JEAN K SOLER
MALTA
WICC TURKU 2016

Update on the ICPC-2-ICD-10 Thesaurus, the TRANSFoRm Project and the Archetype (Content) Model

ICPC-ICD10 THESAURUS

Update

ICPC2-ICD10 THESAURUS

A diagnostic Terminology for Semi-automatic Double Coding in Electronic Patient Records

Henk Becker, Sibo Oskam, Inge Okkes, Kees van Boven, Henk Lamberts
Academic Medical Center/University of Amsterdam
Department of Family Medicine

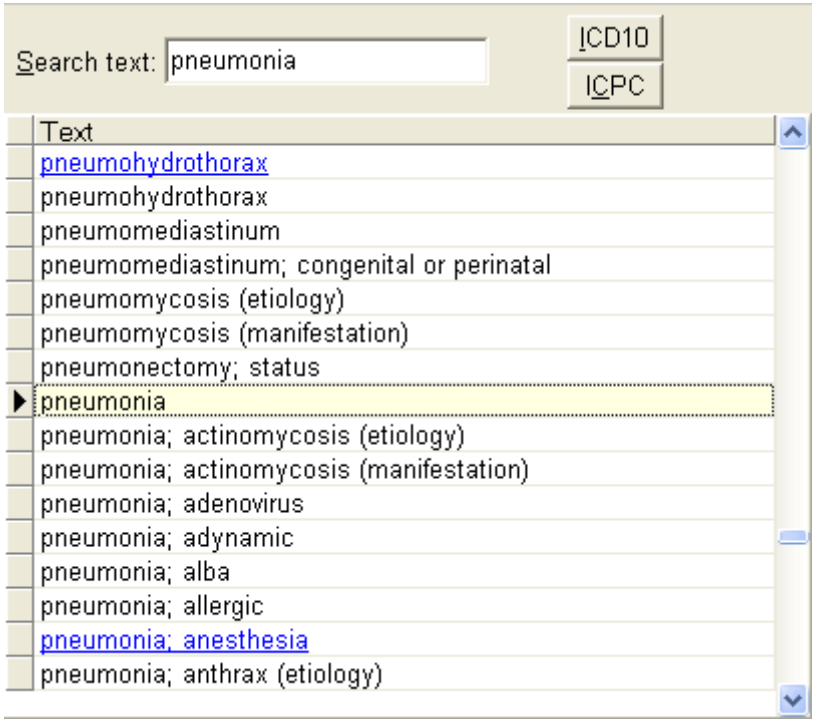
Amsterdam, 2005

Contact: Inge Okkes episode@planet.nl

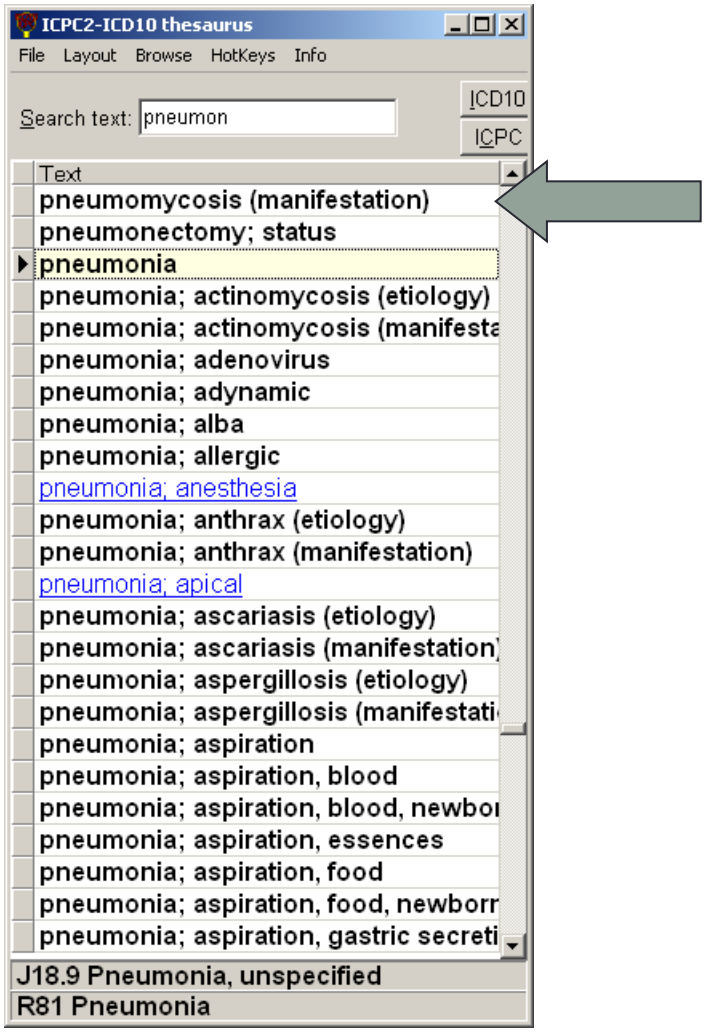
Skip next time

Ok

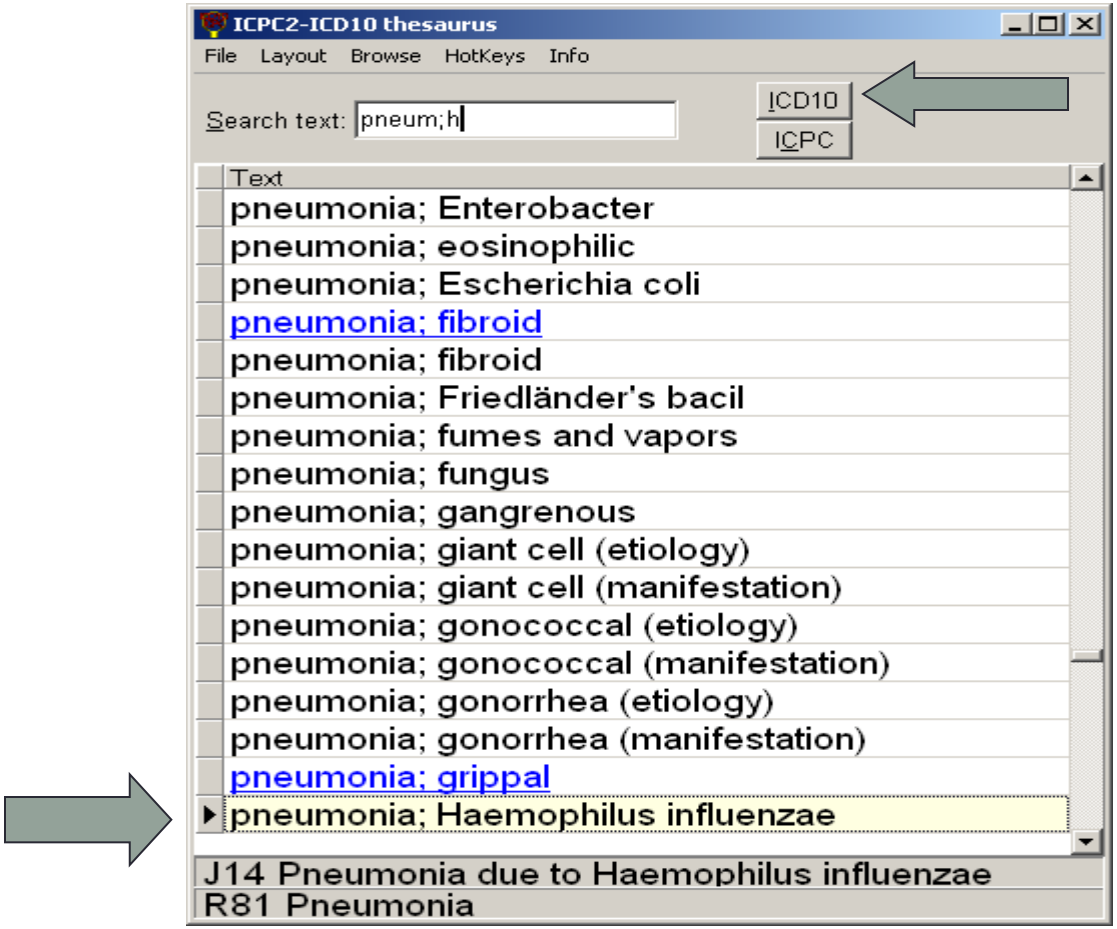
Example:
In the Search text box, you type ‘pneumonia’,



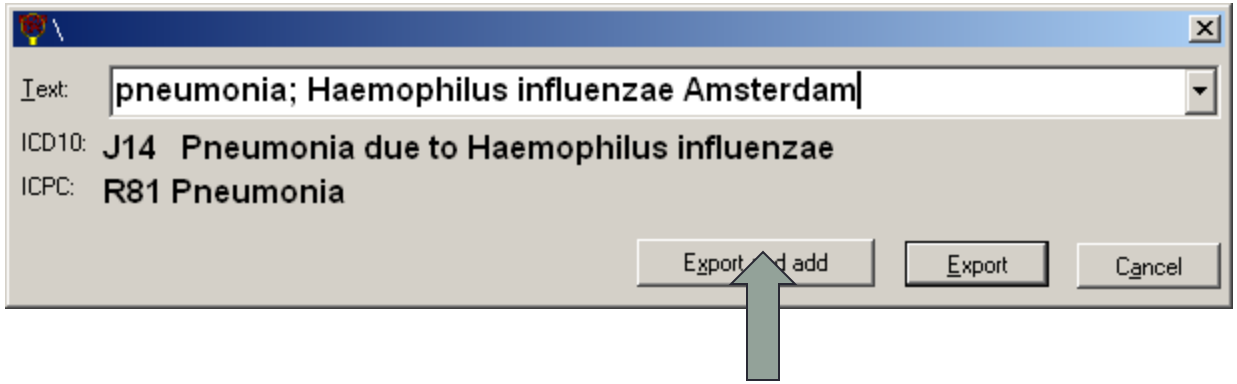
there are many types of pneumonia in ICD-10,

