**­Integrating the Healthcare Enterprise**



**IHE Pharmacy**

**Technical Framework Supplement**

**Mobile Medication Administration**

**(mMA)**

**FHIR ® STU4**

Using Resources at FMM Level 5

**Draft in preparation for Public Comment**

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**Please verify you have the most recent version of this document.** See [here](http://ihe.net/Technical_Frameworks/) for Trial Implementation and Final Text versions and [here](http://ihe.net/Public_Comment/) for Public Comment versions.

**Foreword**

This is a supplement to the IHE Pharmacy Technical Framework <VX.X>. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on <Month XX, 2017> for Public Comment. Comments are invited and may be submitted at <http://www.ihe.net/pharmacy/pharmacycomments.cfm>. In order to be considered in development of the Trial Implementation version of the supplement, comments must be received by <Month XX, 201X>.

This supplement describes changes to the existing technical framework documents.

“Boxed” instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend section X.X by the following:

Where the amendment adds text, make the added text bold underline. Where the amendment removes text, make the removed text bold strikethrough. When entire new sections are added, introduce with editor’s instructions to “add new text” or similar, which for readability are not bolded or underlined.

General information about IHE can be found at: [www.ihe.net](http://www.ihe.net).

Information about the IHE Pharmacy domain can be found at: <http://www.ihe.net/Domains/index.cfm>.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: <http://www.ihe.net/About/process.cfm> and <http://www.ihe.net/profiles/index.cfm>.

The current version of the IHE <Domain name>Technical Framework can be found at: <http://www.ihe.net/Technical_Framework/index.cfm>.

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# Introduction to this Supplement

FHIR is under development by HL7, and the resources and transactions in this Supplement may continue to be revised.

Release 3 of FHIR is used in the MMA profile. HL7 has designated this release as an STU (Standard for Trial Use), and appropriate for non-production use. See <http://hl7.org/fhir>.

Non-normative FHIR resources are given a FHIR Maturity Model (FMM) level 0 (draft) through 5 (normative ballot ready).

The FHIR STU3-defined resources used in this profile and their FMM levels are:

|  |  |
| --- | --- |
| **FHIR Resource Name** | **FMM Level** |
| MedicationRequest | FMM 3 |
| MedicationAdministration | FMM 2 |

The IHE Mobile and Distributed Medication Administration supplement introduces a new generation of interoperability mechanisms to be used in distributed and mobile medication workflows, namely in the requesting and registering of administration of medication, in mobile systems or otherwise distributed systems.

The use of this profile supports the administration of medication with a standard way to:

* (optionally) transmit the instructions for administration
* register and exchange information about the administration of medication

The Mobile Medication Administration profile is intended to be compatible with hospital settings, but also community settings on a mobile environment, or where CDA documents are not used. For CDA documents, refer to the IHE CMA profile.

The content of this profile is functionally compatible with the CMA profile: IHE Pharmacy has decided to provide one consistent interoperability framework, which can be implemented using different technical mechanisms.

The MMA Profile enables mobile and lightweight web applications to register the planned and actual administration of medication.

Some uses for MMA are:

* An application for a home care nurse, that receives the requests and informs the nurse about the medications that each patient is scheduled to take in a given period.
* An application (or the same as above) for a Nurse, where the nurse can register the planned (as above) or unplanned administration of medication
* An application for patients to receive updated medication instructions on their mobile device and / or register the use of medication, e.g. by scanning the barcodes.

Besides mobile applications, more conventional uses are also supported:

* Recording the administration of drugs in a hospital setting
* Recording the administration of drugs by an infusion device (pump)

Further ahead, the IHE Pharmacy Technical Framework will be extended to the entire medication circuit, and the MMA profile will be part of that entire interoperability framework. In other words, the MMA profile is a part of a broader interoperability framework for the medication circuit, and implementers can safely start implementing MMA while the remainder of the IHE medication profiles based on FHIR emerge.

This supplement is intended to be fully compliant with the HL7 FHIR specification, providing only use-case driven constraints to aid with interoperability and compatibility with existing Profiles.

Currently the HL7® FHIR® standard is in “Standard for Test Use” (STU) and may experience a large amount of change during this phase. Readers are advised that, while the profiled components in this supplement may not accurately reflect the most recent version of the FHIR standard, implementations of MMA will be tested as specified in this supplement. Changes to the FHIR STU will be integrated into this supplement via the formal IHE Change Proposal (CP) process.

To include compatibility with existing IHE actors, this profile extends or adds the following actors:

**Medication Administration Performer** – checks for and receives instructions for administration of medications to patients, performs the necessary checks before administering.

**Medication Administration Informer** – sends the reports of the administration actions performed.

**Medication Administration Request Placer** – provides the instance orders of medication administrations to the medication Administration Performer.

**Medication Administration Consumer** – receives the reports of administration of medications.

The structure of this profile allows different systems to concur in the administration of medications for several patients – whether they are remote systems, mobile applications for professionals, or patient apps.

## Open Issues and Questions

1. Are we going for a push-model or pull-model? A: we need both.
   1. For Administration Report, we only support PUSH (mobile app pushes the administration resources to a server). TO\_DISCUSS: Can we close like this?
2. How to handle the sending of prescription changes? Sending only the changes or the whole prescription? Suggest to do risk review on either option, but only later when we address mobile prescription. TO\_DISCUSS: Can we bypass this and close this only later when handling prescriptions?
3. How to handle workflow management by the actors? A separate actor like CMPD? Or at the actors?
   1. Maybe a hybrid model? TO\_DISCUSS: Can we close this later when handling prescription? Should we leave a reference to future work?
4. (ask Julie/Hugh) What is the best word for “one-shot” Administration?
5. When a resource is created at the beginning of the interval and then updated, should implementers post both versions? Can this be done with FHIR? TO\_DISCUSS: Need to investigate.
6. PUT or POST? We do need to update resources. See <https://stackoverflow.com/questions/630453/put-vs-post-in-rest>
7. How to handle two medications in the same event? Suggest medication.partOf (must indicate that in the generic content even before the interval administration.

## Closed Issues

* MMA\_001 medicationAdministration or medicationStatement
  + medication
* MMA\_002 Differentiate requests from prescriptions
* MMA\_003 Can’t search on date
  + Resolved
* MMA\_004 Can’t search on performer
* MMA\_005 link to prescription or order
* MMA\_006 Medication (instance) as a contained resource
* MMA\_007 How to represent a medicationRequest for a composite administration? A: medicationRequest.dosageInstruction

<Note: The sections following this Introduction will eventually be added as Final Text to Volumes 1 – 4 of the Technical Framework. The material above this note (the Introduction, and Open and Closed Issues section) will be deleted when this Supplement is moved to Final Text.>

# General Introduction

Update the following Appendices to the General Introduction as indicated below. Note that these are not appendices to Volume 1.

