



# **Using SNOMED CT in Detailed Clinical Modeling ISC14078**

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# Objective

- Be able to describe interaction between SNOMED CT and Detailed Clinical Models,
- Identify potential for implementation of SNOMED CT based data models in electronic health record (EHR) systems and HL7 v3 messages,
- Illustrate how SNOMED CT and the DCM modeling approach together supports the various data management requirements.



# Introduction

- Despite the wide use of clinical terminologies, terminology is not enough for datamanagement
- in EHR, HL7 v3 data exchange methods, and the use of data for purposes as continuity of care, decision support, quality indicators, clinical research, and health management<sup>2</sup>.
- One approach to combine terminology and information models for EHR and HL7 v3 is Detailed Clinical Models (DCM)<sup>3</sup>.



# Context

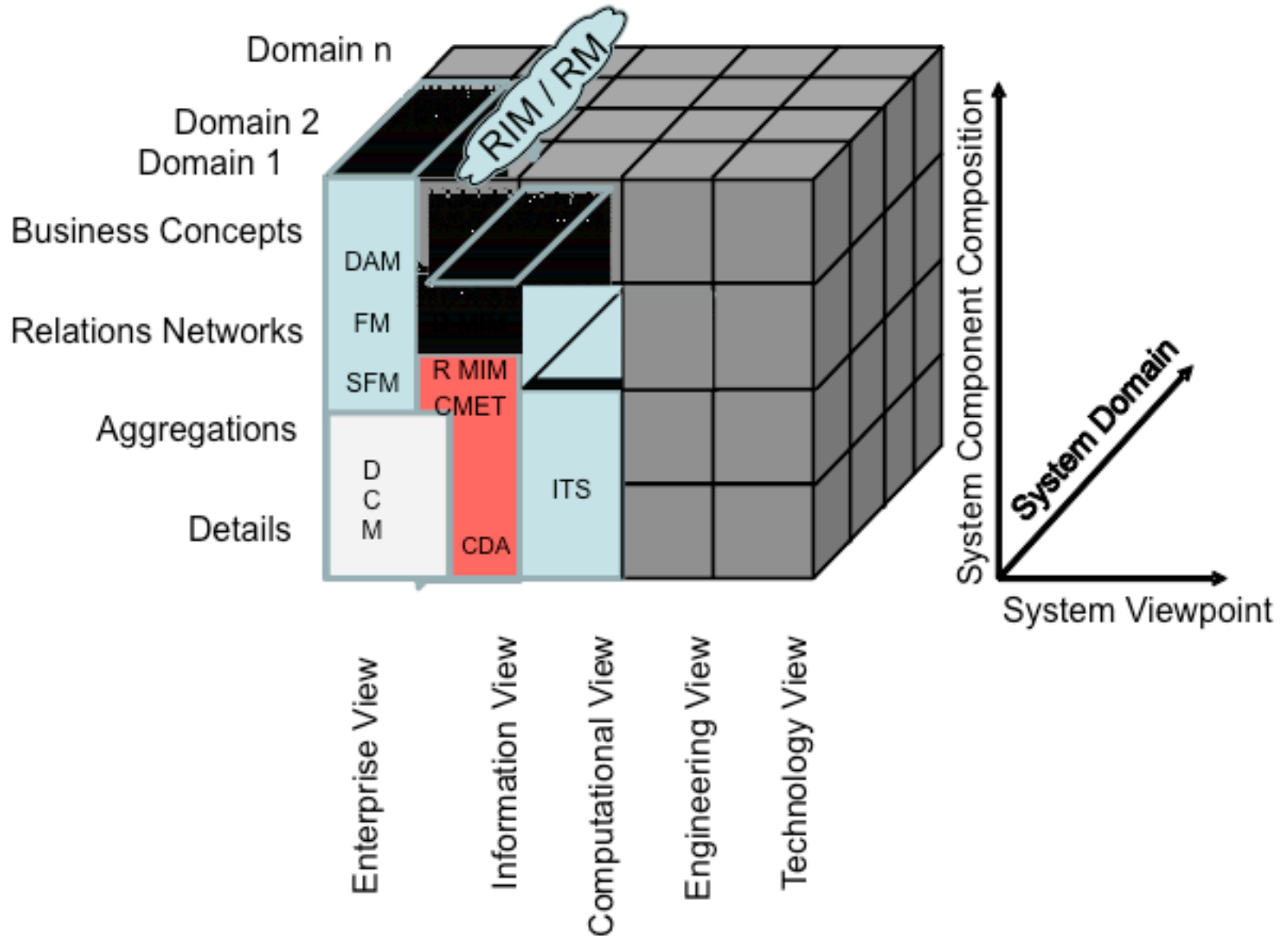


