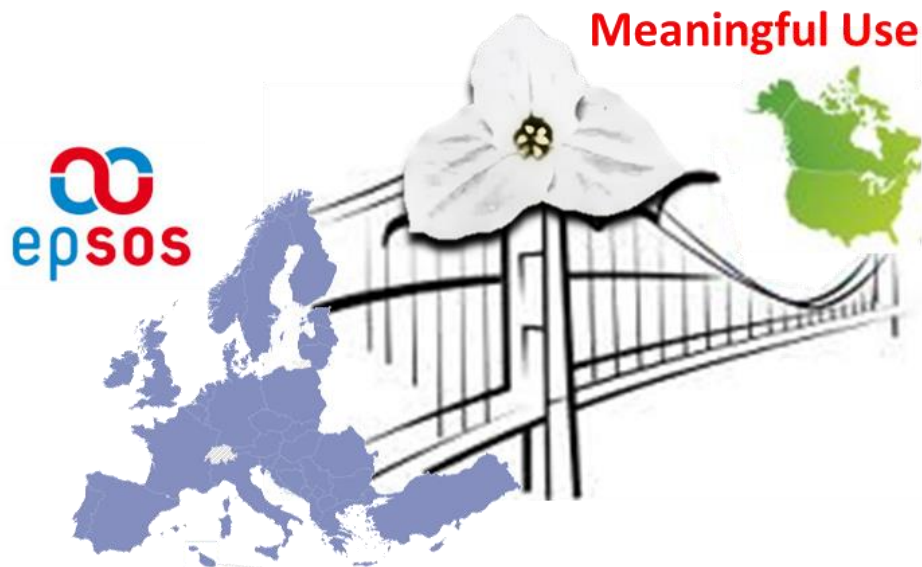


Trillium Bridge

Bridging Patient Summaries across the Atlantic



5

WP 3 – Assembling Interoperability Assets

Deliverable 3.1

Clinical model and terminology mappings: methodological approach

10

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1 Executive Summary

WP3 (Assembling Interoperability Assets) has as its overall objective to analyze the existing interoperability assets in order to help assess the feasibility of the meaningful document exchange between the two sides of the Atlantic. A prototype will be built to this extent which will be available online on a public site (to be delivered as part of D3.2). The prototype will attempt building the services allowing for unambiguous interpretation of selected clinical elements. The present document, D3.1, is paving the way for this implementation by providing the result of the mapping between the clinical concepts and coded elements of the European Patient Summary and the US Continuity of Care Document.

Given the complexity of the security, privacy, authentication and legal issues, and the fact that they are well covered between the WP2 and WP5, WP3 did not address this aspect. WP3 also did not deal with the architecture needed to connect the OpenNCP of the participating Member States (MS) in Europe and the eHealth Exchange in the USA. The infrastructure and architecture is not within the scope of this document, D3.1 focusing only on the semantic aspects of the documents exchange.

The great bulk of work of WP3 consists of a detailed mapping activity of the semantic components contained by the two documents identified by WP2, namely the *European Patient Summary* (using data from the epSOS project) and the *Consolidated Clinical Document Architecture (CCDA)* used in the *Continuity of Care Document (CCD)*. For sake of practicality, and since the European Patient Summary is not yet implemented the document will make references to the *epSOS Patient Summary*.

The mapping starts by focusing on the sections deemed equivalent in the Trillium deliverable D2.2 “*Comparing Patient Summaries in the EU and US: Gap Analysis and Pilot Use Case Definition*”. As Trillium’s main purpose is operational, care has been taken to ensure the existence of a collection of terms that can be interchanged between the two sides of the Atlantic. Trillium tried to use as much as possible the existing mappings, such as those existing between SNOMED CT and ICD-10-CM and RxNorm and NDF-RT and ATC as published by the National Library of Medicine in the United States.

ICD10-CM is the *International Classification of Diseases, Tenth Revision, Clinical Modification*, meaning ICD-10-CM is the clinical modification of WHO’s diagnostic system for the United States, or in other words, ICD10 is a subset of ICD10-CM⁴. epSOS is using the ICD10 as published by WHO, version 2008, up to the 3rd character, with the intention to move to the 4th character. (i.e – both the general name of the disease as well as the next level are available: *A36 Diphtheria, A36.0 Pharyngeal diphtheria, A36.1 Nasopharyngeal diphtheria, A36.2 Laryngeal diphtheria*). Since ICD10 is a subset of the ICD10-CM, all the epSOS 3 and 4 character codes are included in ICD10-CM. This document uses the NLM ICD-10 to SNOMED CT maps.

It is important to recognize that not all the concepts in the value sets are included in the official mappings – in this case the group did not propose mappings when it comes to SNOMED CT as it is lacking the expertise, time and resources. A complete mapping between SNOMED CT and ICD-10 should be available at the end of 2014 from IHTSDO. The group will have to take the map in question and compare it with the existing map in order to examine the extent of the coverage and whether or not it is necessary to switch.

The group had to propose mappings between several code systems in order to ensure minimal interoperability:

- SNOMED CT and UNII

⁴ <http://www.aapc.com/icd-10/naming-conventions.aspx>

- EDQM and NCI Thesaurus
- SNOMED CT and CVX

A comparison between the data elements having mappable value sets resulted in transform rules intended for a syntactic transformation. Trillium does need a special component to be built so that the syntax transformation between the two documents can take place. This is the *Trillium Transformer (TT)*. The transformer interacts with a CTS2 server so that it can access the value sets that are used on each side of the Atlantic in order to ensure an unambiguous semantic interpretation. The transformer specifications and its interactions with the CTS2 server will be part of the deliverable D3.2, “*EU/US CTS-2 Infrastructure with selected Transcoding, Translation and Terminology Mappings for pilot use cases*”, planned for M14., D3.1 focusing on the transformation rules and the mapping between the value sets.

The results of the transformation are subjected to a technical quality assurance by the testing work package, WP4, via a schematron. Once the document exchange infrastructure is in place (i.e. the connection of the European OpenNCP and the USA eHealth Exchange) functional testing can also be done as well as interpretation by medical experts. The group is aware that systematic quality assurance is needed for the mapping between the individual concepts between various code systems, especially where no official mapping exists. This deliverable clearly indicates the mappings between code systems proposed by the project team and which can be seen in the *Appendix*.

The terms that could be unequivocally mapped are listed in green, those which have a somewhat “close” mapping leading to loss of information are listed in blue, and those terms for which no match could be found are listed in red. This mapping needs to be reviewed and fine tuned by clinical subject matter experts as it is being used perhaps in collaboration with IHTSDO and WHO. So far the only quality assurance achieved at this level is comparing the groups’ work with the results of the EU-US eHealth Cooperation Initiative⁵. The consortium hopes that the D3.2 prototype that will be online will encourage subject matter experts to validate the proposed mapping.

Trillium Bridge performed a feasibility study consisting of comparing the two documents and their associated vocabulary. However, it is important to acknowledge that this document does not claim to solve all interoperability and terminology issues, nor is a finite, one-time endeavor. A first attempt to mapping is put forth for testing and implementation. However, it is expected that this continues throughout the remainder of the project and well afterwards, once the proper processes and infrastructure are in place. Our study laid the basis for a feasibility study: i.e. can an exchange of documents take place between the Europe and USA, and can there be any meaningful information transferred between the two sides?

Mapping between terminologies is a complex activity which needs to be continued with the proper subject matter experts on board. It is important that the subject matter experts include not only medical personnel, but also academic and research representatives as well as government and industry ones. Most importantly, the presence and participation of Standards Development Organizations such as IHTSDO and WHO, is necessary.

The results of the feasibility study so far indicate that there are value sets that are much richer in content and granularity on either side of the Atlantic and that a common denominator must be found as to be able to exchange information. However, this common denominator results in loss of clinical information as it is neither specific nor granular enough. The original code and original document must be always sent as to

⁵ EU-US eHealth Cooperation Initiative is an initiative within the SI Framework supported by the Office of the National Coordinator's Office of Standards & Interoperability

preserve the original intended meaning. The translated/transcoded information should be used for information purposes only by the patient and the receiving clinicians.

However, there is value in the efforts undertaken first because it helps establish a base line for interoperability, it furthers cooperations between the two sides, and the information obtained could potentially lead to a harmonization between the syntax and the terminology. Such an effort is out of scope of the current work package. However, WP3 reserves the right to make recommendations to the HL7 project Analysis for Harmonized EU-US Patient Summary Exchange which intends to develop an International Patient Summary specification.

Although there are many caveats to this feasibility study, it remains nevertheless an important effort in the EU-US interoperability roadmap and set the basis for further work.

2 Objectives

The **objectives** of WP3 as listed in the Description of Work are:

In the context of the pilot use cases analysis and selection in WP2:

- elaborate technical and semantic services for the transatlantic exchange of patient summaries
- identify templates and terminology bindings needed to align/transform sections of patient summaries
- identify terminology mappings needed to align patient summary documents in the pilot use cases as presented in the Trillium deliverable D2.2 “*Comparing Patient Summaries in the EU and US: Gap Analysis and Pilot Use Case Definition*”.
- deliver terminology mappings as part of aligned EU/US CTS-2 infrastructure which will be available
- provide guidance on the use of the provided interoperability assets that fit the pilot use cases

There are two deliverables in the WP3, listed below, each with a brief description:

D3.1 Clinical model and terminology mappings: methodological approach and user guidance WP3

WP3 will provide guidance on transforming the value sets and the data structures (i.e. clinical models) that they are bound to, based on their concept domains. The value sets can be loaded to the terminology service with their binding information for later reference. Based on the comparison of the binding of the value sets, harmonization activities will be proposed if the value sets are analogous in meaning. When value sets are not analogous, differences and similarities will be documented. When harmonization is not possible, best-effort mapping between the value sets is proposed. This will be examined in terms of the existing mappings, and provisions will be proposed where harmonization is not possible. Webinars will be developed to educate developers and promote the use of these interoperability assets.

Note: The binding based on the concept domains is not addressed in this document for the simple reason that neither of the two documents is using it. Instead, binding to the usage context (or in other words to the data element) was performed. Also, as the time lines of the project are very short, harmonization activities were not pursued, this being a long-term endeavor and including many working sessions with subject matter experts from two sides of the Atlantic. It is recommended, however that this should be taken into account by projects such as EXPAND which aim to elaborate policies. The webinars will be scheduled after the D3.2 will be completed so that users can have a tool for browsing information.

D3.2 EU/US CTS-2 Infrastructure with selected Transcoding, Translation and Terminology Mappings for pilot use cases Prototype (Online Resource) with user guidance report

The CTS2 infrastructure in place will allow interoperability between terminology servers and connection of subject matter experts. The mapping tool, mapping procedures, and the quality assurance process will be documented with the tool.

3 Glossary

This section contains the terms that are directly applicable to this deliverable.

Transcode – Transcoding involves finding the equivalent of a concept belonging to one code system in another code system. The significance of the concepts is desired to be as identical as possible. Example: Concept A is transcoded to Concept B.

Concept A			Concept B	
Centre of Disease Control (CDC) Vaccine Administered (CVX) code system (2.16.840.1.113883.12.292), version 20130926			SNOMED CT, (2.16.840.1.113883.6.96), version July 2009	
Code	Short Name	Long Name	Code	Name
20	DTaP	diphtheria, tetanus toxoids and acellular pertussis vaccine	421245007	Diphtheria + pertussis + tetanus vaccine

Transform - In the context of this paper, transformation involves using an XSLT processor to syntactically modify a CCD document into an epSOS Patient Summary document and vice-versa. One XSLT transformation is needed per document transformation. For more information on the transformation process please see section 6.

Translate – Translation entails taking one designation associated to a coded concept in one language and translating literally its meaning in another language. The code system and the code system version stay the same. Example: translation of a concept from SNOMED CT, July 2009 version:

Code	English	French
414285001	Food allergy	Hypersensibilité alimentaire

Mapping – Mapping in the context to this document is to be understood as a broad application of transcoding. It can be applied to sections, entries, syntax, value sets and individual concepts in the value sets and it means finding the corresponding, equivalent (or as close as possible) correspondent. The mapping is done between the CCD and epSOS Patient Summary.

4 Methodology

4.1 Establishing of a Common Area of Exchange

The two documents, namely the American Continuity of Care Document (CCD) and the epSOS Patient Summary (epSOS PS) were compared section by section from a clinical point of view in D2.2.

epSOS/EU Directive	EU Patient Guidelines	epSOS PS	CCD	
Section	Optionality	Optionality	Optionality	Optionality
Allergy	R	R	Allergies	R
List of current medicines	R	R	Medications	R
List of current problems / diagnoses	R	R	Problem	R
Surgical Procedures prior to the past six months	R	O	Procedures	O (R only for inpatients)
Major Surgical Procedures in the past six months	R	R	Procedures	O (R only for inpatients)
Medical Devices and implants	R	R	Medical Equipment	O
Vaccinations	O	O	Immunizations	O
List of resolved, closed or inactive problems	O	O	Problem	R
Social History Observations	O	O	Social History	O
Pregnancy history (Expected date of delivery)	O	O	Social History (Pregnancy Observation)	O
Physical findings (Vital Signs Observations)	O	O	Vital Signs	O
Diagnostic tests (Blood group)	O	O	Results Section	R
Treatment Recommendations	R	O	Plan of Care	O
Autonomy / Invalidity	R	O	Functional Status	O
			Advance Directives	O
			Family History	O
			Payer	O
			Encounters	O

Table 1 - A high-level comparison between the PS and the CCD document

There are common sections which are *required* to both documents – they are deemed as the **common intersection** between the two documents which will always be present as they are *mandatory* on both sides of the Atlantic (dark green). There are other sections that are *required* for one document but *optional* for the other, as well as sections that are *optional* for both documents – there are considered **the possible common intersection** between the two documents (light green). There are sections which are present as text only (grey). They are mentioned for completeness sake but are not included in the analysis. Lastly, there are sections that are present in one document but not in the other document – these sections are not considered to be part of the common ground between the two documents (orange).

4.2 Comparing Sections

A CDA document contains a narrative part which is mandatory for human readability and entries which are needed for the machine interpretation. The narrative part can be generated from the existing entries. The information present in the entries must always be covered by the narrative part but not vice-versa. This means that the narrative part of the text will be transferred as they are. In order to improve interoperability,

this document focuses on the sections containing various entries which in turn contain value sets. This document will look at the structure and content of each section in terms of entries and value sets. Whenever applicable, the entries within each section are compared, a transformation is indicated, the value sets are compared, and the concepts belonging to the value sets are mapped. As Trillium project is intended to be operational, the concepts having direct, unambiguous, one-to-one correspondence are listed first. The one-to-many and many-to-one mappings are included as they are important when transforming a USA document to a European one. The project tries to use official mappings as much as possible. The particularities of each mapping are explained in the corresponding section, including the existing gaps.

In order to facilitate the reading of this deliverable only snippet of the mappings were included in the deliverable itself. For a complete mapping please refer to the Appendix of this document. In cases where the mappings are too extensive to be put in the Appendix, they have been uploaded directly onto a CTS2 server.

5 Terminology Mapping Issues

5.1.1 Mapping Goals

Before we can begin to specify code mappings, we need to understand the intended audience and purpose of the mappings. Is the mapping intended to be strictly informative – an additional bit of data that may advise a clinician but is not intended to be definitive? Is the map, instead, intended to be what *would* (or *should*) have been coded had the same situation presented itself to the context of the alternative documentation system? Will the mapped code be recorded in a clinical record? Will it be used for indexing? Will it be used for automated or semi-automated decision making?

The answers to the above questions are critical for the discussion and decisions that follow. If the mapping is to be strictly informative, the map target can have a broader meaning than the source and does not necessarily have to appear in the value set that has been formally assigned to the target representation. If, however, the mapping is intended to be used in a clinical record or decision making role, it is important that the resulting map value be included only in the case where one can be certain that its meaning fully subsumes the meaning of the source concept and that the map target is a valid member of the target value set.

5.1.2 Definition of “Map”

For the purpose of this document, we define *map* as a *coherent collection associations from the members of one value set to the members of a second value set*. In particular, we are interested in associations that assert *substitutability* within a particular context. The assertion, “*concept A in value set 1 maps to concept X in value set 2*” states that, whenever the code for concept A occurs in a coded data element drawn from value set 1, it is safe to infer that the code for concept X is valid for a corresponding coded data element drawn from value set 2. The definition of “safe” depends on the mapping purpose, as discussed in the previous section.

It is important to note that the above assertion:

- 1) Does *not* assert the converse -- that it is safe to infer that the code representing concept A can be substituted for the code representing concept X
- 2) Does *not* assert that the substitution is safe for a code that represents source concept A that appears in any other value set than value set 1
- 3) Does *not* assert that the substitution is safe for a code that represents target concept X that appears in any other value set than value set 2

It is also important to note that there are very few (if any) cases where a map *is* bidirectional – where for every $A \rightarrow X$ entry in the map one can also apply an $X \rightarrow A$ map. If such a map were to exist between two complete code systems, they would, for all practical purposes, be conceptually identical, differing only by the chosen identifier, and there would be no reason to use a formal mapping when a simple identifier map would apply. If two code systems are *not* identical, they will either differ by:

- Scope – one code system will contain codes for concepts that are not coded in the second – or –
- Granularity – either:
 - The concepts represented by codes in one system will be broader in scope than a corresponding concept in the second system – or –

-
- A concept represented in a code in one system only partly represents the concept represented by a code in a second system.

It is possible, however, for bijections⁶ to occur between two value sets. As an example, one might expect a bijection to exist between children of the SNOMED CT code 224037005 | Region of United States of America | and the USPS State Abbreviations (www.bls.gov/cew/cewedr10.htm). Upon close examination, however, one will discover that there are 52 entries in the SNOMED CT codes and 53 in the USPS codes, because the USPS includes the Puerto Rico, and the Virgin Islands while SNOMED CT (inexplicably) includes 224050006 | Region of Hawaii state | as well as the usual state of Hawaii. While this seems to be a trivial case – one could assert that a bijection existed between the *common* members of the two sets – this would be begging the question as the definition of “common members” is nothing more than the subsets of the two sets where a bijection exists.

A seemingly simpler case would be that of a source and target value set that are drawn from exactly the same definition that are applied to different versions of the same code system. Even in this case, however, the moment that a concept is divided – that a concept in the newer code system is replaced by or augmented by a finer partition, we find ourselves with a difference in granularity, meaning that we need to build two unidirectional, partial maps.

While we should need to continue with the following discussion, for the moments we will make the following assertions:

- 1) Any non-trivial map within the context of this discussion is unidirectional. If we intend to be able to translate from CCD to epSOS PS we need a collection of CCD to epSOS PS maps and, if we intend to be able to translate from epSOS PS to CCD, we will need a *second* collection of epSOS PS to CCD maps.
- 2) Any non-trivial unidirectional map will be “lossy” – there will be at least one code that will not have a corresponding code on the target side.

To these assertions, we add the following observations based strictly on experience in this project:

- 1) A goodly number of maps are significantly “lossy” – the percentages of codes that don’t map are high enough to cause the general value of the map to be questioned.
- 2) Maps need to be examined and maintained on a “per value set” and “usage context” basis. Even when maps are based on a generic mapping such as the SNOMED CT to ICD-10-CM map set or the RxNorm to ATC maps, it is necessary to have an expert re-examine each individual map whenever codes are added or removed in the underlying value sets. It is important to note that the context of use is affecting the mapping, for example ATC is paired with RxNorm to obtain the correct common vocabulary for Medication Clinical Drug and Medication Brand Name, but it is paired with NDF-RF when the focus is on the Medication Drug Class.

⁶ In mathematics, a bijection (or bijective function or one-to-one correspondence) is a function between the elements of two sets, where every element of one set is paired with exactly one element of the other set, and every element of the other set is paired with exactly one element of the first set. There are no unpaired elements.

5.1.3 Map Example

The SNOMED CT to ICD-10 map is a *unidirectional* map. It was developed to map information encoded in a clinical record to the appropriate classification in ICD-10, and one can make no assumptions about the validity of any mapping *from* an ICD-10 code *to* a SNOMED CT code. Take the following excerpt, drawn from the SNOMED CT to ICD-10-CM map [for explanation how this mapping was isolated from the official maps, please see section Value Sets under the data element **Problem Code**]:

CCD Code	CCD Display Name	epSOS Code	epSOS Display Name
42338000	Salmonella gastroenteritis (disorder)	A02.0	Salmonella enteritis
302231008	Salmonella infection (disorder)	A02.9	Salmonella infection, unspecified
428874003	Intestinal infection due to Escherichia coli serotype O158 (disorder)	A04.4	Other intestinal Escherichia coli infections
423590009	Clostridium difficile colitis (disorder)	A04.7	Enterocolitis due to Clostridium difficile
75375008	Bacterial enteritis (disorder)	A04.9	Bacterial intestinal infection, unspecified
70014009	Food poisoning due to Clostridium perfringens (disorder)	A05.2	Foodborne Clostridium perfringens [Clostridium welchii] intoxication
81159000	Food poisoning due to Vibrio parahaemolyticus (disorder)	A05.3	Foodborne Vibrio parahaemolyticus intoxication
387754006	Amebic dysentery (disorder)	A06.0	Acute amoebic dysentery

Table 2 – Excerpt drawn from the SNOMED CT to ICD-10 map

As SNOMED CT exists today (20140131), there is only one valid code that corresponds to A02.0 and, from a clinical perspective it could be argued that the vast majority, if not all cases of *Salmonella enteritis* are, in fact, cases of *gastroenteritis* as well. One does need to note that infection due to *S. typhi* and *S. paratyphi* are excluded from the A02 ICD-10 category and, given that one of the synonyms for the SNOMED CT concept 42338000 is “*Enteric paratyphosis*”, one would need to consult with the appropriate clinician before a mapping in either direction is used in clinical practice.

The second row presents a different problem. Our first observation is that the SNOMED CT codes 42338000 and 302231008 cannot appear in the same value set, as their presence together implicitly asserts that one codes *Salmonella gastroenteritis* as 42338000 and *non gastric salmonella infections* as 302231008, which is not what the second code means. On the other hand, it will be highly likely that both A02.0 and A02.9 will be possible codes (as well as A02.1 – *Salmonella septicemia* and A02.8 *Other specified salmonella infections*) in the target value set. If we want to map them back to the source, our only option is the single SNOMED CT code which, while valid, removes potentially critical clinical data.

The validity of the third entry depends on in-depth knowledge of both the clinical domain and both the source and target code systems. We take it as a given that the SNOMED CT code 428874003 (*E. Coli serotype O158*) is neither enteropathogenic, enterotoxigenic, enteroinvasive nor enterohemorrhagic, as these would have been coded as A04.0 through A04.3 respectively. We also need to take into account any additional serotypes that are identified within SNOMED CT and may be included in the value sets, which, at the moment is 456328009 | *Intestinal infection due to Escherichia coli O157:H7*, which being enterohemorrhagic, works for the moment. The conclusion for this row is that we can probably confirm that the mapping is valid for the time being, but we will have to remember to and call on a clinician every time this branch of SNOMED CT or the underlying value set changes.

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
39579001	Anaphylaxis	35001004	Anaphylactoid reaction (disorder)

		39579001	Anaphylaxis (disorder)
		427903006	Anaphylaxis due to fish (disorder)
		429751004	Anaphylaxis due to fruit (disorder)
		430980000	Anaphylaxis due to hymenoptera venom (disorder)
		402390008	Anaphylaxis due to ingested food (disorder)
		427833000	Anaphylaxis due to mollusk (disorder)
		417516000	Anaphylaxis due to substance (disorder)
		428795003	Anaphylaxis due to vegetable (disorder)
		402391007	Anaphylaxis secondary to bite and/or sting (disorder)

Table 3 – Excerpt from the attempted matching of the contents of value set *epSOSReactionAllergy* and *Problem Value Set*

Depending on the CCD coding rules, the *Anaphylaxis* example in the Allergic Response mapping can either be a simple, unidirectional map from the CCD codes for Anaphylaxis (disorder), Anaphylaxis due to fish (disorder), Anaphylaxis due to fruit (disorder) to the single epSOS code of “Anaphylaxis”, where no reverse map is possible or *two* unidirectional maps, with the other direction being “Anaphylaxis” to “Anaphylaxis (disorder)”. The latter map exists only if one assumes that the code “Anaphylaxis (disorder)” does not preclude “Anaphylaxis due to fish (disorder)” even when that code is available.⁷

5.1.3.1 Value Set / Map Alignment

When dealing with officially provided maps, such as those provided by NLM, there are four possible relationships between the source *value set* and the corresponding source *map*:

- **Identical:** - The source value set and source map have the same members.
- **Subset:** - All possible codes in the source value sets are included in the source map, but there may be members in the source map that are not in the value set (**Figure 1**, below):
- **Partially disjoint:** - Some members are part of the map, some are not (**Figure 2**, below):
- **Fully disjoint:** - There are no members of the value set that are part of the source map (**Figure 3**, below):

⁷ One should probably argue that a given value set should not contain both a parent and a child concept unless the coding rules clearly state that the selection of the child automatically implies the parent as well.

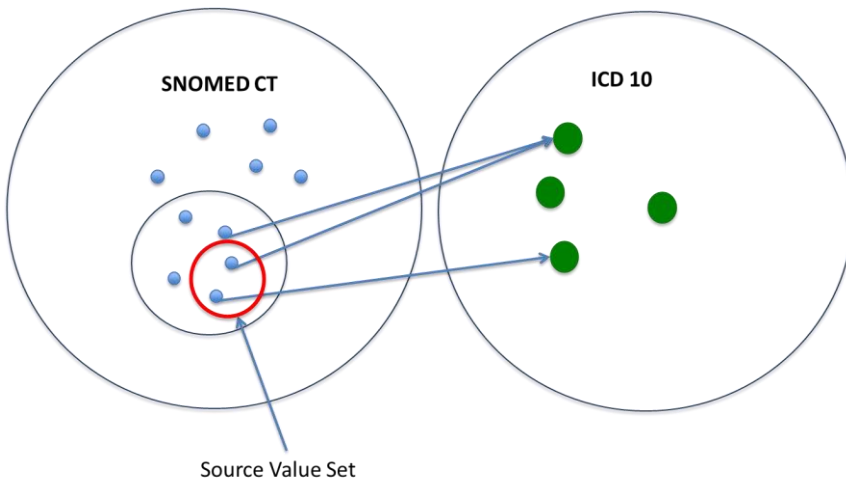


Figure 1 – All the members in the value set are included in the official source map

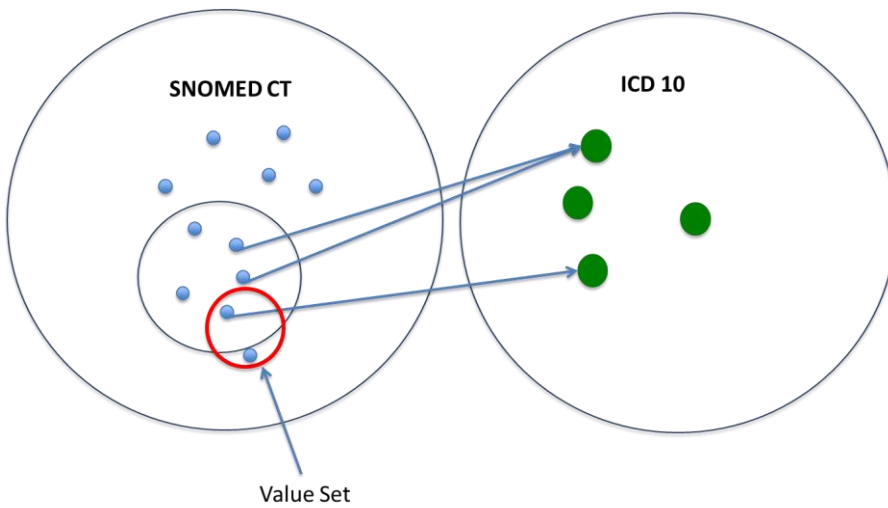


Figure 2 – Some members of the value set are included in the official source map.

