IHE Patient Care Coordination
Technical Framework Supplement

Clinical Mapping
(CMAP)

Trial Implementation

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Please verify you have the most recent version of this document. See here for Trial Implementation and Final Text versions and here for Public Comment versions.
Foreword

This is a supplement to the IHE PCC Technical Framework V10.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on August 5, 2015 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the Patient Care Coordination Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/PCC_Public_Comments.

This supplement describes changes to the existing technical framework documents. “Boxed” instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

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

General information about IHE can be found at: http://ihe.net.
Information about the IHE Patient Care Coordination domain can be found at: http://ihe.net/IHE_Domains.
Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: http://ihe.net/IHE_Process and http://ihe.net/Profiles.

The current version of the IHE IT Infrastructure Technical Framework can be found at: http://ihe.net/Technical_Frameworks.
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Introduction to this Supplement

This supplement modifies the following volumes:

105 Volume 1 – Adds a Clinical Mapping (CMAP) Profile to manage nomenclature transformations mapping to and from clinical terminologies.

Open Issues and Questions

None

Closed Issues

110 Could this profile be extended to include any nomenclature mapping to provide SNOMED, LOINC, RXNORM and other clinical mappings from other standard nomenclatures, clinical or non-clinical? YES
General Introduction

Appendix A - Actor Summary Definitions

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

<table>
<thead>
<tr>
<th>Actor</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Clinical Mapping Requestor (See Note 1 for Requirements) | The Clinical Mapping Requestor identifies terms that need to be mapped and requests mappings for them. In conjunction with a requesting actor provides a list of terms in a Translate Code Request transaction with:
  • Items to be mapped
  • Terminology of the items
  • Targeted terminology for mapping |
| Clinical Mapper (See Note 2 for Requirements) | The Clinical Mapper selects appropriate mappings for terms that it has been requested to map. Responds to the Translate Code Request transaction from the Clinical Mapping Requestor. The Clinical Mapper shall be:
  • Capable of handling multiple mapping tables to be invoked singularly or in combination depending on the terminologies to be mapped
  • Context mapping capable |

Appendix B - Transaction Summary Definitions

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

<table>
<thead>
<tr>
<th>Transaction</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translate Code</td>
<td>This transaction provides a term to be mapped to a specific terminology equivalent and receives a list of terms which may be used to represent the concept in the requested terminology.</td>
</tr>
<tr>
<td>Retrieve Code Mappings</td>
<td>This transaction supports retrieval of all mappings from a source terminology to a destination terminology.</td>
</tr>
</tbody>
</table>
Volume 1 – Profiles

X Clinical Mapping (CMAP) Profile

Mapping to and from clinical terminologies is important to handle situations in which:

- Device generated observations need to be converted to clinical terminologies for use in clinical decision making and record keeping
- Clinical terminologies need to be converted to charge capture / billing compatible terminologies for communicating diagnoses and procedures:
  - ICD-10 for international purposes
  - Others as needed for national extensions
  - Clinical terminologies need to be converted to other clinical terminologies (future)

Benefits include:

- Significant time savings
- Data entry error reduction
- Consistency in practice to permit comparison and aggregation of data post-conversion

X.1 CMAP Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A at http://ihe.net/Technical_Frameworks/.

Figure X.1-1 shows the actors directly involved in the CMAP Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.
Table X.1-1 lists the transactions for each actor directly involved in the CMAP Profile. To claim compliance with this Profile, an actor shall support all required transactions (labeled “R”) and may support the optional transactions (labeled “O”).

<table>
<thead>
<tr>
<th>Acts</th>
<th>Transactions</th>
<th>Optionality</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical</td>
<td>Translate Code</td>
<td>R</td>
<td>PCC TF-2: 3.17</td>
</tr>
<tr>
<td>Mapping Requestor</td>
<td>Retrieve Code Mappings</td>
<td>O</td>
<td>PCC TF-2: 3.18</td>
</tr>
<tr>
<td>Clinical</td>
<td>Translate Code</td>
<td>R</td>
<td>PCC TF-2: 3.17</td>
</tr>
<tr>
<td>Mapper</td>
<td>Retrieve Code Mappings</td>
<td>O</td>
<td>PCC TF-2: 3.18</td>
</tr>
</tbody>
</table>