# Standards, so many to choose from





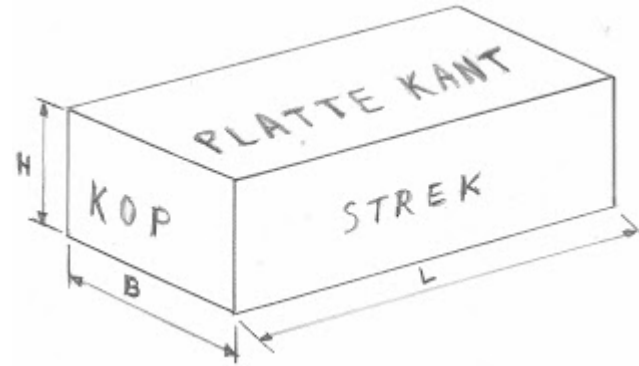
# Blobels architecture cube



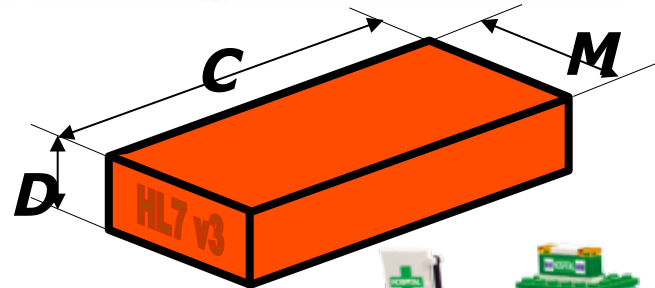


# Model Driven Architecture

Conceptual



Logical



Implementable



# ISO TS 13972 DCM

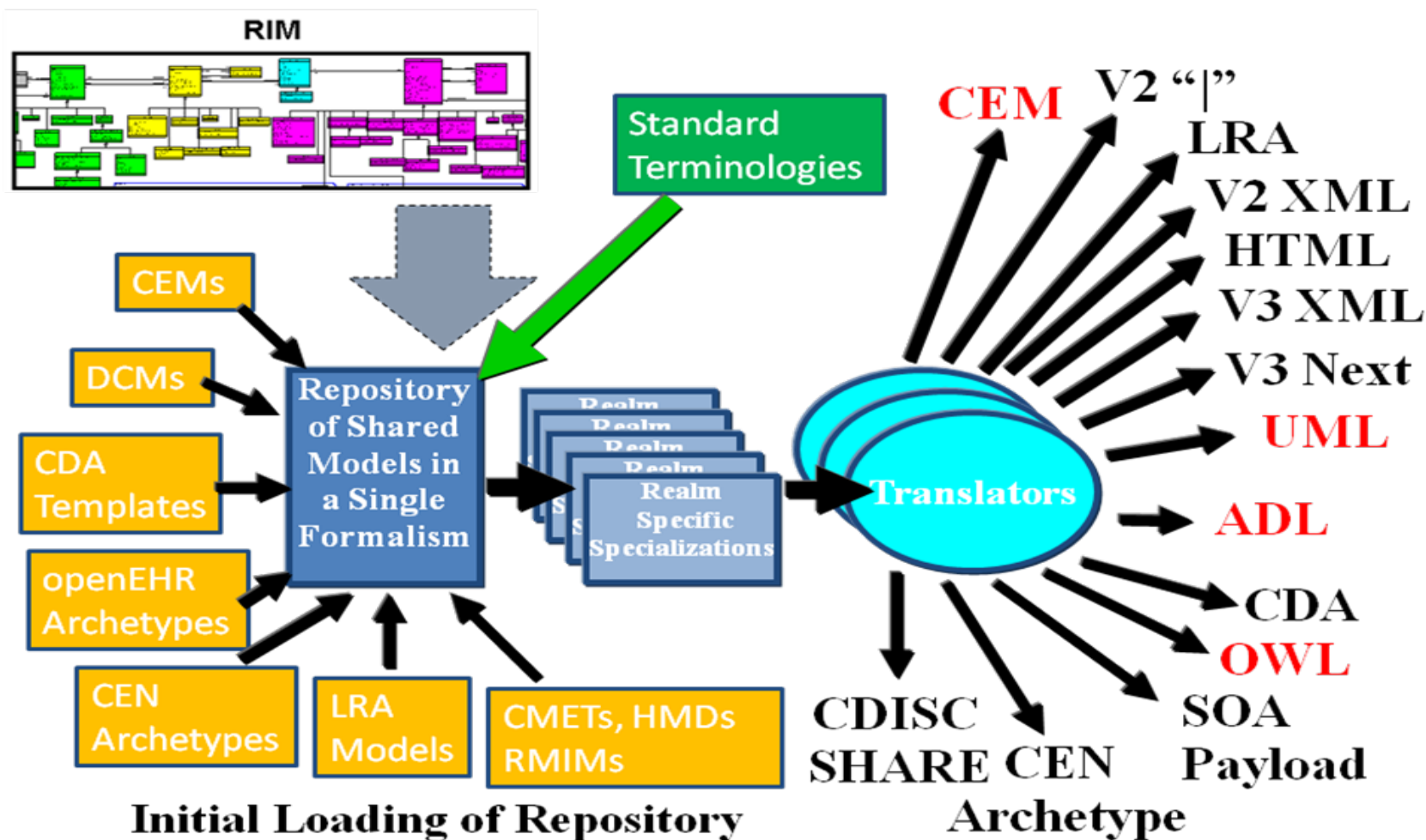


Contents of DCM:

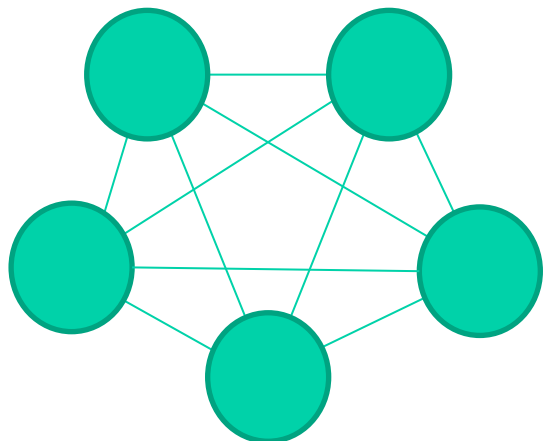
- **Medical knowledge** (target population, evidence, interpretation)
- **Data elements specification**
- **Unique binding to 1-n codes** (preferred Snomed CT, not exclusive)
- **Meta information** (authorship, version, verification, endorsement).



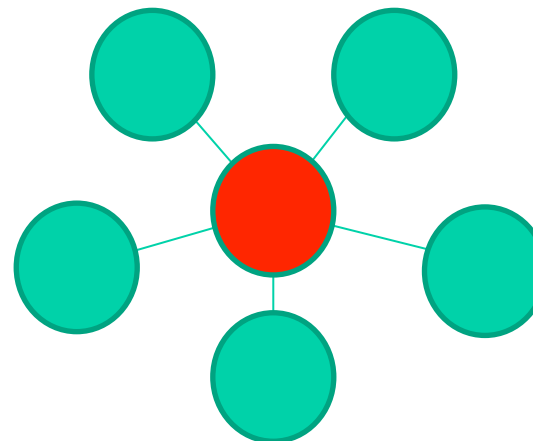
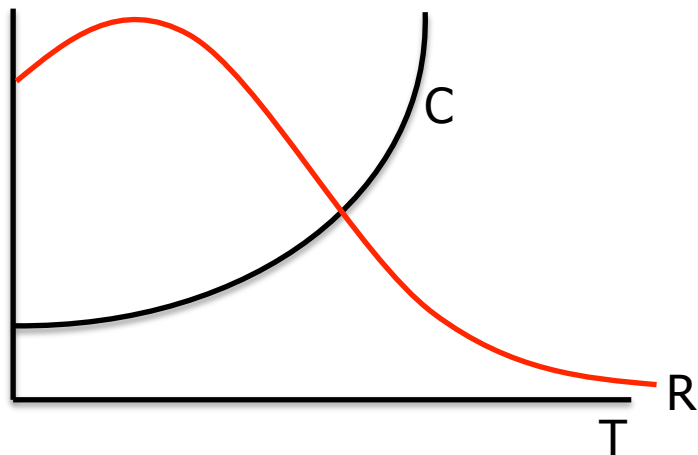
## Information Model Ideas



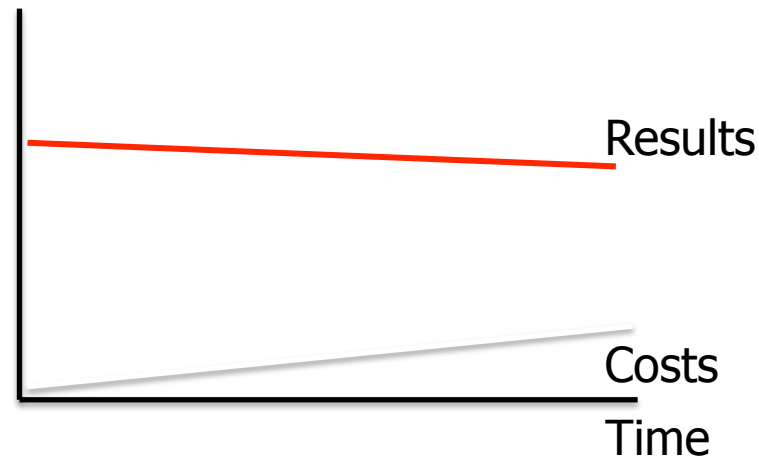
# Business case DCM



$$C = N(N-1)$$



$$C = N-1$$





# **DCM creation & Snomed CT coding**

# DCM Model Creator



WilliamDCMwerk2013 - Enterprise Architect

File Edit View Project Diagram Element Tools Analyzer Extensions Settings Window Help

