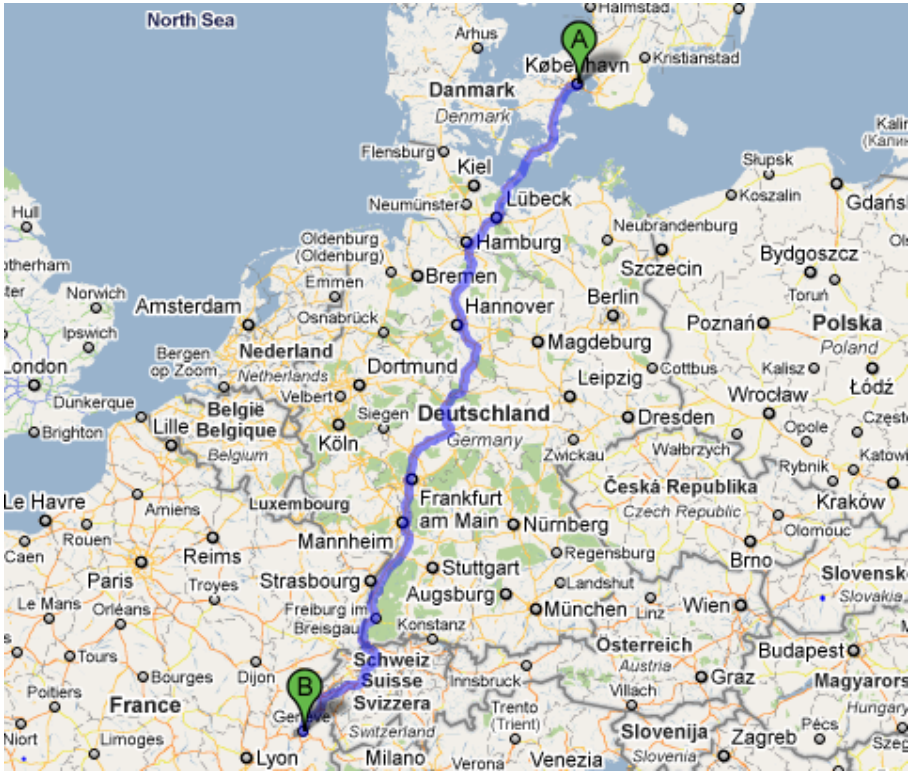
SNOMED CT to ICD-10 Project

Report on Phase One

IHTSDO Implementation Showcase

Sydney

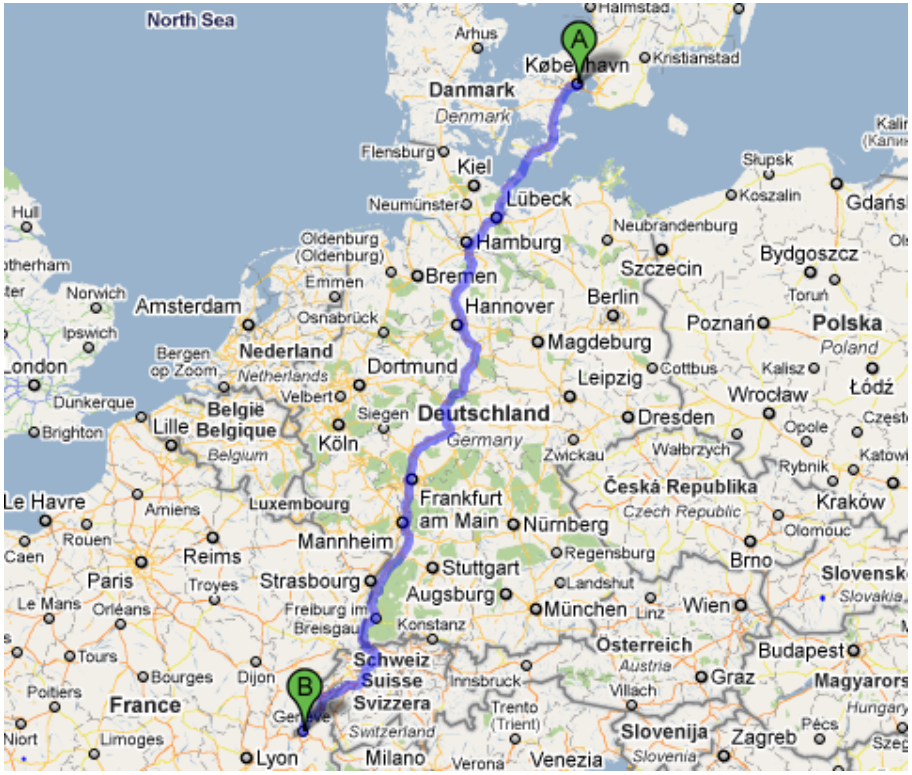
13 October 2011



Content

- Introduction & Background
- Work Progress
- Lessons Learned
- Future Work – Phase 2
- Content Validation - Results