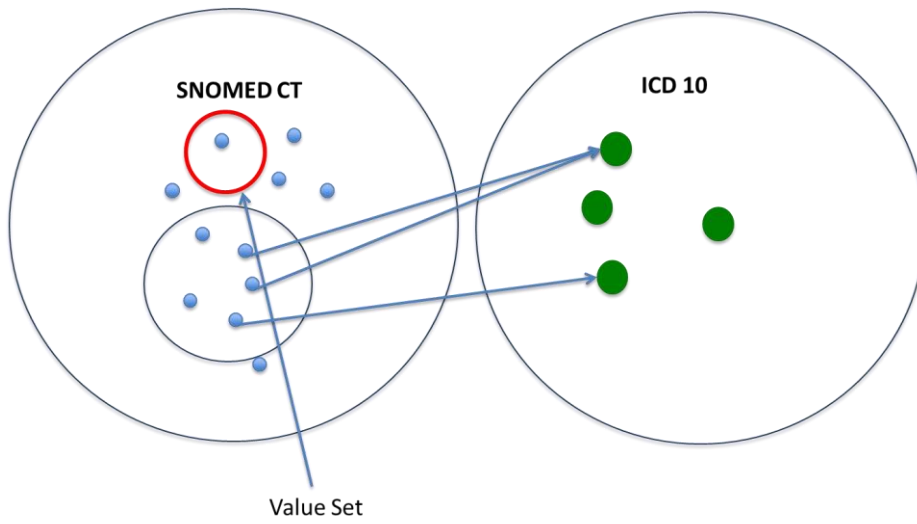


Figure 3 – *There are no members of the value set that are included in the official source map.*

These figures focus on the source value set; however the same cases are applicable to the target value set.

5.1.3.2 Code System Versions

Sometimes the version of a code system presents problems as seen below in **Table 4**

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
39579001	Anaphylaxis	39579001	Anaphylaxis (disorder)
4386001	Bronchospasm	4386001	Bronchospasm (finding)
9826008	Conjunctivite	9826008	Conjunctivitis (disorder)
43116000	Eczema	43116000	Eczema (disorder)
70076002	Rhinite	70076002	Rhinitis (disorder)
41291007	Angio-oedema	41291007	Angioedema (disorder)
200769008	Atopic dermatitis and related conditions	Not matched	
267804004	Pruritus NOS	Not matched	
247472004	Weal	Not matched	

Table 4 – Matching of the value sets epSOSReactionAllergy and Problem Value Set

The epSOS value set is derived from the July 2009 version of SNOMED CT, while the CCD codes are supposed to be drawn from the latest version of SNOMED CT. Codes 200769008, 267804004 and 247472004 have been retired from SNOMED CT, and, as such, do not appear in the later version.

The value sets present in epSOS are static value sets consisting of an explicit enumeration of concepts (extensional value sets). Each value set in the Master Value Set Catalogue (MVC), the pivot vocabulary, has a reference to the specific version of the underlying code systems. The reasons for making this choice are the following:

- the epSOS Semantic Team and endorsed by the Ministries of Health of Member States decided to concentrate on getting the Member States to adopt a common vocabulary and once that accomplished, perhaps only then focus on the terminology management itself. Considering the short time frame of the epSOS project and the ambitious objectives, the terminology management was kept at a minimum, publishing updates to the MVC only when issues pertaining to patient safety were detected (wrong translation, veterinary terms used, etc).
 - Not all sources of truth had the same publishing schedule: EDQM for example is continuously being updated, ATC has annual releases. Imposing a common vocabulary, getting physicians to agree on it and then the subject matter experts to translate it seemed enough of a daunting task without having to worry about dynamically creating the value sets.
 - Another consideration is the fact that once a Member State agreed to use a certain terminology, it had to map its own national terminology onto it (transcoding), for example mapping its national medication coding system to ATC. This has profound ramifications as reimbursement is involved. Having to keep track of versions would have led to an increase chance of rejection of the adoption of the MVC, hence a static snapshot was declared as the “pivot vocabulary”.

Of interest when it comes to code system versions is the fact that CCDA preconizes the use of the value sets as published by PHIN Vocabulary Access and Distribution System (PHIN VADS) as published by CDC (Centers for Disease Control and Prevention). These value sets are supposed to be dynamic, yet although they are dynamically generated as indicated by the name of the excel file that is being exported (ValueSet_PHVS_ProblemList_HITSP_V1_20140317-133550, for example), the version of the code system is from 2010 as it can be seen in **Figure 4**:

Preferred Concept Name	Preferred Alternate Code	Code System OID	Code System Name	Code System Code	Code System Version	HL7 Table
22q partial trisomy syndrome	D4-02226	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
2-Ketoadipic acidemia	D6-A6102	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
3 beta-Hydroxysteroid dehydrogenase deficiency	D6-80130	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
3-Methylglutaconic aciduria	D6-B0003	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
4-quinolones overdose	DF-10757	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
5,10-Methylenetetrahydrofolate reductase deficiency	D6-B4120	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
A pattern strabismus	DF-00B2A	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
AA amyloid nephropathy	D6-94521	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
AA amyloidosis	D6-9450C	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT
Abdominal abscess	D6-30000	2.16.840.1.113883.6.96	SNOMED-CT	PH_SNOMED-CT	20100731	SCT

Figure 4 – CDC PHIN VADS is using SNOMED CT from 2010

The actual content of the value set is using the 20100731 version of SNOMED CT. We have used the NLM Browser with the most updated version of SNOMED CT supported by it, which is 2014_03_01.

Hence, it is very important to keep track of the versioning when managing terminologies. Terms within a value set get obsolete, code systems evolve and mappings as well. Comparing the correct versions of a code system is one of the key components when it comes to assuring interoperability.

5.1.3.3 *Designations in Value Sets*

An additional issue we need to address is that (resolved) value sets can carry a designation. As an example, the CCD Value set, contains “248536006 | *Condition*” while the epSOS carries “248536006 | *Disease*”. According to the CTS2 specification, neither of these designations can be considered “officially representative” of the target concept. When the mapping is actually performed (which, interestingly, is the identity map in this case), the service needs to supply the correct designation in the translation field of the CD type. This does raise the question, however, whether the “correct” designation is the designation in the *latest* version or the version of the target value set.

It is important to note that the concept is conveyed in the code and not in the designation (what is displayed may depend on the context, and potentially locally defined (interface-specific terminologies)).

6 Transformer

This section will give a brief overview of the transformer from a functional point of view. A detail description will be given in the deliverable D3.2, “The transformer is an XSLT processor that transforms epSOS PS into CCD documents and CCD documents into epSOS PS, whenever the data elements are transformable (see Figure 5 and 6, below)

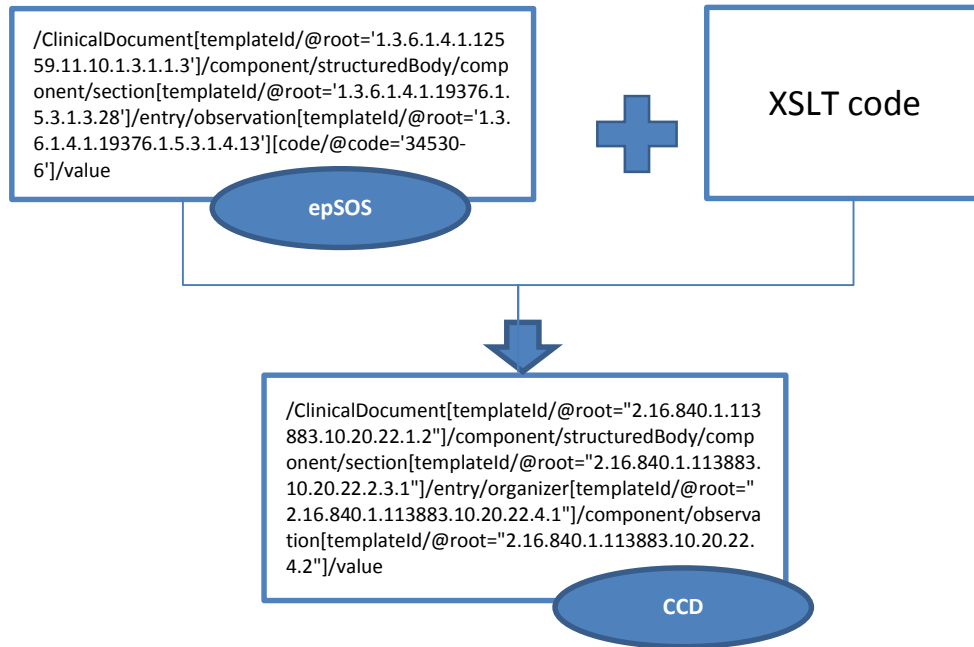


Figure 5 – An example of a transformation of an epSOS document to a CCD document.

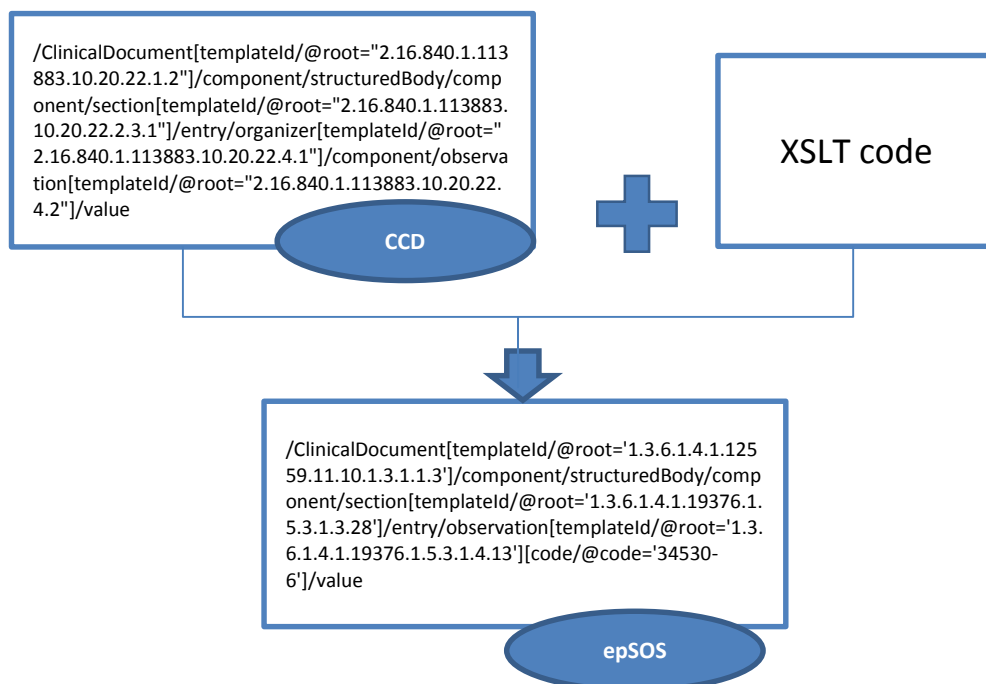


Figure 6 – An example of a transformation of a CCD document into an epSOS Patient Summary.

The Trillium Transformer focuses on transforming the elements that have CE or CD data type (meaning they have a value set from which a value can be chosen for that particular data element) and which have equivalence on both sides (they are found on both sides with the same semantic meaning). After the transformation has taken place (syntactic change), the transformer calls the CTS2 server and performs a transcoding if necessary. The details of the operations of the transformer are part of D3.2.

The header and the sections were compared and the coded data elements that were in common were identified. Section 7 lists in detail the necessary transformation for each of them, from a syntactic point of view as well a proposed common vocabulary. When the data element is to be transformed the template ID changes as well into the one of the other document (i.e. even if the data element has no need to change its structure, the template ID will change from one of epSOS PS to CCD or vice-versa). The combination of syntax (structure of the discrete data) and semantics (the value sets used for a particular data element) give four possibilities:

1. The structure is the same, and the value sets are identical: there is no transformation needed (except for replacing any template IDs).
2. The structure is the same, and the value sets have a mapping: there is no transformation needed (except for replacing any template IDs), but the data element will have a value obtained from the mapping.
3. The structure is different, and the value sets are identical: there is a transformation needed, but the value of the data element stays the same. This category also includes the case where the implemented (XML) structure is used in a different way (e.g. the same information is represented as `observation.code` in one template and as `observation.value` in the other; see for example the allergies case).
4. The structure is different, and the value sets have a mapping: there is a transformation needed, and the data element will have a value obtained from the mapping.

The other data elements (not coded) will be left as they are, in text format. Provisions will be made (details in D3.2 to handle exceptions such as data not present, available or known). The translation from the Member State language to English and from English to the language of the Member State is part of the normal operation of the National Gateway, and is therefore not within the functional perimeter of the Transformer. The transformation rules are written only for those elements that can draw onto the mapping existing in the CTS server.

Each section in Section 7 contains a “Transform” part which lists the complete XPath of the data element. The transformation will use these XPaths to generate a bidirectional transformation as seen in Figure 4 and 5, above. This means that for each discrete data element there are two distinctive pieces of code, one in each direction, for the XSLT transformation.

6.1 Mapping Representation

There are potentially two forms of codes that may undergo mapping. The first involves elements that are explicitly identified as CD or CD-derived types, such as the “code” element below.

```
<xs:complexType name="POCD_MT000040.PlayingEntity">
  <xs:sequence>
    <xs:element name="realmCode" type="CS" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="typeId" type="POCD_MT000040.InfrastructureRoot.typeId" minOccurs="0"/>
    <xs:element name="templateId" type="II" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="code" type="CE" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

```

    <xs:element name="quantity" type="PQ" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="name" type="PN" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="desc" type="ED" minOccurs="0"/>
  </xs:sequence>

```

```
</xs:complexType>
```

The XML representation of the above schema would look like:

```

<participant typeCode="CSM">
  <participantRole classCode="MANU">
    <playingEntity classCode="MMAT">
      <code code="314422" displayName="ALLERGENIC EXTRACT, PENICILLIN"
codeSystem="2.16.840.1.113883.6.88"codeSystemName="RxNorm">
        <originalText>
          <reference value="#agent1"/>
        </originalText>
      </code>
    </playingEntity>
  </participantRole>
</participant>

```

And the second is a generic value, where the type is identified at runtime as being CD or a derivative, as exemplified in the *value* element below:

```

<xs:complexType name="POCD_MT000040.Observation">
  <xs:sequence>
    <xs:element name="realmCode" type="CS" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="typeId" type="POCD_MT000040.InfrastructureRoot.typeId"
minOccurs="0"/>
    <xs:element name="templateId" type="II" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="id" type="II" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="code" type="CD"/>
    <xs:element name="derivationExpr" type="ST" minOccurs="0"/>
    <xs:element name="text" type="ED" minOccurs="0"/>
    <xs:element name="statusCode" type="CS" minOccurs="0"/>
    <xs:element name="effectiveTime" type="IVL_TS" minOccurs="0"/>
    <xs:element name="priorityCode" type="CE" minOccurs="0"/>
    <xs:element name="repeatNumber" type="IVL_INT" minOccurs="0"/>
    <xs:element name="languageCode" type="CS" minOccurs="0"/>
    <xs:element name="value" type="ANY" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>

```

An XML example of codes in this would be:

```

<entryRelationship typeCode="MFST" inversionInd="true">
  <observation classCode="OBS" moodCode="EVN">
    <!-- ** Reaction observation ** -->
    <templateId root="2.16.840.1.113883.10.20.22.4.9"/>
    <id root="4adc1020-7b14-11db-9fe1-0800200c9a64"/>
    <code nullFlavor="NA"/>
    <text>
      <reference value="#reaction1"/>
    </text>
  </observation>

```

```

<statusCode code="completed"/>
<effectiveTime>
  <low value="20070501"/>
  <high value="20090227130000+0500"/>
</effectiveTime>
<value xsi:type="CD" code="422587007" codeSystem="2.16.840.1.113883.6.96"
  displayName="Nausea"/>

```

We focus exclusively on the elements in bold – how the “code” and “value” elements should be translated and represented from the above examples.

The first decision that needs to be made when mapping (“translating”) the above forms is whether the root CD should be replaced with the mapped equivalent or whether the mapping should be represented as a translation. As an example, we could represent the translation of the reaction observation above could either be represented as:

```

<value xsi:type="CD" code="422587007" codeSystem="2.16.840.1.113883.6.96"
  displayName="Nausea">
  <translation code="R11.0" codeSystem="2.16.840.1.113883.6.90" displayName="Nausea"/>
</value>

```

or

```

<value xsi:type="CD" code="R11.0" codeSystem="2.16.840.1.113883.6.90"
  displayName="Nausea">
  <translation code="422587007" codeSystem="2.16.840.1.113883.6.96" displayName="Nausea"/>
</value>

```

(The ISO 21090 specification [ref] provides an additional field, codingRationale, that allows one to state whether a code or its translation is original, post-coded from free text, required, etc., but this attribute is not available in the model we are using.)

If the goal of the mapping is strictly informative, the first form above appears to be preferred. The challenge, however, is that the first form above may not be valid in the context of the target. The second form, while valid, doesn’t fully fit the semantics of the existing V3 translation model, where the assumption is that the second translation is a translation *of* the outer code rather than the reverse.

This decision highlights a basic distinction – a *translation* of a code in a given CD instance is not the same as a *mapping* from one CD instance to a different but related instance.

The second decision we need to make is what to do with codes that have no maps. If the goal of the mapping is strictly informative, this is reasonably simple – we can simply omit the *translation*. If, however, the target is a formal translation, we need to formally indicate that no transformation is available:

```

<value xsi:type="CD" displayName="Nausea" nullFlavor="NI">
  <translation code="R11.0" codeSystem="2.16.840.1.113883.6.3" displayName="Nausea"/>
</value>

```

The null flavor of “No information” seems to be the most specific we have available to us. The “UNC” flavor, which is not a part of the null flavor value set used in the 2005 CDA normative edition, implies that

should be some sort of coding available and risks being confused with locally entered information that may still be actually codable.

At the time of writing of this deliverable, these decisions are not yet taken. The details of the processes of transformation and translation will be carefully detailed in the deliverable D3.2.

7 Header Value Sets

We will start the specification for the mapping and transforming with the header of the two documents. The XPathS of each discret data element are listed only once; however it is important to keep in mind that **two** pieces of code are generated to be used in the transformation rules: one needed to transform from epSOS PS to CCD and one needed to transform from CCD to epSOS PS.

The data elements in the header having corresponding value sets on both sides of the Atlantic can be seen in *Table 5*, below:

Data element	epSOS PS Value Set	Code System	CCD Value Set	Code System
Administrative Gender	epSOSAdministrativeGender	AdministrativeGender	Administrative Gender (HL7) Value Set	AdministrativeGender
Country	epSOSCountry	ISO 3166-1	CountryValueSet	ISO 3166-1
EntityNamePartQualifier	epSOSEntityNamePartQualifier	HL7 EntityNamePartQualifier	EntityNamePartQualifier	HL7 EntityNamePartQualifier
Healthcare Professional Roles	epSOSHealthcareProfessionalRoles	ISCO-08	Provider Type	NUCC Health Care Provider Taxonomy
Confidentiality Code	epSOSConfidentiality	Confidentiality Code	HL7 BasicConfidentialityKind	Confidentiality Code
Language	epSOSLanguage	ISO 639	Language	ISO 639
Contact Relationship	epSOSPersonalRelationship	HL7 RoleCode	Personal Relationship Role Type	HL7 RoleCode
Telecom address use	epSOSTelecomAddress	HL7 AddressUse	Telecom Use (US Realm Header)	HL7 AddressUse
Next of Kin	epSOSRoleClass	HL7 RoleClass	INDRoleclassCodes	HL7 RoleClass

Table 5 – The header data elements that can be mapped.

7.1.1 Administrative Gender

7.1.1.1 epSOS and CCD XPathS for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.12559.11.10.1.3.1.1.3"]/recordTarget/patientRole/patient/administrativeGenderCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/patient/administrativeGenderCode
```

7.1.1.2 Functional Requirements for the Transformer

FRT1 - The transformation will have to change the template ID from epSOS to CCD for the data element **Administrative Gender** as per the Xpaths, the rest of the structure remains the same. There is no need to change the value as the value sets are identical.

FRT2 - The transformation will have to change the template ID from CCD to epSOS for the data element **Administrative Gender** as per the Xpaths, the rest of the structure remains the same. There is no need to change the value as the value sets are identical.

7.1.1.3 Value Sets

The value sets used on both sides are the same:

epSOS

epSOSAdministrativeGender	1.3.6.1.4.1.12559.11.10.1.3.1.42.34
---------------------------	-------------------------------------

CCD

Administrative Gender (HL7) Value Set	1.3.6.1.4.1.12559.11.10.1.3.1.42.34
---------------------------------------	-------------------------------------

based on the HL7 AdministrativeGender code sytem (2.16.840.1.113883.5.1).

7.1.2 Country

7.1.2.1 Patient Country of Living

7.1.2.1.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/recordTarget/patientRole /addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/addr/country
```

7.1.2.1.2 Functional Requirements for the Transformer

FRT03 - The transformation will have to change the template ID from epSOS to CCD for the data element **Country (Patient Country of Living)** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT04 - The transformation will have to change the template ID from CCD to epSOS for the data element **Country (Patient Country of Living)** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.2 Guardian's Country

7.1.2.2.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/recordTarget/patientRole/patient/guardian/addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/patient/guardian/addr/country
```

7.1.2.2.2 Functional Requirements for the Transformer

FRT05 - The transformation will have to change the template ID from epSOS to CCD for the data element **Country (Guardian's Country)** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT06 - The transformation will have to change the template ID from CCD to epSOS for the data element **Country (Guardian's Country)** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.3 Patient Contact's Country

7.1.2.3.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument/participant/associatedEntity/addr/country
```

CCD:

no corresponding structure on the USA side.

7.1.2.3.2 Functional Requirements for the Transformer

There is no conceptually equivalent structure, hence no transformation is possible.

7.1.2.4 *Preferred HCP/ Legal Organization Country*

7.1.2.4.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/participant/associatedEntity/addr/country
```

OR

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/participant/associatedEntity/scopingOrganization/addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/participant/associatedEntity/addr/country
```

7.1.2.4.2 Functional Requirements for the Transformer

FRT07 - The transformation will have to change the template ID and the structure from epSOS to CCD for the data element **Country (Preferred HCP/ Legal Organization Country)** as per the Xpaths. Please note that there are two possibilities to express the preferred HCP in epSOS as it is seen a point of contact for the patient. They both need to be mapped to the same element in CCD. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT08 - The transformation will have to change the template ID and the structure of the CCD to epSOS for the data element **Country (Preferred HCP/ Legal Organization Country)** as per the Xpaths. Please note that there are two possible ways in which the preferred HCP can be expressed in epSOS as it is seen as point of contact for the patient. The CCD structure needs to map to both way of expression. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.5 *Healthcare Facility's Country*

7.1.2.5.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/assignedAuthor/representedOrganization/addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/author/assignedAuthor/addr/country
```

7.1.2.5.2 Functional Requirements for the Transformer

FRT09 - The transformation will have to change the template ID from epSOS to CCD for the data element **Country (Healthcare Facility's Country)** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.2.5.3). This must be supported as well. The

mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT10 - The transformation will have to change the template ID from CCD to epSOS for the data element **Country (Healthcare Facility's Country)** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.2.5.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.5.3 Alternative epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/addr/country
```

7.1.2.5.4 Functional Requirements for the Transformer

FRT11 - The transformation will have to change the template ID from epSOS to CCD for the data element **Country (Healthcare Facility's Country)** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.2.5.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT12 - The transformation will have to change the template ID from CCD to epSOS for the data element **Country (Healthcare Facility's Country)** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.2.5.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.6 Author Organization Country

7.1.2.6.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/assignedAuthor/representedOrganization/addr/country
```

OR

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/addr/country
```

7.1.2.6.2 Functional Requirements for the Transformer

CCD:

not present in the CCD document

There is no conceptually equivalent structure, hence no transformation.

7.1.2.7 Legal Authenticator Country

7.1.2.7.1 epSOS and CCD XPathS for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/legalAuthenticator/assignedEntity/assignedPerson/addr/country
```

OR

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/legalAuthenticator/assignedEntity/representedOrganization/addr/country
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/legalAuthenticator/assignedEntity/addr/country
```

7.1.2.7.2 Functional Requirements for the Transformer

FRT13 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Country (Legal Authenticator Country)** as per the Xpaths. Please note that there are two possibilities to express the legal authenticator in epSOS. They both need to be mapped to the same element in CCD. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

FRT14 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Country (Legal Authenticator Country)** as per the Xpaths. Please note that there are two possible ways in which the legal authenticator can be expressed in epSOS. The CCD structure needs to map to both way of expression. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.8.

7.1.2.8 Value Sets

The value set used in epSOS to illustrate countries is:

epSOSCountry	1.3.6.1.4.1.12559.11.10.1.3.1.42.4
--------------	------------------------------------

The corresponding CCD value set is:

CountryValueSet	2.16.840.1.113883.3.88.12.80.63
-----------------	---------------------------------

Both value sets are based on the code system ISO 3166-1 (OID 1.0.3166.1). There is no need to map them. The code system ISO 3166-1 can be use in its entirety.

7.1.3 EntityNamePartQualifier

The data element is used to define the type of prefixes or suffixes to be added (if any) to the patient's name.

7.1.3.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/recordTarget/patientRole/patient/name/prefix/
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/patient/name/prefix/
```

7.1.3.2 Functional Requirements for the Transformer

FRT15 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **EntityNamePartQualifier** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.3.3.

FRT16 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **EntityNamePartQualifier** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.3.3.

7.1.3.3 Value Sets

The epSOS value set is:

epSOSEntityNamePartQualifier	1.3.6.1.4.1.12559.11.10.1.3.1.42.33
------------------------------	-------------------------------------

And the CCD corresponding value set is:

EntityNamePartQualifier	2.16.840.1.113883.11.20.9.26
-------------------------	------------------------------

Both value sets are based on the HL7 EntityNamePartQualifier 2.16.840.1.113883.5.43

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
AC	academic	AC	academic
AD	adopted	AD	adopted
BR	birth	BR	birth
CL	callme	CL	callme
IN	initial	IN	initial
NB	nobility	NB	nobility
PR	professional	PR	professional
SP	spouse	SP	spouse
TITLE	title	TITLE	title
VV	voorvoegsel	VV	voorvoegsel
LS	legal status	not matched	

Table 6 – The mapping between the epSOSEntityNamePartQualifier and EntityNamePartQualifier

The common vocabulary can be seen in green. The terms which are in red do not have an equivalent.

7.1.4 Healthcare Professional Roles

These are the designations of the healthcare professionals who have participated in a way or another in the patient's care.

7.1.4.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/functionCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/documentationOf/serviceEvent/performer/functionCode
```

7.1.4.2 Functional Requirements for the Transformer

FRT17 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Healthcare Professional Roles** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.3.

FRT18 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Healthcare Professional Roles** as per the Xpaths. The CCD structure needs to map to both way of expression. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.3.

7.1.4.3 Alternative epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/functionCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/author/functionCode
```

7.1.4.3.1 Functional Requirements for the Transformer

FRT19- The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Healthcare Professional** when acting as author as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.4.

FRT20 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Healthcare Professional** when acting as author as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.4.

7.1.4.4 Value Sets

The value set describing the healthcare professional roles in epSOS is:

epSOSHealthcareProfessionalRoles	1.3.6.1.4.1.12559.11.10.1.3.1.42.1
----------------------------------	------------------------------------

and it is based on the 2008 edition of the code system ISCO (International Standard Classification of Occupations 2008 (ISCO-08).

The CCD value set is:

Provider Type	2.16.840.1.114222.4.11.1066
---------------	-----------------------------

and is based on the NUCC Health Care Provider Taxonomy 2.16.840.1.113883.6.101.

There is little exact, one-to-one correspondence between the two value sets as seen below:

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
3251	Dental assistants and therapists	126800000X	Dental Assistant/Tech
2261	Dentists	122300000X	Dentist
2265	Dieticians and nutritionists	133V00000X	Dietitian, Registered
2263	Environmental and occupational health and hygiene professionals	163WX0106X	Occupational Health Professional
3211	Medical imaging and therapeutic equipment technicians	247100000X	Radiologic Technologist
222	Nursing and midwifery professionals	367A00000X	Nurse Midwife
3221	Nursing associate professionals	367500000X	Nurse Anesthetist
3221	Nursing associate professionals	376K00000X	Nursing Assistant
2221	Nursing professionals	163W00000X	Registered Nurse
2262	Pharmacists	183500000X	Pharmacist
2264	Physiotherapists	261QP2000X	Physical Therapist

Table 7 – Mapping between the value sets **epSOSHealthcareProfessionalRoles** and **Provider Type**.

The common vocabulary is highlighted in green. The most bothersome discovery is that there there is no equivalent for “*medical doctor*”. A full list of the mapping can be seen in Appendix A, **Table 6**.