**X.2 Clinical Mapping (CMAP) Actor Options**

Options that may be selected for each actor in this profile are listed in the Table X.2-1 below.
Table X.2-1: Clinical Mapping - Actors and Options

<table>
<thead>
<tr>
<th>Actor</th>
<th>Option Name</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Mapping Requestor</td>
<td>Device Mapping</td>
<td>PCC TF-1:X.2.1</td>
</tr>
<tr>
<td></td>
<td>Problem Mapping</td>
<td>PCC TF-1:X.2.2</td>
</tr>
<tr>
<td></td>
<td>Retrievable Mappings</td>
<td>PCC TF-1:X.2.3</td>
</tr>
<tr>
<td>Clinical Mapper</td>
<td>Device Mapping</td>
<td>PCC TF-1:X.2.1</td>
</tr>
<tr>
<td></td>
<td>Problem Mapping</td>
<td>PCC TF-1:X.2.2</td>
</tr>
<tr>
<td></td>
<td>Retrievable Mappings</td>
<td>PCC TF-1:X.2.3</td>
</tr>
</tbody>
</table>

Note: An actor must implement at least one of the mapping options.

X.2.1 Device Mapping Option

The purpose of the Device Mapping Option is to support translation of IEEE medical device codes produced by personal health monitoring devices into LOINC codes commonly used for reporting measurements in EMR and other Health IT systems. Details for actors implementing this option can be found in the Translate Code transaction.

X.2.2 Problem Mapping Option

The purpose of the Problem Mapping Option is to support translation of SNOMED-CT codes produced by EMR and Health IT systems into ICD-10 codes commonly used for billing and population health reporting. Details for actors implementing this option can be found in the Translate Code transaction.

X.2.3 Retrievable Mappings Option

The purpose of the retrievable mappings option is to identify Clinical Mapping Requester and Clinical Mapper actors that support the Retrieve Code Mappings transaction.

- A Clinical Mapping Requester Actor supporting the Retrievable Mappings Option SHALL implement the Retrieve Code Mappings transaction.
- A Clinical Mapper Actor supporting the Problem Code Mapping Option SHALL implement the Retrieve Code Mappings transaction.

X.3 Required Actor Groupings

There are no required actor groupings.

X.4 Overview

The Clinical Mapping Profile supports the need of systems to translate codes from one terminology to another to support exchange of information between different systems. These translations are often needed at workflow boundaries where concepts used in one workflow have different names than those in another workflow. For example, in reporting device information to an EMR system, the device vendor may wish to capture device measurements of vital signs using
internationally recognized terminologies provided by those devices, but the EMR may need to report these measurements using different terminologies to support local requirements. Another example would be for cases where data captured to support clinical activity for diagnosis or treatment must then be used to facilitate charge capture processes.

There are two ways that mappings can be done. The system doing the mapping can obtain the information on how to map individual terms as needed (e.g., through a query to a terminology mapper), or it can obtain data describing how the mapping should be done for all terms at a single point in time (e.g., startup). The former capability supports all terminology mapping needs, but may have a performance penalty when a large number of mappings need to be performed. The latter capability works in cases where the number of terms to be mapped is small, and the rules by which the mapping is performed are well defined.

**X.4.1 Concepts**

A crosswalk is a mapping from one coding system to another in which concepts from the source coding system are mapped to concepts in the target code system. The simplest form of crosswalk is a lookup table. This form is often used to translate from local codes to codes from standard terminologies. The code translation process in these cases is depicted below.

