Number), OBR.4 (Universal Service Identifier)
	[BLG]	Billing Segment	O	Used as "dummy" segment to avoid parsing errors (see segment description for details). Its use is RECOMMENDED.

Table 8.6. ACK - ORL^O22 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
MSA	Message Acknowledgment	R		
[ERR]	Error	O		
[PID]	Patient Identification	O	Highlights: PID.3 (Patient Identifier List)	
[{ Group }]	Table 8.7. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control), ORC.2 (Placer order Number), ORC.3

Segment	Meaning	Usage	Notes
	Segment	Meaning	Usage Notes
			(Filler order Number), , ORC.4 (Order Group Number)
[OBR]	Observation Request Segment	O	Highlights: OBR.2 (Placer order Number), OBR.3 (Filler order Number), OBR.4 (Universal Service Identifier)
[SPM]	Specimen	O	
[{ZET}]	Local Attribute Table	O	Segment used for labelling informations; one ZET segment for each label

Table 8.8. ACK - ORL^O34 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
MSA	Message Acknowledgment	R		
[ERR]	Error	O		
[PID]	Patient Identification	O	Highlights: PID.3 (Patient Identifier List)	
{Group}	Table 8.9. Specimen Group			
	Segment	Meaning	Usage Notes	
	SPM	Specimen	O	
	{Group}	Table 8.10. Common Order Group		
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=NW, ORC.2 (Placer order Number), , ORC.4 (Order Group Number)
[OBR]	Observation Request Segment	O	Highlights: OBR.2 (Placer order Number), OBR.4 (Universal Service Identifier)	
[{ZET}]	Local Attribute Table	O	Segment used for labelling informations; one ZET segment for each label	

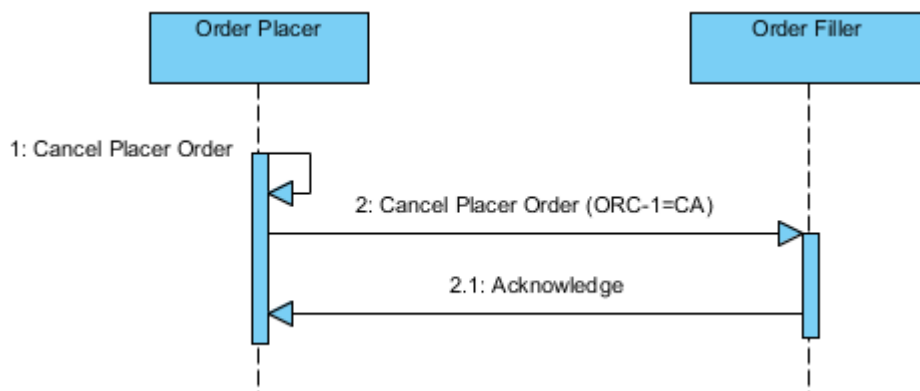
Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2. Cancel Laboratory Order

2.1. Trigger Event

An Order Placer sends a request to the Order Filler system asking for the complete cancellation (i.e. cancellation of all required tests) of a previously required Order Group that has not already been started by the Order Filler. The Order Filler system accepts the request and cancels the Order Group.

The use case is represented in the following diagram:



2.2. Expected Actions

Order Placer:

- To deliver an Order Group cancellation request to the Order Filler, **MUST** compose and send an HL7 2.5 **OML^O21** or **OML^O33** message
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • All the Orders belonging to the Order Group to be cancelled MUST be included in the message, with the same Placer Order Number and Placer Group Number that were specified in the Request Laboratory Order message, and ORC-1=CA • It is RECOMMENDED to specify the Filler Order Number

- **MUST** receive an HL7 2.5 **ORL^O22 (matching a OML^O21)** or **ORL^O34 (matching a OML^O33)** *Synchronous application acknowledge* message from the Order Filler, informing about result of request (ORC.1=CR: cancelled as requested; ORC.1=UC: unable to cancel).

Order Filler:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient or a new Visit, if not existent.
 - **SHOULD NOT** update Patient or Visit informations, if already existent.
 - In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error.
 - In case the Order is already in progress and the Order Filler is not able to accept the cancellation request, **MUST** raise an error condition to be notified back to the Order Placer via the acknowledge message.
 - In case the Order Filler is able to accept the update request, **MUST** apply changes to the Order, and guarantee traceability and reversibility of the order deletion operation, whether it is logical or physical.

- MUST compose and send a *Synchronous application acknowledge* using the HL7 2.5 **ORL^O22 (matching a OML^O21) or ORL^O34 (matching a OML^O33)** message, informing about result of request (ORC.1=CR: cancelled as requested; ORC.1=UC: unable to cancel).

2.3. HL7 message structure

Refer to the message structures for the [Request Laboratory Order](#) message

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3. Update Laboratory Order

3.1. Trigger Event

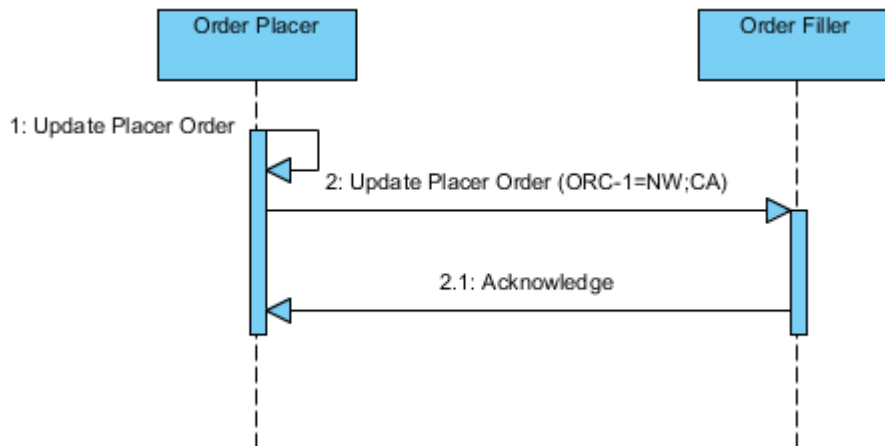
An Order Placer needs to change an existing Order Group that has not already been started by the Order Filler (i.e. an Order Status Update with ORC-5=IP have not been notified by the Order Filler).

We can identify the following sub-usecases:

- Add Tests: The Order Placer needs to add one or more tests to an existing Order Group
- Delete Tests: The Order Placer needs to remove one or more tests from an Order Group
- Add and Delete Tests: it is a combination of previous sub-usecases

Limitations: Test *replacement* sub-usecase, as defined by the IHE function OML Replace Order, is *not supported*; the same result can be reached using a combination of Delete Test and Add Test.

The use case is represented in the following diagram:



3.2. Expected Actions

Order Placer:

- MUST compose an HL7 2.5 **OML^O21 or OML^O33** message, with following rules:
 - Tests to be added, in the ORC-OBR group, MUST have:
 - same Placer Group Number (ORC-4) of the Order Group that is being updated;
 - new and unique Placer Order Number (ORC-2)
 - ORC-1=NW

- Tests to be deleted, in the ORC-OBR group, MUST have:
 - same Placer Group Number (ORC-4) of the Order Group that is being updated
 - same Placer Order Number (ORC-2) as in the Order Group that is being updated
 - ORC-1=CA
- Unchanged tests:
 - MAY be omitted in the update message
 - if specified in the update message, MUST keep same Placer Group Number and Placer Order Number as in the Order Group that is being updated
- The message content MUST uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.
Order Information	It is RECOMMENDED to specify the Filler Order Number

- MUST receive an HL7 2.5 **ORL^O22 (matching a OML^O21) or ORL^O34 (matching a OML^O33)** *Synchronous application acknowledge* message from the Order Filler, informing about the result of the request (ORC.1=OK: request accepted; ORC.1=UA: unable to accept request).
- If ZET segments are included in the message, SHOULD be able to print labels to be attached to the specimens.

Order Filler:

- MUST process the message and apply data to its database, according to following rules:
 - SHOULD NOT insert a new Patient, a new Visit and a new Order, if not existent
 - SHOULD NOT update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message SHOULD be discarded raising at most a warning or a non blocking error
 - In case the Order is already in progress and the Order Filler is not able to accept the update request, MUST raise an error condition to be notified back to the Order Placer via the acknowledge message.
 - In case the Order Filler is able to accept the update request, MUST update the order stopping any further processing of cancelled tests, and guarantee traceability and reversibility of the operation, whether it is logical or physical
 - SHOULD be able to provide updated labelling informations inside ZET segments;
- MUST compose and send a *Synchronous application acknowledge* using the HL7 2.5 **ORL^O22 (matching a OML^O21) or ORL^O34 (matching a OML^O33)** message, informing about result of request (ORC.1=OK: request accepted; ORC.1=UA: unable to accept request) and, when result is successful, the Filler Order Numbers.

- SHOULD be able to include up-to-date labelling informations in ZET segments inside the *application acknowledge* message.

3.3. HL7 message structure

Refer to the message structures for the Request Laboratory Order message

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4. Laboratory Order Status Changed

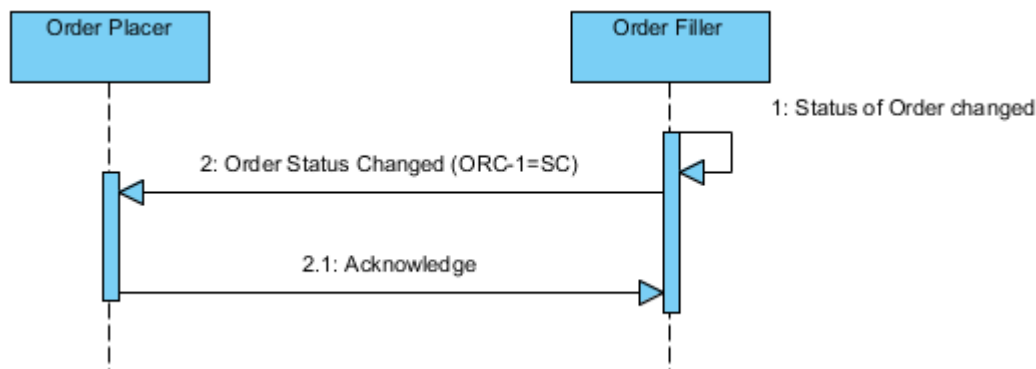
4.1. Trigger Event

During fulfillment of an Order, the Order Filler performs an unsolicited notification to the Order Placer about changes in the status of the order.

Limitations:

For compliance to IHE [IHE-ITI-LTF], this use case MUST not be applied when the Order Placer and the Order Results Tracker are grouped in the same application, because the Transaction LAB-3 message carrying the status change and possible new results is sufficient to inform that application of the new status of the Order.

The use case is represented in the following diagram:



4.2. Expected Actions

Order Filler:

- MUST compose and send an HL7 2.5 **OML^O21** message
 - MUST be able to notify at least the following events::
 - Order In Progress (ORC-5=IP): when the Order has started processing
 - Order Completed (ORC-5=CM): when the complete, verified report is available for the given order
 - Notification of following events is RECOMMENDED:
 - Order scheduled (ORC-5=SC) event
 - Partial Results available (ORC-5=A) event
 - MUST be able to provide, along with an Order Completed notification (ORC-5=CM), the list of supplied Tests in the ORC-OBR group

- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none">• All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer;• All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none">• Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none">• The Placer Order Number and Placer Group Number MUST be specified• It is RECOMMENDED to specify the Filler Order Number

Order Placer:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error
 - **MUST** compose and send a *Synchronous application acknowledge* using the HL7 2.5 **ORL^O34** message, informing about result of request (ORC.1=OK: request accepted; ORC.1=UA: unable to accept request)

4.3. HL7 message structure

Refer to the message structures for the [Request Laboratory Order](#) message

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Chapter 9. Order Result Management

Order Result Management is a **partial** implementation of LAB-3 transaction of the *IHE Laboratory Integration Framework* [IHE-ITI-LTF].

1. Order Results Management scenario

Actors involved in the transaction and their role are:

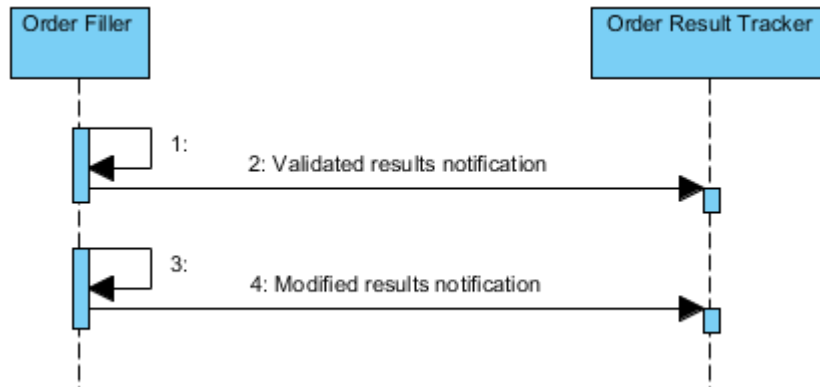


Order Filler Provides notification to the Order Result Tracker for technically/clinically validated results and modification/cancellation of results. Provides the complete sorted set of results related to a Placer Order or a Placer Order Group.