7.1.5 Confidentiality Code

This data element indicates the level of confidentiality of a document.

7.1.5.1 *epSOS and CCD XPaths for This Data Element*

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/confidentialityCode

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/confidentialityCode

7.1.5.2 *Functional Requirements for the Transformer*

FRT21 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Confidentiality Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.5.3.

FRT22 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Confidentiality Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.5.3.

7.1.5.3 *Value Sets*

epSOSConfidentiality	1.3.6.1.4.1.12559.11.10.1.3.1.42.31
----------------------	-------------------------------------

The corresponding CCD value set is:

HL7 BasicConfidentialityKind	2.16.840.1.113883.1.11.16926
------------------------------	------------------------------

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
N	normal	N	Normal
R	restricted	R	Restricted
V	very restricted	V	Very Restricted
B	business	not matched	
D	clinician	not matched	
I	individual	not matched	
L	low	not matched	

Table 8 – Mapping between *epSOSConfidentiality* and *HL7 BasicConfidentialityKind*

Both value sets are based on the code system Code System(s): Confidentiality Code 2.16.840.1.113883.5.25. The common vocabulary is listed in green, with the terms having no correspondence listed in red.

7.1.6 Language

This refers to the language spoken by the patient or to the language of the document.

7.1.6.1 Patient's Preferred Language

7.1.6.1.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/recordTarget/patientRole/patient/languageCommunication/languageCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/patient/languageCommunication/languageCode
```

7.1.6.2 Functional Requirements for the Transformer

FRT23 - The transformation will have to change the template ID from epSOS to CCD for the data element **Patient's Preferred Language** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.6.4.

FRT24 - The transformation will have to change the template ID from CCD to epSOS for the data element **Patient's Preferred Language** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.6.4.

7.1.6.3 Document Language Code

7.1.6.3.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/languageCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/languageCode
```

7.1.6.4 Functional Requirements for the Transformer

FRT25 - The transformation will have to change the template ID from epSOS to CCD for the data element **Document Language Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.6.5.

FRT26 - The transformation will have to change the template ID from CCD to epSOS for the data element **Document Language Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.6.5.

7.1.6.5 Value Sets

The value sets used in epSOS to represent languages is:

epSOSLanguage	1.3.6.1.4.1.12559.11.10.1.3.1.42.6
---------------	------------------------------------

The corresponding representation in the CCD document is:

Language	2.16.840.1.113883.1.11.11526
----------	------------------------------

Both are based on the code system Internet Society Language (2.16.840.1.113883.1.11.11526) and defined by Internet RFC 4646 (replacing RFC 3066). Please see ISO 639 language code set maintained by Library of Congress for enumeration of language codes at (<http://www.ietf.org/rfc/rfc4646.txt>). No mapping is necessary as the epSOS countries value sets is a subset of the whole code system used by CCD. It is important to note that both sides of the Atlantic define languages as concatenations of the language-country. (i.e – en-US, fr-FR, it-IT).

7.1.7 Contact Relationship

The CCD document defines contact relationship as “a Personal Relationship records the role of a person in relation to another person. This value set is to be used when recording the relationships between different people who are not necessarily related by family ties, but also includes family relationships”.

7.1.7.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/participant/associatedEntity/code
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/participant/associatedEntity/code
```

FRT27- The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Document Language Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.7.2.

FRT28- The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Document Language Code** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.7.2.

7.1.7.2 Value Sets

The value set used in epSOS to describe the personal relationship is:

epSOSPersonalRelationship	1.3.6.1.4.1.12559.11.10.1.3.1.42.38
---------------------------	-------------------------------------

And the corresponding value set in CCD is

Personal Relationship Role Type	2.16.840.1.113883.1.11.19563
---------------------------------	------------------------------

Both value sets are based on the code system HL7 RoleCode (2.16.840.1.113883.5.111).

The common area of intersection can be seen below:

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
AUNT	aunt	... AUNT	aunt
CHILD	child	.. CHILD	child
CHLDADOPT	adopted child	... CHLDADOPT	adopted child
CHLDFOST	foster child	... CHLDFOST	foster child
CHLDINLAW	child in-law	... CHLDINLAW	child-in-law
COUSN	cousin	... COUSN	cousin
DAU	natural daughter	... DAU	natural daughter
DAUADOPT	adopted daughter	... DAUADOPT	adopted daughter
DAUC	daughter	... DAUC	daughter
DAUFOST	foster daughter	... DAUFOST	foster daughter
DAUINLAW	daughter in-law	... DAUINLAW	daughter in-law
DOMPART	domestic partner	... DOMPART	domestic partner
FAMMEMB	family member	FAMMEMB	family member
FRND	unrelated friend	. FRND	unrelated friend
FTH	father	... FTH	father
FTHINLAW	father-in-law	... FTHINLAW	father-in-law
GGRPRN	great grandparent	... GGRPRN	great grandparent
GRNDCHILD	grandchild	... GRNDCHILD	grandchild
GRPRN	grandparent	... GRPRN	grandparent
MTH	mother	... MTH	mother
MTHINLAW	mother-in-law	... MTHINLAW	mother-in-law
NBOR	neighbor	. NBOR	neighbor
NCHILD	natural child	... NCHILD	natural child
NIENEPH	niece/nephew	... NIENEPH	niece/nephew
PRN	parent	.. PRN	parent
PRNINLAW	parent in-law	... PRNINLAW	parent in-law
ROOM	roommate	. ROOM	Roommate
SIB	sibling	.. SIB	sibling
SIGOTHR	significant other	.. SIGOTHR	significant other
SON	natural son	... SON	natural son
SONADOPT	adopted son	... SONADOPT	adopted son
SONC	son	... SONC	son
SONFOST	foster son	... SONFOST	foster son
SONINLAW	son in-law	... SONINLAW	son in-law
SPS	spouse	... SPS	spouse
STPCHLD	step child	... STPCHLD	step child
STPDAU	stepdaughter	... STPDAU	stepdaughter
STPSON	stepson	... STPSON	stepson
UNCLE	uncle	... UNCLE	uncle

Table 9 – Mapping between the value sets *epSOSPersonalRelationship* and *Personal Relationship Role Type*

7.1.8 Telecom address use

This is the value set the type of address to be used in telecommunication.

7.1.8.1 Patient's telephone number, e-mail address use

7.1.8.1.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/recordTarget/patientRole/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/telecom/@use

7.1.8.1.2 Functional Requirements for the Transformer

FRT29 - The transformation will have to change the template ID from epSOS to CCD for the data element **Patient's telephone number, e-mail address use** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT30 - The transformation will have to change the template ID from CCD to epSOS for the data element **Patient's telephone number, e-mail address use** as as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.2 Guardian's Telephone, e-mail address use

7.1.8.2.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/recordTarget/patientRole/patient/guardian/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/recordTarget/patientRole/patient/guardian/telecom/@use

7.1.8.2.2 Functional Requirements for the Transformer

FRT31 - The transformation will have to change the template ID from epSOS to CCD for the data element **Guardian's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT32 - The transformation will have to change the template ID from CCD to epSOS for the data element **Guardian's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.3 Patient Contact's Telephone, e-mail address use

7.1.8.3.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/participant/associatedEntity/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/participant/associatedEntity/telecom/@use

7.1.8.3.2 Functional Requirements for the Transformer

FRT33 - The transformation will have to change the template ID from epSOS to CCD for the data element **Patient Contact's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT34 - The transformation will have to change the template ID from CCD to epSOS for the data element **Patient Contact's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.4 Preferred Organization Telephone, e-mail address use

7.1.8.4.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/participant/associatedEntity/scopingOrganization/telecom/@use

OR

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/participant/associatedEntity/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/participant/associatedEntity/telecom/@use

7.1.8.4.2 Functional Requirements for the Transformer

FRT35 - The transformation will have to change the template ID from epSOS to CCD for the data element **Preferred Organization Telephone, e-mail address use** as per the Xpaths. Please note that there are two possibilities to express the healthcare professional roles in epSOS. They both need to be mapped to the same element in CCD. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT36 - The transformation will have to change the template ID from CCD to epSOS for the data element **Preferred Organization Telephone, e-mail address use** as per the Xpaths. Please note that there are two possible ways in which the legal authenticator can be expressed in epSOS. The CCD structure needs to map

to both way of expression. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.5 Health Care Professional's Telephone, e-mail address use

7.1.8.5.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/assignedAuthor/telecom/@use

CCD:

/ClinicalDocument/[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/author/assignedAuthor/telecom/@use

7.1.8.5.2 Functional Requirements for the Transformer

FRT37 - The transformation will have to change the template ID from epSOS to CCD for the data element **Health Care Professional's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.8.5.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT38 - The transformation will have to change the template ID from epSOS to CCD for the data element **Health Care Professional's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.8.5.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.5.3 Alternative epSOS and CCD XPaths for This Data Element

epSOS

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/assignedEntity/telecom/@use

CCD

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/documentationOf/serviceEvent/performer/assignedEntity/telecom/@use

FRT39- The transformation will have to change the template ID from epSOS to CCD for the data element **Health Care Professional's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.8.5.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT40 - The transformation will have to change the template ID from epSOS to CCD for the data element **Health Care Professional's Telephone, e-mail address use** as per the Xpaths, the rest of the structure remains the same. An alternative is possible for expressing the same structure (see 7.1.8.5.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.6 **Healthcare Facility's telephone, e-mail address use**

7.1.8.6.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/assignedAuthor/representedOrganization/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/author/assignedAuthor/representedOrganization/telecom/@use

7.1.8.6.2 Functional Requirements for the Transformer

FRT41 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.6.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT42 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.6.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.6.3 Alternative epSOS and CCD XPaths for This Data Element

epSOS

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/telecom/@use

CCD

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/telecom/@use

7.1.8.6.4 Functional Requirements for the Transformer

FRT43 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.6.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT44 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.6.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.7 **Author Organization telephone, e-mail address use**

7.1.8.7.1 epSOS and CCD XPaths for This Data Element

epSOS:

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/author/assignedAuthor/representedOrganization/telecom/@use

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/author/assignedAuthor/representedOrganization/telecom@use

7.1.8.7.2 Functional Requirements for the Transformer

FRT45 - The transformation will have to change the template ID from epSOS to CCD for the data element **Author Organization telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.7.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT46 - The transformation will have to change the template ID from CCD to epSOS for the data element **Author Organization telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.7.3). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.7.3 Alternative epSOS and CCD XPaths for This Data Element**epSOS**

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.3"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/telecom/@use

CCD

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/documentationOf/serviceEvent/performer/assignedEntity/representedOrganization/telecom/@use

7.1.8.7.4 Functional Requirements for the Transformer

FRT47 - The transformation will have to change the template ID from epSOS to CCD for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.7.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT48 - The transformation will have to change the template ID from epSOS to CCD for the data element **Healthcare Facility's telephone, e-mail address use** as per the Xpaths. An alternative is possible for expressing the same structure (see 7.1.8.7.1). This must be supported as well. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.8 Legal Authenticator Telephone, e-mail address use**7.1.8.8.1 epSOS and CCD XPaths for This Data Element**

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/legalAuthenticator/assignedEntity/assignedPerson/telecom

OR

/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.1.1"]/legalAuthenticator/assignedEntity/representedOrganization/telecom

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/legalAuthenticator/assignedEntity/telecom

7.1.8.8.2 Functional Requirements for the Transformer

FRT49 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Legal Authenticator Telephone, e-mail address use** as per the Xpaths. Please note that there are two possibilities to express the legal authenticator in epSOS. They both need to be mapped to the same element in CCD. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

FRT50 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Country (Legal Authenticator Country)** as per the Xpaths. Please note that there are two possible ways in which the legal authenticator can be expressed in epSOS. The CCD structure needs to map to both way of expression. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.8.9.

7.1.8.9 Vale Sets

The value set used in epSOS is:

epSOSTelecomAddress	1.3.6.1.4.1.12559.11.10.1.3.1.42.40
---------------------	-------------------------------------

and that used in the CCD document is :

Telecom Use (US Realm Header)	2.16.840.1.113883.11.20.9.20
-------------------------------	------------------------------

Both value set are based on HL7 AddressUse (2.16.840.1.113883.5.1119). Below we can see the common vocabulary in green:

epSOS Code	English Display Name	CCD Code	CCD Display Name
WP	work place	WP	work place
MC	mobile contact	MC	mobile contact
HV	vacation home	HV	vacation home
HP	primary home	HP	primary home
PG	pager	Not matched	
H	home	Not matched	
EC	emergency contact	Not matched	
AS	answering service	Not matched	

Table 10 – Mapping between the value sets epSOSTelecomAddress and Telecom Use (US Realm Header)

The green concepts are part of the common vocabulary, the ones in red do not have correspondence.

7.1.9 Next of Kin or Emergency Contact

This value set “identifies other supporting participants, including parents, relatives, caregivers, insurance policyholders, guarantors, and other participants related in some way to the patient”.

7.1.9.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.2.4"]/participant/[@typeCode='IND']/associatedEntity/@classCode
```

CCD:

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/participant/[@typeCode='IND']/associatedEntity/@classCode

7.1.9.2 Functional Requirements for the Transformer

FRT51 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Next of Kin or Emergency Contact** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.9.3.

FRT52 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Next of Kin or Emergency Contact** as per the Xpaths, the rest of the structure remains the same. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.9.3.

7.1.9.3 Value Sets

The epSOS value set is:

epSOSRoleClass	1.3.6.1.4.1.12559.11.10.1.3.1.42.39
----------------	-------------------------------------

The corresponding CCD value set is:

INDRoleclassCodes	2.16.840.1.113883.11.20.9.33
-------------------	------------------------------

Both value sets are based on the HL7 RoleClass (2.16.840.1.113883.5.110). The common vocabulary is listed in green, below:

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
ECON	emergency contact	ECON	RoleClass
NOK	next of kin	NOK	RoleClass
	no match	PRS	RoleClass
	no match	CAREGIVER	RoleClass
	no match	AGNT	RoleClass
	no match	GUAR	RoleClass
	no match	ECON	RoleClass

Table 11 – Mapping between the value sets **epSOSRoleClass** and **INDRoleclassCodes**

7.1.9.4 Gap in the Value Sets

The following value sets are present in the CCD header but do not have correspondence in epSOS Patient Summary header:

Value Set Name	Value Set OID
LanguageAbilityProficiency	2.16.840.1.113883.1.11.12199
EntityNameUse	2.16.840.1.113883.1.11.15913

Ethnicity Value Set	2.16.840.1.114222.4.11.837
HL7 LanguageAbilityMode	2.16.840.1.113883.1.11.12249
HL7 Marital Status	2.16.840.1.113883.1.11.12212
HL7 Religious Affiliation	2.16.840.1.113883.1.11.19185
PostalAddressUse	2.16.840.1.113883.1.11.10637
PostalCodeValueSet	2.16.840.1.113883.3.88.12.80.2
Race	2.16.840.1.113883.1.11.14914
StateValueSet	2.16.840.1.113883.3.88.12.80.1

Table 12 – *The CCD value sets that do not have correspondence for the header*

Note: In Europe it is not legally allowed to have the race and religion displayed – hence this information must be blocked. However, since we have concluded that a pdf document of the original document must always accompany the transformed and transcoded document for safety reason, this remains an open issue that will have to be addressed by the WP5.

8 Section Analysis

The sections below show the relative structure of the sections in both the CCD and epSOS Patient Summary documents. The diagrams are shown for information purposes only. More emphasis is put in the epSOS implementation guide on clearly showing the data elements whereas in the CCD implementation guideline one has to infer them from the technical specifications.

8.1 Allergy

The data elements in the Allergy section in the Patient Summary can be seen below:

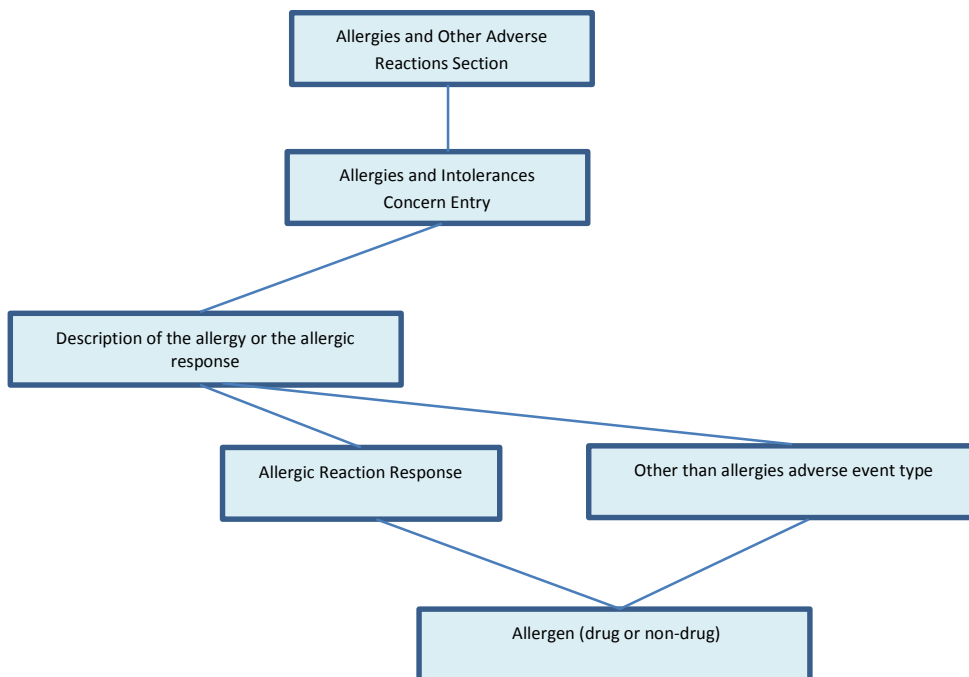


Figure 7 - The structure of the Allergy section in the epSOS Patient Summary.

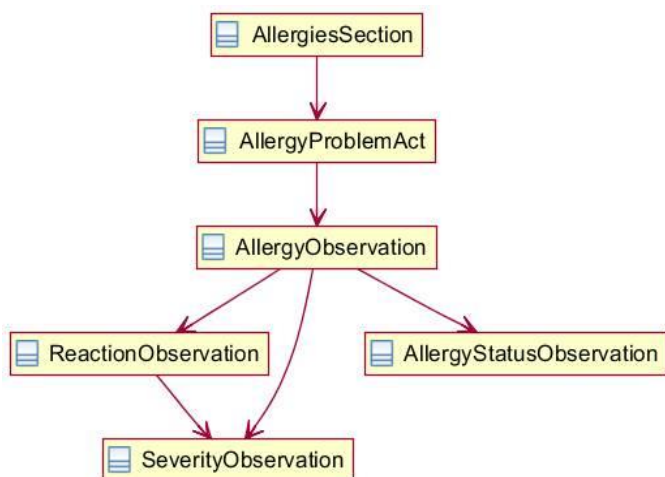


Figure 8 - The structure of the Allergy section in the CCD

Nearly the same clinical information is present in both sections. The CCD contains extra information such as the allergy status and severity. The coded data elements belonging to this section that can be mapped and have equivalence are listed below.

8.1.1 Allergic Response

This data element describes the actual allergic reaction.

8.1.1.1 *epSOS and CCD XPaths for This Data Element*

epSOS

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.13']/entry[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.3']/act[templateId/@root='2.16.840.1.113883.10.20.1.27']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.6']/entryRelationship[@typeCode='MFST']/observation[templateId/@root='2.16.840.1.113883.10.20.1.54']/value
```

CCD

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.6.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.30"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.7"]/entryRelationship[@typeCode="MFST"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.9"]/value
```

8.1.1.2 *Functional Requirements for the Transformer*

FRT53 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Allergic Response** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.1.3.

FRT54 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Allergic Response** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.1.3.

8.1.1.3 *Value Sets*

The value set used to describe the reaction response in epSOS is:

epSOSReactionAllergy	1.3.6.1.4.1.12559.11.10.1.3.1.42.11
----------------------	-------------------------------------

The value set is described as: “The Value Set is used to code the clinical manifestations of allergy developed by patient in the *Allergies and Other Adverse Reactions* section of the patient Summary”.

The value set used in the CCD document for the same data element is:

Problem Value Set	2.16.840.1.113883.3.88.12.3221.7.4
-------------------	------------------------------------

The value set is described as: “Problems and diagnoses limited to terms descending from the Clinical Findings (404684003) or Situation with Explicit Context (243796009) hierarchies”.

This value set is used for other coded data elements, such as the **problem** in the current problem and contains 16,443 terms. This represents a very wide range of problems, including but not limited to allergic responses. The terms that are highlighted in green have a one-to-one correspondence (the same terms).

Both value sets are based on the code system SNOMED CT, with the OID 2.16.840.1.113883.6.96, but on different versions (epSOS is based on the July 2009 version and CCD is based on the most recent version of SNOMED CT as it is a dynamic value set). For the purposes of the Trillium project, the latest version can be used.

The common intersection between the two value sets is listed below, with the terms highlighted in green being part of the common vocabulary and the terms in red not having an equivalent in the corresponding value set.

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
39579001	Anaphylaxis	39579001	Anaphylaxis (disorder)
4386001	Bronchospasm	4386001	Bronchospasm (finding)
9826008	Conjunctivite	9826008	Conjunctivitis (disorder)
43116000	Eczema	43116000	Eczema (disorder)
70076002	Rhinite	70076002	Rhinitis (disorder)
41291007	Angio-oedema	41291007	Angioedema (disorder)
200769008	Atopic dermatitis and related conditions	24079001	Atopic dermatitis (disorder)
267804004	Pruritus NOS	Not matched	
247472004	Weal	Not matched	

Table 13 – The mapping between the value sets *epSOSReactionAllergy* and *Problem Value Set*

The first two terms highlighted in red could not be found in the current version of SNOMED CT. 247472004 is not included in the CCD Problems Value Set. It can also be noted that the *Problem* value set contains information that is much more detailed than the *epSOSReactionAllergy* value set, for example:

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
39579001	Anaphylaxis	35001004	Anaphylactoid reaction (disorder)
		39579001	Anaphylaxis (disorder)
		427903006	Anaphylaxis due to fish (disorder)
		429751004	Anaphylaxis due to fruit (disorder)
		430980000	Anaphylaxis due to hymenoptera venom (disorder)
		402390008	Anaphylaxis due to ingested food (disorder)
		427833000	Anaphylaxis due to mollusk (disorder)
		417516000	Anaphylaxis due to substance (disorder)
		428795003	Anaphylaxis due to vegetable (disorder)
		402391007	Anaphylaxis secondary to bite and/or sting (disorder)

Table 14 – The granularity present in the value sets indicating the allergic response is not the same

The full table is present in the Appendix A, *Table 1*.

We can see that this situation leads to loss of clinical information when transcoding a CCD document to an epSOS document. i.e 427903006 *Anaphylaxis due to fish (disorder)* becomes reduced to only 39579001 *Anaphylaxis*.

8.1.2 Adverse Event Response

This data element describes the type of adverse event.

8.1.2.1 *epSOS and CCD XPaths for This Data Element*

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.13']/entry[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.3']/act[templateId/@root='2.16.840.1.113883.10.20.1.27']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.6']/code
```

CCD:

```
/ClinicalDocument[templateId/@root='2.16.840.1.113883.10.20.22.1.2']/component/structuredBody/component/section[templateId/@root='2.16.840.1.113883.10.20.22.2.6.1']/entry/act[templateId/@root='2.16.840.1.113883.10.20.22.4.30']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='2.16.840.1.113883.10.20.22.4.7']/value
```

8.1.2.2 *Functional Requirements for the Transformer*

FRT 55 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Adverse Event Response** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.3.

FRT 56 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Adverse Event Response** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.2.3.

8.1.2.3 *Value Sets*

The value set used to describe reaction other than allergies to a substance in epSOS is:

epSOSAdverseEventType	1.3.6.1.4.1.12559.11.10.1.3.1.42.18
-----------------------	-------------------------------------

The value set is described as: “The value set is used to code the patient's kind of adverse reaction against substance, food or drugs”.

The value set used in the CCD document for the same data element is:

Allergy/Adverse Event Type	2.16.840.1.113883.3.88.12.3221.6.2
----------------------------	------------------------------------

The value set is described as: “This [value set] describes the type of product and intolerance suffered by the patient.

The common intersection between the two value sets is listed below, with the terms highlighted in green:

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
419199007	Allergy to substance	419199007	Allergy to substance (disorder)
416098002	Drug allergy	416098002	Drug allergy (disorder)
59037007	Drug intolerance	59037007	Drug intolerance (disorder)
414285001	Food allergy	414285001	Food allergy (disorder)
235719002	Food intolerance	235719002	Food intolerance (disorder)
420134006	Propensity to adverse reactions	420134006	Propensity to adverse reactions (disorder)
419511003	Propensity to adverse reactions to drug	419511003	Propensity to adverse reactions to drug (disorder)
418471000	Propensity to adverse reactions to food	418471000	Propensity to adverse reactions to food (disorder)
418038007	Propensity to adverse reactions to substance	418038007	Propensity to adverse reactions to substance (disorder)

Table 15 – The mapping between the value sets *epSOSAdverseEventType* and *Allergy/Adverse Event Type*

There is exact correspondence between the concepts belonging to the two value sets as they belong to the same code system. Both value sets are based on the code system SNOMED CT, with different versions: epSOS is based on the July 2009 version and the CCD value set, being dynamic, is based on the latest available version.

8.1.3 Allergen (Medication)

This is the medication causing the allergy.

8.1.3.1 epSOS and CCD XPaths for This Data Element

epSOS

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.13']/entry[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.3']/act[templateId/@root='2.16.840.1.113883.10.20.1.27']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.6']/participant[@typeCode='CSM']/participantRole[@classCode='MANU']/playingEntity[@classCode='MMAT']/code
```

CCD

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.6.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.30"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.7"]/participant[@typeCode="CSM"]/participantRole[@classCode="MANU"]/playingEntity[@classCode="MMAT"]/code
```

8.1.3.2 Functional Requirements for the Transformer

FRT57 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Allergen (Medication)** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.1.3.

FRT58 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Allergen (Medication)** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.1.3.

8.1.3.3 Value Sets:

The value set used to describe the medication allergen in epSOS is:

epSOSActiveIngredient	1.3.6.1.4.1.12559.11.10.1.3.1.42.24
-----------------------	-------------------------------------

The value set is described as: “The Value Set is used as a mandatory code for the Active Ingredient of medications in the Medications Summary as well as the prescription Sections. Also used to code allergy agents in the Allergies and Other Adverse Reactions Section of the patient Summary.”

The value sets used in the CCD document for the same data element are actually three:

Medication Brand Name	2.16.840.1.113883.3.88.12.80.16
Medication Clinical Drug	2.16.840.1.113883.3.88.12.80.17
Medication Drug Class	2.16.840.1.113883.3.88.12.80.18

indicating either the brand name, the generic name and the drug class causing the allergy.

This means that each of the three value sets in CCD can be mapped to one and only value set used in epSOS describing the active ingredient. From the epSOS to CCD there is the mapping of ATC in terms of the usage context “active ingredient” which is mapped to the Medication Drug Name and Medication Brand Name. Although this information does not directly intend to denote the drug class in epSOS, this information can also be derived through the ATC-NDF-RT mapping. This implies that the ATC can act at times as an active ingredient to map to the Medication Clinical Drug and Medication Brand Name, and at others as a drug class when mapping to Medication Drug Class.

The active ingredient value set from epSOS is the whole ATC (Anatomical Therapeutic Chemical) classification published by the WHO with the OID 2.16.840.1.113883.6.73. The three value sets that are used in CCD are based on the code systems RxNorm (2.16.840.1.113883.6.88) and NDF-RT (2.16.840.1.113883.3.26.1.5).

The files used for obtaining the correspondence between the RxNorm and ATC code systems are those published by the US National Library of Medicine in March, 2014 (*RxNorm_full_03032014*). It is important to state that the RxNorm is not a simple code system but an intricate database, containing many tables with relations between them. The data below is obtained through our analysis and we do welcome any feedback on it.

The total number of terms present in RxNorm is 14001 based on the number of the individual RxCUI out of which only 2721 terms have a corresponding ATC code, representing 19,4 % coverage and indicating that we are working with an incomplete map.

The next step is to compare the value sets.

The *epSOSActiveIngredient* value set contains 5592 terms out of which only 2721 terms have corresponding mappings with RxNorm.

The *Medication Brand Name* value set contains 13885 terms out of which:

- 3499 codes have a one-to-one correspondence with an ATC code.
- 5265 codes have a one-to-many ATC codes
- 5121 do not have any correspondence with an ATC code.

The *Medication Clinical Drug* value set contains 31214 terms out of which:

- 736 codes have a one-to-one correspondence with an ATC code.
- 6144 codes have a one-to-many ATC codes
- 24334 do not have any correspondence with an ATC code.

The *Medication Drug Class* value set contains 10699 terms out of which:

- 1362 codes have a one-to-one correspondence with an ATC code.
- 285 codes have a one-to-many ATC codes
- 9047 do not have any correspondence with an ATC code.

As the excel files are too big to be attached in the Appendix, they were directly fed into the CTS2 server.

8.1.4 Allergen (Non-medication)

This is the allergen that is not a medication causing the allergy.

8.1.4.1 epSOS and CCD XPathS for This Data Element

epSOS

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.13']/entry[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.3']/act[templateId/@root='2.16.840.1.113883.10.20.1.27']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.6']/participant[@typeCode='CSM']/participantRole[@classCode='MANU']/playingEntity[@classCode='MMAT']/code
```