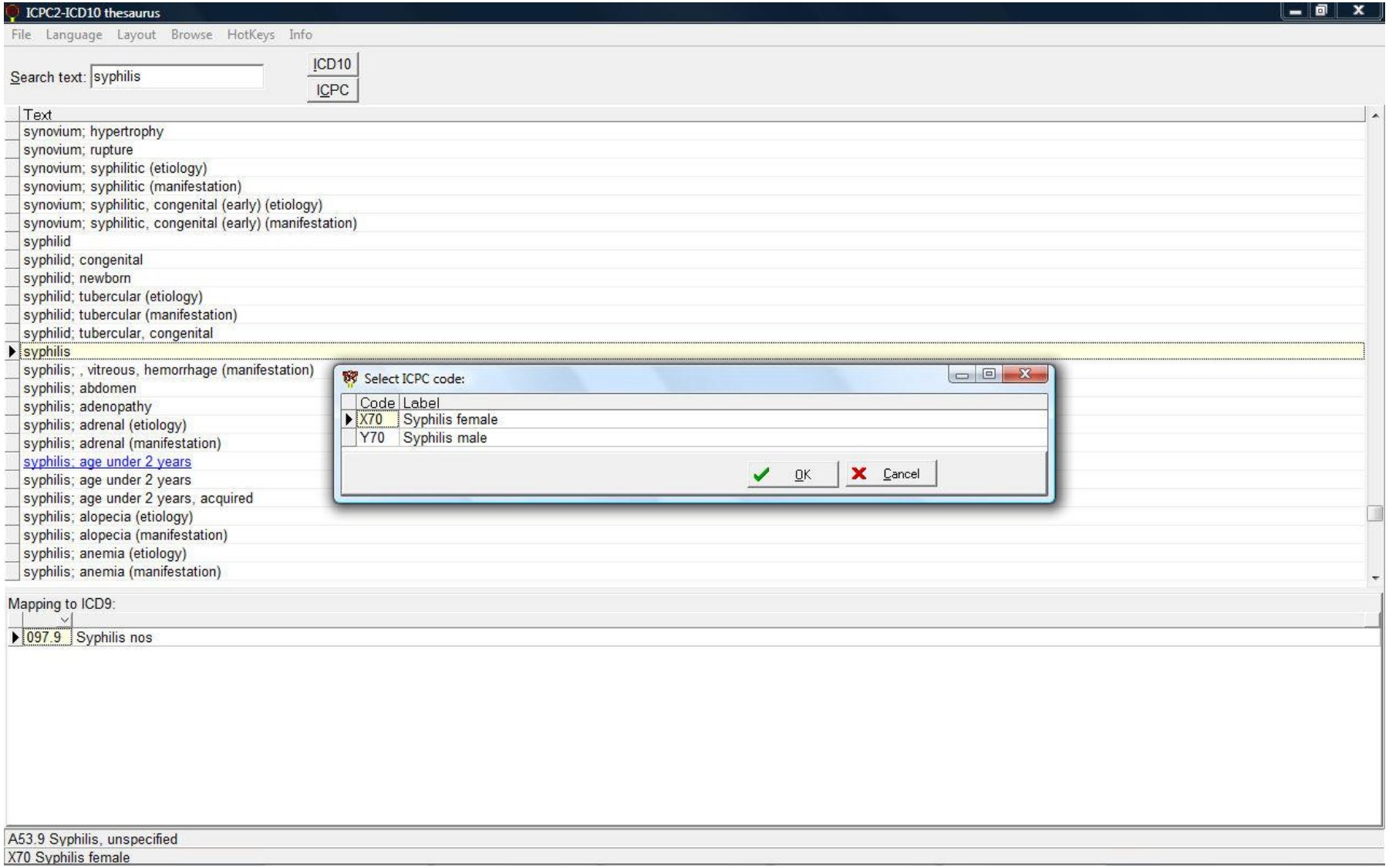


Say we want to select ‘pneumonia; Haemophilus influenzae’ (typing ‘pneum;h’ will do)..



..double click, and the export box shows.
Suppose you want to add a new type (e.g., ‘Amsterdam’). You can add that term, and also you may add this new type to your Thesaurus.. just click ‘Export and add’…




ICPC2-ICD10 thesaurus
File Language Layout Browse HotKeys Info
Search text: syphilis
ICD10
ICPC
Text
synovium; hypertrophy
synovium; rupture
synovium; syphilitic (etiology)
synovium; syphilitic (manifestation)
synovium; syphilitic, congenital (early) (etiology)
synovium; syphilitic, congenital (early) (manifestation)
syphilid
syphilid; congenital
syphilid; newborn
syphilid; tubercular (etiology)
syphilid; tubercular (manifestation)
syphilid; tubercular, congenital
syphilis
syphilis; , vitreous, hemorrhage (manifestation)
syphilis; abdomen
syphilis; adenopathy
syphilis; adrenal (etiology)
syphilis; adrenal (manifestation)
syphilis; age under 2 years
syphilis; age under 2 years
syphilis; age under 2 years, acquired
syphilis; alopecia (etiology)
syphilis; alopecia (manifestation)
syphilis; anemia (etiology)
syphilis; anemia (manifestation)
Select ICPC code:
Code Label
X70 Syphilis female
Y70 Syphilis male
OK
Cancel
Mapping to ICD9:
097.9 Syphilis nos
A53.9 Syphilis, unspecified
X70 Syphilis female

TRANSFORM

Update

CREATING AND APPLYING KNOWLEDGE IN ELECTRONIC HEALTH RECORD SYSTEMS: THE EUROPEAN PERSPECTIVE

Prof Brendan Delaney

www.transformproject.eu

This project is partially funded by the European Commission under the 7th Framework Programme. Grant Agreement No. 247787 Translational Research and Patient Safety in Europe (TRANSFoRm)

21 Partners from 10 EU Member States

Aims of TRANSFoRm

- To develop methods, models, services, validated architectures and demonstrations to support:
  - Epidemiological research using primary care records, including genotype-phenotype studies and other record linkages
  - Research workflow embedded in the EHR
  - Decision support for diagnosis

EU TRANSFoRm WT7.2

- A working terminology service is made available as a **software-based milestone**

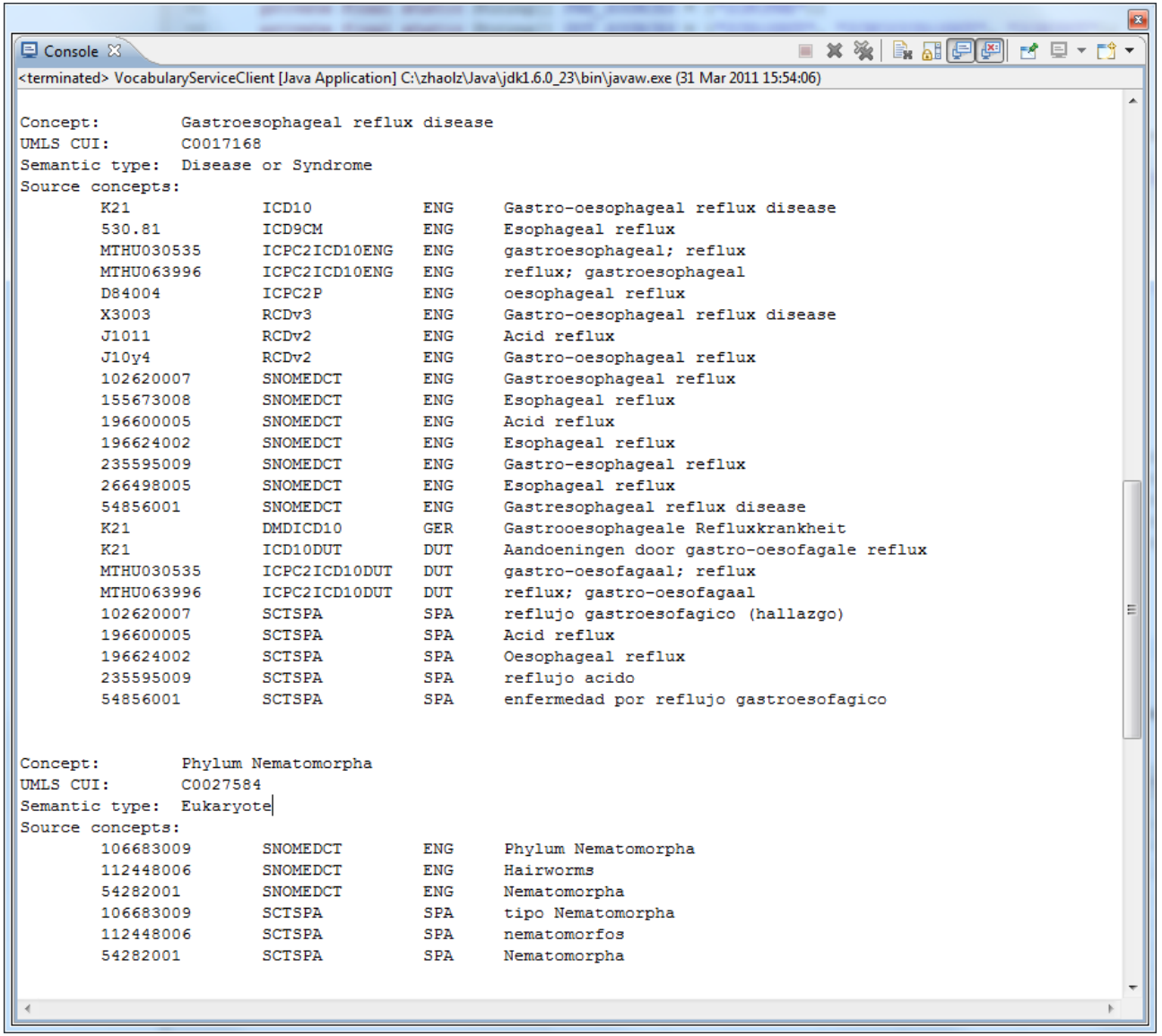
  - A simple web-based interface of the TRANSFoRm Integrated VS, allowing terminology searches through the Unified Medical Language System (UMLS) to a subset of hosted vocabularies, relevant to Primary Care Research and Clinical Practice.
  - A publically* available web service
  - Integration of TRANSFoRm VS to users, such as electronic Primary Care Research Network workbench

