International Medicinal Product Model

Medicinal Product Model

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1 Use cases for the SNOMED CT Medicinal Product hierarchy

The main use cases for the medicinal product hierarchy in the international edition of SNOMED CT are as follows:

1. To provide a consistent and usable set of international medications concepts for member nations to use as a foundation for national medicinal product terminology
    a. For those member nations with an existing terminology, the improved model underpinning the concepts will facilitate both direct use or mapping
    b. For those member nations without an existing terminology, the concepts provide a consistent starting set of concepts and a model to develop from, reducing resource (especially set up costs) and risk in development
2. To provide compatibility with the IDMP model, where possible, for identification of medicinal products. Having compatibility between the patterns used to describe medicinal products in the regulatory environment and those used in clinical care will facilitate the information flow between the two domains of use. For all licensed medicinal products, the prime source of information for their description is their regulatory data; compatibility therefore streamlines the flow of information for maintenance of the clinical terminology. Similarly, for example in pharmacovigilance, the flow of information from clinical records into regulatory reporting, both for suspect and concomitant medications involved in safety events is streamlined. Describing the relationship between the SNOMED CT medicinal product hierarchy and the IDMP model also shows how some SNOMED CT medicinal product concepts complement and add value to IDMP-based concepts, particularly for patient care
3. To facilitate international interoperability of medication concepts for (for example) patient summaries and cross-border care; this is supported most efficiently when the medication concepts themselves are from national extensions built upon or mapped to the international core
4. To facilitate development of international medication decision support, such as allergy checking and duplicate therapy checking, thereby reducing costs of maintenance and implementation
5. To support the use of a classifier on both international and national medicinal product concepts, to facilitate maintenance of the hierarchy
6. To support analysis of medication information in healthcare data for various research purposes
7. To provide medication concepts to support sufficiently defining concepts in other hierarchies within SNOMED CT

2 Model: General Comments

2.1 Open and closed world views: the existential and universal restrictions in the Medicinal Product model

SNOMED CT as an ontology is constructed on the principle of an open world view (the existential restriction) with each concept having a distinct fully specified name. The implication of the open world view for the medicinal product hierarchy is that a concept represents the set of (real world) medicinal products that contains "(at least) some substance X as an active ingredient", but may contain other unspecified active ingredient substances. This 'open world' view is useful for analysis and in some types of decision support. However, the regulation of medicinal products for sale/supply is based on the 'closed world' view (the universal restriction), where **all** active ingredient substances must be explicitly described. This is also the premise for description of medicinal products in the medication process (prescribing, dispensing and administration). Therefore the Medicinal Product hierarchy differs from other concept hierarchies within SNOMED CT in that some classes of concepts within it are modelled using this 'closed world' view which states that a concept represents a medicinal product that contains "only substance X" as an active ingredient"; no other active ingredient substances are present within it. To implement that "closed world view" with the existing tools and systems of SNOMED CT, the "ingredient count" proxy has been developed; some description of this is given below, with further detailed information being available in the machine-readable concept model. For further details on the open and closed world views, please refer to the relevant SNOMED documentation and training materials, e.g. Description Logic: Advanced Features[1].

2.1.1 IDMP Compatibility

IDMP, being a suite of standards developed in and for the regulatory domain, uses a "closed world" view. The active ingredient substance(s) present in a product **must** be listed in full, with no exceptions, so IDMP exists is the "closed world" view and therefore would be compatible with the "universal restriction" only; the existential restriction is not compatible with the concepts in the IDMP suite of standards, which is particularly important to note for the abstract concepts within IDMP in ISO 11616 (PhPIDs, especially L1, L3 and L4).

2.2 Stated and inferred views in the medicinal product model

For further details on the meaning of stated and inferred views, please refer to the relevant SNOMED documentation and training materials for example at 2.3.1 Stated and Inferred Concept Definitions[2] and Proximal Primitive Modeling[3].

1 https://elearning.ihtsdotools.org/mod/page/view.php?id=2208
2 https://confluence.ihtsdotools.org/display/DOCRELFMT/2.3.1+Stated+and+Inferred+Concept+Definitions
3 https://confluence.ihtsdotools.org/display/DOCEG/Proximal+Primitive+Modeling

3 Medicinal Product model diagrams

The diagrams below shows the overall basic medicinal product model. Note that in each diagram, no role or structure or disposition grouper concepts are shown. Definitions and detailed descriptions are given in the sections below this overall model introduction. This first diagram is a class model illustrating the five classes of concepts in the model and the relationships between them, in their three groups (MP, MPF and CD) plus an additional optional sixth sub-class to be populated in limited cases and likely in national extensions only (MP Precise Only). Two classes use the existential restriction (MP and MPF) and four use the (proxy for the) universal restriction (MP only, MPF only, CD and MP Precise Only); MP Precise Only is the optional sub-class that represents a product described explicitly and only by its *precise* active ingredient substances i.e. including clinically significant modification such as "dexamethasone *sodium phosphate*". MP classes are shown in shades of blue, MPF classes in shades of yellow and the CD class in green.

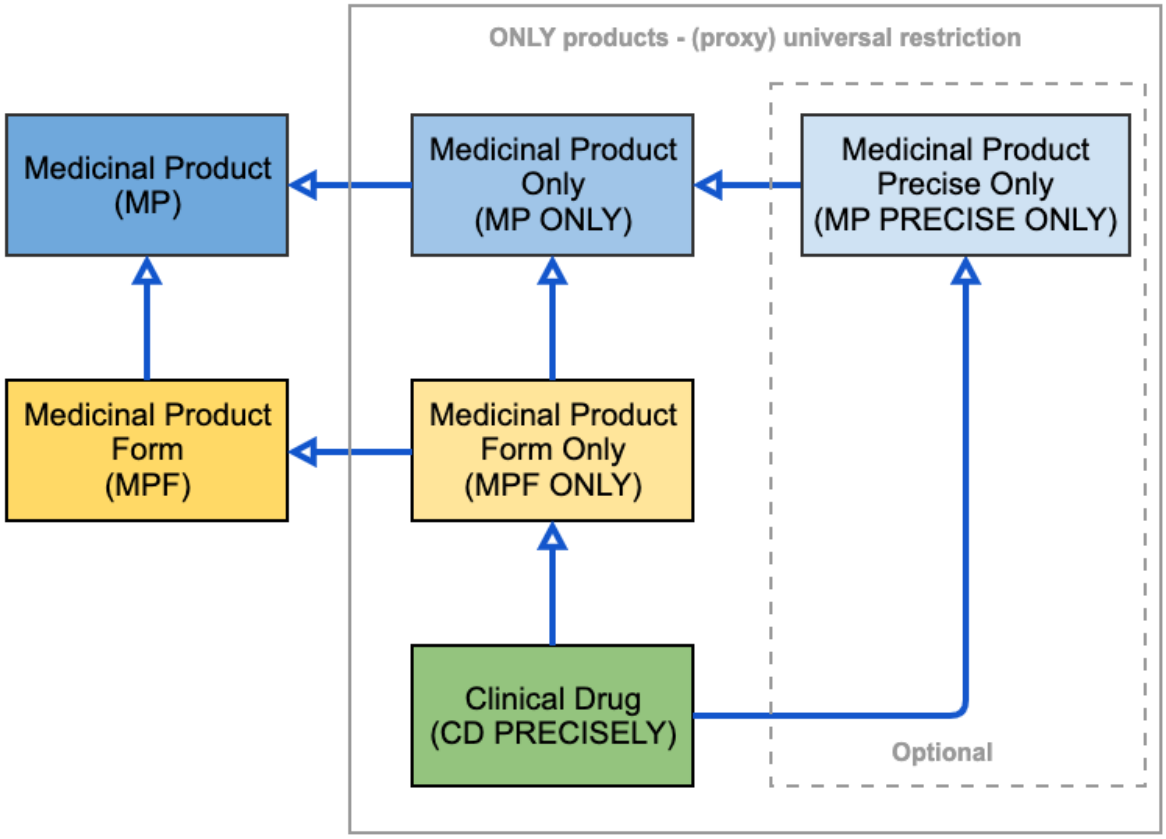

Figure 1: Medicinal Product concept model - International edition

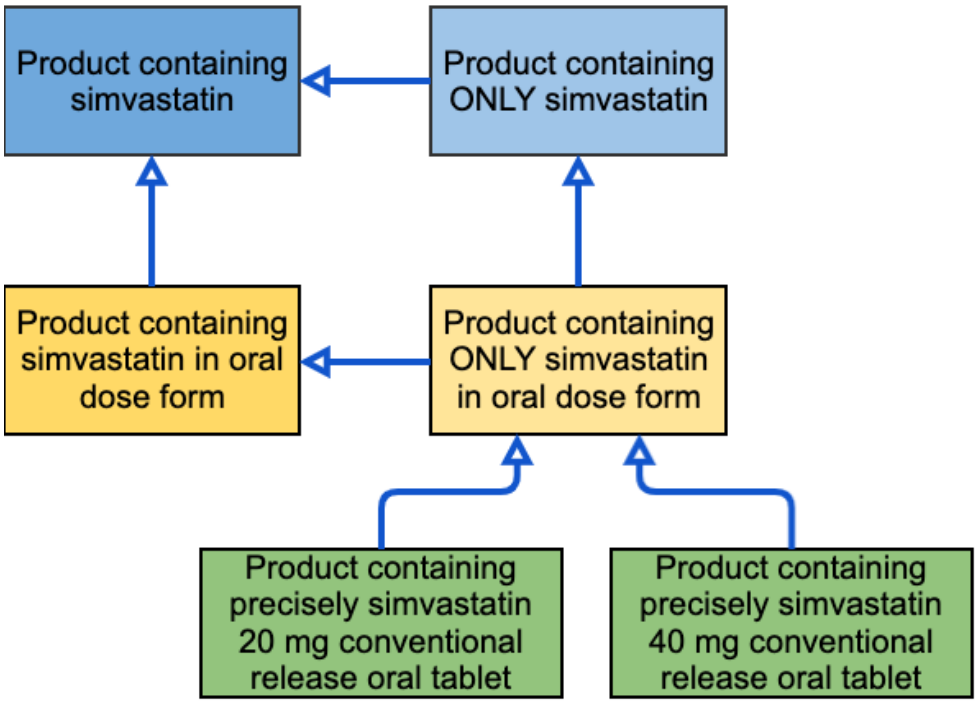

Figure 2: An example Medicinal Product - International edition

The second diagram, below, is in SNOMED notation (inferred view), and shows only the five classes that will be populated in the international release, at least for the foreseeable future.
The Medicinal Product model is parented by the proximal primitive 763158003 |Medicinal product (product)| concept, an abstract concept representing an item that "has been formulated and manufactured for administration to humans (or animals) for treatment or prevention of disease, for diagnosis of illness or to restore, correct or modify physiological function and which contains an active ingredient substance or combination of substances". This parent concept acts both to scope the domain and, in the future, will separate medicinal products from other products in a larger Products hierarchy, which may include medical devices and certain other products such as foods and cosmetics.

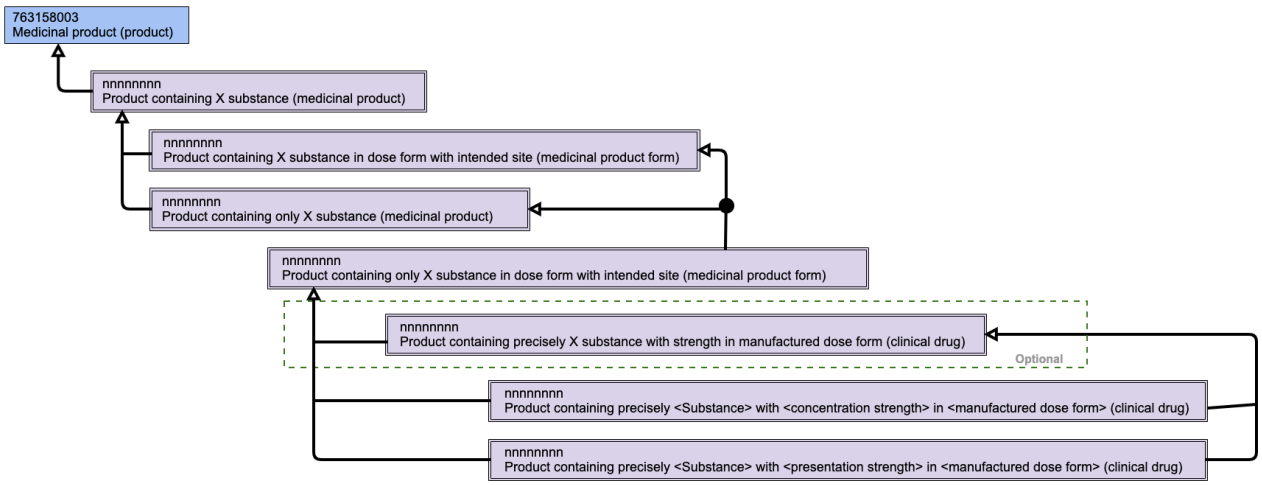

Figure 3: Medicinal Product concept model - International - SNOMED notation

The third model diagram below shows multi-ingredient medicinal products, and therefore has increased complexity. It again shows the three groups (MP, MPF and CD) with MP classes shown in shades of blue, MPF classes in shades of yellow and the CD class in green; each with two single active ingredient representations (X and Y) and one multi-ingredient representation (X + Y) and then the relationships between these. It shows how the single ingredient "containing" classes (the open world classes) subsume the appropriate multi-ingredient class, whereas the single ingredient "containing only" classes (the closed world classes) do not subsume the multi-ingredient class. The optional MP Precise Only class is present but is not shown with any multi-ingredient products, to limit complexity. MP Precise Only multi-ingredient products are discussed below in the Ingredient Count section.

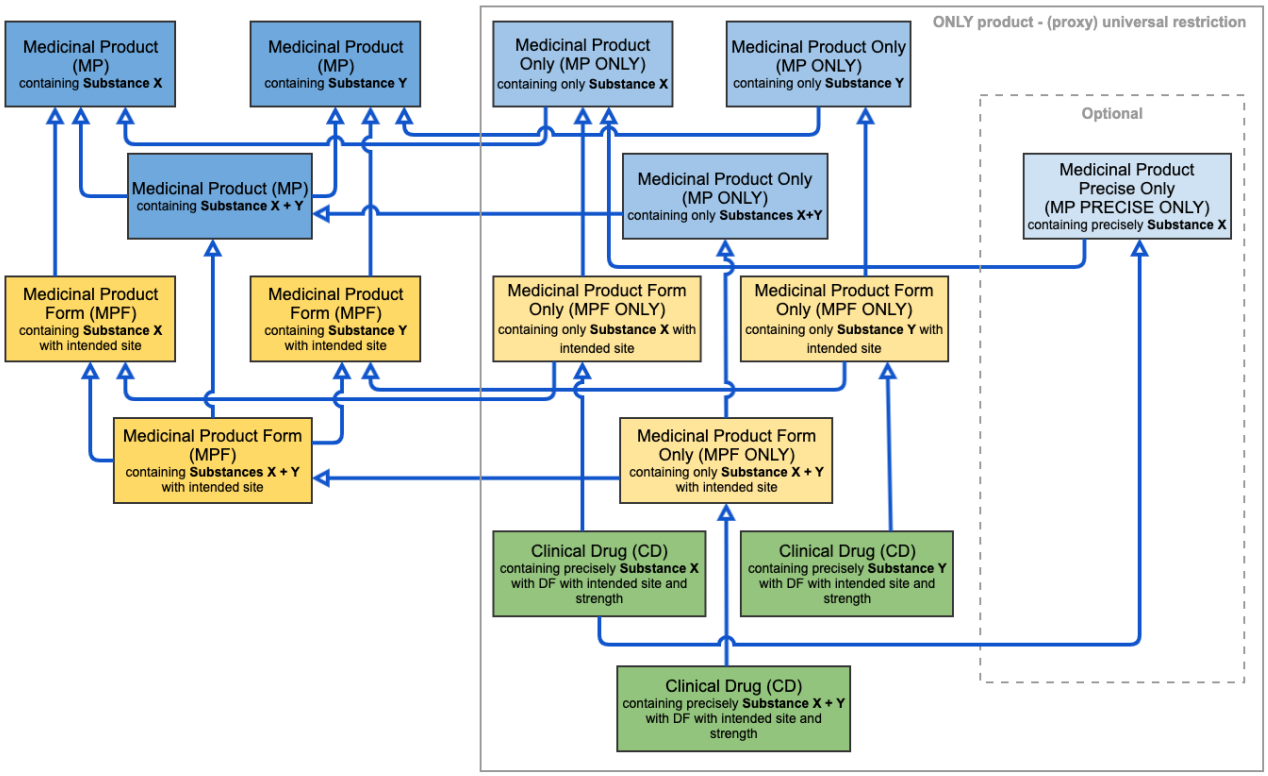

Figure 4: Medicinal Product concept model - International - showing multi-ingredient concepts

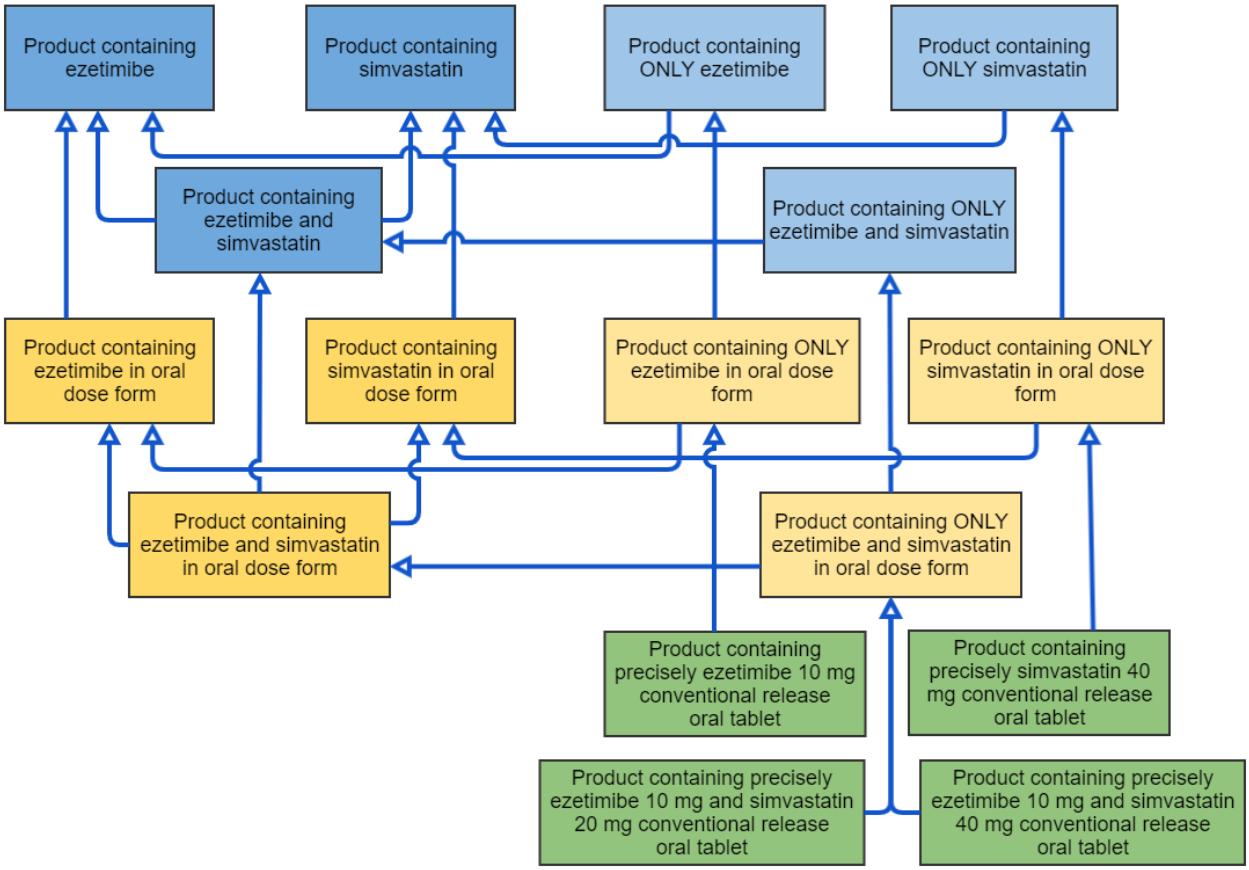

Figure 5: Example multi-ingredient concepts - ezetimibe and simvastatin

In the sections below, each group of classes and its members are defined and described in detail, with their attributes. Detailed definition and discussion of the attributes themselves follows on in a separate section.

3.1 Model population and maintenance

In maintaining a medicinal product terminology, concepts are authored to describe those things that exist and can be used in clinical care and/or clinical research. This means that it is the more granular concepts that are usually recognised first, then the less concrete concepts are abstracted from these. In many medicinal product terminologies, this results in there being lowest level child concepts for every parent concept within the model classes. Due to the historic nature of some of the content in the SNOMED CT international edition medicinal product hierarchy, there will be higher level parent concepts (i.e. MP and MPF concepts) that do not have clinical drug concepts associated with them. These MP and MPF concepts may have had clinical drug type concepts associated with them in the past, but the veracity and provenance of the detailed information to support these CD concepts could not be confirmed, so they have been inactivated, whereas the more abstract MP and MPF concepts remain in the international release to support historic data use cases such as analysis and medication profiles.

There is nothing in the specification that deals with availability of medicinal products for use; neither the presence of a concept nor an absence of a concept gives any sense of its availability in the supply chain globally. Indeed, even when a medicinal product ceases to be available anywhere in the global supply chain, its representation will remain as a valid concept in SNOMED CT for use in patient medication history and patient medication profiles. New medicinal products, both from newly authorised therapeutic substances and in new formulations of existing therapeutic substances, are constantly appearing globally. The principles and process for the ongoing

maintenance of and addition of new content to the medicinal product hierarchy are being developed as part of the Editorial Guidelines for Modeling and Terming (see above).

3.1.1 IDMP Compatibility

The definition of the 763158003 |Medicinal product (product)| concept as providing the scope of the hierarchy is in agreement with the *scope* of the concept of a medicinal product in IDMP. This is a positive position generally and particularly for any future mapping exercise that might be undertaken, since there should be few concepts that cannot be mapped at some level of granularity. However, in IDMP, and specifically in ISO 11615, the Medicinal Product class represents an authorised medicinal product that consists of one or more Manufactured Items as authorised and available; in this sense it is much more concrete concept than the SNOMED parent concept. This difference is not of great significance other than to understand that the same term ("medicinal product") has a different and more specific meaning in IDMP than in the SNOMED CT medicinal mroduct model. Also, the IDMP ISO 11615 model explicitly describes and includes "combination medicinal products" (also known as 'kit' products, 'component' products, 'multi-component packaged products' etc.) where the package placed into the supply chain contains more than one type of component element (clinical drug) within it; since these are correctly packaged products, and packaged products are out of scope of the medicinal product hierarchy for the international edition of SNOMED CT, these combination products are not represented in this SNOMED CT model.

4 Grouper concepts

Medicinal products and their representations in a terminology can be put into groups in many ways, both in terms of abstraction and aggregation of product descriptions. In the SNOMED CT medicinal product model, the following grouping concepts will be used:

- Groupings based on the pharmaceutical characteristics of manufactured medicinal products, and the primary subject of this model and documentation: in each of the sections below, these various model classes and their attributes are defined, described in detail and diagrams provided. In addition, their relationship to IDMP is described and a note as to their population status within the upcoming releases of SNOMED CT is provided.
    - Medicinal product - grouping based on active ingredient substance(s)
    - Medicinal product form - grouping based on active ingredient substance(s) combined with a grouping of the site of administration of manufactured dose form (parenteral dose forms, oral dose forms etc.)
        - These concepts are also grouped using the site of administration of manufactured dose form as a grouping concept
    - Clinical drug - a grouping based on active ingredient substance(s), with their strength, combined with manufactured dose form
- Groupings based on the structural or behavioural characteristics exhibited by the active substance(s) that the products contain:
    - Disposition - grouping based on mechanism of action of the active ingredient substance(s) in the product
    - Structure - grouping based on structural patterns of the active ingredient substance(s) in the product
    - Structure and Disposition - combination of the above
    - Therapeutic role - grouping based on the therapeutic role that a product is designed to fulfil

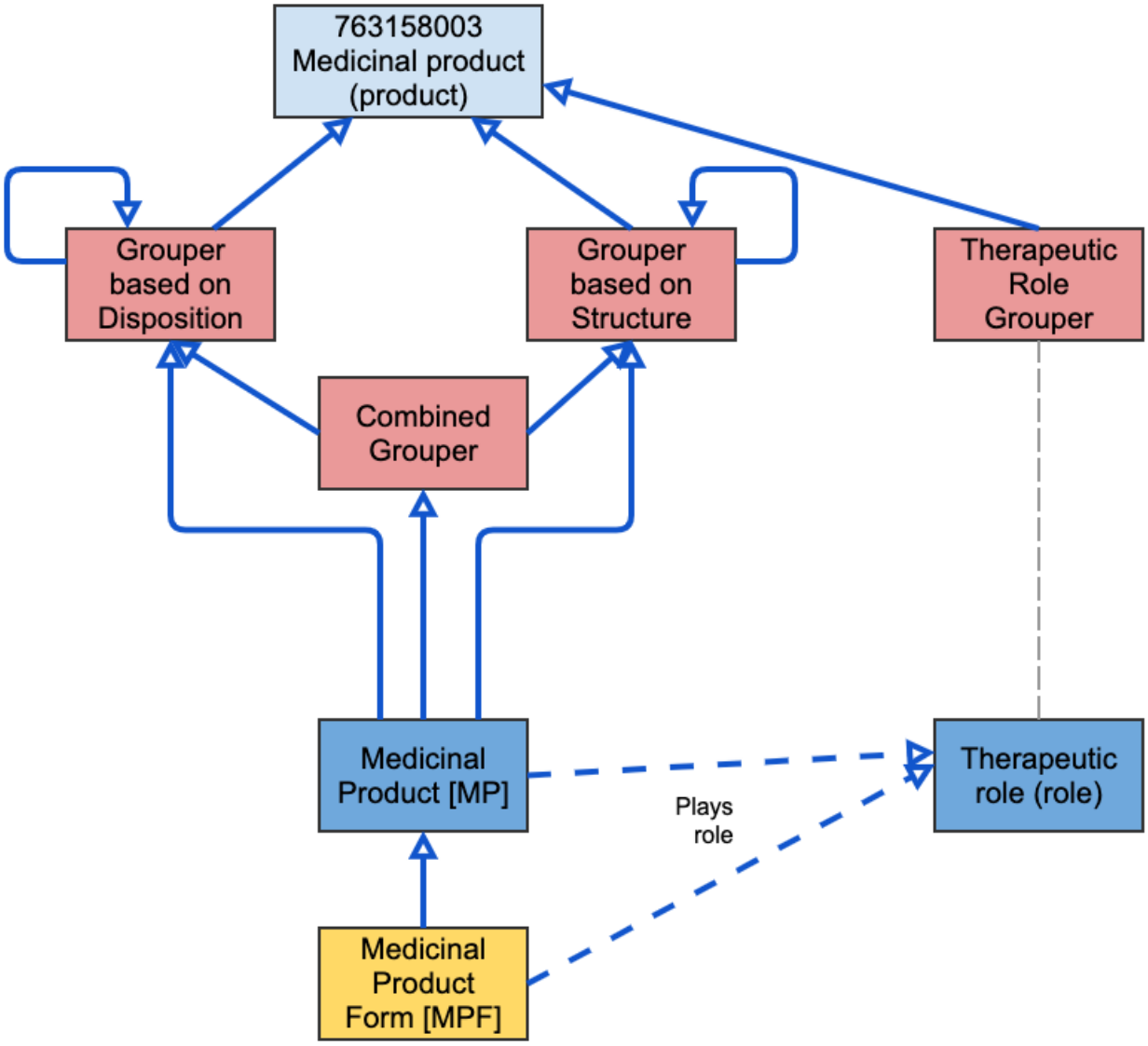

Figure 6: Medicinal Product grouping concepts

4.1 Groups of products based on Disposition

Disposition is a behaviour that something can exhibit (or participate in) given the appropriate context in which to do this. For example, a person may be "disposed" (or pre-disposed) to fidget in their seat when in a stressful situation such as an interview. For medicinal products, disposition behaviour can be thought of as "mechanism of action" of its active ingredient substance(s): the behaviour that the active ingredient substance(s) in the product exhibit when used clinically. Disposition (mechanism of action) is distinguishable from therapeutic role, which is context dependent: for example the mechanism of action of timolol is as a beta-adrenoceptor antagonist; this action can be used therapeutically to reduce hypertension when administered in a product given orally or to treat glaucoma when administered in a product intended to be given ophthalmically. Medicinal products can be collected together into groups based on the disposition of their active ingredient substance(s).