![Figure X.4.1-1: Simple Translation](image)

Lookup tables are often sufficient for many cases, but can be insufficient when concepts are defined at different levels of granularity, or when additional context is needed in order to perform the translation. For example, distinctions involving location or findings associated with a diagnosis may be encoded differently. In SNOMED-CT, the concepts associated with location and additional findings are usually separately encoded (post-coordinated) in a SNOMED-CT expression. In ICD-10 the location is directly associated in the code (pre-coordinated). Thus, a SNOMED-CT code describing a myocardial infarction could be translated into several different ICD-10 codes, depending upon where the infarct occurred, and whether or not there was an associated ST elevation finding in the ECG. The location information can appear elsewhere in the SNOMED-CT expression (e.g., post-coordinated in finding site), and would provide the location context that enables the mapping into ICD-10. This additional information needed to perform an accurate mapping is described as the input context.
In the above case, performing the translation in reverse (from ICD-10 to SNOMED-CT) would lose information about location and ST elevation due to the way that SNOMED-CT uses post-coordination to encode these concepts. To preserve this, the translation can generate not just a code, but also other contextual information as part of the output. This additional information produced by the mapping is described as the output context.

When the codes being transformed identify not just concepts, but also specific physical measurements, the values associated with those codes may also need to be transformed. For example, blood glucose could be reported in units of grams/liter (g/l) when using the source coding system and in units of milligrams per deciliter (mg/dl) in a target coding system. The source units would be part of the input context, and the units used with the target code, and the scale factor is simply another component of the output context.
Crosswalks represent clinical knowledge that may be complex to implement but which changes infrequently. Systems which must perform translation between coding systems can be configured to cache translations, refreshing translations periodically.

The translation can sometimes be performed locally using a mapping table. This is useful in cases where a small number of codes need to be translated periodically but frequently, and the translation is not complicated.

In other cases, translation may not be simply expressed as a mapping table, or the data used to support the implementation may be proprietary, and thus not shared all at once. Thus, the CMAP Profile supports access to individual translations (which could be cached and refreshed according to policy), and provides an optional transaction enabling all translations to be accessed in a tabular format.

**X.4.2 Use Cases**

**X.4.2.1 Use Case #1: Medical Vital Sign Observation Monitoring Discrete Data Retrospective Utilization**

This use case addresses the recording of vital signs monitoring data from an IHE PCD compliant device using IEEE 11073 nomenclature to the EMR in LOINC.

Providers can view patient data generated by patient care devices in an inpatient setting or outpatient encounter room, but when that same provider accesses his or her EMR application that data is not readily available. Getting semantically correct clinical data from patient care devices into clinical applications is generally not achieved today for a couple of reasons:

- The applicable nomenclature from medical devices, IEEE 11073-10101, is not one of the clinically approved nomenclatures in most if not all countries, reducing the incentive to use IEEE 11073 data in clinical applications. The update under review, IEEE 11073-10101a, is also not one of the approved clinical nomenclatures as well.

- There are no commonly accepted mappings of IEEE 11073-10101 to clinical nomenclatures (LOINC and SNOMED-CT® primarily) for clinical measures although...
there are vendors who have done so as proprietary interfaces. The result is that there is no reliable way to translate data captured using IEEE terminology to LOINC for systems needing it.

As a result much of this numeric data generated from medical applications is either not available in clinical or research systems or reentered at significant cost and risk of error. The missing link is a mapping service that can be accessed in a straightforward manner by clinical applications to transform IEEE clinical observations to LOINC nomenclature.

Benefits that can be derived from applications utilizing these mappings include:

- **Improved data collection and patient safety**: Much of the clinical data would no longer need to be reentered from the device to the clinical application, effectively reducing costs and eliminating risks of neglecting to record the data or making transcription errors.

- **Improved patient care**: Additional medical device observation data would be available to clinicians. Increased observation data would be included in the patient’s chart as well as in near real time to the clinical application for clinical decision support.

The benefits would apply to a high volume of work including any scenario involving devices providing vital sign observations. This volume would increase as more clinical observations are added beyond vital signs.

This use case involves the monitoring of vital signs in an inpatient setting (e.g., an ICU, Step Down, Observation, or General / Surgical unit). Vital signs are generally available at the point of care visually from monitoring displays. What is not available and is addressed by this use case is the ability to view and analyze vital signs in time sequence retrospectively for patient care or study purposes.

**Preconditions:**

The patient is transported to an inpatient room. The patient is attached to a monitor to collect core vital signs observations; including the following:

- **Body Temperature**
- **BP Diastolic**
- **BP Systolic**
- **Heart Rate**
- **O₂ % BldC Oximetry**
- **Respiratory Rate**

**Use case actions:**

1. Medical device observations are transmitted using IEEE 11073 nomenclature.
2. The EMR receives these observations.
3. It requests translations of the IEEE nomenclature codes into LOINC codes via this profile.
4. The translated codes are then used to store the observation values in the patient record.