Hosted Vocabularies

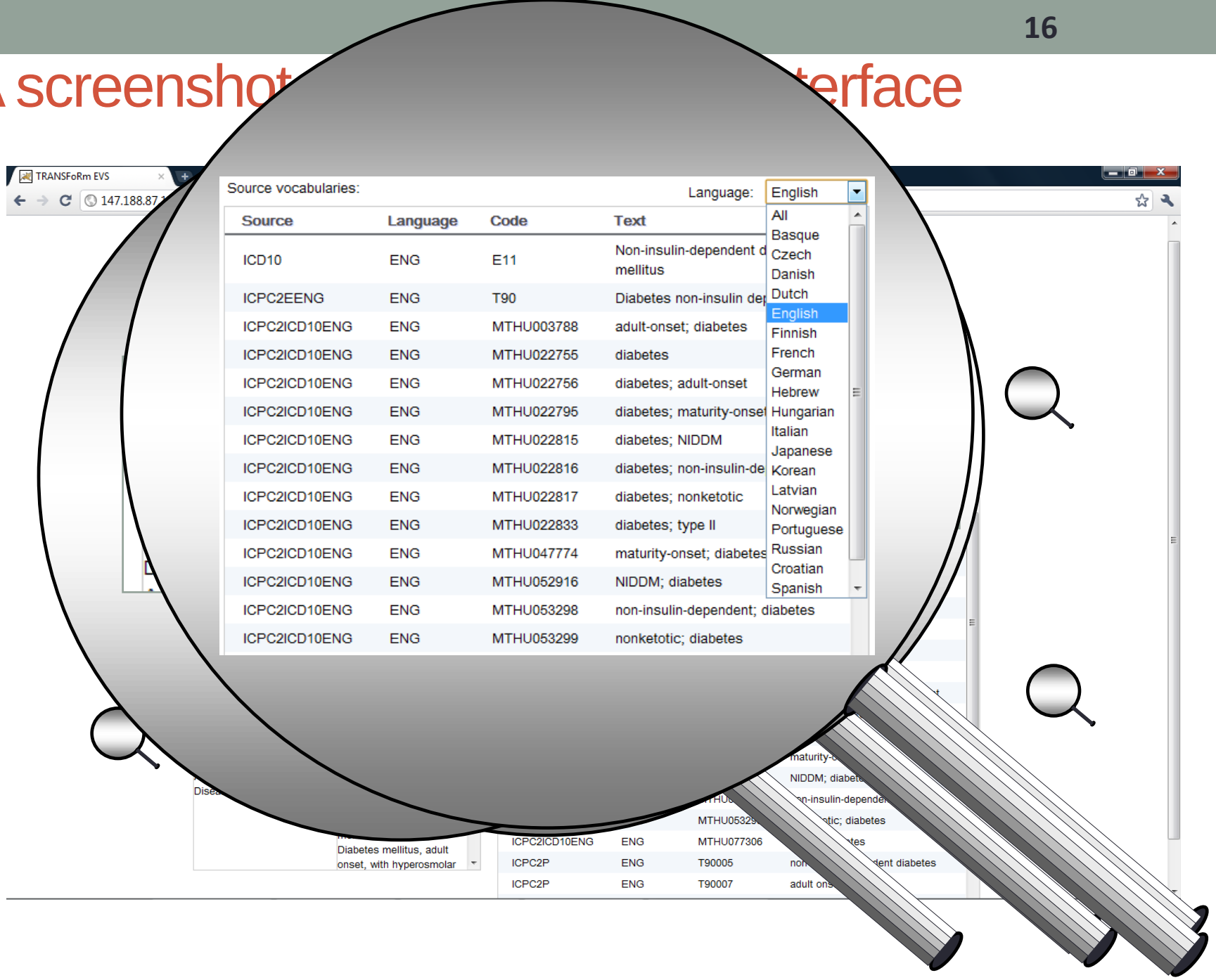
- UMLS Metathesaurus
- National Cancer Institute Thesaurus
- ICD-9-Clinical Modification
- ICD-10
- ICPC-2
- ICPC-2-ICD-10 Thesaurus
- Read Codes version 2

Various Languages (e.g. English, Basque, Danish, Dutch, Finnish, French, German, Hebrew, Hungarian, Italian, Norwegian, Portuguese, Spanish, Swedish)

Web Service: Example of partial output for the search of the abbreviated clinical term “GORD”



A screenshot terface



Use case 3: Diagnostic Decision Support

- Early diagnostic suggestions for presenting problems:
  - chest pain
  - abdominal pain
  - shortness of breath
  - Clinical Prediction Rule web service (with underlying ontology)
  - Prototype Decision Support System integrated with a commercial electronic health record system

Decision Support System

- Dutch and Maltese Transition Project databases incorporated into new database
- Bayesian analyses of all possible associations to define actual associations (“rules”)
- Online browser for rule selection and viewing

Diagnosis of bronchitis

- With cough present, in Dutch primary care patients...
  - Post-test probability = pre-test probability x 16.2

Crosstab of diagnosis against RfE at the start of a new EoC			
	With bronchitis (R78)	**With any other EoC**	**Total**
With cough (R05)	4717 (24.4%)	14578 (75.6%)	**19295**
With any other RfE	1899 (0.6%)	316154 (99.4%)	**318053**
Total	6616 (2.0%)	330732 (98.0%)	337348
LR+: 16.2	**LR-: 0.3**	**Odds: 53.9**	
C. Int.: 15.8 - 16.5	**C. Int: 0.3 - 0.3**	**C. Int.: 51.0 - 57.0**	
Sens: 0.71	**PV+: 0.24**	**Pretest 0.02**	
Spec: 0.96	**PV-: 0.99**	**Posttest: 0.32**	

RfE and episode titles

A03	Fever	**R74(5.9[5.6-6.4];2.8[2.6-3.0];5.3[4.2-6.6]), R78(7.6[7.1-8.2];3.1[2.8-3.5];5.5[4.3-7.1])**
		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
R74 is upper respiratory tract infection
R78 is acute bronchitis
R76 is tonsillitis

RfE and episode titles

Netherlands = 5.9

A03	Fever	**R74(5.9[5.6-6.4];2.8[2.6-3.0];5.3[4.2-6.6]), R78(7.6[7.1-8.2];3.1[2.8-3.5];5.5[4.3-7.1])**
		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
R74 is upper respiratory tract infection
R78 is acute bronchitis
R76 is tonsillitis

RfE and episode titles

Malta = 2.8

A03	Fever	**R74(5.9[5.6-6.4];2.8[2.6-3.0];5.3[4.2-6.6]), R78(7.6[7.1-8.2];3.1[2.8-3.5];5.5[4.3-7.1])**
		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
R74 is upper respiratory tract infection
R78 is acute bronchitis
R76 is tonsillitis

RfE and episode titles

Serbia = 5.3

A03	Fever	**R74(5.9[5.6-6.4];2.8[2.6-3.0];5.3[4.2-6.6]), R78(7.6[7.1-8.2];3.1[2.8-3.5];5.5[4.3-7.1])**
		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
R74 is upper respiratory tract infection
R78 is acute bronchitis
R76 is tonsillitis

RfE and episode titles

A03	Fever	**R74(5.9[5.6-6.4];2.8[2.6-3.0];5.3[4.2-6.6]), R78(7.6[7.1-8.2];3.1[2.8-3.5];5.5[4.3-7.1])**
		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
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RfE and episode titles

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		A97(0.1[0.1-0.1];-;-), A85(0.1[0.1-0.2];-;-), D73(4.3[3.8-4.9];-;-)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];-), R29(-;6.8[6.0-7.7];-)

A03 is fever
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RfE and episode titles

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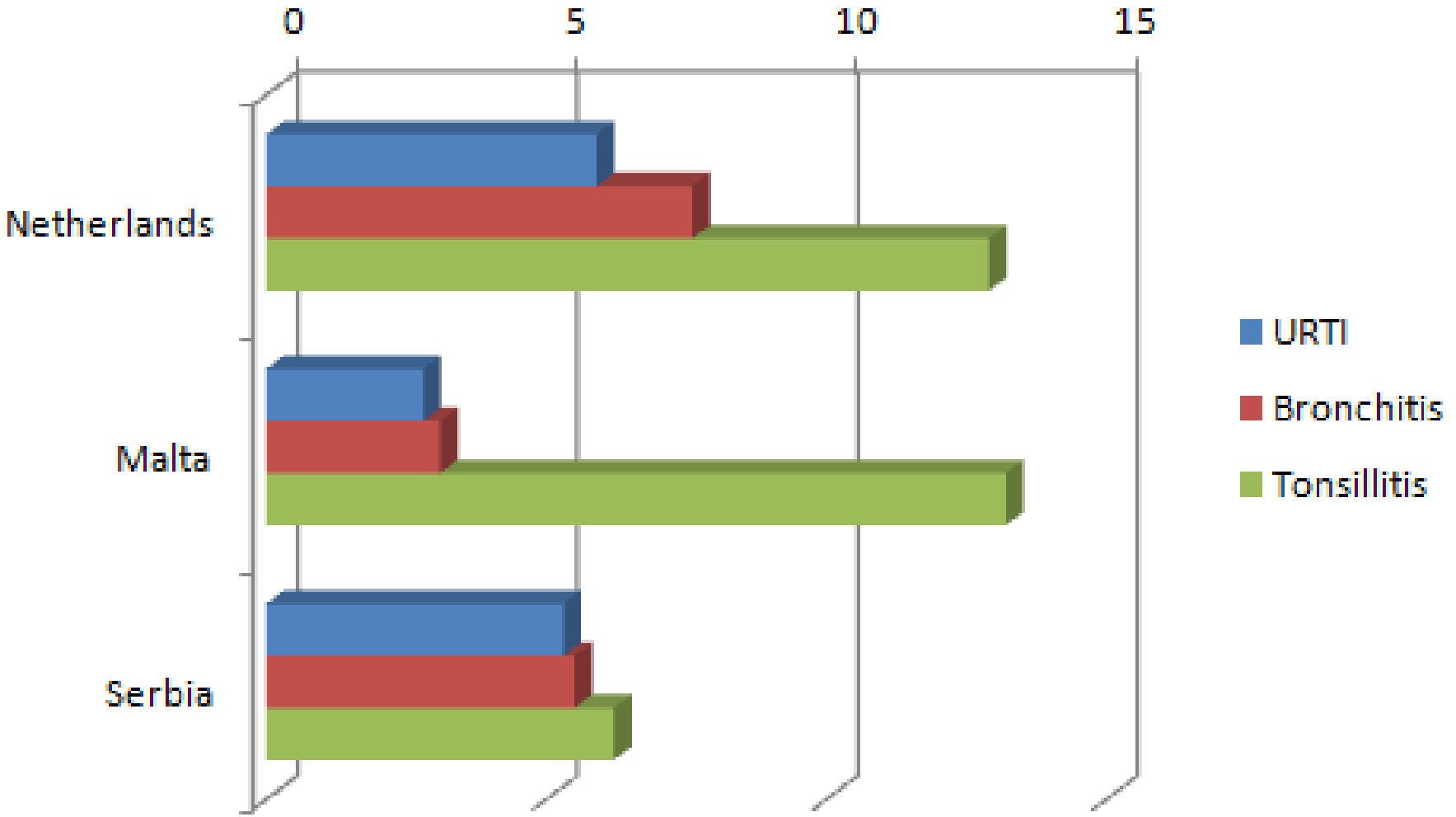
		A97(0.1[0.1-0.1]; ;), A85(0.1[0.1-0.2]; ;-), D73(4.3[3.8-4.9]; ;)
		R76(12.9[11.7-14.2];13.2[11.8-14.7];6.2[4.6-8.5]), R77(2.7[2.3-3.2];-;-)
		R80(33.3[30.0-36.9];6.9[6.1-7.8];), R29(-;6.8[6.0-7.7];-)

A03 is fever
R74 is upper respiratory tract infection
R78 is acute bronchitis
R76 is tonsillitis