Disposition is a characteristic of the active ingredient substance(s) present in the Medicinal Product, therefore disposition grouping concepts are assigned (inferred) by the classifier to medicinal products and to all their child

concepts (medicinal product form and clinical drug concepts) although in a browser such as DailyBuild the inferred grouping concepts will be shown on the proximal concept only (the "medicinal product containing" concept).

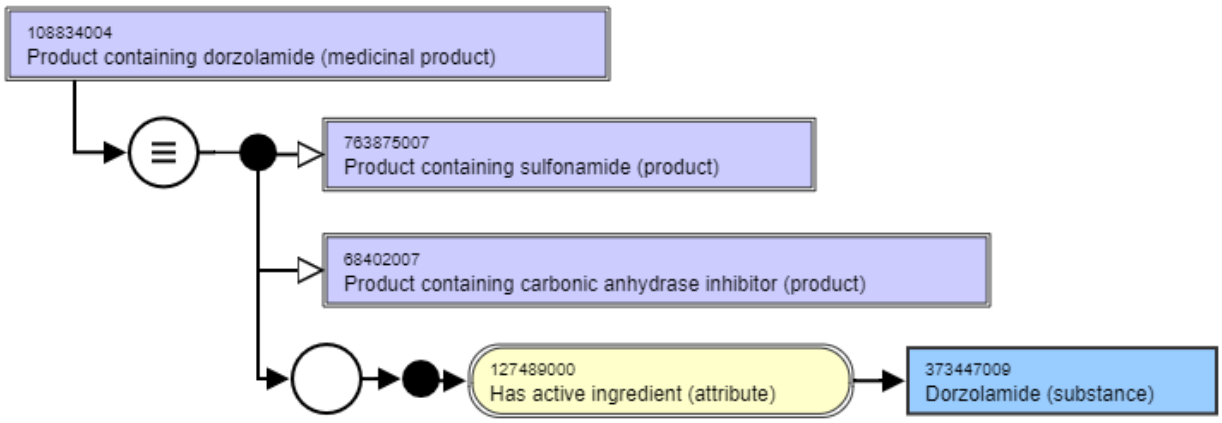

Figure 7: Medicinal product (inferred view) showing membership of a disposition grouping (carbonic anydrase inhibitor)

4.2 Groups of products based on (Chemical) Structure

All substances have spatial arrangement of the atoms and molecules and bonds that they are constituted from and which therefore govern the final shape that the substance takes; this arrangement is their "structure". Substance structures often follow patterns so that similar structures are grouped together and often share particular name patterns. Medicinal products can be collected together into groups based on the structural pattern(s) of their active ingredient substance(s).

Structure-based grouping is a characteristic of the active ingredient substance(s) present in the medicinal product, therefore structure-based grouping concepts are assigned (inferred) by the classifier to medicinal products and include all their child concepts (medicinal product form and clinical drug concepts) although in a browser such as DailyBuild the inferred grouping concepts will be shown on the proximal concept only (the "medicinal product containing" concept).

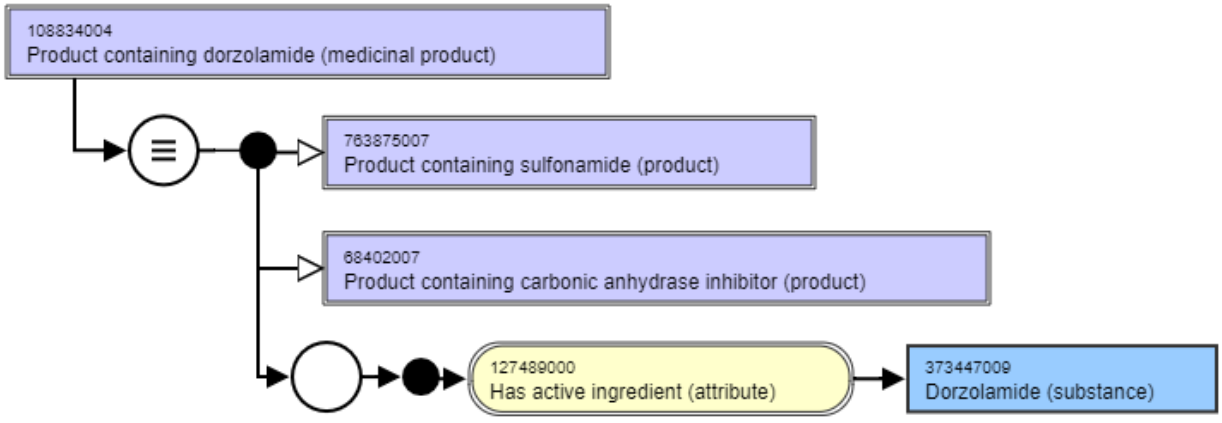

Figure 8: Medicinal product (inferred view) showing membership of a structural grouping (sulfonamide)

4.3 Groups of products based on Structure and Disposition

For some medicinal products, their clinical usefulness is related to the combination of both their structure and their disposition; it is the structure that produces the disposition; for example clemastine, a substance whose anti-histamine behaviour is based upon its structure being ethanolamine derived.

Since structure-based grouping and disposition are characteristics of the active ingredient substance(s) present in the medicinal product, combined 'structure and disposition grouping' concepts are assigned (inferred) by the classifier to medicinal products and include all their child concepts (medicinal product form and clinical drug concepts) although in a browser such as DailyBuild the inferred grouping concepts will be shown on the proximal concept only (the "medicinal product containing" concept).

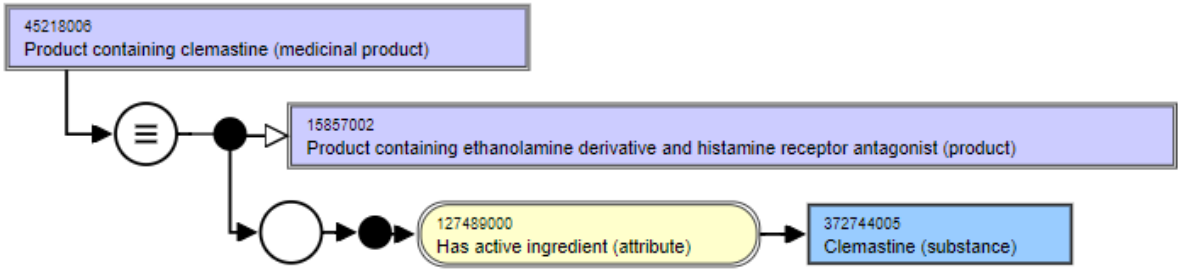

Figure 9: Medicinal Product showing membership of a structure-and-disposition grouping (ethanolamine derivative and histamine receptor antagonist)

4.4 Groups of products based on Therapeutic Role

Medicinal products can be collected together into groups based on the therapeutic role that they are designed to fulfil. Roles are very context dependent and may change over time and with changing circumstances (including the culture and practice of healthcare). Roles are therefore not definitional for medicinal products. Therapeutic role is a broader concept than 'indication for use' of a medicine. Indication may describe information such as the disease(s) that the product may be used in, the intended effect (prophylaxis, cure, symptom relief etc.), the role within an overall treatment regimen (first line, adjunctive etc.) and specific populations for use (e.g. in adults, in children) whereas therapeutic role describes the general condition that the product may be used to treat (e.g. Product acting as antidementia agent) or describes the general treatment effect of the product (e.g. Product acting as haemostatic). Since therapeutic role is often closely associated with product formulation (targeting the therapeutic substance to the correct site of action), therapeutic roles are often assigned to medicinal product form concepts and occasionally to clinical drug concepts; however if all the products share a therapeutic role, it can be assigned at the higher MP level.

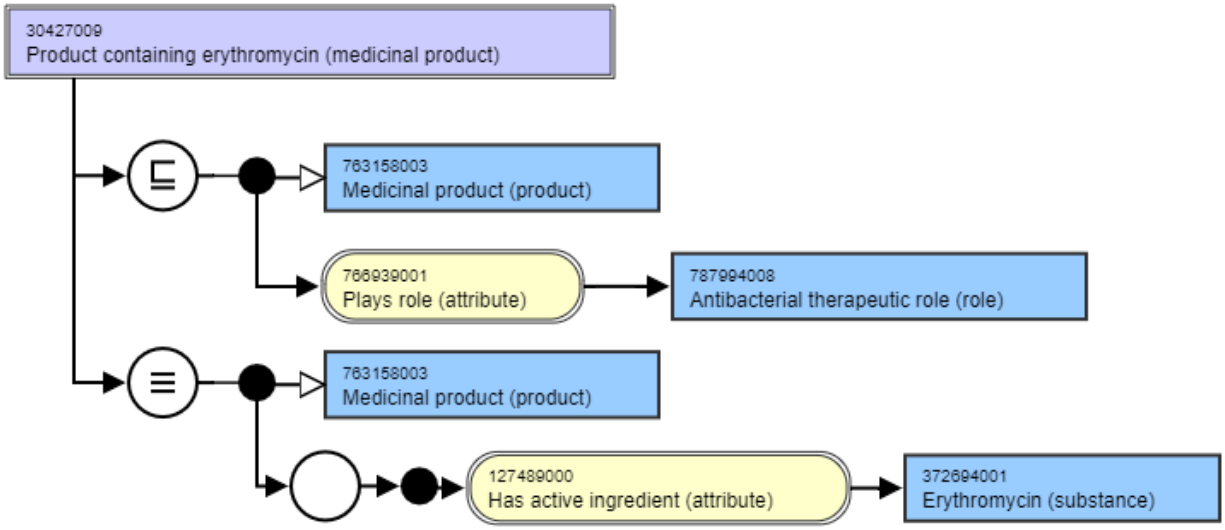

Figure 10: Antibacterial therapeutic role, assigned at medicinal product (stated view)

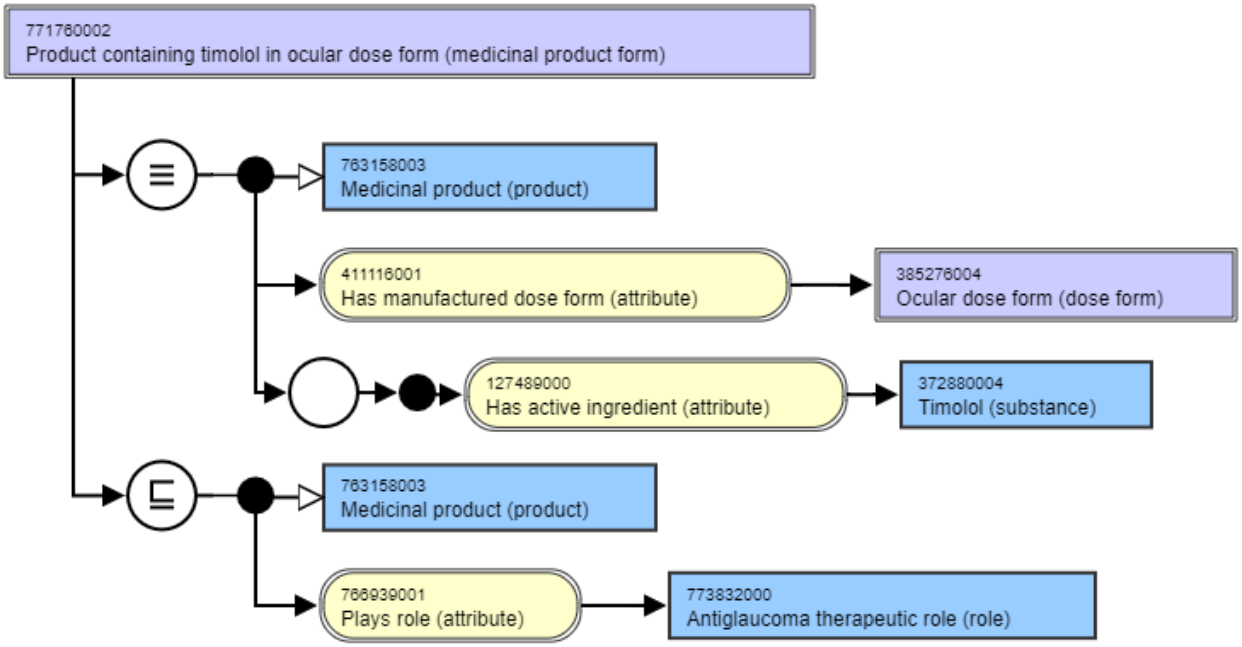

Figure 11: Antiglaucoma therapeutic role, assigned at medicinal product form (stated view)

5 Medicinal Product (MP)

An abstract representation of a medicinal product without reference to its dose form or its strength. This group of concepts has three types, of which is the parent is the "MP containing", with the "MP only" and the optional "MP precisely" being child concepts of that parent.

5.1 Medicinal Product (MP containing) (open world view)

5.1.1 Definition of MP (containing)

An abstract representation of a medicinal product based on description of active ingredient substance(s) that it contains (regardless of any modification of those active ingredient substance(s)), but not exclusively limited by those substances, in that other substances may be present.

For example, "Product containing amoxicillin" represents products that **must contain some amoxicillin** (with any type of modification, be it amoxicillin sodium or amoxicillin trihydrate, or no modification, as in amoxicillin (base)), but *may also* contain other active ingredients, such as clavulanic acid.

In stating “an abstract representation of a medicinal product” the concept definition implies that at least one medicinal product exists or has existed globally that has that set of active ingredient substance(s); this precludes the possibility of generating MPs representing theoretical, or indeed all possible, combinations of sets of active ingredient substances.

5.1.2 Example diagrams for MP (containing)

Stated template view:

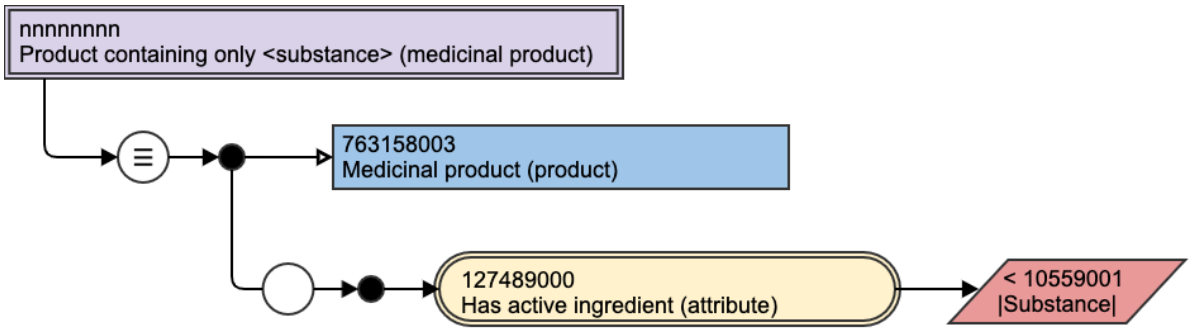

Figure 12: Medicinal Product (containing) stated template view

Example: single active ingredient product: stated view (including therapeutic role) followed by the inferred view that shows the grouper concept associated with the product:

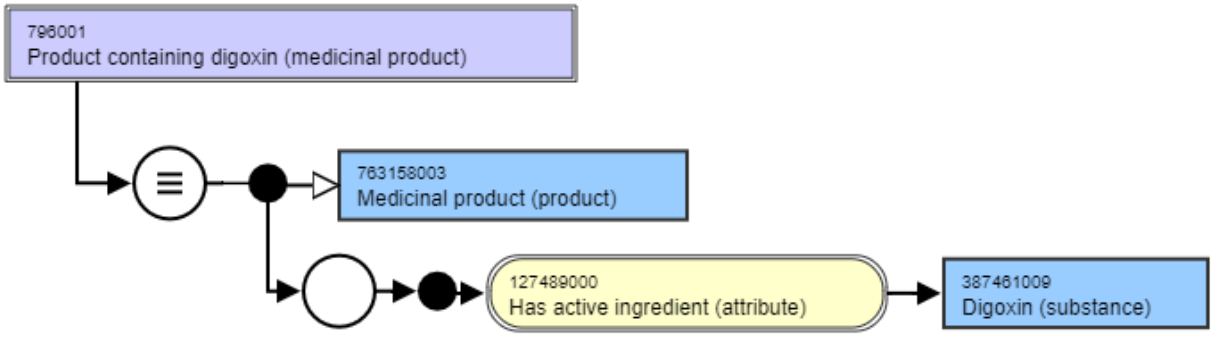

Figure 13: Medicinal Product (containing) example stated view

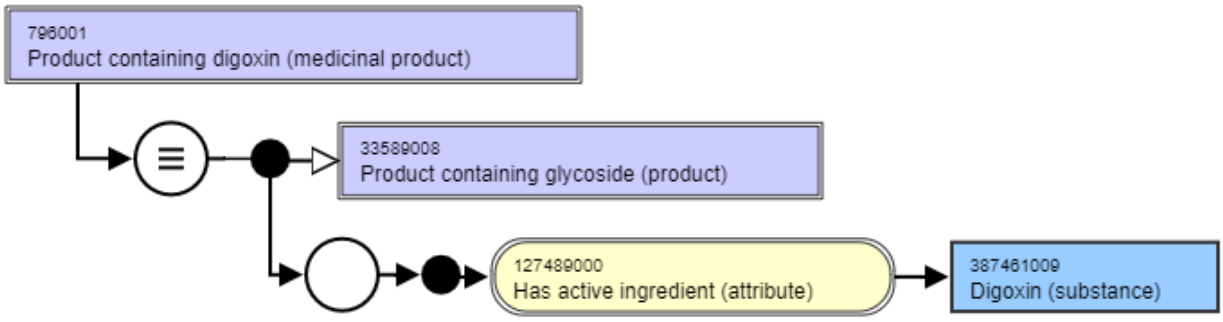

Figure 14: Medicinal Product (containing) example inferred view

Example: multiple active ingredient product: stated view followed by the inferred view that shows the single active ingredient MP concepts that are the proximal parent concepts for the multiple active ingredient product:

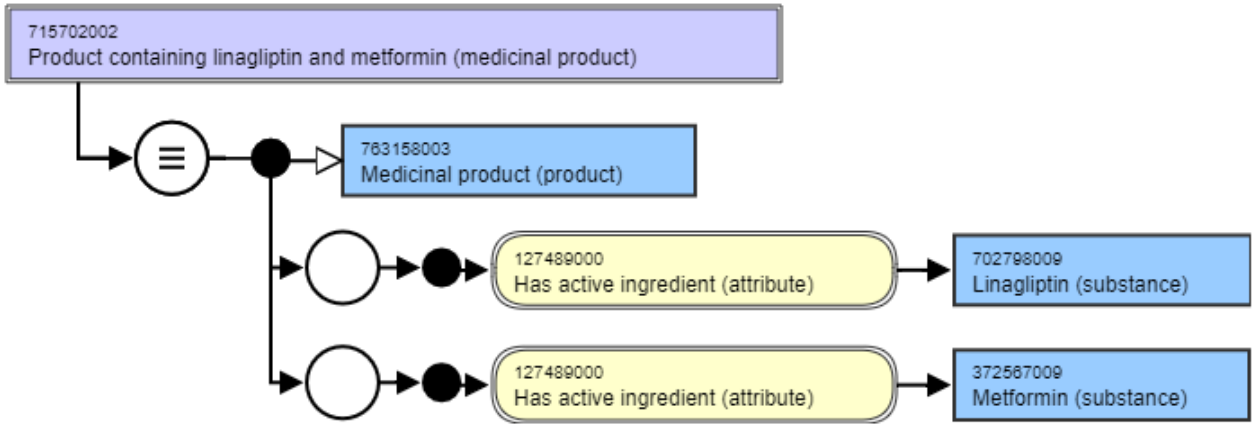

Figure 15: Medicinal Product (containing) example stated view - multi-ingredient concept

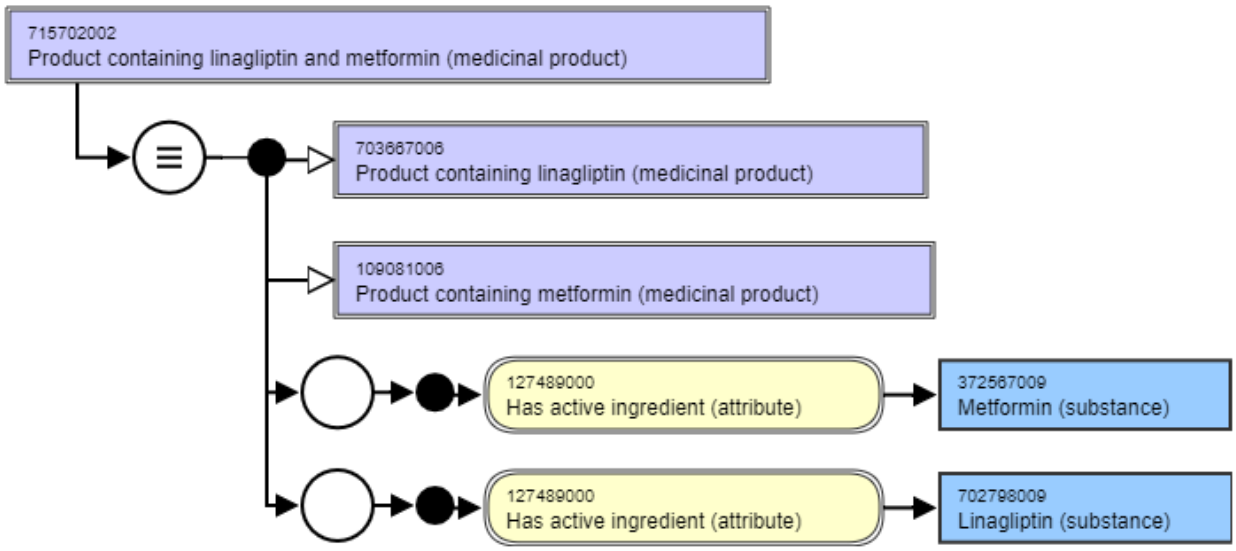

Figure 16: Medicinal Product (containing) example inferred view - multi-ingredient concept

5.1.3 Attributes of MP (containing)

The "containing Medicinal Product" (MP containing) concept is defined by a single attribute:

Semantic tag		(medicinal product)
Definition status		• 900000000000073002 | Sufficiently defined concept definition status|[4] **Exceptions** • None identified
Role Group	**Attribute** 127489000 |Has active ingredient|[5]	**Range** • < 105590001 |Substance|[6] • Excluding concepts representing structural groupers, dispositions, or combined substances **Cardinality** • 1..* **Notes** • There is no technical limit on the number of | Has active ingredient|[7] attributes that may be added

4 http://snomed.info/id/900000000000073002
5 http://snomed.info/id/127489000
6 http://snomed.info/id/105590001
7 http://snomed.info/id/127489000

		to a concept; a practical limit may be imposed at a later date • For content in the international edition, this attribute value should represent the base ingredient, not a modification, unless explicitly identified as an exception. This attribute describes the set of active ingredient substances that the concept minimally contains. A set set of active ingredient substances may well have only one member.

5.1.4 **Use case(s) supported by MP (containing)**

The main use case for describing products containing some active ingredient substance(s), is for analysis; as an aggregation concept for use in research. Details of further use cases will be added as they become available.

5.1.5 **Availability of MP (containing) concepts in the international edition**

This class forms part of the medicinal product content provided in the international edition.

5.1.6 **IDMP Compatibility for MP (containing)**

A concept at this level with the open world view does not correspond to any concept currently in the IDMP suite of standards, although it could act as a parent (higher level grouper) concept for PhP1 concepts, if use case(s) were identified to require this.

5.2 **Medicinal Product (MP only) (closed world view)**

5.2.1 **Definition** of MP (only)

An abstract representation of a medicinal product based on description of only and exclusively the active ingredient substance(s) that it contains but regardless of any modification of those active ingredient substance(s). This is effectively the "set of active moiety(ies)" of the medicinal product.

For example, "Product containing amoxicillin only" represents products that **must contain only amoxicillin** ((with any type of modification, be it amoxicillin sodium or amoxicillin trihydrate, or no modification, as in amoxicillin (base)); they **must not** contain *any* other active ingredients, such as clavulanic acid.