CCD

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.6.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.30"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.7"]/participant[@typeCode="CSM"]/participantRole[@classCode="MANU"]/playingEntity[@classCode="MMAT"]/code
```

8.1.4.2 Functional Requirements for the Transformer

FRT59 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Allergen (Non-medication)** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.3.

FRT60 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Allergen (Non-medication)** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.1.4.3.

8.1.4.3 Value Sets

The value set used to describe the non-medication allergies in epSOS is:

epSOSAllergenNoDrugs	1.3.6.1.4.1.12559.11.10.1.3.1.42.19
----------------------	-------------------------------------

The value set is described as: “The Value Set is used to code the allergenic agents (apart from drugs) against which the patient has developed an adverse reaction”.

The value set used in the CCD document for the same data element is:

Ingredient Name	2.16.840.1.113883.3.88.12.80.20
-----------------	---------------------------------

The allergen in epSOS is based on SNOMED CT, July 2009 version (OID 2.16.840.1.113883.6.96) and in the CCD is based on the Unique Ingredient Identifier (UNII) code system published by the FDA with the OID 2.16.840.1.113883.4.9.

No official mapping exists between these two code systems. As the value set used in epSOS contains 94 concepts, a mapping can be proposed. UNII terms have designated preferred name (PT), clinical drugs (CD) and synonyms or source asserted synonymy (SY). Only the preferred terms were mapped and only the terms which could be mapped in a one-to-one fashion were included in the Appendix A. Since the *Ingredient Name* value set contains 65,536 terms, the many-to-one mapping will be fed directly into the terminology server due to its sheer size.

One can see again the loss of information present in the mapping. In the example below, a concept such as “almond oil” can be said not have lost information as “391737006 Almond oil” can be safely mapped to: “66YXD4DKO9 ALMOND OIL”. However, for the term “264287008 Animal dander” no such mapping is possible as there are several concepts available and the granularity and specificity of the information is lost:

B	C	D	E	F	G
		ALBUMIN HUMAN	PT	ZIF514RVZR	ALBUMIN HUMAN
		HUMAN SERUM ALBUMIN	SY	ZIF514RVZR	ALBUMIN HUMAN
		RECOMBINANT HUMAN ALBUMIN	SY	ZIF514RVZR	ALBUMIN HUMAN
391737006	Almond oil	ALMOND OIL	PT	66YXD4DKO9	ALMOND OIL
		AMYGDALUS COMMUNIS OIL	SY	66YXD4DKO9	ALMOND OIL
		AMYGDALUS DULCIS OIL	SY	66YXD4DKO9	ALMOND OIL
		PRUNUS AMYGDALUS OIL	SY	66YXD4DKO9	ALMOND OIL
		PRUNUS COMMUNIS OIL	SY	66YXD4DKO9	ALMOND OIL
		PRUNUS DULCIS OIL	SY	66YXD4DKO9	ALMOND OIL
264287008	Animal dander	AE-CATTLE DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		ALLERGENIC EXTRACT- CATTLE DANDER BOV	SY	C8VYS72608	BOS TAURUS DANDER
		BOS TAURUS DANDER	PT	C8VYS72608	BOS TAURUS DANDER
		BOS PRIMIGENIUS TAURUS DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		BOS BOVIS DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		COW DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		BOVINE DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		DOMESTIC CATTLE DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		DOMESTIC COW DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		BOS INDICUS DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		BOS PRIMIGENIUS DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		AUROCHS DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		DOMESTICATED CATTLE DANDER	SY	C8VYS72608	BOS TAURUS DANDER
		AE-DOG DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		ALLERGENIC EXTRACT- DOG DANDER CANIS	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		CANIS LUPUS FAMILIARIS DANDER	PT	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		CANIS FAMILIARIS DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		CANIS DOMESTICUS DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		CANIS CANIS DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		CANIS FAMILIARIS DOMESTICUS DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI
		DOMESTIC DOG DANDER	SY	11JCK3024	CANIS LUPUS FAMILIARIS DAI

Figure 9 – Mapping sample between value sets based on the SNOMED CT and UNII.

The one-to-one mapping can be seen in Appendix A, Table 2.

8.1.5 Gap in the Value Sets

The following value sets are present in the CCD document but not in the epSOS document:

Value Set Name	Value Set OID
----------------	---------------

Vaccine Administered Value Set	2.16.840.1.113883.3.88.12.80.22
Medication Fill Status	2.16.840.1.113883.3.88.12.80.64
Medication Product Form	2.16.840.1.113883.3.88.12.3221.8.11
Medication Route FDA Value Set	2.16.840.1.113883.3.88.12.3221.8.7
UCUM Units of Measure (case sensitive)	2.16.840.1.113883.1.11.12839
HITSPProblemStatus	2.16.840.1.113883.3.88.12.80.68

Table 16 - The CCD value sets that do not have equivalence with epSOS in the Allergy Section.

8.2 Medications

The data elements in the Medications section in the epSOS Patient Summary can be seen below:

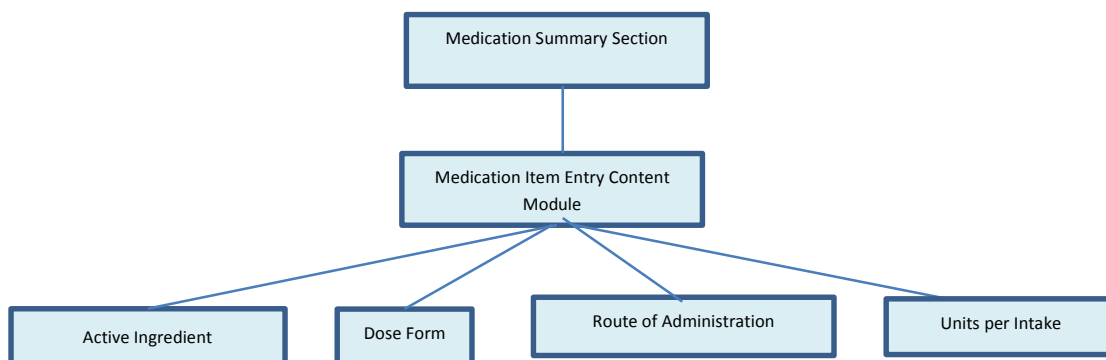


Figure 10 – The structure of the Medications section in epSOS Patient Summary



Figure 11 – The structure of the Medications section in the CCD document.

epSOS expresses medication information using distinct fields for the ingredient, dose and form. CCD can express this information through one or distinct fields. This is possible due to the code system used for medication, RxNorm. CCD also has data elements that are not present in epSOS PS Medication section, namely *Medication Supply Order*, *Medication Dispense*, *Reaction Observation*, *Preconditions for Substance Administration* and *Drug Vehicle*. Certain coded data elements can be mapped between the two and are listed below.

8.2.1 Active Ingredient

This is the active ingredients of the medication that the patient is taking. The active ingredient and strength must be combined to match the RxNorm code.

8.2.1.1 epSOS and CCD XPaths for This Data Element

epSOS

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/substanceAdministration[templateId/[@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/consumable/manufacturedProduct/manufacturedMaterial/ingredient/[@classCode='ACTI']/ingredient/code
  
```

In case of multi active ingredients medicines ingredients are described in *subIngredient/quantity*.

and


```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/substanceAdministration[templateId/[@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/consumable/manufacturedProduct/manufacturedMaterial/ingredient/[@classCode='ACTI'] /quantity
```

In case of multi active ingredients medicines ingredients are described in *subIngredient/quantity*.

This is a CDA extension defined by epSOS (namespace epSOS)

CCD

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.1.1"]/entry/substanceAdministration[templateId/@root="2.16.840.1.113883.10.20.22.4.16"]/consumable/manufacturedProduct/manufacturedMaterial/code
```

8.2.1.2 Functional Requirements for the Transformer

FRT61 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Active Ingredient** as per the Xpaths. The transform rules must be able to map both the active ingredient and the strength to the CCD structure above. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.1.3.

FRT62 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Active Ingredient** as per the Xpaths. The transform rules must be able to map the CCD structure to both the active ingredient and the strength of the epSOS structure above. Note: the transformation shall take in account the fact that the element used is a CDA extension defined by epSOS (with the epSOS namespace). The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.1.3.

8.2.1.3 Value Sets

The value set used to describe the active ingredient in epSOS is:

epSOSActiveIngredient	1.3.6.1.4.1.12559.11.10.1.3.1.42.24
-----------------------	-------------------------------------

The value set is described as: “The Value Set is used as a mandatory code for the Active Ingredient of medications in the Medications Summary as well as the prescription Sections. Also used to code allergy agents in the Allergies and Other Adverse Reactions Section of the patient Summary.” This value set is based on the ATC Anatomical Therapeutic Chemical (OID 2.16.840.1.113883.6.73) published by the World Health Organization (WHO).

The value sets used in the CCD document for the same data element is:

Medication Clinical Drug	2.16.840.1.113883.3.88.12.80.17
--------------------------	---------------------------------

This value set is based on the code system RxNorm (OID 2.16.840.1.113883.6.88) maintained by the National Library of Medicine (NLM). Please see the *Allergy* Section for the mapping information.

8.2.2 Route of administration

This is the route of administration of the medication that the patient is taking.

8.2.2.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/substanceAdministration[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/routeCode
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.1.1"]/entry/substanceAdministration[templateId/@root="2.16.840.1.113883.10.20.22.4.16"]/routeCode
```

8.2.2.2 Functional Requirements for the Transformer

FRT63 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Route of administration** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.2.3.

FRT64 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Route of administration** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.2.3.

8.2.2.3 Value Sets

The epSOS value set is:

epSOSRoutesofAdministration	1.3.6.1.4.1.12559.11.10.1.3.1.44.1
-----------------------------	------------------------------------

The corresponding CCD value set is:

Medication Route FDA Value Set	2.16.840.1.113883.3.88.12.3221.8.7
--------------------------------	------------------------------------

The epSOS value set is based on the code system EDQM (1.3.6.1.4.1.12559.11.10.1.3.1.44.1) and the CCD value set is based on the National Cancer Institute (NCI) Thesaurus (2.16.840.1.113883.3.26.1.1). The terms that are common are listed in green **Appendix A, Table 3**. We see that both epSOS and CCD have terms for which there is no equivalent (about half of the terms). However, the other half that can be mapped provides a common vocabulary.

8.2.3 Dose Form

This is the dose form of the medication that the patient is taking.

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/sub
```

```
stanceAdministration[templateId/[@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/consumable/ma
nufacturedProduct/manufacturedMaterial/formCode
```

This is a CDA extension defined by epSOS (namespace epSOS)

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structured
Body/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.1.1"]/entry/substan
ceAdministration[templateId/@root="2.16.840.1.113883.10.20.22.4.16"]/administrativeUnitCo
de
```

8.2.3.1 Functional Requirements for the Transformer

FRT65 - The transformation will have to change the template ID from epSOS to CCD for the data element **Dose Form** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.2.3.

FRT66 - The transformation will have to change the template ID from CCD to epSOS for the data element **Dose Form** as per the Xpaths. Note: the transformation shall take in account the fact that the element used is a CDA extension defined by epSOS (with the epSOS namespace). The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.2.3.

8.2.3.2 Value Sets

The epSOS value set is:

epSOSDoseForm	1.3.6.1.4.1.12559.11.10.1.3.1.44.1
---------------	------------------------------------

The corresponding CCD value set is:

Medication Product Form	2.16.840.1.113883.3.88.12.3221.8.11
-------------------------	-------------------------------------

The terms that can be mapped directly one-to-one are few, due to the fact that EDQM (1.3.6.1.4.1.12559.11.10.1.3.1.44.1) is more specific than the National Cancer Institute (NCI) Thesaurus (2.16.840.1.113883.3.26.1.1). For example, in NCI we have:

C61005 TABLET, FOR SUSPENSION

And in EDQM there is *Tablet for oral suspension, Tablet for rectal suspension*. These cannot be mapped as we do not know clinical meaning behind the codes in the NCI thesaurus.

epSOS Code	epSOS Display Name	NCI code	NCI Display Name
12100	Capsule	C25158	CAPSULE
10220000	Coated tablet	C42895	CAPSULE, COATED
10502000	Cream	C28944	CREAM
50017000	Dental paste	C42907	PASTE, DENTIFRICE
11203000	Emulsion for injection	C42914	INJECTION, EMULSION
20050	Enema	C42915	ENEMA

50078000	Gas and solvent for dispersion for injection/infusion	C42933	GAS
10503000	Gel	C42934	GEL
10316000	Gingival paste	C42906	GEL, DENTIFRICE
10204000	Granules	C42938	GRANULE
10113000	Granules for oral suspension	C42940	GRANULE, FOR SUSPENSION
50029250	Granules for use in drinking water	C42909	GRANULE, EFFERVESCENT
11301000	Implant	C42942	IMPLANT
22010	Injection	C42946	INJECTION
12113000	Irrigation solution	C42947	IRRIGANT
13220	Lozenge	C42955	LOZENGE
10310000	Mouthwash	C29269	MOUTHWASH
10504000	Ointment	C42966	OINTMENT
10323000	Pastille	C60985	PASTILLE
10522000	Poultice	C47913	POULTICE
50041500	Powder and solution for solution for injection	C42974	INJECTION, POWDER, FOR SOLUTION
10508000	Shampoo	C42981	SHAMPOO
11201000	Solution for injection	C42945	INJECTION, SOLUTION
11013000	Suppository	C42993	SUPPOSITORY
10117000	Syrup	C42996	SYRUP
10219000	Tablet	C42998	TABLET
12200	Tablet	C42998	TABLET

Table 17 – Excerpt from the mapping between the value sets *epSOSDoseForm* and *Medication Product Form*

The full mapping is present in Appendix A, Table 4.

8.2.4 Units per Intake

These are the unit per intake that the patient is taking.

8.2.4.1 *epSOS* and *CCD* XPaths for This Data Element

epSOS

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/substanceAdministration[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/doseQuantity/low/@unit
```

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.3']/entry/substanceAdministration[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.4']/doseQuantity/high/@unit
```

CCD

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.1.1"]/entry/substanceAdministration[templateId/@root="2.16.840.1.113883.10.20.22.4.16"]/doseQuantity/@unit
```

8.2.4.2 Functional Requirements for the Transformer

FRT67 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Units per Intake** as per the Xpaths. If the low and the high values are the same, then the transformer must transform to a single doseQuantity element in CCD, otherwise the high and low expression must be preserved. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.4.3.

FRT68 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Units per Intake** as per the Xpaths. The transformer must transform a single doseQuantity element in CCD into a high and low expression for the epSOS PS. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.2.4.3.

8.2.4.3 Value Sets

The epSOS Value Set is:

epSOSUnits	1.3.6.1.4.1.12559.11.10.1.3.1.42.16
------------	-------------------------------------

The corresponding CCD value set is actually the entire UCUM code system. No mapping is needed in this case between the value sets.

8.2.4.4 Gap in the Value Sets

There are several epSOS value sets for which there is no correspondence in CCD for the section Medications.

Value Set Name	Value Set OID
epSOSPackages	1.3.6.1.4.1.12559.11.10.1.3.1.42.3
epSOSTimingEvent	1.3.6.1.4.1.12559.11.10.1.3.1.42.41
epSOSSubstitutionCode	1.3.6.1.4.1.12559.11.10.1.3.1.42.7
epSOSCodeNoMedication	1.3.6.1.4.1.12559.11.10.1.3.1.42.22

Table 18 – The epSOS value sets not having equivalence in CCD

And vice versa:

Value Set Name	Value Set OID
2.16.840.1.113883.3.88.12.80.22	Vaccine Administered Value Set
2.16.840.1.113883.11.20.9.34	Patient Education
2.16.840.1.113883.1.11.20275	HealthcareServiceLocation
2.16.840.1.113883.3.88.12.3221.7.4	Problem
2.16.840.1.113883.3.88.12.3221.6.8	Problem Severity
2.16.840.1.113883.3.88.12.3221.7.2	Problem Type

Table 19 – The CCD value sets not having equivalence in epSOS

8.3 Problem (List of current problems/diagnoses)

The data elements in the *List of Current Problems/Diagnosis (or Active Problem)* Section in epSOS contains the following coded data elements:

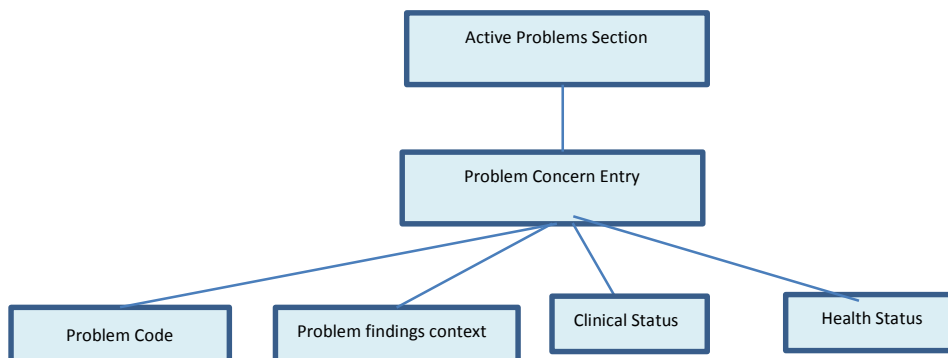


Figure 12 – The structure of the Active Problem Section in epSOS Patient Summary

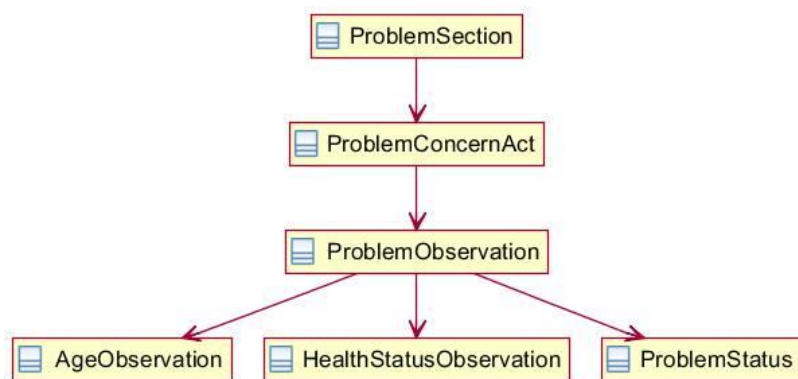


Figure 13 – The structure of the Problems section in the CCD document.

The sections are equivalent in meaning and the common data elements are listed below.

8.3.1 Problem Code

This is the coded description of the problem that the patient is experiencing.

8.3.1.1 epSOS and CCD XPaths for This Data Element

epSOS:

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.6']/entry/act[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.2']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5']/value
  
```

CCD:

```

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.5.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.3"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.4"]/value
  
```

8.3.1.2 Functional Requirements for the Transformer

FRT69 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Problem Code** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.1.3.

FRT70 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Problem Code** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.1.3.

8.3.1.3 Value Sets

The value set used to describe the problems in epSOS is:

epSOSIllnessesandDisorders	1.3.6.1.4.1.12559.11.10.1.3.1.44.2
----------------------------	------------------------------------

The value set is described as: “The Value Set is used to code illnesses, allergies, syndromes or symptoms the patient suffered in the past or is currently suffering.” This value sets consists of the whole of ICD-10 up to the 3rd character⁸ (version 2008).

The official mapping chosen was ICD-10-CM-SNOMED CT because it was believed that it would provide a larger coverage of the SNOMED CT terms. Also in cases where terms might have been differently mapped, the group wanted to have the same map going from Europe to USA as going from USA to Europe.

The value set used in the CCD document for the same data element is:

Problem	2.16.840.1.113883.3.88.12.3221.7.4
---------	------------------------------------

The mapping between the concepts between the two value sets is based on the official mapping provided by the US National Library of Medicine (September 2013 US Edition (SNOMEDCT_ICD10CM_map.201312)). Not all the terms have an unambiguous mapping – some are context dependent for example, depending on gender and age of onset. In the official NLM mapping we have focused only on the cases where:

- mapRule is limited to those equal “TRUE”, independent of context,
- mapAdvice points ALWAYS to an ICD10 code
- mapCategoryValue indicates that **Map source concept is properly classified**

⁸ Retrospectively, the mapping group was informed that epSOS is still using the 3 characters of ICD10 and will eventually migrate to 4 characters within the umbrella of the project EXPAND. However, the mapping group has worked up to 4 characters. This will not have an impact on the accuracy of the transcoding; however will restrain even more the number of available terms.

4598005	Osteomalacia (disorder)	IF ANTICONVULSANT DRUG-INDUCED OSTEOMALACIA CHOOSE T42.6X5?	EPISODE OF	T42.6X5?	Adverse effect of other antiepileptic and sedative-hypnotic	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF ADULT OSTEOMALACIA DUE TO MALABSORPTION CHOOSE M83.2 MAP OF SOURCE	M83.2	M83.2	Adult osteomalacia due to malabsorption	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF OSTEOMALACIC PELVIS CHOOSE M83.8 MAP OF SOURCE CONCEPT IS CONTEXT	M83.8	M83.8	Other adult osteomalacia	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF PUERPERAL OSTEOMALACIA CHOOSE M83.0 MAP OF SOURCE CONCEPT IS CONTEXT	M83.0	M83.0	Puerperal osteomalacia	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF SENILE OSTEOMALACIA CHOOSE M83.1 MAP OF SOURCE CONCEPT IS CONTEXT	M83.1	M83.1	Senile osteomalacia	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF ADULT OSTEOMALACIA DUE TO MALNUTRITION CHOOSE M83.3 MAP OF SOURCE	M83.3	M83.3	Adult osteomalacia due to malnutrition	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF ALUMINIUM-RELATED OSTEOMALACIA CHOOSE M83.4 MAP OF SOURCE CONCEPT IS	M83.4	M83.4	Aluminum bone disease	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF OSTEOMALACIA SECONDARY TO DRUG CHOOSE T50.905? EPISODE OF CARE	T50.905?	T50.905?	Adverse effect of unspecified drugs, medicaments and	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF OSTEOMALACIA SECONDARY TO PREGNANCY CHOOSE M83.0 MAP OF SOURCE	M83.0	M83.0	Puerperal osteomalacia	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF TUMOR-INDUCED OSTEOMALACIA CHOOSE M83.8 MAP OF SOURCE CONCEPT IS	M83.8	M83.8	Other adult osteomalacia	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	IF AGE AT ONSET OF CLINICAL FINDING BEFORE 18.0 YEARS CHOOSE E55.0 MAP OF	E55.0	E55.0	Rickets, active	447639009	Map of source concept is context
4598005	Osteomalacia (disorder)	ALWAYS M83.5	M83.5	M83.5	Adult osteomalacia, unspecified	447639006	Map source concept is properly classified
4598005	Osteomalacia (disorder)	IF ANTICONVULSANT DRUG-INDUCED OSTEOMALACIA CHOOSE M83.5 CONSIDER	M83.5	M83.5	Other drug-induced osteomalacia in adults	447639009	Map of source concept is context

Figure 14 – The original NLM file has mapping that is context-dependent. Only the direct mapping was chosen.

Furthermore, the SNOMED CT maps include ICD-10 codes with 5 or 6 characters (such as M77.40 Metatarsalgia, unspecified foot or H40.839 Aqueous misdirection, unspecified eye) which are localization of ICD-10. epSOS is using the ICD-10 up to 3 characters. The maps were further constrained by reducing the ICD10 terms to 3 characters. We applied all these constraints to the existing maps and studied the value sets used on the two sides of the Atlantic.

The value set *Problem* (2.16.840.1.113883.3.88.12.3221.7.4) contains 16,443 terms. 9284 terms have official mappings provided by NLM (including one-to-many mappings), out of which there are 8430 terms that map to single ICD10 codes. This had to be cross-referenced with the contents of the value set *epOSIllnessesandDisorders* (1.3.6.1.4.1.12559.11.10.1.3.1.44.2) containing 9,515 terms. Only 4062 of these terms have official mappings covered by the NLM official map. The next step was to find the common area between these two value sets.

After cross-referencing the two mappings, there are **1415** terms that have a one-to-one mapping and can be clearly and unambiguously used for the purposes of Trillium. Another map of many-to-one in the other sense has been loaded in the terminology server and not included in the **Appendix** due to its size.

8.3.2 Problem Type

This is the type of problem that the patient is suffering from.

8.3.2.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.6']/entry/act[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.2']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5']/code
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.5.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.3"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.4"]/code
```

8.3.2.2 Functional Requirements for the Transformer

FRT71 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Problem Code** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

FRT72 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Problem Code** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

8.3.2.3 Value Sets

The value sets used to describe the type of problem in epSOS is:

epSOSCodeProb	1.3.6.1.4.1.12559.11.10.1.3.1.42.23
---------------	-------------------------------------

This value set is described as: “The Value Set is used as an optional description of a problem in the patient Summary. It gives information on the circumstances under which the problem was defined/discovered.”

The value set used in the CCD document for the same data elements is:

Problem Type	2.16.840.1.113883.3.88.12.3221.7.2
--------------	------------------------------------

Both value sets are based on SNOMED CT and the equivalence can be seen below. It is interesting to note that in the CCDA CCD implementation guide other names are used, such as Condition instead of Disease for the code 64572001. This is a synonym and not the preferred term. This issue must be taken up with the HL7 Structured Documents working group.

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
404684003	Clinical finding	404684003	Finding
409586006	Complaint	409586006	Complaint
282291009	Diagnosis interpretation	282291009	Diagnosis
64572001	Disease	64572001	Condition
248536006	Finding of functional performance and activity	248536006	Finding of functional performance and activity
418799008	Finding reported by subject or history provider	418799008	Symptom
55607006	Problem	55607006	Problem
not matched		373930000	Cognitive function finding

Table 20 – The mapping between **epSOSCodeProb** and **Problem Type**

8.3.3 Clinical Status

This describes the clinical status of a problem.

8.3.3.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.6']/entry/act[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.2']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5']/entryRelationship[@typeCode='REFR']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.1.1']/value
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.5.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.3"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.4"]/entryRelationship[@typeCode="REFR"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.6"]/value
```

8.3.3.2 Functional Requirements for the Transformer

FRT73 - The transformation will have to change the template ID from epSOS to epSOS for the data element **Clinical Status** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.1.3.

FRT74 - The transformation will have to change the template ID from CCD to epSOS for the data element **Clinical Status** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.1.3.

8.3.3.3 Value Sets

The value set used to describe the status of a problem in epSOS is:

epSOSStatusCode	1.3.6.1.4.1.12559.11.10.1.3.1.42.15
-----------------	-------------------------------------

The value set used in CCD to describe a problem is:

HITSPProblemStatus	2.16.840.1.113883.3.88.12.80.68
--------------------	---------------------------------

Both value sets are based on SNOMED CT. However one can see that only a few terms have correspondence, listed below in green.

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
55561003	Active	55561003	Active
90734009	Chronic	not matched	
73425007	Inactive	73425007	Inactive*
7087005	Intermittent	not matched	
410516002	Known absent	not matched	
413322009	Problem resolved	413322009	Resolved**
255227004	Recurrent	not matched	
415684004	Suspected	not matched	

Table 21 – The mapping between the value sets *epSOSStatusCode* and *HITSPProblemStatus*

8.3.4 Health Status

Describes the health status of a patient following a problem.

