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# Health infomatics — Medication management concepts and definitions

*Informatique de santé — Concepts et définitions relatifs à la gestion de la médication*



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# Foreword

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This document was prepared by Technical Committee ISO/TC 215, *Health informatics*.



 

# Introduction

The approach of this document is first to explain the logical steps in a medication therapy of a patient and to state which data elements are required at that step and what is done with the data. The best definition that would fit at that stage of medication therapy was identified. It was noticed that where a listing of definitions that the interpretations of the various terms were to be made, this would lead to endless discussion of the meaning of the terms.

IHE pharmacy, HL7 Pharmacy and ISO/TC 215 have been convening frequently and noticed that each individual had a different interpretation of the terms used. As SDOs where communication of medication information is the core purpose of these organizations, it is of course vital to understand what a noun means so that all persons have a common understanding of the words used. Terms that have composite ingredients are to a certain extent arbitrarily defined, but this document contains the definitions that are agreed on by HL7 pharmacy, IHE Pharmacy and ISO/TC 215.

The scope in the first stage will be on the definitions of composite information, such as lists. This will be set against the workflow and process in medication therapy.

Communicating information by means of IT can be separated into four layers:

1) The conceptual meaning of terms

2) The content and characteristics of terms

3) The container of information.

4) The communication of information.

The fourth and bottommost layer is the physical distribution of the information, such as pull or push mechanisms. The logistical aspects are not in the scope of this document, nor is the method or required infrastructure to obtain the information part of this document.

The third layer defines how the content is formatted so that senders and receivers can recognize the elements of the content. Examples are CDA documents, HL7v3 or HL7v2 messages. This document is not intended to go into this matter.

The second layer from the top is also called the syntax layer. It defines the content of a term. Some of these elements in the content will be optional. In the context of this document the term syntax refers to the rules governing the composition of meaningful elements. As an example the geographical coordinates (i.e. 41°24'12.2"N 2°10'26.5"E) could have been chosen as the syntax for a location, but it could as well be a street, number, postal code and city as the preferred notation of a logical address. This document is not intended to dive into the syntax of the medication terms.

The top layer is also called the semantic layer. This document focuses on this layer. The intention is to understand the meaning of a term. The result should be, that when a term as "unreconciled medication list" is used, that all readers should interpret the term in the same manner. The context in which the information is exchanged is also of importance for the concept. As an example a medication list for an intake into a mental ward could put more emphasis on other data than a medication list for discharge at a general hospital.

# Health infomatics — Medication management concepts and definitions

## 1 Scope

The purpose of this document is to define the various concepts and terminologies used in the pharmacy domain when applied to the topic of creating medication lists from existing data.

## 2 Normative references

There are no normative references in this document.

NOTE For future considerations, the terms from ISO 13940 will be considered.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

**3.1**
**contraindication**
**contra-indication**
condition or factor that increases the risk involved in using a particular drug, carrying out a medical procedure, or engaging in a particular activity

Note 1 to entry: Pursuing the intention is inadvisable.

[SOURCE: IHE Pharmacy, Standard terminology, modified]

**3.2**
**dispensing**
process of validation of the electronic prescription, preparation of the medicinal product, labelling, informing and handing the medication to the patient or administering healthcare professional

[SOURCE: ISO 17523:2016, 3.2]

**3.3**
**health concern**
health-related matter about a patient that is of interest, importance or worry to someone

Note 1 to entry: This someone may be the patient, the patient's family or a patient's healthcare provider.

Note 2 to entry: A health concern is sometimes called a problem concern. A difference is that a problem concern is mostly related to one diagnosis, while a health concern can change overtime as the situation of the patient aggravates, for example from a simple cough, to pneumonia ending in COPD.

[SOURCE: HL7 929, Health Concern Domain Analysis Model v.3, September 2015]



 

**3.4**
**medication administration**
application of medicine to a subject of care

Note 1 to entry: In general only the medication administration that is registered in a system is taken into consideration.

[SOURCE: IHE Pharmacy: Standard terminology, modified]

**3.5**
**medication**
substance that has an intended therapeutic effect on a patient and may influence the medication safety of a patient

Note 1 to entry: This would include prescribed, but also non-prescribed medication such as cough syrups. A placebo has the intent of a therapeutic effect and is thus considered medication. Alcoholic beverages however also influence medication safety, but are not considered to be medication because they do not have the intent of giving therapy.

**3.6**
**medication management**
act of exercising directives on the medication of a patient

Note 1 to entry: It includes reviewing the medication profile of a patient, providing new medication therapies, adjusting or stopping existing therapies and evaluating its outcome.

**3.7**
**medication statement**
declaration given by the subject of care or a third party about the usage or non-usage of medicine by the subject of care

Note 1 to entry: The primary information is about the medication, but it may include supporting information about observations and conclusions, for example reasons for diverging from the intended dosage.