5.2.2 **Example diagrams for MP (only)**

Stated template view:

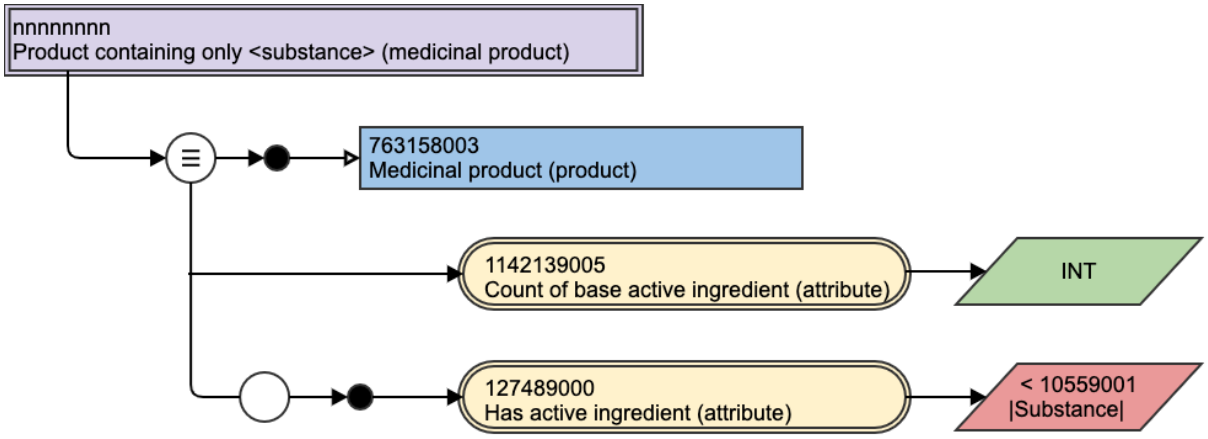

Figure 17: Medicinal Product (only) stated template view

Example: single active ingredient product: stated view followed by the inferred view that shows the proximal parent MP concept associated with the product:

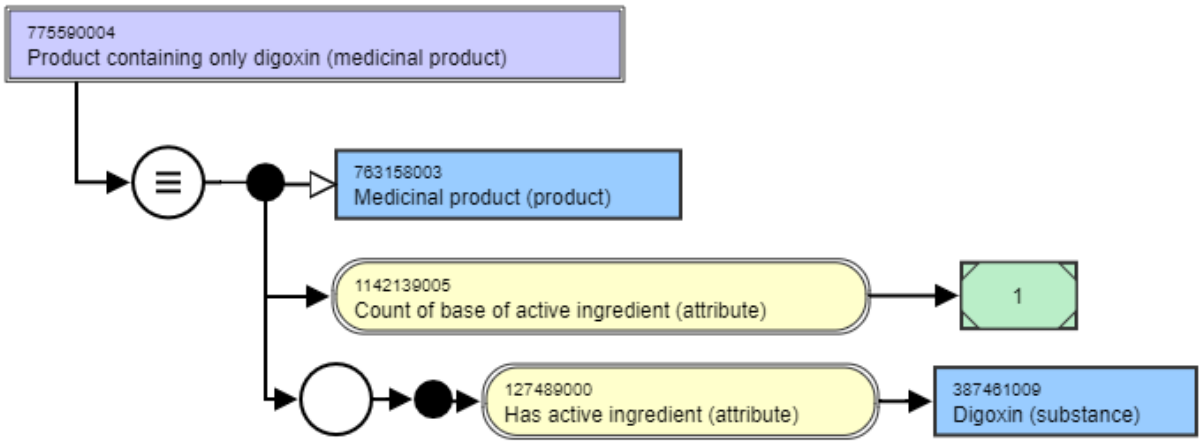

Figure 18: Medicinal Product (only) example stated view

Example inferred view:

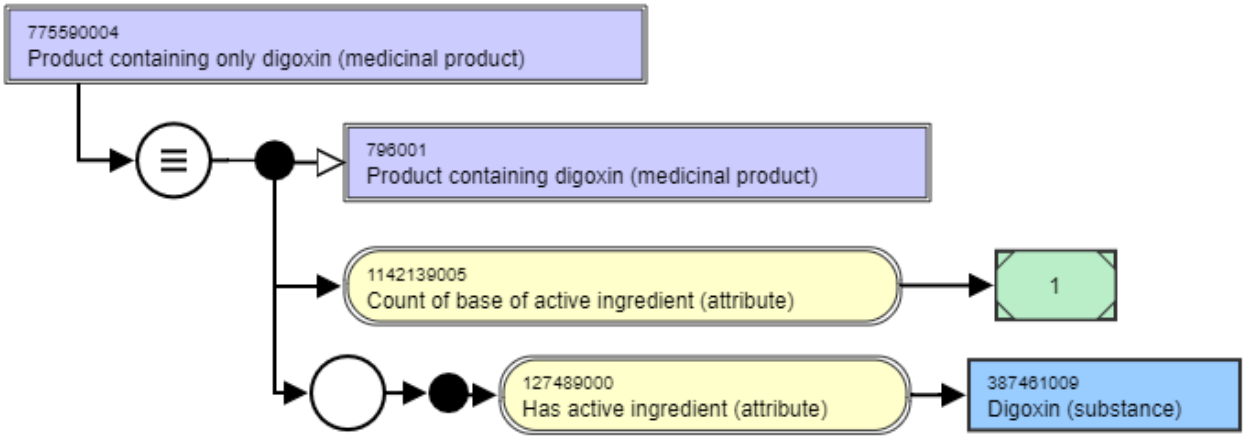

Figure 19: Medicinal Product (only) example inferred view

Example: multiple active ingredient product: stated view followed by the inferred view that shows the proximal parent MP containing concept associated with the product:

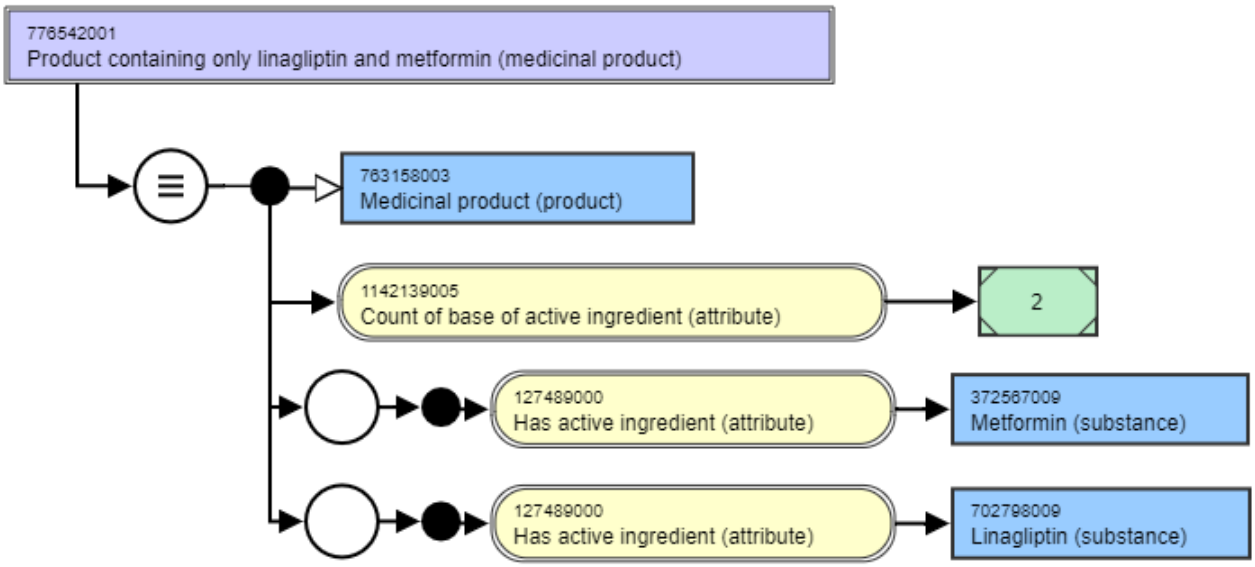

Figure 20: Medicinal Product (only) example stated view - multi-ingredient concept

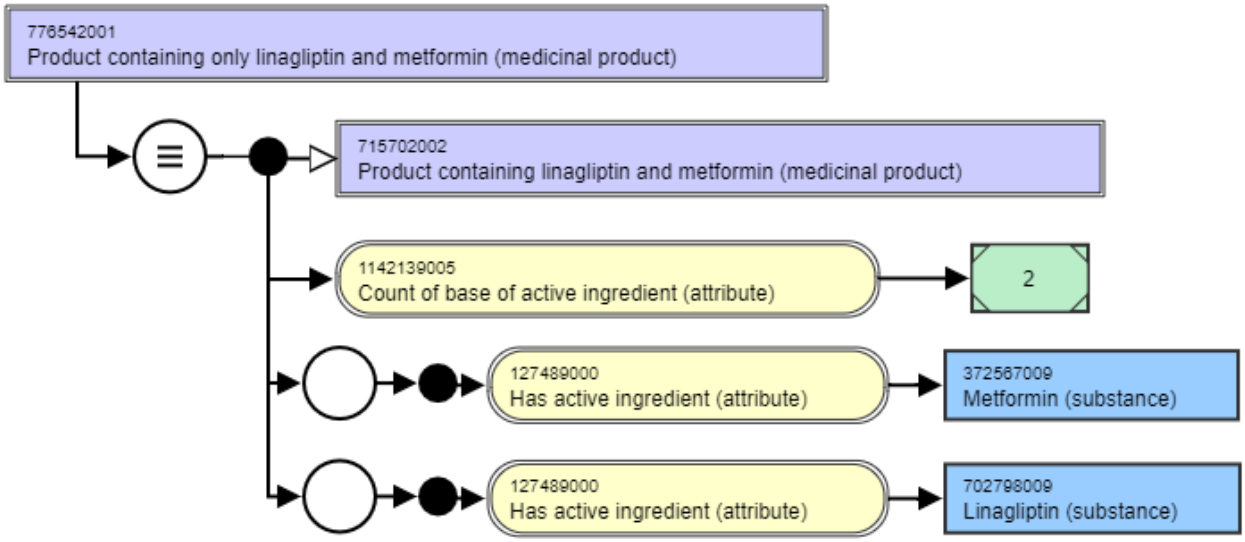

Figure 21: Medicinal Product (only) example inferred view - multi-ingredient concept

5.2.3 Attributes of MP (only)

The " Medicinal Product containing only" (MP only) concept is defined by two attributes describing the active ingredient(s) and the ingredient count:

Semantic tag	(medicinal product)
Definition status	• 900000000000073002 | Sufficiently defined concept definition status[8] **Exceptions** • None identified
Attribute 1142139005 | Count of base of active ingredient[9]	**Range** • Range: Integer **Cardinality** • 1..1 **Notes** • This attribute provides the number of base active ingredient substances present in the medicinal product

8 http://snomed.info/id/900000000000073002
9 http://snomed.info/id/1142139005

Role Group	Attribute	
	127489000 |Has active ingredient|[10]	**Range** • Range: < 105590001 |Substance|[11] - descendants only, excluding concepts representing structural groupers, dispositions, or combined substances • Excluding concepts representing structural groupers, dispositions, or combined substances **Cardinality** • 1..* **Notes** • There is no technical limit on the number of | Has active ingredient|[12] attributes that may be added to a concept; a practical limit may be imposed at a later date • This attribute describes the set of active ingredient substances that the concept minimally contains. A set set of active ingredient substances may well have only one member

5.2.4 Use case(s) supported by MP (only)

There are several use cases that the MP (only) concept can support:

- In national extensions; where it is useful for various clinical purposes, such as prescribing scenarios (so called "abstract" or "non-product-based" prescribing) and in medication history and in medication profiles
- Internationally and nationally in decision support and in protocols and treatment guidelines
- Internationally and nationally for interoperability of patient medication information such as in patient summaries
- Internationally and nationally for recording adverse events and/or sensitivities to medication, particularly for multi-ingredient preparations where there will be no appropriate single substance concept and it is not possible to say which particular active ingredient is responsible for the issue
- In pharmacovigilance, especially for description of concomitant medications where less information may be available (see also below in IDMP Compatibility)
- In analysis and research
- As a supporting attribute for other concepts elsewhere in SNOMED CT

5.2.5 Availability of MP (only) concepts in the international edition

This class forms part of the medicinal product content provided in the international edition.

5.2.6 MP Precisely

Description of the MP Precisely, which is not populated in the International Edition, has moved to the National Extension[13] model.

10 http://snomed.info/id/127489000
11 http://snomed.info/id/105590001
12 http://snomed.info/id/127489000
13 https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=137239135

5.2.7 IDMP Compatibility

The MP (only) concept might be directly compatible with the ISO 11616 concept of a level 1 Pharmaceutical Product (PhPID_SUB_L1), where the "active substance set" comprises the definition of this concept. However, the granularity of description of substance for the PhP1 is not completely clear, but may be more granular than that used for the MP (only) concept. The MP (only) concept is defined by "only and exclusively the active ingredient substance(s) that it contains but **regardless of any modification of those active ingredient substance(s)**" whereas the PhP1 will likely use a substance description that includes any modification, including when there are multiple modifications (e.g. a solvated salt modification). See also the MP (precisely) concept below.

Note that, in IDMP, for products using adjuvants it is probable that the adjuvant would be included as part of the "active substance set" and its role explicitly identified. For example aluminium hydroxide is used as an adjuvant in several vaccine products (e.g. hepatitis A, hepatitis B) in addition to the antigen itself to enhance the immune response; it is not an active ingredient per se and it is not an inactive ingredient, it is explicitly an "adjuvant". However, this type of detail of the implementation of the abstract model of ISO 11616 remains unclear, and in its first implementation, the modelling of adjuvants in the vaccine content in the SNOMED CT international edition has not been finalised.

6 Medicinal Product Form (MPF)

An abstract representation of a medicinal product described by its active ingredient substances and a grouping dose form concept (based on the intended site of administration for the dose form group) but without reference to any product strength.

The grouping dose form concepts are the immediate children of 736542009 |Pharmaceutical dose form (dose form)| [14] and are described in detail in the Editorial Guidance section Grouper Based on Intended Site[15]. These grouper concepts gather together all the formulations (solid, semi-solid, liquid or gaseous manufactured dose forms) that have the same intended site of administration. The intended site of administration of a dose form concept is a description of the general body site (i.e. not exactly anatomically explicit - no laterality etc.) where the dose form will be administered, For example, products formulated with a dose form of eye drops are required to meet various pharmacopoeial standards of sterility, particulate contamination and pH as they are intended to be administered to an "ocular" site. For further information see section 5.3.2.7 of ISO 11239:2012 *Health informatics - Identification of medicinal products — Data elements and structures for the unique identification and exchange of regulated information on pharmaceutical dose forms, units of presentation, routes of administration and packaging*.

6.1 Medicinal Product Form (MPF containing) (open world view)

6.1.1 Definition of MPF (containing)

An abstract representation of a medicinal product based on description of active ingredient substances it contains and on the (generalised) intended site of use for the product.

For example, "Product containing amoxicillin in oral dosage form" represents the group of products that must contain some amoxicillin (be it amoxicillin sodium or amoxicillin trihydrate or amoxicillin base), but *may also* contain other active ingredients, such as clavulanic acid, in manufactured dose forms such as oral suspension, oral capsule (any type), oral tablet (any type).

6.1.2 Example diagrams for MPF (containing)

Stated template view:

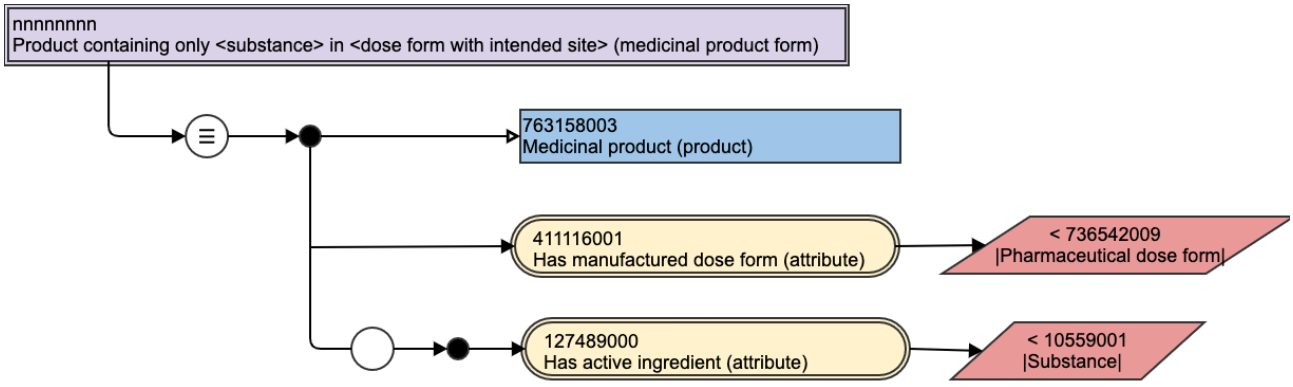

Figure 22: Medicinal Product Form (containing) stated template view

14 http://snomed.info/id/736542009
15 https://confluence.ihtsdotools.org/display/DOCEG/Grouper+Based+on+Intended+Site

Example: single active ingredient product, oral dose form: stated view followed by the inferred view that shows the two proximal parent concepts associated with the product:

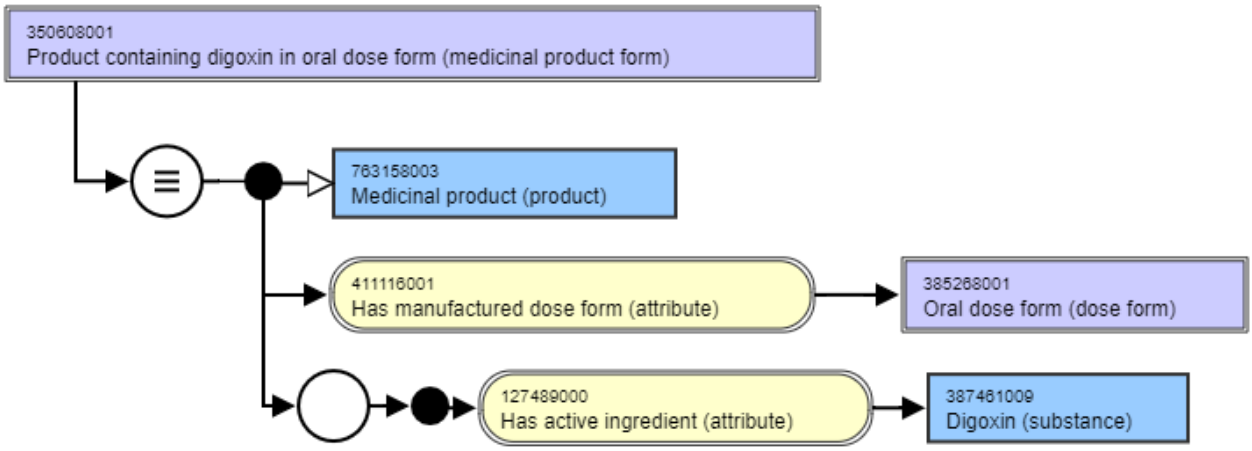

Figure 23: Medicinal Product Form (containing) example stated view

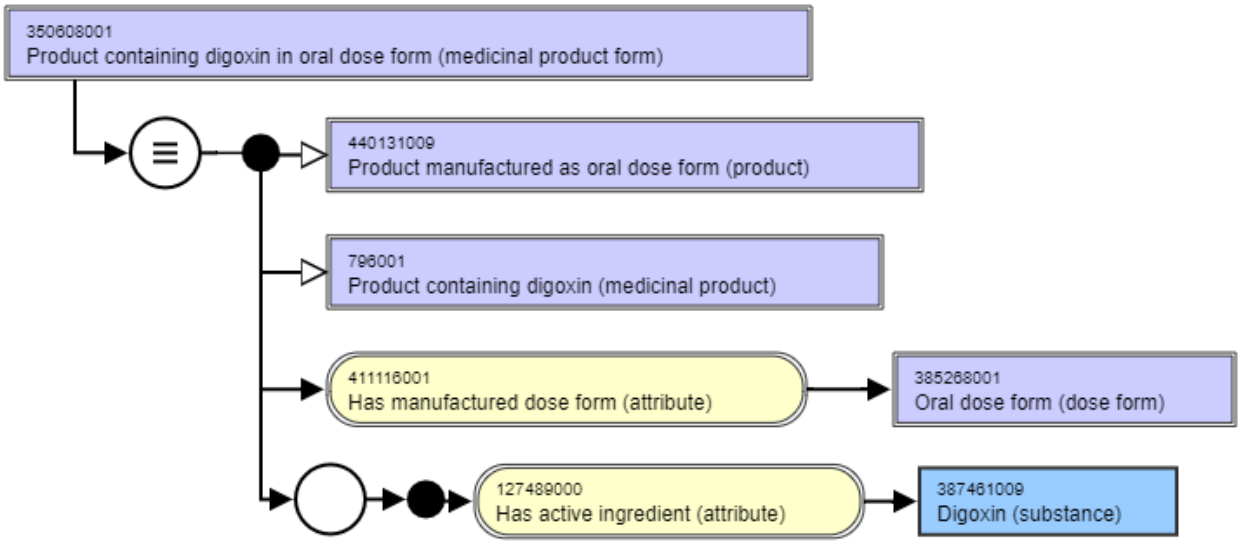

Figure 24: Medicinal Product Form (containing) example inferred view

6.1.3 **Attributes of MPF (containing)**

The Medicinal Product Form (MPF containing) concept is defined by attributes to describe the active ingredients(s) and to describe the dosage form:

Semantic tag	(medicinal product form)

Definition status		• 900000000000073002 |Sufficiently defined concept definition status|[16] **Exceptions** • None identified
Role Group	**Attribute** 127489000 |Has active ingredient|[17]	**Range** • < 105590001 |Substance|[18] • Excluding concepts representing structural groupers, dispositions, or combined substances **Cardinality** • 1..* - **Notes** • There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date • For content in the International Release, this attribute value should represent the base ingredient, not a modification, unless explicitly identified as an exception. • This attribute describes the set of active ingredient substances that the concept minimally contains. A set set of active ingredient substances may well have only one member

16 http://snomed.info/id/900000000000073002
17 http://snomed.info/id/127489000
18 http://snomed.info/id/105590001

Attribute 411116001 |Has manufactured dose form|[19]	**Range** • < 736542009 |Pharmaceutical dose form|[20] • Only descendants that are groupers representing intended site only (e.g. 385268001 | Oral dose form (dose form)|[21], 385287007 | Parenteral dose form (dose form)|[22]) **Cardinality** • 1..1 **Notes** • This attribute describes a grouping dose form concept for the medicinal product, where the grouping is the intended site for administration of the dose form of the product

6.1.4 Use case(s) supported by MPF (containing)

The main use case for the MPF (containing) is for analysis; as an aggregation concept for use in research. It may be that this concept may be used to support the modelling of other concepts in the future.

6.1.5 Availability of MPF (containing) concepts in the international edition

This class forms part of the medicinal product content provided in the international edition.

6.1.6 IDMP Compatibility

A concept at this level with the open world view does not correspond to any concept currently in the IDMP suite of standards.

6.2 Medicinal Product Form (MPF only) (closed world view)

6.2.1 Definition of MPF (only)

An abstract representation of a medicinal product based on description of only and exclusively the active ingredient(s) it contains and on the (generalised) intended site of use for the product.
For example, "Product containing only amoxicillin in oral dose form (medicinal product form)" represents products that must contain only amoxicillin (be it amoxicillin sodium or amoxicillin trihydrate), with no other active ingredients in manufactured dose forms such as oral suspension, oral capsule (any type), oral tablet (any type).

19 http://snomed.info/id/411116001
20 http://snomed.info/id/736542009
21 http://snomed.info/id/385268001
22 http://snomed.info/id/385287007

6.2.2 Example diagrams for MPF (only)

Stated template view:

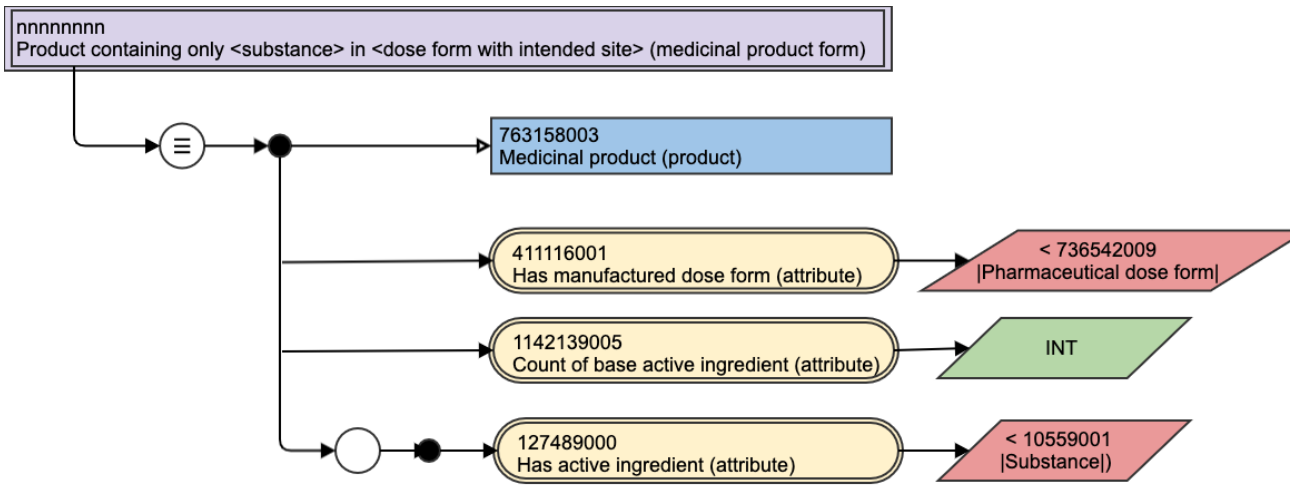

Figure 25: Medicinal Product Form (only) stated template view

Example: single active ingredient product, oral dose form: stated view followed by the inferred view that shows the proximal parent concepts associated with the product:

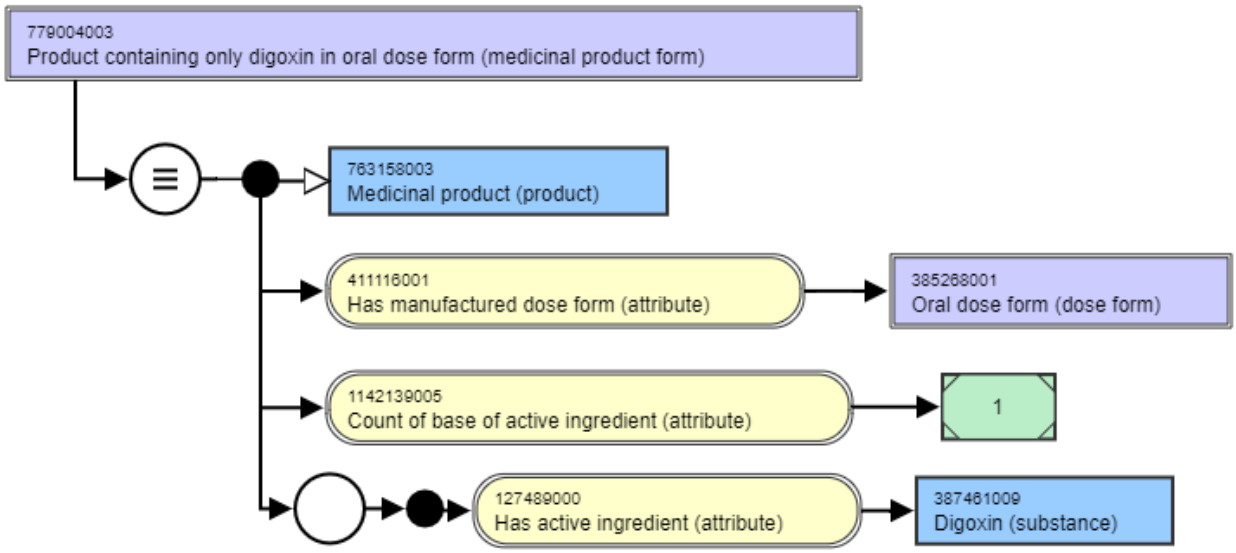

Figure 26: Medicinal Product Form (only) example stated view

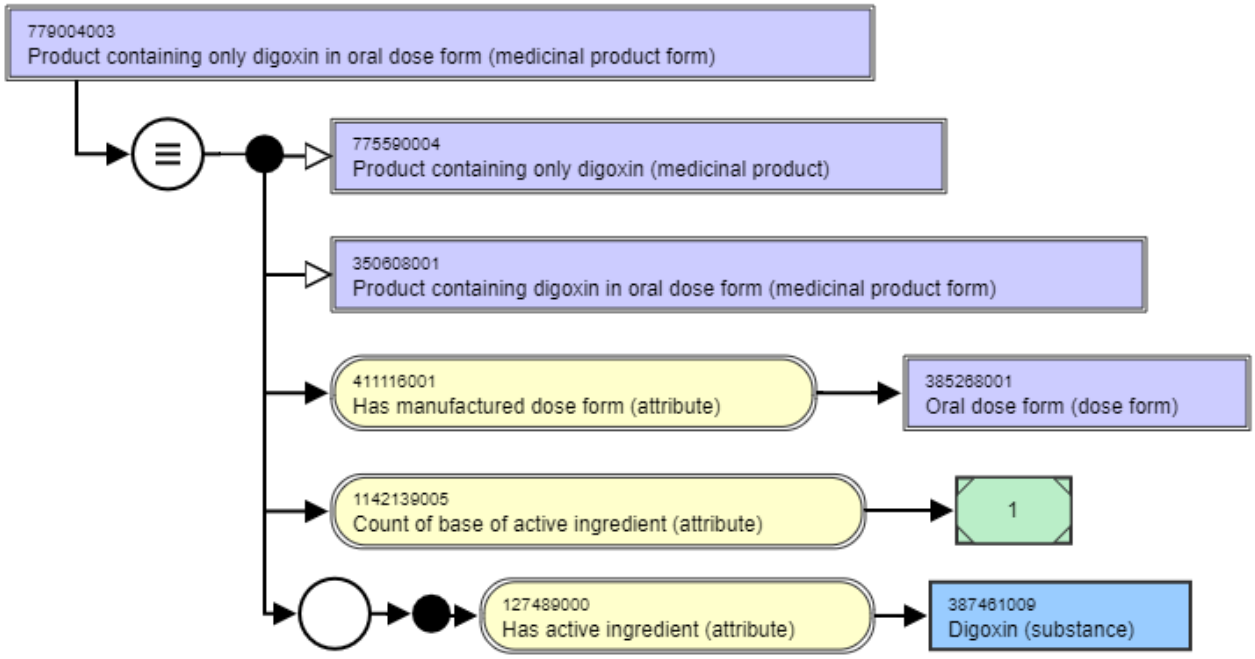

Figure 27: Medicinal Product Form (only) example inferred view

6.2.3 Attributes of MPF (only)

The "Medicinal Product Form (only) " (MPF only) concept is defined by attributes to describe the active ingredient(s), the ingredient count and the dosage form intended site grouper:

Semantic tag	(medicinal product form)
Definition status	• 900000000000073002 |Sufficiently defined concept definition status|[23] **Exceptions** • None identified

23 http://snomed.info/id/900000000000073002

Role Group	**Attribute** 127489000 |Has active ingredient|[24]	• **Range**
		  • < 105590001 |Substance|[25]
		  • Excluding concepts representing structural groupers, dispositions, or combined substances
		Cardinality
		  • 1..* -
		Notes
		  • There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date
		  • For content in the International Release, this attribute value should represent the base ingredient, not a modification, unless explicitly identified as an exception.
		  • This attribute describes the set of active ingredient substances that the concept minimally contains. A set set of active ingredient substances may well have only one member

	Attribute 411116001 |Has manufactured dose form|[26]	**Range** • < 736542009 |Pharmaceutical dose form|[27] • Only descendants that are groupers representing intended site only (e.g. 385268001 | Oral dose form (dose form)|[28] , 385287007 | Parenteral dose form (dose form)|[29]) **Cardinality** • 1..1 **Notes** • This attribute describes a grouping dose form concept for the medicinal product, where the grouping is the intended site for administration of the dose form of the product
	Attribute 1142139005 | Count of base of active ingredient|[30]	**Range** • INT (integer) **Cardinality** • 1..1 **Note** • This attribute provides the number of base active ingredient substances present in the medicinal product

For concepts that have two or more active ingredient substances that are modifications of the same base substance, and where MP precisely concepts are required, and for single ingredient product concepts where the

24 http://snomed.info/id/127489000
25 http://snomed.info/id/105590001
26 http://snomed.info/id/411116001
27 http://snomed.info/id/736542009
28 http://snomed.info/id/385268001
29 http://snomed.info/id/385287007
30 http://snomed.info/id/1142139005

active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142141006 |Count of base and modification pair|[31]	**Range** • INT (integer) **Cardinality** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base active ingredient substance (i.e. parent ingredient substance) **and where** one is a further modification of the other (for example, a multi-ingredient product containing both dexamethasone phosphate and dexamethasone sodium phosphate, where the dexamethasone phosphate is a modification of dexamethasone (base) and dexamethasone sodium phosphate is a further modification of the dexamethasone phosphate) and where MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142140007 |Count of active ingredient|[32]	**Range** • INT (integer) **Cardinality** • 1..1

As described in the MRCM rules, for practical and pragmatic reasons the additional ingredient count attributes have to be applied iteratively based on requirement.