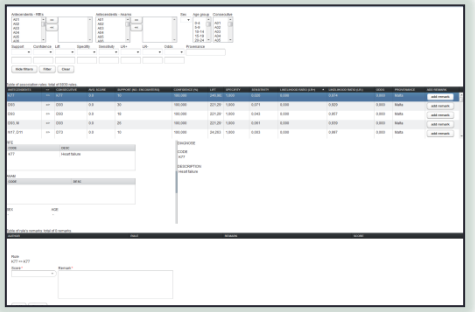
Diagnostic odds ratios for RfE “fever” and common infections



	Tonsillitis (R76)				
RfE rubric	**RfE label**	Nl	Mt	Sb	Jp
R21	Sympt/complt throat	**181,68(164,33-200,87)**	**18,62(16,55-20,95)**	**14,92(12,85-17,33)**	**18,15(13,69-24,06)**
A03	Fever	**12,88(11,70-14,17)**	**13,18(11,82-14,70)**	**6,24(4,58-8,51)**	**11,30(8,54-14,96)**
R05	Cough	*0,59(0,47-0,74)*	*0,42(0,34-0,52)*	*0,95(0,73-1,25)*	*0,66(0,40-1,09)*
R07	Sneezing/nasal congestion	*0,20(0,05-0,79)*	**0,33(0,25-0,43)**	*0,93(0,23-3,79)*	*0,51(0,23-1,16)*
R01	Pain attrib to respir system	*0,28(0,04-2,00)*	-	**6,44(5,25-7,90)**	-
B02	Enlarged lymph gland(s)	**9,81(7,32-13,14)**	**6,08(4,20-8,81)**	*0,98(0,13-7,11)*	-

		0-14	15-44	45-64	65+
RfE rubric	**RfE label**	Nl			
R21	Sympt/complt throat	**66,89(56,96-78,56)**	**223,91(191,36-262,00)**	**410,34(278,20-605,23)**	*792,58(359,50-1747,36)*
A03	Fever	**7,77(6,69-9,02)**	**14,14(12,13-16,49)**	**12,43(8,32-18,57)**	*15,65(8,13-30,14)*
R05	Cough	*0,61(0,46-0,79)*	*0,27(0,16-0,45)*	*0,36(0,13-0,97)*	*0,68(0,17-2,77)*
R07	Sneezing/nasal congestion	-	*0,16(0,02-1,14)*	-	*4,81(0,66-34,80)*
R01	Pain attrib to respir system	-	-	*2,52(0,35-18,11)*	-
B02	Enlarged lymph gland(s)	*2,46(1,21-5,00)*	**7,55(5,21-10,93)**	*29,90(13,71-65,21)*	*117,54(35,16-392,94)*
RfE rubric	**RfE label**	Mt			
R21	Sympt/complt throat	**10,00(8,59-11,63)**	**37,98(29,96-48,16)**	*60,34(30,83-118,12)*	*21,26(5,68-79,67)*
A03	Fever	**8,60(7,38-10,02)**	**11,39(9,52-13,64)**	*21,47(13,13-35,10)*	*23,86(5,88-96,84)*
R05	Cough	**0,22(0,17-0,29)**	*0,53(0,37-0,75)*	*0,68(0,27-1,70)*	-
R07	Sneezing/nasal congestion	**0,20(0,14-0,28)**	**0,31(0,19-0,50)**	*0,27(0,04-1,95)*	-
R01	Pain attrib to respir system	-	-	-	-
B02	Enlarged lymph gland(s)	*3,64(1,91-6,96)*	**6,58(4,08-10,62)**	*15,28(3,53-66,26)*	-

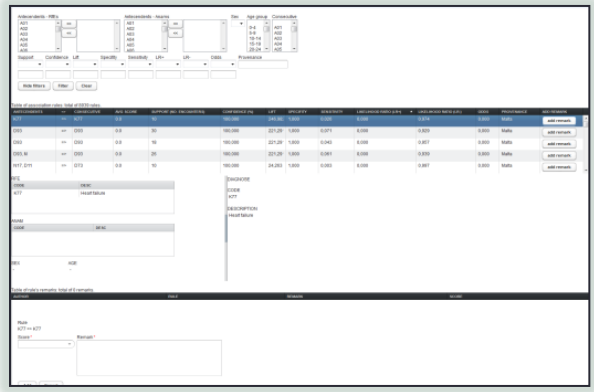
TransHIS - preliminary results 1/3



- **8,939** rules
  - 3,744 for Malta
  - 5,195 for the Netherlands
- Many rules of type **U71 => U71** (*Cystitis/urinary infection other*)
  - Refers 3,095 episodes in Holland
  - Only 28 eposides in Malta
- Pre-selection needs GP support
- Final selection of useful rules requires physician assitance – manual verification

TransHIS - preliminary results 2/3

- Rules **x => U71**, (Cystitis/urinary infection, other)
  - total **823 rules**
  - 188 rules for Malta
  - 635 rules for the Netherlands
- Important cues:
  - **RFE=U01** (Dysuria/painful urination)
  - **RFE=U02** (Urinary frequency/urgency)
  - **ANAM=U06** (Haematuria)
  - Various combinations of age and gender



TransHIS - preliminary results 3/3

- **x => U70** (Pyelonephritis/pyelitis) – more severe vs. U71
  - total **only 75** rules
  - only 2 rules for Malta
  - 73 rules for the Netherlands (more information)
- Important cues:
  - **RFE=A03** (Fever) + Male (Malta)
  - **RFE=A03** (Fever) + Female (Netherlands)
  - **RFE=L02** (Back symptom/complaint)
  - **RFE=L05** (Flank/axilla symptom/complaint)
  - **RFE=D06** (Abdominal pain localized, other)
  - **RFE=A10** (Bleeding/haemorrhage NOS)
  - **RFE=A02** (Chills)

Antecedents - RfEs

D04
D05
D07
D08
D09
D10

>>
<<

D06

Antecedents - Anams

A01
A02
A03
A04
A05
A06

>>
<<

Sex

Age group

0-4
5-9
10-14
15-19
20-24

Consecutive

U26
U27
U28
U29
U70
U71

Support	Confidence	Lift	Specifity	Sensitivity	LR+	LR-	Odds	Score	Provenance	Scenario
									Netherlans	a_130613

Hide filters | Filter | Clear

Expand table

Number of rules: 43

ANTECENDENTS	=>	CONSECUTIVE	AVG SCORE	SUPPOF	CONFIDENCE (%)	LIFT	SPECIFITY	SENSITIVITY	LR+	LR-	ODDS	PROVENANCE	SCENARIO	ADD REMARK
D06, U01	=>	U71	0.0	72	58,50	25,50	1,00	0,01	60,10	0,99	60,10	Netherlans	a_130613	add rema
D06, U01, F	=>	U71	0.0	65	62,50	27,23	1,00	0,01	70,95	0,99	70,95	Netherlans	a_130613	add rema
D06, U02	=>	U71	0.0	41	37,60	16,39	1,00	0,01	25,67	0,99	25,67	Netherlans	a_130613	add rema

RFE

ICPC2	DESC
U01	Dysuria/painful urination
D06	Abdominal pain localized, other

EPISODE DIAGNOSE

ICPC2

U71

DESCRIPTION

Cystitis/urinary infection, other

TransHIS analysis example

Rules **x => U71**, (Cystitis/urinary infection, other)

- U01 – Dysuria
- U02 – Urinary Frequency
- U06 – Haematuria
- A03 – Fever
- D06 – Abdominal pain localised

- Important cues compare favourably with literature – e.g. JAMA reviews

ICPC ARCHETYPE

A vision for ICPC-3

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ICPC archetype

- Retains all qualities of ICPC-2
  - Its purpose is to order the domain of family practice.
  - It provides a single terminology for the patient's RFE and the family doctor's diagnosis.
  - It captures the changes (transitions) in the content of episodes of care over time.
  - It follows strict taxonomic rules, and so its classes are mutually exclusive.
  - It offers–if possible–one class for common (occurring >1 per 1000 patient years) reasons for encounter and diagnoses. Less common classes are included in 'ragbags'.
  - Its biaxial structure (chapters for body systems/problem areas and components identical throughout all chapters) results in three digit mnemonic, alphanumeric codes.
  - Its reliability and validity are supported by its coding rules and a growing comparative international database.
  - In the coding process, localization takes precedence over aetiology.
  - Symptom diagnoses take precedence over disease diagnoses that are uncertain (i.e. do not fulfil the inclusion criteria).
  - It does not cater for mind-body metaphors: 'psychosomatic' and 'somatoform' disorders are not included.

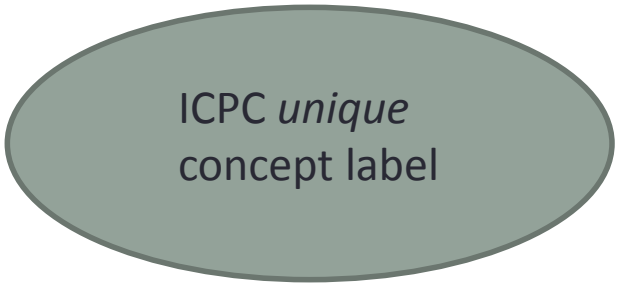
ICPC archetype

- Allows various use-cases for ICPC
  - Using ICPC codes or rubrics directly, referencing from a two-pager of codes and terms
  - Using ICPC codes or rubrics directly from a computer-based electronic medical record
  - Using terms to search for concepts in a thesaurus or terminology based on ICPC concepts
  - Coding through any international or national coding system or terminology, mapped to ICPC

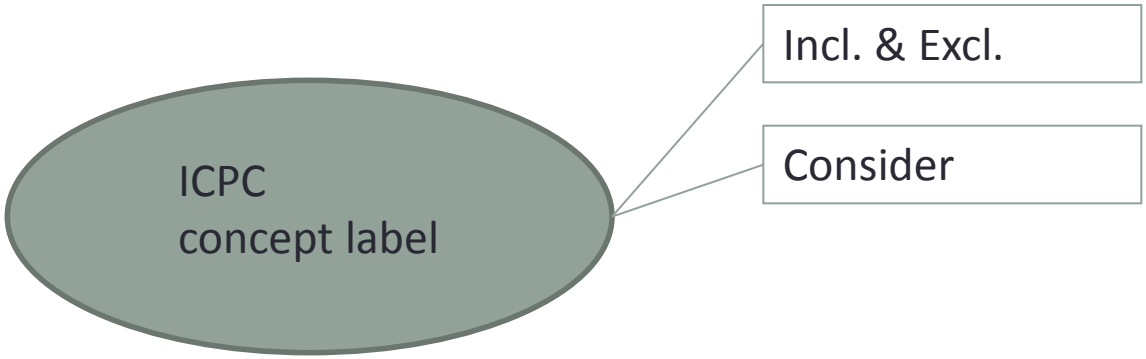
ICPC archetype

- Introduces new qualities to ICPC
  - Allows more space, without limitations in each chapter and component
  - Allows multiple attributes to be attached to each ICPC concept or rubric for grouping at higher levels
    - Risk factors
    - Preventive medicine
    - Grouping of infections, neoplasms and others
    - Symptom or disease label
  - Embeds characteristics of the rubric within the archetype structure
    - Chapter and component
    - Limitation to an age-sex group (e.g. Prostatism only in males)