Appendix A - Actor Summary Definitions

Add the following actors to the IHE Technical Frameworks General Introduction list of Actors:

|  |  |
| --- | --- |
| Actor | Definition |
| Medication Administration Performer | Receives instructions for administration of medications to patients, to perform the necessary checks and display it to the user (patient or heathcare professional) |
| Medication Administration Informer | Sends the reports of the administration actions performed. |
| Medication Administration Request Placer | Submits the instance orders of medication administrations to the medication Administration Performer. |
| Medication Administration Consumer | Receives the reports of administration of medications |

Appendix B - Transaction Summary Definitions

Add the following transactions to the IHE Technical Frameworks General Introduction list of Transactions:

The IHE Mobile and Distributed Medication Administration supplement introduces the interoperability mechanisms to be used in the requesting and registering of administration of medication, in mobile systems or otherwise distributed systems, as well as in traditional systems.

The use of this profile supports the administration of medication with a standard way to:

* (optionally) transmit the instructions for administration
* register and exchange information about the administration of medication

|  |  |
| --- | --- |
| Transaction | Definition |
| Query Administration Requests | Request for individual administration actions to be performed |
| Report Administration Results | Report on the outcome of each single administration event |

Glossary

Add the following glossary terms to the IHE Technical Frameworks General Introduction Glossary:

|  |  |
| --- | --- |
| Glossary Term | Definition |
| Administration Request | An instruction for a single medication administration event. For example, a request to “administer medication X on 1/7, at 13:00”. An administration request does not expect any further action (such as dispensing), only the administration. |
|  |  |

Volume 1 – Profiles

Add the following to the IHE Technical Frameworks General Introduction Copyright section:

The HL7® FHIR® standard License can be found at <http://hl7.org/fhir/STU3/license.html>.

## <*Domain-specific additions>*

<Some domains have specific sections, added as subsections to Sections 1 or 2, in their Technical Frameworks. These types of additions are allowed as long as they do not adjust the overall numbering scheme which needs to remain consistent across domains. If there are such additions, they should be included here.>

Add to Section …

# X Mobile Medication Administration (MMA) Profile

# The Mobile Medication Administration Profile provides integration between systems or actors that are in charge of medication administration and systems or actors that are upstream (e.g. prescription or dispensing systems) or downstream (e.g. EHRs or others).

The MMA profile supports the data exchange for the following actors and cases:

1. A Medication Administration Request Placer contains the planned individual medication administration actions. The Medication Administration Performer retrieves these scheduled actions from the Medication Administration Request Placer, in order to perform them.
   1. Note: For not scheduled (emergency or not prescribed) medications, the individual Administration Requests do not exist, neither a prescription.
   2. Note: For “As needed” orders, the individual Administration Requests do not exist, although a prescription may exist.
2. The Medication Administration Informer informs a Medication Administration Consumer about the performing of the administration activity (or its reported absence).
   1. Is this a push or a pull? The server should not be on the mobile side, so PUSH.

## 3.1 MMA Actors, Transactions, and Content Modules

This section defines the actors, transactions, and content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A at <http://www.ihe.net/Technical_Framework/index.cfm>.

Figure 3.1-1 shows the actors directly involved in the MADM Profile and the relevant transactions between them.

↑ Query Administration   
Requests  
[PHARM-2]

↓ Transaction 2 [2]

Medication Administration Request Placer

Actor A

Medication Administration Consumer

Actor B

Medication Administration Performer

Actor D

Medication Administration Informer

↑ Report Administration Result   
[PHARM-3]

↓ Transaction 2 [2]

Figure X.1-1: MADM Actor Diagram

Table X.1-1 lists the transactions for each actor directly involved in the MMA Profile. To claim compliance with this Profile, an actor shall support all required transactions (labeled “R”) and may support the optional transactions (labeled “O”).

Table X.1-1: MMA Profile - Actors and Transactions

| Actors | Transactions | Optionality | Reference |
| --- | --- | --- | --- |
| Administration Request Placer | Query Administration Requests | O | PHARM-M1 TF-2: 3.Y1 |
| Administration Performer | Query Administration Requests | O | PHARM-M1 TF-2: 3.Y1 |
| Administration Request Placer | Send Administration Request | O | PHARM-M1 TF-2: 3.Y2 |
| Administration Performer | Send Administration Request | O | PHARM-M1 TF-2: 3.Y2 |
| Administration Informer | Administration Report | R | PHARM-M2 TF-2: 3.Y3 |
| Administration Consumer | Administration Report | R | PHARM-M2 TF-2: 3.Y3 |
|  |  |  |  |

Note 1: The Administration Performer must be able to get the list of planned administrations, either by querying (Pull) or receiving (Push). Therefore, either Transaction Y1 or Transaction Y2 (or both) shall be implemented for Administration Request Placer / Administration Performer.

### X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in Transactions (Volume 2). This section documents any additional requirements on profile’s actors.

In a typical implementation, after the Medication is prescribed, the administrations are scheduled and administration events (instance orders) are defined, for example in an EHR in a hospital. Such systems implement the Medication Administration Order Placer.

The medication orders are then consulted in a nurse’s or a patient’s mobile application, for the purpose of performing these administrations. This system thus implements the Medication Administration Performer actor.

After administration, the same system informs about the status of administrations – This system thus implements the Medication Administration Informer actor. The administration is for example received by the EHR, which then also implements the Administration Consumer actor.

#### X.1.1.1 Medication Administration Order Placer

The Medication Administration Order Placer contains the instance orders for each planned medication administration. It responds to a FHIR search request from the Medication Administration Performer.

#### X.1.1.2 Medication Administration Performer

The Medication Administration Performer invokes a FHIR search for the planned administrations that are relevant for the context of the Medication Administration Performer. This context can be a combination of any of the following:

* A specific nurse that is planned to perform the administrations (in case for example of a mobile app for a nurse);
* A specific care team that is planned to perform the administrations (in case for example of a mobile app for a care team in a hospital ward);
* The patient for which the administration is planned;
* The time of administration (e.g. only the administrations for a given day, or a given shift).
* …

#### X.1.1.3 Medication Administration Informer

The Medication Administration Informer provides, by pushing a FHIR resource, a report of the outcome of a planned administration: whether the administration was effectively performed, and the actual time of administration, the performer, any additional information, etc.

It also publishes a report of unplanned administrations if such unplanned administrations occur

#### X.1.1.4 Medication Administration Consumer

The Medication Administration Consumer receives the information about the Medication Administration.

This can be implemented by systems that follow the treatment, like the prescription or medication management systems. Or it can be systems that take …

Note for later: Dispense embeddedin Prescription??

Also – Task.

#### X.2 MMA Actor Options

<Modify the following Table listing the actors in this profile, the options available for each, and references to sections that state requirements for compliance to each Option. For actors with no options, state “No options defined” in the Options column.>

<Note: Options are directly carried over to the Integration Statements which are published by vendors for review by buyers. Too many options can be confusing for readers.>

< Try to **minimize** options for Actors and only use if necessary.>

<Several options for Content Consumers are defined in PCC TF-2 section 3.1.1-3.1.4. It is recommended that these options are reused for content module definitions, but read the option definitions thoroughly to be certain that they apply. If they do apply in their entirety, you will need to define a corresponding option in this profile. The recommended naming convention for a similar, but different, option is, for example, “View Option - <profile acronym>, etc., “View Option – CIRC”.>

Options that may be selected for each actor in this profile, if any, are listed in the table X.2-1. Dependencies between options when applicable are specified in notes.