6.2.4 Use cases supported by MPF (only)

There are several use cases that the MPF (only) concept can support:

- Internationally and nationally in decision support (especially drug interaction checking) and in protocols and treatment guidelines
- Internationally and nationally for interoperability of patient medication information such as in patient summaries and medication profiles, where patient information may only be available in using an abstract description (e.g. "patient reports they were taking oral captopril for 5 years")
- Internationally for the provision of cross border care, where a particular formulation of a medicinal product from one jurisdiction may not be present in a second jurisdiction; the MPD (only) class can support finding alternatives
- In pharmacovigilance, especially for description of concomitant medications where less information may be available (see also below in IDMP Compatibility)
- In analysis and research
- As a supporting attribute for other concepts elsewhere in SNOMED CT

6.2.5 Availability of MPF (only) concepts in the international edition

This class forms part of the medicinal product content provided in the international edition.

31 http://snomed.info/id/1142141006
32 http://snomed.info/id/1142140007

6.2.6 IDMP Compatibility

A concept at this level, despite using the universal restriction, does not directly correspond to any concept currently in the IDMP suite of standards.

The Level 3 Pharmaceutical Product concept (PhPID_SUB_C3) uses a granular *administrable dose form concept* for a product which will have an intended site of administration (bearing in mind that the exact implementation of ISO 11616 is not yet known). The MPF uses a more abstract dose form grouping concept where the grouping is on the basis of the intended site of administration for *manufactured* dose form (with some exceptions for oral antibiotic products that are supplied as powders/granules but dispensed to patients as solutions/suspensions). However, there should be little difference in the intended site of administration between a manufactured dose form and its administrable form for those dose forms that do not require transformation. For some groups of products, the MPF (only) concept has the potential to bring additional value to users beyond PhPID_SUB_C3 because it is a larger grouping concept.

For example, the dose form intended site concept 385276004 |Ocular dose form (dose form)|[33] covers 14 more granular pharmaceutical dose forms, of which two would undergo transformation to different administrable dose forms, but still with the ocular intended site. This means that the single MPF grouping concept will be relevant to a considerably larger group of actual products than the 12 potential PhPID_SUB_C3 concepts for the same active ingredient substance(s) that might exist in IDMP.

As with the Medicinal Product (only) concept, the granularity of description of substance for the PhP3 is not completely clear, but may well be more granular than that used for the MPF (only) concept.

6.3 Medicinal Product Form (MPF precisely) (closed world view)

This concept class, which is not shown in any of the overall diagrams in the introductory section, would be a representation of a medicinal product based on description of only and exclusively the precise active ingredient(s) it contains and on the (generalised) intended site of use for the product. For example, "Product containing precisely amoxicillin trihydrate in oral dosage form" represents products that must contain only amoxicillin trihydrate (not amoxicillin sodium or amoxicillin base) as the precise ingredient substance, with no other active ingredients in manufactured dose forms such as oral suspension, oral capsule (any type), oral tablet (any type). This class is not part of the international edition, but may be of use in national extensions. It would be modelled in the same way as the MPF only, but would use the precise active ingredient attribute and the two additional ingredient count attributes if and when required, using the same rules as for MP precisely.

33 http://snomed.info/id/385276004

7 Clinical Drug (CD)

7.1 **Definition of CD (precisely)**

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as presentation strength with unit of presentation or as concentration strength as appropriate, and 3) with its manufactured dose form (but in reconstituted oral liquid preparations, the administrable dose form - see below).

All Clinical Drugs that contain multiple *active* ingredient substances will have parent MPF and MP concepts that have the same set of active ingredient substances.

The limitation of the Clinical Drug class to the closed world view by the description of its precise active ingredient substances *only* precludes description of excipient substances such as flavours, preservatives, sweeteners etc as ingredients in a Clinical Drug. These substances can have significance for allergies etc. but can only be reliably described for individual authorised manufactured products, and as such are not within the scope of the international edition.

Similarly, by limiting the the Clinical Drug class in the international edition to expression of strength *either* as concentration strength *or* as presentation strength, medicinal product concepts that could usefully have *both* concentration and presentation strength (for example some liquid products such as liquid parenteral products or liquids for inhalation via a nebuliser) will have only concentration strength in the international edition. National extensions may author clinical drug concepts using the presentation strength(s) and unit(s) of presentation available in their jurisdiction if use case(s) require this. These concepts will be child concepts of the concentration clinical drug in the international edition. The diagrams below illustrate this:

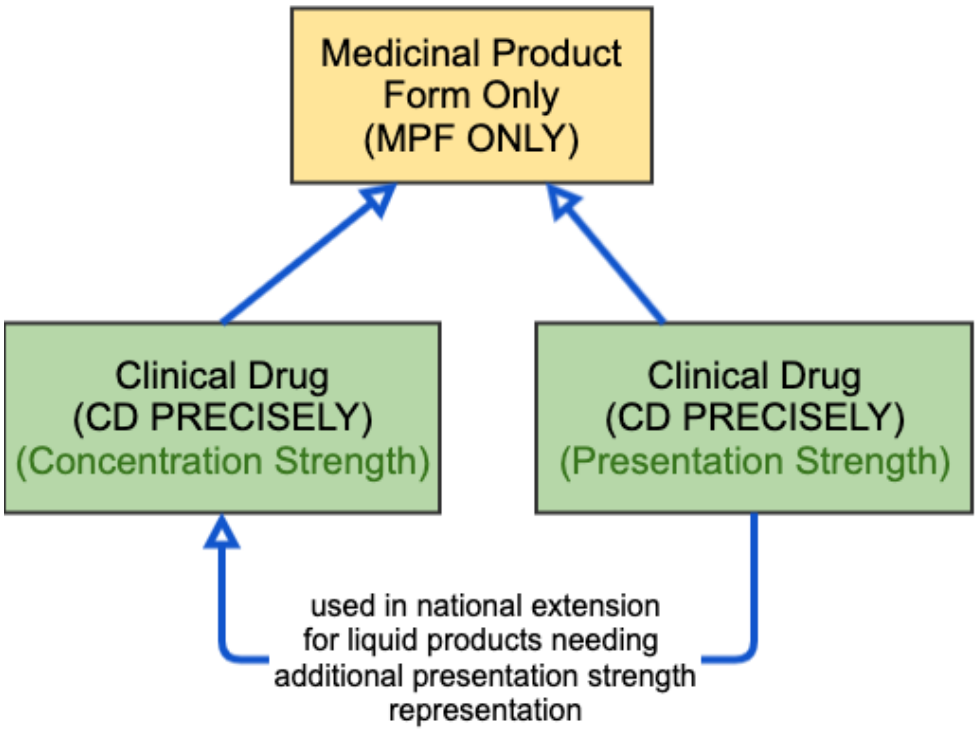

Figure 28: Clinical Drug concepts and their relationship together and to MPF only concepts

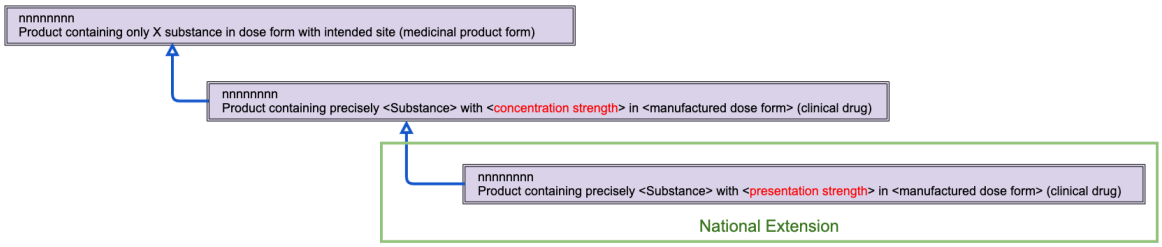

Figure 29: Clinical Drug concepts and their relationship together and to MPF only concepts in SNOMED notation, showing optional national extension concepts

Example:

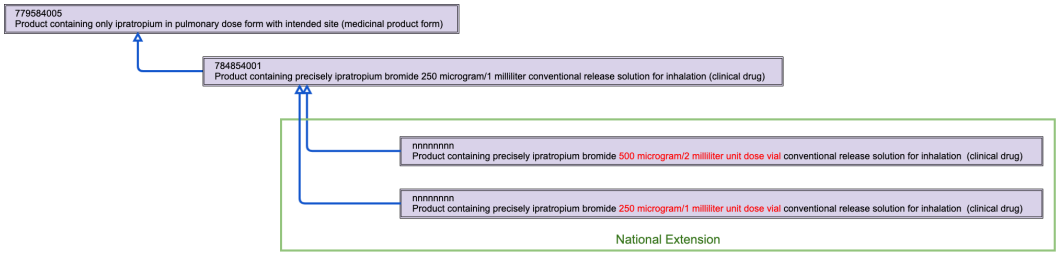

Figure 30: Clinical Drug example showing optional national extension concepts

Please also reference the National Extension specification for how to use additional model attributes to fully define concepts that can have both a concentration strength and a presentation strength such that they classify correctly.

7.2 Use cases supported by CD (precisely)

Use cases supported by the clinical drug concept include:

- As the abstract representation of products that are authorised, although without any sense of the excipient substances, the clinical drug concept is the source from which all other representation of medicinal product concepts flows; it acts as a clinically relevant grouper concept for medicinal products, and as such can support
    - international cross-border care delivery
    - International and national interoperability of patient medication information such as in patient summaries
- In national extensions, for many clinical purposes, such as product prescribing, adverse event reporting, formulary management, in recording medication history and in medication profiles
- Internationally and nationally in decision support and in protocols and treatment guidelines, when a more complete description of a product is required than MP or MPF
- In pharmacovigilance, especially for description of concomitant medication
- In analysis and research

7.3 Availability of CD concepts in the international edition

This class forms part of the medicinal product content provided in the international edition, although for liquid products, only concentration strength representation is provided.

7.4 Clinical Drug (precisely) (presentation strength)

7.4.1 Definition of Clinical Drug (precisely) (presentation strength)

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as presentation strength with unit of presentation and 3) with its manufactured dose form.

This is used for product types such as tablets, capsules, pessaries, suppositories (Strength Pattern 1a in Appendix A: Product Patterns[34]), sachets, ampoules or vials *containing* powders or granules etc. (solid dosage forms) and those presented with a metered dose valve such as inhalers and sprays.

7.4.2 Example diagrams for CD (precisely) presentation strength

Stated template view:

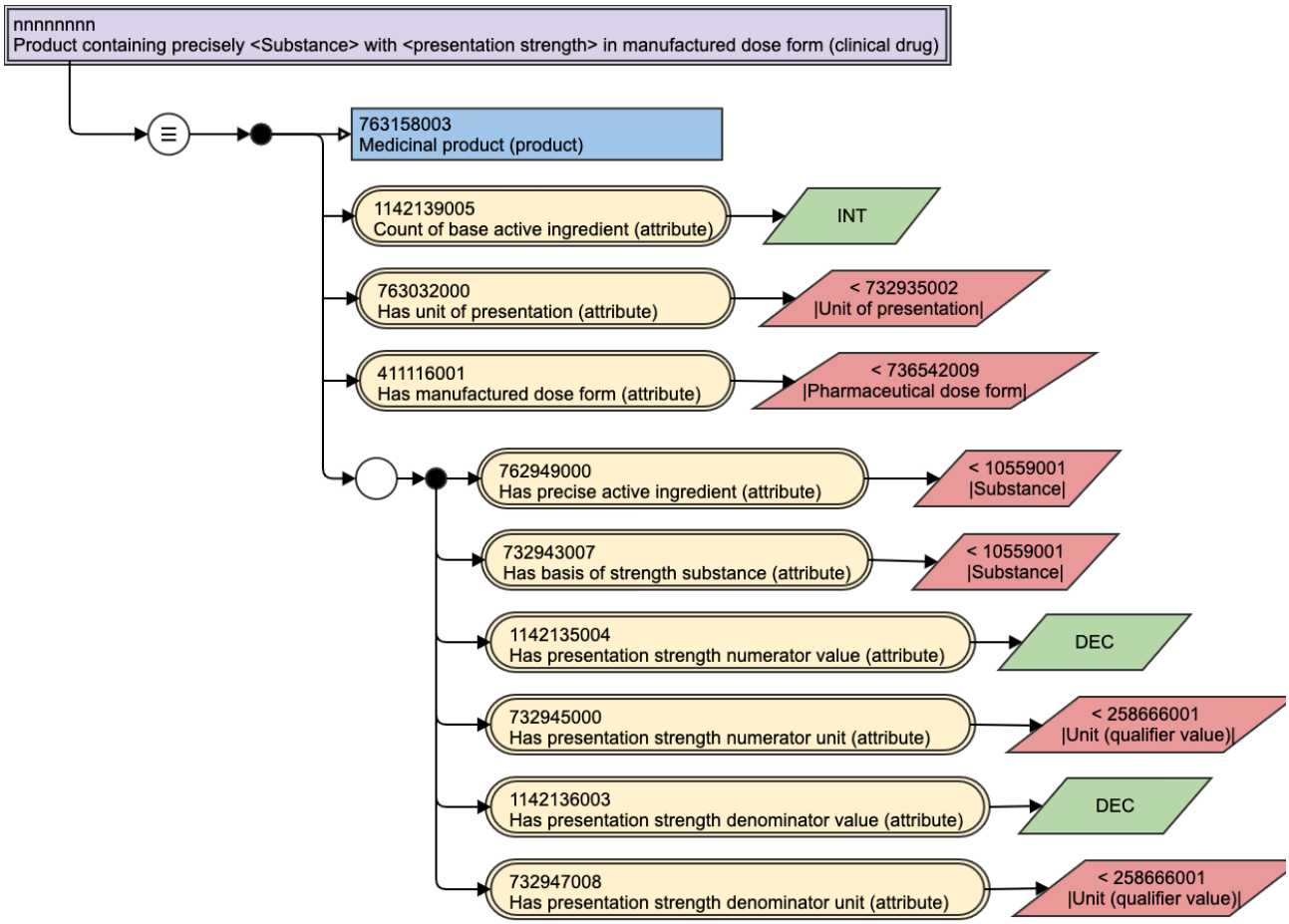

Figure 31: Clinical drug, presentation strength, stated template view

34 https://confluence.ihtsdotools.org/display/DOCMPM/Appendix+A%3A+Product+Patterns

Examples: single active ingredient product: stated view followed by the inferred view that shows the proximal parent concepts associated with the product:

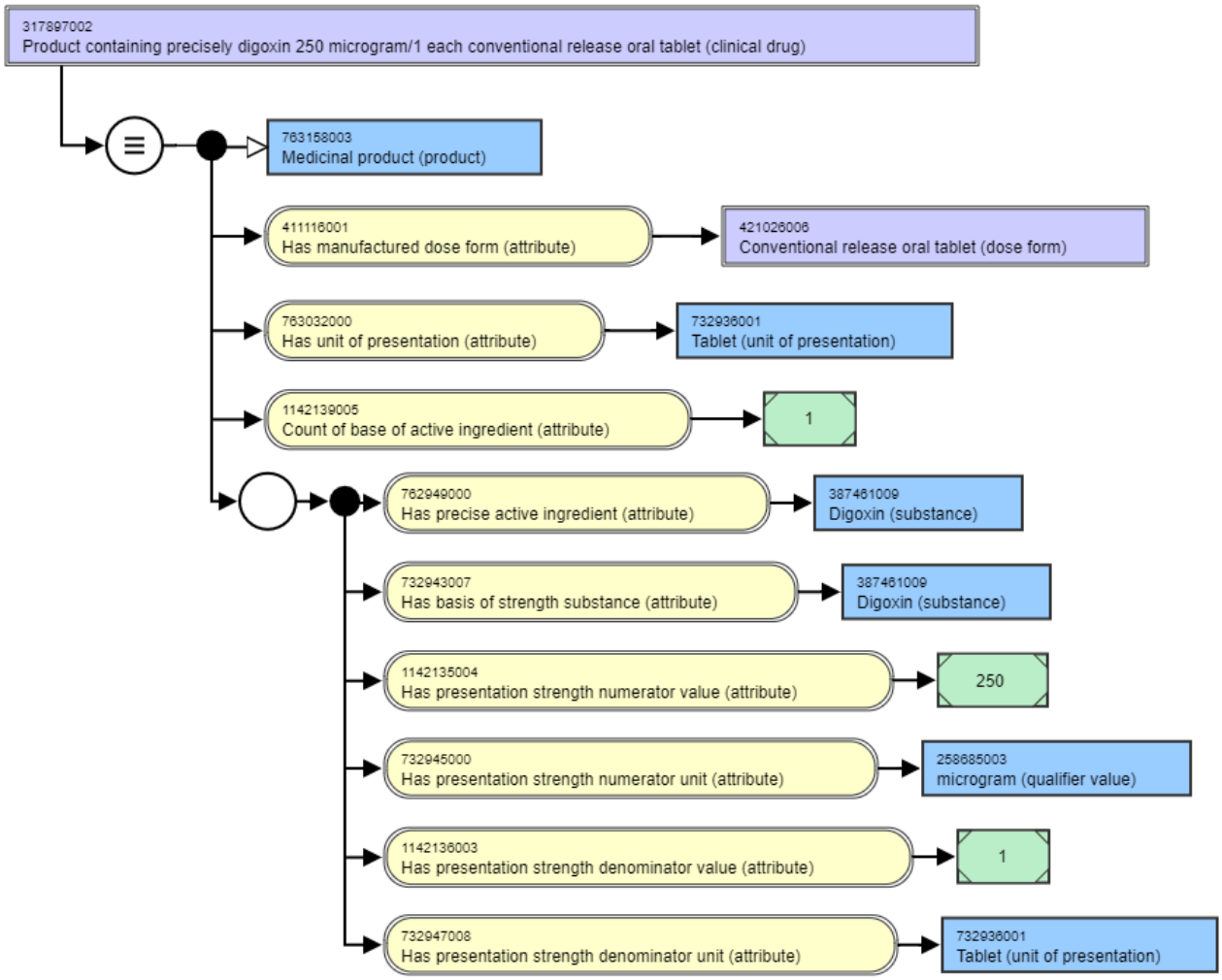

Figure 32: Clinical drug, presentation strength, example stated view

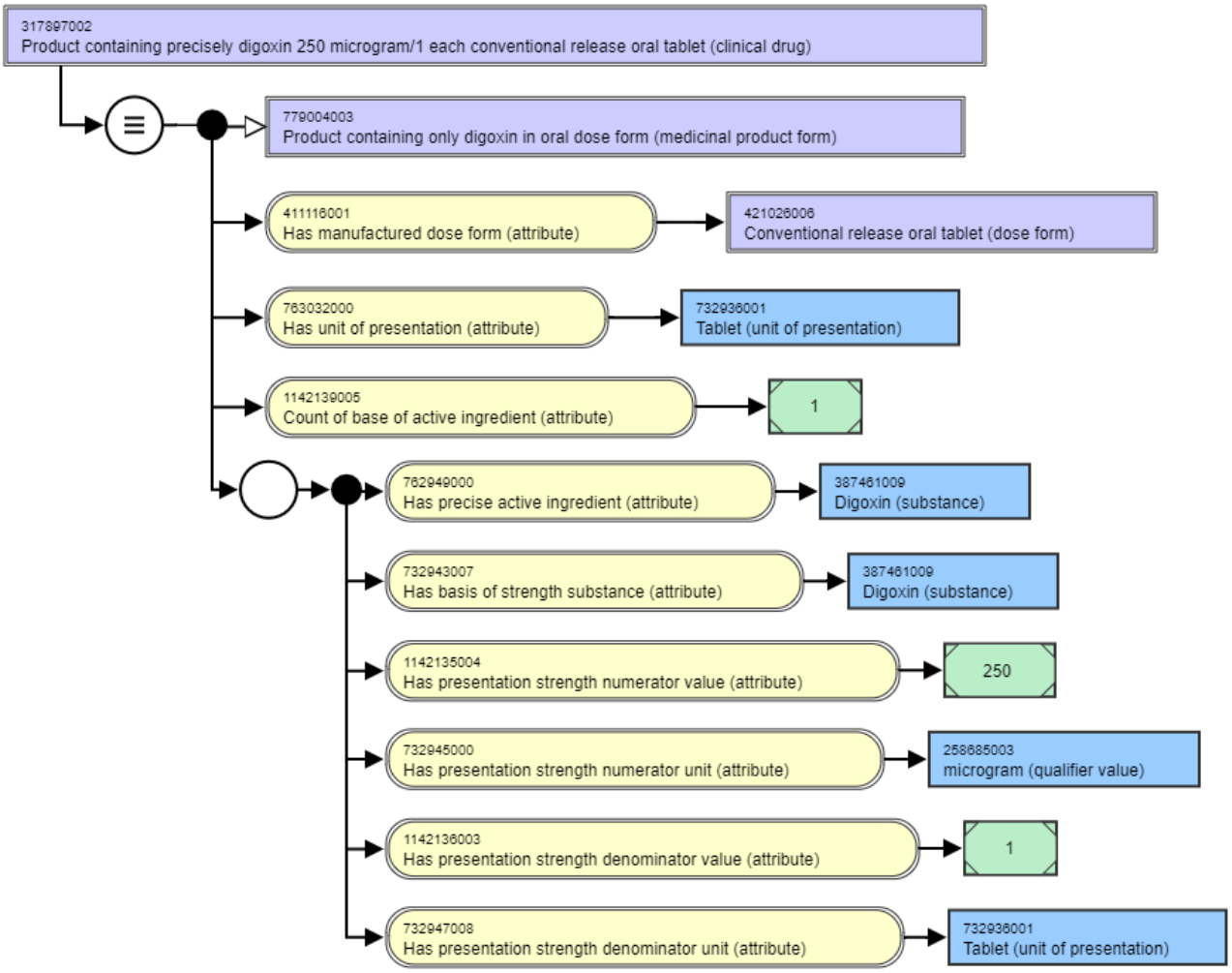

Figure 33: Clinical drug, presentation strength, example inferred view

7.4.3 Attributes of CD (precisely) (presentation strength)

The Clinical Drug (CD precisely) (presentation) concept is defined by three attributes and a set of substance/ strength attributes:

Semantic tag	(clinical drug)
Definition status	• 900000000000073002 |Sufficiently defined concept definition status|[35] **Exceptions** • None identified

35 http://snomed.info/id/900000000000073002

Attribute 411116001 | Has manufactured dose form|[36]	**Range** • < 736542009 |Pharmaceutical dose form|[37] **Cardinality** • 1..1 **Notes** • This attribute describes a grouping dose form concept for the medicinal product, where the grouping is the intended site for administration of the dose form of the product
Attribute 763032000 | Has unit of presentation|[38]	**Range** • < 732935002 |Unit of presentation|[39] **Cardinality** • 0..1 **Notes** • This is the countable entity in which the clinical drug is presented • See Appendix A: Product Patterns[40] for the various patterns of use for the unit of presentation
Attribute 1142139005 | Count of base of active ingredient|[41]	**Range** • INT (integer) **Cardinality** • 1..1 **Note** • This attribute provides the number of base active ingredient substances present in the medicinal product

36 http://snomed.info/id/411116001
37 http://snomed.info/id/736542009
38 http://snomed.info/id/763032000
39 http://snomed.info/id/732935002
40 https://confluence.ihtsdotools.org/display/DOCMPM/Appendix+A%3A+Product+Patterns
41 http://snomed.info/id/1142139005

Role Group [1..*] One role group is required for each precise active ingredient	**Attribute** 762949000 |Has precise active ingredient| [42]	**Range** • < 105590001 |Substance| [43] **Cardinality** (within role group) • 1..1 **Notes** • This is a precise active ingredient substance that the concept contains. • In each role group, only one precise active ingredient substance is stated
	Attribute 732943007 |Has basis of strength substance| [44]	**Range** • < 105590001 |Substance| [45] **Cardinality** (within role group) • 1..1 **Notes** • This is the basis of strength substance that the concept uses. • In each role group, only one precise active ingredient substance is stated. • The basis of strength substance is always stated explicitly, even when it is the same as the precise active ingredient substance
	Attribute 1142135004 |Has presentation strength numerator value| [46]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 732945000 |Has presentation strength numerator unit| [47]	**Range** • < 767524001 |Unit of measure (qualifier value)| [48] **Cardinality** (within role group) • 1..1

42 http://snomed.info/id/762949000
43 http://snomed.info/id/105590001
44 http://snomed.info/id/732943007
45 http://snomed.info/id/105590001
46 http://snomed.info/id/1142135004
47 http://snomed.info/id/732945000
48 http://snomed.info/id/767524001

	Attribute 1142136003 |Has presentation strength denominator value|[49]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 732947008 |Has presentation strength denominator unit|[50]	**Range** • < 767524001 |Unit of measure (qualifier value)|[51] **Cardinality (within role group)** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base substance **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required in order to support correct relationships generated by the MRCM:

Attribute 1142141006 |Count of base and modification pair|[52]	**Range** • INT (integer) **Cardinality** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base active ingredient substance (i.e. parent ingredient substance) **and** where one is a further modification of the other (for example, a multi-ingredient product containing both dexamethasone phosphate and dexamethasone sodium phosphate, where the dexamethasone phosphate is a modification of dexamethasone (base) and dexamethasone sodium phosphate is a further modification of the dexamethasone phosphate) **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required in order to support correct relationships generated by the MRCM:

Attribute 1142140007 |Count of active ingredient|[53]	**Range** • INT (integer) **Cardinality** • 1..1

49 http://snomed.info/id/1142136003
50 http://snomed.info/id/732947008
51 http://snomed.info/id/767524001
52 http://snomed.info/id/1142141006
53 http://snomed.info/id/1142140007

As described in the MRCM rules, for practical and pragmatic reasons the additional ingredient count attributes have to be applied iteratively based on requirement.