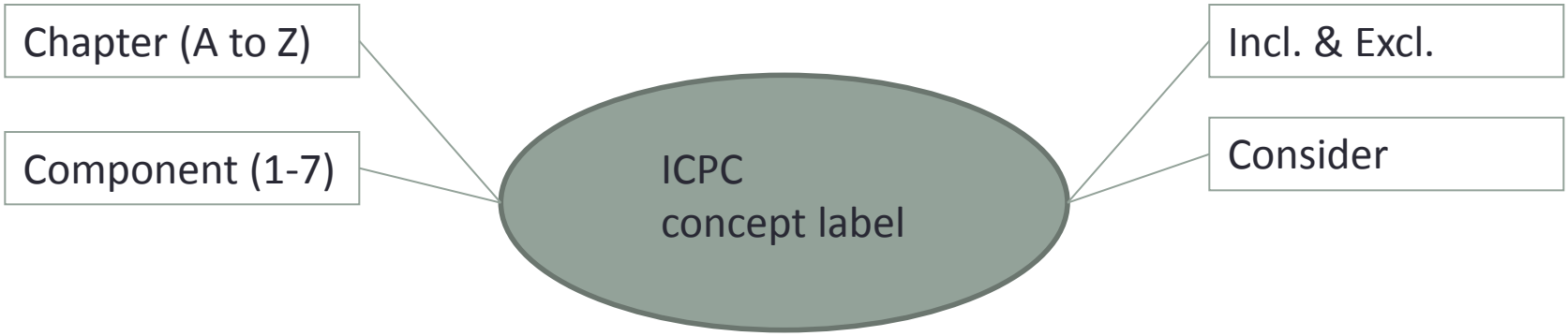
ICPC archetype



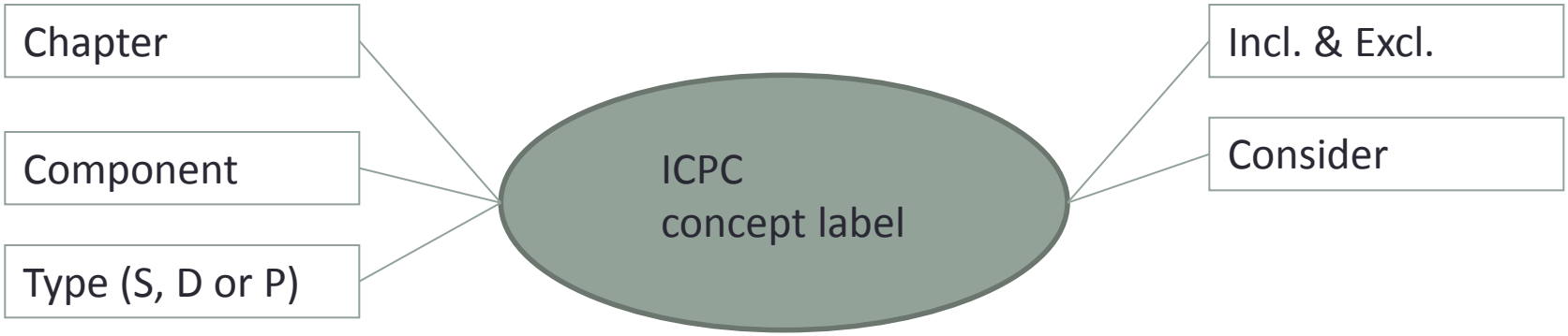
ICPC *unique* concept becomes the most important part of the rubric, NOT the code



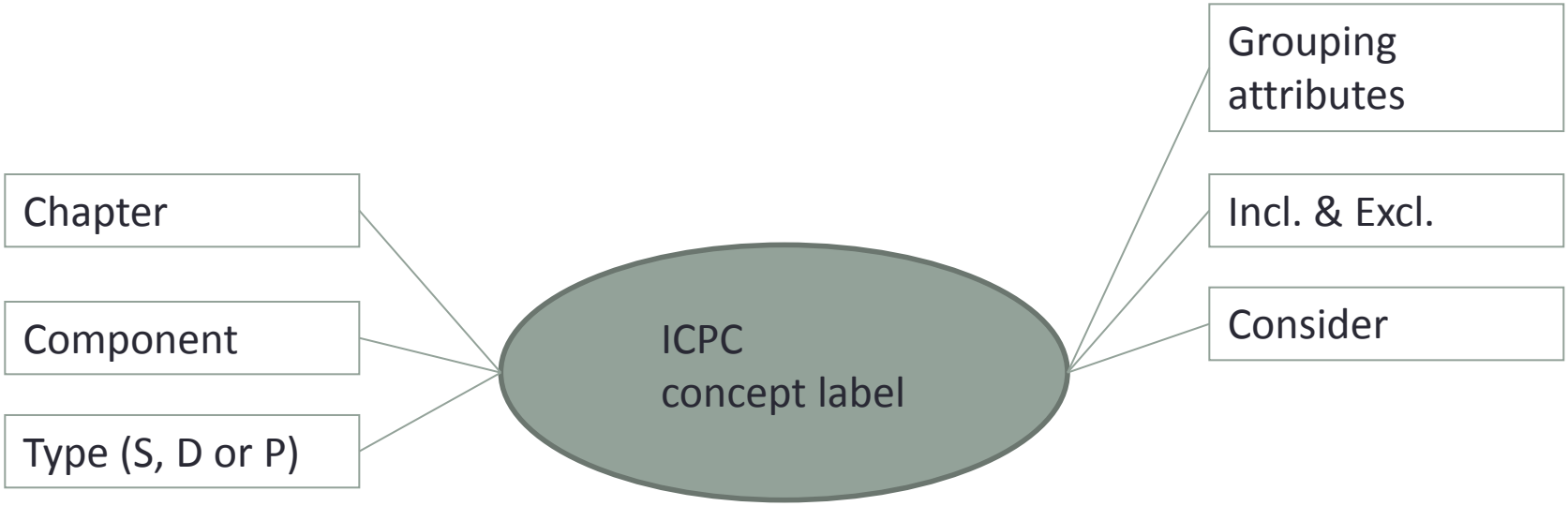
ICPC inclusion and exclusion criteria define the concept. “Consider” keeps classes clean.



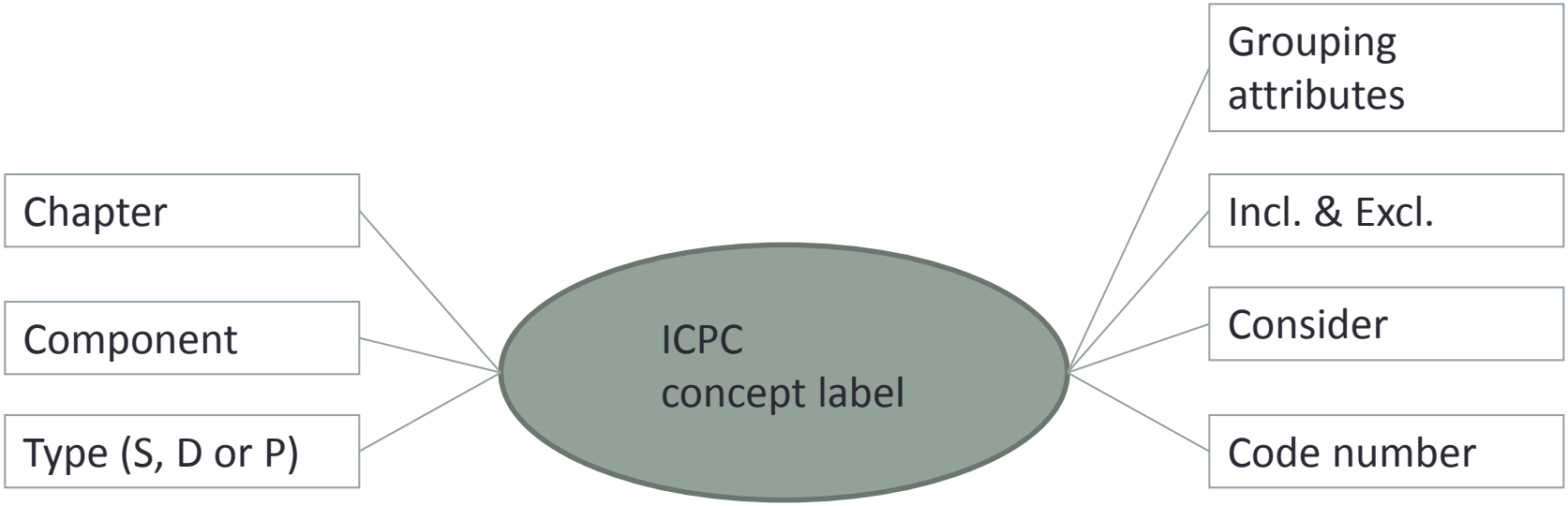
ICPC Chapter and Component are attached to each concept as appropriate