Table X.2-1: Mobile Medication Administration - Actors and Options

| Actor | Option Name | Reference  *<either reference TF-3 or the applicable X.2.x subsection below table>* |
| --- | --- | --- |
| Administration Request Placer / Administration Performer | PULL requests |  |
| PUSH requests |  |
| Administration Informer | No options defined | -- |
| Administration Consumer | No options defined | -- |

Note: *<Conditional or required options must be described in this SHORT note, for longer notes use section X.2.1.>,*

### X.2.1 PULL requests

The PULL option is used when the administration performer (e.g. the nurse’s mobile app) triggers the request for medication orders. This is typically the case when the context information (e.g. which medications to pull, for which period, for which patient) is defined at the Medication Administration Informer.

### X.2.1 PUSH requests

The PSH option is used when the Administration Request Placer (e.g. the EHR) sends a set of medication requests to the Administration Performer. This is typically the case when the context information (e.g. which medications to pull, for which period, for which patient) is defined at the Administration Request Placer, like a central scheduling system that assigns patients to care teams, and there is an interest and ability to centrally control the distribution of medication requests – for example to ensure that each care team only gets their own requests and cannot query beyond that.

## X.3 MMA Required Actor Groupings

An Actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile ***in addition to*** all of the transactions required for the grouped actor (Column 2).

Table X.3-1: <Profile Name> - Required Actor Groupings

| <this Profile Acronym> Actor | Actor to be grouped with | Reference | Content Bindings Reference |
| --- | --- | --- | --- |
| Administration Request Placer | None |  |  |
| Administration Performer | None |  |  |
| Administration Informer | None |  |  |
| Administration Consumer | None |  |  |

## X.4 MMA Overview

The MMA profile gives the mechanisms to inform about the planned and actual administration of medications.

### X.4.1 Concepts

### X.4.1.1 Types of medication administration

### X.4.1.2 Implementation Considerations

Systems implementing the MMA profile will determine whether an administration is instantaneous or if it is a continuous implementation. At runtime, this can be determined by either

* the nature of the user actions (e.g. user simply presses a button “Done”)
* the nature of the medication or the administration requested (oral solid forms vs continuous infusion)

To ensure interoperability, systems implementing the Medication Administration Informer actor shall be compatible with the following logic:

* If the administration is instantaneous,
  + one single medicationAdministration resource instance is issued with the details of the administration event.
  + At any time, if there is additional information (e.g. an adverse reaction), the same resource instance may be updated.
* If admin is continuous:
  + There may be an optional “parent” medicationAdministration resource, which is kept “in progress” for accumulating the “children” administration intervals.
  + At the beginning of the administration interval, one single medicationAdministration resource is issued, with status “in progress”. Note that this is optional, and some systems may only send out the resource when the administration is complete. Systems that implement the Medication Administration Informer actor shall support this optionality.
  + At the end of the administration interval, the same medicationAdministration resource instance is updated with status “complete”. If there was no resource instance issued at the beginning of the administration, then this is the only resource instance and contains the details of the entire interval.
  + If at any time the medication administration becomes a complex administration, i.e. if there is another interval in the same administration:
    - If the medicationAdministration resource instance for the first interval, did not have a “parent” resource instance:
      * The previous simple interval administration becomes the parent
      * A child medicationAdministration resource instance is created, which contains the interval that just finished. This interval has status “complete” and its parent is the previous resource instance.
      * Another child medicationAdministration resource instance is created, with status “in progress” which represents the newly started interval. The same logic applies as for the previous intervals.

See the section “Message Semantics” for details on the constraints that support this logic.

### X.4.2 Use Cases

MMA supports the clear functionality profiled: getting medication administration requests, and informing about the administration.

The use of FHIR is a precursor for distributed applications, to enhanced data exchange using a reliable, common and lightweight technical approach. The approach described here may be used in a range of contexts – hospitals, communities, national or regional data exchange – but the starting focus of this profile are:

* Mobile applications used by nurses, where they check the schedule and inform the administration of medication
* Patient mobile devices such as smartphones
* Other devices reporting administration of drugs, such as ambulatory drug infusion devices, or others.
* Other cases

This profile starts with two use cases that will benefit especially from the use of REST interfaces.

#### X.4.2.1 Use Case #1: Home Nursing Scenario

This use case describes the situation in which a nurse receives a list of medications to give to patients in an ambulatory setting, and uses a mobile device to plan and check the appropriateness of the administration, using also the same device to record the execution of the administration.

##### X.4.2.1.1 Home Nursing Scenario Use Case Description

In this use case, nurses are responsible for medication administration of elderly patients in an ambulatory environment. The patients reside at home or in a wide spread nursing homes where internet is not always available.

The nurses are responsible for the care of a group of patients, and each nurse receives a working list of the patients she has to visit on that particular day. Each patient could have multiple medications.

The assignments could involve several tasks like measuring temperature, blood pressure or taking blood samples, but this document concentrates on the medication administration.

The logistical supply of the medication is articulated with this profile but defined elsewhere and are not part of the scope of this profile. See the IHE Pharmacy Technical Framework for relevant profiles on dispense, resupply, inventory management and consumption. For this document, the patient could have the medication available at home or the nurse could take a medication strip along her, with the medication dispensed for the specific patients, or medication in bulk that she then splits as needed.

It is assumed that the nursing application has a “list” or “catalog” of the medications available, so that when the nurse scans a barcode, this barcode can be matched to a prescribed product.

This matter of “Catalog” / “Formulary” is also not addressed in this document, although this document provides a clear requirement for such “Catalog” or “Formulary”.

##### X.4.2.1.2 Home Nursing Scenario Process Flow

**Pre-conditions:**

1. It is assumed that the medication administrations are planned (i.e. each planned administration is scheduled and assigned to a nurse or care team).
2. There is a system (e.g. EHR) that contains this information.