**Postconditions:**

Medical device observations are available in the EMR.

**X.4.2.2 Use Case #2: Creating Billing Documents from Clinical Encounter Documentation**

Healthcare payers often require the use of ICD-10 terminology for billing and reporting uses. However, other terminologies, such as SNOMED-CT are often used to capture problems in the EMR.

**Preconditions:**

A patient visits his or her doctor for a scheduled ambulatory encounter. During the course of the encounter, the doctor documents relevant clinical facts about the patient in the EMR system. When documenting the patient’s problems, the EMR system assists the doctor to code each problem with appropriate codes selected from SNOMED-CT.

**Use Case Actions:**

1. Following the encounter, the practice billing clerk creates a bill by extracting relevant data from the EMR system.

2. The billing system requests translations for the relevant SNOMED-CT codes to ICD-10 codes for use in the bill.

3. The billing system submits the SNOMED-CT code to the clinical mapping service.

4. If additional modifiers provided are insufficient the mapping service reports additional modifiers it needs to provide more accurate mappings.

5. The billing system can supply these additional modifiers and request the translation again for more accurate mappings (NOTE: This can also be done pre-emptively in step 3).

6. Once it has all required data, the mapping system returns the appropriate ICD-10 code for use by the billing system.

**Post Condition:**

The billing system is able to create a bill using the appropriate ICD-10 codes.

**X.5 Clinical Mapping (CMAP) Security Considerations**

The process of Clinical Mapping need not contain personal health information (PHI). The specifications selected for the CMAP Profile transactions do not typically include PHI, although context information (e.g., age, gender, or rare disease codes) could in fact represent PHI in certain contexts. Thus, implementers may wish to encrypt the communications channel using the IHE ATNA Profile.

Services providing clinical mappings affect the content of patient records where translations of codes are being used. To ensure appropriate translations and verify the identity of these service
providers, the service should be authenticated. Some services may be offered only to licensed users by vendors, and so the system accessing the service, or the user of the service should also be authenticated. The IHE ATNA Profile offers capabilities for mutual system authentication. The IHE EUA, XUA and IUA profiles can be used to support individual user authentication.

The data and algorithms used to implement a translation service for clinical mappings represent a significant technical investment by providers of translation services. Those service providers may not be interested or willing to support distribution of the intellectual property which enables local implementation of translations without using a service. The Retrieve Code Mappings transaction is optional for this reason. Service users can still access translations in a standard format, but must process each one individually.

Translating codes in real time as they are encountered within a system through the interfaces specified in this profile could result in excessive use of network bandwidth. This could especially be the case when translating remote monitoring data. Given that code translations are slowly changing resources, the protocol enables caching of responses, at both the application and lower levels.

X.6 Clinical Mapping (CMAP) Cross Profile Considerations

This profile may be used with a Device Observation Consumer Actor from the IHE PCD Device Enterprise Communication (DEC) Profile. It enables the Device Observation Consumer Actor to translate specific IEEE observation codes contained in the HL7® v2.6 message produced by the PCD-01: Communicate Device Data transaction into clinically usable LOINC.
Volume 2 – Transactions

Add Section 3.17

3.17 Translate Code [PCC-17]

3.17.1 Scope
This transaction is used to translate a code from one coding system to another.

3.17.2 Actor Roles

![Use Case Diagram]

Table 3.17.2-1: Actor Roles

<table>
<thead>
<tr>
<th>Actor</th>
<th>Clinical Mapping Requester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>An information system requesting a mapping of a code from one vocabulary to another.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actor</th>
<th>Clinical Mapper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>An information system that responds to a mapping request</td>
</tr>
</tbody>
</table>

3.17.3 Referenced Standards

375 HL7® Fast Healthcare Information Resources (FHIR®) DSTU 2.0 (work in progress)¹

¹ The version to use for this Trial Implementation can be found at ftp://ftp.ihe.net/TF_Implementation_Material/PCC/fhir/FHIR-08-2015.zip
3.17.4 Interaction Diagram

3.17.4.1 Translate Code

The Translate Code transaction is implemented through the FHIR® $translate operation on a ConceptMap resource. The details of this transaction are described below under Message Semantics. That operation defines a mechanism by which codes can be translated from one coding system to another.