7.5 Clinical Drug (precisely) (concentration strength)

7.5.1 Definition of Clinical Drug (precisely) (concentration strength)

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as concentration strength and 3) with its manufactured dose form (with the exception of reconstituted oral liquid preparations, where the administrable dose form is be used as it is the most clinically relevant),

This is used for product types such as cutaneous semi-solids (without metered actuation), bulk powders and granules, topical liquids (without metered actuation) including drops, oral liquids and drops, nebuliser liquids and liquid parenteral products.

7.5.2 Example diagrams for CD (precisely) concentration strength

Stated template view:

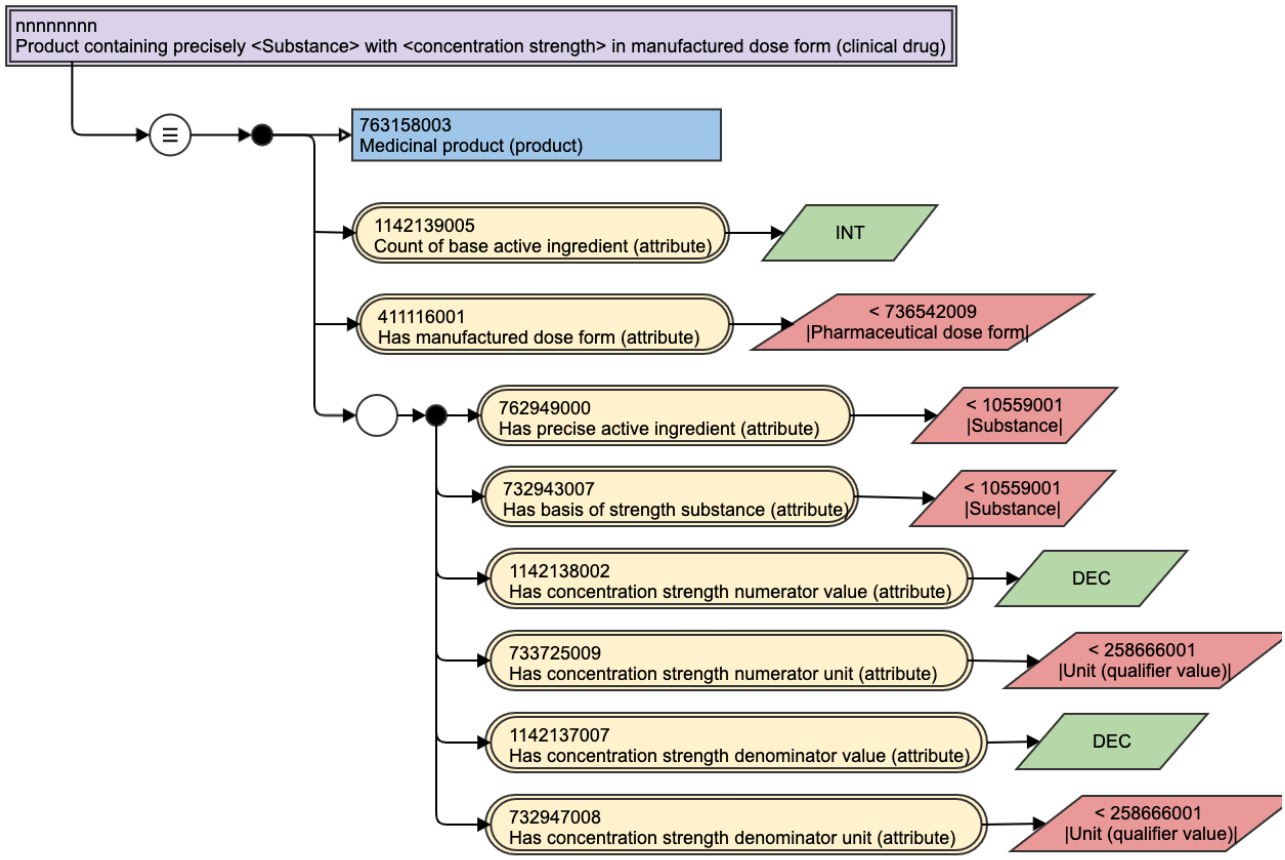

Figure 34: Clinical drug, concentration strength, stated template view

Examples: single active ingredient product: stated view followed by the inferred view that shows the proximal parent concepts associated with the product:

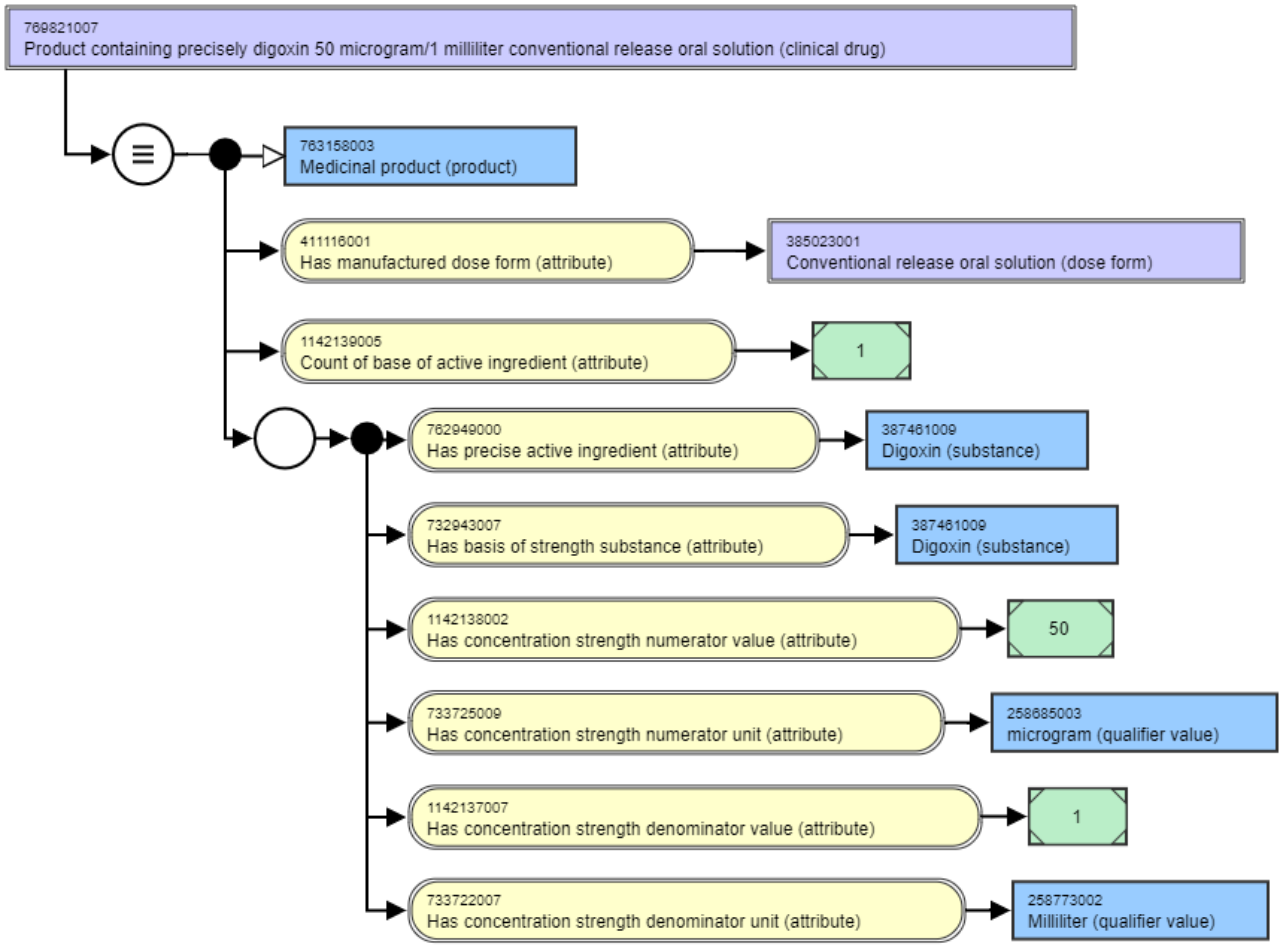

Figure 35: Clinical drug, concentration strength, example stated view

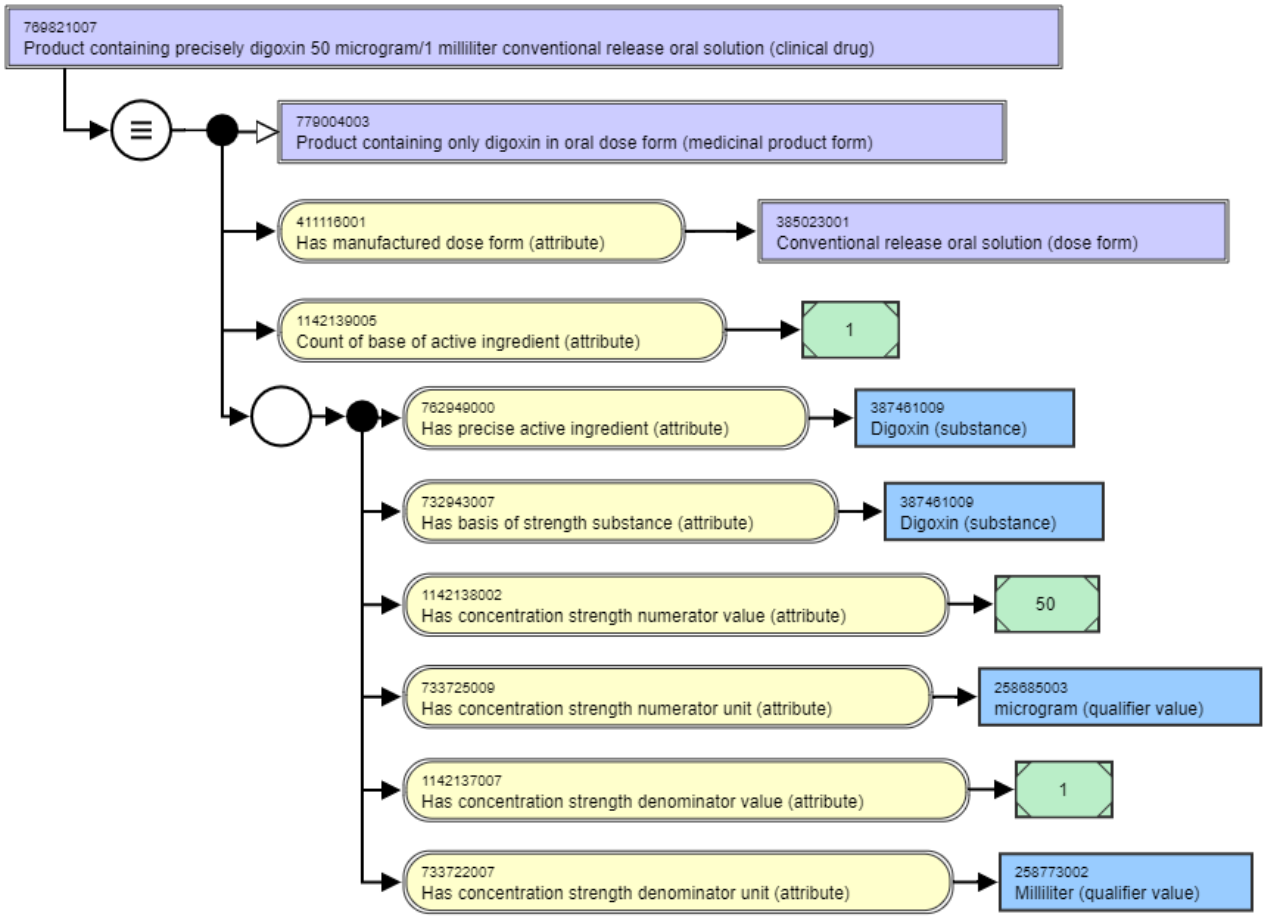

Figure 36: Clinical drug, concentration strength, example inferred view

7.5.3 Attributes of CD (precisely) (concentration strength)

The Clinical Drug (CD precisely) (concentration) concept is defined by two attributes and a set of substance/ strength attributes; a Clinical Drug described only by concentration strength does not have a unit of presentation:

Semantic tag	(clinical drug)
Definition status	• 900000000000073002 |Sufficiently defined concept definition status|[54] **Exceptions** • None identified

54 http://snomed.info/id/900000000000073002

Attribute 411116001 |Has manufactured dose form| [55]		**Range** • < 736542009 |Pharmaceutical dose form| [56] **Cardinality** • 1..1 **Notes** • This is the finished dose form that a medicinal product is presented in by the manufacturer, before any transformation into an administrable dose form has taken place
Attribute 1142139005 | Count of base of active ingredient| [57]		**Range** • INT (integer) **Cardinality** • 1..1 **Note** • This attribute provides the number of base active ingredient substances present in the medicinal product
Role Group [1..*] One role group is required for each precise active ingredient	**Attribute** 762949000 | Has precise active ingredient| [58]	**Range** • < 105590001 |Substance| [59] **Cardinality** (within role group) • 1..1 **Notes** • This is a precise active ingredient substance that the concept contains. • In each role group, only one precise active ingredient substance is stated

55 http://snomed.info/id/411116001
56 http://snomed.info/id/736542009
57 http://snomed.info/id/1142139005
58 http://snomed.info/id/762949000
59 http://snomed.info/id/105590001

Attribute 732943007 | Has basis of strength substance|[60]	**Range** • < 105590001 |Substance|[61] **Cardinality** (within role group) • 1..1 **Notes** • This is the basis of strength substance that the concept uses. • In each role group, only one precise active ingredient substance is stated. • The basis of strength substance is always stated explicitly, even when it is the same as the precise active ingredient substance
Attribute 1142138002 | Has concentration strength numerator value|[62]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
Attribute 733725009 | Has concentration strength numerator unit|[63]	**Range** • < 767524001 |Unit of measure (qualifier value)|[64] **Cardinality** (within role group) • 1..1
Attribute 1142137007 | Has concentration strength denominator value|[65]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
Attribute 733722007 | Has concentration strength	**Range** • < 767524001 |Unit of measure (qualifier value)|[67] **Cardinality** (within role group) • 1..1

60 http://snomed.info/id/732943007
61 http://snomed.info/id/105590001
62 http://snomed.info/id/1142138002
63 http://snomed.info/id/733725009
64 http://snomed.info/id/767524001
65 http://snomed.info/id/1142137007
67 http://snomed.info/id/767524001

	denominator unit[66]

For concepts that have two or more active ingredient substances that are modifications of the same base substance **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142141006 |Count of base and modification pair[68]	**Range** • INT (integer) **Cardinality** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base active ingredient substance (i.e. parent ingredient substance) **and** where one is a further modification of the other (for example, a multi-ingredient product containing both dexamethasone phosphate and dexamethasone sodium phosphate, where the dexamethasone phosphate is a modification of dexamethasone (base) and dexamethasone sodium phosphate is a further modification of the dexamethasone phosphate) **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142140007 |Count of active ingredient[69]	**Range** • INT (integer) **Cardinality** • 1..1

As described in the MRCM rules, for practical and pragmatic reasons the additional ingredient count attributes have to be applied iteratively based on requirement.

7.6 Other Clinical Drug Grouping Concepts not present in this model or in the international edition

Clinical Drug concepts in the international release are defined by their precise active ingredient substance(s) and their basis of strength substance, as described above. A concept that grouped clinical drugs by their strength and basis of strength substance only (i.e. disregarding the precise active ingredient substance) may be appropriate in some contexts in national extensions (e.g. 'amlodipine 10mg conventional release oral tablet' as a concept with three child concepts 'amlodipine (as amlodipine besiliate) 10mg conventional release oral tablet' and 'amlodipine (as amlodipine mesiliate) 10mg conventional release oral tablet' 'amlodipine (as amlodipine maleate) 10mg conventional release oral tablet'. A Clinical Drug grouping concept of this nature would be a "Basis of Strength Substance Clinical Drug" concept as opposed to a "Clinical Drug containing Precisely" concept.

66 http://snomed.info/id/733722007
68 http://snomed.info/id/1142141006
69 http://snomed.info/id/1142140007

7.7 IDMP Compatibility

Although a Clinical Drug might look directly compatible with the IDMP concept of "Manufactured Item", in IDMP, a Manufactured Item is an "actual manufactured item (the tablet, liquid, cream contained within the package) as it is delivered from the manufacturer but before any transformation, if applicable, for administration to or use by the patient"; it is therefore a representation of a real entity, rather than an abstract entity. They are therefore not directly compatible classes of entities. A Manufactured Item is described by substances in a variety of roles, including excipient substances, not just its active substance(s) and their strengths. A Manufactured Item can be related to an appropriate Clinical Drug on the basis of its **active** ingredient substance(s) and relevant strength so that the Clinical Drug being an abstracted representation of the Manufactured Item, but they are not equivalent. The Manufactured Item concept in IDMP is equivalent to the Real Clinical Drug concept of the SNOMED national extension model.

On the basis that the IDMP concept of a Pharmaceutical Product could be defined by substance(s) playing only an active ingredient role, then the Clinical Drug concept is more directly compatible with the IDMP Pharmaceutical Product concept however if it is intended that the IDMP Pharmaceutical Product does include excipient substances, then there is no compatibility. Even then, the IDMP Pharmaceutical Product concept is clear that the dose form attribute is populated by the *administrable* dose form rather than the manufactured dose form, whereas, for everything other than products presented as reconstituted oral liquids, the Clinical Drug uses the *manufactured* dose form. Although for probably the majority of medicinal products the manufactured dose form is also the administrable dose form, for the minority for which this is not the case (for example, parenteral products presented as powders or granules that must be dissolved or dispersed prior to administration to the patient) this difference is significant. It is therefore not possible to state any direct class level equivalence between a Clinical Drug and an IDMP Pharmaceutical Product.

There is some compatibility between an IDMP PhP4 concept and a Clinical Drug. However, It is not (yet) clear as to how the "active substance - strength" description will be described in IDMP implementation. The SNOMED Clinical Drug is explicit in stating the basis of strength substance in its relevant granularity as required for patient care; IDMP is currently less clear as to how that will be done and what effect that will have on the description of a Pharmaceutical Product. In addition, IDMP allows for "active substance - strength" to be described by using either (and possibly even both) a Substance and Specified Substance. The distinction between Substance and Specified Substance in IDMP is thus: a substance is "any matter of defined composition that has discrete existence, whose origin may be biological, mineral or chemical" whereas a Specified Substance is one that is "defined by groups of elements that describes multi-substance materials or specifies further information on substances relevant to the description of Medicinal Products". Specified substances are substances like simeticone, which are mixture substances, or substances that are defined by pharmacopoeial specification (like water for injection) or substance where a particular manufacturing process is specified (as for biosimilar products). For SNOMED CT, all such substances, with the possible exception of 'water for injection') could be present in the Substance hierarchy and are therefore candidate concepts to be used in the ingredient role attributes of concepts in the Medicinal Product hierarchy; as such the IDMP distinction between Substance and Specified Substance has no material effect.

7.7.1 Definition of CD (precisely)

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as presentation strength with unit of presentation or as concentration strength as appropriate, and 3) with its manufactured dose form (but in reconstituted oral liquid preparations, the administrable dose form - see below).

All Clinical Drugs that contain multiple *active* ingredient substances will have parent MPF and MP concepts that have the same set of active ingredient substances.

The limitation of the Clinical Drug class to the closed world view by the description of its precise active ingredient substances *only* precludes description of excipient substances such as flavours, preservatives, sweeteners etc as ingredients in a Clinical Drug. These substances can have significance for allergies etc. but can only be reliably described for individual authorised manufactured products, and as such are not within the scope of the international edition.

Similarly, by limiting the the Clinical Drug class in the international edition to expression of strength *either* as concentration strength *or* as presentation strength, medicinal product concepts that could usefully have *both* concentration and presentation strength (for example some liquid products such as liquid parenteral products or liquids for inhalation via a nebuliser) will have only concentration strength in the international edition. National extensions may author clinical drug concepts using the presentation strength(s) and unit(s) of presentation available in their jurisdiction if use case(s) require this. These concepts will be child concepts of the concentration clinical drug in the international edition. The diagrams below illustrate this:

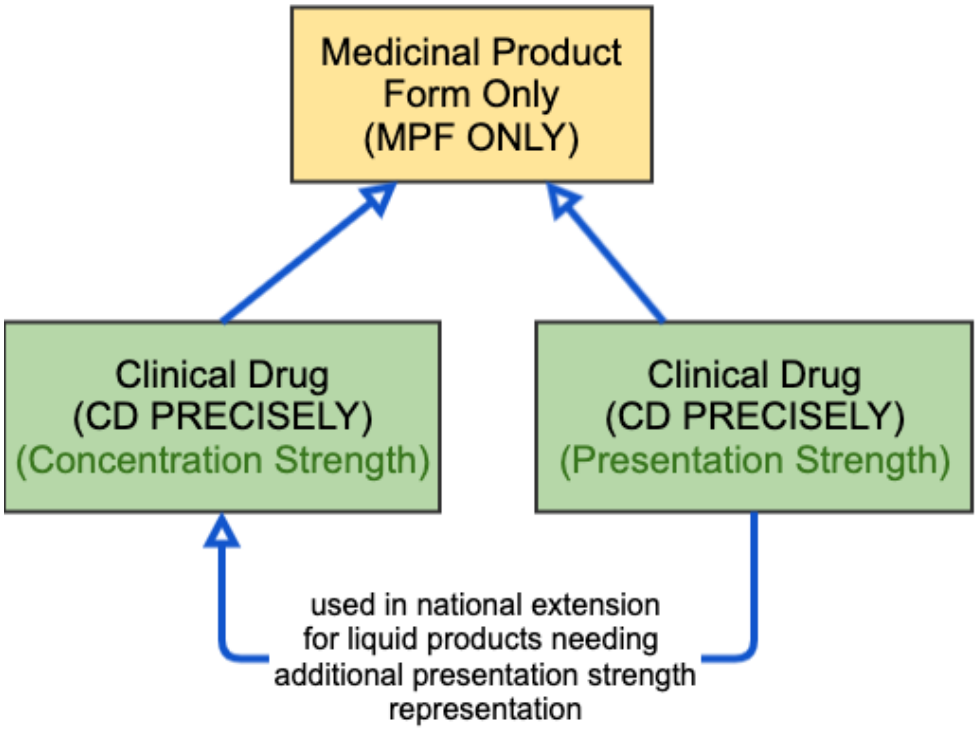

Figure 37: Clinical Drug concepts and their relationship together and to MPF only concepts

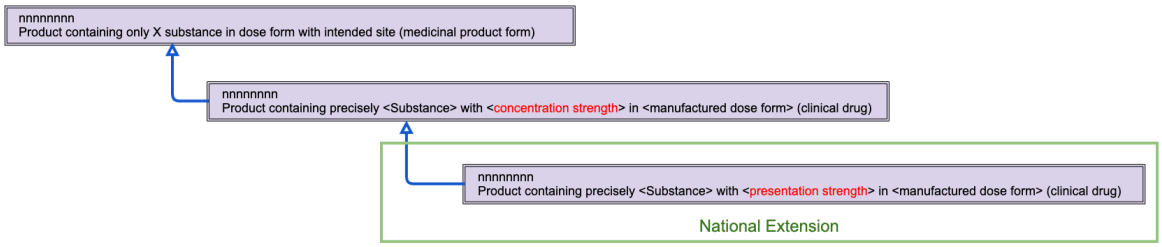

Figure 38: Clinical Drug concepts and their relationship together and to MPF only concepts in SNOMED notation, showing optional national extension concepts

Example:

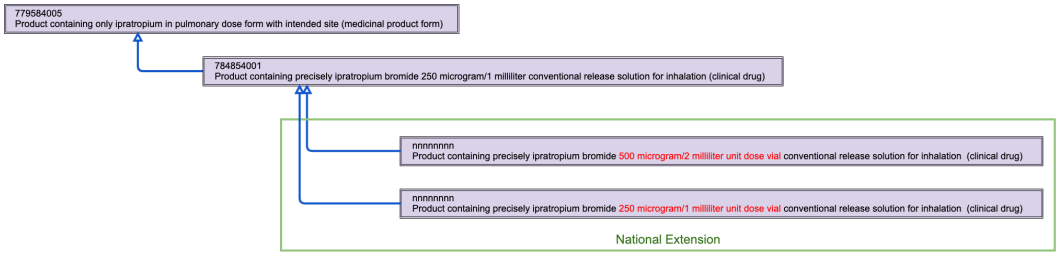

Figure 39: Clinical Drug example showing optional national extension concepts

Please also reference the National Extension specification for how to use additional model attributes to fully define concepts that can have both a concentration strength and a presentation strength such that they classify correctly.

7.7.2 Use cases supported by CD (precisely)

Use cases supported by the clinical drug concept include:

- As the abstract representation of products that are authorised, although without any sense of the excipient substances, the clinical drug concept is the source from which all other representation of medicinal product concepts flows; it acts as a clinically relevant grouper concept for medicinal products, and as such can support
    - international cross-border care delivery
    - International and national interoperability of patient medication information such as in patient summaries
- In national extensions, for many clinical purposes, such as product prescribing, adverse event reporting, formulary management, in recording medication history and in medication profiles
- Internationally and nationally in decision support and in protocols and treatment guidelines, when a more complete description of a product is required than MP or MPF
- In pharmacovigilance, especially for description of concomitant medication
- In analysis and research

7.7.3 Availability of CD concepts in the international edition

This class forms part of the medicinal product content provided in the international edition, although for liquid products, only concentration strength representation is provided.

7.8 Clinical Drug (precisely) (presentation strength)

7.8.1 Definition of Clinical Drug (precisely) (presentation strength)

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as presentation strength with unit of presentation and 3) with its manufactured dose form.

This is used for product types such as tablets, capsules, pessaries, suppositories (Strength Pattern 1a in Appendix A: Product Patterns[70]), sachets, ampoules or vials *containing* powders or granules etc. (solid dosage forms) and those presented with a metered dose valve such as inhalers and sprays.