**Main Flow:**

1. Each nurse logs in to her tablet.
2. **The tablet (which implements the Medication Administration Performer actor) queries the EHR for the medication that is relevant for the nurse to administer: For example, the medications for all the patients that are scheduled to be visited that same day.**
3. **The EHR responds with a list of the relevant medication administration instructions.**
4. The nurse checks her tablet and compares visually the names of the patients and the amount of medication lines with the EHR to verify if the download has been successful. If not successful she tries a second attempt to download the instructions once more.
5. The app on the tablet tells the nurse the optimal routing with the names and addresses of the patients she has to visit.
6. At each address, the nurse looks on the tablet for the medication and the dosage for the appropriate patient.
7. The nurse searches for the medication for the patient among the Baxter strips and scans the barcodes on the strip with the camera in her tablet. The app generates a warning if the medication and the patient do not match.
8. She sees to it that the medication is being swallowed.
9. For unplanned medication administrations (unplanned, or conditional medications), the nurse can also scan the barcode of the package or enters a code manually into the app.
10. If medications were scheduled but were not administered after the time has elapsed, the nurse can also register that this medication has not been consumed (including the reason).
11. Before she leaves she can enter remarks about the state of the patient.
12. If the nurse does not document all the scheduled administrations, the tablet issues a warning to the nurse.
13. After her round of patients, the nurse returns to her institution and connects with her EHR.
14. **The resultcs of the medication administration round are reported back to the EHR. This could be initiated from the EHR from where the data from the app is uploaded to the EHR.**

**Post conditions:**

1. The medication management profile of the patients are updated with the feedback of the substance administration.

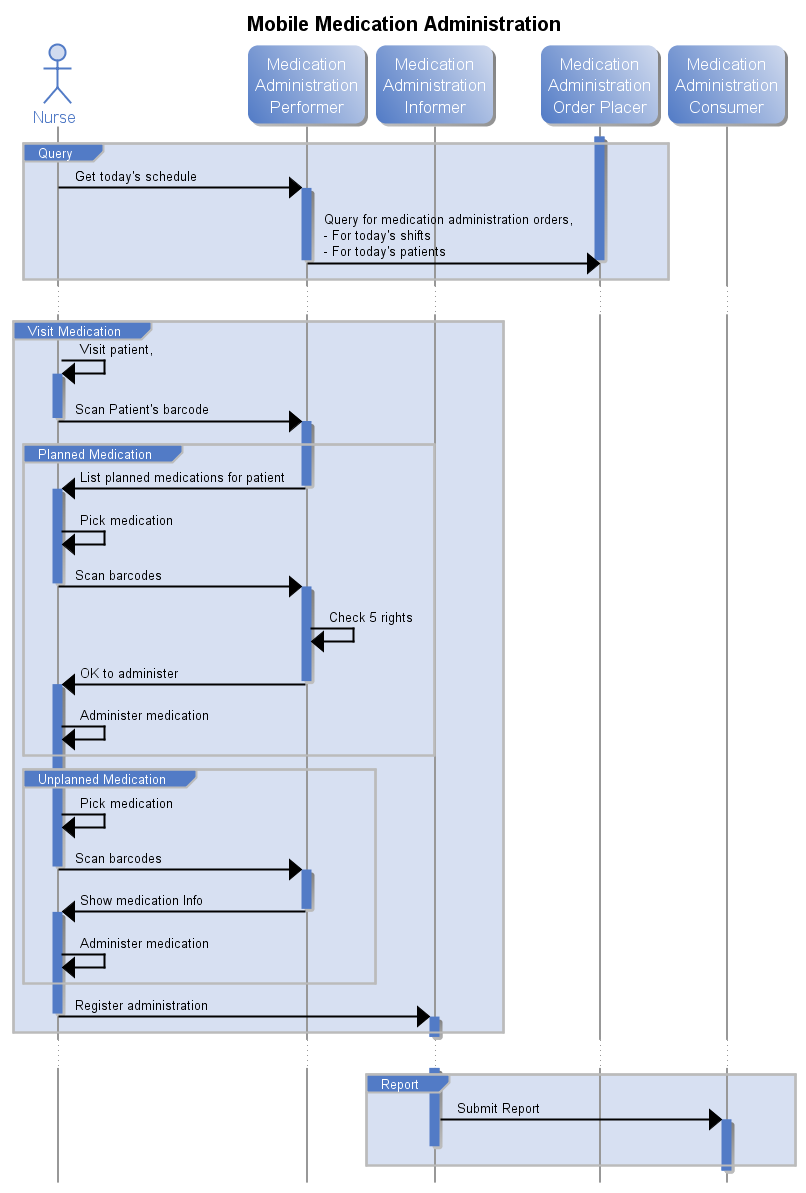


Figure X.4.2.2-1: Scheduled Administration Process Flow in MMA Profile

#### X.4.2.1 Use Case #2: Home Chemotherapy Administration

This use case describes the situation in which a patient receives instructions for the daily dosage and confirms the usage of the medication.

##### X.4.2.1.1 Home Chemotherapy Administration Use Case Description

In several countries, Chemotherapy treatments can be administered at home for improving the quality of life of the patient: The patient does not need to reside in a hospital, but can remain in his own familiar setting and follow the instructions on the app of a mobile device. These dosage instructions are complex schemas which have to prescribed by specialized oncologists. The app should be able to perform independently even if no internet connection is available.

##### X.4.2.1.2 Home Chemotherapy Administration Process Flow

Pre-conditions

1. Patient Adam Everyman has a malignant tumor in his throat. It has been treated with radiation, but Adam has to complete the therapy with a chemotherapy for 4 weeks.
2. The therapy has to be followed strictly, in dosage as well as in timing.
3. The oncologist sets up Adam for a close monitoring of the treatment administration, which means that the oncologist issues an administration order every day (i.e. there is no pre-scheduled administration orders), and Adam has to follow the instructions on his phone app every day to take the medication.
4. The oncologist enters the medication request instructions in the EHR of the hospital on a daily basis following a protocol, but this protocol is always adjusted with the outcome of the patient’s well-being.

Main Flow:

1. **The phone app downloads the medication request instructions and stores it locally in the memory of the phone. The app can function on its own, even if no internet is available.**
2. The app issues a signal every time Adam has to take his medication.
3. Adam has to take a combination of 3 drugs, each with different dosage and timing. Adam confirms the medication which he has taken or not taken. Sometimes the side effects are so strong that Adam vomits all his food and medication. He can use the same app to report that event.
4. The app provides the ability to register additional medication that Adam uses to soothe the nausea or soften pain.
5. **When Adam is back at home he synchronizes his app through internet with the hospital EHR and the results are reported back to the hospital.**

Post conditions:

1. With an updated information about the patient’s administration and its effects, the oncologist and the pharmacist evaluate Adam’s therapy and adjust the medication schema for the following day.