Class Diagram: "Information Model" created: 8-1-2010 13:51:46 modified: 31-5-2013 7:43:44 100% 1169 x 827

Default Style

Project Browser

- «DCM» nl.PRN.ApgarScore-v0.96
  - Revision History
  - Concept
  - Mindmap
  - Purpose
  - Patient population
  - Evidence Base
  - Information Model
    - Information Model
    - Information Model (NL)
      - «rootconcept» ApgarScore
      - «data...» TotalScore
      - «qualifier...» PostBirthMoment
      - «containers» ListingOfIndividualScores
      - «data...» GrimaceReflexes
      - «data...» MuscleTone
      - «data...» Pulse
      - «data,enumerati...» Respiration
      - «data,enumerati...» SkinColor
    - Example Instances
    - Example Instances NL
    - Instructions
    - Interpretation
    - Care Process
    - Example of the Instrument
    - Constraints
    - Issues
    - References
    - Functional Model
    - Traceability to other Standards
    - Disclaimer
    - Terms of Use
    - Copyrights

Class Relationships

Common

Class

Package

Class

Interface

Data Type

Enumeration

Primitive

Table

Signal

Association

Name: Information Model  
Author: ZeIM  
Version: 0.96  
Created: 8-1-2010 13:51:46  
Updated: 31-5-2013 7:43:44

«rootconcept»  
ApgarScore

«data, derivation»  
Total Score  
constraints  
[totaal van de items  
[value minimaal 0 en maximaal 10]

«qualifier, enumerati...»  
PostBirthMoment  
«enum»  
+ After1Minute  
+ After2Minutes  
+ After5Minutes  
+ After10Minutes  
+ After20Minutes

«containers»  
ListingOfIndividualScores  
0..1

«data, enumeration»  
SkinColor  
«enum»  
+ CompletelyPinkOrGoodColour = 2  
+ NormalBodyColourHandsFeetAreBlue = 1  
+ WholeBodysBlueOrPale = 0

«data, enumerati...»  
Respiration  
«enum»  
+ GoodCrying = 2  
+ Irregular = 1  
+ None = 0

«data, enumeration»  
MuscleTone  
«enum»  
+ ActiveMotionOfArmsLegs = 2  
+ SomeFlexingOfArmsLegs = 1  
+ Limp = 0

«data, enumeration»  
Pulse  
«enum»  
+ GreaterThan100BeatsPerMinute = 2  
+ LessThan100BeatsPerMinute = 1  
+ NoHeartBeat = 0

«data, enumeration»  
GrimaceReflexes  
«enum»  
+ GrimaceSneezeCoughPullingBackDuringSuction = 2  
+ GrimaceDuringSuction = 1  
+ NoResponseToSuctionOfAirways = 0

Tagged Values

Enumeration (Muscle Tone)  
DCM::DefinitionCode  
SCT: 249225007 Apgar muscle tone score (special conce...  
Tagged Values Notes

Start Page DCM Repository Information Model Information Model

Model Mail

RESULTS4CARE



# SNOMED CT® Browsers

[Learn more about SNOMED CT](#)
[Tell us about other SNOMED CT browsers](#)
[SNOMED CT browser requirements](#)

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## Online Browsers

[Downloadable Browsers](#)
[Mobile Applications](#)
[Conditions of Use](#)

Name	Type	Description	Link	Availability	Provider
IHTSDO SNOMED CT Browser	Online browser	Beta version of an IHTSDO online, multilingual SNOMED CT Browser, being developed as part of the Open Tooling Framework. This is an evolving service which will change frequently for review. It is a BETA version, and should not be used in a production environment.	<a href="http://browser.ihtsdotools.org">http://browser.ihtsdotools.org</a>	Free service	IHTSDO
ITServer	Online browser	Online browser with fast searches, hierarchy filtering and various other interesting features.	<a href="http://www.itserver.es/ITServer/Browser/snomedctbrowser.faces">http://www.itserver.es/ITServer/Browser/snomedctbrowser.faces</a>	Free service	Indizen
Nictiz Browser	Online browser	Online SNOMED CT browser fast searches, hierarchy filtering and a novel way to display definition of the concept selected.	<a href="https://terminologie.nictiz.nl/art-decor/snomed-ct">https://terminologie.nictiz.nl/art-decor/snomed-ct</a>	Free service	Nictiz
NLM SNOMED CT Browser	Online browser	Search for and display SNOMED CT content, as included in UMLS® Metathesaurus®. Expands searches to include synonymous terms from over 100 Metathesaurus vocabulary sources.	<a href="https://uts.nlm.nih.gov/">https://uts.nlm.nih.gov/</a>	Free service	National Library of Medicine
NPEX Browser	Online browser	Online browser intended for use in UK NHS Data includes UK National Extension	<a href="http://www.snomedbrowser.com">http://www.snomedbrowser.com</a>	Free service	X-Lab
Snoflake Browser	Online browser	Online browser, with support for ICD10 code search. Includes UK extensions, subset, suffix & favourite filtering, user favourites, prefix searching.	<a href="http://www.snoflake.co.uk">http://www.snoflake.co.uk</a>	Free service	Dataline Software
Snolex	Online browser	Online browser with fast searches, hierarchy filtering, search counts per hierarchy and various other interesting features.	<a href="https://snolex.com/">https://snolex.com/</a>	Free service	Noesis Informatica
VTSL Terminology Browser	Online browser	Browser is designed to search and browse SNOMED CT International release as extended by VTSL to include the Veterinary Extension.	<a href="http://vtsl.vetmed.vt.edu/browser">http://vtsl.vetmed.vt.edu/browser</a>	Free service	Veterinary Terminology Services Lab at Virginia Tech

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View as form

Home > Groups > Cardiology Smart Care 2014

# nl.HealthBase.Bloeddruk

## Reviews

You can use a review to give an overall view, rather than contribute comments intended to help develop it.

[Add a review.](#)

View as form

View as data

Documentation

Metadata

Settings

Close all

- Body Position
- Bovendruk
- GemiddeldeArterieleDruk
- Method
- Korotkoff
- Polsdruk
- BeïnvloedendeFactoren
- **Onderdruk**
- Meetlocatie
- Manchet

### Onderdruk

Description Het minimum van de druk die optreedt tussen twee samentrekkingen van het hart in, als het hart zich weer met bloed vult.