Order Result Tracker Receives test order and results from the Order Filler, gives access to this order and results to the healthcare enterprise.

Among all use cases of LAB-3 IHE transaction, only two will be implemented:

- new results notification from Order Filler to Order Result Tracker, after technical/clinical validation
- results modification notification from Order Filler to Order Result Tracker



1.1. Validated Results Notification

1.1.1. Trigger Event

This use case is triggered on the Order Filler when one or more results of an order reaches the "exportable" status, in order to notify the Order Result Tracker of the new information; "exportable" refers to the status allowing a results to be made available for public use. Usually, a result can be exported for public use upon technical or clinical validation, in some cases even print of results or digital signing could be considered.

The choice whether to trigger event upon one of those events can be defined by local agreements, even if the clinical validation is the most frequent case and is **RECOMMENDED**.

1.1.2. Expected Actions

Order Filler:

- After validation of results, **MUST** compose and send an HL7 2.5 **OUL^R22** message
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit, order); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Patient Encounter Consumer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is REQUIRED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter's hospital identifier) MUST be included
Order information	<ul style="list-style-type: none"> • The Filler Order Number is REQUIRED. • It is RECOMMENDED to include the Placer Group Number and/or the Placer Order Number • The values in Filler Order Number, Placer Order Number and Placer Group number MUST be the same used in any other message and transaction related to the same order
Results information	<ul style="list-style-type: none"> • Specimen Type MUST be included (code at least, description recommended) • Specimen Collection Date/Time MUST be included • Observation Identifier MUST be included • Observation Value MUST be included • Observation Result Status MUST be included, stating that the result notified is a new one in Final status • In case of numeric results, References Range MUST be included, if available, and should be set to the only range that apply to the patient condition (ex. considering age, sex, etc.) • See also details in <u>Microbiology results representation</u>

Order Result Tracker:

- **MUST** process the message and apply data to its database, according to following rules:
 - **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - **MUST** store the results, linking them to the context provided in the message (e.g. Patient, Visit and Order information).

1.1.3. HL7 message structure

Table 9.1. Validated Results Notification - OUL^R22 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)

Table 9.2. Specimen Group

Segment	Meaning	Usage	Notes
SPM	Specimen information	R	Highlights: SPM.4 (Specimen Type), SPM.17 (Specimen Collection Date/Time)

Table 9.3. Order + Results Group

Segment	Meaning	Usage	Notes	
{Group}	OBR	Observation Request	R	Highlights: OBR.2 (Placer order Number), OBR.3 (Filler Order Number) See also details in Microbiology results representation
	ORC	Common Order Segment	R	Highlights: ORC.2 (Placer order Number), ORC.3 (Filler Order Number), ORC.4 (Placer Group Number)
	[TQ1]	Timing/Quantity Segment	O	
	{OBX}	Observation Result	R..*	Highlights: OBX.3 (Observation Identifier), OBX.5 (Observation Value), OBX.7 (References Range), OBX.11 (Observation Result Status) See also details in Microbiology results representation

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

1.1.3.1. Microbiology results representation

Since Microbiology results have a complex, multi-level structure, in the following more details will be given to explain OUL^R22 HL7 message components mapping those information.

It is known that Microbiology results usually rely on three levels of detail of clinical analysis::

- *test result* (e.g. "Positive", "Negative", etc.);
- if the result is positive, a deeper analysis may occur leading to *identified microorganisms* (plus "auxiliary" information, like colony morphology, etc.)
- for each microorganism identified, *antibiotics susceptibility* may be tested

In HL7 messages, this hierarchical structure is represented using groups of OBR-ORC-{OBX} segments linked together, with each group carrying the data of one microbiology result level. To better explain with a schema:

```
MSH| ...
PID| ...

OBR| ... (Res)          -- "test result" group begin
ORC| ... (Res)
{OBX|... (Res, n)}     -- "test result" group end

OBR|... (Micro)        -- "identified microorganisms" group begin
ORC|... (Micro)        -- (includes microorganism-related results, like count, etc.)
{OBX|... (Micro, n)}   -- "identified microorganisms" group end

OBR|... (ATB)          -- "tested antibiotics" group begin
ORC|... (ATB)
{OBX|... (ATB, n)}     -- "tested antibiotics" group end
```

To allow linking of the groups each others, it is assumed that:

- the "test results" group and the "identified microorganisms" group are linked using the *elementary test code*, whose identifier **MUST** be included in both of
 - OBX.3 CE.1 of segment OBX|... (Res, n)
 - OBR.26 of segment OBR|... (Micro)

As an example, see fields highlighted in bold + underline in the example hereafter:

Example 9.1. Link between Microbiology "test results" and "identified microorganisms"

```
...
OBR|1||03000583^DN^1-03000583-200611281540|AREMO^Coltura aerobi^DN^AREMO@1^^DN
||200611281540|||010006|||LAB-1|F|^200611281540
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|
20061128170733||010006|||OB - Ambulatorio Chirurgia
Plastica^^^^^FI^^^AMCHPL9
TQ1|1|||200611281540|R
OBX|1|NM|AREMO^Coltura aerobi^DN^AREMO@1^^DN|Positivo/a||AA||F||
20061128155300|DEMO
OBR|2||03000583^DN^1-03000583-200611281540|LIS_MIC^Microorganismi Identificati^DN
||200611281540|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|20061128170733
|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
OBX|1|NM|11475-1^Micro organism identified^LN|1|haeinf^Haemophilus influenzae^DN
||N||F||20061128155300|DEMO
OBX|2|NM|11475-1^Micro organism identified^LN|2|hanano^Hansenula anomala^DN||N
||F||20061128155300|DEMO
OBR|3||03000583^DN^1-03000583-200611281540|LIS_ATB^Antibiotici Testati^DN||
200611281540|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|20061128170733
|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
OBX|1|SN|cf^Cefalotina^DN|1|>381||S|AB|F||20061128155300|DEMO
OBX|2|SN|tax^Cefotaxime^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|3|SN|ccl^Cefaclor^DN|1|<=8||S|AB|F||20061128155300|DEMO
OBX|4|SN|roxh^Cefuroxime^DN|1|<=4||S|AB|F||20061128155300|DEMO
...
```

- A similar link is created between the "identified microorganisms" group and the "tested antibiotics" group, always using the *elementary test code*, whose identifier **MUST** be included in both of
 - OBX.3 CE.1 of segment OBX|... (Res, n)
 - OBR.26 of segment OBR|... (ATB)

As an example, see fields highlighted in bold + underline in the example hereafter:

Example 9.2. Link between Microbiology "test results" and "tested antibiotics"

```

...
OBR|1||03000583^DN^1-03000583-200611281540|AREMO^Coltura aerobi^DN^AREMO@1^^DN
|||200611281540|||010006|||LAB-1|F|^200611281540
ORC|SC||03000583^DN^1-03000583-200611281540|CM|^200611281540||
20061128170733||010006|||OB - Ambulatorio Chirurgia
Plastica^^^^^FI^^^AMCHPL9
TQ1|1|||200611281540||R
OBX|1|NM|AREMO^Coltura aerobi^DN^AREMO@1^^DN|Positivo/a||AA||F||
20061128155300|DEMO
OBR|2||03000583^DN^1-03000583-200611281540|LIS_MIC^Microorganismi Identificati^DN
|||200611281540|||010006|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC||03000583^DN^1-03000583-200611281540|CM|^200611281540||20061128170733
|||010006|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
OBX|1|NM|11475-1^Micro organism identified^LN|1|haeinf^Haemophilus influenzae^DN
||N||F||20061128155300|DEMO
OBX|2|NM|11475-1^Micro organism identified^LN|2|hanano^Hansenula anomala^DN
||N||F||20061128155300|DEMO
OBR|3||03000583^DN^1-03000583-200611281540|LIS_ATB^Antibiotici Testati^DN
|||200611281540|||010006|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC||03000583^DN^1-03000583-200611281540|CM|^200611281540||
20061128170733|||010006|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^
AMCHPL9
OBX|1|SN|cf^Cefalotina^DN|1|>381||S|AB|F||20061128155300|DEMO
OBX|2|SN|tax^Cefotaxime^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|3|SN|ccl^Cefaclor^DN|1|<=8||S|AB|F||20061128155300|DEMO
OBX|4|SN|roxh^Cefuroxime^DN|1|<=4||S|AB|F||20061128155300|DEMO
...

```

- The link between an "identified microorganism" and the related "tested antibiotics" (an OBX|... (ATB, n) each) is carried out using the microorganism progressive index, whose value **MUST** be included in both of
 - OBX.4 of segment OBX|... (Micro, n) (one segment for each of the N microorganisms detected, with different progressive index from 1 to N)
 - OBX.4 of segment OBX|... (ATB, n) (one segment for each tested antibiotics; every antibiotic will have OBX.4 filled with the same progressive index of the microorganism is related to)

As an example, see fields highlighted in bold + underline in the example hereafter:

Example 9.3. Link between Microbiology "identified microorganisms" and "tested antibiotics"

```

...
OBR|2||03000583^DN^1-03000583-200611281540|LIS_MIC^Microorganismi Identificati^DN
|||200611281540|||LAB-1|F|AREMO|^^^200611281540|^AREMO
ORC|SC||03000583^DN^1-03000583-200611281540|CM|^^^200611281540|20061128170733
|||OB - Ambulatorio ChirurgiaPlastica^^^^^FI^^^AMCHPL9
OBX|1|NM|11475-1^Micro organism identified^LN|1|haeinf^Haemophilus influenzae^DN
||N||F||20061128155300|DEMO
OBX|2|NM|11475-1^Micro organism identified^LN|2|hanano^Hansenula anomala^DN
||N||F||20061128155300|DEMO
OBR|3||03000583^DN^1-03000583-200611281540|LIS_ATB^Antibiotici Testati^DN|||
200611281540|||LAB-1|F|AREMO|^^^200611281540|^AREMO
ORC|SC||03000583^DN^1-03000583-200611281540|CM|^^^200611281540|20061128170733
|||OB - Ambulatorio ChirurgiaPlastica^^^^^FI^^^AMCHPL9
OBX|1|SN|cf^Cefalotina^DN|1|>381||S|AB|F||20061128155300|DEMO
OBX|2|SN|tax^Cefotaxime^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|3|SN|ccl^Cefaclor^DN|1|<=8||S|AB|F||20061128155300|DEMO
OBX|4|SN|roxh^Cefuroxime^DN|1|<=4||S|AB|F||20061128155300|DEMO
OBX|5|SN|c^Cloramfenicolo^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|6|SN|am^Ampicillina^DN|1|<=1||S|AB|F||20061128155300|DEMO
OBX|7|SN|sxt^Trimetoprin/Sulfam.^DN|1|<=0.5||S|AB|F||20061128155300|DEMO
OBX|8|SN|ofx^Ofloxacina^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|9|SN|tet^Tetraciclina^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|10|SN|amc^Amoxicillina/A.CLAV.^DN|1|<=4||S|AB|F||20061128155300|DEMO
OBX|11|SN|rif^Rifampicina^DN|1|<=1||S|AB|F||20061128155300|DEMO
OBX|12|SN|cf^Cefalotina^DN|2||R|AB|F||20061128155300|DEMO
OBX|13|SN|cfu^Cefuroxime^DN|2||S|AB|F||20061128155300|DEMO
OBX|14|SN|cc^Clindamicina^DN|2|>= 100||S|AB|F||20061128155300|DEMO
OBX|15|SN|cxt^Co-Trimoxazolo^DN|2|> 200||S|AB|F||20061128155300|DEMO
OBX|16|SN|e^Eritromicina^DN|2|>=2.5||S|AB|F||20061128155300|DEMO
OBX|17|SN|gm^Gentamicina^DN|2||I|AB|F||20061128155300|DEMO
OBX|18|SN|ox^Oxacillina^DN|2||R|AB|F||20061128155300|DEMO
OBX|19|SN|peng^Penicillina G^DN|2||R|AB|F||20061128155300|DEMO
...