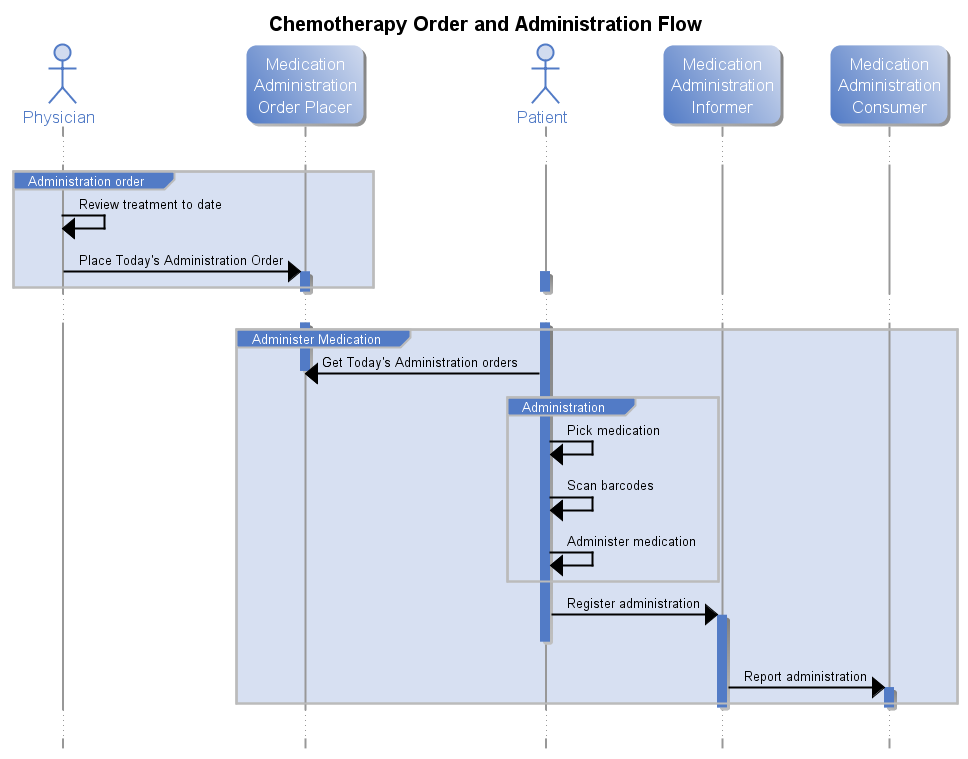


Figure X.4.2.2-1: Home Chemotherapy Administration Process Flow

## X.5 MMA Security Considerations

See IHE ITI-TF Appendix Z.8 “Mobile Security Considerations”

## X.6 MMA Cross Profile Considerations

Not currently applicable.

When the Catalog transaction is available, it may be grouped with this actor, to support the case when a nurse enters a not-prescribed medication, and the system should query to get the characteristics of the medication.

Appendices

<Add Appendices to this Profile here. Examples of an appendix include HITSP mapping to IHE Use Cases or long use case definitions.>

<Volume 1 Appendices are informational only. No “SHALL” language is allowed in a Volume 1 appendix.>

Appendix A – <Appendix A Title>

Appendix A text goes here.

* 1. <Add Title>

Appendix A.1 text goes here

Appendix B – <Appendix B Title>

Appendix B text goes here.

* 1. <Add Title>

Appendix B.1 text goes here.

Volume 2 – Transactions

Add section 3.Y

## 3.Y Medication Administration Request Query

### 3.Y.1 Scope

This transaction is used to retrieve the planned administrations for a given context.

### 3.Y.2 Actor Roles

Medication Administration Performer

Actor DEF

Medication Administration Request Placer

Figure 3.Y.2-1: Use Case Diagram

Table 3.Y.2-1: Actor Roles

|  |  |
| --- | --- |
| **Actor:** | Medication Administration Request Placer |
| **Role:** | Provide the list of planned administrations |
| **Actor:** | Medication Administration Performer |
| **Role:** | Search for the planned administrations for a given context |
| **Actor:** | Medication Administration Informer |
| **Role:** | Provide the report of administration events (or non-administrations) |
| **Actor:** | Medication Administration Consumer |
| **Role:** | Obtain the report of administration events (or non-administration) |

### 3.Y.3 Referenced Standards

|  |  |
| --- | --- |
| HL7 FHIR | Fast Healthcare Interoperability Resources DSTU3 <http://hl7.org/fhir/DSTU3/index.html> |
| IETF RFC 2616 | Hypertext Transfer Protocol – HTTP/1.1 |
| IETF RFC 7540 | Hypertext Transfer Protocol – HTTP/2 |
| IETF RFC 3986 | Uniform Resource Identifier (URI): Generic Syntax |
| IETF RFC 4627 | The application/json Media Type for JavaScript Object Notation (JSON) |
| IETF RFC 6585 | Additional HTTP Status Codes |

### 3.Y.4 Interaction Diagram

Query Administration Request Query (PHARM TF-2: 3.Y.4.1):   
HTTP GET /MedicationRequest

Query Administration Request Response (PHARM TF-2:3.Y.4.2):   
Bundle (MedicationRequest)

Medication Administration Order Placer

Medication Administration Performer

Actor B/ Actor C

#### 3.Y.4.1 Query Medication Administration Requests

This message represents an HTTP GET parameterized query from the Medication Administration Performer to the Medication Administration Order Placer.

##### 3.Y.4.1.1 Trigger Events

When the nurse requests the list of medications planned for a given context – a specific patient, or a specific schedule, for a specific nurse.

##### 3.Y.4.1.2 Message Semantics

The Medication Administration Order Request is conducted by the Medication Administration Performer by executing an HTTP GET against the Medication Administration Order Placer’s MedicationRequest Resource URL.

The search target follows the FHIR http specification, addressing the MedicationRequest Resource type (see <http://hl7.org/fhir/STU3>)

GET [base]/[type]{?[parameters]{&\_format=[mime-type]}}

This URL is configurable by the Medication Administration Performer and is subject to the following constraints.

The [parameters] represents a series of encoded name-value pairs representing the filter for the query specified in Section 3.Y.4.1.2.1, as well as control parameters to modify the behavior of the Medication Administration Order Placer such as response format, or pagination.

###### 3.Y.4.1.2.1 Query Search Parameters

The Medication Administration Performer may supply any of the query parameters listed below, and therefore the Medication Administration Order Placer shall be capable of processing all the same query parameters. See <http://hl7.org/implement/standards/fhir/http.html#mime-type> for details on encoding.

Medication Administration Order Placers may choose to support additional query parameters beyond the subset listed below. Such parameters are considered out of scope for this document.

Table 3.Y.4.1 shows the values

| Attribute | type | repeat | Meaning |
| --- | --- | --- | --- |
| type | Fixed Value: MedicationRequest |  | … |
| identifier |  | Y |  |
| (date/time) from | Datetime  yyyy-mm-dd hh:mm:ss | N | The time start that the medication is planned to be administered |
| (date/time) to | Datetime  yyyy-mm-dd hh:mm:ss | N | The time end that the medication is planned to be administered |
| (patient) |  | N | The patient for which the medication is planned |
| status | string | N | The status of the medication request. Typically this is “active” |
| Performer |  | N | The intended performer |
| Order type | Fixed value: “instance-order” | N | The type of Medication Request. Administration Requests are of type “**instance-order**” |

**\_id**

This parameter of type string*,* when supplied, represents the resource identifier to be retrieved. It is intended to retrieve one specific resource instance for which the id is known. An example could be to get a specific instance for which reception is not complete or may have been updated.

Note: A search using \_id is always an exact match search.

**identifier Search Parameter**

This repeating parameter of type token*,* when supplied, specifies an identifier associated with the Medication Administration Order instance whose information is being queried (e.g., a local identifier, account identifier, etc.).

If multiple instances of this parameter are provided in the query, the query represents a logical AND condition (i.e., all of the associated identifiers must match).