Datatype integer []

Cardinality 1

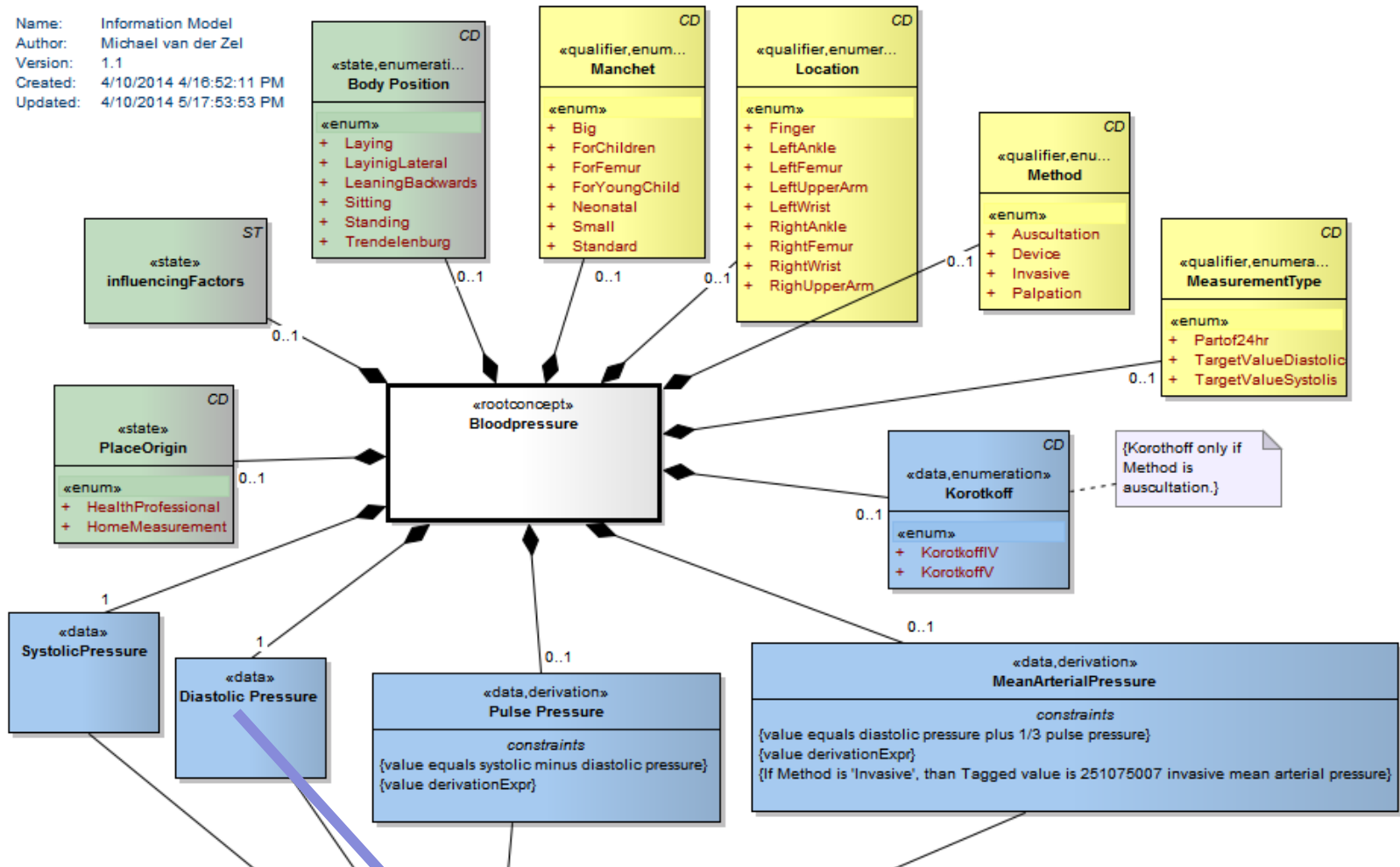
Coding SCT: 271650006 diastolic blood pressure

[edit](#)

+ add a file

class Information Model

Name: Information Model  
 Author: Michael van der Zel  
 Version: 1.1  
 Created: 4/10/2014 4/16:52:11 PM  
 Updated: 4/10/2014 5/17:53:53 PM



{Korotkoff only if Method is auscultation.}

**Tagged Values**

Class (Diastolic Pressure)