70 https://confluence.ihtsdotools.org/display/DOCMPM/Appendix+A%3A+Product+Patterns

7.8.2 Example diagrams for CD (precisely) presentation strength

Stated template view:

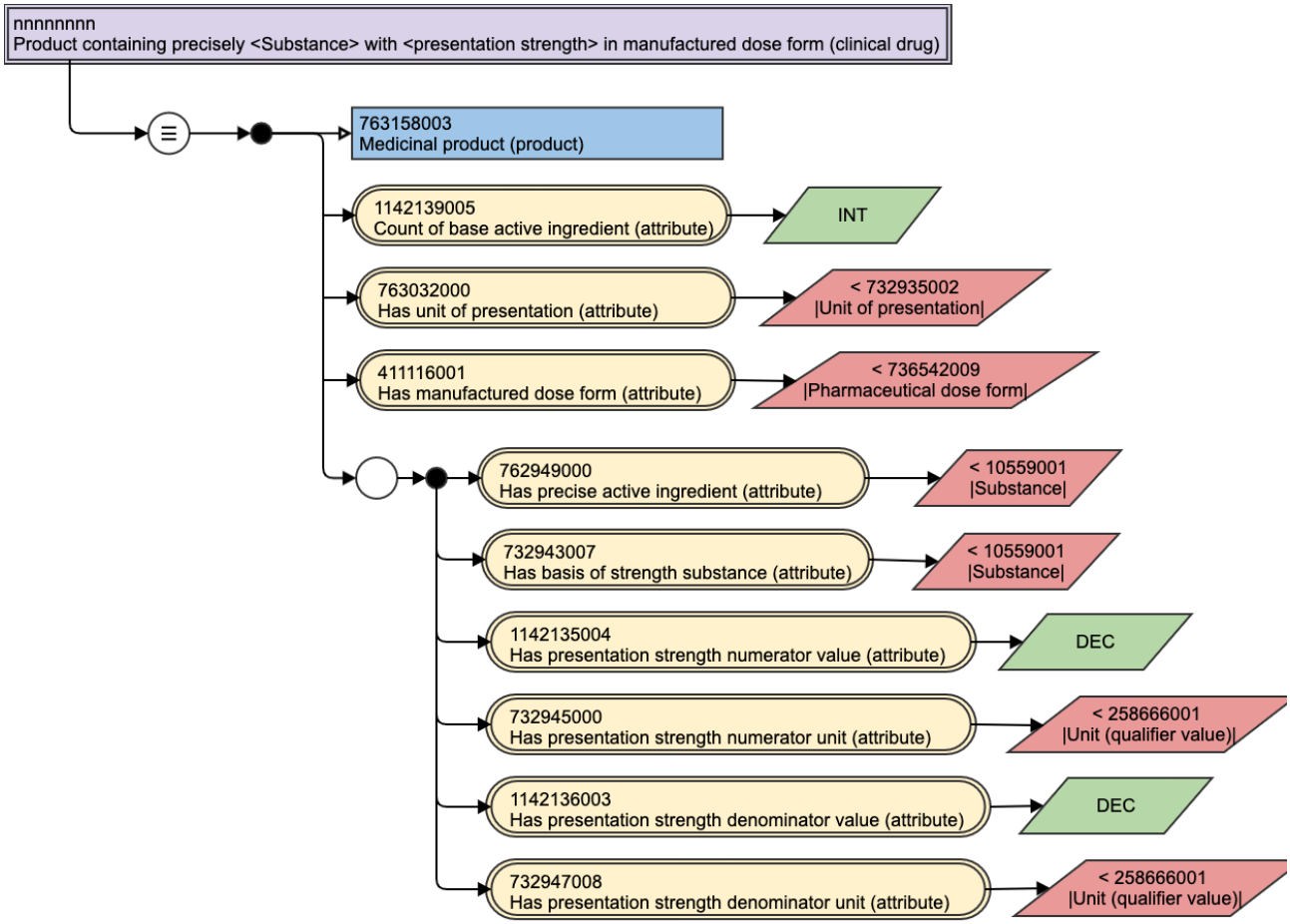

Figure 40: Clinical drug, presentation strength, stated template view

Examples: single active ingredient product: stated view followed by the inferred view that shows the proximal parent concepts associated with the product:

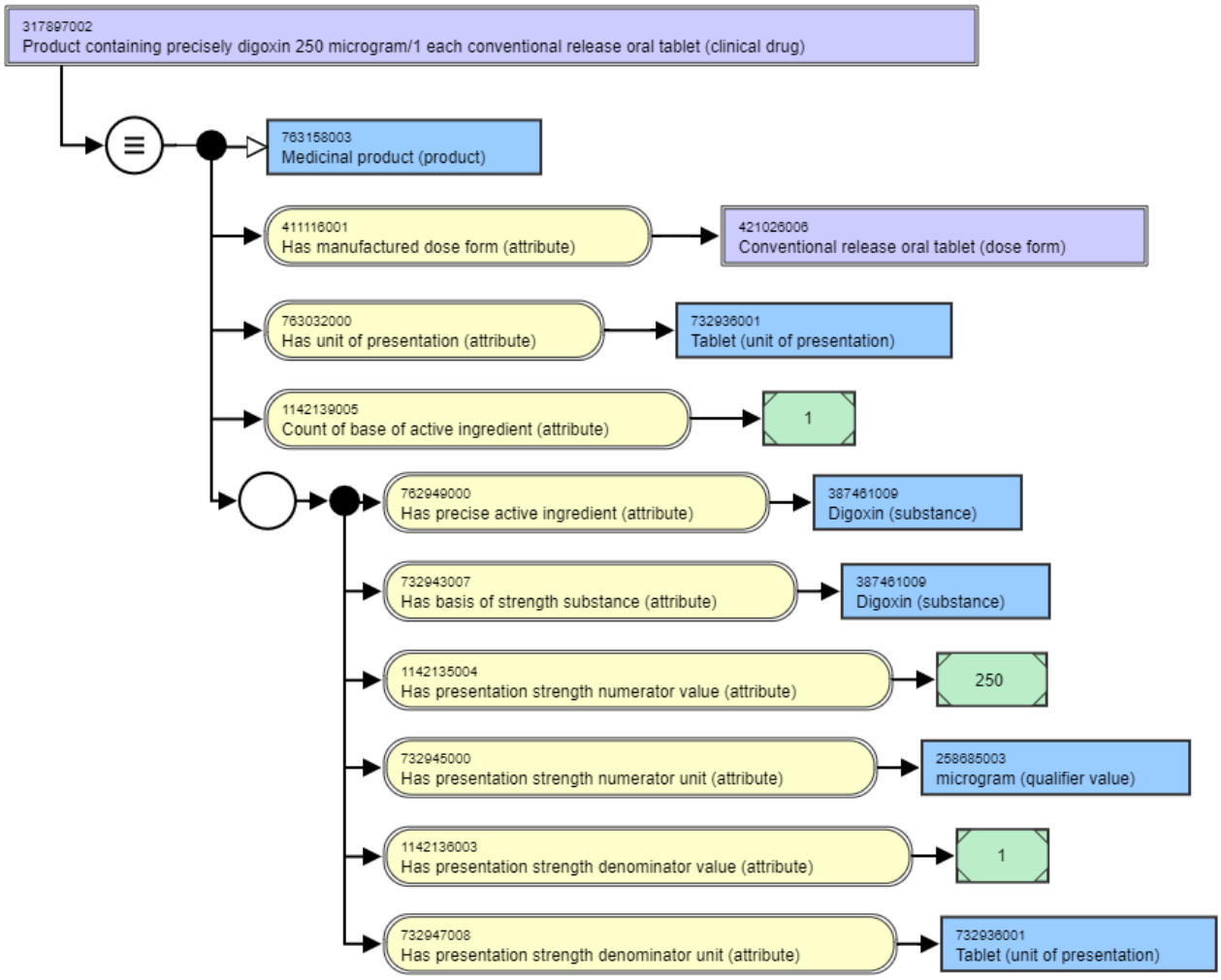

Figure 41: Clinical drug, presentation strength, example stated view

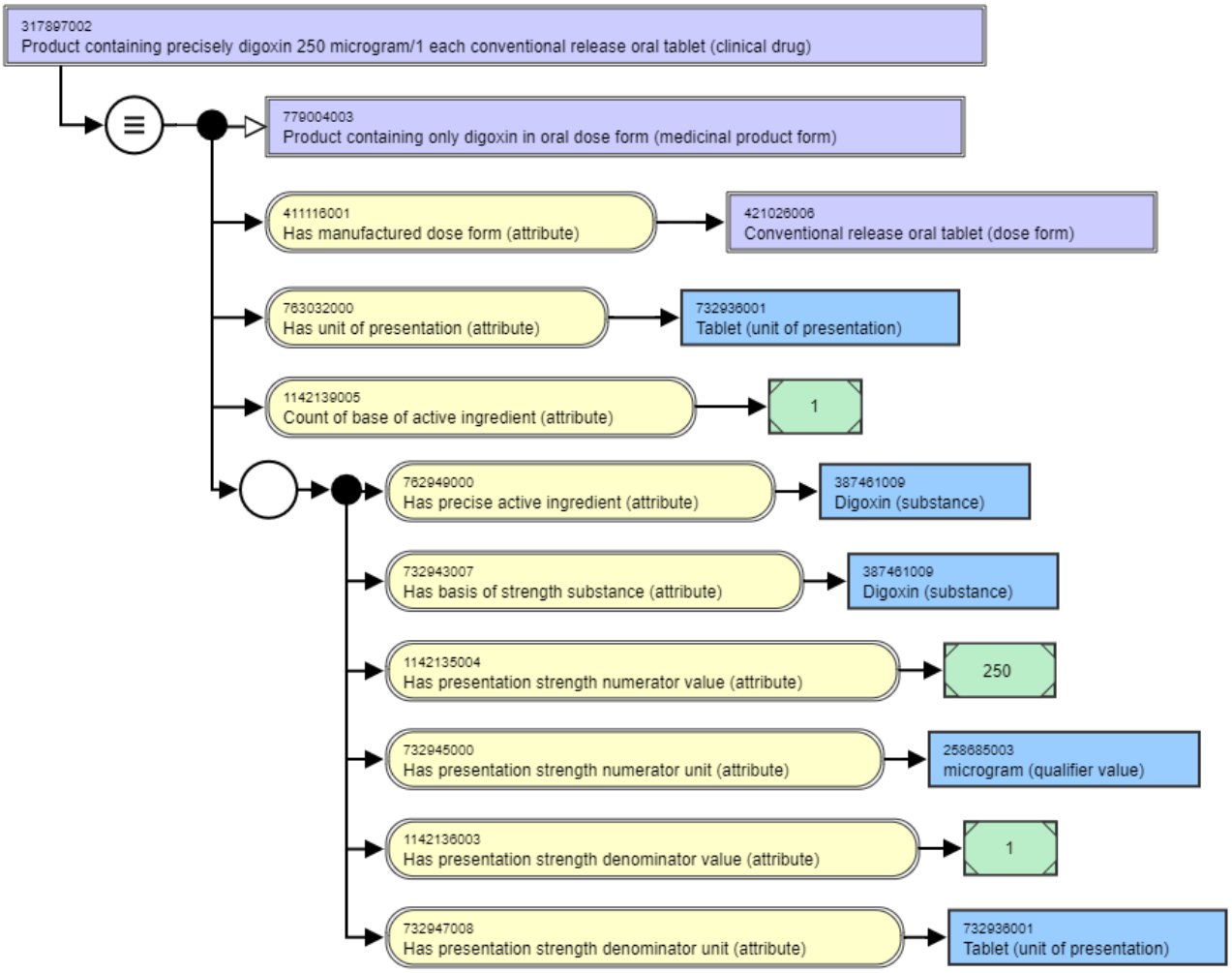

Figure 42: Clinical drug, presentation strength, example inferred view

7.8.3 Attributes of CD (precisely) (presentation strength)

The Clinical Drug (CD precisely) (presentation) concept is defined by three attributes and a set of substance/ strength attributes:

Semantic tag	(clinical drug)
Definition status	• 900000000000073002 |Sufficiently defined concept definition status|[71] **Exceptions** • None identified

71 http://snomed.info/id/900000000000073002

Attribute 411116001 | Has manufactured dose form|[72]	**Range** • < 736542009 |Pharmaceutical dose form|[73] **Cardinality** • 1..1 **Notes** • This attribute describes a grouping dose form concept for the medicinal product, where the grouping is the intended site for administration of the dose form of the product
Attribute 763032000 | Has unit of presentation|[74]	**Range** • < 732935002 |Unit of presentation|[75] **Cardinality** • 0..1 **Notes** • This is the countable entity in which the clinical drug is presented • See Appendix A: Product Patterns[76] for the various patterns of use for the unit of presentation
Attribute 1142139005 | Count of base of active ingredient|[77]	**Range** • INT (integer) **Cardinality** • 1..1 **Note** • This attribute provides the number of base active ingredient substances present in the medicinal product

72 http://snomed.info/id/411116001
73 http://snomed.info/id/736542009
74 http://snomed.info/id/763032000
75 http://snomed.info/id/732935002
76 https://confluence.ihtsdotools.org/display/DOCMPM/Appendix+A%3A+Product+Patterns
77 http://snomed.info/id/1142139005

Role Group [1..*] One role group is required for each precise active ingredient	**Attribute** 762949000 |Has precise active ingredient| [78]	**Range** • < 105590001 |Substance| [79] **Cardinality** (within role group) • 1..1 **Notes** • This is a precise active ingredient substance that the concept contains. • In each role group, only one precise active ingredient substance is stated
	Attribute 732943007 |Has basis of strength substance| [80]	**Range** • < 105590001 |Substance| [81] **Cardinality** (within role group) • 1..1 **Notes** • This is the basis of strength substance that the concept uses. • In each role group, only one precise active ingredient substance is stated. • The basis of strength substance is always stated explicitly, even when it is the same as the precise active ingredient substance
	Attribute 1142135004 |Has presentation strength numerator value| [82]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 732945000 |Has presentation strength numerator unit| [83]	**Range** • < 767524001 |Unit of measure (qualifier value)| [84] **Cardinality** (within role group) • 1..1

78 http://snomed.info/id/762949000
79 http://snomed.info/id/105590001
80 http://snomed.info/id/732943007
81 http://snomed.info/id/105590001
82 http://snomed.info/id/1142135004
83 http://snomed.info/id/732945000
84 http://snomed.info/id/767524001

	Attribute 1142136003 |Has presentation strength denominator value|[85]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 732947008 |Has presentation strength denominator unit|[86]	**Range** • < 767524001 |Unit of measure (qualifier value)|[87] **Cardinality (within role group)** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base substance **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required in order to support correct relationships generated by the MRCM:

Attribute 1142141006 |Count of base and modification pair|[88]	**Range** • INT (integer) **Cardinality** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base active ingredient substance (i.e. parent ingredient substance) **and** where one is a further modification of the other (for example, a multi-ingredient product containing both dexamethasone phosphate and dexamethasone sodium phosphate, where the dexamethasone phosphate is a modification of dexamethasone (base) and dexamethasone sodium phosphate is a further modification of the dexamethasone phosphate) **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required in order to support correct relationships generated by the MRCM:

Attribute 1142140007 |Count of active ingredient|[89]	**Range** • INT (integer) **Cardinality** • 1..1

85 http://snomed.info/id/1142136003
86 http://snomed.info/id/732947008
87 http://snomed.info/id/767524001
88 http://snomed.info/id/1142141006
89 http://snomed.info/id/1142140007

As described in the MRCM rules, for practical and pragmatic reasons the additional ingredient count attributes have to be applied iteratively based on requirement.

7.9 Clinical Drug (precisely) (concentration strength)

7.9.1 Definition of Clinical Drug (precisely) (concentration strength)

An abstract representation of a medicinal product based on description of 1) its precise active ingredient substances only and explicitly, 2) the stated basis of strength substance(s) with strength, expressed as concentration strength and 3) with its manufactured dose form (with the exception of reconstituted oral liquid preparations, where the administrable dose form is be used as it is the most clinically relevant),

This is used for product types such as cutaneous semi-solids (without metered actuation), bulk powders and granules, topical liquids (without metered actuation) including drops, oral liquids and drops, nebuliser liquids and liquid parenteral products.

7.9.2 Example diagrams for CD (precisely) concentration strength

Stated template view:

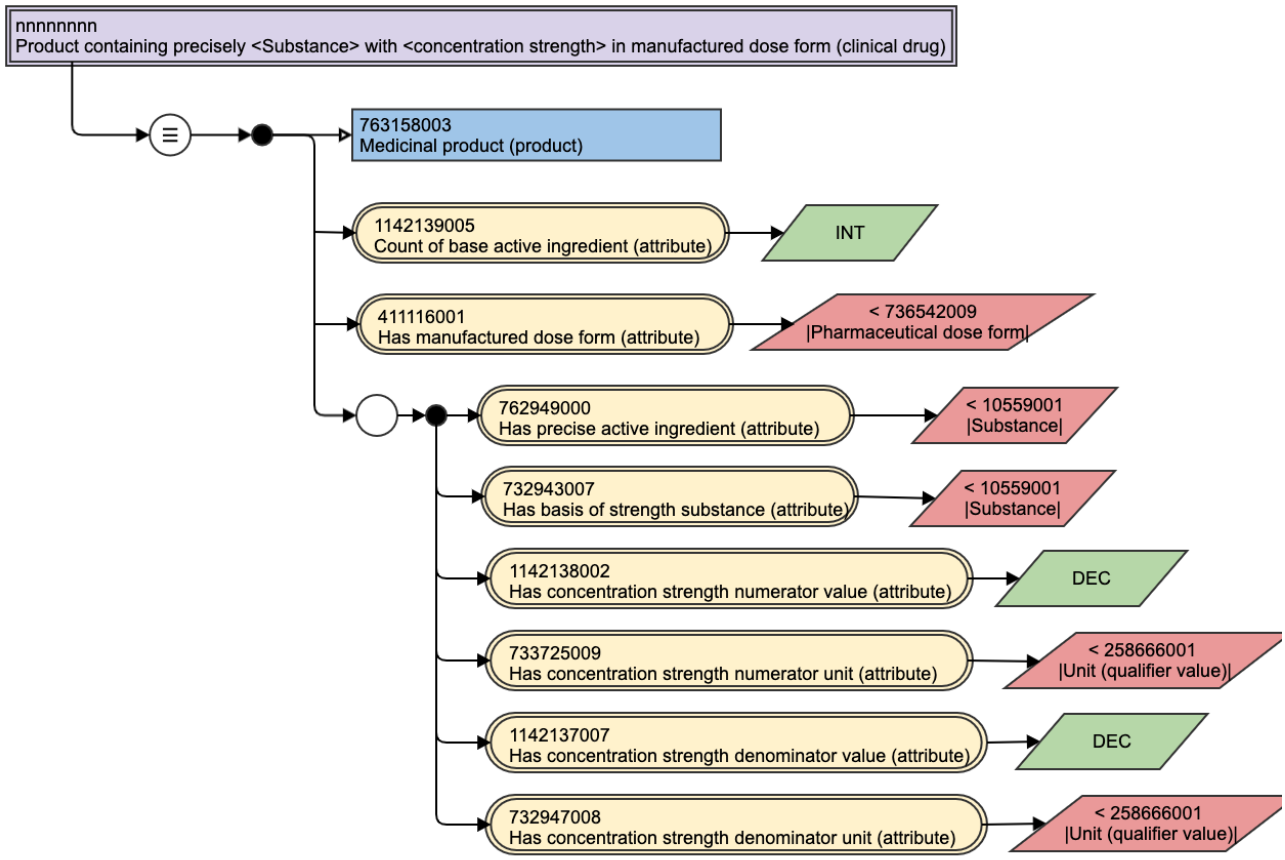

Figure 43: Clinical drug, concentration strength, stated template view

Examples: single active ingredient product: stated view followed by the inferred view that shows the proximal parent concepts associated with the product:

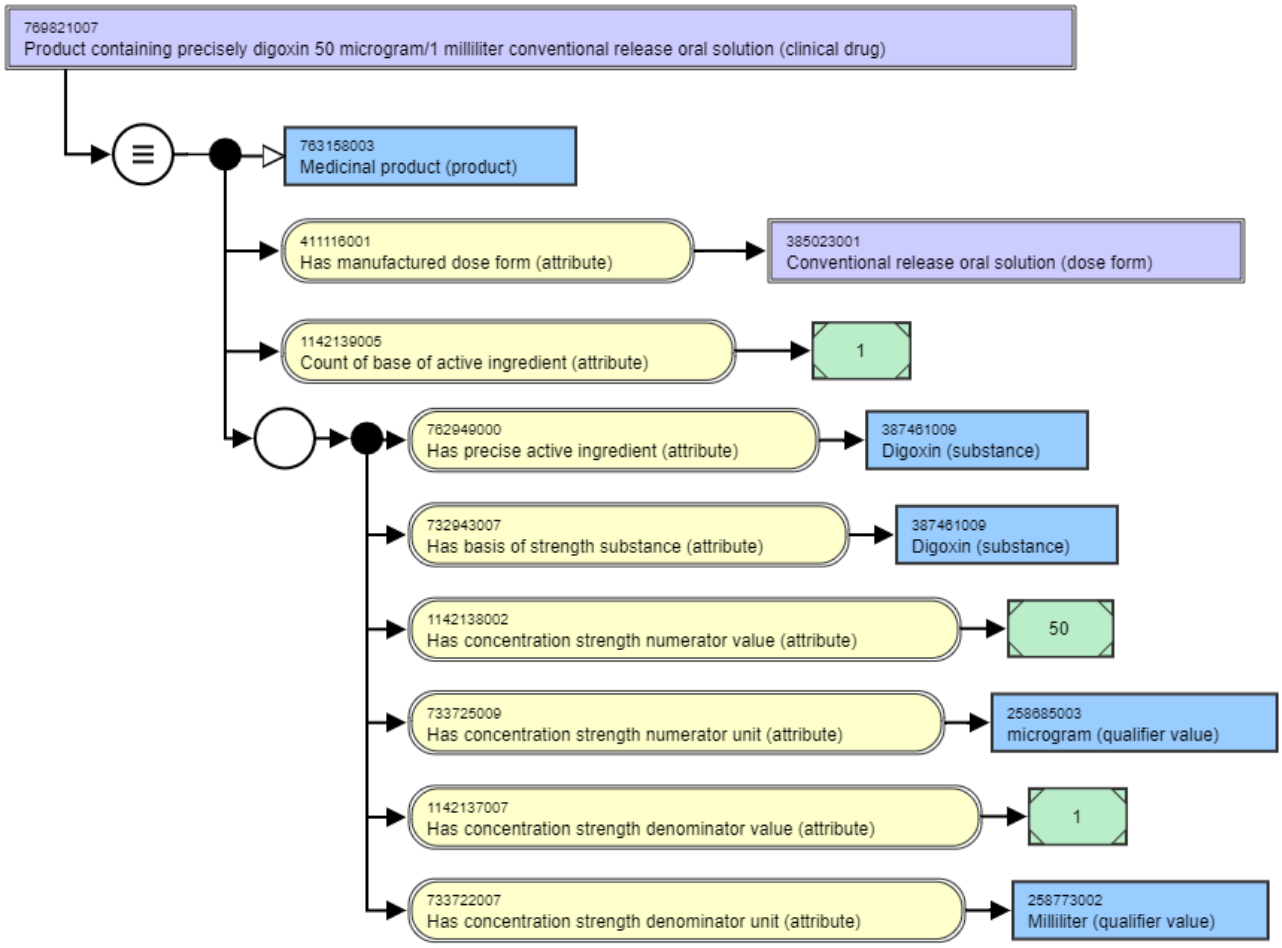

Figure 44: Clinical drug, concentration strength, example stated view

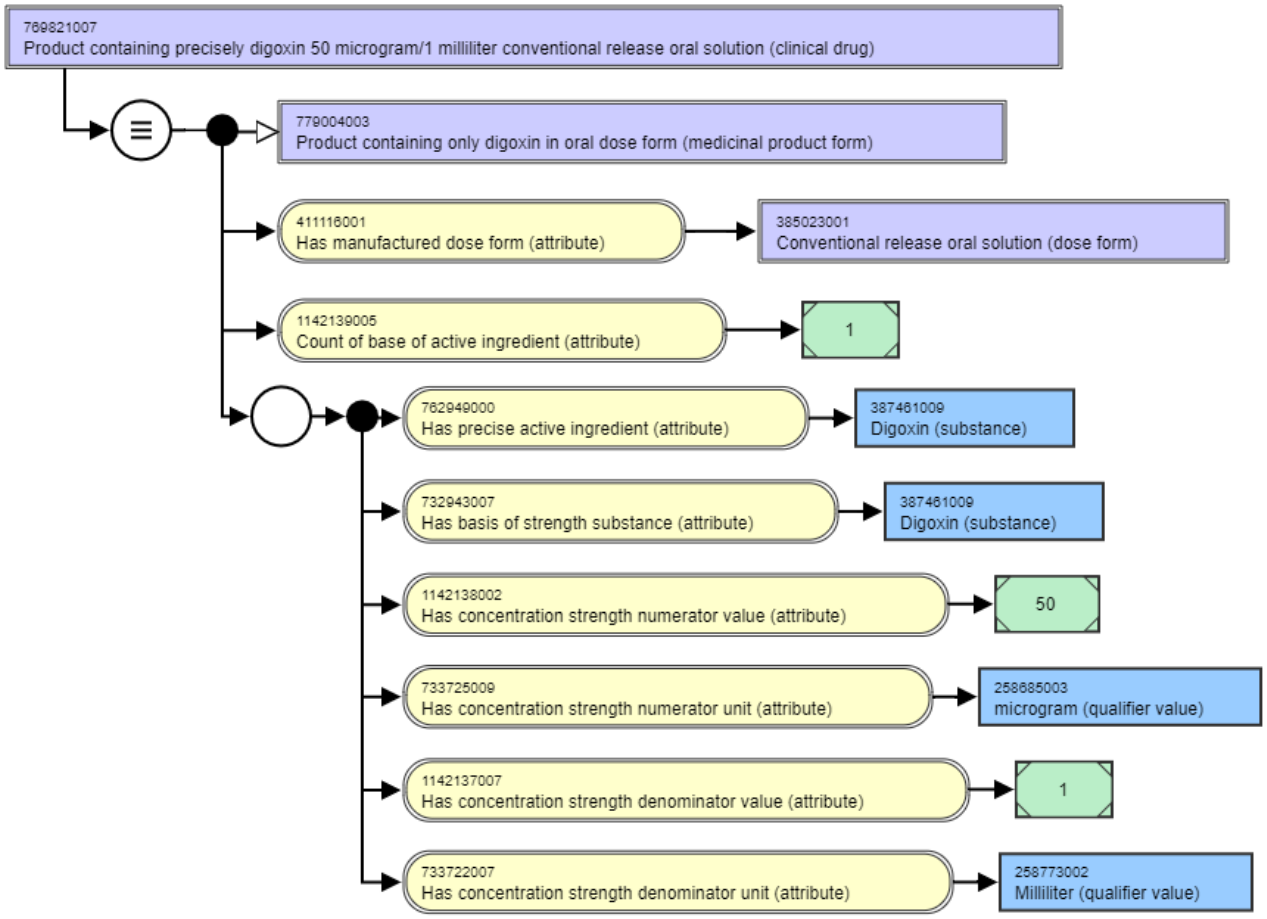

Figure 45: Clinical drug, concentration strength, example inferred view

7.9.3 Attributes of CD (precisely) (concentration strength)

The Clinical Drug (CD precisely) (concentration) concept is defined by two attributes and a set of substance/ strength attributes; a Clinical Drug described only by concentration strength does not have a unit of presentation:

Semantic tag	(clinical drug)
Definition status	• 900000000000073002 |Sufficiently defined concept definition status|[90] **Exceptions** • None identified

90 http://snomed.info/id/900000000000073002

Attribute 411116001 |Has manufactured dose form|[91]		**Range** • < 736542009 |Pharmaceutical dose form|[92] **Cardinality** • 1..1 **Notes** • This is the finished dose form that a medicinal product is presented in by the manufacturer, before any transformation into an administrable dose form has taken place
Attribute 1142139005 | Count of base of active ingredient|[93]		**Range** • INT (integer) **Cardinality** • 1..1 **Note** • This attribute provides the number of base active ingredient substances present in the medicinal product
Role Group [1..*] One role group is required for each precise active ingredient	**Attribute** 762949000 | Has precise active ingredient|[94]	**Range** • < 105590001 |Substance|[95] **Cardinality** (within role group) • 1..1 **Notes** • This is a precise active ingredient substance that the concept contains. • In each role group, only one precise active ingredient substance is stated

91 http://snomed.info/id/411116001
92 http://snomed.info/id/736542009
93 http://snomed.info/id/1142139005
94 http://snomed.info/id/762949000
95 http://snomed.info/id/105590001

	Attribute 732943007 | Has basis of strength substance|[96]	**Range** • < 105590001 |Substance|[97] **Cardinality** (within role group) • 1..1 **Notes** • This is the basis of strength substance that the concept uses. • In each role group, only one precise active ingredient substance is stated. • The basis of strength substance is always stated explicitly, even when it is the same as the precise active ingredient substance
	Attribute 1142138002 | Has concentration strength numerator value|[98]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 733725009 | Has concentration strength numerator unit|[99]	**Range** • < 767524001 |Unit of measure (qualifier value)|[100] **Cardinality** (within role group) • 1..1
	Attribute 1142137007 | Has concentration strength denominator value|[101]	**Range** • DEC (decimal) **Cardinality** (within role group) • 1..1
	Attribute 733722007 | Has concentration strength	**Range** • < 767524001 |Unit of measure (qualifier value)|[103] **Cardinality** (within role group) • 1..1

96 http://snomed.info/id/732943007
97 http://snomed.info/id/105590001
98 http://snomed.info/id/1142138002
99 http://snomed.info/id/733725009
100 http://snomed.info/id/767524001
101 http://snomed.info/id/1142137007
103 http://snomed.info/id/767524001

	denominator unit[102]

For concepts that have two or more active ingredient substances that are modifications of the same base substance **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142141006 |Count of base and modification pair[104]	**Range** • INT (integer) **Cardinality** • 1..1

For concepts that have two or more active ingredient substances that are modifications of the same base active ingredient substance (i.e. parent ingredient substance) **and** where one is a further modification of the other (for example, a multi-ingredient product containing both dexamethasone phosphate and dexamethasone sodium phosphate, where the dexamethasone phosphate is a modification of dexamethasone (base) and dexamethasone sodium phosphate is a further modification of the dexamethasone phosphate) **and where** MP precisely concepts are required, and for single ingredient product concepts where the active substance is an ingredient in these multiple modification multi-ingredient products, the following extra ingredient count attribute will be required n order to support correct relationships generated by the MRCM:

Attribute 1142140007 |Count of active ingredient[105]	**Range** • INT (integer) **Cardinality** • 1..1

As described in the MRCM rules, for practical and pragmatic reasons the additional ingredient count attributes have to be applied iteratively based on requirement.