**Date and time of planned administration**

These parameters of type dateTime serve to query for medication administrations planned for a given time period. For example, only a morning shift, or only a specific day.

See FHIR specs for search based on boundaries and approximate searches…

**Patient Identification**

This parameter serves to allow retrieving the medication administrations planned for a specific patient

If multiple instances of this parameter are provided in the query, the query represents a logical AND condition (i.e., all the associated identifiers must match). This is a FHIR constraint and not a constraint from this profile. Due to this,

**Status**

This parameter of type string serves to get only medication administration requests that have one specific status. Normally, this could be only “active” medication administration requests. Other statuses are supported.

**Intended Administration Performer**

This parameter of type string serves to get only medication administration requests that already have an intended performer associated. This performer can be for example the care team or the specific professional.

**Medication Order Type**

This parameter of type string must have a fixed value of “instance-order”.

###### 3.Y.4.1.2.5 Populating Expected Response Format

The FHIR standard provides encodings for responses as either XML or JSON. Medication Administration Order Placer Actors shall support both message encodings, whilst Medication Administration Performer Actors shall support one and may support both.

##### 3.Y.4.1.3 Expected Actions

In response to the request, the Medication Administration Order Placer shall return a bundle of medicationRequest resources. The response is synchronous (i.e., on the same connection as was used to initiate the request), and shall include the records (medicationRequest resources) that match all of the search criteria provided by the Medication Administration Performer.

The mechanics of the planning and scheduling requests, and how these requests are populated, are outside the scope of this framework.

If the Medication Administration Performer supplied a query parameter, or used a query parameter modifier which the Medication Administration Order Placer is not capable of utilizing, then the Medication Administration Order Placer shall respond with an **HTTP 400** (Bad request) status code and an OperationOutcome resource indicating the parameters in error.

The Medication Administration Order Placer shall respond to the query request as described by the following cases with a Medication Administration Order Response message described in Section 3.Y.4.2, and shall behave according to the cases listed below:

**Case 1:** The Medication Administration Order Placer finds in its information source, at least one patient record matching the criteria sent as HTTP query parameters.

**HTTP 200** (OK) is returned as the HTTP status code.

A resource bundle is returned representing the result set. The Medication Administration Order Placer populates the total property of the bundle with the total number of matching results. One entry is returned from the Medication Administration Order Placer for each MedicationRequest Resource found.

**Case 2:** The Medication Administration Order Placer fails to find in its information source, any patient record matching the criteria sent as HTTP query parameters.

**HTTP 200** (OK) is returned as the HTTP status code.

A resource bundle is returned representing the zero result set. The Medication Administration Order Placer populates the total with a value of 0 indicating no results were found. No entry attributes are provided in the result.

**Case 5:** The Medication Administration Order Placer is not capable of producing a response in the requested format specified by \_format parameter (specified in Section 3.Y.4.1.2.5).

**HTTP 406** (Not Acceptable) is returned as the HTTP status code.

An OperationOutcome Resource is returned indicating that the requested response format is not supported in an issue having:

| Attribute | Value |
| --- | --- |
| severity | error |
| code | {http://hl7.org/fhir/issue-type.html, ,not-supported} |

The Medication Administration Order Placer may be capable of servicing requests for response formats not listed in Section 3.78.4.1.2.5, but shall, at minimum, be capable of producing XML and JSON encodings.

The Medication Administration Order Placer may return other HTTP status codes to represent specific error conditions. When HTTP error status codes are returned by the Medication Administration Order Placer, they shall conform to the HTTP standard RFC 2616. Their use is not further constrained or specified by this transaction.

#### 3.Y.4.2 Query Patient Resource Response message

##### 3.Y.4.2.1 Trigger Events

The response is triggered when the Medication Administration Request placer finds administration requests matching the query parameters specified by the medicationRequest as a result of a Query Medication Orders Request.

##### 3.Y.4.2.2 Message Semantics

The Query Medication Request Response is a bundle of medicationRequest resources.

###### 3.Y.4.2.2.1 MedicationRequest Resource Definition in the Context of Query Medication Request

The components of the MedicationRequest Resource with cardinality greater than 0 (as shown below) are required, and the detailed description of the content is provided here. All other attributes of the response are optional.

###### 3.Y.4.2.2.2 medicationRequest content and constraints

For all the medicationRequest resources, the following constraints apply:

* If the product referred is a kind, the medicationRequest.medication should be a link to a resource, not a contained resource. This is to ensure synchronization of product information (is this OK???)
* The medicationRequest.medication is typically a resource representing a product kind, i.e. it does not contain expiry date and lot number. As such, it will normally be a link, and not a contained resource.
  + In some cases, the medication indicated is a physical instance. This can be the case when the medication is dispensed and the batch numbers and expiry dates are known for each administration for each patient (e.g. Patient 171 will receive medication X at 1 pm, and the physical product dispensed for that event has a lot L0123 and expiry date August 2021). In these cases, the medicationRequest.medication may be either contained or a link to a resource representing that physical instance.

###### 3.Y.4.2.2.3 Logic

An Administration Request for an instantaneous administration shall contain … time period….

An Administration Request for a simple interval shall contain the interval details, and …

An Administration Request for a complex interval shall contain the conditions for each interval in the dosageInstruction repetitions. If there is a need to change other parameters….

###### 3.Y.4.2.2.4 Resource Bundling

Please see ITI TF-2x: Appendix Z.1 for details on the IHE guidelines for implementing FHIR bundles.

###### 3.Y.4.2.2.5 Incremental Response Processing - Paging of Resource Bundle

Paging is supported: the response may be split into different pages….

The Medication Administration Request Placer shall represent these incremental responses as specified by FHIR – Paging: <http://hl7.org/fhir/STU3/http.html#paging>

##### 

##### 3.Y.4.2.3 Expected Actions

The constraints specified in Section 3.Y.4.2.2 represent the minimum set of information that must be implemented by a Medication Administration Request Placer. This does not prevent the Medication Administration Request Placer from sending additional FHIR attributes in a response; such as extensions, text, etc. The Medication Administration Performer shall ignore additional attributes and extensions if not understood.

The consumer shall process the response in some manner specific to its application function (for example: displaying on a user interface). This application behavior is not specified by IHE.

##### 3.Y.4.2.5 Conformance Resource

Medication Administration Performer implementing [PHARM-2] should provide a Conformance Resource as described in ITI TF-2x: Appendix Z.4 indicating the query operation for the MedicationRequest Resource has been implemented and shall include all query parameters implemented for the MedicationRequest Resource.