[SOURCE: IHE Pharmacy, Standard Terminology]

**3.8**
**prescription**
set of values or attributes that is produced as the output of a prescription act

Note 1 to entry: A prescription is a set of instructions written by a prescriber that authorizes a medicinal product or treatment to be given to a patient. It is a) an instruction by an authorized healthcare professional, b) a request to dispense by an authorized healthcare professional and c1) advice to a patient on his/her medication treatment, or c2) an instruction to administer by an authorized healthcare professional.

Note 2 to entry: The word "prescription" is sometimes used when referring to the act of prescribing - "prescription process". To avoid confusion with the term "prescription" as an information object, throughout this document the word "prescription" is reserved for the information object. For the act of prescribing, the term "prescribing" is used.

Note 3 to entry: An older definition of prescription can also be found in ENV 13607: "Direction created by an authorized healthcare person, to instruct a dispensing agent, regarding the preparation and use of a medicinal product or medicinal appliance to be taken or used by a subject of care". This definition is more appropriate when referring to the act of prescribing.

[SOURCE: ISO 17523:2016, 3.7]

**3.9**
**sex**
biological background of a patient

Note 1 to entry: This is as opposed to gender, which is the preference of the patient.

Note 2 to entry: The biological background is considered to be more relevant for the purpose of medication management.

## 4 Abbreviated terms

ER — Emergency room.

Unit of a hospital where emergency care takes place.

EHR — Electronic Health Record.

Used as the abbreviation for Care Provider IT systems for health records with data structured and represented in a manner suited to computer calculation and presentation.

NOTE: The UK National Health Service (NHS) uses the term Electronic Health Record to describe the concept of a longitudinal record of a patient's health and healthcare from cradle to grave and uses the term EPR to describe the record of the periodic care provided mainly by one institution.

GP — General Practitioner.

Doctor that performs general practice, in some countries also called as family doctor or primary care provider (PCP).

INR — International Normalized Ratio.

Ratio that gives an indication how much longer time the blood of a thrombosis patient would need for coagulation than a normal patient.

IHE — Integrating Healthcare Enterprises.

Standards organization that uses existing communication standards for the healthcare to combine them in a workflow in the care. These workflows such as an ordering process, are called IHE profiles.

OTC — Over the counter.

Refers to medication that does not require a prescription to procure such as cough syrups, painkillers, sterilizing liquids.

PHR — Personal Health Record.

Health IT system in which a patient can manage their own personal health information by downloading and storing information from a variety of sources.