7.10 Other Clinical Drug Grouping Concepts not present in this model or in the international edition

Clinical Drug concepts in the international release are defined by their precise active ingredient substance(s) and their basis of strength substance, as described above. A concept that grouped clinical drugs by their strength and basis of strength substance only (i.e. disregarding the precise active ingredient substance) may be appropriate in some contexts in national extensions (e.g. 'amlodipine 10mg conventional release oral tablet' as a concept with three child concepts 'amlodipine (as amlodipine besiliate) 10mg conventional release oral tablet' and 'amlodipine (as amlodipine mesiliate) 10mg conventional release oral tablet' 'amlodipine (as amlodipine maleate) 10mg conventional release oral tablet'. A Clinical Drug grouping concept of this nature would be a "Basis of Strength Substance Clinical Drug" concept as opposed to a "Clinical Drug containing Precisely" concept.

102 http://snomed.info/id/733722007
104 http://snomed.info/id/1142141006
105 http://snomed.info/id/1142140007

7.11 IDMP Compatibility

Although a Clinical Drug might look directly compatible with the IDMP concept of "Manufactured Item", in IDMP, a Manufactured Item is an "actual manufactured item (the tablet, liquid, cream contained within the package) as it is delivered from the manufacturer but before any transformation, if applicable, for administration to or use by the patient"; it is therefore a representation of a real entity, rather than an abstract entity. They are therefore not directly compatible classes of entities. A Manufactured Item is described by substances in a variety of roles, including excipient substances, not just its active substance(s) and their strengths. A Manufactured Item can be related to an appropriate Clinical Drug on the basis of its **active** ingredient substance(s) and relevant strength so that the Clinical Drug being an abstracted representation of the Manufactured Item, but they are not equivalent. The Manufactured Item concept in IDMP is equivalent to the Real Clinical Drug concept of the SNOMED national extension model.

On the basis that the IDMP concept of a Pharmaceutical Product could be defined by substance(s) playing only an active ingredient role, then the Clinical Drug concept is more directly compatible with the IDMP Pharmaceutical Product concept however if it is intended that the IDMP Pharmaceutical Product does include excipient substances, then there is no compatibility. Even then, the IDMP Pharmaceutical Product concept is clear that the dose form attribute is populated by the *administrable* dose form rather than the manufactured dose form, whereas, for everything other than products presented as reconstituted oral liquids, the Clinical Drug uses the *manufactured* dose form. Although for probably the majority of medicinal products the manufactured dose form is also the administrable dose form, for the minority for which this is not the case (for example, parenteral products presented as powders or granules that must be dissolved or dispersed prior to administration to the patient) this difference is significant. It is therefore not possible to state any direct class level equivalence between a Clinical Drug and an IDMP Pharmaceutical Product.

There is some compatibility between an IDMP PhP4 concept and a Clinical Drug. However, It is not (yet) clear as to how the "active substance - strength" description will be described in IDMP implementation. The SNOMED Clinical Drug is explicit in stating the basis of strength substance in its relevant granularity as required for patient care; IDMP is currently less clear as to how that will be done and what effect that will have on the description of a Pharmaceutical Product. In addition, IDMP allows for "active substance - strength" to be described by using either (and possibly even both) a Substance and Specified Substance. The distinction between Substance and Specified Substance in IDMP is thus: a substance is "any matter of defined composition that has discrete existence, whose origin may be biological, mineral or chemical" whereas a Specified Substance is one that is "defined by groups of elements that describes multi-substance materials or specifies further information on substances relevant to the description of Medicinal Products". Specified substances are substances like simeticone, which are mixture substances, or substances that are defined by pharmacopoeial specification (like water for injection) or substance where a particular manufacturing process is specified (as for biosimilar products). For SNOMED CT, all such substances, with the possible exception of 'water for injection') could be present in the Substance hierarchy and are therefore candidate concepts to be used in the ingredient role attributes of concepts in the Medicinal Product hierarchy; as such the IDMP distinction between Substance and Specified Substance has no material effect.

8 Attribute Concepts

The following sections describe the attribute concepts used to represent the defining properties of concepts in the medicinal product hierarchy.

8.1 Ingredient Substance Attributes

The following sections discuss the attribute concepts used to represent the ingredient substances of concepts in the medicinal product hierarchy.

8.1.1 **Ingredient Substances**

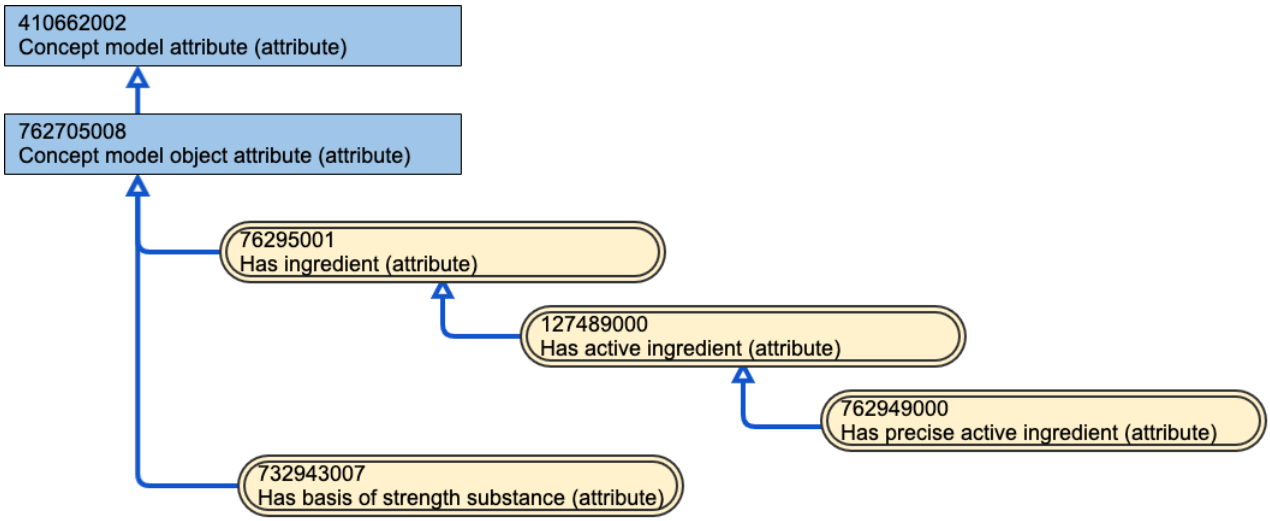

Figure 46: Ingredient role attributes

The diagram above shows the relationship of the various attribute roles that a substance can play in the definition of MP, MPF and CD description of medicinal products. Any concept from the Substance hierarchy may play one or more of these roles within a product. In all of the descriptions below, when the phrase "a set of substances" is used, the set may have only one member.

8.1.1.1 **Has ingredient**

A medicinal product concept has a set of substances that are combined to manufacture the medicinal product that can be described using the "has ingredient" attribute. However, each substance(s) in the "has ingredient" set will have more specific ingredient role that should be described using that more specific concept. Therefore, this is a grouping concept that is not used for definition of medicinal product concepts in the medicinal product hierarchy; it is a parent concept and it provides scope for further child concepts to be added to support future use cases, such as the description of inactive/excipient ingredient substances in products in a national extension. The physical

presence or otherwise of an ingredient substance in the finished product may not explicitly be necessary for it to be part of the product's substance description; for example substances that play a role in the manufacturing process, such as solvents etc. are deemed "ingredients" for the product; their presence may or may not remain in the manufactured item. As such, basis of strength substance could be considered as a child concept of the Has ingredient concept, although it is not modelled in that way currently.

8.1.1.2 **Has active ingredient**

A medicinal product concept has a set of active ingredient substance(s) responsible for providing the therapeutic effect of the medicinal product and which are described using the clinically relevant part or whole of the substance that is intended to have a therapeutic action on or within the body. In the majority of cases, this description excludes modifiers such as esters, salts or other non-covalent derivatives (such as a complex, chelate etc.), but may include them in the minority of cases when clinically significant (e.g. liposomal substances). This is therefore usually an abstract representation of the active ingredient substance(s) and is used in more abstract representations of medicinal products, such as MP (containing).

Note that "clinical significance" can be described as "something that has a practical, demonstrable effect on the treatment and condition of the patient". For example: different modifiers of a particular active moiety have clinical significance if they affect the potency of the therapeutic action of the moiety (and therefore have an affect on the dose quantities to be used). See Kazdin, E The Meanings and Measurement of Clinical Significance *Journal of Consulting and Clinical Consulting* 67 (3): 332–9 (see page 0)
This is the attribute role that is used in the definition of the MP concept (containing and only) and the MPF concept. Examples of substances playing the role of active ingredient in a medicinal product:

- azithromycin where the precise active ingredient may be azithromycin hemiethanolate, azithromycin isopropanolate
- haloperidol where the precise active ingredient may be haloperidol hydrochloride, haloperidol decanoate, haloperidol lactate
- esomeprazole where the precise active ingredient may be esomeprazole magnesium, esomeprazole sodium
- oxybutynin where the precise active ingredient may be oxybutynin chloride or oxybutynin xinafoate
- diclofenac where the precise active ingredient may be diclofenac sodium, diclofenac potassium, diclofenac diethylamine
- axitnitib where the precise active ingredient substance is also axitinitib

8.1.1.3 **Has precise active ingredient**

A medicinal product concept has a set of precise active ingredient substance(s), those substance(s) that provides the therapeutic effect of the medicinal product and which are described using the fullest and most specific description of the substance *as it is used in the product(s) that the concept represents* (as they are presented by the manufacturer in the manufactured dose form, before any dilution or transformation). The precise active ingredient substance may include various modifiers, such as salts, esters and/or polymers (e.g. pegylation); not all substances, even when used as the precise active ingredient substance, have a modification (see axitnitib). This is the attribute role that is used in the definition of the MP (precisely) concept, and in the definition of the CD (precisely).
Examples:

- azithromycin hemiethanolate monohydrate
- haloperidol decanoate
- esomeprazole magnesium dihydrate
- oxybutynin chloride
- paroxetine hydrochloride isopropyl solvate
- dexamethasone sodium phosphate
- sorafenib tosylate
- axitinib

The precise active ingredient attribute will use the Substance hierarchy as a flat list (without role chaining), so that a Clinical Drug containing a modified substance is not subsumed under a clinical drug containing the unmodified substance, thereby unintentionally adding more recursion to the clinical drug class (for example: so that a morphine (base) precise clinical drug does not subsume a clinical drug containing precisely morphine sulphate). This highlights the difference between the semantic of "contains precisely" which explicitly and exclusively describes the full modified substance in the medicinal product concept and "contains only" which inclusively describes the therapeutically active moiety which may be manifest in one or more substance modifications of itself.

Examples:

- "contains dexamethasone only" means that a product will contain only dexamethasone as its active ingredient; but that dexamethasone may be present as dexamethasone base, as dexamethasone phosphate, dexamethasone sodium phosphate, as dexamethasone acetate, as dexamethasone palmitate etc.
- "contains dexamethasone phosphate only" means that a product can contain either dexamethasone phosphate or dexamethasone sodium phosphate (which is a modification of dexamethasone phosphate) as its active ingredient; but it will not contain dexamethasone acetate or dexamethasone palmitate etc.
- "contains dexamethasone phosphate precisely" means that a product will contain exclusively dexamethasone phosphate; dexamethasone sodium phosphate will not be present

See also the subsection below "Using the ingredient roles" which provides a diagram further describing the use of role chaining with the active ingredient role and that there is no role chaining for the precise active ingredient role.

8.1.1.4 **Basis of strength substance**

A medicinal product clinical drug concept has one or more substances that have the role of being the substance against which the strength quantity(s) of the product(s) are measured. There will be a basis of strength substance stated for each active ingredient substance present in a multi-ingredient clinical drug product.

Examples:

- azithromycin - in an oral suspension containing azithromycin hemiethanolate, where the strength is 100 mg per 5 mL of azithromycin
- haloperidol in a solution for injection containing haloperidol decanoate, where the strength is 250 mg per 5 mL of haloperidol
- esomeprazole - in a prolonged release tablet containing esomeprazole magnesium, where the strength is 20 mg per tablet of esomeprazole
- oxybutynin chloride – in an oral tablet containing oxybutynin chloride, where the strength is 5 mg per tablet of oxybutynin chloride
- paroxetine – in an oral tablet containing paroxetine hydrochloride, where the strength is 10 mg per tablet of paroxetine
- dexamethasone phosphate – in a solution for injection containing dexamethasone sodium phosphate, where the strength is 4 mg per 1 mL of dexamethasone phosphate
- diclofenac sodium – in a gastro-resistant tablet containing diclofenac sodium, where the strength is 25 mg per tablet of diclofenac sodium
- sorafenib – in an oral tablet containing sorafenib tosylate, where the strength is 200 mg per tablet of sorafenib

Almost always, the basis of strength substance is either the active ingredient substance or the precise active ingredient substance; very occasionally products are licensed using a "reference" basis of strength substance (e.g. a product containing diclofenac diethylammonium as its precise active ingredient substance having its strength expressed in terms of diclofenac sodium).

8.1.1.5 Using the ingredient role

The Medicinal Product and Medicinal Product Form use the active ingredient attribute, which will have a role chain attached to it, so that it can use the Substance hierarchy as a hierarchy through the "is modification" relationship. This allows the classifier to make the appropriate relationships between MPs, MPFs and CDs based on their active ingredient substances. The role chain is a characteristic that is not inherited, so the precise active ingredient attribute does not inherit this characteristic. The Clinical Drug uses the precise active ingredient attribute/ relationship which will use the Substance hierarchy as a flat list without role chaining, so that a clinical drug containing a modified substance is not subsumed under a clinical drug containing the unmodified substance, thereby unintentionally adding more recursion to the clinical drug class (for example: so that a morphine (base) precise clinical drug does not subsume a clinical drug containing precisely morphine sulphate).

Gliffy Macro Error

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- **Name:** Ingredient substance role chaining

Figure 47: Ingredient role chaining

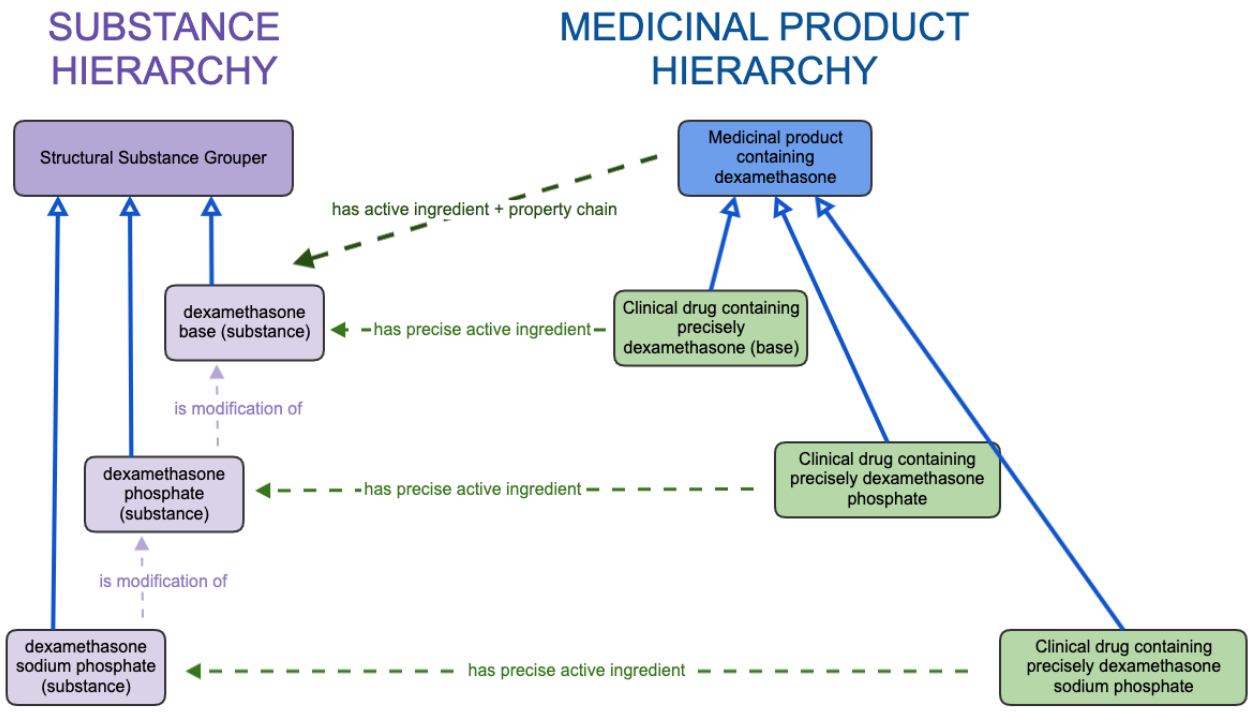

Figure 48: Ingredient role chaining example

8.1.1.6 IDMP Compatibility

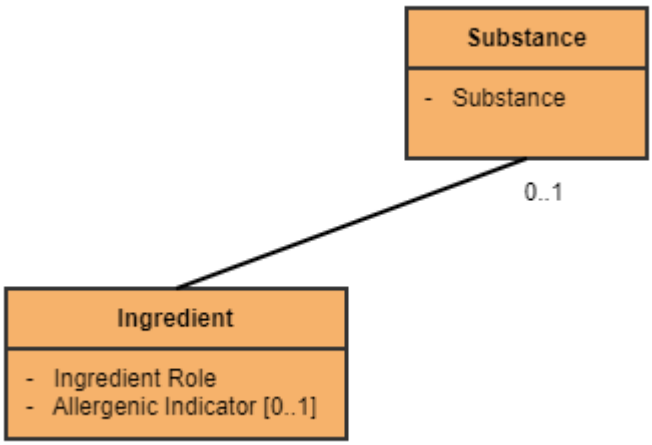

Figure 49: Ingredient role in ISO 11615 of IDMP

Ingredient role is a specific attribute in ISO 11615 in IDMP, but no vocabulary/value set was specified in the conceptual standard for the ingredient roles. Examples that have been given include "active", "inactive" and "adjuvant". This supports the regulatory listing of all the substances present in a product, with their basic role (therapeutic or otherwise).

The explicit use of ingredient roles in the medicinal product model is compatible with the IDMP conceptual model; however, the relationship of ingredient role to substance strength is still being elucidated in IDMP. Note that the concept of "basis of strength substance", in the very few cases where it is not actually a substance present in the product, is managed by the use of the Reference Substance class in IDMP. See also IDMP Compatibility for Clinical Drug (Clinical Drug (CD)(see page 36)).

8.2 Ingredient Strength Attributes

The following sections describe the attribute concepts used to represent the ingredient strength of concepts in the medicinal product hierarchy.

8.2.1 Describing Medicinal Product Strength - Presentation and Concentration Strength

"Medicinal product strength" is not well defined in standards. It is closely aligned with "potency" which in pharmacology describes the measurement or calculation of the therapeutic activity of the medicine; this is expressed in terms of the amount of medicine required to produce an effect of given intensity.

Strength is a ratio type concept: expressing the amount of something against another amount of something, which in practical terms is expressed fractionally using the numerator and denominator quantities and their relevant units. The numerator represents how much of the active ingredient substance there is, and the denominator represents the "whole" that the numerator amount is present in.

For a medicinal product, therefore, the strength is:

> *the amount of (active) substance (in the form of) the basis of strength substance* ***in one instance of "a whole" of medicinal product***

It is the "*one instance of "a whole" of medicinal product*" that causes the difficulty. It is not possible to have a single pattern for what this means for all types of medicinal products. Therefore, the consensus for all medicinal product terminology is to define the pattern for each type of product and apply it consistently. In addition, because historically, there has been a difference in how to develop and apply these patterns, a differentiation has developed

between two types of representation "presentation strength" and "concentration strength", which are best expressed explicitly.

Presentation strength

Presentation strength is the amount of the basis of strength substance present in the unit of presentation of or in the volume (or mass) of the single clinical drug being represented.

Concentration strength

Concentration strength is the amount of the basis of strength substance present per unitary amount (volume, mass) of the single clinical drug being represented.

These two options may be used separately, as they are in this international model specification but can also be used together (as may be used in national extensions), thereby producing three patterns for how medicinal product strength can be described. The place of unit of presentation to provide the "bounding" and to support the description of "a whole" for the medicinal product is described in detail in its own section below.

8.2.1.1 Use of concentration strength and presentation strength

Description of strength is a safety issue. Mindful that SNOMED CT international edition is primarily a reference terminology not an interface terminology, it is still important that the description of product strength should be that which is least confusing for national extensions to use and build out from. Presentation strength is deemed by patient safety agencies to be the least confusing for the majority of types of products so should be provided whenever possible. However, to avoid combinatorial explosion and to have realistic maintenance processes for the international editioncontent, some types of products that could be described with both presentation and concentration strength will be described with concentration strength only.

8.2.1.2 Table of Strength Patterns

Strength Pattern	Product Types	Unit of Presentation	Presentation Strength (logical)	Presentation Strength (usual description)	Concentration Strength	Example (not necessarily to SNOMED FSN pattern)
Pattern 1a Unit of presentation draws from/bounded as the basic dose form	tablets, capsules, pessaries, suppositories etc.	The basic solid dose form e.g. "tablet"	Mass amount per 1 unit of presentation e.g. "5 mg per tablet	Mass amount only; the “per” is implicit e.g. "5 mg"	The weight of one finished dose form (including excipients) is rarely known so concentration strength is not usually available Not deemed of any clinical significance	Bendroflumethiazide 5mg conventional release oral tablet

Strength Pattern	Product Types	Unit of Presentation	Presentation Strength (logical)	Presentation Strength (usual description)	Concentration Strength	Example (not necessarily to SNOMED FSN pattern)
Pattern 1b Unit of presentation bounds as a continuous basic solid dose form	sachets, ampoules or vials *containing* powders or granules etc.	The "intimate container" e.g. "vial"	Mass amount per 1 unit of presentation e.g. "2 g per vial"	Mass amount, with the "per" either implicit or explicit e.g. "2 g per vial" or just "2 g"	The concentration strength is not usually available (total amount of solid, including excipients not known) Not deemed of any clinical significance	Cefotaxime 2g (per vial) powder for solution for injection
Pattern 1c Unit of presentation bounds continuous basic dose form using a metered dose valve	pressurised inhalers, cutaneous sprays, nasal sprays etc.	Actuation	Mass amount per 1 unit of presentation e.g. "100 mcg per actuation"	Mass amount, with the "per" explicitly stated e.g. "100 mcg per actuation"	The concentration of product (usually liquid) inside the metered delivery system may be known (to the regulatory agency) but is Not deemed of any clinical significance	Beclometasone dipropionate 100 mcg per actuation pressurised inhalation
Pattern 2a - *not used in the international release, may be used in national extensions* Unit of presentation bounded by the intimate container, which contains a volume of a liquid dose form	parenteral liquids, unit dose nebuliser solutions etc.	The "intimate container" "e.g. "ampoule"	Mass amount per volume contained in the unit of presentation e.g. "100 mg per 20 mL"	Mass amount per volume the "per" is explicitly stated e.g. "100 mg per 20 mL"	Mass amount per unitary volume e.g. "5 mg per (1) mL"	Metoclopramine hydrochloride 100 mg per 20 mL solution for injection ampoule

Strength Pattern	Product Types	Unit of Presentation	Presentation Strength (logical)	Presentation Strength (usual description)	Concentration Strength	Example (not necessarily to SNOMED FSN pattern)
Pattern 2a - *not used in the international, may not be used in national extensions either, depending on culture and use case(s)* Unit of presentation is an "external volume delivery device" (as opposed to a metering valve that is integral to the presentation of the medicinal product)	oral liquids	"Volume delivery device" e.g. "5 mL (medicine spoon)"	Mass amount per volume contained in the unit of presentation e.g. "100 mg per 5 mL"	Mass amount per volume the “per” is explicitly stated e.g. "100 mg per 5 mL"	Mass amount per unitary volume e.g. "40 mg per (1) mL"	Aciclovir 200mg/5mL oral suspension
Pattern 3a Unit of presentation exists, but clinically relevant strength is concentration strength (as a proxy for rate)	transdermal patches	The "intimate container" e.g. "patch"	Mass amount per unit of presentation e.g. "20.4 mg per patch" Not deemed of any clinical significance	NA	Mass amount per unitary volume/time e.g. "100 mcg per (1) hour"	Fentanyl 100 mcg per hour transdermal patch
Pattern 3a Unit of presentation exists, but clinically relevant strength is concentration strength	insulins	The "intimate container" e.g. "cartridge"	Mass amount per unit of presentation e.g. "150 units per cartridge" Not deemed of any clinical significance	NA	Mass amount per unitary volume e.g. "100 unit per (1) mL"	Insulin human soluble 100 unit / mL solution for injection

Strength Pattern	Product Types	Unit of Presentation	Presentation Strength (logical)	Presentation Strength (usual description)	Concentration Strength	Example (not necessarily to SNOMED FSN pattern)
Pattern 3a Unit of presentation exists, but clinically relevant strength is concentration strength	bulk parenteral solutions	The "intimate container" e.g. "bag"	Mass amount per unit of presentation e.g. "450 mg per 500 mL" Not deemed of any clinical significance	NA	Mass amount per unitary volume e.g. "9 mg per 1 mL" *Synonym: 0.9% w/v*	Sodium chloride 0.9% solution for infusion
Pattern 3a Unit of presentation exists, but is not stated, concentration strength used	parenteral liquids, unit dose nebuliser solutions etc.	The "intimate container" e.g. "ampoule"	Mass amount per volume contained in the unit of presentation e.g. "100 mg per 20 mL"	Mass amount per volume the “per” is explicitly stated e.g. "100 mg per 20 mL"	Mass amount per unitary volume e.g. "5 mg per (1) mL"	Metoclopramide hydrochloride 5 mg per 1 mL solution for injection ampoule
Pattern 3b Continuous presentation; no unit of presentation exists	cutaneous semi-solids (without metered actuation)	Does not exist			Mass amount per unitary mass/volume e.g."10 mg per 1 g" *Synonym: 1 % w/w*	Hydrocortisone 1% cutaneous cream
Pattern 3b Continuous presentation; no unit of presentation exists	bulk powders and granules	Does not exist			Mass amount per unitary mass/volume e.g."620 mg per 1 g" *Synonym: 62 % w/w*	Sterculia 62% oral granules

Strength Pattern	Product Types	Unit of Presentation	Presentation Strength (logical)	Presentation Strength (usual description)	Concentration Strength	Example (not necessarily to SNOMED FSN pattern)
Pattern 3b Continuous presentation; no unit of presentation exists	topical liquids (without metered actuation)	Does not exist			Mass amount per unitary mass/volume e.g."5 mg per 1 mL" *Synonym: 0.5 % w/v*	Chloramphenicol 0.5% eye drops
Pattern 3b Continuous presentation; no unit of presentation exists	oral liquids/ drops	Does not exist			Mass amount per unitary mass/volume e.g."50 mcg per 1 mL"	Digoxin 50 mcg per 1 mL oral drops, solution

8.2.1.3 Use of Product Strength patterns for Clinical Drug concepts in the international edition

Clinical drug concepts using pattern 1 will be present in the international edition as will clinical drugs using strength pattern 3. Clinical drugs using strength pattern 2 may be authored in national extensions.