8.3.4.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.6']/entry/act[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5.2']/entryRelationship[@typeCode='SUBJ']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.5']/entryRelationship[@typeCode='REFR']/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.1.2']/value
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.5.1"]/entry/act[templateId/@root="2.16.840.1.113883.10.20.22.4.3"]/entryRelationship[@typeCode="SUBJ"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.4"]/entryRelationship[@typeCode="REFR"]/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.5"]/value
```

8.3.4.2 Functional Requirements for the Transformer

FRT75 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Health Status** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

FRT76 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Health Status** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

8.3.4.3 Value Sets

The value set used in epSOS to describe the health status in epSOS is:

epSOSResolutionOutcome	1.3.6.1.4.1.12559.11.10.1.3.1.42.30
------------------------	-------------------------------------

This value set is used to describe the clinical status of a problem outcome.

The value set used in CCD to describe the health status is:

HealthStatus	2.16.840.1.113883.1.11.20.12
--------------	------------------------------

Both value sets are based on SNOMED CT (July 2009 and the current version) and although there is a good match between the concepts belonging to the value set, there is a discrepancy between the label of the terms, where, just as in the case mentioned above, the display name of a synonym is used rather than the preferred name.

epSOS Code	epSOS Display Name	CCD Code	CCD Display Name
161901003	Chronic sick	161901003	Chronically ill
419099009	Dead	not matched	
21134002	Disability	21134002	Disabled
161045001	Disability - severe	161045001	Severely disabled
162467007	Free of symptoms	162467007	Symptom free
271593001	Moribund	271593001	Severely ill
81323004	Normal general body function	81323004	Alive and well
313386006	Patient in remission	313386006	In remission

Table 22 – The mapping between the value sets **epSOSResolutionOutcome** and **HealthStatus**

8.3.4.4 Gap in the Value Sets

For the section **Active Problems**, epSOS has two value sets which do not have their correspondence in CCD:

Value Set Name	Value Set OID
epSOSSeverity	1.3.6.1.4.1.12559.11.10.1.3.1.42.13
epSOSUnknownInformation	1.3.6.1.4.1.12559.11.10.1.3.1.42.17

Table 23 – The epSOS value sets which do not have a correspondence in CCD

Note: The value set *epSOSUnknownInformation* must be used in the transformer exceptions to be described in the deliverable D3.2.

CCD also has a value set which does not have a correspondence in epSOS:

Value Set Name	Value Set OID
AgePQ_UCUM	2.16.840.1.113883.11.20.9.21

Table 24 – The CCD value sets which do not have correspondence in epSOS

8.4 List of resolved, closed or inactive problems (Problem)

The epSOS Patient Summary contains the *History of Past Illness* section to indicate the history of a problem no longer active. When present, this section requires the usage of problem coded entry as described for the Active Problem section (see § 8.3). For the CCD all the problems (current and past) are recorded in the Problem List section, and the indication that this is a closed problem comes from the date (and the status). In this context we assume that the Problem List section will be used for conveying the current and past problems. Please refer to the Problem section for the mapping rules (§ 8.3).

8.5 Procedures

The procedures in the epSOS Patient Summary mean to cover only the procedures that the patient has had. In epSOS there is the distinction between the procedure that took place within the last 6 months and the procedures prior to that – this is managed by using the same information structure in conjuncture with the date.

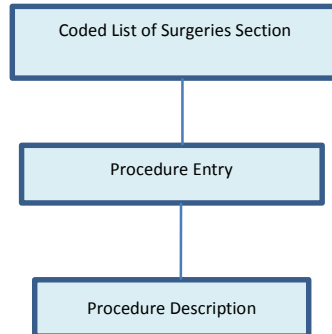


Figure 15 – The structure of the **Coded List of Surgeries** section in the epSOS Patient Summary

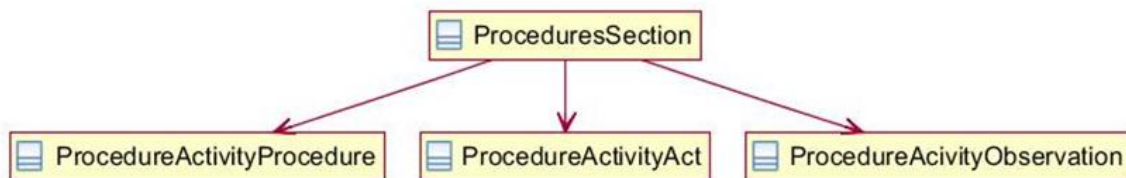


Figure 16 – The structure of the **Procedures** section of the CCD document.

epSOS focuses only on the surgical procedures whereas CCD lists the the interventional, observational and other procedures. For the purposes of this comparison, only the the interventional procedures from the CCD document can be equated with the surgical procedures in epSOS.

8.5.1 Procedure Description (Type)

This is a description of the procedure that the patient underwent.

8.5.1.1 epSOS and CCD XPathS for This Data Element

epSOS:

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.12']/entry/procedure[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.19']/code
    
```

CCD:

```

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.7.1"]/entry/procedure[templateId/@root="2.16.840.1.113883.10.20.22.4.14"]/code
    
```

30 **8.5.1.2 Functional Requirements for the Transformer**

FRT77 - The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Procedure Description** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

FRT78 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Procedure Description** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

Note: The absence of information about a procedure needs to be treated along with the other exceptions to be handled by the Transformer as this section is mandatory (meaning this section must be always sent even if no information is present).

35 **8.5.1.3 Value Sets**

The value set used to describe procedure in epSOS is:

epSOSProcedures	1.3.6.1.4.1.12559.11.10.1.3.1.42.10
-----------------	-------------------------------------

40

The CCD specifications indicate that in the entry *ProcedureActivityProcedure* “[the] code in a procedure activity SHOULD be selected from LOINC (codeSystem 2.16.840.1.113883.6.1) or SNOMED CT (CodeSystem: 2.16.840.1.113883.6.96), and MAY be selected from CPT-4 (CodeSystem: 2.16.840.1.113883.6.12), ICD9 Procedures (CodeSystem: 2.16.840.1.113883.6.104), ICD10 Procedure Coding System (CodeSystem: 2.16.840.1.113883.6.4).

45

For the purposes of the Trillium Bridge’s operational needs, we will focus only on the possibility of using SNOMED CT for procedures. As the code system is the same, there is no need for mapping. A verification was performed to see whether the concepts in the value set **epSOSProcedures** based on the July 2009 version are all present in the SNOMED CT version currently uploaded in the National Library of Medicine version (September 2013). All concepts are present; the only discrepancy is between the display names of two terms:

50

SNOMED CT code	epSOS Display Name	SNOMED CT Browser Sept 2013 Display Name
133864008	Lithotripsie	Lithotripsy
6025007	Laparoscopic appendicectomy	Laparoscopic appendectomy

Table 25 – Two of the terms of the value set used in Procedures have a discrepancy in their names.

The 2013 display names are proposed as corrections to the epSOS terms and were loaded in the CTS2 sever.

55 **8.5.2 Gap in the Value Sets**

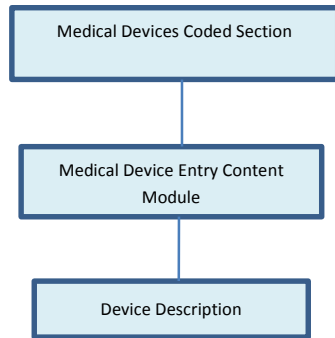
The following value sets are present in CCD but do not have correspondence in epSOS Patient Summary in the **Procedures** section:

Value Set Name	Value Set OID
ActPriority	2.16.840.1.113883.1.11.16866
HealthcareServiceLocation	2.16.840.1.113883.1.11.20275
Medication Clinical Drug	2.16.840.1.113883.3.88.12.80.17
Medication Fill Status	2.16.840.1.113883.3.88.12.80.64
Medication Product Form	2.16.840.1.113883.3.88.12.3221.8.11
Medication Route FDA Value Set	2.16.840.1.113883.3.88.12.3221.8.7
Patient Education	2.16.840.1.113883.11.20.9.34
Problem	2.16.840.1.113883.3.88.12.3221.7.4
Problem Severity	2.16.840.1.113883.3.88.12.3221.6.8
Problem Type	2.16.840.1.113883.3.88.12.3221.7.2
ProcedureAct statusCode	2.16.840.1.113883.11.20.9.22
UCUM Units of Measure (case sensitive)	2.16.840.1.113883.1.11.12839
Vaccine Administered Value Set	2.16.840.1.113883.3.88.12.80.22

Table 26 – *The CCD value sets which do not have equivalence in epSOS*

60 **8.6 Medical Devices (Medical Equipment)**

The Medical Devices and Implants in epSOS are through the Medical Devices Coded Section:



65

Figure 17 – The structure of the Coded List of Surgeries section in the epSOS Patient Summary

70

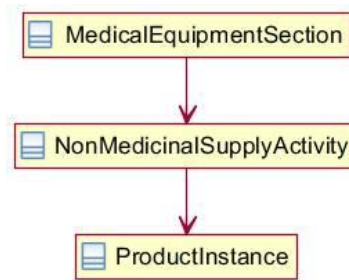


Figure 18 – The structure of the Medical Equipment section of the CCD document

75 **8.6.1 Medical Device Description**

This is a description of the type of medical device in epSOS but an instantiation of the medical device in CCD. It is important to note that a medical device is identified by a Unique Device Identification (UDI) system that requires the label of devices to bear a unique identifier.

80 **8.6.1.1 epSOS and CCD XPathS for This Data Element**

epSOS

85 `/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.2.4']/entry/supply[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.3.5']/participant[@typeCode='DEV']/participantRole/playingDevice/code`

CCD

90 `/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.23"]/entry/supply[templateId/@root="2.16.840.1.113883.10.20.22.4.50"]/participant[@typeCode="PRD"]/participantRole[templateId/@root="2.16.840.1.113883.10.20.22.4.37"]/playingDevice/code`

8.6.1.2 Functional Requirements for the Transformer

FRT79 - The transformation will have to change the template ID from epSOS to CCD for the data element **Medical Equipment** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.6.1.3.

FRT80 - The transformation will have to change the template ID from CCD to epSOS for the data element **Medical Equipment** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.6.1.3.

95 8.6.1.3 Value Sets

The value set used to describe the medical device worn by a patient in the epSOS Patient Summary is:

epSOSMedicalDevices	2.16.840.1.113883.6.96
---------------------	------------------------

100 In the CCD document, the entry *Product Instance* contains the *PlayingDevice*. No particular value set or system is indicated; however in the example given one can see that the code system is SNOMED CT. The CCD-A specifications say that: “*The FDA Amendments Act specifies the creation of a Unique Device Identification (UDI) System that requires the label of devices to bear a unique identifier that will standardize device identification and identify the device through distribution and use*”.

105 The value set epSOSMedicalDevices contains 66 concepts and is based on the July 2009 version of SNOMED CT. A check performed to see if all the concepts are included in version loaded on the SNOMED CT browser containing the September 2013 version of SNOMED CT shows that all terms are present and the display name is the same in both value sets.

8.6.1.4 Gap in the Value Sets

110 There are no detectable gaps between the value sets as no particular value set is used in CCD. The epSOSMedicalDevice value set is part of the SNOMED CT code system which CCD shows as an example. Whenever transforming a CCD document into an epSOS PS, only the subset present in epSOS can be transmitted in a computable form to Europe.

8.7 Plan of Care (Treatment Recommendations)

115 This is a section indicating the recommendations to follow concerning exercise, diet, life style changes (anything other than medication) that the patient is to follow as to improve the course of a disease or to avert further illness.

This section is narrative in epSOS Patient Summary: *“This is a narrative section as the codes that exists with regards to diet, exercise, and other therapeutic recommendations that do not include drugs.”*

120 As this section does not contain any coded elements that can be compared and transcoded or translated, it is not included in the detailed gap analysis.

8.8 Autonomy/ Invalidation (Functional Status)

This section contains the description of capability of the patient to perform acts of daily living and it is in narrative format in the epSOS Patient Summary.

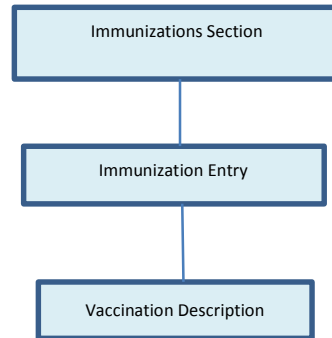
- 125 Again, since there are no coded elements that can be exchanged between the two documents, this section has not been included in the detailed gap analysis.

8.9 Vaccinations (Immunizations)

This section captures the immunization that the patient had.

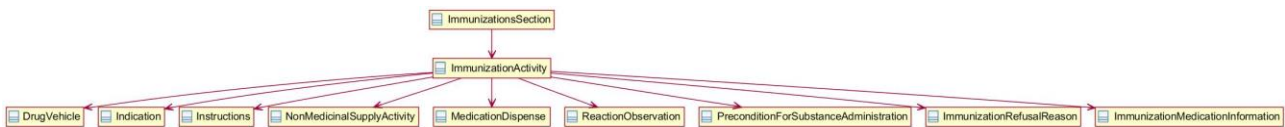
The data elements in the *Immunizations* section of the Patient Summary can be seen below:

130



135

Figure 19 – The structure of the *Immunization* section in the epSOS Patient Summary



140

Figure 20 – The structure of the *Immunizations* section in the CCD document

This is a description of the immunization that the patient has received.

8.9.1.1 epSOS and CCD XPaths for This Data Element

epSOS

145

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.23']/entry[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.12']/substanceAdministration[templateId/@root='2.16.840.1.113883.10.20.1.24']/consumable/manufacturedProduct/manufacturedMaterial/code
    
```

CCD

150

```

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.2.1"]/entry/substanceAdministration[templateId/@root="2.16.840.1.113883.10.20.22.4.52"]/consumable/manufacturedProduct[templateId/@root="2.16.840.1.113883.10.20.22.4.54"]/manufacturedMaterial/code
    
```

155

8.9.1.2 Functional Requirements for the Transformer

FRT81 - The transformation will have to change the template ID from epSOS to CCD for the data element **Vaccinations** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

FRT82 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Vaccinations** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.3.2.3.

160 **8.9.1.3 Value Sets**

The value set used to describe the immunization received by a patient in the epSOS Patient Summary is:

epSOSVaccine	1.3.6.1.4.1.12559.11.10.1.3.1.42.28
--------------	-------------------------------------

The value set used in CCD to describe the immunization received by a patient is:

Vaccine Administered Value Set	2.16.840.1.113883.3.88.12.80.22
--------------------------------	---------------------------------

165 The epSOS Vaccine is based on SNOMED CT July 2009 version (2.16.840.1.113883.6.96). The Vaccine Administered Value set is based on the Centre of Disease Control (CDC) Vaccine Administered (CVX) code system with the OID 2.16.840.1.113883.12.292).

Again, only the one-to-one mapping is included for the operation purposes of Trillium Bridge.

The vaccines belonging to the exact one-to-one mapping can be seen on the next page:

CVX Code	CVX Short Description	Full Vaccine Name	VaccineStatus	SNOMED CT Code	SNOMED CT Vaccine Name
19	BCG	Bacillus Calmette-Guerin vaccine	Active	420538001	Tuberculosis vaccine
12	diphtheria antitoxin	diphtheria antitoxin	Active	428214002	Diphtheria vaccine
20	DTaP	diphtheria, tetanus toxoids and acellular pertussis vaccine	Active	421245007	Diphtheria + pertussis + tetanus vaccine
130	DTaP-IPV	Diphtheria, tetanus toxoids and acellular pertussis vaccine, and poliovirus vaccine, inactivated	Active	414005006	Diphtheria + tetanus + pertussis + poliomyelitis
120	DTaP-Hib-IPV	diphtheria, tetanus toxoids and acellular pertussis vaccine, Haemophilus influenzae type b conjugate, and poliovirus vaccine, inactivated (DTaP-Hib-IPV)	Active	414004005	Diphtheria + tetanus + pertussis + poliomyelitis + Haemophilus influenzae b
104	Hep A-Hep B	hepatitis A and hepatitis B vaccine	Active	333702001	Hepatitis A+B vaccine
52	Hep A, adult	hepatitis A vaccine, adult dosage	Active	14745005	Hepatitis A virus vaccine
43	Hep B, adult	hepatitis B vaccine, adult dosage	Active	34689006	Hepatitis B virus vaccine
160	Influenza A monovalent (H5N1), ADJUVANTED-2013	Influenza A monovalent (H5N1), adjuvanted, National stockpile 2013	Active	427036009	Influenza virus H5N1 vaccine
141	Influenza, seasonal, injectable	Influenza, seasonal, injectable	Active	46233009	Influenza virus vaccine (product)
03	MMR	measles, mumps and rubella virus vaccine	Active	61153008	Measles + Mumps + Rubella vaccine
07	mumps	mumps virus vaccine	Active	90043005	Mumps live virus vaccine
10	IPV	poliovirus vaccine, inactivated	Active	111164008	Poliovirus vaccine
06	rubella	rubella virus vaccine	Active	386013003	Rubella vaccine
41	typhoid, parenteral	typhoid vaccine, parenteral, other than acetone-killed, dried	Active	89428009	Typhoid vaccine
75	vaccinia (smallpox)	vaccinia (smallpox) vaccine	Active	33234009	Smallpox vaccine
21	varicella	varicella virus vaccine	Active	108729007	Varicella vaccine
37	yellow fever	yellow fever vaccine	Active	56844000	Yellow fever vaccine

170

Table 27 – The mapping between the value sets *epSOSVaccine* and *Vaccine Administered Value Set*

The number of vaccines that can be unequivocally mapped is very small, being further reduced by the fact that some of the correspondent CDC vaccines are deemed “inactive”.

175 One could increase the number of terms if the mapping criteria are changed from one-to-one to many-to-one from the USA side to the epSOS side to see perhaps if the “inactive” status vaccines cannot be used strictly for the purposes of Trillium Bridge. Below we can see a mapping for Pneumococcal vaccine. The terms in green are unequivocally mapped; however the issue is that the terms in CVX are inactive. In blue we can see a proposed mapping which leads to loss of clinical information going from the CCD side to the epSOS side. This mapping as it is proposed by the project team must be validated by subject matter experts.

CVX Code	CVX Short Description	Full Vaccine Name	VaccineStatus	SNOMED CT Code	SNOMED CT Vaccine Name
109	pneumococcal, unspecified formulation	pneumococcal vaccine, unspecified formulation	Inactive	333598008	Pneumococcal vaccine
133	Pneumococcal conjugate PCV 13	pneumococcal conjugate vaccine, 13 valent	Active	333598008	Pneumococcal vaccine
100	pneumococcal conjugate PCV 7	pneumococcal conjugate vaccine, 7 valent	Active	333598008	Pneumococcal vaccine
33	pneumococcal polysaccharide PPV23	pneumococcal polysaccharide vaccine, 23 valent	Active	333598008	Pneumococcal vaccine

180

Table 28 – Mapping of Pneumococcal Vaccine

The mappable term present in the CDC vaccine set is not active, hence the “Pneumococcal vaccine” cannot be part of the common vocabulary used when dealing with vaccines in Trillium. Also, while the more specific CDC can be safely mapped to the simpler “Pneumococcal vaccine” term, the converse cannot be said.

185

8.9.1.4 Gap in the Value Sets

There are several value sets present in the CCD document which have no correspondence in the epSOS Patient Summary:

Value Set Name	Value Set OID
Body Site Value Set	2.16.840.1.113883.3.88.12.3221.8.9
HealthcareServiceLocation	2.16.840.1.113883.1.11.20275
Medication Clinical Drug	2.16.840.1.113883.3.88.12.80.17
Medication Fill Status	2.16.840.1.113883.3.88.12.80.64
Medication Product Form	2.16.840.1.113883.3.88.12.3221.8.11
MoodCodeEvnInt	2.16.840.1.113883.11.20.9.18
No Immunization Reason Value Set	2.16.840.1.113883.1.11.19717
Patient Education	2.16.840.1.113883.11.20.9.34
Problem	2.16.840.1.113883.3.88.12.3221.7.4
Problem Severity	2.16.840.1.113883.3.88.12.3221.6.8
Problem Type	2.16.840.1.113883.3.88.12.3221.7.2

190 **Table 29** – The CCD value sets that do not have equivalence in epSOS

Some of these value sets do have there equivalent but not in the vaccine section of the epSOS Patient Summary where only the three value sets from above are used.

8.10 Social History

The data elements in the Social History section in the Patient Summary can be seen below:

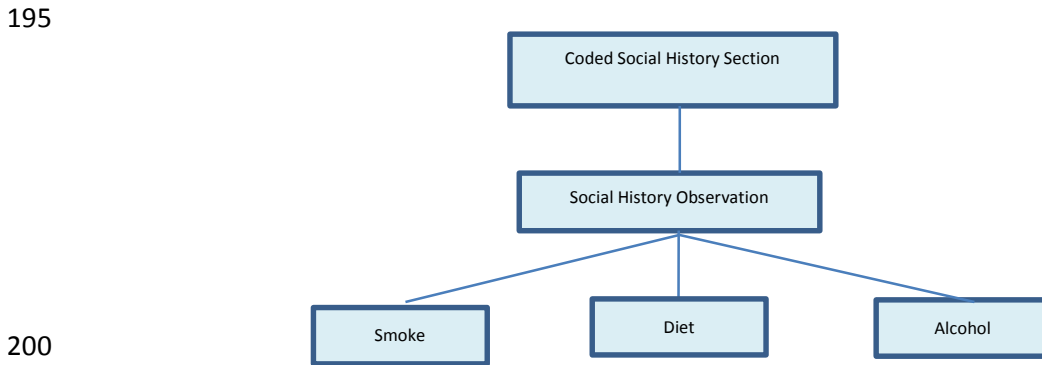


Figure 21 – The structure of the *Coded Social History Section* in the epSOS Patient Summary.

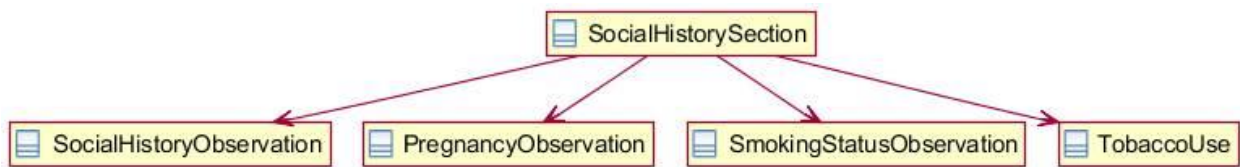


Figure 22 – The structure of the *Social History Section* in the CCD document

205 In both epSOS and CCD, the social history is coded as an observation with a type (code) and a value. The values between the two may have different data types, for example PQ in epSOS and ST in CCD. In addition, the CCD defines a specific Assertion type for smoking status, with its own template.

8.10.1 Social History Observation Type

210 8.10.1.1 epSOS and CCD XPaths for This Data Element

epSOS

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root="1.3.6.1.4.1.19376.1.5.3.1.3.16.1"]/entry/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.13.4']/code
    
```

215 CCD

```

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.17"]/entry/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.38"]/code
    
```

220 8.10.1.2 Functional Requirements for the Transformer

FRT83 - The transformation will have to change the template ID from epSOS to CCD for the data element **Social History** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.10.1.3.

FRT84- The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Social History** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.10.1.3.

8.10.1.3 Value Sets

225 The epSOS value set is:

epSOSSocialHistory	1.3.6.1.4.1.12559.11.10.1.3.1.44.1
--------------------	------------------------------------

This value set is based on the code system SNOMED CT (OID 2.16.840.1.113883.6.96)

Social History Type Set Definition	2.16.840.1.113883.3.88.12.80.60
------------------------------------	---------------------------------

epSOS Code	epSOS Display Name	CCD code	CCD Display Name
160573003	Alcohol intake	160573003	Alcohol intake
364703007	Employment detail	364703007	Employment detail
256235009	Exercise	256235009	Exercise
364393001	Nutritional observable	364393001	Nutritional observable
229819007	Tobacco use and exposure	229819007	Tobacco use and exposure
425400000	Toxic exposure status	425400000	Toxic exposure status
363908000	Details of drug misuse behaviour	363908000	Details of drug misuse behavior
228272008	Health-related behaviour	228272008	Health-related behavior
not matched		105421008	Educational Achievement

230 **Table 30** – The mapping between the value sets *epSOSSocialHistory* and *Social History Type Set Definition*

Although epSOS contains all these values, the only ones frequently used are alcohol intake; tobacco uses and diet are supposed to be provided in epSOS.

Two other value sets are of interest from the CCD site, providing information about smoking:

Value Set Name	Value Set OID
Tobacco Use	2.16.840.1.113883.11.20.9.41
Smoking Status	2.16.840.1.113883.11.20.9.38

235 **Table 31** – CCD value sets providing information about smoking

It is of interest to list them as they do provide information about the amount of smoking a person did/does such as in the value set “Tobacco Use” (OID: 2.16.840.1.113883.11.20.9.41):

SNOMED CT Code	SNOMED Display Name
81703003	Chews tobacco
228494002	Snuff user
59978006	Cigar smoker
43381005	Passive smoker
449868002	Current every day smoker
428041000124106	Current some day smoker
8517006	Former smoker
266919005	Never smoker
77176002	Smoker, current status unknown
266927001	Unknown if ever smoked

Table 32 – “*Tobacco Use*” value set

The other value set shows the smoking status of a person (for example, if they have quit smoking)

SNOMED CT Code	SNOMED Display Name
Code	Print Name
449868002	Current every day smoker
428041000124106	Current some day smoker
8517006	Former smoker
266919005	Never smoker (Never Smoked)
77176002	Smoker, current status unknown
266927001	Unknown if ever smoked

240 **Table 33** – “*Smoking Status*” value set

While this information is useful when assessing a patient, it does not exist as coded information (only as physical quantity PQ) in the epSOS Patient Summary site, hence no common vocabulary can be found for transcoding and translating the concepts in the value sets.

245 8.10.2 Pregnancy Observation - Estimated delivery date

The Pregnancy Observation entry of the CCD Social History “represents current and/or prior pregnancy dates enabling investigators to determine if the subject of the case report was pregnant during the course of a condition”. This is equivalent to the Pregnancy History Section in epSOS Patient Summary.

250 While epSOS defines a specific section for pregnancy, the CCD specifies the use of a Pregnancy Observation entry under the social history section. The mapping therefore should be as follows:

- From epSOS Patient Summary to the CCD – if there is a pregnancy section in the epSOS document, then a social history pregnancy observation shall be created, and
 - if the epSOS pregnancy observation code is 11778-8, then an Estimated Date of Delivery template shall be included in the CCD Pregnancy Observation

- 255 • From CCD to epSOS Patient Summary – if there is a Pregnancy Observation in the CCD, then a Pregnancy section shall be created in the epSOS document, and
 - If the CCD Pregnancy Observation contains an Estimated Delivery Template, then a Pregnancy Observation shall be added to the epSOS Pregnancy section with code 11778-8.

260 **8.10.2.1 epSOS and CCD XPaths for This Data Element**

epSOS

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.1.5.3.4']/entry/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.13.5']/code
```

265 **CCD**

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.17"]/entry/observation[templateId/@root="2.16.840.1.113883.10.20.15.3.8"]/entryRelationship[@typeCode="REFR"]/observation[templateId/@root="2.16.840.1.113883.10.20.15.3.1"]
```

270 **8.10.2.2 Functional Requirements for the Transformer**

FRT85- The transformation will have to change the template ID from **epSOS** to **CCD** for the data element **Pregnancy Observation - Estimated delivery date** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.10.1.3.

FRT86 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Pregnancy Observation - Estimated delivery date** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.10.1.3.

8.10.2.3 Value Sets

275 epSOS contains a value set indicating the possible type for the delivery date:

epSOSPregnancyInformation	1.3.6.1.4.1.12559.11.10.1.3.1.42.9
---------------------------	------------------------------------

epSOS Code	epSOS Display Name
11778-8	Delivery date estimated (clinical)
11779-6	Delivery date estimated from last menstrual period
11780-4	Delivery date estimated from ovulation

Table 34 – “epSOSPregnancyInformation” value set

In CCD the **Pregnancy Observation** entry (2.16.840.1.113883.10.20.15.3.8) contains the **Estimated Date of Delivery** (2.16.840.1.113883.10.20.15.3.1) which “SHALL contain exactly one [1..1] code="11778-8" Estimated date of delivery (CodeSystem: LOINC 2.16.840.1.113883.6.1) “.