DCM::DefinitionCode

SnomedCT: 271650006 diastolic blood pressure

Tagged Values | Notes



# DCM Uses





# Data needs & DCM use

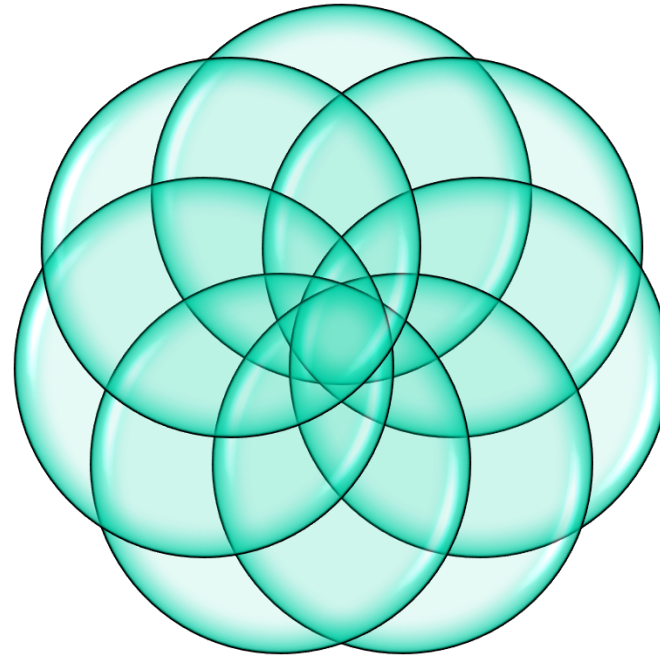
Primary  
process

Financial

Continuity  
of care

Epidemiology

Q- indicator



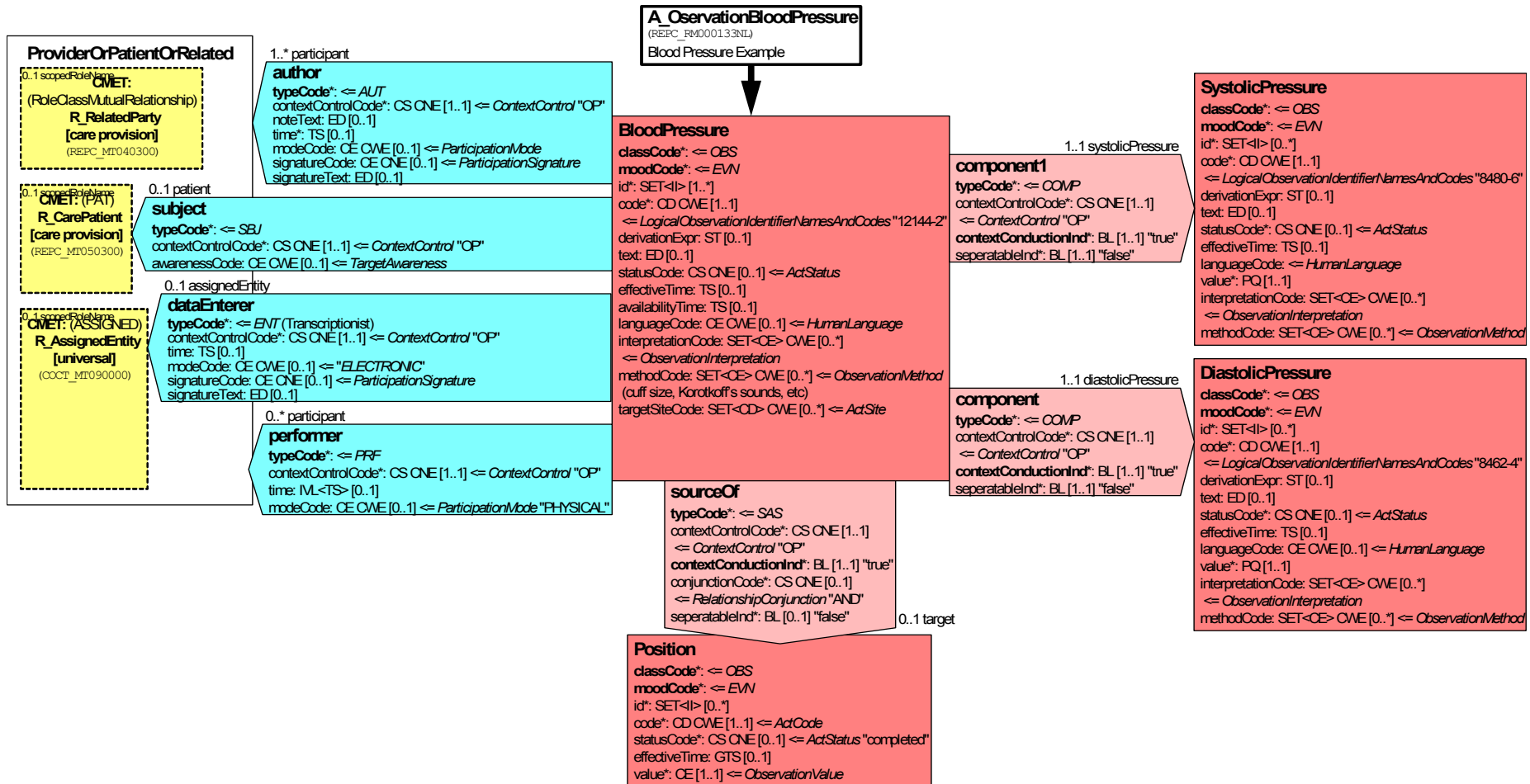
Clinical trial

Management

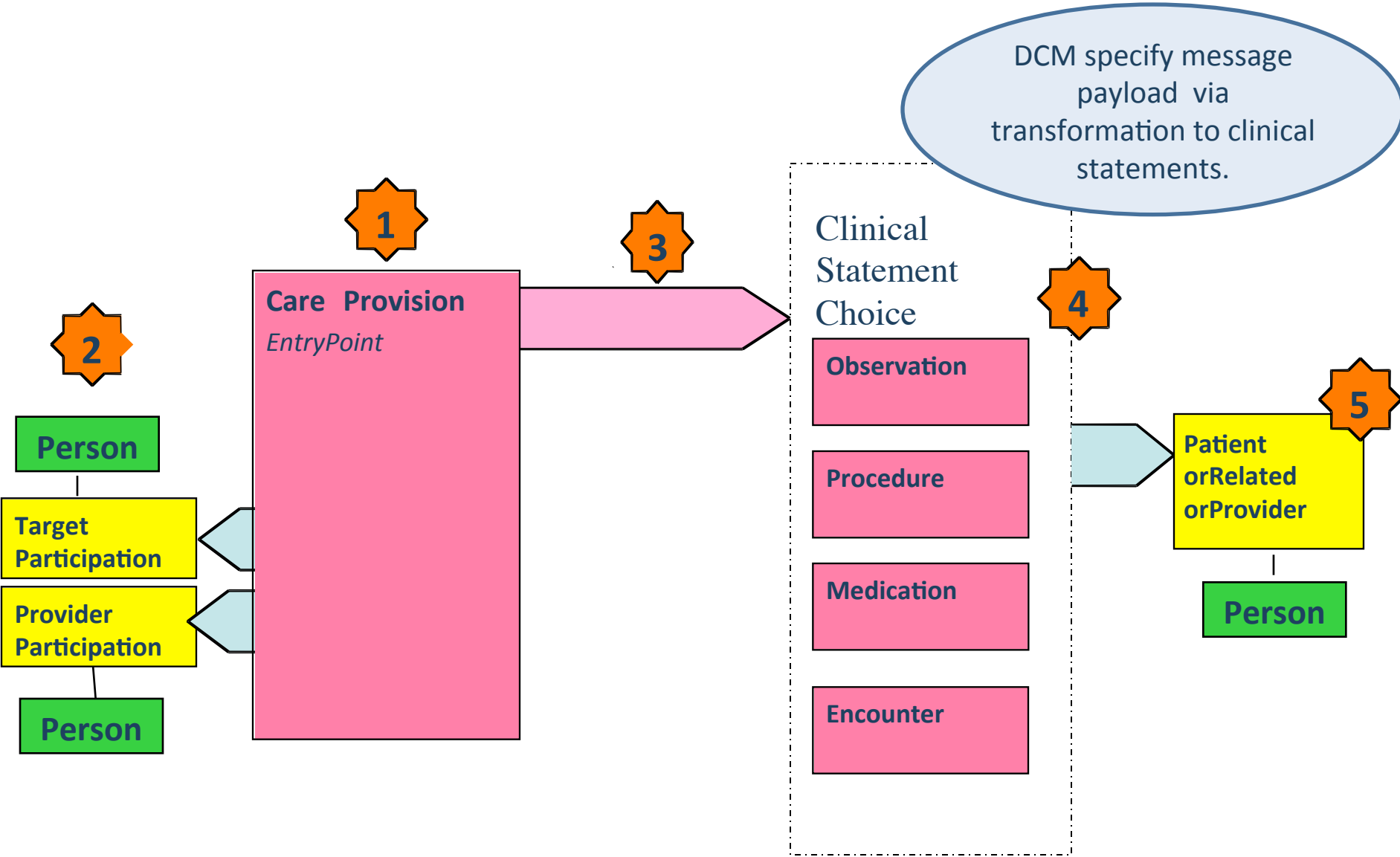


# HL7 R-MIM voor Blood Pressure

- R-MIM in MS Visio Approach stopped about 2006



# R-MIMs fit HL7 v3 Care Record message & CDA



# DCM HL7 expression + SnomedCT



```
<?xml version="1.0" encoding="utf-8"?>
```

```
<REPC_MT000100UV01.Organizer xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
  xsi:type="REPC_MT000100UV01.
```

```
<!-- Generated by the R4C DCM Model Creator 2012 . Based on HL7 v3 Normative Edition 2009/2010 Schemas -->
```

```
<code displayName="Bloodpressure" codeSystemName="DCMInternal">
```

```
<translation code="35094-2" displayName="Blood pressure panel" codeSystemName="LOINC"  
  codeSystem="2.16.840.1.113883.6.1" />
```

```
<translation code="75367002" displayName="blood pressure" codeSystemName="SnomedCT"  
  codeSystem="2.16.840.1.113883.6.96" />
```

```
</code>
```

```
<!-- several parts removed -->
```

```
<component typeCode="COMP">
```

```
<observation classCode="OBS" moodCode="DEF">
```

```
<code="27165006" displayName="diastolic blood pressure" codeSystemName="SnomedCT"  
  codeSystem="2.16.840.1.113883.6.96" />
```

```
</code>
```

```
<repeatNumber>
```

```
<low value="1" />
```

```
<high value="1" />
```

```
</repeatNumber>
```

```
<value xsi:type="PQ" unit="mmHg" value="92" />
```