## 5 General process

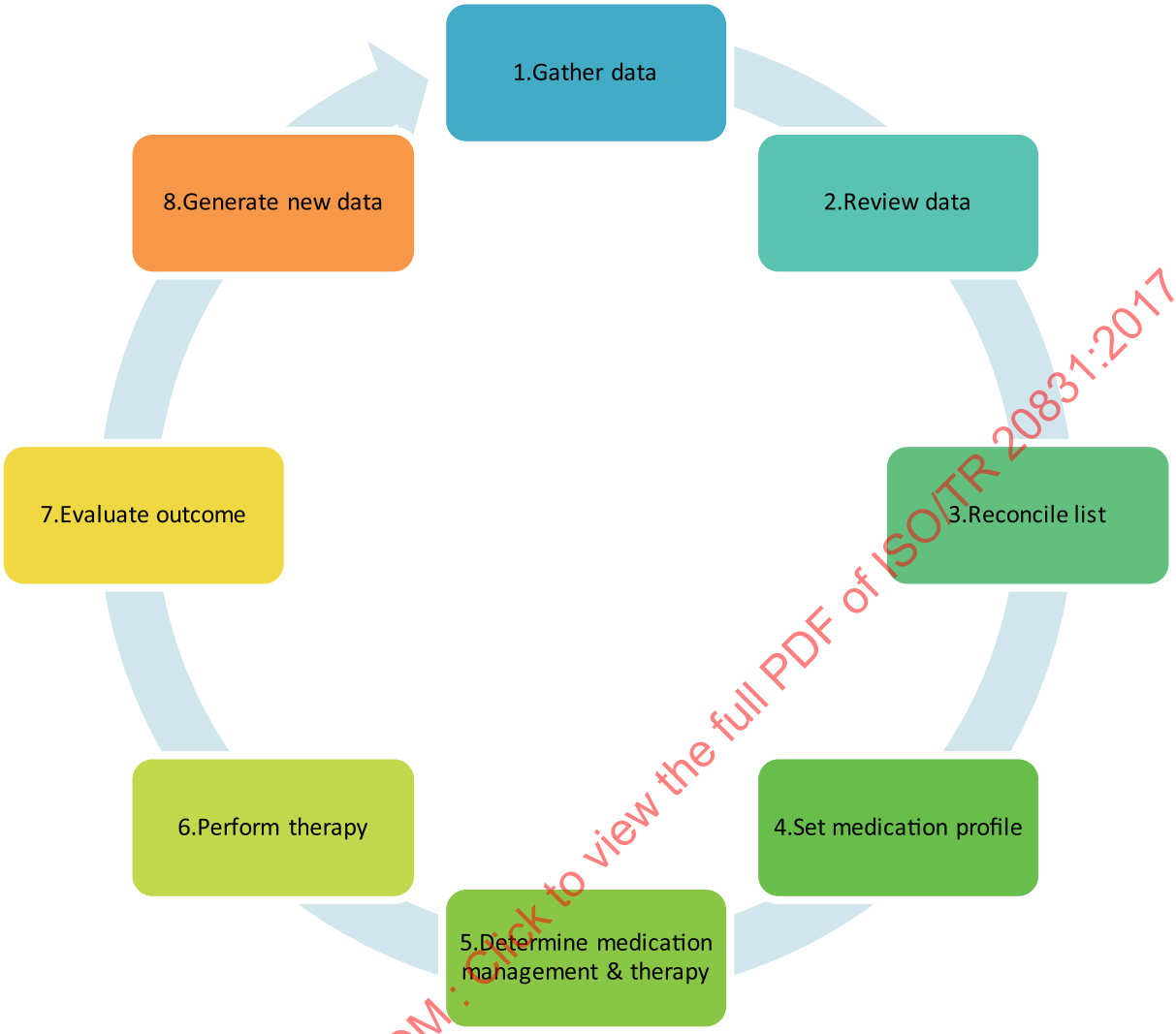


**Figure 1 — Cycle of treatment process**



The medication process is actually a recurring cycle (symbolized in Figure 1). This is often not recognized by healthcare providers, because the healthcare providers are frequently replaced, or the patient is transferred from one institution to another, but certainly from the point of view of the patient the events of the medication therapy can be seen as a recurring loop.

The loop does not have always have a smooth constant flow. While "gather data" is the logical starting point in the medication management process diagram, it is not uncommon for the process to start at a different step/point in the process. Events could happen all the time that could make intervention necessary. For example admission of patient into hospital triggers review of patient's existing medication list and the medication profile. The condition of the patient changes (deteriorates or improves) or new lab results are published that requires adjustments of the dosage. This all affects the medication management and provides short cuts in the loop.

These steps in the flow of the medication management of the patient result in different kinds of lists, profiles of medication of the patient. The purpose and the status of each type of list must not only be understood by the author, but also by other care professionals who share the information with the original source. The intent of this document is to distinguish the different steps in medication management and which type of document belongs to which process part.

The following sequence of sections is used for the explanation of definitions:

— identify the basic data elements relevant to medication management;

— define the possible process steps and the variations in the processes;

— name the various report types that can be linked to that part of the process.

The emphasis of this document is focused on steps 1 to 5 (gathering data up to determine the medication management and therapy). The actual therapy, such as administering the medication is performed in step 6. Steps 7 and 8 (evaluate outcome and generate new data) of course do have effect on the medication management, but it will be apparent if the process restarts with step 1.

# 6 Data elements relevant to medication management

## 6.1 General

Effective medication therapy management requires the inputs of relevant historic and current information including medication and related clinical information. This clause provides an overview of the information important for medication therapy management planning and review processes. Details of the information requirement (including data elements, data types and terminology constraints) for each of these data components are out-of-scope for this document.

The collection of data elements is seen as a list of possible data components. It is evident that it is not possible to make a compulsory list of data elements. The ultimate goal would be to know everything, but there is a cost incurred to put information into systems. That effort might not always be worthwhile. Tradition, but certainly also a level of computerization, accessibility of that information, jurisdictional restrictions and the differences in workflow are factors that influence the availability of data.

## 6.2 Prescription data

A prescription is a medication request usually authorized by a qualified practitioner such as medical practitioner, dentist, nurse practitioner (and in some jurisdictions, pharmacist). The medication request could be part of larger care plan, including other treatment and therapies such as nutrition requests, procedures (e.g. dialysis, dressing, operations).

Prescribed medications are drugs that can only be made available to patients by a medication request (usually written and signed) of a qualified practitioner.

It is important to recognize that the data of a prescription consists of two distinct components:

— a therapy that the prescriber has agreed with the patient;

— a logistical order to supply a tangible product, most commonly the medication.

In certain settings these elements might be seen as separate entities. An order to stop medication can be seen as an example of a request where there is a therapy instruction to stop using the medication and where the supply is left void.

Depending on the constituency and the type of process the prescriber might leave the level of detail of the order open for others to fill in. In many cases the medication on the prescription would be prescribed on a generic level with the focus on the active ingredient while what is dispensed is most certainly a tangible product.

Prescription (together with dispense and administration) data are key components of a patient's medication list and medication profile. These data are very important for safe and effective management of a patient's medication therapy and are an integral component of the patient's medication management plan.

The most common source for prescription data are the prescribing systems.

## 6.3 Dispense data

The dispensing of medication includes the act of preparing and supplying medications.

Medication dispense data capture details about (prescribed) medication dispensed for use by the patient. Dispense information is usually collected from pharmacy systems.

In the institutional setting the administration of medication to a patient might be from the ward stock; the replenishment from the pharmacy stock to the ward is not on a patient's name. In such a case no dispense can be identified. In the view of medication management medication is defined as dispensed, if it is in the possession of, or ready to be administered to the patient.