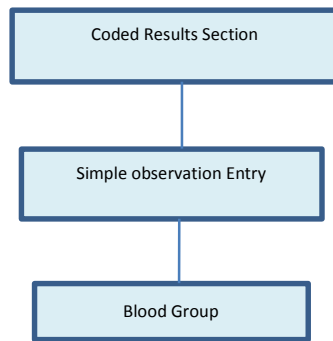
280

There is only one code used in CCD, the 11778-8 Estimated Date of Delivery that can be included in the common vocabulary.

285 **8.11 Results**

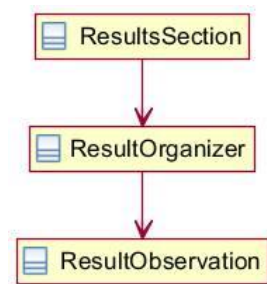
The results section in epSOS Patient Summary addressed only the blood type results as it can be seen from the data structure below:

290



295

Figure 23 – The structure of the Coded Results Section in the epSOS Patient Summary



300 **Figure 24** –The structure of the Results Section in the CCD document

8.11.1 Blood Group

The Results section in the CCD document can include details of a lab, radiology, or other study performed on a patient, whereas in the epSOS Patient Summary, the Result Observation contains only the blood type indicated by the code '34530-6' from LOINC as fixed vocabulary.

No specific instructions were found in the CCD document as to what code system should be used to express the results of the blood group. However, the PCC CDA Content Modules from October 4th, 2013 indicates that either SNOMED CT or ISBT 128 2.16.840.1.113883.6.18 code systems could be used. We will focus only on SNOMED CT as this code system can seem to be used routinely.

8.11.1.1 epSOS and CCD XPaths for This Data Element

epSOS:

```
/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.3.28']/entry/observation[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.13'][code/@code='34530-6']/value
```

CCD:

```
/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/structuredBody/component/section[templateId/@root="2.16.840.1.113883.10.20.22.2.3.1"]/entry/organizer[templateId/@root="2.16.840.1.113883.10.20.22.4.1"]/component/observation[templateId/@root="2.16.840.1.113883.10.20.22.4.2"]/value
```

8.11.1.2 Functional Requirements for the Transformer

FRT87 - The transformation will have to change the template ID from epSOS to CCD for the data element **Blood Group** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element from the CTS2 server is listed in section 7.11.1.3.

FRT88 - The transformation will have to change the template ID from CCD to epSOS for the data element **Blood Group** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element Blood Group from the CTS2 server is listed in section 7.11.1.3.

Note: Generally, the results section of a CCD will be passed along as-is, except for the case where the test described is a blood group test, which is available for the epSOS Patient Summary document. The transformer needs to be able to determine if the CCD coded results section contains such a result in order to initiate the transformation

8.11.1.3 Value Sets

The value set used in epSOS is based on SNOMED CT (2.16.840.1.113883.6.96) and can be seen underneath:

epSOSBloodGroup	2.16.840.1.113883.6.96
-----------------	------------------------

epSOS Code	English Display Name
112144000	Blood group A
278152006	Blood group A Rh(D) negative

278149003	Blood group A Rh(D) positive
165743006	Blood group AB
278154007	Blood group AB Rh(D) negative
278151004	Blood group AB Rh(D) positive
112149005	Blood group B
278153001	Blood group B Rh(D) negative
278150003	Blood group B Rh(D) positive
58460004	Blood group O
278148006	Blood group O Rh(D) negative
278147001	Blood group O Rh(D) positive

Table 35 – The “*epSOSBloodGroup*” value set

All the above values are included in the September 2013 version of SNOMED CT available through the National Library of Medicine SNOMED Browser:

8.12 Vital Signs

8.12.1 Blood Pressure

The only vital signs are the blood pressure in epSOS. The structure of the data elements can be seen below:

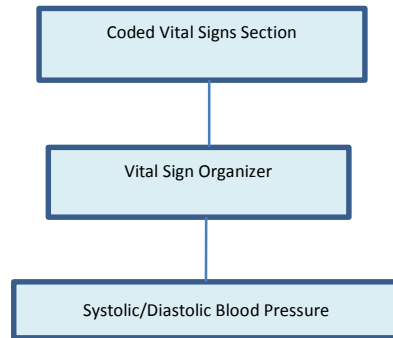


Figure 25 – The structure of the Coded Vital Signs Section in the epSOS Patient Summary



Figure 26 – The structure of the Vital Signs Section in the CCD document.

8.12.1.1 epSOS and CCD XPaths for This Data Element

epSOS

```

/ClinicalDocument[templateId/@root='1.3.6.1.4.1.12559.11.10.1.3.1.1.3']/component/structuredBody/component/section[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.1.5.3.2']/entry/organizer[templateId/@root='1.3.6.1.4.1.19376.1.5.3.1.4.13.1']/component/observation/code
    
```

CCD

```

/ClinicalDocument[templateId/@root="2.16.840.1.113883.10.20.22.1.2"]/component/section[templateId/[@root='2.16.840.1.113883.10.20.22.2.3.1']/entry/organizer[templateId/@root='2.16.840.1.113883.10.20.22.4.1']/component/observation/[templateId/@root='2.16.840.1.113883.10.20.22.4.2']/code
    
```

8.12.1.2 Functional Requirements for the Transformer

FRT89 - The transformation will have to change the template ID from epSOS to CCD for the data element **Blood Pressure** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element Blood Group from the CTS2 server is listed in section 7.11.1.3.

FRT90 - The transformation will have to change the template ID from **CCD** to **epSOS** for the data element **Blood Pressure** as per the Xpaths. The mapping providing a common vocabulary for the value of this data element Blood Group from the CTS2 server is listed in section 7.11.1.3.

8.12.1.3 Value Sets

The blood pressure is expressed through the following value set in epSOS:

epSOSBloodPressure	1.3.6.1.4.1.12559.11.10.1.3.1.42.10
--------------------	-------------------------------------

The blood pressure is expressed by the following value sets in CCD:

HITSP Vital Sign Result Type	2.16.840.1.113883.3.88.12.80.62
------------------------------	---------------------------------

The only common area of intersection of the two value sets are:

epSOS Code	English Display Name	CCD Code	CCD Display Name
8462-4	Diastolic blood pressure	8462-4	BP Diastolic
8480-6	Systolic blood pressure	8480-6	BP Systolic
not matched		9279-1	Respiratory Rate
not matched		8867-4	Heart Rate
not matched		2710-2	O2 % BldC Oximetry
not matched		8310-5	Body Temperature
not matched		8302-2	Height
not matched		8306-3	Height (Lying)
not matched		8287-5	Head Circumference
not matched		3141-9	Weight Measured
not matched		39156-5	BMI (Body Mass Index)
not matched		3140-1	BSA (Body Surface Area)

Table 27– The mapping between the value sets **epSOSBloodPressure** and **HITSP Vital Sign Result Type**

9 Lessons Learned

- The main lessons learned were as follows:
- A limited common intersection exists in section, data element and value set coverage
- The granularity of clinical information is lost in most cases
- Original code must always be sent for safety reasons, pdf must be sent as well with the transcoded and translated document (same as in epSOS)
- Although the syntax is the same, transformation is still needed
- Code systems used are not the same or they are not used in the same manner
- A long way away from an International Patient Summary
- Important Feasibility Study to prepare the road for future projects.

10 Conclusion

A considerable amount of work went into the analysis of the semantic components of the epSOS Patient Summary and the Continuity of Care (CCD) document. Sections were compared, then data elements contained by the sections, followed by the value sets. Although the documents are different and were originally intended for slightly different purposes (CCD for planned care and epSOS PS for unplanned care), there is a considerable amount of overlap in the clinical information. However, the way the structure is expressed bring forth the need for a syntactic transformation. epSOS Patient Summary is based on IHE content profiles; whereas CCD, belonging to CCDA, has already undergone the process of harmonization between IHE and HL7. This can explain the differences in the way the clinical information is syntactically expressed. A transformer can help with this syntactic conversion.

However, syntax represents only half of the semantic components. The value sets that are used in the data elements of the CD data type also need to be mapped. In some cases not all the value sets have equivalence on both sides; this has been documented in the gap analysis. The difference between the uses of the value sets can be attributed to the different clinical needs identified by the healthcare professionals who contributed to the development of each of the specifications. In the value sets that do have equivalence there is also a difference. In some case the value sets are based on the same code systems and are identical (such as in the representation of the *Adverse Event Response*), in others they contain more or less of the terms than its equivalent, again based on the clinical and administrative needs (such as the value sets used in *Confidentiality*, for example). In other cases, even if the value sets are based on the same code systems, one member of the pair will contain a much more detailed and granular number of terms (such as in the description of the Allergic Response). In cases where the value sets are based on different code systems, existing official mapping were sought (such as the ones provided by the National Library of Medicine). Even though the official mapping exists, there are cases where the value set is only partially covered by it, leading to incomplete correspondence in both ICD-10 and SNOMED CT and RxNorm and ATC. Of great importance is the fact that the mapping itself is between a classification (ICD-10) and a very precise code system (SNOMED CT), and it is unidirectional. Although some terms can be isolated where there is a one-to-one equivalence, the maps are quite small. The end user must use the information translated and transcoded for information puposes only for the time being and always read the original documents so that no clinical information is lost. Lastly, mappings were proposed where none existed. This must be verified by subject matter experts in the respective fields.

We hope that by taking the first stab at such a complex issue and by offering an on-line tool which will be documented in D3.2, we can entice the end users to contribute to the quality assurance of the maps themselves.

Ultimately, these efforts can serve as a good base for harmonization efforts in the future.

Appendix A - Mappings between the various value sets

The terms that could be unequivocally mapped are listed in green, those which have a somewhat “close” mapping leading to loss of information are listed in blue, and those terms for which no match could be found are listed in red. This mapping needs to be reviewed and fine tuned by subject matter experts.

Table 1 *epSOSReactionAllergy* (1.3.6.1.4.1.12559.11.10.1.3.1.42.11) and *Problem Value Set* (2.16.840.1.113883.3.88.12.3221.7.4)

epSOS		CCD	
39579001	Anaphylaxis	39579001	Anaphylaxis (disorder)
		35001004	Anaphylactoid reaction (disorder)
		419042001	Anaphylactic shock, due to adverse effect of correct medicinal substance properly administered (disorder)
		427903006	Anaphylaxis due to fish (disorder)
		429751004	Anaphylaxis due to fruit (disorder)
		430980000	Anaphylaxis due to hymenoptera venom (disorder)
		402390008	Anaphylaxis due to ingested food (disorder)
		427833000	Anaphylaxis due to mollusk (disorder)
		417516000	Anaphylaxis due to substance (disorder)
		428795003	Anaphylaxis due to vegetable (disorder)
		402391007	Anaphylaxis secondary to bite and/or sting (disorder)
4386001	Bronchospasm	4386001	Bronchospasm (finding)
9826008	Conjonctivite	9826008	Conjunctivitis (disorder)
		193876005	Conjunctivitis with mucocutaneous disorder (disorder)
43116000	Eczema	43116000	Eczema (disorder)
		186535001	Eczema herpeticum (disorder)
		95812002	Eczema of external auditory canal (disorder)
		36259009	Eczematous dermatitis of eyelid (disorder)
70076002	Rhinite	70076002	Rhinitis (disorder)
		427897002	Rhinitis due to alpha-adrenergic blocking agent (disorder)
		95239003	Rhinitis medicamentosa (disorder)
41291007	Angio-oedema	41291007	Angioedema (disorder)
200769008	Atopic dermatitis and related conditions	not matched	not matched
267804004	Pruritus NOS	not matched	not matched
247472004	Weal	not matched	not matched

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Table 2

epSOSAllergenNoDrugs (1.3.6.1.4.1.12559.11.10.1.3.1.42.19) and *Ingredient Name* (2.16.840.1.113883.3.88.12.80.20).

One must note that in some cases the synonym (ST) matches better than the preferred term (PT). These are highlighted in yellow.

epSOS		CCD			
226491003	Apple juice	APPLE JUICE	PT	9871T0PD5P	APPLE JUICE
391737006	Almond oil	ALMOND OIL	PT	66YXD4DKO9	ALMOND OIL
11526002	Aspartame	ASPARTAME	PT	Z0H242BBR1	ASPARTAME
288328004	Bee venom	APIS MELLIFERA VENOM	PT	76013O881M	APIS MELLIFERA VENOM
		BEE VENOM	SY	76013O881M	APIS MELLIFERA VENOM
9021002	Carbaryl	CARBARIL	PT	R890C8J3N1	CARBARIL
256319004	Carrot	CARROT	PT	L56Z1JK48B	CARROT
260152009	Cat dander	FELIS CATUS DANDER	PT	ZDN2AC0L08	FELIS CATUS DANDER
		CAT DANDER	SY	ZDN2AC0L08	FELIS CATUS DANDER
256310000	Cherry - dietary	CHERRY	PT	BUC5I9595W	CHERRY
102262009	Chocolate	COCOA	PT	D9108TZ9KG	COCOA
		AE-CHOCOLATE	SY	D9108TZ9KG	COCOA

227388008	Cinnamon	CINNAMON	PT	5S29HWU6QB	CINNAMON
59351004	Citrate	CITRIC ACID MONOHYDRATE	PT	2968PHW8QP	CITRIC ACID MONOHYDRATE
		CITRATE	SY	2968PHW8QP	CITRIC ACID MONOHYDRATE
102259006	Citrus fruit	CITRUS FRUIT	PT	XDK00Z8012	CITRUS FRUIT
11894001	Clostridium botulinum toxin	BOTULINUM TOXIN TYPE A	PT	E211KPY694	BOTULINUM TOXIN TYPE A
		BOTULINUM NEUROTOXIN TYPE A (EC 3.4.24.69) FROM CLOSTRIDIUM BOTULINUM	SY	E211KPY694	BOTULINUM TOXIN TYPE A
412357001	Corn	CORN	PT	0N8672707O	CORN
264295007	Cow's milk protein	CASEIN	PT	48268V50D5	CASEIN
		CASEIN, COW MILK	SY	48268V50D5	CASEIN
396031000	Dimeticone	DIMETHICONE	PT	92RU3N3Y1O	DIMETHICONE
260154005	Dog dander	CANIS LUPUS FAMILIARIS DANDER	PT	11JCK302I4	CANIS LUPUS FAMILIARIS DANDER
		CANIS FAMILIARIS DANDER	SY	11JCK302I4	CANIS LUPUS FAMILIARIS DANDER
33008008	Dust	HOUSE DUST	PT	EYO007VX98	HOUSE DUST
102263004	Eggs (edible)	EGG	PT	291P45F896	EGG
227425007	Figs	FIG	PT	TGD87RII2U	FIG
227037002	Fish - dietary	FISH	PT	1PIO77PW2X	FISH
406774009	Fish derived omega 3 fatty acid	OMEGA-3 FATTY ACIDS	PT	71M78END5S	OMEGA-3 FATTY ACIDS
226359003	Fish oil - dietary	FISH OIL	PT	XGF7L72M0F	FISH OIL

72511004	Fruit	FRUIT	PT	C2AIY4ERZC	FRUIT
256417003	Horse dander	EQUUS CABALLUS DANDER	PT	J81SZ18495	EQUUS CABALLUS DANDER
		HORSE DANDER	SY	J81SZ18495	EQUUS CABALLUS DANDER
128488006	House dust	HOUSE DUST	PT	EYO007VX98	HOUSE DUST
111088007	Latex	NATURAL LATEX RUBBER	PT	2LQ0UUW8IN	NATURAL LATEX RUBBER
230031005	Lobster - dietary	LOBSTER	SY	ZQ6LG2C39M	LOBSTER, UNSPECIFIED
230032003	Oyster - dietary	OYSTER	SY	S614XWR17V	OYSTER, UNSPECIFIED
255667006	Paraffin	PARAFFIN	PT	I9O0E3H2ZE	PARAFFIN
256349002	Peanut - dietary	PEANUT	PT	QE1QX6B99R	PEANUT
387398009	Podophyllum resin	PODOPHYLLUM RESIN	PT	16902YVY2B	PODOPHYLLUM RESIN
83619009	Polyvinyl alcohol	POLYVINYL ALCOHOL	PT	532B59J990	POLYVINYL ALCOHOL
226934003	Pork	PORK	PT	O138UB266J	PORK
260170007	Potato - dietary	POTATO	PT	CFE1S8DYWD	POTATO
256303006	Ragweed pollen	AMBROSIA ARTEMISIIFOLIA POLLEN	PT	K20Y81ACO3	AMBROSIA ARTEMISIIFOLIA POLLEN
		ANNUAL RAGWEED POLLEN	SY	K20Y81ACO3	AMBROSIA ARTEMISIIFOLIA POLLEN
226915003	Red meat	too many			
43230003	Rubber	NATURAL LATEX RUBBER	PT	2LQ0UUW8IN	NATURAL LATEX RUBBER

412068007	Rye	RYE	PT	0R4AQI398X	RYE
303314008	Scorpion venom	ANDROCTONUS AUSTRALIS VENOM	PT	25IMQ489AW	ANDROCTONUS AUSTRALIS VENOM
		SAHARA SCORPION VENOM	SY	25IMQ489AW	ANDROCTONUS AUSTRALIS VENOM
227146005	Shellfish - dietary	SHELLFISH	PT	1G4F72G3PH	SHELLFISH
278840001	Shrimp product	SHRIMP	SY	1891LE191T	SHRIMP, UNSPECIFIED
13652007	Silicone	SILICON	PT	Z4152N8IUI	SILICON
7791007	Soy protein	AMINO ACIDS, SOY	PT	NWB9514AZM	AMINO ACIDS, SOY
303315009	Spider venom	LATRODECTUS MACTANS VENOM	PT	TI41393577	LATRODECTUS MACTANS VENOM
		SOUTHERN BLACK WIDOW SPIDER VENOM	SY	TI41393577	LATRODECTUS MACTANS VENOM
102261002	Strawberry	STRAWBERRY	PT	4J2TY8Y81V	STRAWBERRY
415710007	Terpene	EUCALYPTUS TERPENE OIL	SY	2R04ONI662	EUCALYPTUS OIL
256327008	Tomato - dietary	TOMATO	PT	Z4KHF2C175	TOMATO
256440004	Wasp venom	POLISTES FUSCATUS VENOM PROTEIN	PT	AKT0E6058K	POLISTES FUSCATUS VENOM PROTEIN
		COMMON PAPER WASP VENOM PROTEIN	SY	AKT0E6058K	POLISTES FUSCATUS VENOM PROTEIN
419420009	Watermelon	WATERMELON	PT	231473QB6R	WATERMELON
412071004	Wheat	WHEAT	PT	4J2I0SN84Y	WHEAT
419633007	White paraffin	PARAFFIN	PT	I9O0E3H2ZE	PARAFFIN
		PARAFFIN, WHITE SOFT	SY	I9O0E3H2ZE	PARAFFIN

412161004	Wool	ALLERGENIC EXTRACT- WOOL OVIS	SY	503LYG631H	SHEEP WOOL
395922006	Wool alcohols	LANOLIN ALCOHOLS	PT	884C3FA9HE	LANOLIN ALCOHOLS
		WOOL ALCOHOLS	SY	884C3FA9HE	LANOLIN ALCOHOLS
12503006	Aluminium	ALUMINUM	PT	CPD4NFA903	ALUMINUM
43735007	Sulphur	SULFUR	PT	70FD1KFU70	SULFUR
260126003	Olive pollen	OLEA EUROPAEA POLLEN	PT	43R41XZ627	OLEA EUROPAEA POLLEN
		AE-OLIVE POLLEN	SY	43R41XZ627	OLEA EUROPAEA POLLEN
256419000	Mouse epithelium	MUS MUSCULUS SKIN	PT	390AN9GB09	MUS MUSCULUS SKIN
		MOUSE EPITHELIA	SY	390AN9GB09	MUS MUSCULUS SKIN
89889006	Cotton fiber	COTTON FIBER	PT	70LDW53ROO	COTTON FIBER
89811004	Gluten	WHEAT GLUTEN	PT	1534K8653J	WHEAT GLUTEN
		GLUTEN	SY	1534K8653J	WHEAT GLUTEN
47703008	Lactose	LACTOSE	PT	J2B2A4N98G	LACTOSE
227344001	Broad bean - dietary	FAVA BEAN	PT	Y90472823X	FAVA BEAN
		BROAD BEAN	SY	Y90472823X	FAVA BEAN
230034002	Nuts and seeds	too many			
406466009	House dust allergen	HOUSE DUST	PT	EYO007VX98	HOUSE DUST

25564000	Biocide	not found			
102264005	Cheese	CASEIN	PT	48268V50D5	CASEIN
		ALLERGENIC EXTRACT- CHEESE, SWISS	SY	13811K7P3X	CASEIN, EMMENTAL CULTURED
		AE-CHEESE, COTTAGE	SY	489F5JNV5B	CASEIN, LACTOCOCCUS LACTIS CULTURED
		ALLERGENIC EXTRACT- CHEESE, COTTAGE	SY	489F5JNV5B	CASEIN, LACTOCOCCUS LACTIS CULTURED
		ALLERGENIC EXTRACT- CHEESE, CHEDDAR	SY	CJP9NL7JSJ	CASEIN, LACTOCOCCUS LACTIS CULTURED, AGED
		AE-CHEESE, ROQUEFORT	SY	IYI0G2057S	CASEIN, LACTOCOCCUS LACTIS CULTURED, PENICILLIUM ROQUEFORTI CULTURED, AGED
		ALLERGENIC EXTRACT- CHEESE, ROQUEFORT	SY	IYI0G2057S	CASEIN, LACTOCOCCUS LACTIS CULTURED, PENICILLIUM ROQUEFORTI CULTURED, AGED
		ALLERGENIC EXTRACT- CHEESE, PARMESAN	SY	EV7Y02KOMA	CASEIN, STREPTOCOCCUS THERMOPHILUS CULTURED, PROPIONIBACTERIUM FREUDENREICHII SUBSP. SHERMANII CULTURED, AGED
420111002	Contact metal agent	not found			
289122001	Cosmetic material	DOW CORNING 556 COSMETIC GRADE FLUID	SY	DR0K5NOJ4R	PHENYL TRIMETHICONE
226760005	Dairy foods	not found			
116273005	Dietary substance	not found			
61789006	Dye	too many			
303300008	Egg protein	not found			
115589000	Ethanolamine	ETHANOLAMINE HYDROCHLORIDE	PT	KKP3YYL02F	ETHANOLAMINE HYDROCHLORIDE
		ETHANOLAMINE OLEATE	PT	U4RY8MRX7C	ETHANOLAMINE OLEATE
256435007	Feathers	canary, duck, goose, parekeet			
256292005	Flower and weed pollen	sunflower derivatives only			
256277009	Grass pollen	too many			
31006001	Kingdom Plantae	not found			

260156007	Mouse urine proteins	not found			
406472009	Animal protein and epidermal allergen	not found			
406473004	Contact allergen	not found			
13577000	Nut	too many			
418504009	Oats	not found			
116549003	Organochlorine pesticide	not found			
119417004	Organophosphate insecticide	not found			
410853002	Perfluorochemical	not found			
418785009	Perfume	not found			
59545008	Pesticide	not found			
395835001	Plasma protein				
256259004	Pollen	not found			
227313005	Pulse vegetables	not found			
311846002	Pyrethroid insecticide	not found			
44027008	Seafood	not found			
264337003	Seed	SEEDS not sure this is it. Not found.	PT	0L2S019D68	SEEDS
256260009	Tree and shrub pollen	too many			
256305004	Tree resin	resin too many, benjamin tree resin too specific.			
256352005	Walnut - nut	too many			
14402002	Wood	not found			
418266005	Yellow paraffin	not found			
412069004	Flavouring agent	not found			
406771001	Sulphite and/or sulphite derivative	too specific			
37352007	Fungus antigenic agent	not found			
289949002	Cypress pollen	too many			
280939008	Insect venom	not found			
406470001	Insect allergen	not found			
260118006	Wall pellitory pollen	not found			

37017009	Helminth	HELMINTHOSPORIUM SOLANI ?	PT	U6Z259H815	HELMINTHOSPORIUM SOLANI
59533004	Food additive	too many - yellow, red, green			

10 **Table 3** *epSOSRoutesofAdministration* (1.3.6.1.4.1.12559.11.10.1.3.1.44.1) and *Medication Route FDA Value Set* (2.16.840.1.113883.3.88.12.3221.8.7)

epSOS		CCD	
20001000	Auricular use	AURICULAR (OTIC)	C38192
20002500	Buccal use	BUCCAL	C38193
20003000	Cutaneous use	CUTANEOUS	C38675
20004000	Dental use	DENTAL	C38197
20006000	Endocervical use	ENDOCERVICAL	C38205
20007000	Endosinusial use	ENDOSINUSIAL	C38206
20009000	Epidural use	EPIDURAL	C38210
20011000	Extraamniotic use	EXTRA-AMNIOTIC	C38211
20011500	Extracorporeal use	EXTRACORPOREAL	C38212
20015000	Hemodialysis	HEMODIALYSIS	C38200
20022000	Intraamniotic use	INTRA-AMNIOTIC	C38221
20023000	Intraarterial use	INTRA-ARTERIAL	C38222
20024000	Intraarticular use	INTRA-ARTICULAR	C38223
20025000	Intrabursal use	INTRABURSAL	C38226
20026000	Intracardiac use	INTRACARDIAC	C38227
20026500	Intracartilaginous use	INTRACARTILAGINOUS	C38228
20027000	Intracavernous use	INTRACAVERNOUS	C38230
20027010	Intracerebral use	INTRACEREBRAL	C38232
20028500	Intracisternal use	INTRACISTERNAL	C38233
20029000	Intracoronary use	INTRACORONARY	C38218
20030000	Intradermal use	INTRADERMAL	C38238
20031000	Intradiscal use	INTRADISCAL	C38239
20031500	Intraepidermal use	INTRAEPIDERMAL	C38243
20032000	Intralesional use	INTRALESIONAL	C38250
20033000	Intralymphatic use	INTRALYMPHATIC	C38252
20035000	Intramuscular use	INTRAMUSCULAR	C28161
20036000	Intraocular use	INTRAOCULAR	C38255
20037000	Intrapericardial use	INTRAPERICARDIAL	C38257
20038000	Intraperitoneal use	INTRAPERITONEAL	C38258
20039000	Intrapleural use	INTRAPLEURAL	C38259
20039500	Intraprostatic use	INTRAPROSTATIC	C38260

20042000	Intrathecal use	INTRATHECAL	C38267
20043000	Intratumoral use	INTRATUMOR	C38269
20044000	Intrauterine use	INTRAUTERINE	C38272
20045000	Intravenous use	INTRAVENOUS	C38276
20046000	Intravesical use	INTRAVESICAL	C38278
20047000	Intravitreal use	INTRAVITREAL	C38280
20047500	Iontophoresis	IONTOPHORESIS	C38203
20049000	Nasal use	NASAL	C38284
20053000	Oral use	ORAL	C38288
20055000	Oropharyngeal use	OROPHARYNGEAL	C38289
20057000	Periarticular use	PERIARTICULAR	C38292
20058000	Perineural use	PERINEURAL	C38293
20059000	Periodontal use	PERIODONTAL	C38294
20061000	Rectal use	RECTAL	C38295
20061500	Retrobulbar use	RETROBULBAR	C38296
20065000	Subconjunctival use	SUBCONJUNCTIVAL	C38298
20066000	Subcutaneous use	SUBCUTANEOUS	C38299
20067000	Sublingual use	SUBLINGUAL	C38300
20067500	Submucosal use	SUBMUCOSAL	C38301
20070000	Transdermal use	TRANSDERMAL	C38305
20071000	Urethral use	URETHRAL	C38271
20072000	Vaginal use	VAGINAL	C38313
20008000	Endotracheopulmonary use	ENDOTRACHEAL	C38208
20048000	Laryngopharyngeal use	LARYNGEAL	C38282
20010000	Epilepsional use	no match	
20013000	Gastroenteral use	no match	
20013500	Gastric use	no match	
20014000	Gingival use	no match	
20015500	Implantation	no match	
20020000	Inhalation use	no match	
20021000	Intestinal use	no match	
20028000	Intracervical use	no match	
20036500	Intraosseous use	no match	
20041000	Intrasternal use	no match	