```

Despite HL7 standard would suggest a different approach, for the sake of easiness all the antibiotics tested on all the microorganisms identified of a single elementary microbiology test are included in the same OBR-ORC-{OBX} group.

- Finally, a common link among the three groups is introduced, by using the identifier of the *complex test* that MUST be included in all of
- OBR.4 CE.1 of segment OBR|... (Res)
- OBR.29 EIP.2 EI.1 of segment OBR|... (Micro)
- OBR.29 EIP.2 EI.1 of segment OBR|... (ATB)

As an example, see fields highlighted in bold + underline in the example hereafter:

Example 9.4. Link between Microbiology "test results", "identified microorganisms" and "tested antibiotics"

```

...
OBR|1||03000583^DN^1-03000583-200611281540|AREMO^Colturaaerobi^DN^AREMO@1^^DN
||200611281540|||010006|||LAB-1|F|^200611281540
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|20061128170733
||010006|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
TQ1|1|||200611281540|R
OBX|1|NM|AREMO^Coltura aerobi^DN^AREMO@1^^DN|Positivo/a||AA||F||20061128155300
|DEMO
OBR|2||03000583^DN^1-03000583-200611281540|LIS_MIC^Microorganismi Identificati^DN
||200611281540|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|20061128170733
|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
OBX|1|NM|11475-1^Micro organism identified^LN|1|haeinf^Haemophilus influenzae^DN
||N||F||20061128155300|DEMO
OBX|2|NM|11475-1^Micro organism identified^LN|2|hanano^Hansenula anomala^DN
||N||F||20061128155300|DEMO
OBR|3||03000583^DN^1-03000583-200611281540|LIS_ATB^Antibiotici Testati^DN
||200611281540|||LAB-1|F|AREMO|^200611281540|^AREMO
ORC|SC|03000583^DN^1-03000583-200611281540|CM|^200611281540|20061128170733
|||OB - Ambulatorio Chirurgia Plastica^^^^^FI^^^AMCHPL9
OBX|1|SN|cf^Cefalotina^DN|1|>381||S|AB|F||20061128155300|DEMO
OBX|2|SN|tax^Cefotaxime^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|3|SN|ccl^Cefaclor^DN|1|<=8||S|AB|F||20061128155300|DEMO
OBX|4|SN|roxh^Cefuroxime^DN|1|<=4||S|AB|F||20061128155300|DEMO
OBX|5|SN|c^Cloramfenicolo^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|6|SN|am^Ampicillina^DN|1|<=1||S|AB|F||20061128155300|DEMO
OBX|7|SN|sxt^Trimetoprin/Sulfam.^DN|1|<=0.5||S|AB|F||20061128155300|DEMO
OBX|8|SN|ofx^Ofloxacina^DN|1|<=2||S|AB|F||20061128155300|DEMO
OBX|9|SN|tet^Tetraciclina^DN|1|<=2||S|AB|F||20061128155300|DEMO
...

```

1.2. Modified Results Notification

1.2.1. Trigger Event

This use case is triggered on the Order Filler when one or more results, previously notified, have been modified. New values must be notified to the Order Result Tracker.

To be noted that this use case MAY combine notification of results corrections and notifications of new results, applying the rules of the [Validated Results Notification](#) use case.

1.2.2. Expected Actions

The use case management is basically the same of previous [Validated Results Notification](#) use case.

The only significant difference is that, in modified results data, Observation Result Status MUST be included stating that the Observation Value is the *Correction* of a previously notified result.

Part IV. Radiology Management

Use cases

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Chapter 10. Radiology Order Management overview

The Radiology Order Management is about the management of orders to the Radiology department; it is inspired by the IHE **Scheduled Workflow** Integration Profile of the *IHE Radiology Integration Framework* [IHE-RAD-TF], of which it implements the following transactions:

- RAD-2: Placer Order Management
- RAD-3: Filler Order Management

We will refer to above transaction as two different **scenarios**: Placer Order Management and Filler Order Management

For more informations concerning localizations for CRS-SISS regional project, refer to CRS-SISS technical documentation [CRS-SISS-HL7]

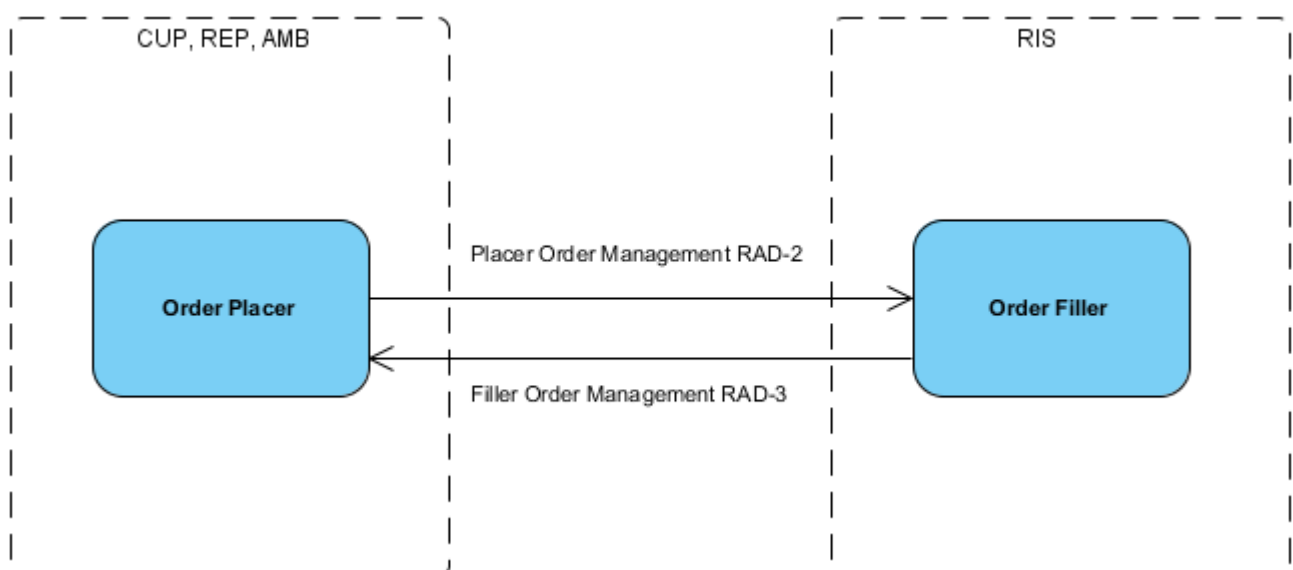
1. Actors

Two actors are involved in Radiology Order Management, having different roles depending on the scenario in which they are participating:

- *Placer Order Management scenario*
 - **Order Placer**: Places orders and order cancelations to the Order Filler
 - **Order Filler**: Receives and processes (fills) orders and cancellations from the Order Placer
- *Filler Order Management scenario*
 - **Order Filler**: Creates new or cancels existing orders; sends notifications of order status to the Order Placer.
 - **Order Placer**: Receives new order and order cancellation requests from Order Filler. Receives Order Status updates from Order Filler.

2. Process Flow

The following schema shows a general process flow in Radiology Order Management.



All of the Actors **are assumed to be provided with up-to-date patient demographic and encounter data**, thus no specific patient or encounter management transactions will be covered. Such functionalities SHOULD be

achieved by "grouping" actors in current integration profile with appropriate actors of the [Patient Administration Management](#) integration profile, and applying its rules. Nonetheless, basic specifications for patient identity and encounter management will be also given as a workaround in case this is not possible.

3. Glossary and definitions

- **Prescription:** is defined as the paper that originates the order and identifies the required services. Prescriptions are strictly related with billing, but they have also legal implications, as they may indicate that the prescriber takes responsibility for the clinical care of the patient. Every order can be associated to zero, one or more prescriptions, and each prescription can generate one or more orders.

Prescriptions may have a unique identifier; in Italy the identifier of prescriptions filled by general practitioners is called Codice RUR (identificativo ricetta); in CRS-SISS project electronic prescriptions filled by general practitioners are assigned a unique identifier called IUP (Identificativo Univoco della Prescrizione).

- **Order:** An order is a request for the execution of healthcare services. The order has always an unique requesting organization unit (placer) and an unique receiver organization unit (designated filler). An order is identified by a number or code in a placer system (Placer Order Number) and by another number or code in a filler system (Filler Order Number). Both these identifiers must univocally identify the order in the scope of the placer and filler respectively.
- **Requested Service:** health services that are requested with an order. Typically services of a same order belong to the same specialty. If the set of requested services contains more specialties, services are splitted in more orders, each one specific for a specialty.
- **Accession Number:** A user-friendly identifier created by the Order Filler, which identifies an instance of a filler order or imaging service request. It may group one or more requested procedures.
- **Requested Procedure:** unit of work that must be performed by the Order Filler to fulfill a requested service. In the Radiology domain they are identified by a *Study Instance UID*
- **Study Instance UID:** a globally unique identifier for each Requested Procedure. This identifier is used to identify all generated images and other DICOM objects related to a Requested Procedure.

4. Communication implementation

The IHE directives are taken into account, thus the use cases described in the following chapters will be implemented by using **HL7 2.5 messages, pipe-separated format**.

For the sake of clarity and easiness of reading, only the segments structure of messages will be described, leaving the detailed specifications of segments and fields contents to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG]. The HL7 messages structure will be described using the syntax explained in [Messages Description Conventions](#) section.

In the following, the description of the use cases will be given from a functional point of view only; details on the low-level HL7 protocol communication issues (e.g. acknowledgments, TCP/IP communication, messages envelopes, etc.) will be covered in section [MLLP Communication Protocol](#).

5. Future directions

At the date of release of this document, the following issues and items are *not supported* and identified as possible future document's enhancements and extensions:

- Structured Radiology Report export ([IHE-RAD-TF]), transaction RAD-28 (ORU^R01)
- Appointment Notification ([IHE-RAD-TF]), transaction RAD-48 (SIU messages)

Chapter 11. Radiology Placer Order Management

Radiology Placer Order Management is a **partial** implementation of RAD-1 transaction of the *IHE Laboratory Integration Framework* [IHE-RAD-TF].

In this scenario, the Order Placer will *place a new order* to the Order Filler. The Order Placer will be able to *cancel the order* until the Order filler starts processing it. Order Placer will be allowed to make *modifications* to a placed order, only by cancelling the initial order and placing the new order.



We assume that the order placed by the Order Placer contains only radiology services, that is services for different diagnostic systems (e.g. Cardiology) will be placed into separate orders.

The following use cases will be considered and managed for the Placer Order Management scenario:

- Request Radiology Order
- Book Radiology Order
- Cancel Radiology Order
- Update Radiology Order

1. Request Radiology Order

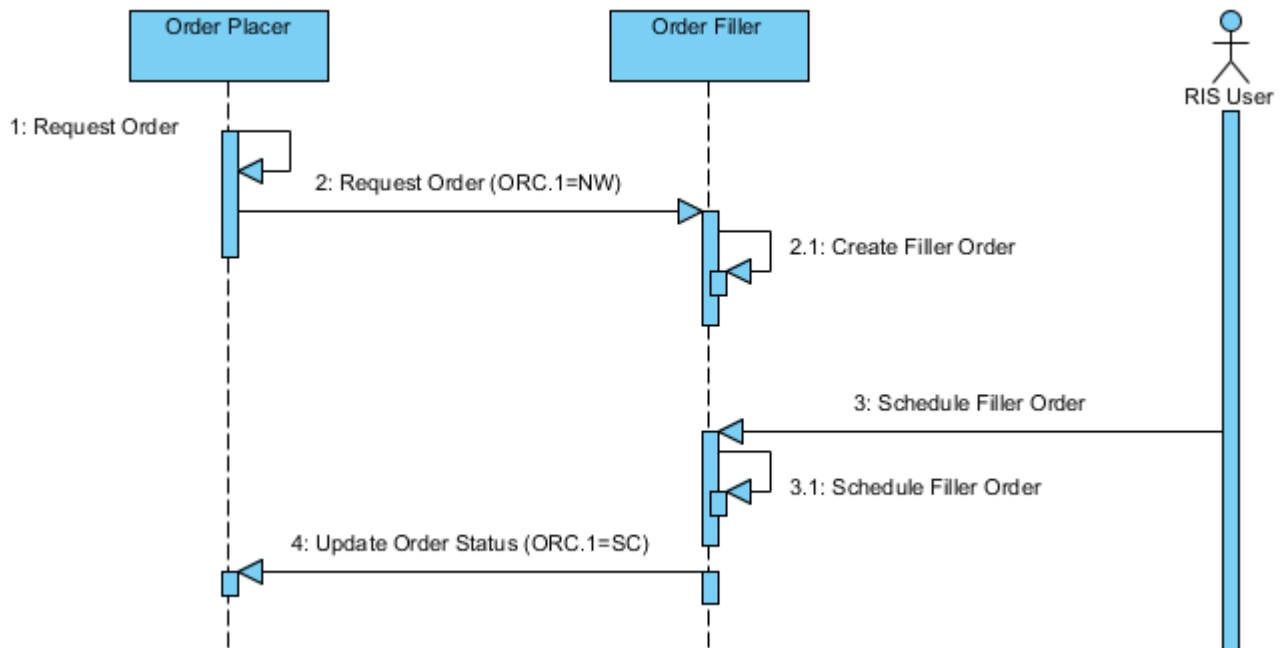
1.1. Trigger Event

An application playing the role of Order Placer (e.g. CUP, Ward Order Entry), places a new order to the Radiology system asking for the execution of one or more radiology services, for inpatients or outpatients. The Radiology system creates a Filler order with associated requested procedures (studies) fulfilling the requested services. Then the Filler Order is available to RIS users for scheduling (i.e. confirm/assign execution times and modalities).