The table below presents the optionality and cardinality for each medicationRequest that is in the response:

Add section 3.Z

## 3.Z Medication Administration Report

### 3.Z.1 Scope

This transaction is used to record a medication administration event (or to record the not administration of a planned medication). It is intended to be used in the conditions described in

### 3.Z.2 Actor Roles

Medication Administration Informer

Actor DEF

Medication Administration Consumer

Figure 3.Y.2-1: Use Case Diagram

Table 3.Y.2-1: Actor Roles

|  |  |
| --- | --- |
| **Actor:** | Medication Administration Informer |
| **Role:** | Provide the report of administration events (or non-administrations) |
| **Actor:** | Medication Administration Consumer |
| **Role:** | Receive the report of administration events (or non-administration) |

### 3.Z.3 Referenced Standards

|  |  |
| --- | --- |
| HL7 FHIR | Fast Healthcare Interoperability Resources DSTU3 <http://hl7.org/fhir/DSTU3/index.html> |
| IETF RFC 2616 | Hypertext Transfer Protocol – HTTP/1.1 |
| IETF RFC 7540 | Hypertext Transfer Protocol – HTTP/2 |
| IETF RFC 3986 | Uniform Resource Identifier (URI): Generic Syntax |
| IETF RFC 4627 | The application/json Media Type for JavaScript Object Notation (JSON) |
| IETF RFC 6585 | Additional HTTP Status Codes |

### 3.Z.4 Interaction Diagram

Administration Report (PHARM TF-2: 3.Y.4.1):   
HTTP PUT/POST Bundle (MedicationAdministration)

Administration Report Response (PHARM TF-2:3.Y.4.2):   
HTTP response

Medication Administration Informer

Medication Administration Consumer

Actor B/ Actor C

#### 3.Z.4.1 Medication Administration Reports

This message represents an HTTP ~~POST~~ PUT of a bundle of medication administration reports.

The bundle is necessary to contain several administration reports, since typically the nurse will upload the results when there is connectivity. In some circumstances, the administration may be sent immediately, so there may be only one MedicationAdministration resource in the bundle.

##### 3.Z.4.1.1 Trigger Events

When the nurse synchronizes the mobile application with the server or in some cases when the nurse device is online and it is possible to send an update after each administration.

Note that given the time between an administration and the reporting, expressed in section XXXX, the trigger for submitting an administration will typically be some time after. This sequence is not always existing. For example the patient may inform about a skipped administration even before the scheduled time.

##### 3.Z.4.1.2 Message Semantics

* If the medication administration is a result of an “administration request”, medicationAdministration.request shall not be empty and must point to that “administration request” as specified in transaction PHARM-2
* If any of the characteristics change from the presumed or stated in the request (e.g route is not the “official” route, or dosage differs from the prescribed dosage) then the actual elements shall be reported - they become mandatory and they convey not what was intended or default, but the actual outcome.
* If there are more medications being administered at the same time (for example, two tablets taken at the same time, or two medications in an infusion), then two medicationAdministration resource instances shall be used, with the same timing… This applies to all cases except when there is a medication representing the two medications, for example if for “mixture of product A and product B diluted in solvent C” there is a unique code that unambiguously represents that mixture, then it is correct to use the code, and in this case the mixture is considered a single medication.
* The previous consideration applies to the entirety of this document: when there is an indication that one medicationAdministration resource instance shall be issued, it should be considered that it is one medicationAdministration resource instance per medication.
* medicationAdministration.subject should be linked, not a contained resource. Only exceptional circumstances should require a contained patient resource, such as an emergency administration for a patient that is not known by the systems.
* medicationAdministration.Medication shall refer to a physical instance of a product and as such contain, whenever available, the lot or batch number, the expiry date, and serial number, as well as other identifiers.
  + For this reason, medicationAdministration.Medication would normally be a contained resource, pointing to a specific instance of a medication, unless the medication administration request already specifies a linked medication instance resource (i.e. if the medication administration request already contains a link to a physical instance, with lot number, expiry date, etc.)
* If the medication administration is a result of a prescription, e.g. ah-doc, PRN… medicationAdministration.request shall point instead to the Prescription.
* If medication is emergency/unplanned, no constraints apply

Open issue: What if the administration is consequence of an implicit order that comes from a dispense?

* If admin is instantaneous (ask Julie/Hugh), medicationAdministration.effectiveDateTime is mandatory and contains the time of administration.
* If administration is continuous,
  + At the beginning, a medicationAdministration resource instance may be issued, with
    - status = “in-progress”
    - period.starttime contains the time when the administration interval started
    - period.stoptime is empty.
    - Implementers may opt to include a “parent” administration, to support the case of a complex interval administration. This is not guaranteed or mandatory.
  + At the end of the interval, if the administration is completed with this interval:
    - If no resource was previously submitted, a new medicationAdministration resource instance is issued.
    - If a medicationAdministration resource instance was issued at the beginning of the interval, the same resource instance is updated.
      * status is “complete”,
      * period.starttime is the same as the previous resource instance
      * period.stoptime is now filled in with the time the administration stopped.
  + If the administration is complex or when it becomes complex (i.e. a new interval is added , whether planned or not), there shall be a parent medicationAdministration resource instance, and the previous interval and present and future intervals shall be linked to this parent. Typically, to implement this, the following logic (or similar) is followed:
    - The first step is to see if there is already a parent administration. If not:
      * The medicationAdministration resource instance corresponding to the first interval (if it had not been created before, one shall be created at this moment) becomes the parent of the complex administration.
        + The Start time of the parent interval remains the same,
        + The Stop time is still unknown
        + The status remains “ongoing”
      * A new child medicationAdministration resource instance shall be created for the first interval, where:
        + part of = (resourceID of the “parent”). **Note that to obtain the ID may imply either a query to the server, or, most commonly, that the resource is created with a predefined id.**
        + Starttime is the start of the first interval
        + Endtime is the time when the 1st interval ended
        + Status = “complete”
      * A new child medicationAdministration resource instance may be created for the second interval, where:
        + part of = (resourceID of the “parent”).
        + Starttime is the time of the change (i.e. typically the end time of the previous interval. If not, this could mean a pause in the administration between the two intervals)
        + Endtime is empty
        + Status is “in-progress”

Later, when the second interval is finished, the resource instance is updated. Like for the simple interval, the medicationAdministration resource instance for the second interval may only be created at the end of the interval instead, and not updated.

Each of the intervals in a complex interval administration thus follows the same rules as the simple interval administration.

* When it is known that the medication has not or will not be taken (for example one medication administration is coming up and the previous is known not to have been taken), a medicationAdministration resource instance is created
  + Time = ????
  + Status = NotDone
  + ReasonNotGiven should be filled in if status is NotGiven

##### 3.Y.4.1.3 Response

Review for POST or PUT:

In response to the request, the Medication Administration Consumer shall return the http result code together with the outcome of the operation. The response is synchronous (i.e., on the same connection as was used to initiate the request).

If the operation is successful, the Medication Administration Consumer shall respond with an HTTP 201 (Created) and return a bundle of medicationAdministration resources that were created or updated.



The Medication Administration Consumer may return other HTTP status codes to represent specific error conditions. When HTTP error status codes are returned by the Medication Administration Consumer , they shall conform to the HTTP standard RFC 2616. Their use is not further constrained or specified by this transaction.

Management of workflows:

When updating an administration, this has an impact on the workflows. It is beyond the scope of this profile to provide guidance on this. For example, if there is a task associated with the medicationAdministration, that task should be updated. The management of “administration complete” must be done at the main administration task.