Certain systems define the medication as dispensed as soon as the order is ready for dispatch (i.e. ready to be picked up by the patient). In the view of medication management a medication is defined as dispensed if it is in the possession of the patient. This is to exclude medication that is not picked up.

In the community setting, medication dispense data provides feedback on what was prescribed. The presence of medication dispense data against a prescription gives certain confidence that the patient is more likely to comply with medication management plan. The dispense should be matched with a prescription via a reference to the prescription id.

In many cases a dispense list will provide complementary information to a listing of prescriptions, because pharmacies will also show dispense from (external) healthcare providers who use paper prescriptions. Prescriptions where no dispenses can be found to link with could indicate that patients are not compliant with the suggested therapy.

OTC medication supplies are often not visible in the dispense list, because they cannot be linked to a patient, for example because they are acquired in a supermarket and are shared within a household.

The dispense list is likely to give more detail, because it will contain a product that can be dispensed while prescriptions contain a generic product code or an active ingredient.

The dispenser might also have added dates (or time interval), which the prescriber might have left open. This will influence whether the medication will appear in the requested period of the dispense list.

## 6.4 Medication administration data

Medication administration data capture details about (prescribed and non-prescribed) medications administered to or taken by a patient. Each medication administration record/entry is an account of one administration event, which may be a point in time event (representing a dose of medication), or may be an occurrence over a time interval (e.g. intravenous administration of antibiotic over duration of 30 min).

Medication administration data differs from medication statement, which represents an assertion of known use of medication in general.

Medication administration is usually registered in the institutional setting, but not in the community setting. The presence of medication administration data in the community setting allows more accurate assessment of patient compliance profile. An example is the report of patients with thrombosis who register their use of anti-coagulant medication or pharmacists who administer vaccines to patients.

Medication administration data originate from nurses, patients or relatives, home care aids or even administration machines and have various sources ranging from EHR to telemedicine systems.

## 6.5 Medication statement data

A medication statement is a declaration of medication actually used, known to be used, as well as intended to be used by the patient in the future. A medication statement refers to exactly one medication. This information might be obtained as a result of the process of medication review and reconciliation (e.g. by interviewing the patient or by querying and reviewing trustworthy data sources).



 

A medication statement captures information that is not formally captured in prescription, dispense and administration repositories. It provides important additional information that adds to the completeness of a patient's medication profile and is important input to facilitate safe and effective patient medication management.

Statements from the patient about the use of OTC medication or herbal mixtures can be captured in the medication statements. This could even be extended to the registration of recreational drug use or alcohol consumption. The statement could also state that the patient is not complying with the therapy and reasons why, perhaps because of side effects. The source of the information could be the patient, relatives or even an interviewing healthcare provider. The information could originate from any system varying from an EHR to a PHR.

The reliability of the statement is just as reliable as the source. Assertion is acceptable.

NOTE The identification of the medication might not be exact (foreign medication, herbal mixtures etc.).

## 6.6 Health concern data

A patient's health concern data include data that reflect the assessment of the patient's health. They could include:

- sex
- age
- body weight
- genetic profile
- health risks (including risks associated with family history)
- issues/problems (including compliance issues)
- diagnosis
- health status (including diagnostic test findings)
- other relevant vital signs.

The latest and historic patient health concern assessment information will always influence a clinician's decision in planning a patient's treatment (medication management included).

## 6.7 Contraindication risks

Medication is prescribed as a remedy against a certain health issue. Contraindications are other health risks of the patient which might give reason not to prescribe this medication, or at least to take into consideration before prescribing the medication to the patient. This could range from an allergy to the medication, or other conditions (for example hypertension or pregnancy) that could worsen when the medication is used. Not all health risks of the patient are relevant for each case. It depends on the circumstances and the medication prescribed. Therefore they are called contraindication risks.

## 6.8 Specific laboratory results

Laboratory results such as liver function tests, renal function tests, blood counts, INR levels, etc. are needed for safe medication. The metabolic pathways of drugs and their toxicity need to be carefully considered and monitored before initiation and management of medication therapies management.

### 6.9 Drug and alcohol usage

Large consumption of illicit drugs or alcohol do not combine well with medication usage. Certain countries have a requirement to register the use of illicit drugs or alcohol abuse on the medication profile of certain patients.

### 6.10 Smoking habits

Smoking can alter the metabolism of some medicine. The smoking habit and frequency of tobacco or nicotine use provides input for medication management.

## 7 Process steps

### 7.1 The act of gathering data

Gathering data is usually necessary when an unfamiliar patient appears for the first time to an institution or at least when no medication data can be found in the IT system. There could be multiple sources for the data and the methods to retrieve data might be different. The data might originate from document repositories or databases from various sources such as pharmacy systems, GP systems, hospital pharmacy systems, laboratories, EHR systems from hospitals, regional or national database, PHR-systems. The method to retrieve the data is not described in this document, but can be found in other documents such as IHE profiles.