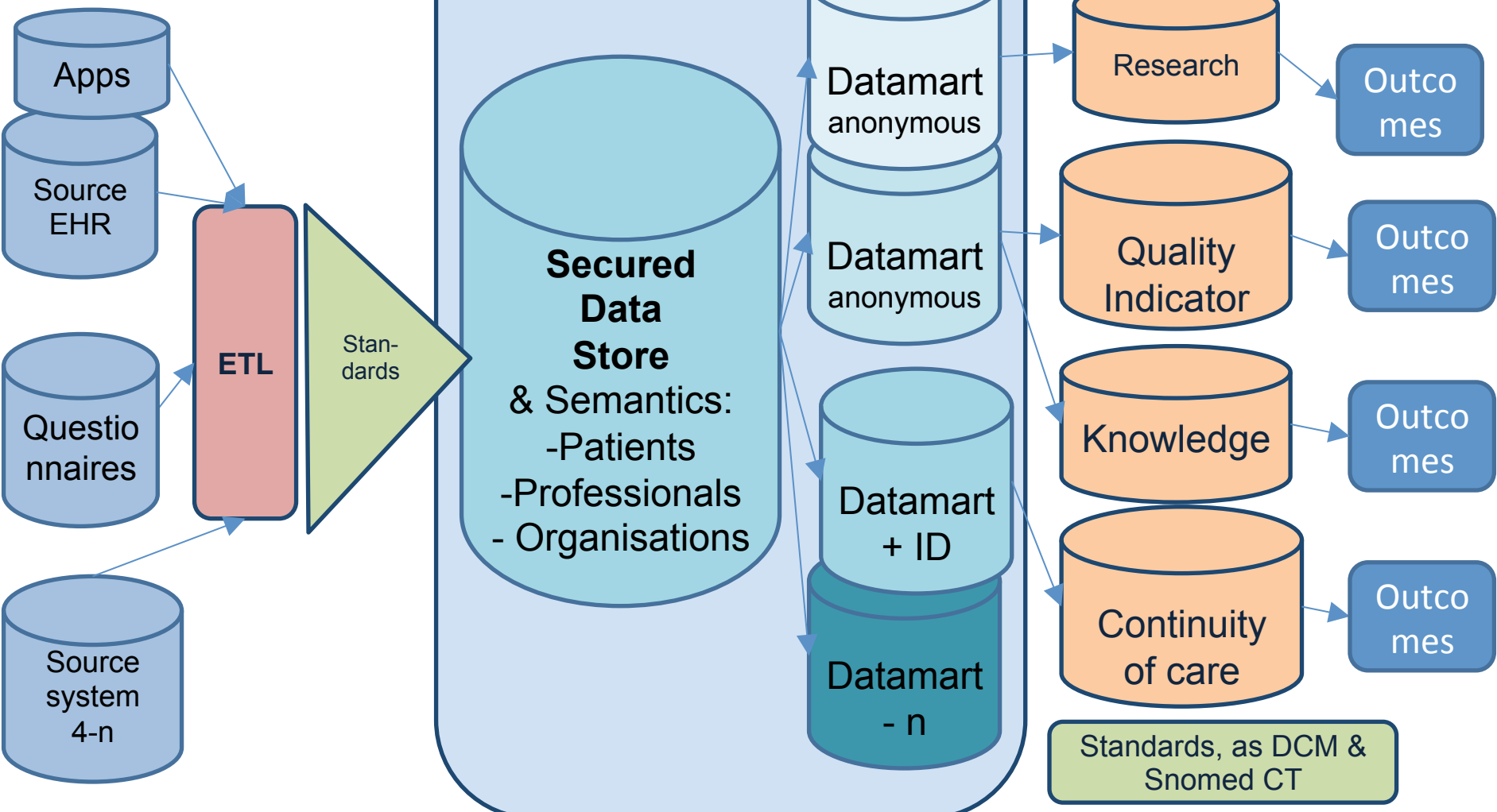
```
</observation>
```

```
</component>
```