These are the fields from HMW which should now be ported to MMA as needed: (This is just an overview, since most attributes will exist in related resources.

|  |  |  |
| --- | --- | --- |
|  | FHIR resource | Has constraints? |
| Patient | Patient resource | Can only be linked, not contained. |
| Patient Name | Patient resource |  |
| Personal Identification | Patient resource |  |
| Administrative Sex : Gender | Patient resource |  |
| Date of Birth : Birthdate | Patient resource |  |
| Address : Address | Patient resource |  |
| Contact Information : telecom | Patient resource |  |
| Guardian : contact |  |  |
| contact information |  |  |
| Guardian Name |  |  |
| Guardian Relationship |  |  |
| Marital Status : MaritalStatus |  |  |
| Race : stdExt |  |  |
| Ethnicity : stdExt |  |  |
| Religious Affiliation stdExt |  |  |
| Patient Contact Information : ???? |  |  |
| Payers : |  |  |
| Coded Vital Signs |  |  |
| Allergies and Drug Sensitivities |  |  |
| Active Problems |  |  |
| Resolved Problems |  |  |
| Immunizations |  | Immunizattion resource?? |
| Pregnancy History |  |  |
| Encounter |  | Encounter resource |
|  |  |  |
| EncounterID :context |  |  |
| Patient Location |  |  |
| Organization |  |  |
| Name |  |  |
| Address |  |  |
| Organization Identifier |  |  |
| Contact Information |  |  |
|  |  |  |
| Prescription | prescription |  |
| PrescriptionID |  |  |
|  |  |  |
| Ward\_Staff | Performer |  |
| Name |  |  |
| Address |  |  |
| HCP Identification |  |  |
| Department |  |  |
| Administered\_Item medicationX | Reference or content? |  |
| Effective start of administration date/time | Effective |  |
| Effective end of administration date/time | Effective |  |
| Administration | Location |  |
| Expiration date medication | Medication?? What if reference? | CONTAINED RESOURCE |
| Batch number medication | Medication?? What if reference? | CONTAINED RESOURCE |
| Quantity administered | Dosage |  |
| Code | Medication | CONTAINED RESOURCE |
| Name | Medication | CONTAINED RESOURCE |
| Units | Medication |  |
| Form | Medication | CONTAINED RESOURCE |
| Administration comments | Note |  |
| Reason for non-administration | ReasonNotGiven | Admini.. |
| Reaction | Note |  |
| Route of administration | Route | Administration.route |
| Administration Status | Status |  |
| Barcode |  | CONTAINED RESOURCE |

##### 3.Y.4.2.3 Expected Actions

The medication Administration Consumer is expected to add the information about the administration to the clinical and operational records existing. This can mean several things. Some examples:

* Update the clinical systems to indicate that the treatment triggered by the prescription is “started” or “in progress” (or any other status. If the planned medication administration was the last one in a treatment sequence, it is possible that the system will assign the status “complete”).
* If the management of workflow involved tasks, these tasks should also be updated accordingly (e.g. noting the progress, updating status of the task and adjacent resources). It is beyond the scope of this profile to provide further guidance on this. The management of “administration complete” must be done at the main administration task.
* Any other conclusions

### 3.Y.5 Security Considerations

The Medication Administration Order Placer and the Administration Performer shall be grouped with a Secure Node actor.

Systems implementing the Medication Administration Order Placer and the Administration Performer shall implement the Secure Application actor in ATNA.

#### 3.Y.5.1 Security Audit Considerations

The event to be supported is :

Order-record-event, health-service-event, or only medication?

##### 3.Y.5.1.(z) <Actor> Specific Security Considerations

<This section should specify any specific security considerations on an Actor by Actor basis.>

Appendices

<Detailed cross transaction relationships or mapping details are described in an appendix in Volume 2x. Volume 2 appendices may be informational or normative. Immediately after the title of a Volume 2 appendix, provide a very explicit statement defining whether this new appendix is informative or normative.>

Appendix A – <Appendix A Title>

Appendix A text goes here.

* 1. <Add Title>

Appendix A.1 text goes here

Appendix B – <Appendix B Title>

Appendix B text goes here.

* 1. <Add Title>

Appendix B.1 text goes here.

Volume 2 Namespace Additions

Add the following terms to the IHE General Introduction Appendix G:

<Please explicitly identify all new OIDs, UIDs, URNs, etc., defined specifically for this profile. These will be added to the IHE TF General Introduction namespace appendix when it becomes available. These items should be collected from the sections above, and listed here as additions when this document is published for Trial Implementation. This section will be deleted prior to inclusion into the Technical Framework as Final Text, but should be present for publication of Public Comment and Trial Implementation.>

Appendices

*<Add any applicable appendices below; NA if none.>*

Appendix A – <Appendix A Title>

Appendix A text goes here.

* 1. <Add Title>

Appendix A.1 text goes here

Appendix B – <Appendix B Title>

Appendix B text goes here.

* 1. <Add Title>

Appendix B.1 text goes here.

Volume 3 Namespace Additions

Add the following terms to the IHE Namespace:

<Please explicitly identify all new OIDs, UIDs, URNs, etc., defined specifically for this profile. These will be added to the IHE TF General Introduction namespace appendix when it becomes available. These items should be collected from the sections above by the author, and listed here as additions when this document is published for Trial Implementation. This section will be deleted prior to inclusion into the Technical Framework as Final Text, but should be present for publication of Public Comment and Trial Implementation.>

Volume 4 – National Extensions

Add appropriate Country section

4 National Extensions

4.I National Extensions for <Country Name or IHE Organization>

<A template for Volume 4 is included in this document for completeness; however, National Extensions are typically developed after a profile has been published for Trial Implementation. If you are developing a new profile for Public Comment, it is recommended that this section be marked “Not Applicable”.>

<Avoid using this section if you can, this is “only if absolutely necessary”. Differences add cost to implementation and testing and can reduce interoperability. Review carefully to determine if the national use case truly requires a difference in the profile mechanisms rather than just differences in system configuration.>

< National Extensions can add requirements above and beyond IHE, but NOT relax requirements. This would prevent Connectathon results based on national testing being recognized elsewhere. For more information, see <http://wiki.ihe.net/index.php?title=National_Extensions_Process>.>

The format of this section is not strongly specified due to the varying nature of national extensions. For an example of National Extensions, see Radiology TF Volume 4.>

4.I.1 Comment Submission

This national extension document was authored under the sponsorship and supervision of <sponsor name>, who welcome comments on this document and the IHE <country> initiative. Comments should be directed to:

<Name, organization, title, email address>

4.I.2 <Profile Name> <(Profile Acronym)>

<Add info or tables>

#### 4.I.2.1<Profile Acronym> <Type of Change>

<Add info or tables>

#### 4.I.2.2<Profile Acronym> <Type of Change>

<Add info or tables>

# 4.I+1.1 National Extensions for <Country Name or IHE Organization>

*<Repeat (and increment) the section above as needed for additional National Extensions>*