Sometimes the patient might have brought along a listing of medication on paper and it is not unusual that they bring their pills along in a plastic bag to show them to a healthcare provider. Gathering data is also required when a patient returns to the institution after treatment elsewhere. The patient might already have medication data in the system, but the data are most likely to be outdated if the patient has multiple treatments in different care institutions. An update of the medication data is required to have a valid and recent file.

The result of gathering data might be a collection of raw data.

A typical product that comes out of this phase is an unreconciled medication list.

For further elaboration see 8.2.2.

### 7.2 The act of making sense of the data

The raw acquired material might not be useful to be able to draw conclusions on what the patient is using at the moment. The volume of retrieved information might be too large to be able to make a sensible report. The following methods can be used to make sense of the data.

— Removing outdated data, for example medication that has been stopped and the information on its use has no further value.

— Removing duplicates. In retrieving data from different external sources particular dispenses that might have been copied across multiple data sources might appear twice.

— Compound similar data to singular grouped data, daily dispenses for a repetitive prescription.

— Removing insignificant data such as bandages or diapers that are dispensed through a pharmacy.

A part of this cleaning process can be done automatically on the basis of filtering rules, such as checking on identities, product identifiers and dates, but in the end human interpretation is required to draw the final conclusions of what should be on the list.

Particular consideration is given to the grouping of the components prescription, dispense and the administration or medication statements from the patient. Prescriptions are normally written based on the generic medication, while dispensing information would contain specific trade product information



 

with a distinct product identifier. Grouping the prescription and dispense data together could therefore be done by matching the prescription-id, but this might not always be present. This is even more the case with medication statements, where a prescription-id might be unknown to the person who has gathered the information.

It is important to recognize the distinction in concept of static and dynamic filters in the cleaning up process. A static filter is a process that occurs during data collection such that if an element is deleted or aggregated it cannot be undone. The advantage is that the cleaning up is done only once. The disadvantage is that the filtering rules have less flexibility. You cannot ask detail information any more once you have aggregated the data into one element.

In a dynamic filtering the cleaning up process is only done temporarily on the run and needs to be repeated every time this report is required. The dynamic filtering could be ticking a checkbox in a parameter screen before the starting the display of a list. The advantage is that the filtering rules can be changed depending on the need of that moment. The disadvantage is, that rework has to be done every time. In the example of detailed dispenses, the dispenses are aggregated every time a report is run.

There is no exact rule where to put the boundary for static or dynamic clean up. This is very much a choice of the IT vendors and their users.

The sequence in which a report is shown is usually done dynamically. Computers are fast enough to sort long list of medications in real time, whether you want to sort it by medication code, date or health concern.

A typical product that comes out of this step is an aggregated medication list.

For further elaboration see chapter 8.2.4.

## 7.3 The act of verification of the data

It is not unusual to verify medication an unreconciled list with (a relative of) the patient or an intermediate of the patient, such as a nurse or a primary care provider. Human interaction is involved in the act of verification. This could be the care provider acting alone or in conjunction with the patient. The patient might deny that certain medication is still used and add other medication products that are relevant for the medication list. Examples are over the counter medication that the patient has bought in a drugstore.

The verification of data is not only limited to medication but to all types of information relevant for the medication safety as described in the previous chapter, such as allergies and contra-indications. As a result data elements may be refined, corrected, added or removed.

The result of this process step is having a collection of data that the healthcare provider regards as correct and relevant for the further treatment of the patient as described in the next paragraph. A snapshot of the collection of data is stored on a system.

A typical product that comes out of this step is a reconciled medication list.

For further elaboration see 8.2.3.

## 7.4 The act of adding data to the collection

The next step in the treatment is usually where the healthcare provider draws conclusions from the existing collection of data and sets up a new treatment plan. This could be orders for additional analysis or a medication therapy plan. The therapy plan could also include adjusting an existing treatment.

This collection of data i.e. cleaned up and verified data together with a new treatment plan form an up-to-date profile for the patient. At this point in time the healthcare provider and the patient know what has occurred in the past and what they set up to do for the future.

Taking new measures by the healthcare provider is generally regarded as an act of managing the treatment of the patient. This would add the word *management* to this process step.

A typical product that comes out of this step is a medication (management) profile.

For further elaboration see chapter 8.3.

### 7.5 The acts of carrying out the therapy and evaluating the outcome

Eventually the medication therapy is carried out and the outcome of the therapy is evaluated. In the ambulatory setting the outcome might be regarded successful unless the patient comes back.

In the institutional setting the outcome is monitored and reviewed by the healthcare providers. Evaluation might be added. This in itself generates new input and data or new data are generated by partners in the healthcare, such as the community pharmacy.

Other results such as lab results or observations that are relevant for the therapy have to be considered and are added to the collection. This is actually new raw data. The circle in the process has returned to its starting point and the process steps will repeat again.

## 8 Definitions of medication management

### 8.1 General

Reflecting on the process steps described in Clause 7, the various types of medication management lists are organized in the following subclauses according to their acts in an overall overview. This results in the diagram shown in Figure 2.