After the Order has been scheduled by the Order Filler, a message is sent to the Order Placer informing that the order has been scheduled.

Since in some cases the order message might be the only source of patient's demographic and visit data for the order filler, it is important that the order palcer fills both PID and PV1 segments.

The use case is represented in the following diagram:



1.2. Expected Actions

Order Placer:

- After creation of a new Order (Placer Order), MUST compose and send an HL7 2.5 **ORM^O01** message, including the required services
- The message content MUST allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.
Order information	<ul style="list-style-type: none"> • Order start date/time or exam date/time MUST be included in the “Quantity/Timing” field of both the ORC and OBR segments.

- It is RECOMMENDED to receive an Update Radiology Order Status (ORM^O01) message delivering scheduling informations, as described in the Radiology Filler Order Management. **Note:** for CRS-SISS projects, an ORR^O02 might be required instead of ORM^O01

Order Filler:

- MUST process the message and apply data to its database, according to following rules:
 - MUST, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances

or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).

- **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
- If the Placer Order is valid (e.g. all required services are valid,...), **MUST** create a new order inside the database (Filler Order) with associated procedures fulfilling the requested services, linking it to the context provided in the message (e.g. Patient, Visit, Placer Order).
- If the Placer Order is **NOT** valid (e.g. some requires services are unknown to the Filler system,...), **MUST** discard the order and raise an error condition
- It is **RECOMMENDED** to compose and send an Update Radiology Order Status(ORM^O01) message delivering scheduling informations, as described in the Radiology Filler Order Management. **Note:** for CRS-SISS projects, an ORR^O02 might be required instead of ORM^O01

1.3. HL7 message structure

Table 11.1. Request Radiology Order - ORM^O01 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
[PD1]	Additional demographic	O		
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)	
[PV2]	Patient Visit – Additional Info	O		
{Group}	Table 11.2. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=NW, ORC.2 (Placer order Number), ORC.7 (Quantity/Timing)
	OBR	Observation Request Segment	R	Highlights: OBR.2 (Placer order Number), OBR.4 (Universal Service Identifier), OBR.27 (Quantity/Timing)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2. Book Radiology Order

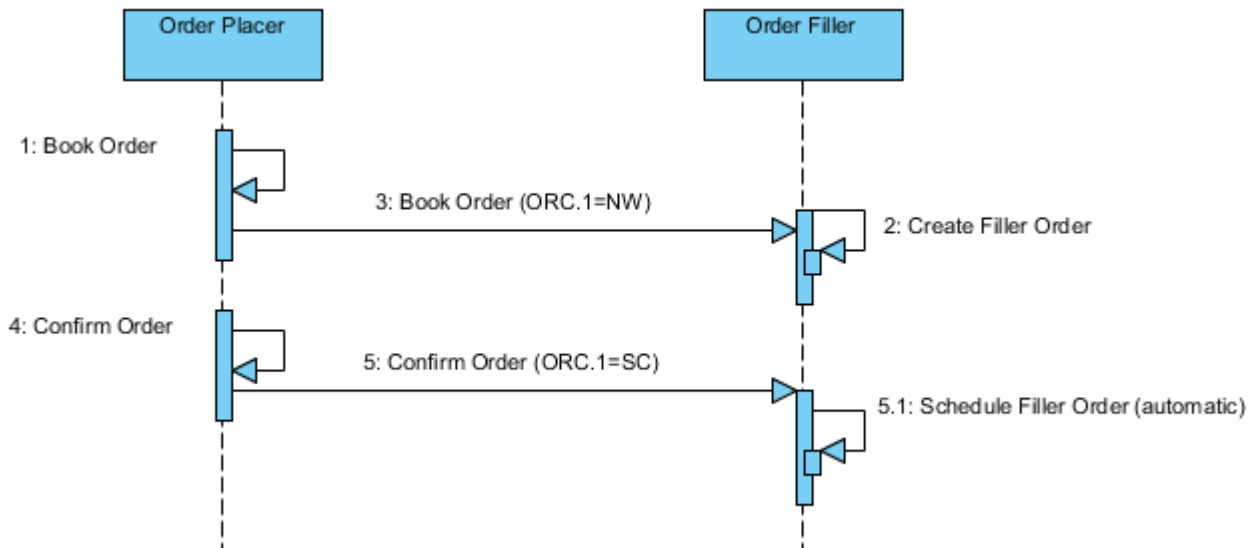
2.1. Trigger Event

This is an extension of the Request Radiology Order use case, allowing the order Placer to perform a two-steps Order Request & Confirm for booking first and later confirming an order, as described in the following:

1) Book Radiology Order: like in the Request Radiology Order use case, the Order Placer sends an Order to the order Filler in order to book an Order without scheduling it;

2) Confirm Radiology Order: the Order Placer sends a second message to the Order Filler to confirm the order previously booked (for example, after an Encounter has been registered for the patient at the hospital); the Order Filler performs automatic scheduling (based either on scheduling informations - time and modalities - that the order placer may specify in the OBR segment, or on the Order Filler configuration preferences).

The use case is represented in the following diagram:



2.2. Expected Actions

Order Placer:

- MUST *Book a new order* via an HL7 2.5 **ORM^O01** message with ORC.1=NW, following the rules stated for the use case Request Radiology Order
- MUST *Confirm the order* via an HL7 2.5 **ORM^O01** message with ORC.1=SC, following the rules stated for the use case Request Radiology Order with following additional rules:
 - the Order Placer Number (ORC-2 and OBR-2) MUST be the same as specified in the Book Radiology Order message

Order Filler:

- MUST process the *Book Radiology Order* message according to the rules stated for the use case Request Radiology Order
- MUST process the *Confirm Radiology Order* according to the following rules:
 - MUST schedule the Order, assigning execution time and modalities to required procedures
 - In case the Order is not available in the database, the message SHOULD be discarded raising at most a warning or a non blocking error

2.3. HL7 message structure

Refer to the message structures for the Request Radiology Order message

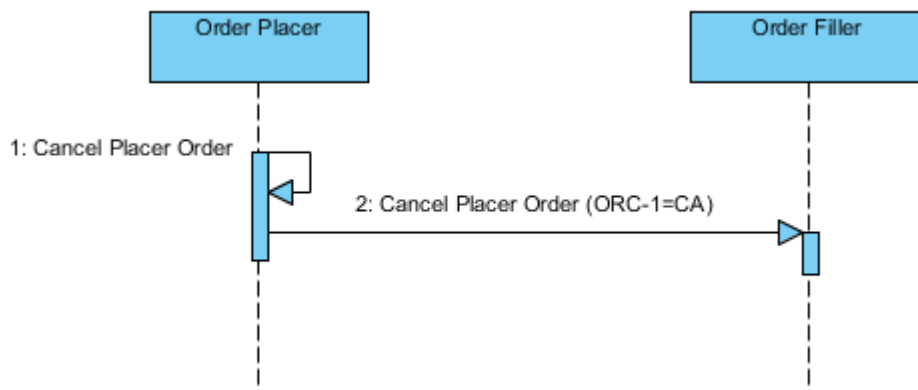
3. Cancel Radiology Order

3.1. Trigger Event

An Order Placer sends a request to the Radiology system asking for the cancellation of a previously required order that has not already been started. The Radiology system accepts the request and cancels the order.

The use case does not allow for partial cancellation of orders: the whole order with all required services will be cancelled.

The use case is represented in the following diagram:



3.2. Expected Actions

Order Placer:

- To deliver an order cancellation request to the Order Filler, **MUST** compose and send an HL7 2.5 **ORM^O01** message, including the required services
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number to be cancelled MUST be specified • It is RECOMMENDED to specify the Filler Order Number

Order Filler:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
- In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error

- In case the Order is already in progress and the Order Filler is not able to accept the cancellation request, MUST raise an error condition to be notified back to the Order Placer via the acknowledge message.
- In case the Order Filler is able to accept the cancellation request, MUST cancel the order stopping any further processing, and guarantee traceability and reversibility of the operation, whether it is logical or physical

3.3. HL7 message structure

Table 11.3. Cancel Radiology Order - ORM^O01 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number)
ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control) = CA, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number),

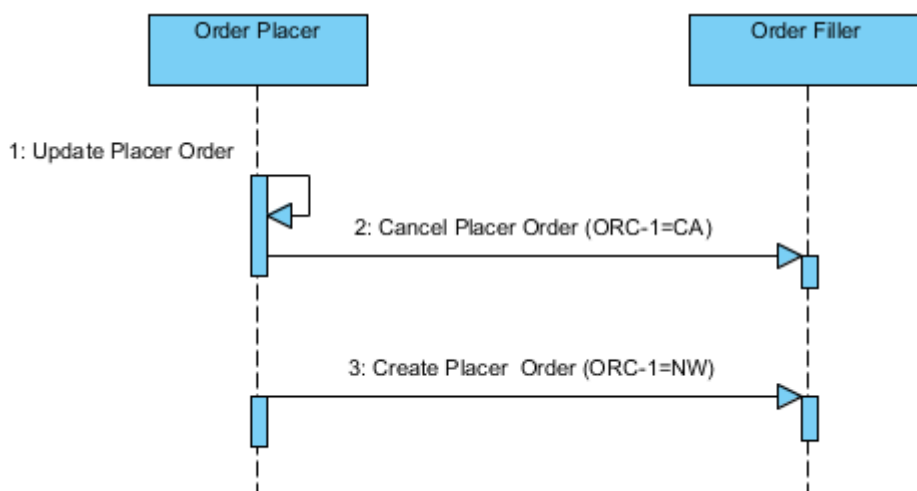
Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

4. Update Radiology Order

4.1. Trigger Event

An Order Placer needs to change a previously accepted Order, for example to add or delete one or more services, that has not already been started by the Order Filler (i.e. an Order Status Update with ORC-5=IP should not have been notified by the Order Filler via the Update Radiology Order Status message. This use case can be fulfilled in two steps: first the Order Placer sends a cancellation request for the Order that needs to be changed, then it sends a new order with the complete list of services that are required.

The use case is represented in the following diagram:



4.2. Expected Actions

Order Placer:

- MUST *cancel the order* that needs to be updated via an HL7 2.5 **ORM^O01** message, following the rules stated for the use case Cancel Radiology Order
- MUST *create a new order* via an HL7 2.5 **ORM^O01** message, following the rules stated for the use case Request Radiology Order, with following additional rules:
 - the new Order MUST have a different Placer Order Number than the old order (ORC-2 and OBR-2)
 - the new Order MAY have the same or different Placer Group Number (ORC-4)

Order Filler:

- MUST process the *cancel message* according to the rules stated for the use case Cancel Radiology Order
- MUST process the *new order message* according to the rules stated for the use case Request Radiology Order

4.3. HL7 message structure

Refer to the message structures for the Cancel Radiology Order message and Request Radiology Order message

Chapter 12. Radiology Filler Order Management

Radiology Filler Order Management is a **partial** implementation of RAD-2 transaction of the *IHE Laboratory Integration Framework* [IHE-RAD-TF].