Introduction & Background



ICD-10 Mapping Objectives

- Develop a collaborative working relationship with worldwide standards development organizations promoting interoperation with SNOMED CT
- Design and deploy an extensible architecture for knowledge-based interoperation between healthcare records encoded in SNOMED CT and epidemiologic aggregate reporting employing WHO classifications
- Produce a resource map from SNOMED CT to ICD-10
- Support IHTSDO member nations in their needs for interoperation and derivative maps in service of their national terminology requirements

Timeline

- **2007**: April - IHTSDO assumes ownership of SNOMED CT
  : Technical development for ICD-10 map begins
  : Negotiations for collaboration begin with WHO
- **2009** : June – Guidance for training of mapping personnel
  : September – Technical protocols concluded
- **2010**: July - agreement between IHTSDO and WHO concluded
  : October - Volunteer project staff training in Toronto
  : Joint Advisory Group meets
- **2011** : March – project staff training; mapping begins
  : September – preview publication of phase 1 issued
  : October - Content validation work concludes

Use Case

MAP with patient context management: Patient Jones is being discharged from the hospital. The attending physician has maintained a diagnosis and health-related problem list coded in SNOMED CT during the stay and updates the entries at discharge. The vendor software employs the MAP, which uses a knowledge-based algorithm of sequential computable Map Rules. These rules evaluate context (data recorded about the patient in the electronic health record) and co-morbidities in the electronic record to identify the most appropriate candidate ICD-10 code list based on ICD-10 exclusion / inclusion guidance and other conventions. Vendor software which cannot employ these knowledge based features can employ the helpful Map Advice to provide a readable and understandable list of step-by-step instructions for the physician to support a choice of an ICD-10 code. The ICD-10 coding professional later reviews and edits the classification list prior to submission for statistical morbidity reporting. The Map Advice data further guides them with information regarding additional WHO rubrics and requirements.

Use Case

- Assumes SNOMED CT encoded diagnosis (problem) list:
  - Clinical findings
  - Events
  - Situations (Patient and Family History)
- Assumes demographic and co-morbidity data accessible to vendor EHR
  - Date of birth
  - Gender
  - Concurrent problems

Use Case

- Evaluates patient contextual information from remainder of record in accordance with WHO guidelines
- Supports knowledge-based redirection of MAP in support of WHO guidance:
  - Automated patient context re-mapping for vendors which support a rules engine
  - Map advice summarizes logic and guidelines for vendors not offering decision support and to manage non-classifiable cases
- Presumes classification expert as final editor

INTERNATIONAL HEALTH TERMINOLOGY STANDARDS DEVELOPMENT ORGANISATION

Exemplar: Menarche

Doctor Able renders a consultation regarding patient Baker, an 18 year old female with report of recent onset of menstruation. After evaluation he updates the problem list, adding menarche to concurrent problem of type 1 diabetes. He notes his primary diagnosis and the vendor EHR must report the appropriate ICD-10 codes for the encounter to the national registry.

Problem List

- Healthcare maintenance
- Type 1 diabetes mellitus
- ✓ Menarche

Problem List (Core EHR)

- 24441001 Health maintenance alteration (finding)
- 44635009 Diabetes mellitus type 1 (disorder)
- ✓ 20016009 Menarche (finding)

ICD-10 Alphabetic Index

Memory disturbance, lack or loss (*see also* Amnesia) R41.3
– mild, following organic brain damage F06.7
Menarche
– delayed E30.0
– precocious E30.1
Mendacity, pathologic F60.2
Mendelson's syndrome (due to anesthesia) J95.4
– in labor and delivery O74.0
– in pregnancy O29.0
– postpartum, puerperal O89.0
Ménétrier's disease or syndrome K29.6
Ménière's disease, syndrome or vertigo H81.0
Meninges, meningeal – *see condition*
Meningioma (M9530/0) – *see also* Neoplasm, meninges, benign