# Metadata: Detailed Clinical Models DCM ISO TS 13972

Source Systems:  
Various codes

Target Systems:  
unique codes

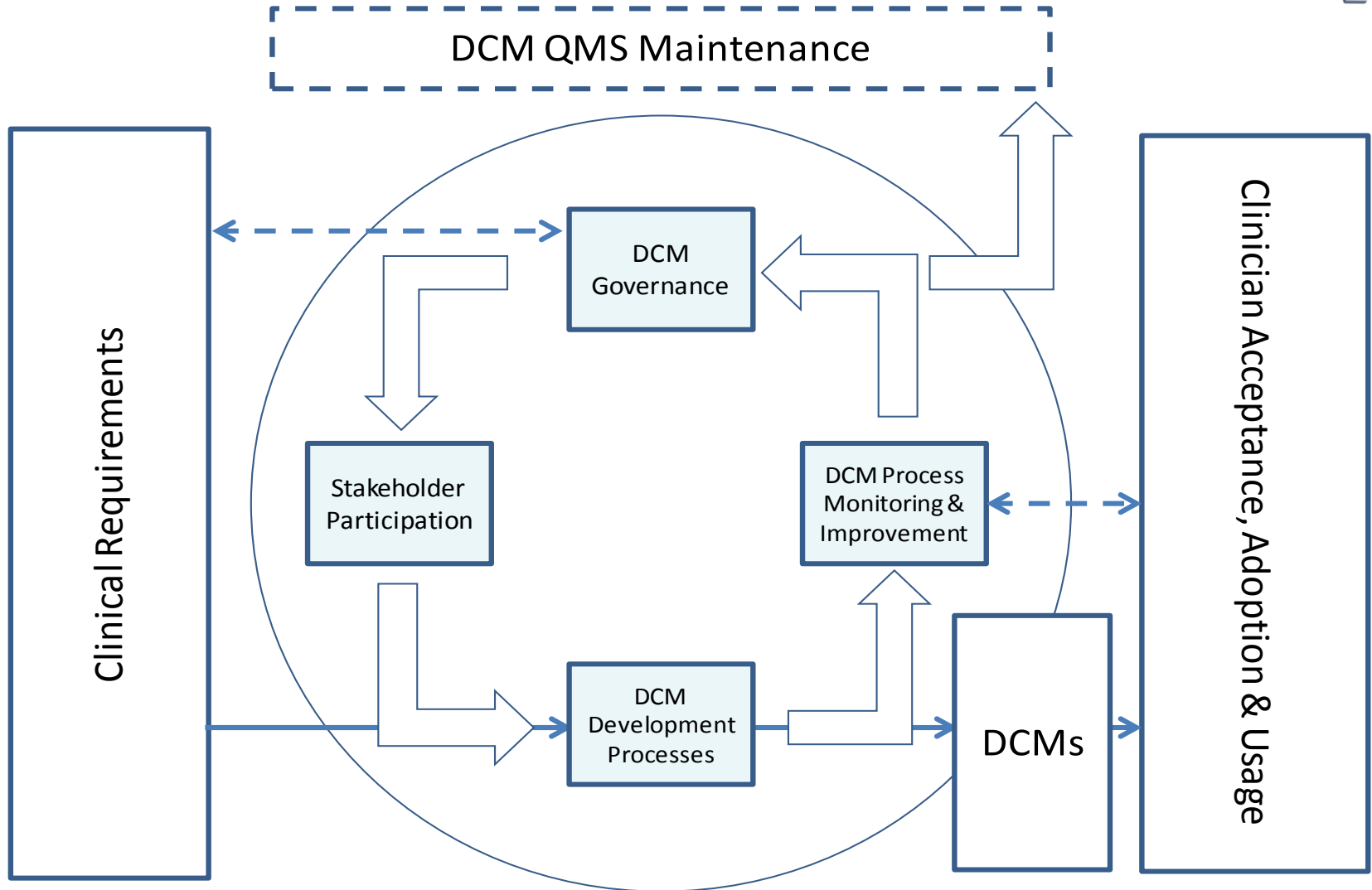


# DCM services

# Governance: ISO TS 13972



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# Repository DCM



The screenshot shows a GitHub repository page for 'DetailedClinicalModels / DCM-Verified-Implemented'. The repository has 11 commits, 1 branch, 0 releases, and 2 contributors. The main content is a list of files and folders, including 'DMO protocol', 'Pain score - Pijnscore', 'Pupil Reaction - Pupil reactie', 'SNAQ score', 'Temperature-Temperatuur', 'Weight-Gewicht', 'van Wiechenschema', '.gitattributes', '.gitignore', and 'README.md'. The repository is described as 'These DCMs have been approved by minimum of one clinical community and have been used for at least one implementation in systems'. The page also shows options to clone the repository in Desktop or download a ZIP file.

GitHub repository page for **DetailedClinicalModels / DCM-Verified-Implemented**. The repository contains 11 commits, 1 branch, 0 releases, and 2 contributors. The main content is a list of files and folders, including:

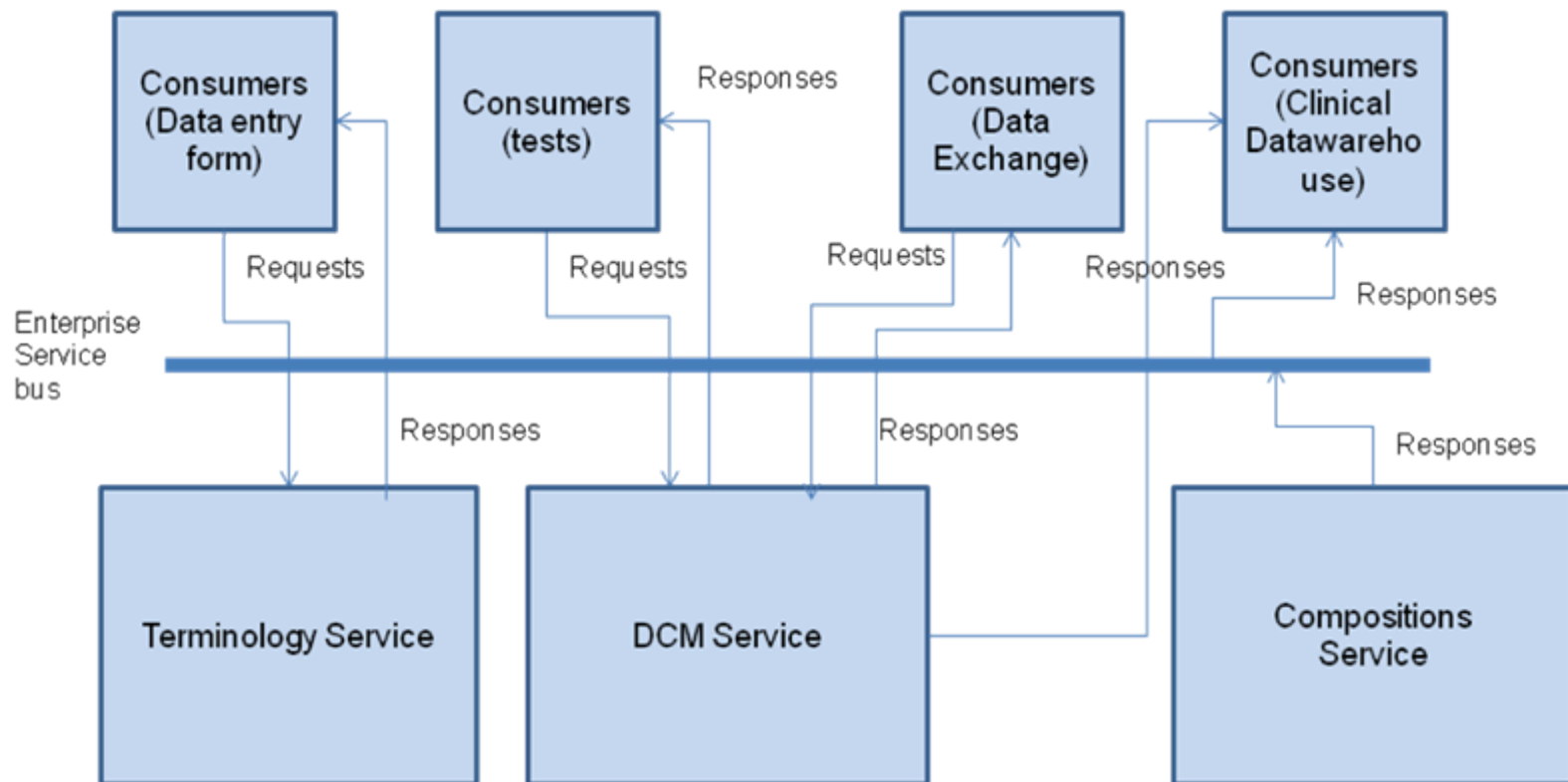
- DMO protocol (21 days ago)
- Pain score - Pijnscore (6 days ago)
- Pupil Reaction - Pupil reactie (a month ago)
- SNAQ score (6 days ago)
- Temperature-Temperatuur (6 days ago)
- Weight-Gewicht (27 days ago)
- van Wiechenschema (29 days ago)
- .gitattributes (a month ago)
- .gitignore (a month ago)
- README.md (a month ago)

The repository is described as: "These DCMs have been approved by minimum of one clinical community and have been used for at least one implementation in systems".