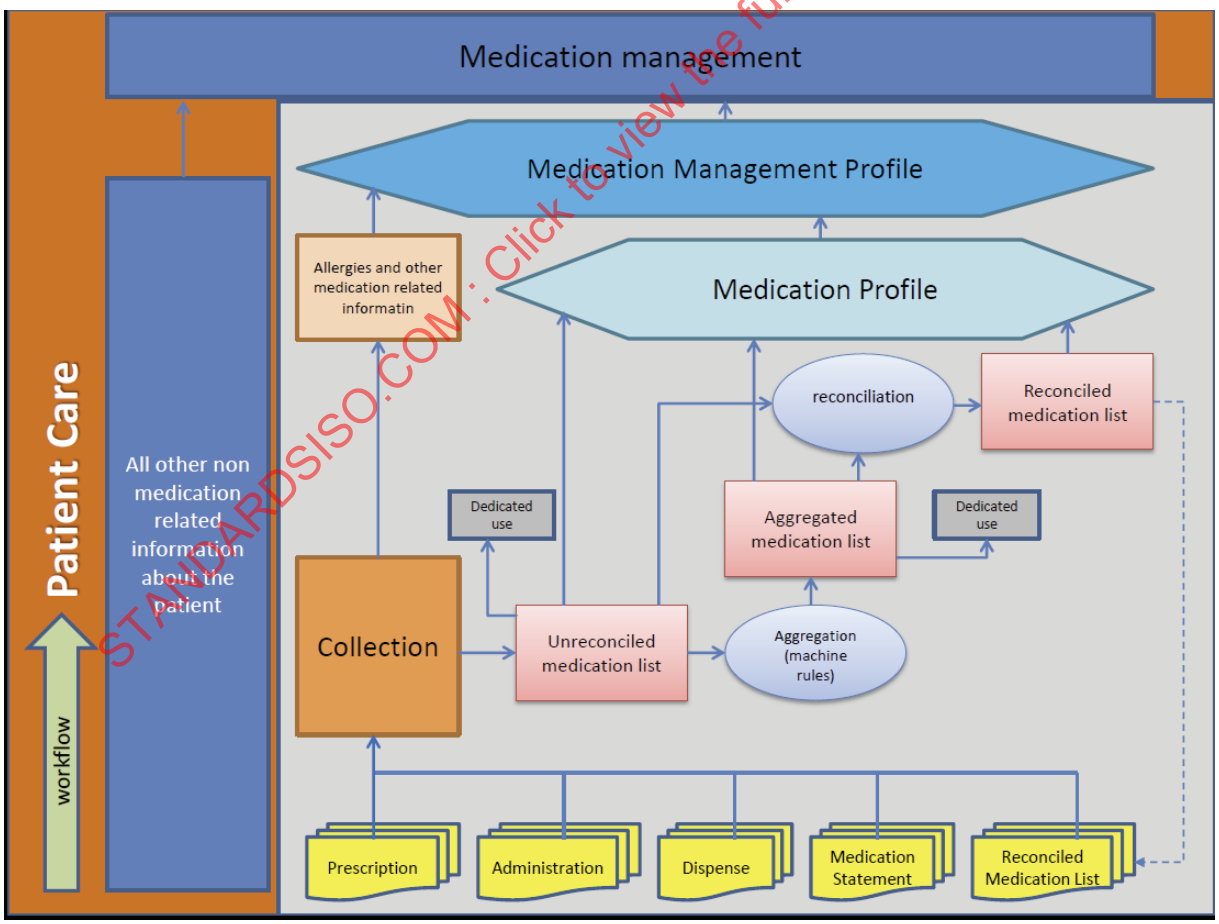


**Figure 2 — General diagram of medication management**

Figure 2 reflects the overall overview and the relationship between the various terms used in the medication management. In the following subclauses the various topics of this overall concept will be explained.

## 8.2 Medication lists

### 8.2.1 General

In practice the process steps do not run nicely in order and certain domains would have procedures that might differ from other healthcare guidelines. Therefore no exact definition can be made on the various types of medication lists and people use these names indifferently without any clue of what it should imply. The following paragraphs contain an enumeration of various medication lists with which most reports can be classified with.

In general a medication list is a collection of information, organized in the format of a list, describing the drug therapy/regime that the patient is or has been taking. It can be presented as an electronic view from query to the EHR repository; or as printout which the patient carries.

The medication list may contain:

— prescriptions;

— dispenses;

— medication administration;

— medication statements;

— input from existing (older) medication lists.

Some definitions also mention intolerances and allergies, but that is not a general rule. The medication list could be listed in various ways. Its entry point is usually the medicinal product over time.

Medication lists should not only contain the present medication. The past medication history could provide valuable hints for future medication management decisions, especially if there has been exceptional reasons for discontinuity of the past therapy, such as intolerance or ineffectiveness. For instance if an antihypertensive medicine had previously been taken but did not have the desired effect of lowering blood pressure, then the prescriber would need to know this so that he or she did not re-start a medicine that had previously been ineffective. A special section for exceptional terminated medication would provide added value to a medication list.