3.17.4.1.1 Trigger Events

The Clinical Mapping Requester can request a code to be translated at several points in time:

1. It may periodically make requests for information on how to translate codes which will be saved and applied repeatedly during normal operation of the system.
2. It may receive information using a particular code and dynamically request translation of that code into a different coding system.

3.17.4.1.2 Message Semantics

The message is a FHIR® operation with the input and output parameters shown below in Table 3.17.4.1.2-1. The name of the operation is $translate, and it is applied to ConceptMap resources. It is sent synchronously in JSON format from the Clinical Mapping Requester Actor to the Clinical Mapper Actor using an HTTP or HTTPS GET request.

The URL for this operation is: [base]/ConceptMap/$translate

Where [base] is the base URL for the Clinical Mapper Actor.
### Table 3.17.4.1.2-1: $translate Message Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Card.</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Parameters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>code</td>
<td>1..1</td>
<td>code</td>
<td>The code to translate.</td>
</tr>
<tr>
<td>system</td>
<td>1..1</td>
<td>uri</td>
<td>The system for the code that is to be translated.</td>
</tr>
<tr>
<td>target</td>
<td>1..1</td>
<td>uri</td>
<td>A URI identifying the target value set from which the translated code should come from.</td>
</tr>
<tr>
<td>dependency</td>
<td>0..*</td>
<td></td>
<td>Additional context may be necessary to identify a mapping. Each dependency parameter identifies some piece of context information that could be used to facilitate mapping.</td>
</tr>
<tr>
<td>dependency.element</td>
<td>1..1</td>
<td>uri</td>
<td>The element part of the parameter provides a reference to a model element holding a coded value from which the additional context information is obtained. This can be an element in a FHIR® resource, a specific reference to a data element in a different specification (e.g., v2) or a general reference to a kind of data field, or a reference to a value set with an appropriately narrow definition.</td>
</tr>
<tr>
<td>dependency.coding</td>
<td>0..1</td>
<td>CodeableConcept</td>
<td>Describes the additional coded context information. NOTE: Either dependency.coding shall be present, or dependency.cmap:value, but not both.</td>
</tr>
<tr>
<td>dependency.coding.codeSystem</td>
<td>1..1</td>
<td>uri</td>
<td>The code system in the referenced element.</td>
</tr>
<tr>
<td>dependency.coding.code</td>
<td>1..1</td>
<td>string</td>
<td>Value of the referenced element</td>
</tr>
<tr>
<td>dependency.cmap:value</td>
<td>0..1</td>
<td>Quantity</td>
<td>The value of the referenced element. NOTE: Either dependency.coding shall be present, or dependency.cmap:value, but not both.</td>
</tr>
<tr>
<td><strong>Output Parameters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>result</td>
<td>1..1</td>
<td>boolean</td>
<td>A value of true or false indicating whether a mapping could be performed.</td>
</tr>
<tr>
<td>message</td>
<td>0..1</td>
<td>string</td>
<td>Error details when result = false, warnings if result = true</td>
</tr>
<tr>
<td>match</td>
<td>0..*</td>
<td></td>
<td>Details about a mapped code. Multiple codes may be matched.</td>
</tr>
<tr>
<td>match.equivalence</td>
<td>0..1</td>
<td>code</td>
<td>A code indicting the strength of the match.</td>
</tr>
<tr>
<td>match.concept</td>
<td>0..1</td>
<td>Coding</td>
<td>The mapped code.</td>
</tr>
<tr>
<td>match.product</td>
<td>0..*</td>
<td></td>
<td>A mapping may produce additional context information. Each product parameter identifies some piece of context produced by a mapping. (see also dependency above).</td>
</tr>
<tr>
<td>match.product.element</td>
<td>1..1</td>
<td>uri</td>
<td>A reference to a model element that would hold a coded value where the produced context is used.</td>
</tr>
<tr>
<td>match.product.concept</td>
<td>0..1</td>
<td>Coding</td>
<td>The coded result in the referenced element. NOTE: Either product.concept or product.cmap:range SHALL be present, but not both.</td>
</tr>
<tr>
<td>match.product.concept.codeSystem</td>
<td>1..1</td>
<td>uri</td>
<td>The code system in the referenced element.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Card.</td>
<td>Data Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>match.product. concept. code</td>
<td>1..1</td>
<td>string</td>
<td>The code produced as a result of the mapping. Either product.concept.code or product.</td>
</tr>
<tr>
<td>match.product. cmap:range</td>
<td>0..1</td>
<td>Range</td>
<td>The value range produced as a result of the mapping. NOTE: Either product.concept or product.cmap:range SHALL be present, but not both.</td>
</tr>
<tr>
<td>match. cmap: scalingFactor</td>
<td>0..1</td>
<td>decimal</td>
<td>The scaling factor produced as a result of the mapping.</td>
</tr>
<tr>
<td>cmap: dependency</td>
<td>0..*</td>
<td></td>
<td>The dependency output parameter may be present to specify which additional dependencies should be specified to obtain a better match.</td>
</tr>
<tr>
<td>cmap: dependency. element</td>
<td>1..1</td>
<td>uri</td>
<td>The element part of the parameter provides a reference to a model element holding a coded value from which the additional context information would be obtained.</td>
</tr>
<tr>
<td>cmap: dependency. codeSystem</td>
<td>0..1</td>
<td>uri</td>
<td>If the model element described above refers to a coded concept, this field shall contain the code system that should be used to represent the value of the referenced element.</td>
</tr>
</tbody>
</table>