20050000	Nebulisation use	no match	
20051000	Ocular use	no match	
20054000	Oromucosal use	no match	
20056000	Paravertebral use	no match	
20059300	Periosseous use	no match	
20059500	Posterior juxtasceral use	no match	
20062000	Route of administration not applicable	no match	
20063000	Skin scarification	no match	
no match	no match	CONJUNCTIVAL	C38194
no match	no match	ELECTRO-OSMOSIS	C38633
no match	no match	ENTERAL	C38209
no match	no match	INFILTRATION	C38215
no match	no match	INTERSTITIAL	C38219
no match	no match	INTRA-ABDOMINAL	C38220
no match	no match	INTRABILIARY	C38224
no match	no match	INTRABRONCHIAL	C38225
no match	no match	INTRACAUDAL	C38229
no match	no match	INTRACAVITARY	C38231
no match	no match	INTRACORNEAL	C38234
no match	no match	INTRACORONAL, DENTAL	C38217
no match	no match	INTRACORPORUS CAVERNOSUM	C38235
no match	no match	INTRACRANIAL	C38236
no match	no match	INTRADUCTAL	C38240
no match	no match	INTRADUODENAL	C38241
no match	no match	INTRADURAL	C38242
no match	no match	INTRAEPICARDIAL	C79144
no match	no match	INTRAESOPHAGEAL	C38245
no match	no match	INTRAGASTRIC	C38246
no match	no match	INTRAGINGIVAL	C38247
no match	no match	INTRAHEPATIC	C38248
no match	no match	INTRAILEAL	C38249
no match	no match	INTRALINGUAL	C79138
no match	no match	INTRALUMINAL	C38251
no match	no match	INTRAMAMMARY	C79137

no match	no match	INTRAMEDULLARY	C38253
no match	no match	INTRAMENINGEAL	C38254
no match	no match	INTRANODAL	C79141
no match	no match	INTRAOMENTUM	C79142
no match	no match	INTRAOVARIAN	C38256
no match	no match	INTRAPULMONARY	C38261
no match	no match	INTRARUMINAL	C79139
no match	no match	INTRASINAL	C38262
no match	no match	INTRASPINAL	C38263
no match	no match	INTRASYNOVIAL	C38264
no match	no match	INTRATENDINOUS	C38265
no match	no match	INTRATESTICULAR	C38266
no match	no match	INTRATHORACIC	C38207
no match	no match	INTRATUBULAR	C38268
no match	no match	INTRATYMPANIC	C38270
no match	no match	INTRAVASCULAR	C38273
no match	no match	INTRAVENTRICULAR	C38277
no match	no match	IRRIGATION	C38281
no match	no match	NASAL	C38284
no match	no match	NASOGASTRIC	C38285
no match	no match	NOT APPLICABLE	C48623
no match	no match	OCCLUSIVE DRESSING TECHNIQUE	C38286
no match	no match	OPHTHALMIC	C38287
no match	no match	PARENTERAL	C38291
no match	no match	PERCUTANEOUS	C38676
no match	no match	PERIDURAL	C38677
no match	no match	RESPIRATORY (INHALATION)	C38216
no match	no match	SOFT TISSUE	C38198
no match	no match	SUBARACHNOID	C38297
no match	no match	SUBGINGIVAL	C65103
no match	no match	SUBRETINAL	C79143
no match	no match	TOPICAL	C38304
no match	no match	TRANSENDOCARDIAL	C79145
no match	no match	TRANSMUCOSAL	C38283

no match	no match	TRANSPLACENTAL	C38307
no match	no match	TRANSTRACHEAL	C38308
no match	no match	TRANSTYMPANIC	C38309
no match	no match	URETERAL	C38312

Table 4 –*epSOSDoseForm* (1.3.6.1.4.1.12559.11.10.1.3.1.42.2) and *Medication Product Form* (2.16.840.1.113883.3.88.12.3221.8.11)

epSOS		CCD	
12100	Capsule	C25158	CAPSULE
10220000	Coated tablet	C42895	CAPSULE, COATED
10502000	Cream	C28944	CREAM
50017000	Dental paste	C42907	PASTE, DENTIFRICE
11203000	Emulsion for injection	C42914	INJECTION, EMULSION
20050	Enema	C42915	ENEMA
50078000	Gas and solvent for dispersion for injection/infusion	C42933	GAS
10503000	Gel	C42934	GEL
10316000	Gingival paste	C42906	GEL, DENTIFRICE
10204000	Granules	C42938	GRANULE
10112000	Granules for oral solution	C42939	GRANULE, FOR SOLUTION
10113000	Granules for oral suspension	C42940	GRANULE, FOR SUSPENSION
50029250	Granules for use in drinking water	C42909	GRANULE, EFFERVESCENT
11301000	Implant	C42942	IMPLANT
22010	Injection	C42946	INJECTION
12113000	Irrigation solution	C42947	IRRIGANT
13220	Lozenge	C42955	LOZENGE
10310000	Mouthwash	C29269	MOUTHWASH
10504000	Ointment	C42966	OINTMENT
10323000	Pastille	C60985	PASTILLE
10522000	Poultice	C47913	POULTICE
50041500	Powder and solution for solution for injection	C42974	INJECTION, POWDER, FOR SOLUTION
10508000	Shampoo	C42981	SHAMPOO
11201000	Solution for injection	C42945	INJECTION, SOLUTION
11013000	Suppository	C42993	SUPPOSITORY
10117000	Syrup	C42996	SYRUP
10219000	Tablet	C42998	TABLET
12200	Tablet	C42998	TABLET
10504001	Ointment	C60984	OINTMENT, AUGMENTED
50001500	Concentrate and diluent for solution for infusion	C60891	CONCENTRATE
50002000	Concentrate and solvent for concentrate for solution for infusion	C60892	CONCENTRATE

50003000	Concentrate and solvent for cutaneous solution	C60893	CONCENTRATE
50004000	Concentrate and solvent for cutaneous use	C60894	CONCENTRATE
50005000	Concentrate and solvent for injection	C60895	CONCENTRATE
50006000	Concentrate and solvent for solution for infusion	C60896	CONCENTRATE
50007000	Concentrate and solvent for solution for injection	C60897	CONCENTRATE
50008000	Concentrate and solvent for suspension for injection	C60898	CONCENTRATE
10514000	Concentrate for cutaneous solution	C60899	CONCENTRATE
50009000	Concentrate for cutaneous spray, emulsion	C60900	CONCENTRATE
50009300	Concentrate for dispersion for infusion	C60901	CONCENTRATE
50009500	Concentrate for emulsion for infusion	C60902	CONCENTRATE
10302000	Concentrate for gargle	C60903	CONCENTRATE
11405000	Concentrate for haemodialysis solution	C60904	CONCENTRATE
50010000	Concentrate for oral solution	C60905	CONCENTRATE
50011000	Concentrate for oral/rectal solution	C60906	CONCENTRATE
50012000	Concentrate for peritoneal dialysis solution	C60907	CONCENTRATE
11008000	Concentrate for rectal solution	C60908	CONCENTRATE
11213000	Concentrate for solution for infusion	C60909	CONCENTRATE
11209000	Concentrate for solution for injection	C60910	CONCENTRATE
50079000	Concentrate for solution for injection/infusion	C60911	CONCENTRATE
50013000	Concentrate for solution for intravesical use	C60912	CONCENTRATE
50013500	Concentrate for spray emulsion	C60913	CONCENTRATE
50014000	Concentrate for suspension for infusion	C60914	CONCENTRATE
50026500	Granules and solvent for oral suspension	C42921	GRANULE, FOR SUSPENSION, EXTENDED RELEASE
11118000	Inhalation gas	C42944	INHALANT
11109000	Inhalation powder	C42945	INHALANT
21100	Inhalation powder	C42946	INHALANT
11110000	Inhalation powder, hard capsule	C42947	INHALANT
11111000	Inhalation powder, pre-dispensed	C42948	INHALANT
50030000	Inhalation powder, tablet	C42949	INHALANT
50081000	Inhalation solution	C42950	INHALANT
21140	Inhalation vapour	C42951	INHALANT
11113000	Inhalation vapour, capsule	C42952	INHALANT
50031000	Inhalation vapour, effervescent tablet	C42953	INHALANT
50032000	Inhalation vapour, emulsion	C42954	INHALANT

50033000	Inhalation vapour, impregnated pad	C42955	INHALANT
11117000	Inhalation vapour, liquid	C42956	INHALANT
11116000	Inhalation vapour, ointment	C42957	INHALANT
11112000	Inhalation vapour, powder	C42958	INHALANT
11114000	Inhalation vapour, solution	C42959	INHALANT
11115000	Inhalation vapour, tablet	C42960	INHALANT
11208000	Powder and solvent for suspension for injection	C42976	INJECTION, POWDER, FOR SUSPENSION
11208000	Powder and solvent for suspension for injection	C42977	INJECTION, POWDER, FOR SUSPENSION, EXTENDED RELEASE
11206000	Powder for suspension for injection	C42975	POWDER, FOR SUSPENSION
10120000	Soluble tablet		
12103000	Solution for blood fraction modification	C42986	SOLUTION
11403000	Solution for haemodiafiltration	C42987	SOLUTION
11404000	Solution for haemodialysis	C42988	SOLUTION
50057000	Solution for haemodialysis/haemofiltration	C42989	SOLUTION
11402000	Solution for haemofiltration	C42990	SOLUTION
11210000	Solution for infusion	C42991	SOLUTION
50058000	Solution for infusion and oral solution	C42992	SOLUTION
11210500	Solution for infusion in administration system	C42993	SOLUTION
50062000	Suspension and effervescent granules for oral suspension	C42994	SUSPENSION
50062500	Suspension and solution for spray	C42995	SUSPENSION
50063000	Suspension for infusion	C42996	SUSPENSION
11202000	Suspension for injection	C42997	SUSPENSION
50063100	Suspension for injection in cartridge	C42998	SUSPENSION
50063200	Suspension for injection in pre-filled pen	C42999	SUSPENSION
50063300	Suspension for injection in pre-filled syringe	C43000	SUSPENSION
50063500	Suspension for use in drinking water	C43001	SUSPENSION
12100500	Absorbable coated sponge	not matched	
12102000	Anticoagulant and preservative solution for blood	not matched	
10501000	Bath additive	not matched	
11502000	Bladder irrigation	not matched	
31030	Blood fraction modifier	not matched	
10314011	Buccal film	not matched	
10320000	Buccal tablet	not matched	
10209000	Cachet	not matched	

10210000	Capsule, hard	not matched	
10211000	Capsule, soft	not matched	
10214000	Chewable capsule, soft	not matched	
10228000	Chewable tablet	not matched	
50001000	Chewable/dispersible tablet	not matched	
50001250	Coated granules in sachet	not matched	
10520000	Collodion	not matched	
10322000	Compressed lozenge	not matched	
50015000	Cutaneous and nasal ointment	not matched	
10516000	Cutaneous emulsion	not matched	
10507000	Cutaneous foam	not matched	
10512000	Cutaneous liquid	not matched	
15130	Cutaneous liquid	not matched	
10505000	Cutaneous paste	not matched	
10517500	Cutaneous patch	not matched	
10517000	Cutaneous powder	not matched	
10513000	Cutaneous solution	not matched	
10524000	Cutaneous sponge	not matched	
15090	Cutaneous spray	not matched	
50015500	Cutaneous spray, emulsion	not matched	
50016000	Cutaneous spray, ointment	not matched	
10511000	Cutaneous spray, powder	not matched	
10509000	Cutaneous spray, solution	not matched	
10510000	Cutaneous spray, suspension	not matched	
10523000	Cutaneous stick	not matched	
10515000	Cutaneous suspension	not matched	
50015400	Cutaneous/oromucosal spray	not matched	
50015300	Cutaneous/oromucosal/oral solution	not matched	
10408000	Dental emulsion	not matched	
10402000	Dental gel	not matched	
10404000	Dental insert	not matched	
14050	Dental liquid	not matched	
10405000	Dental powder	not matched	
10406000	Dental solution	not matched	

10403000	Dental stick	not matched	
10407000	Dental suspension	not matched	
12101000	Denture lacquer	not matched	
10121000	Dispersible tablet	not matched	
12109000	Dispersion	not matched	
50077000	Dispersion for injection	not matched	
10701000	Ear cream	not matched	
17040	Ear drops	not matched	
10706000	Ear drops, emulsion	not matched	
10707000	Ear drops, powder and solvent for suspension	not matched	
10704000	Ear drops, solution	not matched	
10705000	Ear drops, suspension	not matched	
10702000	Ear gel	not matched	
10703000	Ear ointment	not matched	
10708000	Ear powder	not matched	
17090	Ear spray	not matched	
10711000	Ear spray, emulsion	not matched	
10709000	Ear spray, solution	not matched	
10710000	Ear spray, suspension	not matched	
10715000	Ear stick	not matched	
10714000	Ear tampon	not matched	
17120	Ear wash	not matched	
10713000	Ear wash, emulsion	not matched	
10712000	Ear wash, solution	not matched	
50018000	Ear/eye drops, solution	not matched	
50019000	Ear/eye ointment	not matched	
50020000	Ear/eye/nose drops, solution	not matched	
50020500	Effervescent buccal tablet	not matched	
10205000	Effervescent granules	not matched	
10203000	Effervescent powder	not matched	
10222000	Effervescent tablet	not matched	
10913000	Effervescent vaginal tablet	not matched	
50021500	Emulsion and suspension for emulsion for injection	not matched	
11211000	Emulsion for infusion	not matched	

50021000	Emulsion for injection/infusion	not matched	
11701000	Endocervical gel	not matched	
50022000	Endosinusial wash, suspension	not matched	
26010	Endotracheopulmonary instillation	not matched	
11604000	Endotracheopulmonary instillation, powder and solvent for solution	not matched	
11602000	Endotracheopulmonary instillation, powder for solution	not matched	
11601000	Endotracheopulmonary instillation, solution	not matched	
11603000	Endotracheopulmonary instillation, suspension	not matched	
10601000	Eye cream	not matched	
16040	Eye drops	not matched	
10604500	Eye drops, emulsion	not matched	
10606000	Eye drops, powder and solvent for solution	not matched	
10607000	Eye drops, powder and solvent for suspension	not matched	
10609000	Eye drops, prolonged-release	not matched	
10604000	Eye drops, solution	not matched	
50023000	Eye drops, solution in single-dose container	not matched	
10608000	Eye drops, solvent for reconstitution	not matched	
10605000	Eye drops, suspension	not matched	
10602000	Eye gel	not matched	
10610000	Eye lotion	not matched	
10611000	Eye lotion, solvent for reconstitution	not matched	
10603000	Eye ointment	not matched	
12109500	Fibrin sealant-powder and solvent for fibrin sealant	not matched	
50023500	Film coated gastro-resistant tablet	not matched	
10221000	Film-coated tablet	not matched	
10301000	Gargle	not matched	
10303000	Gargle, powder for solution	not matched	
10304000	Gargle, tablet for solution	not matched	
50024000	Gargle/mouthwash	not matched	
12111000	Gastroenteral emulsion	not matched	
31080	Gastroenteral liquid	not matched	
12108000	Gastroenteral solution	not matched	
12110000	Gastroenteral suspension	not matched	
12120	Gastro-resistant capsule	not matched	

10212000	Gastro-resistant capsule, hard	not matched	
10213000	Gastro-resistant capsule, soft	not matched	
50025000	Gastro-resistant coated tablet	not matched	
10206000	Gastro-resistant granules	not matched	
50026000	Gastro-resistant granules for oral suspension	not matched	
50026250	Gastro-resistant prolonged-release tablet	not matched	
10225000	Gastro-resistant tablet	not matched	
11204000	Gel for injection	not matched	
10315000	Gingival gel	not matched	
10312000	Gingival solution	not matched	
50027000	Granules and solvent for suspension for injection	not matched	
50028000	Granules for oral and rectal suspension	not matched	
50029000	Granules for oral drops, solution	not matched	
10119000	Granules for syrup	not matched	
50029500	Granules for vaginal solution	not matched	
50029600	Hard capsule with gastro-resistant pellets	not matched	
10122000	Herbal tea	not matched	
50029700	Herbal tea in bag	not matched	
11303000	Implantation chain	not matched	
11303500	Implantation suspension	not matched	
11302000	Implantation tablet	not matched	
10525000	Impregnated dressing	not matched	
12117000	Impregnated pad	not matched	
22100	Infusion	not matched	
10202000	Instant herbal tea	not matched	
12120000	Intestinal gel	not matched	
11906000	Intrauterine capsule	not matched	
11901000	Intrauterine delivery system	not matched	
11904000	Intrauterine emulsion	not matched	
50033300	Intrauterine foam	not matched	
29020	Intrauterine liquid	not matched	
11902000	Intrauterine solution	not matched	
11903000	Intrauterine suspension	not matched	
11905000	Intrauterine tablet	not matched	

10900500	Intravaginal ring	not matched	
50033500	Intravitreal implant in applicator	not matched	
12107000	Kit for radiopharmaceutical preparation	not matched	
50034000	Liquefied gas for dental use	not matched	
12118000	Living tissue equivalent	not matched	
10321000	Lozenge	not matched	
11214500	Lyophilisate and solvent for solution for injection	not matched	
11215000	Lyophilisate for solution for infusion	not matched	
11217000	Lyophilisate for solution for injection	not matched	
10116000	Lyophilisate for suspension	not matched	
11218000	Lyophilisate for suspension for injection	not matched	
10229000	Medicated chewing-gum	not matched	
10521000	Medicated nail lacquer	not matched	
10506000	Medicated plaster	not matched	
12119000	Medicated sponge	not matched	
12130000	Medicated thread	not matched	
10914000	Medicated vaginal tampon	not matched	
12301000	Medicinal gas, compressed	not matched	
12302000	Medicinal gas, cryogenic	not matched	
12303000	Medicinal gas, liquefied	not matched	
10217000	Modified-release capsule, hard	not matched	
10218000	Modified-release capsule, soft	not matched	
50035000	Modified-release film-coated tablet	not matched	
10208000	Modified-release granules	not matched	
50036000	Modified-release granules for oral suspension	not matched	
10227000	Modified-release tablet	not matched	
10311000	Mouthwash, tablet for solution	not matched	
50036100	Muco-adhesive buccal prolonged-release tablet	not matched	
10319000	Muco-adhesive buccal tablet	not matched	
10521500	Nail solution	not matched	
10801000	Nasal cream	not matched	
18040	Nasal drops	not matched	
10806000	Nasal drops, emulsion	not matched	
10804000	Nasal drops, solution	not matched	

10805000	Nasal drops, suspension	not matched	
10802000	Nasal gel	not matched	
10803000	Nasal ointment	not matched	
10807000	Nasal powder	not matched	
18080	Nasal spray	not matched	
50037000	Nasal spray and oromucosal solution	not matched	
10810000	Nasal spray, emulsion	not matched	
10808000	Nasal spray, solution	not matched	
50037250	Nasal spray, solution in single-dose container	not matched	
10809000	Nasal spray, suspension	not matched	
10812000	Nasal stick	not matched	
10811000	Nasal wash	not matched	
50036500	Nasal/oromucosal solution	not matched	
12004000	Nebulisation solution	not matched	
11105000	Nebuliser emulsion	not matched	
21010	Nebuliser liquid	not matched	
11101000	Nebuliser solution	not matched	
11102000	Nebuliser suspension	not matched	
10612000	Ophthalmic insert	not matched	
10613000	Ophthalmic strip	not matched	
11010	Oral drops	not matched	
10103000	Oral drops, emulsion	not matched	
50037750	Oral drops, liquid	not matched	
50082000	Oral drops, powder for suspension	not matched	
10101000	Oral drops, solution	not matched	
10102000	Oral drops, suspension	not matched	
10107000	Oral emulsion	not matched	
10108000	Oral gel	not matched	
10230000	Oral gum	not matched	
10104000	Oral liquid	not matched	
11050	Oral liquid	not matched	
10224000	Oral lyophilisate	not matched	
10109000	Oral paste	not matched	
10201000	Oral powder	not matched	

10105000	Oral solution	not matched	
50038500	Oral solution/concentrate for nebuliser solution	not matched	
10106000	Oral suspension	not matched	
50070000	Oral suspension for use in drinking water	not matched	
50038000	Oral/rectal suspension	not matched	
10236100	Orodispersible film	not matched	
10223000	Orodispersible tablet	not matched	
10317000	Oromucosal capsule	not matched	
10314010	Oromucosal cream	not matched	
10307000	Oromucosal drops	not matched	
10313000	Oromucosal gel	not matched	
13050	Oromucosal liquid	not matched	
10314005	Oromucosal ointment	not matched	
10314000	Oromucosal paste	not matched	
50039000	Oromucosal patch	not matched	
50039300	Oromucosal powder in pouch	not matched	
10305000	Oromucosal solution	not matched	
10308000	Oromucosal spray	not matched	
10306000	Oromucosal suspension	not matched	
50039500	Oromucosal/laryngopharyngeal solution	not matched	
50040000	Oromucosal/laryngopharyngeal solution/spray	not matched	
10410000	Periodontal gel	not matched	
10411000	Periodontal insert	not matched	
10401000	Periodontal powder	not matched	
10909000	Pessary	not matched	
10231000	Pillules	not matched	
50041000	Pillules in single-dose container	not matched	
10550000	Plaster for provocation test	not matched	
30047500	Pouch	not matched	
50042000	Powder and solvent for concentrate for solution for infusion	not matched	
50044000	Powder and solvent for cutaneous solution	not matched	
50071000	Powder and solvent for dental gel	not matched	
50044500	Powder and solvent for dispersion for injection	not matched	
11702000	Powder and solvent for endocervical gel	not matched	

50045000	Powder and solvent for endosinusal solution	not matched	
50045500	Powder and solvent for epileisional solution	not matched	
50046000	Powder and solvent for gingival gel	not matched	
11304000	Powder and solvent for implantation paste	not matched	
50047000	Powder and solvent for instillation solution for intraocular use	not matched	
50047500	Powder and solvent for intravesical solution	not matched	
50047700	Powder and solvent for nebuliser solution	not matched	
10114000	Powder and solvent for oral solution	not matched	
10115000	Powder and solvent for oral suspension	not matched	
50048000	Powder and solvent for prolonged-release suspension for injection	not matched	
12116000	Powder and solvent for sealant	not matched	
11214000	Powder and solvent for solution for infusion	not matched	
11207000	Powder and solvent for solution for injection	not matched	
50048250	Powder and solvent for solution for injection in pre-filled syringe	not matched	
50080000	Powder and solvent for solution for injection/infusion	not matched	
50048300	Powder and solvent for suspension for injection in pre-filled syringe	not matched	
50048500	Powder and suspension for suspension for injection	not matched	
11503000	Powder for bladder irrigation	not matched	
50048750	Powder for concentrate for dispersion for infusion	not matched	
50049000	Powder for concentrate for haemodialysis solution,	not matched	
50049100	Powder for concentrate for intravesical suspension	not matched	
50043000	Powder for concentrate for solution for infusion	not matched	
50049250	Powder for concentrate for solution for injection/infusion	not matched	
50049270	Powder for dental solution	not matched	
50049300	Powder for epileisional solution	not matched	
50049500	Powder for implantation suspension	not matched	
22120	Powder for infusion	not matched	
22050	Powder for injection	not matched	
50050000	Powder for intravesical solution	not matched	
50051000	Powder for intravesical suspension	not matched	
50051100	Powder for mouth wash	not matched	
11104000	Powder for nebuliser solution	not matched	
11103000	Powder for nebuliser suspension	not matched	
10110000	Powder for oral solution	not matched	

10111000	Powder for oral suspension	not matched	
50052000	Powder for oral/rectal suspension	not matched	
11009000	Powder for rectal solution	not matched	
11010000	Powder for rectal suspension	not matched	
11212000	Powder for solution for infusion	not matched	
11205000	Powder for solution for injection	not matched	
50053000	Powder for solution for injection or infusion	not matched	
50053500	Powder for solution for injection/infusion	not matched	
50073000	Powder for solution for intraocular irrigation	not matched	
50054000	Powder for solution for intravesical use	not matched	
50055000	Powder for solution for nasal spray	not matched	
10118000	Powder for syrup	not matched	
50072000	Powder for use in drinking water	not matched	
50048600	Powder, dispersion and solvent for concentrate for dispersion for injection	not matched	
21060	Pressurised inhalation	not matched	
11108000	Pressurised inhalation, emulsion	not matched	
11106000	Pressurised inhalation, solution	not matched	
11107000	Pressurised inhalation, suspension	not matched	
12150	Prolonged-release capsule	not matched	
10215000	Prolonged-release capsule, hard	not matched	
10216000	Prolonged-release capsule, soft	not matched	
50055500	Prolonged-release film-coated tablet	not matched	
10207000	Prolonged-release granules	not matched	
50056000	Prolonged-release granules for oral suspension	not matched	
10226000	Prolonged-release tablet	not matched	
12106000	Radionuclide generator	not matched	
12105000	Radiopharmaceutical precursor	not matched	
50056500	Radiopharmaceutical precursor, solution	not matched	
11014000	Rectal capsule	not matched	
11001000	Rectal cream	not matched	
11007000	Rectal emulsion	not matched	
11004000	Rectal foam	not matched	
11002000	Rectal gel	not matched	
11003000	Rectal ointment	not matched	

11005000	Rectal solution	not matched	
11006000	Rectal suspension	not matched	
11015000	Rectal tampon	not matched	
10539500	Scrub	not matched	
12115000	Sealant	not matched	
50060100	Solution for injection in cartridge	not matched	
50060200	Solution for injection in pre-filled pen	not matched	
50060300	Solution for injection in pre-filled syringe	not matched	
50060400	Solution for injection in pre-filled syringe with automatic needle guard	not matched	
50059000	Solution for injection/concentrate for solution for infusion	not matched	
50060000	Solution for injection/infusion	not matched	
50060500	Solution for injection/infusion in pre-filled syringe	not matched	
50061000	Solution for intraperitoneal use	not matched	
11501000	Solution for intravesical use	not matched	
10518000	Solution for iontophoresis	not matched	
12112000	Solution for organ preservation	not matched	
11401000	Solution for peritoneal dialysis	not matched	
12131000	Solution for provocation test	not matched	
50061500	Solution for sealant	not matched	
10548000	Solution for skin-prick test	not matched	
10549000	Solution for skin-scratch test	not matched	
50061300	Solution for use in drinking water	not matched	
12115500	Solution of perfusion of organs	not matched	
50061600	Solvent for nasal use	not matched	
11216000	Solvent for parenteral use	not matched	
50076000	Solvent for solution for infusion	not matched	
50074000	Solvent for solution for intraocular irrigation	not matched	
22090	Sterile concentrate	not matched	
12114000	Stomach irrigation	not matched	
10309000	Sublingual spray	not matched	
10318000	Sublingual tablet	not matched	
50065000	Tablet and powder for oral solution	not matched	
50064000	Tablet and solvent for rectal suspension	not matched	
50066000	Tablet for oral suspension	not matched	