Going down the hierarchy the medication list can be divided into the various subtypes.

### 8.2.2 Unreconciled medication list

An unreconciled medication list is a list of medications of the raw data, usually ordered by date of occurrence. The list could consist of various elements (prescriptions, dispense, administrations) often depending on the accessibility of the systems and sources available. A standalone GP system would for example contain their prescriptions as the main ingredient of the unreconciled medication list.

The list is not processed or changed in terms of clearing, removing duplicates, grouping of medications, etc. The unreconciled medication list is usually the result of act 7.1, gathering data.

The unreconciled medication list is usually generated prior to consultation with the patient and is the result of querying one or multiple systems.

### 8.2.3 Reconciled medication list

A reconciled medication list is a collection/set of a patient's known medications at a point in time obtained from various sources, organized and presented in a list format. The contents of the procured

medication list have gone through the process of clinical verification. Any discrepancies identified by the reviewer are discussed with the prescriber and/or patient and reasons for changes to therapy then documented.

The reconciled medication list is in most cases the next step after gathering information in an unreconciled medication list. This is described as act 7.3, verification of data. Human interaction is involved in the act of reconciling the medication list.

### 8.2.4 Aggregated medication list

An aggregated medication list is a list of medications that is derived by the process of medication aggregation (with some kind of machine pre-processing of the data e.g. combining same medications, clearing duplicates).

The data structure differs from the original data structure of the data source elements. It contains additional information e.g. in the case of the combination of same medications the date-range a patient was on that medication.

No human interaction is required in the process of aggregating the medication list.

## 8.3 Medication profile

A medication profile is a general term for a collection of medication information. Raw data as well as all three types of medication lists (unreconciled, reconciled, and aggregated) may be part of that collection. A proper medication profile should be patient-centric and approaches the view from the health concerns of the patient rather than the medication. This means that if the patient over time has changed brands of medication for chronic hypertension, that these medication data would be grouped under one concern.

## 8.4 Medication management profile

The medication management profile should provide the healthcare provider with necessary information to be able to perform medication management.

A proper medication management profile should be patient-centric. This means that the patient characteristics would be the starting point of display of information. The health concerns or problem concerns of the patient would be the initial view and would state what (medication) therapies have been applied throughout the timeline, rather than that the rows of medication would state for which purpose they were prescribed.

The medication management profile is an extension of the medication profile and contains other relevant health concern data such as:

- general patient data
- sex, age, body weight
- contra-indications
- intolerances and allergies
- relevant lab results.

A medication management profile is the final basis for performing medication management. Figure 3 is an example of a medication profile screen. In this example the medications are grouped under the health concerns (diagnosis).

The medication management profile would, just like medication lists, also contain not only the actual medication profile but also past history and experiences of the patient with regards to medication therapies. For example variations in dosage, reasons for stopping, adverse drug events.



 