### 3.17.4.1.3 Expected Actions

1. The Clinical Mapping Requester Actor shall send a $translate request to the Clinical Mapper Actor.

2. Upon receipt of a $translate request, the Clinical Mapper Actor SHALL identify the appropriate mapping tables to apply to the $translate request.

3. If vocabulary mapping from the system to the target vocabulary is not supported (e.g., NDC to CPT), the mapper SHALL return a result parameter of false. The message parameter should indicate that no translation is possible between the two vocabularies.

4. If vocabulary mapping from the system to the target vocabulary is supported,
   a. If the specified code can be mapped to one or more codes,
      i. A match parameter SHALL be produced to record each matched code identified.
      ii. The result parameter SHALL be set to true.
   b. If the specified code cannot be mapped to one or more codes,
      i. The match parameter SHALL NOT be present.
      ii. The result parameter SHALL be set to false.
   c. If the specified code can be mapped to multiple different codes depending on additional context not already specified in the dependency parameter, then additional contexts that support a better mapping shall be reported in the dependency output parameters.
3.17.4.1.4 Expected Actions for the Device Mapping Option

When a mapping is being requested for an IEEE nomenclature code to LOINC and the Device Mapping Option is supported:

The Clinical Mapping Requestor Actor SHALL populate the input parameters such that:

1. The code parameter SHALL be populated with a value from the IEEE nomenclature.
2. The system parameter SHALL be populated with “urn:std:iso:11073:10101”.
3. The target parameter SHALL be populated with “http://loinc.org”.
4. At most one dependency parameter SHALL be present. If present:
   a. The dependency.element parameter SHALL have the value of “Observation.valueQuantity.units”.
   b. The dependency.codeSystem parameter SHALL have the value “urn:std:iso:11073:10101”.
   c. The dependency.code parameter SHALL have a value selected from the IEEE nomenclature specifying the reporting unit associated with the measurement.

The Clinical Mapper Actor shall return a Parameters resource such that:

1. The outcome parameter, if present contains a code from the LOINC terminology.
2. When a mapping is found:
   a. Exactly one product element SHALL be present where product.element parameter has the value of “Observation.valueQuantity.units” and:
      i. The product.codeSystem parameter SHALL have the value “http://unitsofmeasure.org”.
      ii. The product.code parameter SHALL have a value selected from UCUM specifying the reporting unit associated with the measurement.
   b. At most one cmap:scalingFactor element SHALL be present.