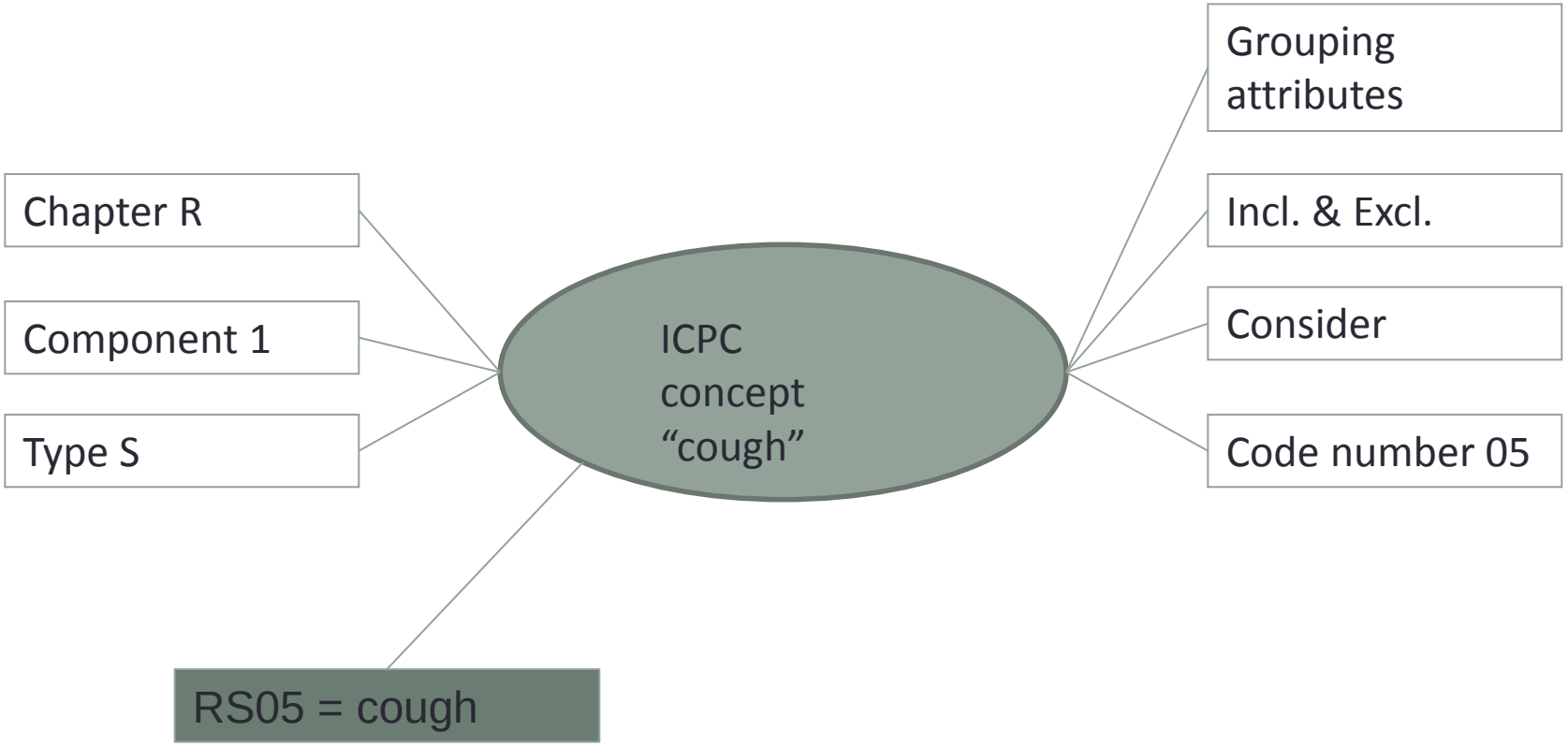
ICPC component also added as a letter to define symptoms, disease and process labels



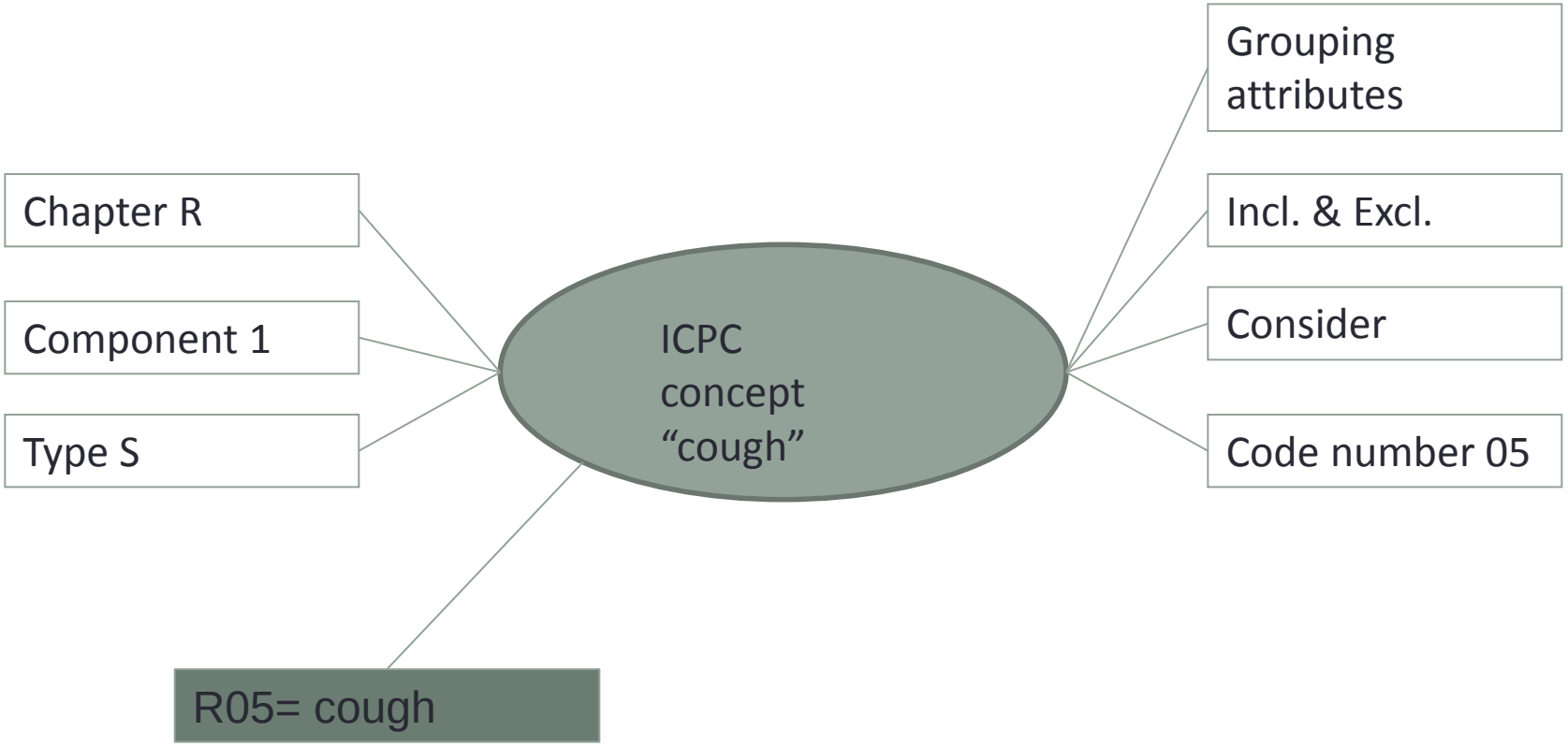
Grouping attributes such as “g” for germ or “r” for risk factor or “m” for male only



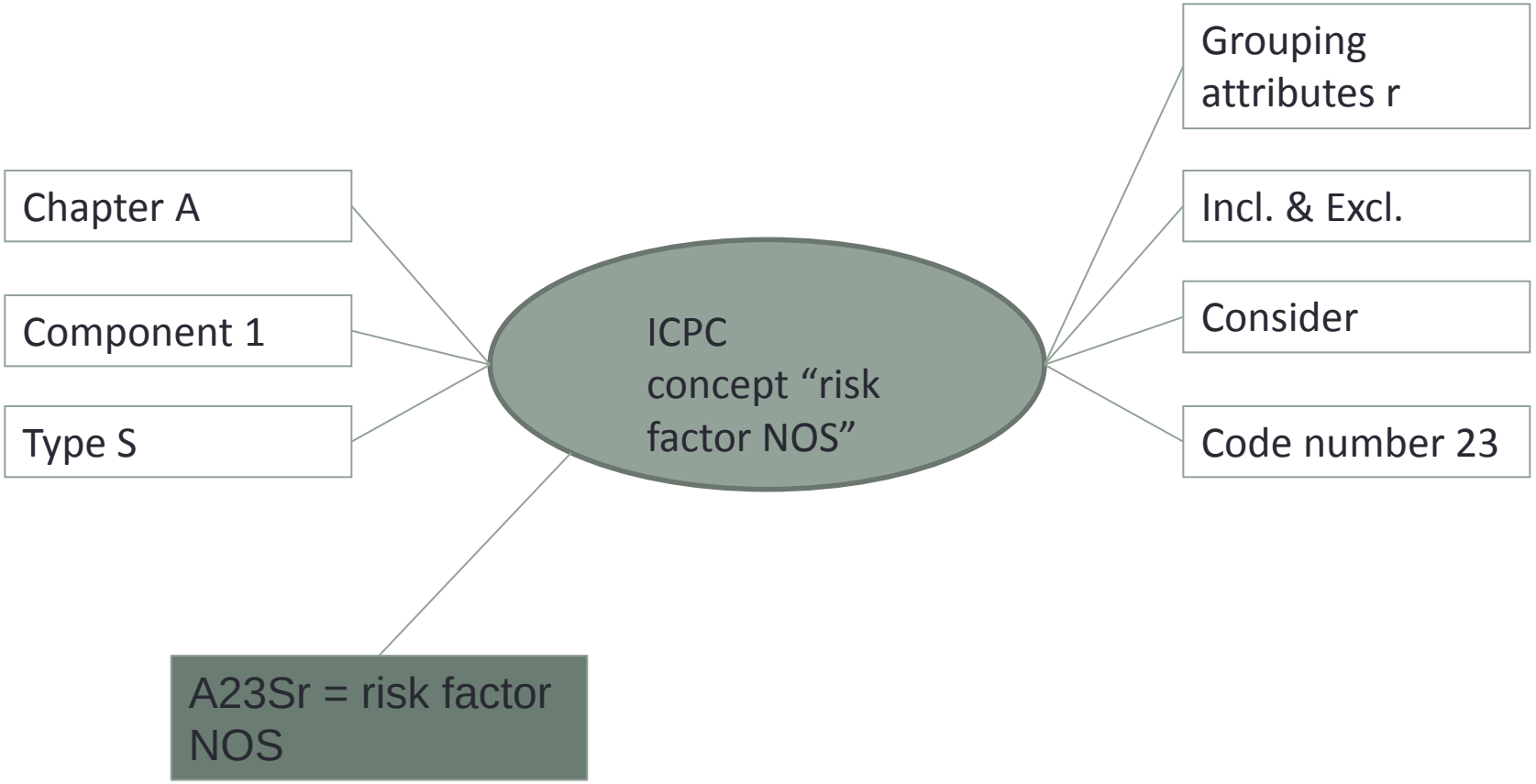
Code number is a number from 01 to 99, or 001 to 999, depending on space needed