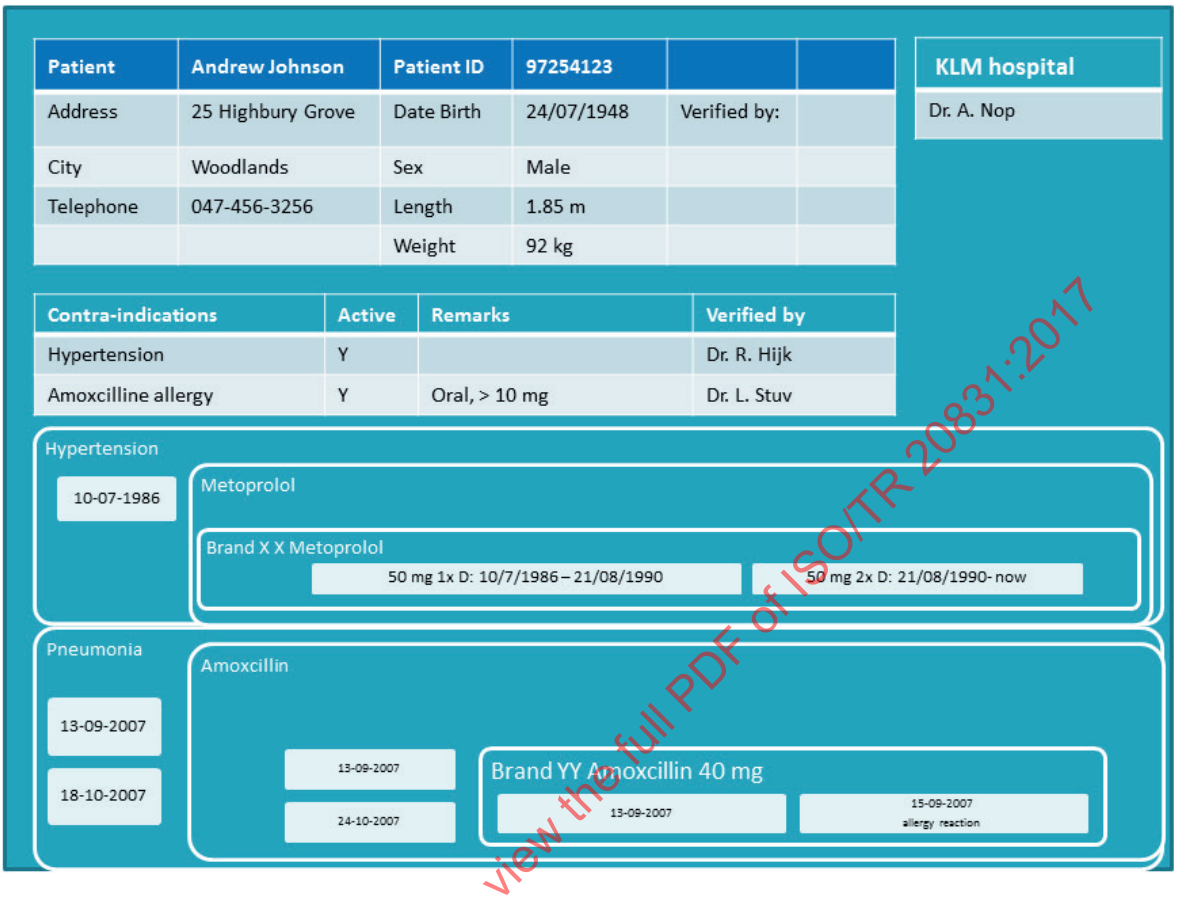


**Figure 3 — Example of medication management profile screen**



## 8.5 Medication management

Medication management is the act of managing the medication therapy of a patient. Medication management is usually performed by prescribers, but pharmacists also play an important role in medication management.

Medication management should identify interactions between multiple drugs with food and herbal medicine, report on possible effects on clinical analysis and ensure suitability in the prescription based on both pharmacological drug information, physiological information and such as medical history and conditions of each patient.

# 9 Example use case — Storyboard patient intake at hospital admission

Patient John Doe, 68 years old, is scheduled for a hospital surgery at the AAA Hospital for herniated intervertebral discs. John Doe not only suffers from his hernia but is also a patient with cardiovascular problems and hypertension. He occasionally suffers from a rash from eczema. John Doe has been requested to take his home medication along and report at the admission office for an intake interview.

John Doe has been treated at AAA Hospital two years ago for a knee operation and his old medical file is still in the EHR-system. It has not been updated since his discharge. Dr Anna Brown is the admission interviewer. She retrieves the old medical records from the hospital EHR-system. The rows of medication data show no end date and the lines of information appear in the present medication. She

also queries the hospital ambulatory pharmacy system, which is a separate IT system, where patients usually acquire their medication when they are treated for day care treatment (see 7.1).

John has taken a printed report of the medication list from his community pharmacy and a plastic bag with all the medication that he uses.

An import function is available from the ambulatory hospital pharmacy into the EHR, so as a first step Dr Brown merges the input file of the hospital ambulatory pharmacy into the EHR. Some of the dispensed medication of the EHR system have been replaced in the hospital ambulatory pharmacy system by newer cheaper brands and she therefore sets the old dispenses of the hospital EHR system to the status of completed. (In certain systems this is done by entering an end date in de medication data.) This will have the effect that this medication will not be visible in the section of active medication in the medication list. John Doe has only been treated for the knee and therefore they only know about the painkillers and the anti-inflammation medication (prednisone) he has used during the revalidation period. These medications are not considered relevant anymore and therefore Dr Brown sets a flag to hide this information (see 7.2).

The next step is to compare the hardcopy medication list from the community pharmacy with the medication records in the EHR. The treatment of the cardiovascular problems are under the supervision of the general practitioner and this medication is dispensed by the community pharmacy. John Doe uses carbasalate calcium as an anti-coagulant and metoprolol for his hypertension. Dr Brown therefore has to add these medications manually to the EHR. The EHR has no record of the cardiovascular and hypertension problems and therefore Dr Brown decides to add this information as contra-indications risks (see 7.3).

Finally she looks into the plastic bag and recognizes the previously mentioned medication in the bag. The ointment against the eczema rash however did not appear previously in the mentioned lists. John Doe explains that this tube has been prescribed two years ago and that even though the expiry date has elapsed, that he still uses this medication when the rash appears again. He also uses ibuprofen, which is freely available at the drugstore against the hernia pain he has had lately.

Dr Brown adds the fusidic acid and the ibuprofen to the medication list (see 7.3). The anti-coagulant is also added to the list, but she notes down that this is currently stopped because of the upcoming operation. It is to remind the care providers that this regimen has to be reinstated after discharge. She adds that note to the medication management system. Dr Brown prepares the medication orders for the medication regime during the institutional stay and sends the orders to the hospital pharmacy (see 7.4).

The hospital pharmacist Peter Piper sees the new orders, retrieves the medication profile of John Doe from the EHR-system of the hospital and checks the dosages of the orders. He confirms the medication orders from Dr Brown and schedules the medication treatment in the medication administration module (see 7.5).

A model of the use case is displayed in Figure 4.