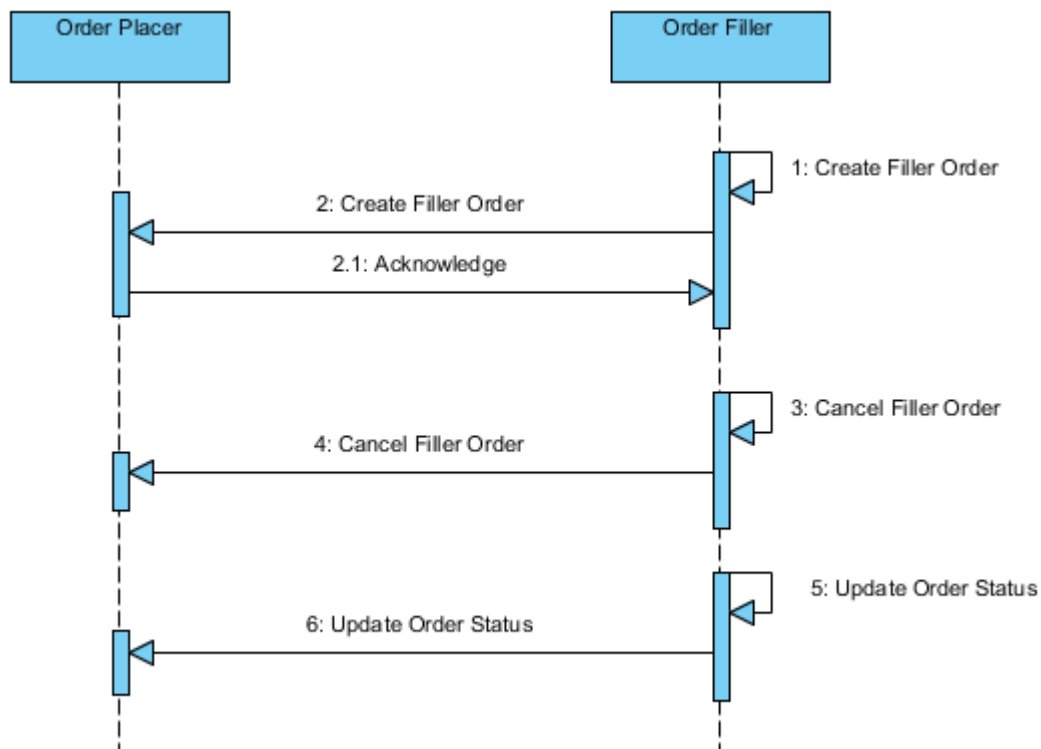
This scenario is used by the Order Filler to inform the Order Placer about the orders it creates and cancels, including the status of the orders it is fulfilling. If the Order Filler needs to change an order, it has to do so as a combination of Order Cancel followed by New Order.



The following use cases will be considered and managed for the Filler Order Management scenario:

- Create Radiology Filler Order
- Cancel Radiology Filler Order
- Update Radiology Order Status

Above use cases are represented in the following sequence diagram:



1. Create Radiology Filler Order

1.1. Trigger Event

A new Order is entered at the Radiology system (Order Filler); the Radiology sends a message to the Order Placer to inform about it, then the Order Placer replies sending the Placer Order Number.

1.2. Expected Actions

Order Filler:

- After creation of a new Order (Filler Order), MUST compose and send an HL7 2.5 **ORM^O01** message, with ORC-1=SN and ORC-3= Filler Order Number
- The message content MUST allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.

- MUST receive an HL7 2.5 **ORR^O02** *Synchronous application acknowledge* message from the Order Placer, informing about the result of the request; if the result is successful, MUST store the Placer Order Number in the order record

Order Placer:

- MUST process the message and apply data to its database, according to the following rules:
 - MUST, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. SHOULD NOT, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - MUST, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). SHOULD NOT, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - If the Filler Order is valid (e.g. all services are valid,...), MUST create a new order inside the database (Placer Order) with requested services, linking it to the context provided in the message (e.g. Patient, Visit, Filler Order).

- If the Filler Order is NOT valid (e.g. some services are unknown to the Placer system,...), SHOULD raise an error condition.
- MUST compose and send an *Synchronous application acknowledge* using the HL7 2.5 **ORR^O02** message with the result for the Order creation (i.e. failed or successful), and, when successful, an ORC segment with ORC-1=NA and ORC-2=Placer Order Number.

1.3. HL7 message structure

Table 12.1. Create Radiology Filler Order - ORM^O01 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
[PD1]	Additional demographic	O		
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)	
[PV2]	Patient Visit – Additional Info	O		
{ Group }	Table 12.2. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=SN, ORC.3 (Filler order Number)
OBR	Observation Request Segment	R	Highlights: OBR.3 (Filler Order Number), OBR.4 (Universal Service Identifier), OBR.27 (Quantity/Timing)	

Table 12.3. ACK - ORR^O02 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
MSA	Message Acknowledgment	R	Highlights: MSA.1 (Acknowledgment Code), MSA.2 (Message Control ID)
[ERR]	Error Segment	RC	Conditions: Required for notification of Error
[ORC]	Common Order Segment	RC	Conditions: Required for notification of Success Highlights: ORC.1 (Order Control)=NA, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2. Cancel Radiology Filler Order

2.1. Trigger Event

The Order Filler (Radiology system) sends a notification to the Order Placer system informing about the cancellation of a previously accepted Order. The Order Placer system accepts the request and cancels the order.

2.2. Expected Actions

Order Filler:

- To deliver an order cancellation notification to the Order Placer, **MUST** compose and send an HL7 2.5 **ORM^O01** message, with ORC-1=OC
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers;
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number MUST be specified • It is RECOMMENDED to specify the Filler Order Number

Order Placer:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error
 - **MUST** guarantee traceability and reversibility of the operation, whether it is logical or physical

2.3. HL7 message structure

Table 12.4. Cancel Radiology Filler Order - ORM^O01 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number)
ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control) = OC, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number),

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3. Update Radiology Order Status

3.1. Trigger Event

During fulfillment of an Order, the Order Filler performs an unsolicited notification to the Order Placer about changes in the status of the order and required services.

Depending on the system that is playing the role of Order Placer:

- it may be needed to communicate only a subset of available Order status changes:

for example, an Order Placer for Outpatients (e.g: CUP application) typically needs to be notified only when a service is complete, whereas an Emergency or a Ward application is interested in knowing that there are results available as soon as they're ready.

- it may be required to notify not only the status of the order, but to communicate the complete list of required and supplied service, together with their status:

for example, if the Order Placer application is responsible on behalf of the Order Filler for the data flow of supplied services for reimbursement purposes, when the order completes it is required that the Order Filler delivers to the Order Placer the list of supplied services.

3.2. Expected Actions

Order Filler:

- To deliver an order status change notification to the Order Placer, **MUST** compose and send an HL7 2.5 **ORM^O01** message, with ORC-1=SC
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number MUST be specified • It is RECOMMENDED to specify the Filler Order Number

- **MUST** be able to notify at least the following events (ref. IHE):
 - Order In Progress (ORC-5=IP): when the first Performed Procedure Step corresponding to the Order has been created
 - Order Completed (ORC-5=CM): when the complete, verified report is available for the given order
- It is **RECOMMENDED** to be able to notify:
 - Order scheduled (ORC-5=SC) event
 - Partial Results available (ORC-5=A) event
- If an order is being created by the Order Filler, Order Status Update message **MUST NOT** be issued until New Order message has been sent by the Order Filler (ref.IHE)
- **MUST** be able to provide, along with an Order Completed notification, the list of required and supplied services in the OBR segment

Order Placer:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent

- In case the Order is not available in the database, the message SHOULD be discarded raising at most a warning or a non blocking error.

3.3. HL7 message structure

Note: Though not stated by IHE, we require mandatory PID, PV1 and OBR segments

Table 12.5. Order Update Status - ORM^O01 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)

Table 12.6. Common Order Group				
	Segment	Meaning	Usage	Notes
{Group}	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=SC, ORC.2 (Placer order Number), ORC.3 (Filler order Number), ORC.5 (Order Status)
	OBR	Observation Request Segment	R	Highlights: OBR.2 (Placer Order Number), OBR.3 (Filler Order Number), OBR.4 (Universal Service Identifier), OBR.27 (Quantity/Timing)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Part V. Generic Order Management

Use cases

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Chapter 13. General Clinical Order Management overview

The General Clinical Order Management is about the management of orders for Ambulatory patients; it is inspired by the IHE **Scheduled Workflow** Integration Profile of the *IHE Radiology Integration Framework, version 11* [IHE-RAD-TF_11], of which implements the following transactions:

- RAD-2: Placer Order Management
- RAD-3: Filler Order Management

We will refer to above transaction as two different **scenarios**: Placer Order Management and Filler Order Management.

The use cases for the General Clinical Order Management keep strong similarity to the ones for Radiology Order Management; the main implementation difference with Radiology is the set of HL7 messages used: here we use OMG, in Radiology we use ORM.

For more informations concerning localizations for CRS-SISS regional project, refer to CRS-SISS technical documentation [CRS-SISS-HL7]

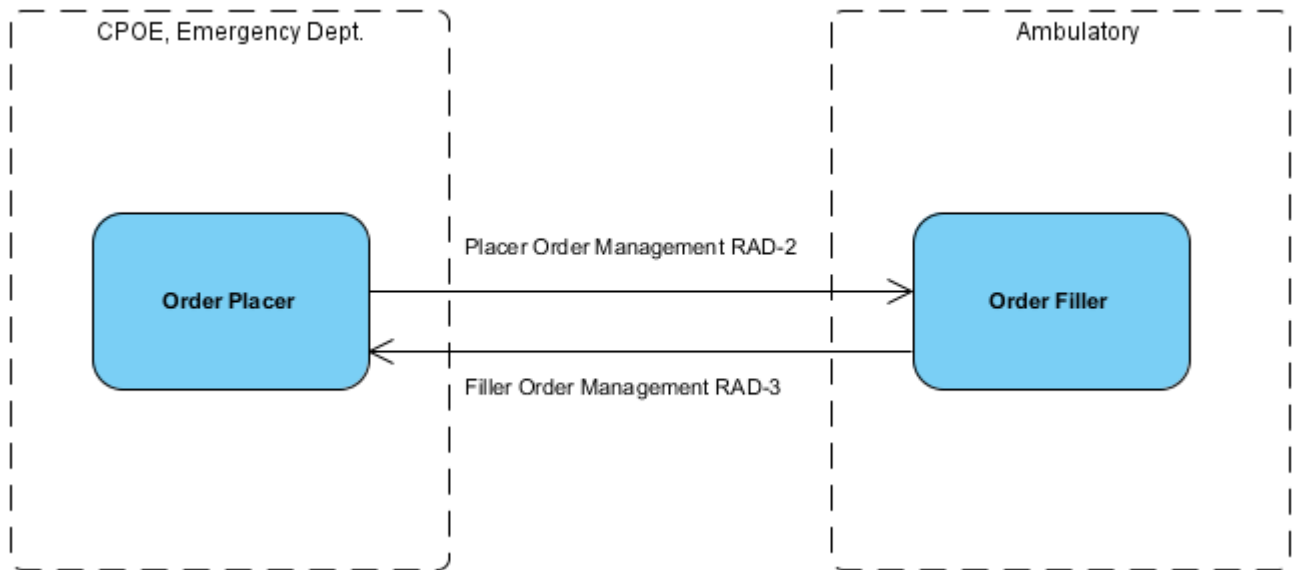
1. Actors

Two actors are involved in General Clinical Order Management, having different roles depending on the scenario in which they are participating:

- *Placer Order Management scenario*
 - **Order Placer**: Places orders and order cancelations to the Order Filler
 - **Order Filler**: Receives and processes (fills) orders and cancellations from the Order Placer
- *Filler Order Management scenario*
 - **Order Filler**: Creates new or cancels existing orders; sends notifications about changes in order status to the Order Placer.
 - **Order Placer**: Receives new order and order cancellation requests from Order Filler. Receives Order Status updates from Order Filler.

2. Process Flow

The following schema shows a general process flow in General Clinical Order Management.



All of the Actors **are assumed to be provided with up-to-date patient demographic and encounter data**, thus no specific patient or encounter management transactions will be covered. Such functionalities SHOULD be achieved by "grouping" actors in current integration profile with appropriate actors of the Patient Administration Management integration profile, and applying its rules. Nonetheless, basic specifications for patient identity and encounter management will be also given as a workaround in case this is not possible.

3. Glossary and definitions

- **Prescription:** is defined as the paper that originates the order and identifies the required services. Prescriptions are strictly related with billing, but they have also legal implications, as they may indicate that the prescriber takes responsibility for the clinical care of the patient. Every order can be associated to zero, one or more prescriptions, and each prescription can generate one or more orders (that is, there is a n:m relation between prescriptions and orders).