3.17.4.1.5 Expected Actions for the Problem Mapping Option

When a mapping is being requested for SNOMED-CT term to ICD-10 and the Problem Mapping Option is supported:

The Clinical Mapping Requestor Actor shall populate the input parameters such that:

1. The code parameter SHALL be populated with a value from SNOMED-CT.
2. The system parameter SHALL be populated with “http://snomed.info/sct”.
3. The target parameter SHALL be populated with “http://hl7.org/fhir/sid/icd-10” or other ICD-10 derived coding system as determined by regional policy.
4. Multiple dependency parameters MAY be present.
a. The value of `dependency.element` parameter **MAY** contain a value from the set of values listed below. This material is derived from the US National Library of Medicine technical documentation for their SNOMED CT to ICD-10 map².

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition.onsetAge</td>
<td>The age of the patient at the time of onset of the disease.</td>
</tr>
<tr>
<td>Condition.patient.gender</td>
<td>The gender of the patient.</td>
</tr>
<tr>
<td>Condition.location.site</td>
<td>The site of the condition. ICD-10 codes may vary depending on the body site affected.</td>
</tr>
<tr>
<td>Condition.location.site.modifier</td>
<td>The laterality or other modifier on ambiguous body sites. For example, when the condition is a fracture of the arm (specified in site above), different ICD-10 codes might be produced depending on whether it was the left or right arm, or the upper or lower part of the arm.</td>
</tr>
</tbody>
</table>

b. When `dependency.element` parameter contains `Condition.onsetAge`, `dependency.cmap:value` **SHALL** be set to the patient age at onset.

The Clinical Mapper Actor **SHALL** return a Parameters resource such that:

1. The `match` parameter, if present **SHALL** be populated with a code from ICD-10 or derived coding system as determined by regional policy.

2. If additional context is necessary, **SHALL** populate one or more `dependency` parameters. Such parameters if present:

   a. SHOULD contain a `dependency.element` from the values listed in Table 3.17.4.1.5 -1 above.

The Clinical Mapper Actor **SHALL** support the dependencies listed in Table 3.17.4.1.5 -1 above. At the very least, use of these values **SHALL NOT** cause the $translate request to fail or be rejected. The Clinical Mapper Actor **SHOULD** use these values to produce better mappings when present. Other dependency values may be supported.

**3.18 Retrieve Code Mappings [PCC-18]**

**3.18.1 Scope**

This transaction is used to retrieve the table used to perform code mapping.

3.18.2 Actor Roles

![Use Case Diagram]

**Figure 3.18.2-1: Use Case Diagram**

<table>
<thead>
<tr>
<th>Actor:</th>
<th>Clinical Mapping Requester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role:</td>
<td>An information system requesting the table of mappings from one code system to another.</td>
</tr>
<tr>
<td>Actor:</td>
<td>Clinical Mapper</td>
</tr>
<tr>
<td>Role:</td>
<td>An information system that responds to the request</td>
</tr>
</tbody>
</table>

3.18.3 Referenced Standards

480  HL7® Fast Healthcare Information Resources (FHIR®) DSTU 2.0 Draft for Ballot

3.18.4 Interaction Diagram
3.18.4.1 Retrieve Code Mapping

The Retrieve Code Mapping transaction is implemented through the FHIR® ConceptMap query operation.

3.18.4.1.1 Trigger Events

The Clinical Mapping Requester can request the mapping table when it is preparing itself to map several codes from one coding system to another.

3.18.4.1.2 Message Semantics

The message is a FHIR® query requesting a ConceptMap resource using an HTTP GET and the source and target query parameters.

The URL for this operation is:

```
[base]/ConceptMap?source=sourceCodingURI&target=targetCodingURI
```

Where [base] is the base URL for the Clinical Mapper Actor.

3.18.4.1.3 Expected Actions

The Clinical Mapper Actor will return all ConceptMap resources that support mapping from the coding system identified by sourceCodingURI to the coding system specified in targetCodingURI.

3.18.5 Security Considerations

Clinical Mapping tables often represent intellectual property that may only be available to licensed users. To protect this IP, the Clinical Mapper may require the channel over which the request is made to be encrypted, and the system making the request to be authenticated. The IHE ATNA Profile can be used to provide these capabilities.