MAP Refset Data

Concept ID	Description			Map Rule	Map Advice	ICD-10	ICD-10 Description
20016009	Menarche (finding)	1	1	IFA 83017007 | Late menarche (finding) |	IF LATE MENARCHE CHOOSE E30.0	E30.0	Delayed puberty
20016009	Menarche (finding)	1	2	IFA 44062003 | Early menarche (finding) |	IF EARLY MENARCHE CHOOSE E30.1	E30.1	Precocious puberty
20016009	Menarche (finding)	1	3	OTHERWISE TRUE	MAP CONCEPT IS OUTSIDE SCOPE OF TARGET CLASSIFICATION		

Vendor Clinical Interface

- Healthcare maintenance
- Type 1 diabetes mellitus — E10.9 Type I diabetes
- ✓ Menarche — Cannot compute

USER ADVICE:

IF LATE MENARCHE USE E30.0
IF EARLY MENARCHE USE E30.1
OTHERWISE OUT OF SCOPE FOR ICD-10

Prior Work

- SIEB SNOMED maps:
  - ICD-9-CM (rules-based reimbursement map, US)
  - ICD-O3 (morphology and topography)
  - LOINC integration map

- Existing maps of SNOMED to ICD-10
  - ICD-10 (UKTC)
  - UMLS Metathesaurus (NLM)

Project Overview

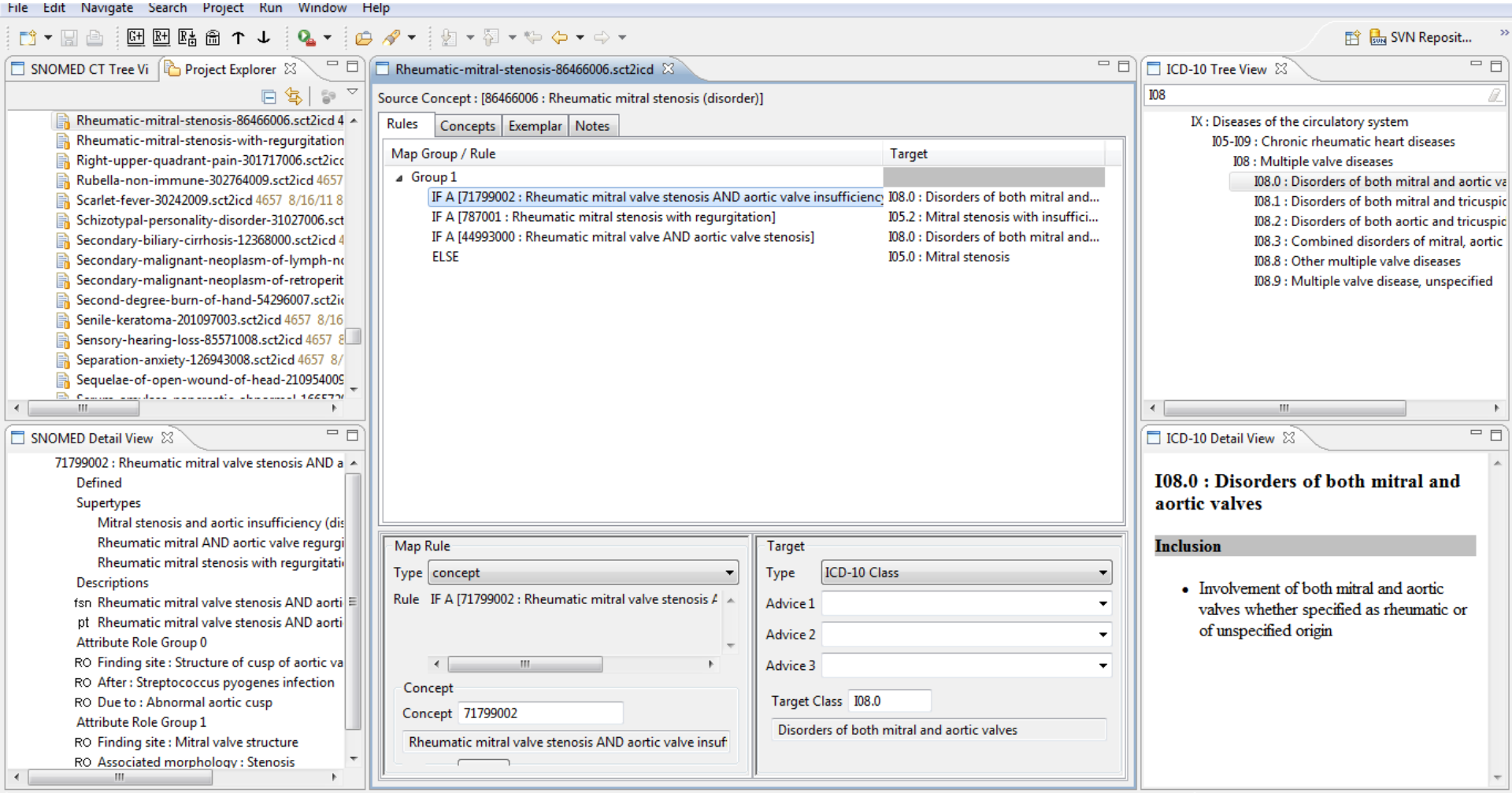
- Due to substantial costs for mapping 110,000 concepts of clinical findings, events and situations, organize in phases to maximize utility
- To promote reproducibility, proceed with dual mapping of all source concepts (either legacy or map specialist work)
- Organize map activity by teams of map specialists working in parallel supervised by map leads who distribute work and review map concordance
- Manage mapping discordance with consensus review by WHO/IHTSDO panel
- Publish work in stages to encourage community review and input