Prescriptions may have a unique identifier; in Italy the identifier of prescriptions filled by general practitioners is called Codice RUR (identificativo ricetta); in CRS-SISS project electronic prescriptions filled by general practitioners are assigned a unique identifier called IUP (Identificativo Univoco della Prescrizione).

- **Order:** An order is a request for the execution of healthcare services. The order has always an unique requesting organization unit (placer) and an unique receiver organization unit (designated filler). An order is identified by a number or code in a placer system and by a number or code in a filler system. Both these identifiers must univocally identify the order in the scope of the placer and filler respectively.
- **Requested Service:** health services that are requested with an order. Typically services of a same order belong to the same clinical specialty. If the set of requested services contains more specialties, services are splitted in more orders, each one specific for a specialty.

4. Communication implementation

The IHE directives are taken into account, thus the use cases described in the following chapters will be implemented by using **HL7 2.5 messages, pipe-separated format**.

For the sake of clarity and easiness of reading, only the segments structure of messages will be described, leaving the detailed specifications of segments and fields contents to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG]. The HL7 messages structure will be described using the syntax explained in Messages Description Conventions section.

In the following, the description of the use cases will be given from a functional point of view only; details on the low-level HL7 protocol communication issues (e.g. acknowledgments, TCP/IP communication, messages envelopes, etc.) will be covered in section MLLP Communication Protocol.

Chapter 14. General Placer Order Management

General Placer Order Management is a **partial** implementation of RAD-2 transaction of the *IHE Radiology Integration Framework, version 11* [IHE-RAD-TF_11].

In this scenario, the Order Placer will *place a new order* to the Order Filler. The Order Placer will be able to *cancel the order* until the Order filler starts processing it. Order Placer will be allowed to make *modifications* to a placed order, only by completely cancelling the initial order and placing the new order.



We assume that an order placed by the Order Placer will be fulfilled by a unique Order Filler, letting services for different Order Fillers to be placed using separate orders.

The following use cases will be considered and managed for the Placer Order Management scenario:

- Request General Order
- Cancel General Order
- Update General Order

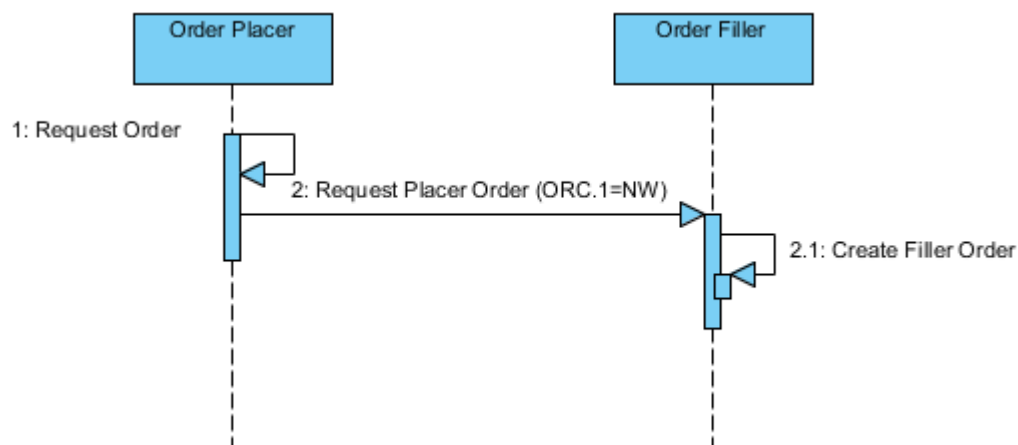
1. Request General Order

1.1. Trigger Event

An application playing the role of Order Placer (e.g. CPOE, CUP, Emergency Department), places a new order to the Ambulatory system asking for the execution of one of more services, for inpatients or outpatients. The Ambulatory system creates a Filler order fulfilling the requested services.

Since in some cases the order message might be the only source of patient's demographic and visit data for the order filler, it is important that the order palcer fills both PID and PV1 segments.

The use case is represented in the following diagram:



1.2. Expected Actions

Order Placer:

- After creation of a new Order (Placer Order), **MUST** compose and send an HL7 2.5 **OMG^O19** message, including the required services
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is essential to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.

Order Filler:

- **MUST** process the message and apply data to its database, according to following rules:
 - **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - If the Placer Order is valid (e.g. all required services are valid,...), **MUST** create a new order inside the database (Filler Order) with associated procedures fulfilling the requested services, linking it to the context provided in the message (e.g. Patient, Visit, Placer Order).
 - If the Placer Order is **NOT** valid (e.g. some requires services are unknown to the Filler system,...), **MUST** discard the order and raise an error condition

1.3. HL7 message structure

Table 14.1. Request General Order - OMG^O19 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)

Segment	Meaning	Usage	Notes	
[PD1]	Additional demographic	O		
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)	
[PV2]	Patient Visit – Additional Info	O		
{Group}	Table 14.2. Common Order Group			
	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=NW, ORC.2 (Placer order Number)
	[TQ1]	Quantity/Timing	O	
	OBR	Observation Request Segment	R	Highlights: OBR.2 (Placer order Number), OBR.4 (Universal Service Identifier)
	[BLG]	Billing Segment	O	Used as "dummy" segment to avoid parsing errors (see segment description for details). Its use is RECOMMENDED.

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

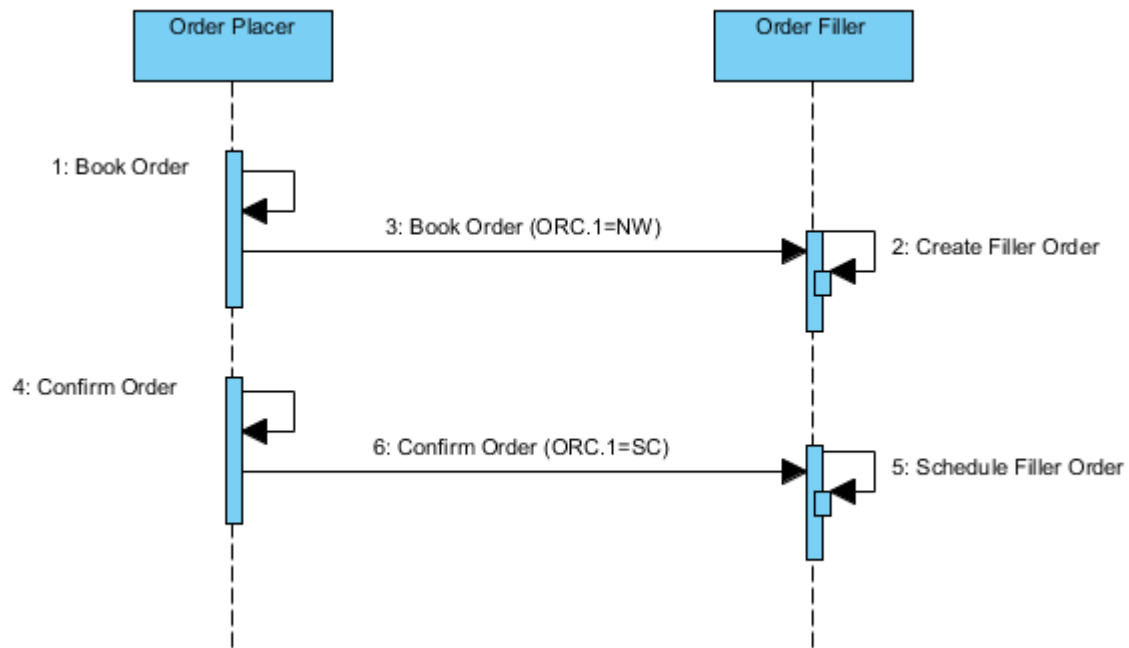
2. Book General Order

2.1. Trigger Event

This is an extension of the Request General Order use case, allowing the order Placer to perform a two-steps Order Request & Confirm for booking first and later confirming an order, as described in the following:

- 1) Book General Order: like in the Request General Order use case, the Order Placer sends a first message to the order Filler in order to book an Order without scheduling it;
- 2) Confirm General Order: after an Encounter has been registered for the patient at the hospital, the Order Placer sends a second message to the Order Filler to confirm and schedule the order previously booked.

The use case is represented in the following diagram:



2.2. Expected Actions

Order Placer:

- MUST *Book a new order* via an HL7 2.5 **OMG^O19** message with ORC.1=NW, following the rules stated for the use case Request General Order
- MUST *Confirm the order* via an HL7 2.5 **OMG^O19** message with ORC.1=SC, following the rules stated for the use case Request General Order with following additional rules:
 - the Order Placer Number (ORC-2 and OBR-2) MUST be the same as specified in the Request General Order message

Order Filler:

- MUST process the *Book General Order* message according to the rules stated for the use case Request General Order
- MUST process the *Confirm General Order* according to the following rules:
 - MUST schedule the Order, assigning execution time and modalities to required procedures
 - In case the Order is not available in the database, the message SHOULD be discarded raising at most a warning or a non blocking error

2.3. HL7 message structure

Refer to the message structures for the Request General Order message

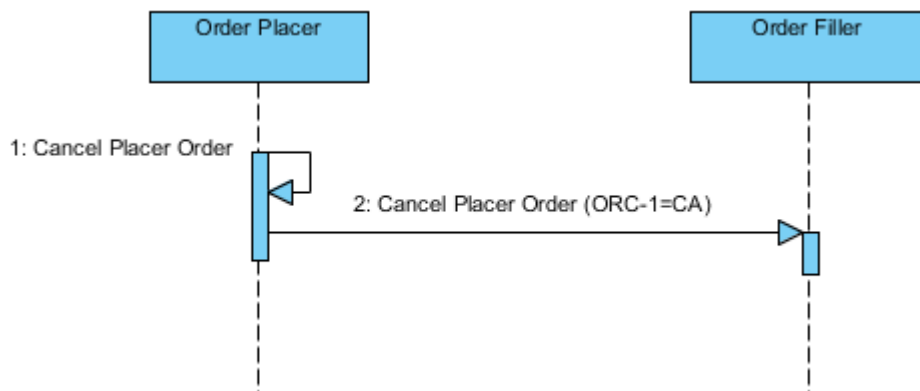
3. Cancel General Order

3.1. Trigger Event

An Order Placer sends a request to the Order Filler system asking for the cancellation of a previously required order that has not already been started. The Order Filler system accepts the request and cancels the order.

The use case does not allow for partial cancellation of orders: the whole order with all requested services will be cancelled.

The use case is represented in the following diagram:



3.2. Expected Actions

Order Placer:

- To deliver an order cancellation request to the Order Filler, **MUST** compose and send an HL7 2.5 **OMG^O19** message, including the required services
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Filler; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number to be cancelled MUST be specified • It is RECOMMENDED to specify the Filler Order Number

Order Filler:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error
 - In case the Order is already in progress and the Order Filler is not able to accept the cancellation request, **MUST** raise an error condition to be notified back to the Order Placer via the acknowledge message.
 - In case the Order Filler is able to accept the cancellation request, **MUST** cancel the order and all of its related services, stopping any further processing, and guarantee traceability and reversibility of the operation, whether it is logical or physical.

3.3. HL7 message structure

Table 14.3. Cancel General Order - OMG^O19 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number)
ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control) = CA, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number),

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

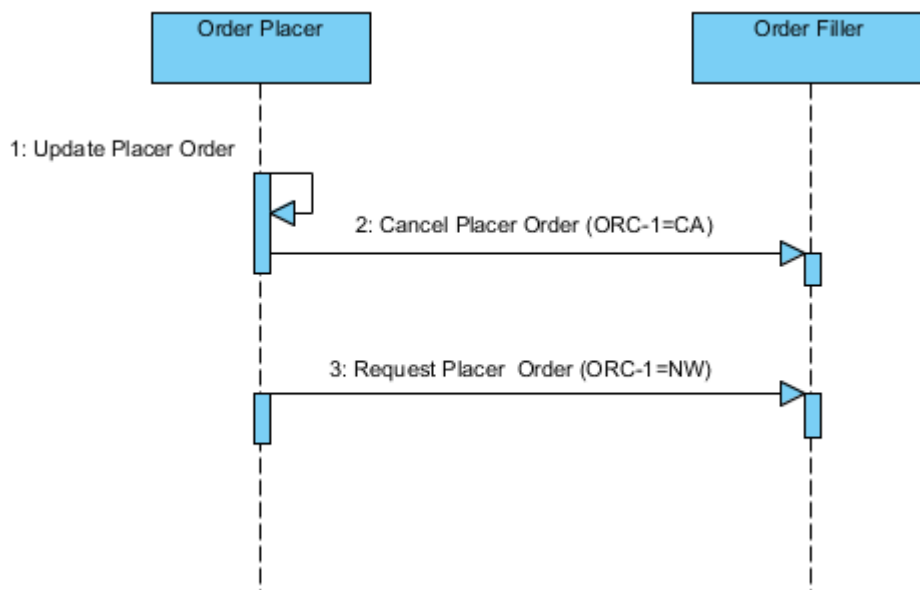
4. Update General Order

4.1. Trigger Event

An Order Placer needs to change a previously accepted Order, for example to add or delete one or more services, that has not already been started by the Order Filler (i.e. an Order Status Update with ORC-5=IP should not have been notified by the Order Filler). This use case can be fulfilled in two steps: first the Order Placer sends a cancellation request for the Order that needs to be changed, then it sends a new order with the complete list of services that are required.