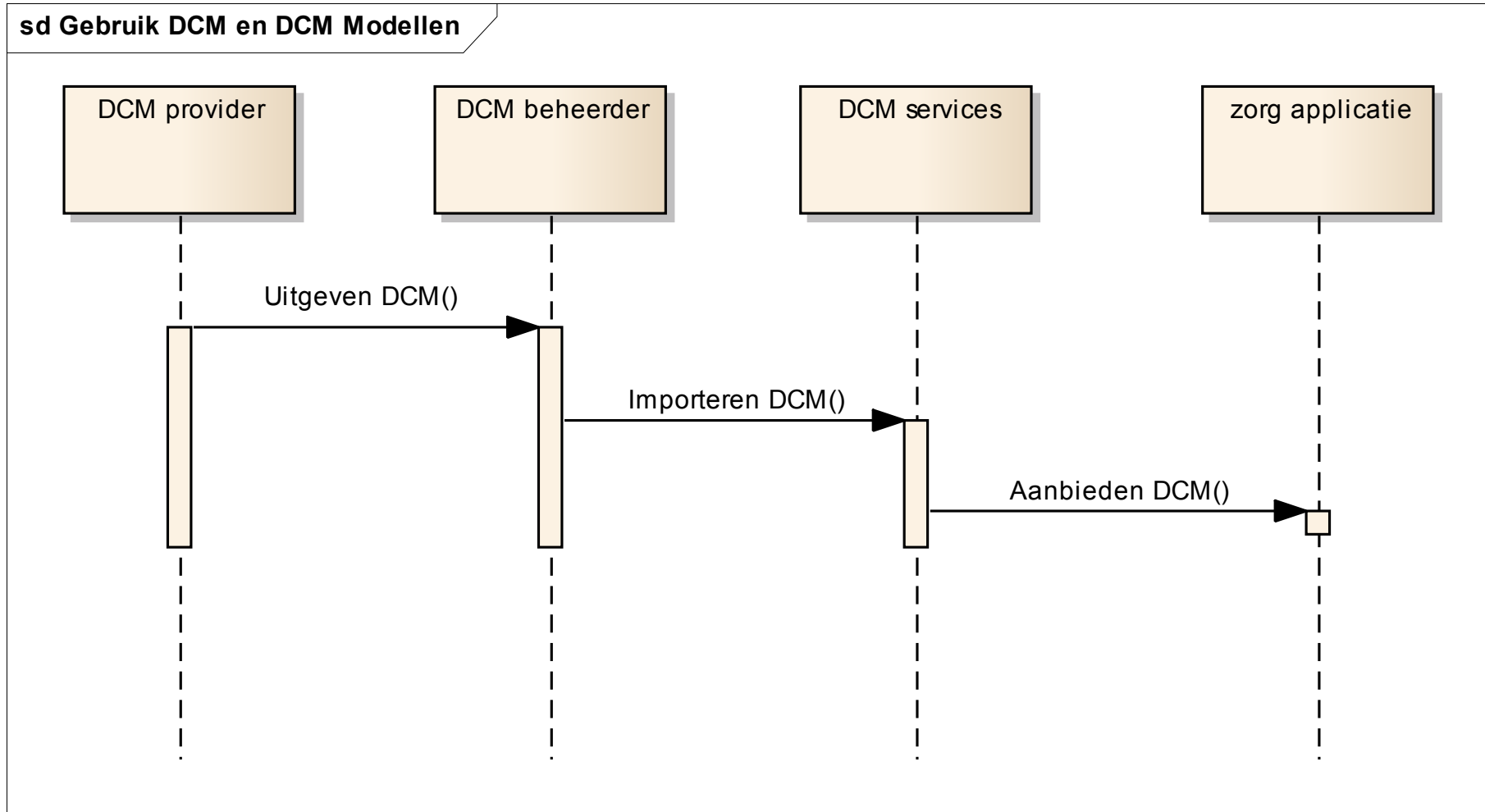
Options to clone the repository are available: Clone in Desktop or Download ZIP.



# Context of terminology service and DCM service in architecture



# Use DCM service

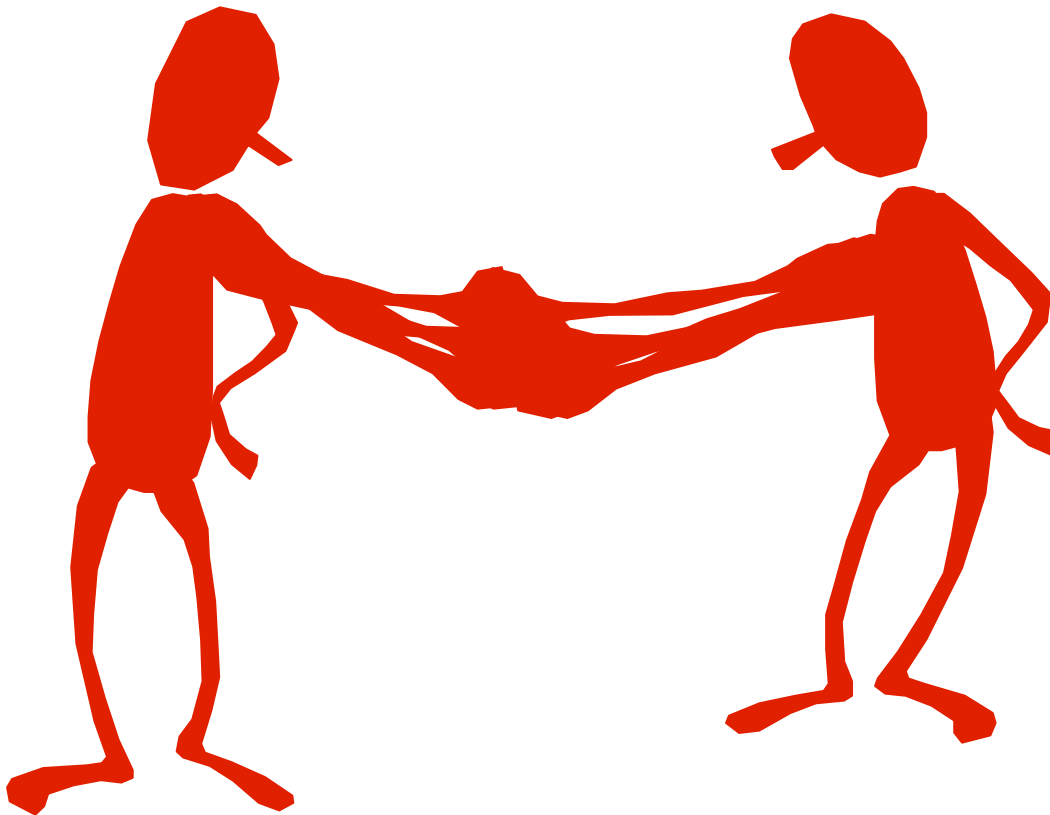


# Conclusion

## **Detailed Clinical Models according ISO TS 13972, combined with SNOMED CT codes:**

- Offer a rich way to collect, store and use terminology based data
- Fits with EHR / PHR's based on consistent architectures
- Enhances systems flexibility allowing any clinical relevant composition and pathway with terminology and DCM
- Hence, allow many meaningful clinical data aggregations
- DCM and compositional services as addition to terminology services will facilitate clinical care, continuity and meaningful aggregations.

# Thanks for your attention



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- [www.results4care.eu](http://www.results4care.eu)

[info@results4care.nl](mailto:info@results4care.nl)