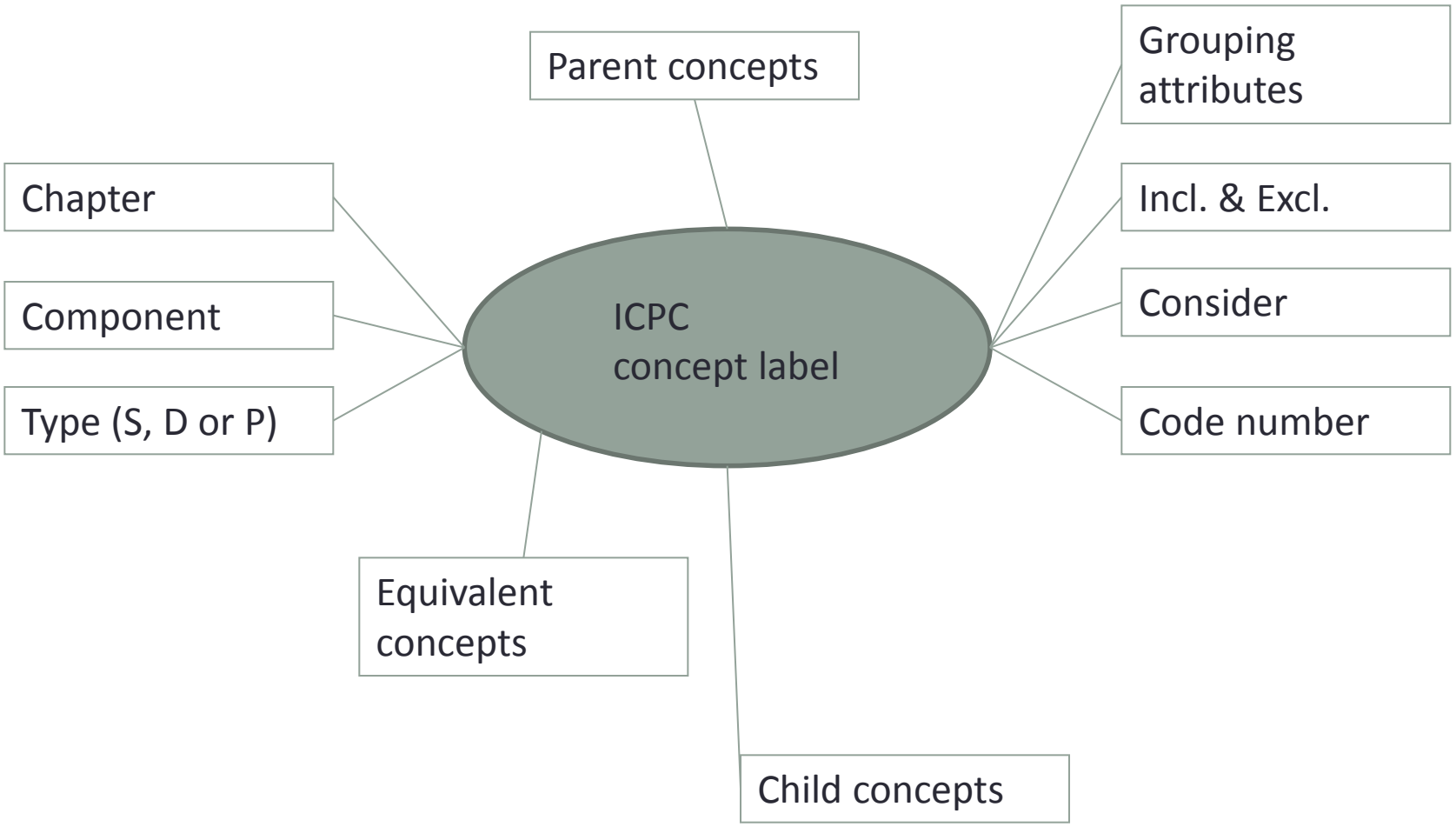
Different code views can be generated by the computer, dynamically



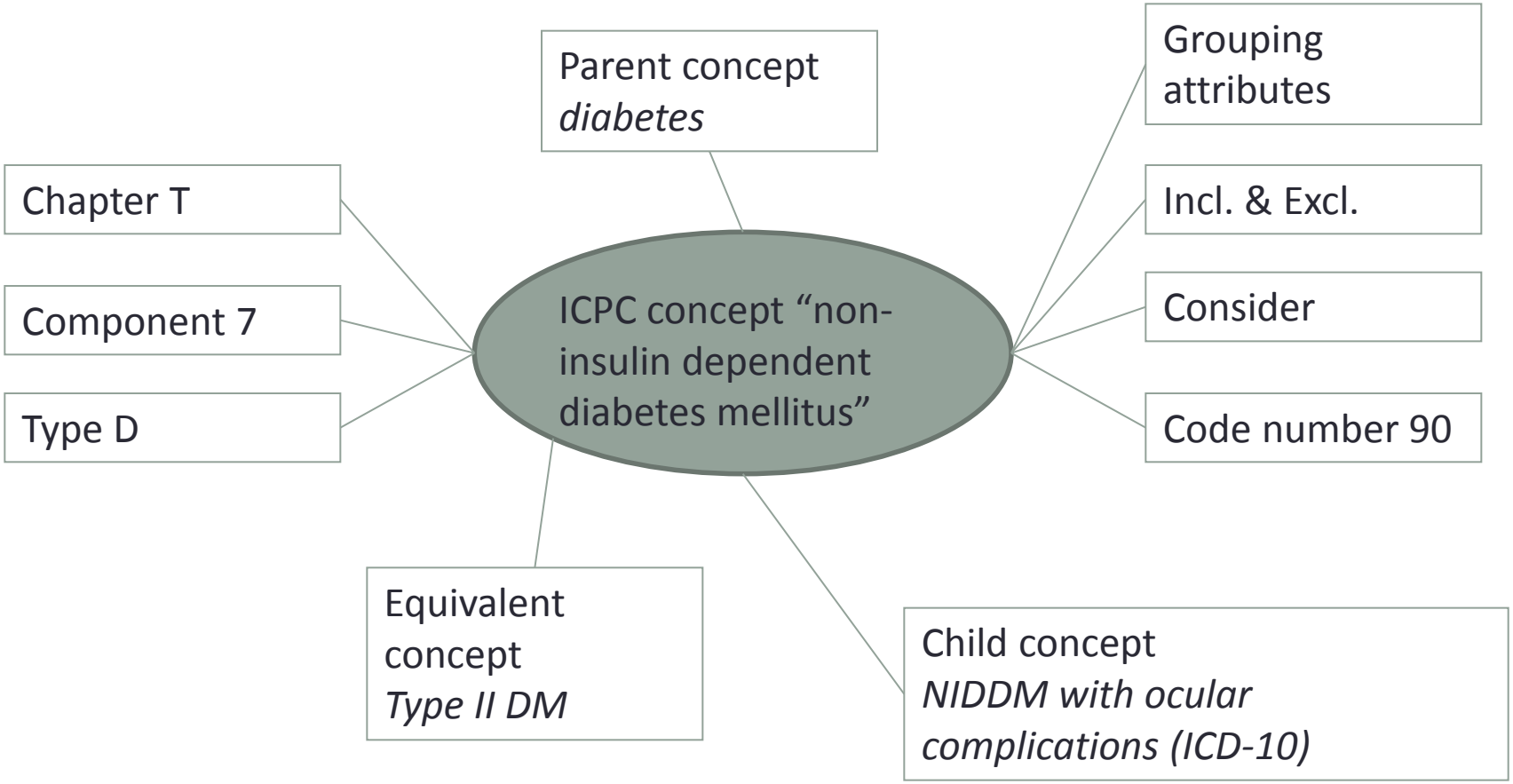
Where ICPC-2 codes are not redundant, the old code can be kept as desirable



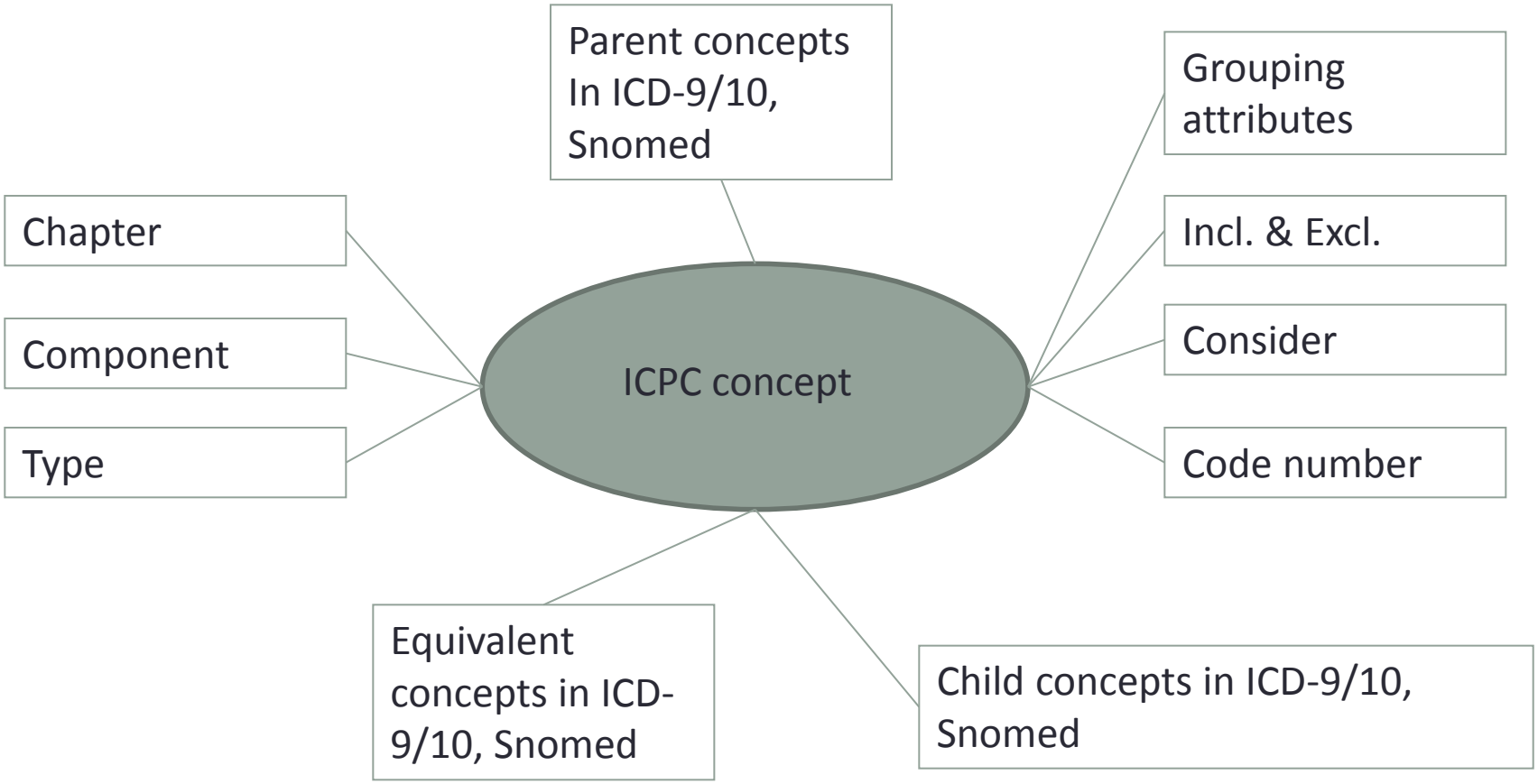
Risk factors, or even general and cardiovascular risk factors, may be grouped