As stated in Cancel General Order, it is not allowed to delete a single service requested, but rather the whole order and all of its services are deleted; this implies that, even updating a single service of an order, it is **REQUIRED** to delete the order and all of its services, and then insert a new order including modified and unmodified services.

The use case is represented in the following diagram:



4.2. Expected Actions

Order Placer:

- MUST *cancel the order* that needs to be updated via an HL7 2.5 **OMG^O19** message, following the rules stated for the use case Cancel General Order
- MUST *create a new order* via an HL7 2.5 **OMG^O19** message, following the rules stated for the use case Request General Order, with following additional rules:
 - the new Order MUST have a different Placer Order Number than the old order (ORC-2 and OBR-2)
 - the new Order MAY have the same or different Placer Group Number (ORC-4)

Order Filler:

- MUST process the *cancel message* according to the rules stated for the use case Cancel General Order
- MUST process the *new order message* according to the rules stated for the use case Request General Order

4.3. HL7 message structure

Refer to the message structures for the Cancel General Order message and Request General Order message

Chapter 15. General Filler Order Management

General Filler Order Management is a **partial** implementation of RAD-3 transaction of the *IHE Laboratory Integration Framework, version 11* [IHE-RAD-TF_11].

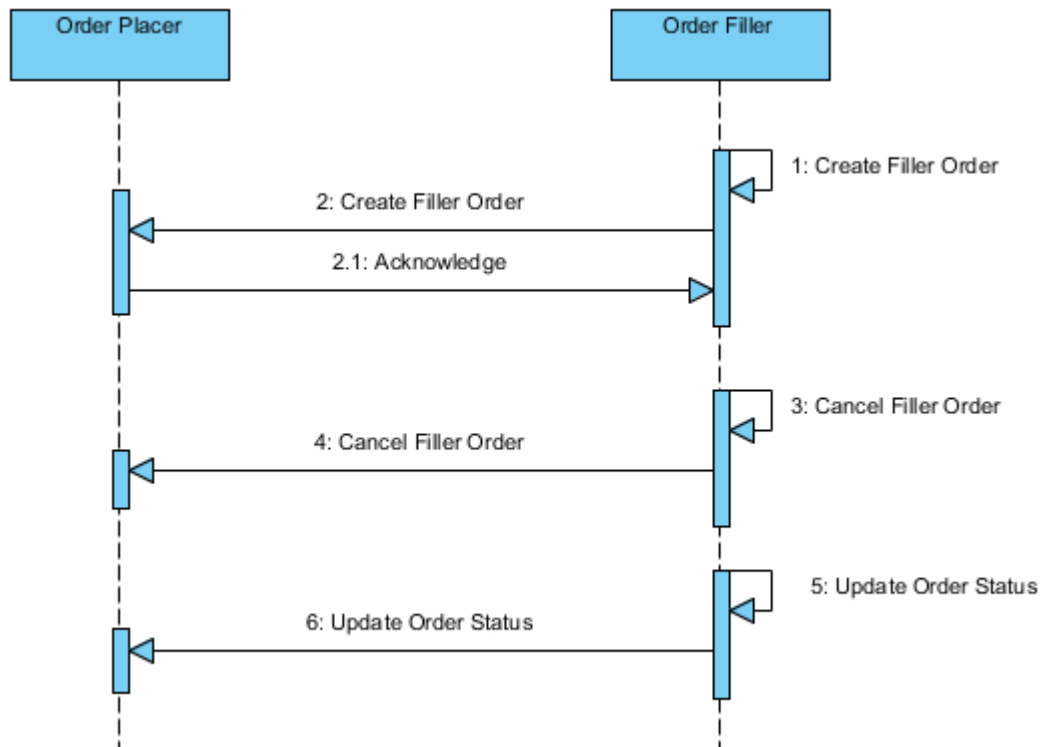
This scenario is used by the Order Filler to inform the Order Placer about the orders it creates and cancels, including the status of the orders it is fulfilling. If the Order Filler needs to change an order, it has to do so as a combination of Cancel Order followed by Create Order.



The following use cases will be considered and managed for the Filler Order Management scenario:

- Create General Filler Order
- Cancel General Filler Order
- Update General Order Status

Above use cases are represented in the following sequence diagram:



1. Create General Filler Order

1.1. Trigger Event

A new Order is entered at the Ambulatory system (Order Filler); the Ambulatory sends a message to the Order Placer to inform about it, then the Order Placer replies sending the Placer Order Number.

1.2. Expected Actions

Order Filler:

- After creation of a new Order (Filler Order), **MUST** compose and send an HL7 2.5 **OMG^O19** message, with ORC-1=SN and ORC-3= Filler Order Number
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers • It is RECOMMENDED to include in the message all the available demographic information about the person.
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included • It is RECOMMENDED to include in the message all the available visit information about the person.

- **MUST** receive an HL7 2.5 **ORG^O20 Synchronous application acknowledge** message from the Order Placer, informing about the result of the request; if the result is successful, **MUST** store the Placer Order Number in the order record

Order Placer:

- **MUST** process the message and apply data to its database, according to the following rules:
 - **MUST**, in case the person demographic data is not available in the database, register it as a new patient, following the business logic of the Create Person use case. **SHOULD NOT**, in case the person data is somehow already stored in the database, update demographic data; this should be carried out as a separate transaction using the Update Person Information use case. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - **MUST**, in case the encounter data is not available in the database, register it as a new encounter, following the business logic of the encounter registration use case that is appropriate for the patient encounter scenario (available in PV1.2 - Patient Class). **SHOULD NOT**, in case the encounter data is somehow already stored in the database, update the encounter data; this should be carried out as a separate transaction using use case appropriate for the patient's encounter scenario. Nevertheless this may not apply under specific circumstances or by local project agreements (e.g. when the Supplier is considered to be a "reliable" data source, update may occur directly).
 - If the Filler Order is valid (e.g. all services are valid,...), **MUST** create a new order inside the database (Placer Order) with requested services, linking it to the context provided in the message (e.g. Patient, Visit, Filler Order).
 - If the Filler Order is **NOT** valid (e.g. some services are unknown to the Placer system,...), **SHOULD** raise an error condition.

- MUST compose and send a *Synchronous application acknowledge* using the HL7 2.5 **ORG^O20** message with the result for the Order creation (i.e. failed or successful), and, when successful, an ORC segment with ORC-1=NA and ORC-2=Placer Order Number.

1.3. HL7 message structure

Table 15.1. Create General Filler Order - OMG^O19 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)	
[PD1]	Additional demographic	O		
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)	
[PV2]	Patient Visit – Additional Info	O		
Table 15.2. Common Order Group				
{Group}	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=SN, ORC.3 (Filler order Number)
	[TQ1]	Quantity/Timing	O	
	OBR	Observation Request Segment	R	Highlights: OBR.3 (Filler Order Number), OBR.4 (Universal Service Identifier), OBR.27 (Quantity/Timing)
	[{SPM}]	Specimen	O	
	[BLG]	Billing Segment	O	Used as "dummy" segment to avoid parsing errors (see segment description for details). Its use is RECOMMENDED.

Table 15.3. ACK - ORG^O20 Message structure

Segment	Meaning	Usage	Notes	
MSH	Message Header	R		
MSA	Message Acknowledgment	R	MSA.1 (Acknowledgment Code), MSA.2 (Message Control ID)	
[{ERR}]	Error Segment	O		
[ORC]	Common Order Segment	O	ORC.1 (Order Control)=NA, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number)	
Table 15.4. Common Order Group				
[{Group}]	Segment	Meaning	Usage	Notes
	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=NA, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number)
	[OBR]	Observation Request Segment	O	Highlights: OBR.2 (Placer order Number), OBR.3 (Filler order Number), OBR.4 (Universal Service Identifier)

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

2. Cancel General Filler Order

2.1. Trigger Event

The Order Filler (Ambulatory system) sends a notification to the Order Placer system informing about the cancellation of a previously accepted Order. The Order Placer system accepts the request and cancels the order.

2.2. Expected Actions

Order Filler:

- To deliver an order cancellation notification to the Order Placer, **MUST** compose and send an HL7 2.5 **OMG^O19** message, with ORC-1=OC
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers;
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number MUST be specified • It is RECOMMENDED to specify the Filler Order Number

Order Placer:

- **MUST** process the message and apply data to its database, according to following rules:
 - **SHOULD NOT** insert a new Patient, a new Visit and a new Order, if not existent
 - **SHOULD NOT** update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message **SHOULD** be discarded raising at most a warning or a non blocking error
 - **MUST** guarantee traceability and reversibility of the operation, whether it is logical or physical

2.3. HL7 message structure

Table 15.5. Cancel General Filler Order - OMG^O19 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.19 (Visit Number)
ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control) = OC, ORC.2 (Placer Order Number), ORC.3 (Filler Order Number),

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

3. Update General Order Status

3.1. Trigger Event

During fulfillment of an Order, the Order Filler performs an unsolicited notification to the Order Placer about changes in the status of the order and required services.

Depending on the system that is playing the role of Order Placer:

- it may be needed to communicate only a subset of available Order status changes:

for example, an Order Placer for Outpatients (e.g: CUP application) typically needs to be notified only when a service is complete, whereas an Emergency or a Ward application is interested in knowing that there are results available as soon as they're ready.

- it may be required to notify not only the status of the order, but to communicate the complete list of required and supplied service, together with their status:

for example, if the Order Placer application is responsible on behalf of the Order Filler for the data flow of supplied services for reimbursement purposes, when the order completes it is required that the Order Filler delivers to the Order Placer the list of supplied services.

3.2. Expected Actions

Order Filler:

- To deliver an order cancellation notification to the Order Placer, **MUST** compose and send an HL7 2.5 **OMG^O19** message, with ORC-1=SC
- The message content **MUST** allow to uniquely identify the context (e.g. patient, visit); for this sake, it is necessary to take special care to the information listed hereafter:

Patient information	<ul style="list-style-type: none"> • All the available person identifiers MUST be included in the Patient Identifier List, in order to allow the highest possible level of identification at the Order Placer; • All the person identifiers sent MUST be completely and clearly qualified, using the standard NoemaLife qualifiers
Visit information	<ul style="list-style-type: none"> • Visit Number (the encounter hospital identifier) MUST be included
Order Information	<ul style="list-style-type: none"> • The Placer Order Number MUST be specified • It is RECOMMENDED to specify the Filler Order Number

- **MUST** be able to notify at least the following events (ref. IHE):
 - Order In Progress (ORC-5=IP): when the first Performed Procedure Step corresponding to the Order has been created
 - Order Completed (ORC-5=CM): when the complete, verified report is available for the given order
- It is **RECOMMENDED** to be able to notify:
 - Order scheduled (ORC-5=SC) event
 - Partial Results available (ORC-5=A) event
- If an order is being created by the Order Filler, Order Status Update message **MUST NOT** be issued until New Order message has been sent by the Order Filler (ref.IHE)

- MUST be able to provide, along with an Order Completed notification, the list of required and supplied services in the OBR segment

Order Placer:

- MUST process the message and apply data to its database, according to following rules:
 - SHOULD NOT insert a new Patient, a new Visit and a new Order, if not existent
 - SHOULD NOT update Patient, Visit or Order informations, if already existent
 - In case the Order is not available in the database, the message SHOULD be discarded raising at most a warning or a non blocking error.