11011000	Tablet for rectal solution	not matched	
11012000	Tablet for rectal suspension	not matched	
10908000	Tablet for vaginal solution	not matched	
10409000	Toothpaste	not matched	
10519000	Transdermal patch	not matched	
10546500	Transdermal spray, solution	not matched	
10547000	Transdermal system	not matched	
11504000	Urethral gel	not matched	
11505000	Urethral stick	not matched	
19100	Vaginal capsule	not matched	
10910000	Vaginal capsule, hard	not matched	
10911000	Vaginal capsule, soft	not matched	
10901000	Vaginal cream	not matched	
10915000	Vaginal delivery system	not matched	
10907000	Vaginal emulsion	not matched	
10904000	Vaginal foam	not matched	
10902000	Vaginal gel	not matched	
19050	Vaginal liquid	not matched	
10903000	Vaginal ointment	not matched	
10905000	Vaginal solution	not matched	
10916000	Vaginal sponge	not matched	
10906000	Vaginal suspension	not matched	
10912000	Vaginal tablet	not matched	
12104000	Wound stick	not matched	
not matched		C42887	AEROSOL
not matched		C42888	AEROSOL, FOAM
not matched		C42960	AEROSOL, METERED
not matched		C42971	AEROSOL, POWDER
not matched		C42889	AEROSOL, SPRAY
not matched		C42892	BAR, CHEWABLE
not matched		C42890	BEAD
not matched		C42896	CAPSULE, COATED PELLETS
not matched		C42917	CAPSULE, COATED, EXTENDED RELEASE
not matched		C42902	CAPSULE, DELAYED RELEASE

not matched		C42904	CAPSULE, DELAYED RELEASE PELLETS
not matched		C42916	CAPSULE, EXTENDED RELEASE
not matched		C42928	CAPSULE, FILM COATED, EXTENDED RELEASE
not matched		C42936	CAPSULE, GELATIN COATED
not matched		C42954	CAPSULE, LIQUID FILLED
not matched		C100103	CELLULAR SHEET
not matched		C60884	CLOTH
not matched		C42901	CRYSTAL
not matched		C43525	DISC
not matched		C42679	DOUCHE
not matched		C42763	DRESSING
not matched		C17423	DRUG DELIVERY SYSTEM
not matched		C42912	ELIXIR
not matched		C42913	EMULSION
not matched		C42929	EXTRACT
not matched		C60926	FIBER, EXTENDED RELEASE
not matched		C42932	FILM
not matched		C42920	FILM, EXTENDED RELEASE
not matched		C42984	FILM, SOLUBLE
not matched		C60927	FOR SOLUTION
not matched		C60928	FOR SUSPENSION
not matched		C60929	FOR SUSPENSION, EXTENDED RELEASE
not matched		C60930	GEL, METERED
not matched		C42937	GLOBULE
not matched		C42903	GRANULE, DELAYED RELEASE
not matched		C42894	GUM, CHEWING
not matched		C113106	INJECTABLE FOAM
not matched		C60931	INJECTABLE, LIPOSOMAL
not matched		C42950	INJECTION, LIPID COMPLEX
not matched		C42959	INJECTION, POWDER, LYOPHILIZED, FOR LIPOSOMAL SUSPENSION
not matched		C42957	INJECTION, POWDER, LYOPHILIZED, FOR SOLUTION
not matched		C42958	INJECTION, POWDER, LYOPHILIZED, FOR SUSPENSION
not matched		C42956	INJECTION, POWDER, LYOPHILIZED, FOR SUSPENSION, EXTENDED RELEASE
not matched		C42899	INJECTION, SOLUTION, CONCENTRATE

not matched		C42995	INJECTION, SUSPENSION
not matched		C42926	INJECTION, SUSPENSION, EXTENDED RELEASE
not matched		C42951	INJECTION, SUSPENSION, LIPOSOMAL
not matched		C42988	INJECTION, SUSPENSION, SONICATED
not matched		C60933	INSERT
not matched		C42922	INSERT, EXTENDED RELEASE
not matched		C47915	INTRAUTERINE DEVICE
not matched		C42948	JELLY
not matched		C47916	KIT
not matched		C42949	LINIMENT
not matched		C42952	LIPSTICK
not matched		C42953	LIQUID
not matched		C60934	LIQUID, EXTENDED RELEASE
not matched		C29167	LOTION
not matched		C60957	LOTION, AUGMENTED
not matched		C60958	LOTION/SHAMPOO
not matched		C42965	OIL
not matched		C42967	PASTE
not matched		C42968	PATCH
not matched		C42923	PATCH, EXTENDED RELEASE
not matched		C42911	PATCH, EXTENDED RELEASE, ELECTRICALLY CONTROLLED
not matched		C42969	PELLET
not matched		C42943	PELLET, IMPLANTABLE
not matched		C42918	PELLETS, COATED, EXTENDED RELEASE
not matched		C25394	PILL
not matched		C42970	PLASTER
not matched		C42972	POWDER
not matched		C42908	POWDER, DENTIFRICE
not matched		C42973	POWDER, FOR SOLUTION
not matched		C42975	POWDER, FOR SUSPENSION
not matched		C42961	POWDER, METERED
not matched		C60988	RING
not matched		C42979	RINSE
not matched		C42980	SALVE

not matched		C42982	SHAMPOO, SUSPENSION
not matched		C42983	SOAP
not matched		C42898	SOLUTION, CONCENTRATE
not matched		C42987	SOLUTION, FOR SLUSH
not matched		C60994	SOLUTION, GEL FORMING / DROPS
not matched		C42935	SOLUTION, GEL FORMING, EXTENDED RELEASE
not matched		C60992	SOLUTION/ DROPS
not matched		C47912	SPONGE
not matched		C42989	SPRAY
not matched		C42962	SPRAY, METERED
not matched		C42990	SPRAY, SUSPENSION
not matched		C42991	STICK
not matched		C47914	STRIP
not matched		C42924	SUPPOSITORY, EXTENDED RELEASE
not matched		C42994	SUSPENSION
not matched		C42925	SUSPENSION, EXTENDED RELEASE
not matched		C60995	SUSPENSION/ DROPS
not matched		C47898	SWAB
not matched		C42893	TABLET, CHEWABLE
not matched		C42897	TABLET, COATED
not matched		C60997	TABLET, COATED PARTICLES
not matched		C42905	TABLET, DELAYED RELEASE
not matched		C42997	TABLET, DELAYED RELEASE PARTICLES
not matched		C42910	TABLET, EFFERVESCENT
not matched		C42927	TABLET, EXTENDED RELEASE
not matched		C42931	TABLET, FILM COATED
not matched		C42930	TABLET, FILM COATED, EXTENDED RELEASE
not matched		C61004	TABLET, FOR SOLUTION
not matched		C61005	TABLET, FOR SUSPENSION
not matched		C42964	TABLET, MULTILAYER
not matched		C42963	TABLET, MULTILAYER, EXTENDED RELEASE
not matched		C42999	TABLET, ORALLY DISINTEGRATING
not matched		C61006	TABLET, ORALLY DISINTEGRATING, DELAYED RELEASE
not matched		C42985	TABLET, SOLUBLE

not matched		C42992	TABLET, SUGAR COATED
not matched		C47892	TAMPON
not matched		C47897	TAPE
not matched		C43000	TINCTURE
not matched		C43001	TROCHE
not matched		C43003	WAFER

Table 5 – Mapping between *epSOSVaccine* (1.3.6.1.4.1.12559.11.10.1.3.1.42.28) and *Vaccine Administered Value Set* (2.16.840.1.113883.3.88.12.80.22)

CVX Code	CVX Short Description	Full Vaccine Name	VaccineStatus	SNOMED CT Code	SNOMED CT Vaccine Name
19	BCG	Bacillus Calmette-Guerin vaccine	Active	420538001	Tuberculosis vaccine
26	cholera	cholera vaccine	Inactive	35736007	Cholera vaccine
12	diphtheria antitoxin	diphtheria antitoxin	Active	428214002	Diphtheria vaccine
20	DTaP	diphtheria, tetanus toxoids and acellular pertussis vaccine	Active	421245007	Diphtheria + pertussis + tetanus vaccine
130	DTaP-IPV	Diphtheria, tetanus toxoids and acellular pertussis vaccine, and poliovirus vaccine, inactivated	Active	414005006	Diphtheria + tetanus + pertussis + poliomyelitis
120	DTaP-Hib-IPV	diphtheria, tetanus toxoids and acellular pertussis vaccine, Haemophilus influenzae type b conjugate, and poliovirus vaccine, inactivated (DTaP-Hib-IPV)	Active	414004005	Diphtheria + tetanus + pertussis + poliomyelitis + Haemophilus influenzae b
107	DTaP, unspecified formulation	diphtheria, tetanus toxoids and acellular pertussis vaccine, unspecified formulation	Inactive	421245007	Diphtheria + pertussis + tetanus vaccine
01	DTP	diphtheria, tetanus toxoids and pertussis vaccine	Inactive	421245007	Diphtheria + pertussis + tetanus vaccine
17	Hib, unspecified formulation	Haemophilus influenzae type b vaccine, conjugate unspecified formulation	Inactive	333680004	Haemophilus influenzae Type b vaccine
104	Hep A-Hep B	hepatitis A and hepatitis B vaccine	Active	333702001	Hepatitis A+B vaccine
52	Hep A, adult	hepatitis A vaccine, adult dosage	Active	14745005	Hepatitis A virus vaccine
85	Hep A, unspecified formulation	hepatitis A vaccine, unspecified formulation	Inactive	14745005	Hepatitis A virus vaccine
43	Hep B, adult	hepatitis B vaccine, adult dosage	Active	34689006	Hepatitis B virus vaccine
45	Hep B, unspecified formulation	hepatitis B vaccine, unspecified formulation	Inactive	34689006	Hepatitis B virus vaccine
137	HPV, unspecified formulation	HPV, unspecified formulation	Inactive	424519000	Human papillomavirus vaccine
160	Influenza A monovalent (H5N1), ADJUVANTED-2013	Influenza A monovalent (H5N1), adjuvanted, National stockpile 2013	Active	427036009	Influenza virus H5N1 vaccine
151	influenza nasal, unspecified formulation	influenza nasal, unspecified formulation	Inactive	46233009	Influenza virus vaccine (product)
123	influenza, H5N1-1203	influenza virus vaccine, H5N1, A/Vietnam/1203/2004 (national stockpile)	Inactive	427036009	Influenza virus H5N1 vaccine
141	Influenza, seasonal, injectable	Influenza, seasonal, injectable	Active	46233009	Influenza virus vaccine (product)
05	measles	measles virus vaccine	Inactive	386012008	Measles vaccine
03	MMR	measles, mumps and rubella virus vaccine	Active	61153008	Measles + Mumps + Rubella vaccine
108	meningococcal, unspecified formulation	meningococcal vaccine, unspecified formulation	Inactive	423531006	Meningococcus vaccine
147	meningococcal MCV4, unspecified formulation	Meningococcal, MCV4, unspecified formulation(groups A, C, Y and W-135)	Inactive	423531006	Meningococcus vaccine
07	mumps	mumps virus vaccine	Active	90043005	Mumps live virus vaccine

11	pertussis	pertussis vaccine	Inactive	61602008	Pertussis vaccine
109	pneumococcal, unspecified formulation	pneumococcal vaccine, unspecified formulation	Inactive	333598008	Pneumococcal vaccine
10	IPV	poliovirus vaccine, inactivated	Active	111164008	Poliovirus vaccine
90	rabies, unspecified formulation	rabies vaccine, unspecified formulation	Inactive	333606008	Rabies vaccine
122	rotavirus, unspecified formulation	rotavirus vaccine, unspecified formulation	Inactive	116077000	Rotavirus vaccine
06	rubella	rubella virus vaccine	Active	386013003	Rubella vaccine
139	Td(adult) unspecified formulation	Td(adult) unspecified formulation	Inactive	350327004	Diphtheria + tetanus vaccine
77	tick-borne encephalitis	tick-borne encephalitis vaccine	Inactive	333699008	Tick-borne encephalitis vaccine
41	typhoid, parenteral	typhoid vaccine, parenteral, other than acetone-killed, dried	Active	89428009	Typhoid vaccine
91	typhoid, unspecified formulation	typhoid vaccine, unspecified formulation	Inactive	89428009	Typhoid vaccine
75	vaccinia (smallpox)	vaccinia (smallpox) vaccine	Active	33234009	Smallpox vaccine
21	varicella	varicella virus vaccine	Active	108729007	Varicella vaccine
37	yellow fever	yellow fever vaccine	Active	56844000	Yellow fever vaccine
89	polio, unspecified formulation	poliovirus vaccine, unspecified formulation	Inactive	111164008	Poliovirus vaccine
47	Hib (HbOC)	Haemophilus influenzae type b vaccine, HbOC conjugate	Inactive	333680004	Haemophilus influenzae Type b vaccine
152	Pneumococcal Conjugate, unspecified formulation	Pneumococcal Conjugate, unspecified formulation	Inactive	333598008	Pneumococcal vaccine
46	Hib (PRP-D)	Haemophilus influenzae type b vaccine, PRP-D conjugate	Inactive	333680005	Haemophilus influenzae Type b vaccine
49	Hib (PRP-OMP)	Haemophilus influenzae type b vaccine, PRP-OMP conjugate	Active	333680006	Haemophilus influenzae Type b vaccine
48	Hib (PRP-T)	Haemophilus influenzae type b vaccine, PRP-T conjugate	Active	333680007	Haemophilus influenzae Type b vaccine
31	Hep A, pediatric, unspecified formulation	hepatitis A vaccine, pediatric dosage, unspecified formulation	Inactive	14745005	Hepatitis A virus vaccine
83	Hep A, ped/adol, 2 dose	hepatitis A vaccine, pediatric/adolescent dosage, 2 dose schedule	Active	14745005	Hepatitis A virus vaccine
84	Hep A, ped/adol, 3 dose	hepatitis A vaccine, pediatric/adolescent dosage, 3 dose schedule	Inactive	14745005	Hepatitis A virus vaccine
118	HPV, bivalent	human papilloma virus vaccine, bivalent	Active	424519002	Human papillomavirus vaccine
62	HPV, quadrivalent	human papilloma virus vaccine, quadrivalent	Active	424519003	Human papillomavirus vaccine
111	influenza, live, intranasal	influenza virus vaccine, live, attenuated, for intranasal use	Active	46233009	Influenza virus vaccine (product)
15	influenza, split (incl. purified surface antigen)	influenza virus vaccine, split virus (incl. purified surface antigen)-retired CODE	Inactive	46233009	Influenza virus vaccine (product)
88	influenza, unspecified formulation	influenza virus vaccine, unspecified formulation	Inactive	46233009	Influenza virus vaccine (product)
16	influenza, whole	influenza virus vaccine, whole virus	Inactive	46233009	Influenza virus vaccine (product)

135	Influenza, high dose seasonal	influenza, high dose seasonal, preservative-free	Active	46233009	Influenza virus vaccine (product)
153	Influenza, injectable, MDCK, preservative free	Influenza, injectable, Madin Darby Canine Kidney, preservative free	Active	46233009	Influenza virus vaccine (product)
158	influenza, injectable, quadrivalent	influenza, injectable, quadrivalent, contains preservative	Active	46233009	Influenza virus vaccine (product)
150	influenza, injectable, quadrivalent, preservative free	Influenza, injectable, quadrivalent, preservative free	Active	46233009	Influenza virus vaccine (product)
149	influenza, live, intranasal, quadrivalent	influenza, live, intranasal, quadrivalent	Active	46233009	Influenza virus vaccine (product)
140	Influenza, seasonal, injectable, preservative free	Influenza, seasonal, injectable, preservative free	Active	46233009	Influenza virus vaccine (product)
134	Japanese Encephalitis IM	Japanese Encephalitis vaccine for intramuscular administration	Active	333697005	Japanese B encephalitis vaccine
39	Japanese encephalitis SC	Japanese Encephalitis Vaccine SC	Active	333697005	Japanese B encephalitis vaccine
103	meningococcal C conjugate	meningococcal C conjugate vaccine	Inactive	423531006	Meningococcus vaccine
148	Meningococcal C/Y-HIB PRP	Meningococcal Groups C and Y and Haemophilus b Tetanus Toxoid Conjugate Vaccine	Active	423531006	Meningococcus vaccine
136	Meningococcal MCV4O	meningococcal oligosaccharide (groups A, C, Y and W-135) diphtheria toxoid conjugate vaccine (MCV4O)	Active	423531006	Meningococcus vaccine
114	meningococcal MCV4P	meningococcal polysaccharide (groups A, C, Y and W-135) diphtheria toxoid conjugate vaccine (MCV4P)	Active	423531006	Meningococcus vaccine
32	meningococcal MPSV4	meningococcal polysaccharide vaccine (MPSV4)	Active	423531006	Meningococcus vaccine
133	Pneumococcal conjugate PCV 13	pneumococcal conjugate vaccine, 13 valent	Active	333598008	Pneumococcal vaccine
100	pneumococcal conjugate PCV 7	pneumococcal conjugate vaccine, 7 valent	Active	333598008	Pneumococcal vaccine
33	pneumococcal polysaccharide PPV23	pneumococcal polysaccharide vaccine, 23 valent	Active	333598008	Pneumococcal vaccine
02	OPV	poliovirus vaccine, live, oral	Inactive	111164008	Poliovirus vaccine
40	rabies, intradermal injection	rabies vaccine, for intradermal injection	Active	333606008	Rabies vaccine
18	rabies, intramuscular injection	rabies vaccine, for intramuscular injection	Active	333606008	Rabies vaccine
119	rotavirus, monovalent	rotavirus, live, monovalent vaccine	Active	116077000	Rotavirus vaccine
116	rotavirus, pentavalent	rotavirus, live, pentavalent vaccine	Active	116077000	Rotavirus vaccine
74	rotavirus, tetravalent	rotavirus, live, tetravalent vaccine	Inactive	116077000	Rotavirus vaccine
144	influenza, seasonal, intradermal, preservative free	seasonal influenza, intradermal, preservative free	Active	Influenza virus vaccine (product)	
155	influenza, recombinant, injectable, preservative free	Seasonal, trivalent, recombinant, injectable influenza vaccine, preservative free	Active	Influenza virus vaccine (product)	
09	Td (adult), adsorbed	tetanus and diphtheria toxoids, adsorbed, for adult use	Active	350327004	Diphtheria + tetanus vaccine
113	Td (adult) preservative free	tetanus and diphtheria toxoids, adsorbed, preservative free, for adult use	Active	350327004	Diphtheria + tetanus vaccine

138	Td (adult)	tetanus and diphtheria toxoids, not adsorbed, for adult use	Active	350327004	Diphtheria + tetanus vaccine
35	tetanus toxoid, adsorbed	tetanus toxoid, adsorbed	Active	333621002	Tetanus vaccine
142	tetanus toxoid, not adsorbed	tetanus toxoid, not adsorbed	Active	333621002	Tetanus vaccine
115	Tdap	tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine, adsorbed	Active	421245007	Diphtheria + pertussis + tetanus vaccine
112	tetanus toxoid, unspecified formulation	tetanus toxoid, unspecified formulation	Inactive	333621002	Tetanus vaccine
25	typhoid, oral	typhoid vaccine, live, oral	Active	89428009	Typhoid vaccine
53	typhoid, parenteral, AKD (U.S. military)	typhoid vaccine, parenteral, acetone-killed, dried (U.S. military)	Active	89428009	Typhoid vaccine
101	typhoid, ViCPs	typhoid Vi capsular polysaccharide vaccine	Active	89428011	Typhoid vaccine
105	vaccinia (smallpox) diluted	vaccinia (smallpox) vaccine, diluted	Inactive	33234010	Smallpox vaccine
54	adenovirus, type 4	adenovirus vaccine, type 4, live, oral	Inactive	not matched	
55	adenovirus, type 7	adenovirus vaccine, type 7, live, oral	Inactive	not matched	
82	adenovirus, unspecified formulation	adenovirus vaccine, unspecified formulation	Inactive	not matched	
143	Adenovirus types 4 and 7	Adenovirus, type 4 and type 7, live, oral	Active	not matched	
24	anthrax	anthrax vaccine	Active	not matched	
801	AS03 Adjuvant	AS03 Adjuvant	Active	not matched	
27	botulinum antitoxin	botulinum antitoxin	Active	not matched	
29	CMVIG	cytomegalovirus immune globulin, intravenous	Active	not matched	
56	dengue fever	dengue fever vaccine	Never Active	not matched	
146	DTaP,IPV,Hib,HepB	Diphtheria and Tetanus Toxoids and Acellular Pertussis Adsorbed, Inactivated Poliovirus, Haemophilus b Conjugate (Meningococcal Outer Membrane Protein Complex), and Hepatitis B (Recombinant) Vaccine.	Pending	not matched	
28	DT (pediatric)	diphtheria and tetanus toxoids, adsorbed for pediatric use	Active	not matched	
106	DTaP, 5 pertussis antigens	diphtheria, tetanus toxoids and acellular pertussis vaccine, 5 pertussis antigens	Active	not matched	
50	DTaP-Hib	DTaP-Haemophilus influenzae type b conjugate vaccine	Active	not matched	
110	DTaP-Hep B-IPV	DTaP-hepatitis B and poliovirus vaccine	Active	not matched	
102	DTP-Hib-Hep B	DTP- Haemophilus influenzae type b conjugate and hepatitis b vaccine	Inactive	not matched	
22	DTP-Hib	DTP-Haemophilus influenzae type b conjugate vaccine	Inactive	not matched	
51	Hib-Hep B	Haemophilus influenzae type b conjugate and Hepatitis B vaccine	Active	not matched	

57	hantavirus	hantavirus vaccine	Never Active	not matched	
154	Hep A, IG	Hepatitis A immune globulin	Never Active	not matched	
30	HBIG	hepatitis B immune globulin	Active	not matched	
42	Hep B, adolescent/high risk infant	hepatitis B vaccine, adolescent/high risk infant dosage	Inactive	not matched	
44	Hep B, dialysis	hepatitis B vaccine, dialysis patient dosage	Active	not matched	
08	Hep B, adolescent or pediatric	hepatitis B vaccine, pediatric or pediatric/adolescent dosage	Active	not matched	
58	Hep C	hepatitis C vaccine	Never Active	not matched	
59	Hep E	hepatitis E vaccine	Never Active	not matched	
60	herpes simplex 2	herpes simplex virus, type 2 vaccine	Never Active	not matched	
131	typhus, historical	Historical record of a typhus vaccination	Inactive	not matched	
132	DTaP-IPV-HIB-HEP B, historical	Historical record of vaccine containing * diphtheria, tetanus toxoids and acellular pertussis, * poliovirus, inactivated, * Haemophilus influenzae type b conjugate, * Hepatitis B (DTaP-Hib-IPV)	Inactive	not matched	
61	HIV	human immunodeficiency virus vaccine	Never Active	not matched	
86	IG	immune globulin, intramuscular	Active	not matched	
87	IGIV	immune globulin, intravenous	Active	not matched	
14	IG, unspecified formulation	immune globulin, unspecified formulation	Inactive	not matched	
129	Japanese Encephalitis, unspecified formulation	Japanese Encephalitis vaccine, unspecified formulation	Inactive	not matched	
63	Junin virus	Junin virus vaccine	Never Active	not matched	
64	leishmaniasis	leishmaniasis vaccine	Never Active	not matched	
65	leprosy	leprosy vaccine	Never Active	not matched	
66	Lyme disease	Lyme disease vaccine	Inactive	not matched	
67	malaria	malaria vaccine	Never Active	not matched	
04	M/R	measles and rubella virus vaccine	Inactive	not matched	
94	MMRV	measles, mumps, rubella, and varicella virus vaccine	Active	not matched	
68	melanoma	melanoma vaccine	Never Active	not matched	
998	no vaccine administered	no vaccine administered	Inactive	not matched	
128	Novel Influenza-H1N1-09, all formulations	Novel influenza-H1N1-09, all formulations	Inactive	not matched	
127	Novel influenza-H1N1-09	Novel influenza-H1N1-09, injectable	Inactive	not matched	
125	Novel Influenza-H1N1-09, nasal	Novel Influenza-H1N1-09, live virus for nasal administration	Inactive	not matched	
126	Novel influenza-H1N1-09, preservative-free	Novel influenza-H1N1-09, preservative-free, injectable	Inactive	not matched	
69	parainfluenza-3	parainfluenza-3 virus vaccine	Inactive	not matched	

23	plague	plague vaccine	Active	not matched	
70	Q fever	Q fever vaccine	Never Active	not matched	
34	RIG	rabies immune globulin	Active	not matched	
99	RESERVED - do not use	RESERVED - do not use	Inactive	not matched	
71	RSV-IGIV	respiratory syncytial virus immune globulin, intravenous	Active	not matched	
145	RSV-MAb (new)	respiratory syncytial virus monoclonal antibody (motavizumab), intramuscular	Pending	not matched	
93	RSV-MAb	respiratory syncytial virus monoclonal antibody (palivizumab), intramuscular	Active	not matched	
72	rheumatic fever	rheumatic fever vaccine	Never Active	not matched	
157	Rho(D) -IG IM	Rho(D) Immune globulin - IM	Active	not matched	
156	Rho(D)-IG	Rho(D) Immune globulin- IV or IM	Active	not matched	
159	Rho(D) - Unspecified formulation	Rho(D) Unspecified formulation	Inactive	not matched	
73	Rift Valley fever	Rift Valley fever vaccine	Never Active	not matched	
38	rubella/mumps	rubella and mumps virus vaccine	Inactive	not matched	
76	Staphylococcus bacterio lysate	Staphylococcus bacteriophage lysate	Inactive	not matched	
13	TIG	tetanus immune globulin	Active	not matched	
95	TST-OT tine test	tuberculin skin test; old tuberculin, multipuncture device	Inactive	not matched	
96	TST-PPD intradermal	tuberculin skin test; purified protein derivative solution, intradermal	Inactive	not matched	
97	TST-PPD tine test	tuberculin skin test; purified protein derivative, multipuncture device	Inactive	not matched	
98	TST, unspecified formulation	tuberculin skin test; unspecified formulation	Inactive	not matched	
78	tularemia vaccine	tularemia vaccine	Inactive	not matched	
999	unknown	unknown vaccine or immune globulin	Inactive	not matched	
79	vaccinia immune globulin	vaccinia immune globulin	Active	not matched	
36	VZIG	varicella zoster immune globulin	Active	not matched	
117	VZIG (IND)	varicella zoster immune globulin (Investigational New Drug)	Inactive	not matched	
92	VEE, unspecified formulation	Venezuelan equine encephalitis vaccine, unspecified formulation	Inactive	not matched	
81	VEE, inactivated	Venezuelan equine encephalitis, inactivated	Inactive	not matched	
80	VEE, live	Venezuelan equine encephalitis, live, attenuated	Inactive	not matched	
121	zoster	zoster vaccine, live	Active	not matched	

Table 6 – Mapping between *epSOSHealthcareProfessionalRoles* (1.3.6.1.4.1.12559.11.10.ou 1.3.1.42.1) and *Healthcare Provider Taxonomy* (NUCC - HIPAA) (2.16.840.1.114222.4.11.1066)

epSOS Code	English Display Name	NUCC Code	NUCC Label
3258	Ambulance workers	146L00000X	EMT/Paramedic
3251	Dental assistants and therapists	126800000X	Dental Assistant/Tech
2261	Dentists	122300000X	Dentist
2265	Dieticians and nutritionists	133V00000X	Dietitian, Registered
2263	Environmental and occupational health and hygiene professionals	163WX0106X	Occupational Health Professional
3211	Medical imaging and therapeutic equipment technicians	247100000X	Radiologic Technologist
222	Nursing and midwifery professionals	367A00000X	Nurse Midwife
3221	Nursing associate professionals	367500000X	Nurse Anesthetist
3221	Nursing associate professionals	376K00000X	Nursing Assistant
2221	Nursing professionals	163W00000X	Registered Nurse
2262	Pharmacists	183500000X	Pharmacist
2264	Physiotherapists	261QP2000X	Physical Therapist
3258	Ambulance workers	207PE0004X	Other First Responder
3251	Dental assistants and therapists	261QD0000X	Other Dental Worker
3259	Health associate professionals not elsewhere classified	332B00000X	Central Supply
3259	Health associate professionals not elsewhere classified	3747A0650X	Attendant/orderly
2269	Health professionals not elsewhere classified	163WI0500X	IVT Team Staff
2269	Health professionals not elsewhere classified	163WI0600X	Infection Control Professional
2269	Health professionals not elsewhere classified	167G00000X	Psychiatric Technician
2269	Health professionals not elsewhere classified	364SC1501X	Public Health Worker
3256	Medical assistants	363A00000X	Physician Assistant
2221	Nursing professionals	164W00000X	Licensed Practical Nurse
2221	Nursing professionals	363L00000X	Nurse Practitioner
226	Other health professionals	227800000X	Respiratory Therapist/Tech
226	Other health professionals	246QM0706X	Medical Technologist
226	Other health professionals	246RP1900X	Phlebotomist/IV Team
2266	Audiologists and speech therapists	not matched	
3253	Community health workers	not matched	
3254	Dispensing opticians	not matched	
3257	Environmental and occupational health inspectors and associates	not matched	

2211	Generalist medical practitioners	not matched	
32	Health associate professionals	not matched	
22	Health professionals	not matched	
3214	Medical and dental prosthetic technicians	not matched	
3212	Medical and pathology laboratory technicians	not matched	
321	Medical and pharmaceutical technicians	not matched	
221	Medical doctors	not matched	
3252	Medical records and health information technicians	not matched	
3222	Midwifery associate professionals	not matched	
2222	Midwifery professionals	not matched	
322	Nursing and midwifery associate professionals	not matched	
2267	Optometrists and ophthalmic opticians	not matched	
325	Other health associate professionals	not matched	
224	Paramedical practitioners	not matched	
3213	Pharmaceutical technicians and assistants	not matched	
3255	Physiotherapy technicians and assistants	not matched	
2212	Specialist medical practitioners	not matched	
323	Traditional and complementary medicine associate professionals	not matched	
223	Traditional and complementary medicine professionals	not matched	
225	Veterinarians	not matched	
not matched	not matched	227900000X	Other Student
not matched	not matched	261QR1100X	Researcher
not matched	not matched	124Q00000X	Dental Hygienist