8.2.1.4 IDMP Compatibility

IDMP (and in particular (ISO 11615 section 9.7.2.4) is clear that strength "can be expressed in two ways: strength (presentation) and strength (concentration)" and it uses both in parallel within the standard. Presentation strength is generally required for description of manufactured items, whereas concentration strength may be optionally provided. When describing the strength of a pharmaceutical product that has undergone a transformation (e.g. dissolution or dispersion), the strength is specified as it would occur "when the transformation undertaken exactly in accordance with the regulated product information". It is not clear whether, if the regulated product information provides alternative transformations, more than one pharmaceutical product would be authored. Since the Medicinal Product model does not intend to represent a transformed product using the administrable dose form when this is different, primarily because of this type of uncertainty, this issue can be put aside.
IDMP has the concept of "Reference Strength" to explicitly describe the difference between the precise active ingredient substance and the basis of strength substance, or to support description of strength in alternative units. The Medicinal Product model supports basis of strength substance explicitly, and therefore is compatible with IDMP, and because alternative descriptions (synonyms) are a core part of the SNOMED structure, alternative strength representations could be provided if required (e.g. adrenaline 1:1000 rather than 1 mg per mL).

See also the IDMP Compatibility part of the Clinical Drug section. (Clinical Drug (CD)(see page 36)).

Measurement Point

ISO 11615 in IDMP introduces the concept of "measurement point" for strength in some products, usually those with a metered dosage value system, for example the strength of the active ingredient substance in some inhaler products is measured at a particular distance from the point of aerosolisation. Using a strength measurement point

is currently something that is country-specific (although regulation may change to make it more standardized as its use becomes more widespread). In the international core, it may become important to specify the measurement point for the strength of some products to allow national extensions to select the correct concept for their use, since it would appear that differences in measurement point between otherwise similar products can be clinically significant. Measurement point is currently not explicitly described in the international release. This is a developing area and will be kept under review.

8.3 Ingredient Count Attributes

The following sections describe the attribute concepts that are used to represent the ingredient counts for all concepts represented using the "closed world view" (the "only" and "precisely" concepts) in the medicinal product hierarchy.

8.3.1 **Ingredient Count**

Ingredient count is the mechanism that the SNOMED CT concept model is using as a proxy to implement a "closed world" view of medicinal products such that a medicinal product concept can be represented as containing only substance X as its active ingredient, and that all more granular child medicinal product concepts also containing only substance X subsume under the correct parent concept(s).

Three count attributes are available for use, but only one is mandatory for all "only" concepts; i.e. MP (only), MP (precisely), MPF (only) and CD). The additional ingredient counts have to be applied iteratively, if and when they are required based on the presence of multi-ingredient concepts which contain active ingredient substances that have modifications of the same base. For new concepts, the count attribute is first authored for Clinical Drug concepts, which have their precise ingredient substance described; the more abstract classes can then be populated upwards using the base (or parent) active ingredient substance if different.

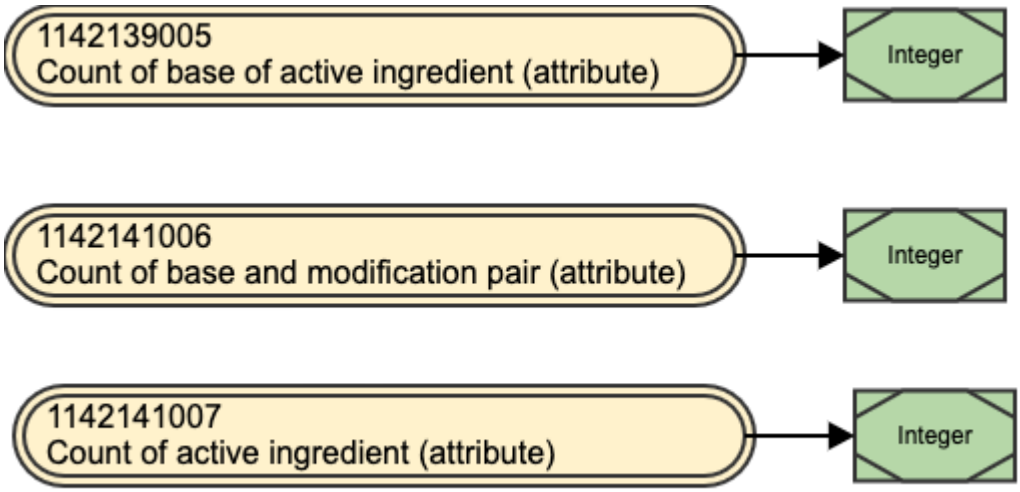

Figure 50: Ingredient count attributes

8.3.1.1 **Count of base of active ingredient - mandatory for the closed world view**

This count is the number of base (or root or main parent) active ingredient substance(s) (as described in the SNOMED CT Substance hierarchy) present in the medicinal product. Base ingredient substances can be identified

from their modifications through the relation "is modification of", traversed iteratively if necessary, until reaching a substance that is not a modification of any other substance.

For all single ingredient products and for the majority of multi-ingredient products, this is the only count information that needs to be described in order to support correct subsumption.

Note: for simplicity, all the intermediate medicinal product form concepts have been omitted from the diagrams and examples.

Example:

Precise active ingredient substance(s)	Base active ingredient substance(s)	Count of base of active ingredient
amlodipine besilate	amlodipine	1
atorvastatin calcium	atorvastatin	1
amlodipine besylate and atorvastatin calcium	amlodipine and atorvastatin	2

The tooling uses these values to produce the correct subsumption hierarchy, as shown diagrammatically below:

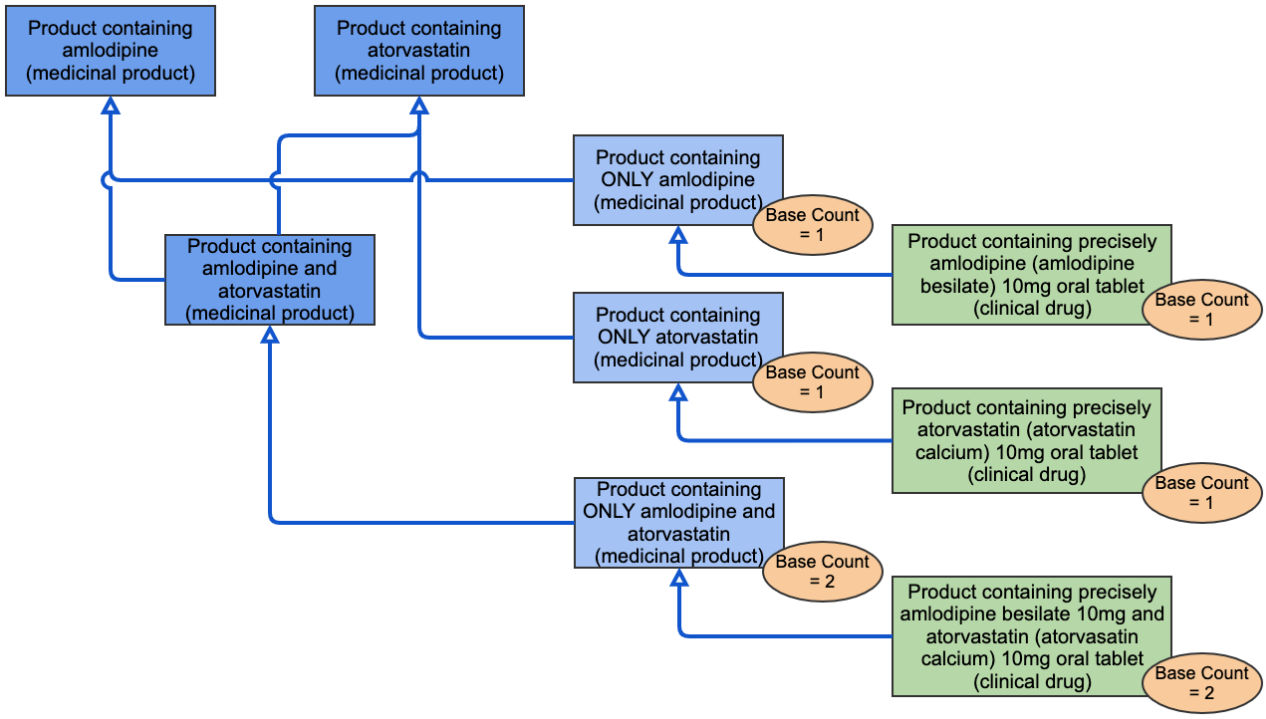

Figure 51: Ingredient count attributes simple multi-ingredient example

The base count facilitates the correct subsumption relationship between the "Product containing only amlodipine and atorvastatin" and the clinical drug that contains only amlodipine and atorvastatin. It avoids the "Product containing only amlodipine and atorvastatin" being incorrectly subsumed by the concept "Product containing only

amlodipine" or by the concept "Product containing only atorvastatin" since a concept of a base count of 1 will not subsume a product with a base count of 2. Similarly the clinical drug concepts containing only amlodipine or only atorvastatin, both of which have a base count of 1, are prevented from being subsumed by the "Product containing only amlodipine and atorvastatin" which has a base count of 2.

8.3.1.2 Count of base and modification pair (closed world view) - optional - to be used in certain circumstances

This count is used for multi-ingredient products where the two (or more) active ingredient substances share the same base active ingredient substance. This will only occur when at least one of the active ingredient substances is a modification of a base active ingredient substance. The count used in addition to the base active ingredient substance count. The count is of how many pairs of base + modification substances are present in the medicinal product; this draws from the Substance hierarchy where concepts are managed using the pattern of base substance with related concepts being modifications (salts, esters, chelates) of the base substance; each modification is therefore a "pair".

Example:

Precise active ingredient substance(s)	Base active ingredient substance(s)	Count of base of active ingredient	Base + modification pair	Count of Base + modification pair
betamethasone sodium phosphate	betamethasone	1	betamethasone + sodium phosphate	1
betamethasone acetate	betamethasone	1	betamethasone + acetate	1
betamethasone sodium phosphate and betamethasone a cetate	betamethasone	1	betamethasone + sodium phosphate betamethasone + acetate	2

Betamethasone sodium phosphate and betamethasone acetate are both modifications of the betamethasone: a phosphorylation and an acetate esterification; however neither are modifications of each other.

The tooling uses these values to produce the correct subsumption hierarchy, as shown diagrammatically below:

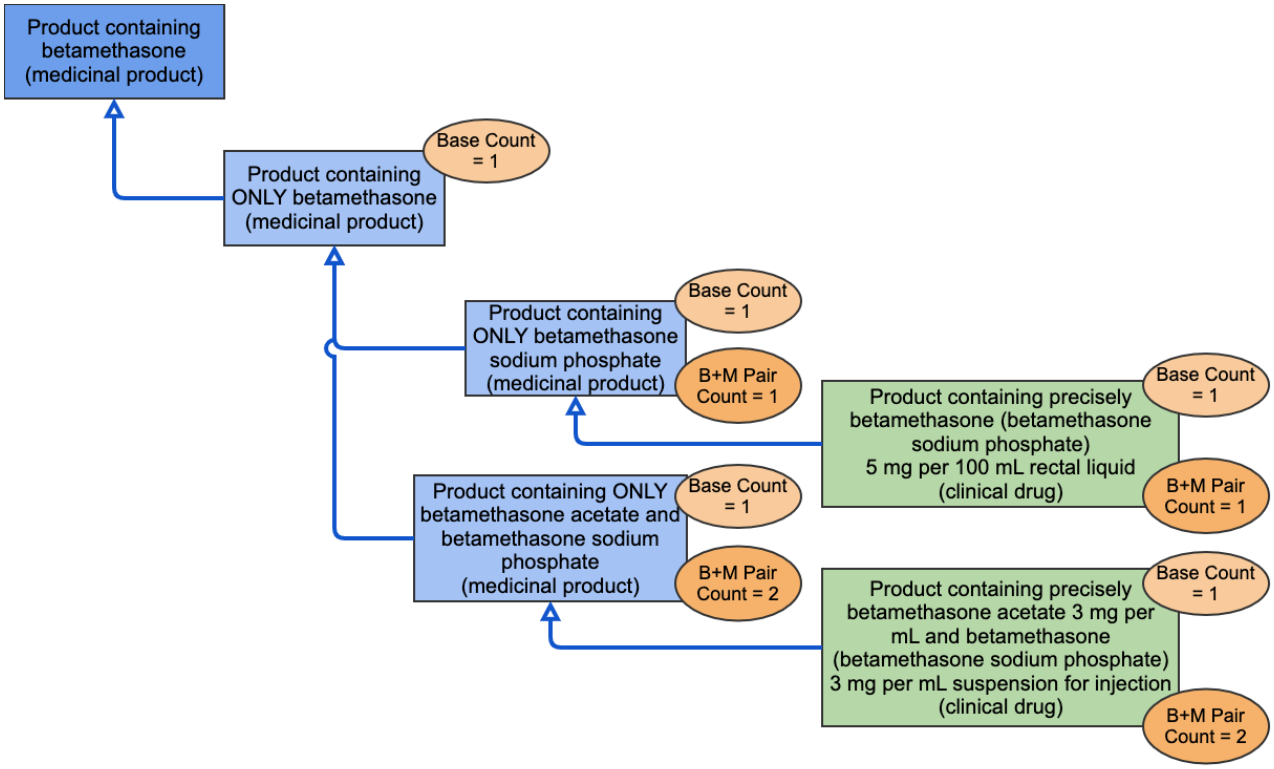

Figure 52: Ingredient count attributes complex multi-ingredient example with multiple modification of a single base active ingredient requiring two ingredient count attributes

Base count alone would not prevent the incorrect subsumption of the "Clinical drug containing precisely betamethasone sodium phosophate and betamethasone acetate" to the parent medicinal product concepts containing only betamethasone sodium phosophate (or only betamethasone acetate - not shown on the above diagram). By adding in the Count of base + modification pair, that incorrect subsumption is avoided and the "Clinical drug containing precisely betamethasone sodium phosophate and betamethasone acetate" is correctly subsumed by just the one parent medicinal product - that "containing only betamethasone sodium phosophate and betamethasone acetate". The (grand)parent medicinal product concept "Product containing only betamethasone" does not (cannot) have a Count of base + modification pair, since it does not have any active ingredient modification described; therefore it can correctly parent medicinal product concepts containing only betamethasone sodium phosophate, containing only betamethasone acetate (not shown) and containing "only betamethasone sodium phosophate and betamethasone acetate", because they all share a base count of 1, relating to betamethasone.

8.3.1.3 Count of active ingredient (closed world view) - optional - to be used in certain circumstances

This count is used for the fairly rare cases of multi-ingredient products where the two (or more) precise active ingredient substance(s) share the same base active ingredient substance and one of those precise active ingredient substances is a modification of another; it is used in addition to the base count and the base + modification pair count. The count is of how many precise active ingredient substance(s) are present in the product (and therefore can be a count of the number of precise active ingredient attributes are present on a concept).

Example:

Precise active ingredient substance(s)	Base active ingredient substance(s)	Count of base of active ingredient	Base + modification pair	Count of Base + modification pair	Count of (precise) ingredient substance(s)
insulin aspart	Insulin	1	insulin + aspart	1	1
insulin aspart protamine	Insulin	1	insulin + aspart protamine	1	1
insulin aspart and Insulin aspart protamine	Insulin	1	insulin + aspart insulin + aspart protamine	1	2

Insulin aspart and insulin aspart protamine are both modifications of insulin; but since Insulin aspart protamine is itself a modification of Insulin aspart, the Base + modification pair count is only equal to 1 (insulin plus 1 modification - the aspart). To get correct subsumption between the Clinical Drug and Medicinal Product concepts in these types of situations, the third count, that of precise active ingredient substance, must be used as well.

The tooling uses these values to produce the correct subsumption hierarchy, as shown diagrammatically below:

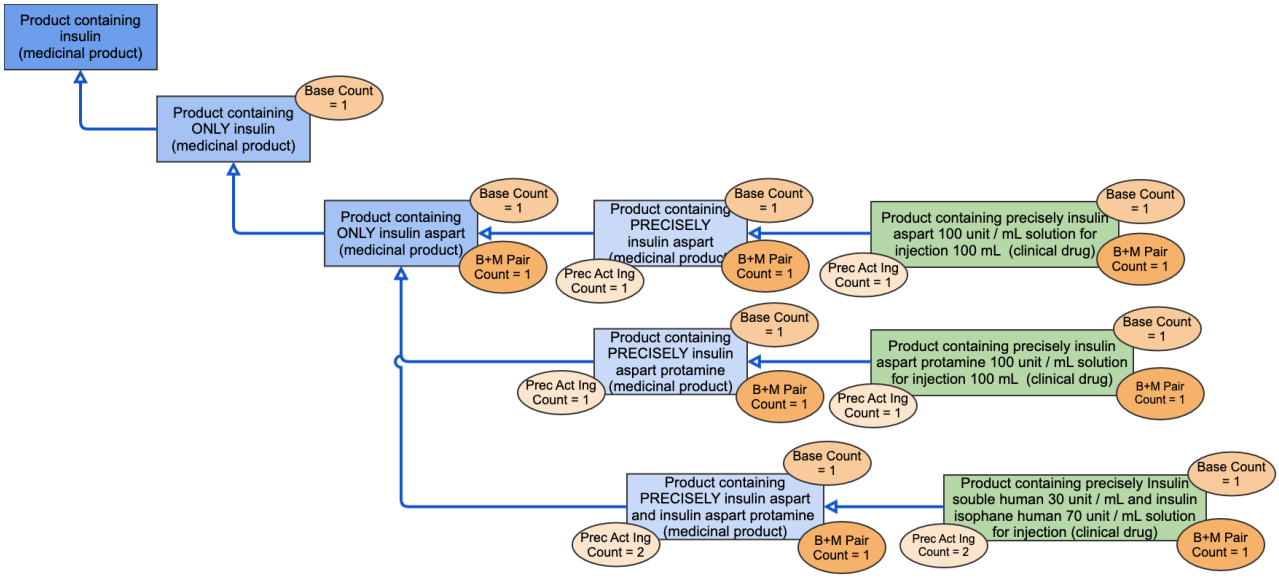

Figure 53: Ingredient count attributes complex multi-ingredient example with multiple modification of a single base active ingredient requiring three ingredient count attributes

Neither base count alone nor base count and base + modification pair count would prevent the incorrect subsumption of the "Clinical drug containing precisely insulin aspart and insulin aspart protamine" because both give a count of 1. The differentiation comes from the counting the precise active ingredient substances. This then gives the (optional in the international release) intermediate parent concepts of "Medicinal product containing

precisely" either "insulin aspart", "insulin aspart protamine" or "insulin aspart and insulin aspart protamine" with their correct clinical drug concepts as children. The MP (precisely) concepts are then correctly subsumed to the (grandparent) MP (only) concept of insulin aspart only, on the basis of the base count of 1.

8.4 Dose Form Attributes

The following sections discuss the attribute concepts that are used to represent the dose form of concepts in the medicinal product hierarchy.

8.4.1 **Describing Dose forms**

A Clinical Drug concept has a pharmaceutical dose form, the physical manifestation of a medicinal product that contains the active ingredient substance(s) and inactive ingredient substances that are intended for administration for the patient. The Clinical Drug concept in the international release is defined by its manufactured dose form, the dose form as the item is presented by the manufacturer into the supply chain. This may be the same as the administrable dose form, which is the dose form that can be given to the patient after any necessary transformation (such as dissolution or dispersion) has taken place. or it may be different. Examples of the relationship between manufactured and administrable dose forms and transformation are given below. Note that both manufactured dose forms and administrable dose forms are types of pharmaceutical dose form.

Manufactured dose form	**Administrable dose form**	**Transformation**
conventional release oral tablet	conventional release oral tablet	none
tablet for conventional release oral solution (synonym "soluble oral tablet")	oral solution	dissolve
conventional release cutaneous cream	conventional release cutaneous cream	none
powder for prolonged-release suspension for injection	prolonged-release suspension for injection	disperse

The exception to the principle of using the manufactured dose form to describe Clinical Drugs in the international release is for oral antimicrobial liquid products (solutions, suspensions) that are supplied by the manufacturer as powders but that undergo dissolution or dispersion prior to dispensing for administration. The exception is present because of the need to describe these products using a clinically relevant strength reflecting the concentration of the administered liquid.

See also SNOMED CT Editorial Guide - Pharmaceutical Dose Form[106].

8.5 Unit of Presentation Attributes

The following sections discuss the attribute concepts that are used to represent the unit of presentation of concepts in the medicinal product hierarchy.

106 https://confluence.ihtsdotools.org/display/DOCEG/SNOMED+CT+Editorial+Guide+-+Pharmaceutical+Dose+Form

8.5.1 Unit of Presentation

A unit of presentation is a qualitative concept that describes a countable entity in which the clinical drug is presented, or by which it is bounded. It is used to support expression of presentation strength, where it provides the denominator for the strength ratio, and to differentiate different clinical drug products when the "intimate container" (see below) is clinically important (e.g. differentiating pre-filled syringes from ampoules for a solution for injection product).
As described in the Strength section above and detailed further in Appendix A, there are various patterns for describing how unit of presentation and expression of strength relate together, based on whether the unit of presentation relates to the basic dose form or the intimate container (which is therefore the countable unit) of the medicinal product. As the countable entity for a medicinal product, unit of presentation is also important in describing packages, which although out of scope of the international edition, may be of major importance for national extensions describing medicinal products. There are three types of unit of presentation:

- **those that are basic solid dosage forms: e.g. tablets, capsules, suppositories, pessaries etc.**
    - in this type, the solid dosage form, because of its discrete nature, is the countable unit; it provides the physical boundary in which the active ingredient substance(s) of the medicinal product are presented
- **those that are created by metered dosing valves: e.g. the "actuation" of inhalers, sprays etc.**
    - in this type, the countable unit is the "actuation" provided by the metering valve; it is the valve that determines (bounds) the physical amount of the active ingredient substance(s) of the medicinal product are presented
- **those that are intimate containers: e.g. ampoules, vials, sachets, cartridges etc.**
    - see below for detail

8.5.1.1 Intimate container

The "intimate container" of a medicinal product is the receptacle or vessel used to contain (or bound) liquid and some solid or semi-solid medicinal products into countable entities. A medicinal product presented in an intimate container will almost always have at least one layer of additional packaging added to it in order to make it into a packaged medicinal product; this external packaging is not described in the international edition. For example: an ampoule is an intimate container to present a solution for injection dosage form; the ampoule will always be supplied in a box or a moulded carton, possibly additionally with a blister strip as intermediate packaging. Particularly for liquid parenteral products for nebuliser liquids, and for some semi-solid presentations, the intimate container/unit of presentation may have clinical significance: providing a patient heparin in a pre-filled syringe is different from supplying that same concentration of heparin in a (multi-dose) vial. Similarly, hormone replacement gels may be supplied in single dose sachets to provide the correct administration amount.

8.5.1.2 IDMP Compatibility

In IDMP, the "*one countable instance of a whole of medicinal product*" is managed through the information model: it is (generally) one instance of the Manufactured Item, with its manufactured dose form and unit of presentation or one instance of the Pharmaceutical Product (with its administrable dose form and unit of presentation). The Manufactured Item is therefore the concept/class that most closely resembles the SNOMED CT Clinical Drug, but both Manufactured Item and Pharmaceutical Product contain the key "unit of presentation" attribute. However, the Manufactured Item is a representation of something that is real, with (at least in theory) all its excipient substances described and therefore is not directly compatible to the Clinical Drug - indeed the Clinical Drug could be seen as a grouper concept for similar Manufactured Items, if excipient substances etc. and packaging are disregarded. The unit of presentation in IDMP is what specifies the "real world" units in which the quantity of the manufactured item is described. The unit of presentation can be specified in accordance with ISO 11239 and ISO/TS 20440 and its resulting terminology [implemented through EDQM.

IDMP goes on to state: "For items where their quantity is a measured quantity of weight or volume, the "unit of presentation" shall not be given since it is the same as the units of that quantity (that is ml, mg or %). For solid dose forms and other items that are measured by counting integer quantities, the unit for quantity shall be "unit" and the "unit of presentation" shall be the item that is counted."
In EDQM, unit of presentation is defined as the "Qualitative term describing the discrete countable entity in which a pharmaceutical product or manufactured item is presented, in cases where strength or quantity is expressed referring to one instance of this countable entity."

> **EXAMPLE 1:** To describe strength: "Contains 100 mg per tablet" ('tablet' is the unit of presentation).
> **EXAMPLE 2:** To describe quantity: "Contains 100 mL per bottle" ('bottle' is the unit of presentation).

Unit of Presentation is therefore sometimes known as "the countable unit".