3.3. HL7 message structure

Note: Though not stated by IHE, we require mandatory PID, PV1 and OBR segments

Table 15.6. Order Update Status - OMG^O19 Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
PID	Patient Identification	R	Highlights: PID.3 (Patient Identifier List)
PV1	Patient Visit	R	Highlights: PV1.2 (Patient Class), PV1.3 (Assigned Patient Location), PV1.5 (Preadmit Number), PV1.19 (Visit Number), PV1.44 (Admit date/time)

Table 15.7. Common Order Group				
	Segment	Meaning	Usage	Notes
{ Group }	ORC	Common Order Segment	R	Highlights: ORC.1 (Order Control)=SC, ORC.2 (Placer order Number), ORC.3 (Filler order Number), ORC.5 (Order Status)
	OBR	Observation Request Segment	R	Highlights: OBR.2 (Placer Order Number), OBR.3 (Filler Order Number), OBR.4 (Universal Service Identifier), OBR.27 (Quantity/Timing)
	[BLG]	Billing Segment	O	Used as "dummy" segment to avoid parsing errors (see segment description for details). Its use is RECOMMENDED.

Refer to *NoemaLife HL7 Integration Framework - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for more details on segments and fields and the complete data requirements.

Chapter 16. HL7 conventions

1. Messages description conventions

This section explains the rules and conventions adopted in tables describing the HL7 2.5 messages' structure.

Column "Segment" Represents the standard HL7 segment identifier (three characters code) and, in case, its optionality and repeatability.

Accordingly to the Abstract Message Syntax (AMS) adopted by HL7:

- segments in square brackets (e.g. [XYZ]) are optional
- segments in braces (e.g. {XYZ}) are repeatable
- square brackets and braces can be combined (e.g. {XYZ [ABC]}) refers to a group of segments that may repeat, where in each group at least one XYZ segment must exist while a segment ABC may be present or not)

Column "Meaning" Standard HL7 2.5 segment's name

Column "Usage" This column gives information on segment optionality and segment repeatability using a syntax different than AMS, for better understanding.

Table 16.1. Optionality types

USAGE	Meaning	Description
R	mandatory/ required	
O	optional	
RC	conditional mandatory	field item <i>mandatory</i> if condition laid out in Description column is true, else <i>optional</i>
OC	optional mandatory	field item <i>optional</i> if condition laid out in Description column is true, else <i>ignored</i>

Information related to repeatability of fields is added as a suffix to optionality codes using the following syntax:

- No suffix segment is not repeatable
- ..N segment is repeatable to a maximum of N times
- ..* segment is repeatable an unlimited number of times

Example 16.1. Examples of optionality and repeatability syntax

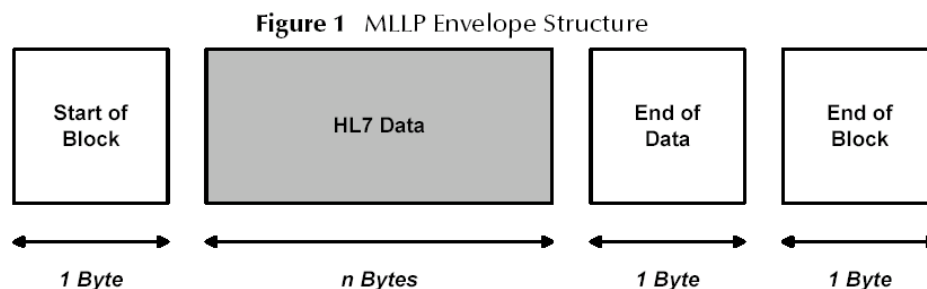
- R Required segment, not repeatable
- O..2 Optional segment, repeatable to a maximum of 2 times
- RC..* Segment required under specific conditions (exposed in column "Notes"), repeatable an unlimited number of times

Column "Notes" This column further details the use of the segment in the message and use case context.

2. MLLP Communication Protocol

Transmission of HL7 messages from source to destination, in "pipelined" format (delimited string), will be carried out using the MLLP protocol (Minimum Lower Layer Protocol).

The protocol requires the message to be included inside an envelope with the following structure:



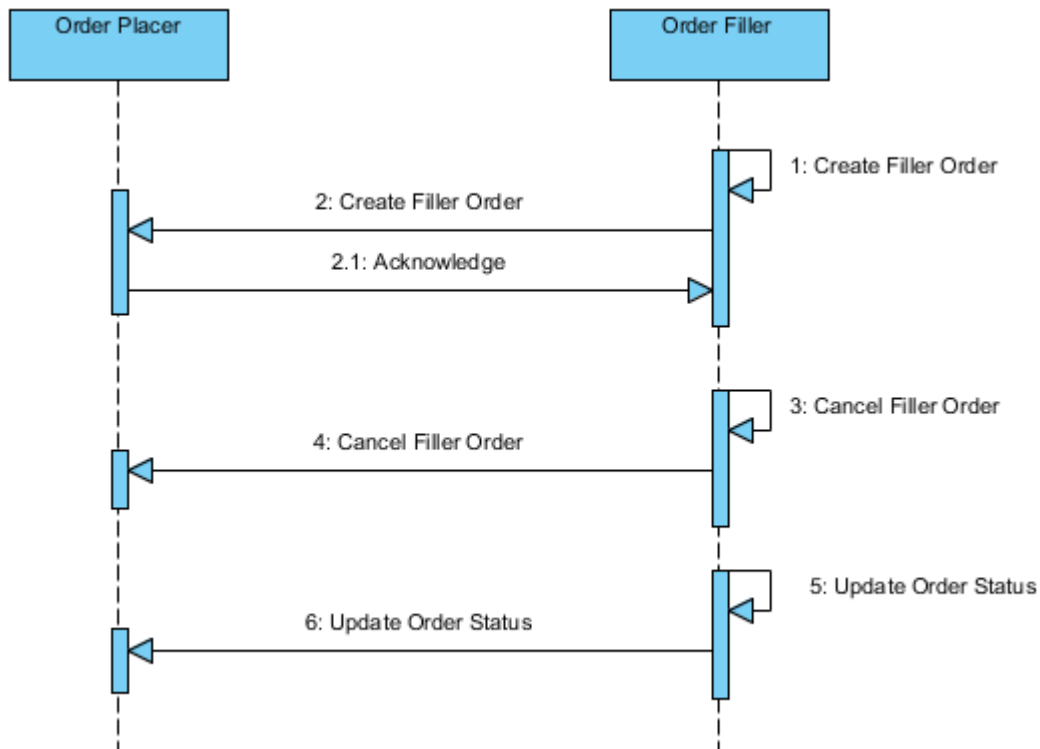
where:

Name	Description	Default Value
Start of Block	Is the character starting the HL7 message block (envelope start)	VT, ASCII(11), Hex(0b)
End of Data	Is the character stating the end of HL7 message data	FS, ASCII(28), Hex(1C)
End of Block	Is the character ending the HL7 message block (envelope end)	CR, ASCII(13), Hex(0d)

The enveloped message is then transmitted over TCP/IP protocol, using the following steps:

- the Sender composes the HL7 message;
- the Sender envelopes the HL7 message according to the MLLP schema above;
- the Sender required the TCP/IP socket opening to the Receiver, on the port exposed by the Receiver;
- the Receiver accepts the request and opens the TCP/IP socket;
- the Sender uses the TCP/IP socket to transmit the message envelope;
- the Receiver receives the envelope and, possibly, performs syntactic/semantic checks on the HL7 message;
- the Receiver composes an HL7-compliant acknowledge message; it may be a Commit Acknowledge (only stating that transmission was fine) or an Application Acknowledge (stating that transmission and functional processing of the message was fine); the decision to use one or the other can be taken on local agreement basis, even if it is RECOMMENDED to use the Application Acknowledge (HL7 Original Mode). If not otherwise specified, the acknowledge message must be considered Synchronous. When the use of Asynchronous Application Acknowledge is explicitly required, both the message initiating the transaction and the corresponding Asynchronous Application Acknowledge must be acknowledged by a synchronous Commit Acknowledge.

For better comprehension, we describe a couple of sequence diagrams taken from use cases described in this document.

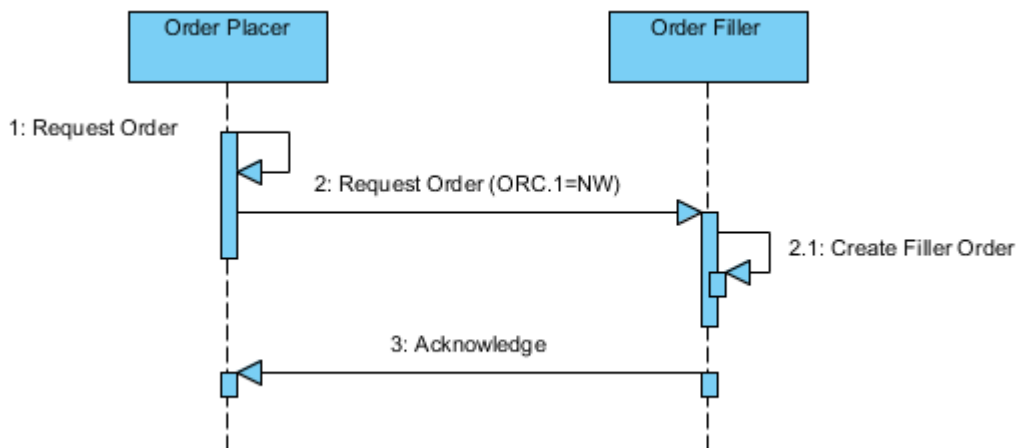
Example 16.2. Example 1

The above diagram shows three transactions, for each one a Synchronous Application Acknowledge is delivered, according to HL7 Original Mode.

In the first transaction (Create Filler Order) the Acknowledge message has been drawn explicitly because the use case requires an acknowledge message different from the standard one (ACK), in this case it might be an ORM^O01 message.

In the second and third transactions instead (Cancel and Update Filler Order), the Acknowledge message has not been drawn: in this case a standard synchronous ACK message will be delivered.

Example 16.3. Example 2



The above diagram shows one transaction where an Asynchronous Application Acknowledge is delivered, according to HL7 Enhanced Mode. Upon receiving the Request message, the Filler replies using a Synchronous Commit ACK, and the Placer itself replies with an Synchronous Commit ACK to the Application Acknowledge received by the Filler.

- the Receiver envelopes the acknowledge accordingly to the MLLP schema above;
- the Receiver transmits to the Sender the enveloped acknowledge, *using the same socket previously opened*;
- finally, the Sender MAY use the same socket to send other messages in the same way, or close it. The socket MUST NOT be closed by the Receiver.

If not otherwise specified, through this document all the Use Cases will use Synchronous Application Acknowledge (HL7 Original Mode), implemented via the standard HL7 "ACK" message, whose structure is the following:

Table 16.2. ACK Message structure

Segment	Meaning	Usage	Notes
MSH	Message Header	R	
MSA	Message Acknowledge	R	
[ERR]	Error	O	

Refer to *NoemaLife HL7 Integration Policy - HL7 2.5 Segments Definition* [NL-HL7-IP-MSG] for fields definitions.

3. HL7 escape sequences in text fields

HL7 requires the encoding of the special characters used for fields and sub-fields delimiting.

The special characters are the ones included in the MSH.2 (encoding characters) field of each message, and MUST be encoded in every field of type TX, FT, or CF. In NoemaLife integrations, only the standard HL7 values will be supported: |, ^, & and ~.

An **escape sequence** consists of the escape character followed by an escape code ID of one character, zero (0) or more data characters, and another occurrence of the escape character. For purposes of this section, and according to HL7 specifications, the character \ will be used as escape character.

The following escape sequences are defined, and **MUST** be used and accepted in integrations:

\F\ field separator (the | character)

\S\ component separator (the ^ character)

\T\ subcomponent separator (the & character)

\R\ repetition separator (the ~ character)

\E\ escape character (the \ character itself)

\Xdddd\ used for encoding of other special characters (where dddd is the hexadecimal UTF-8 code of the character)

\.sp\ new line ("enter", or CR+LF)

4. Special values in text fields

As per HL7 standard specifications, the following rules apply as a receiver processes a message:

- an empty field (...|...) **MUST NOT** alter the value in the receiver database field; remains (or is set to) null if was null, remains at the previous value if a non-null value was already stored in the database
- a null string in quotation marks (...|"") **MUST** set to null the value in the receiver database field, that is deleting the previous content if not null

External References

Corporate Documents

- [BPSDP] *Software Development Process*. Blueprints. Federico Lelli, Nicolò Dé Faveri Tron, Raffaella Tibaldi, Michele Carenini, Davide Distefano, Paolo Apparuti, and Tommaso Sansoni. <http://distro.noemalife.loc/projects/devspecs/1.0.0/docs/html/sdp.html> .
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Internet Resources

- [RFC-2119] *Key words for use in RFCs to Indicate Requirement Levels*. RFC 2119. S. Bradner. Copyright © 1997. <http://www.ietf.org/rfc/rfc2119.txt> .

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