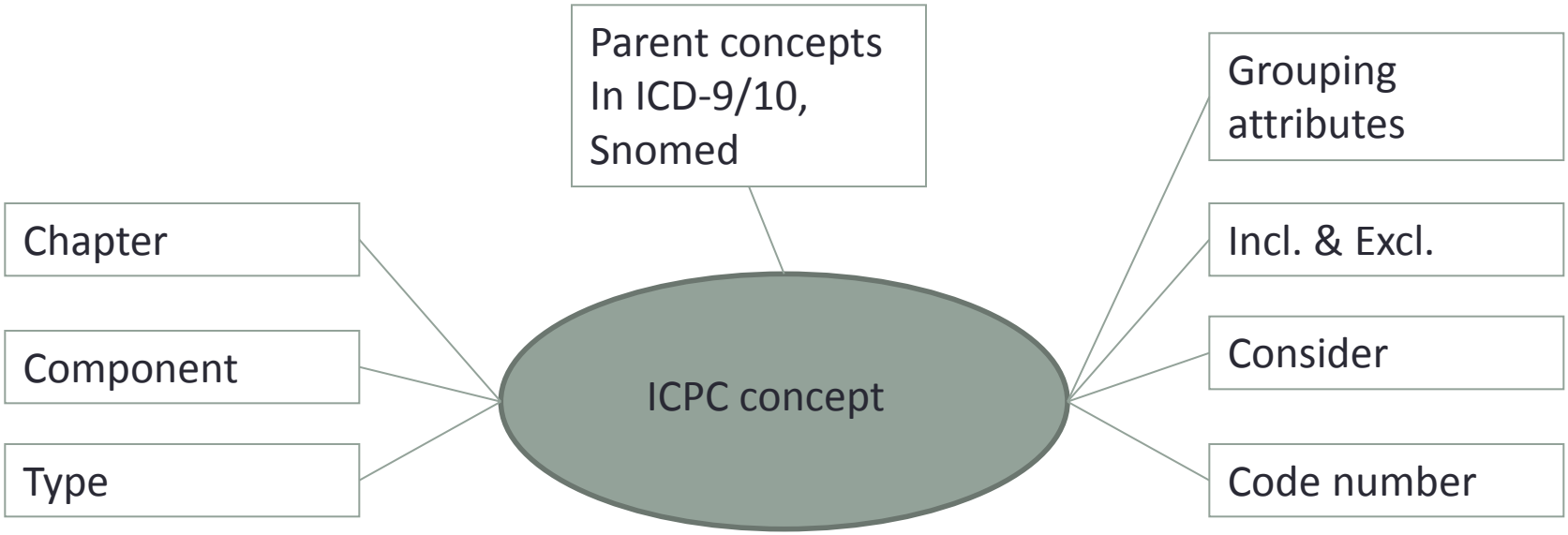
Mapping to related concepts may be much more sophisticated, and embedded in the archetype



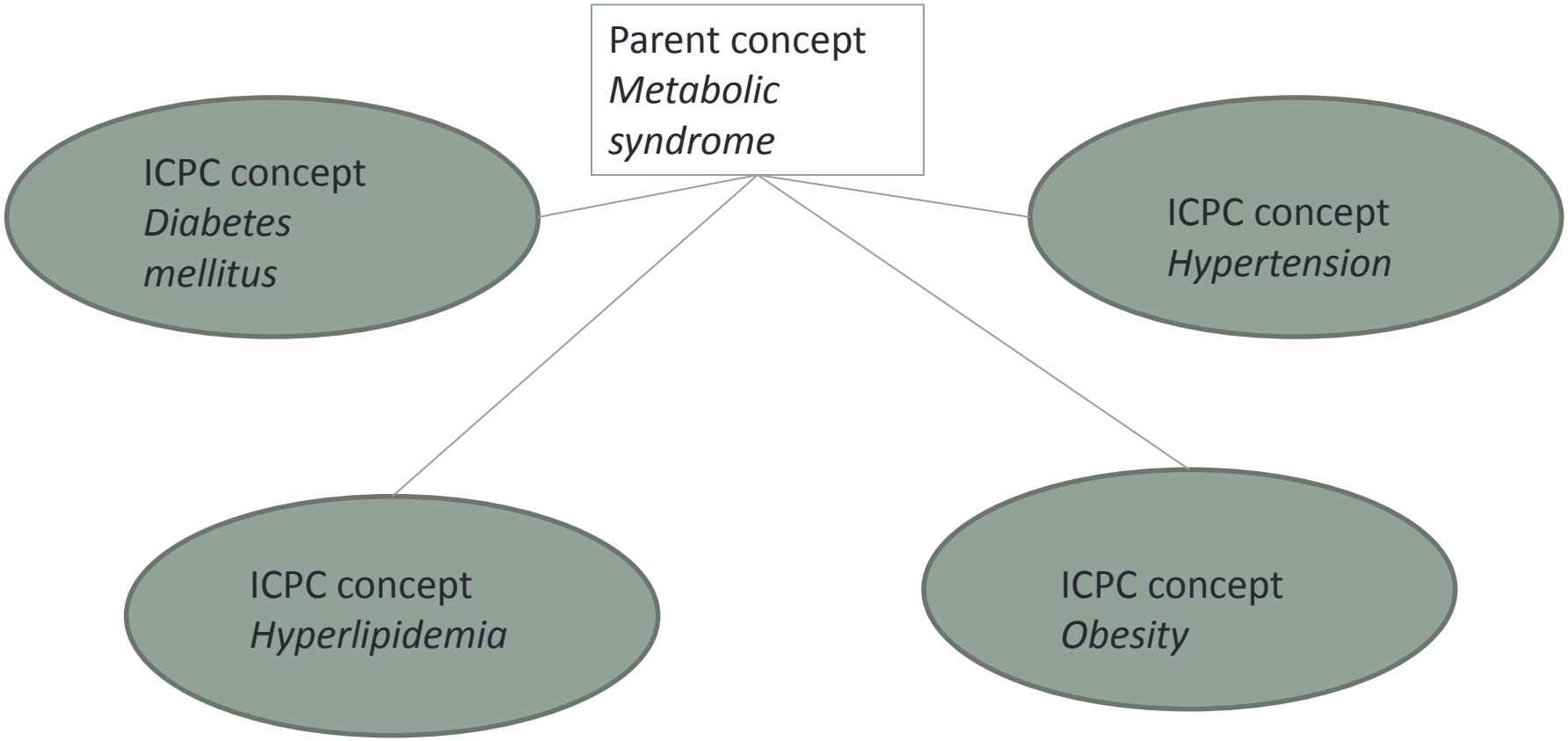
Mapping to related concepts may be much more sophisticated, and embedded in the archetype – an example



Mapping to other coding systems may be embedded in the archetype



And this will help resolve ambiguity with super-concepts such as “metabolic syndrome”



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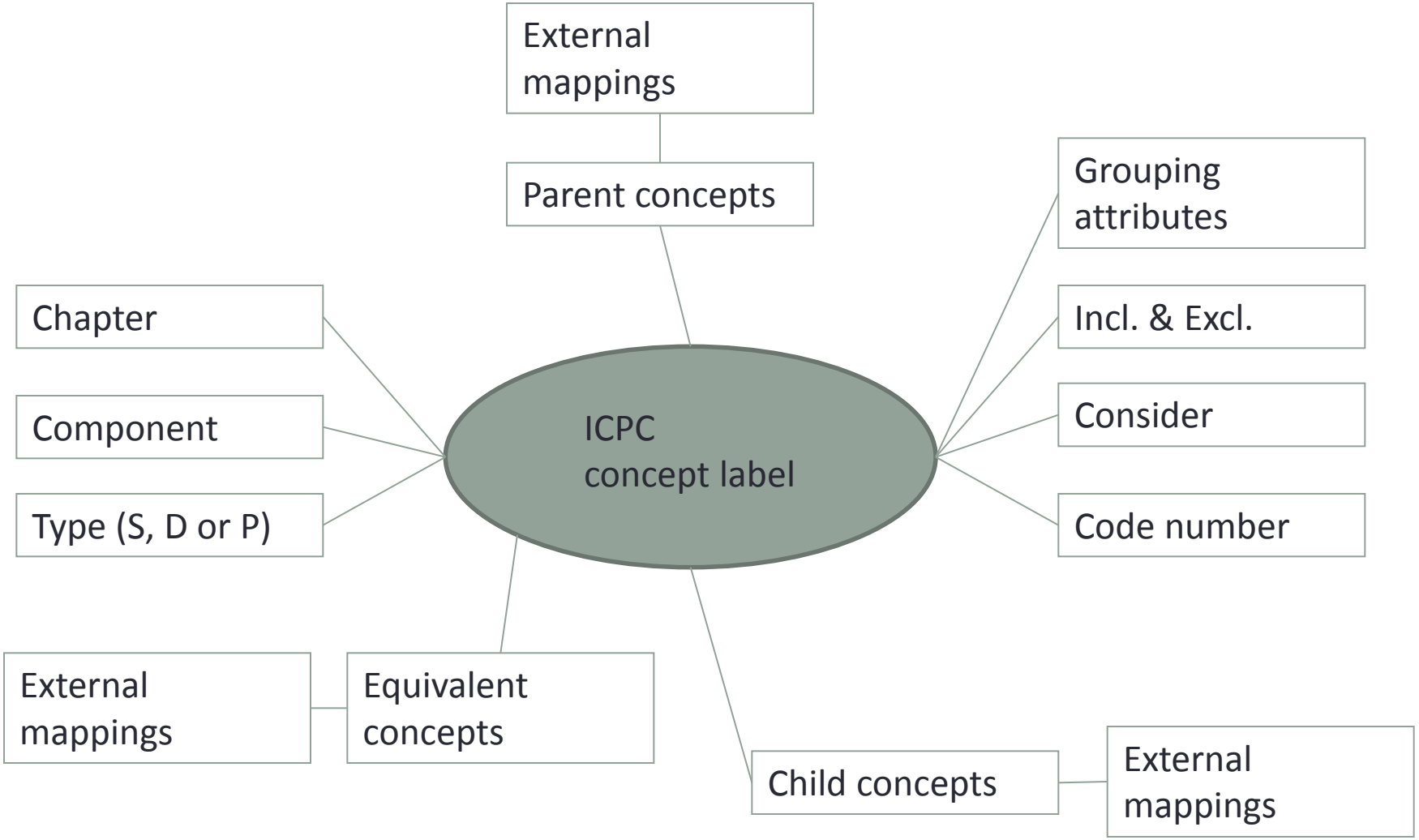

The ICPC Archetype model is the perfect way to implement ICPC-3 in the information age, addressing the various use-cases for ICPC without exclusion