Educational Development

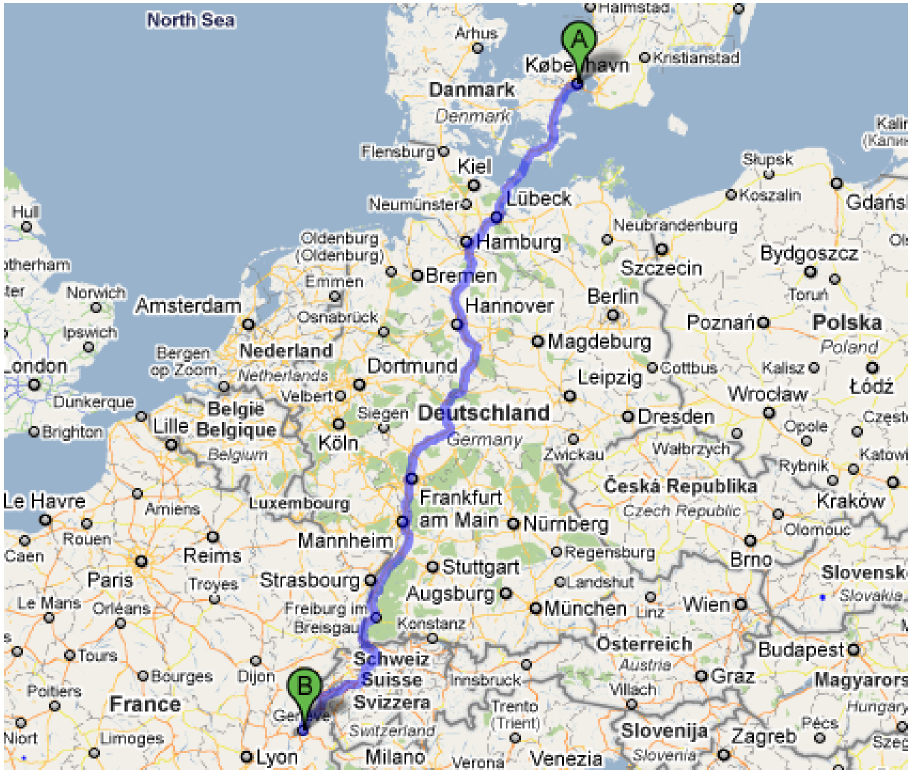
- Training and skill development for map specialists is essential to reproducibility of map products
- June 2009: Education SIG developed *Guidance on the Preparation of Terminology / Classification Mapping Personnel*
- Prototype map tooling environment confirmed
- Project role, competencies and training curriculum developed for the project as collaboration between Education and Mapping SIGs
- Training program required of all mapping project personnel

Tooling Development

INTERNATIONAL HEALTH TERMINOLOGY
STANDARDS DEVELOPMENT ORGANISATION



Work Progress



Work Progress

Began with face to face training of volunteer work force in Toronto October 2010:

Mapping :

- Started with first 500 of priority set (priority set = 9800)
- Data imported 8 November 2010
- Began mapping end of November
- Finished mapping first 500 by beginning of March 2011

Work Progress

Decision to recruit 2 x FTE funded Map Specialists

- Training in Chicago in March 2011
- Began mapping of remaining priority set on 14 March 2011

Mapping Team

Map Leads:

- 2 x 0.5 (volunteer)

Map Specialists

- 2 x FTE (funded)
- 4 part time = 1 FTE (volunteer)

Consensus Managers

- 2 x part time as required (1 from IHTSDO and 1 from WHO)

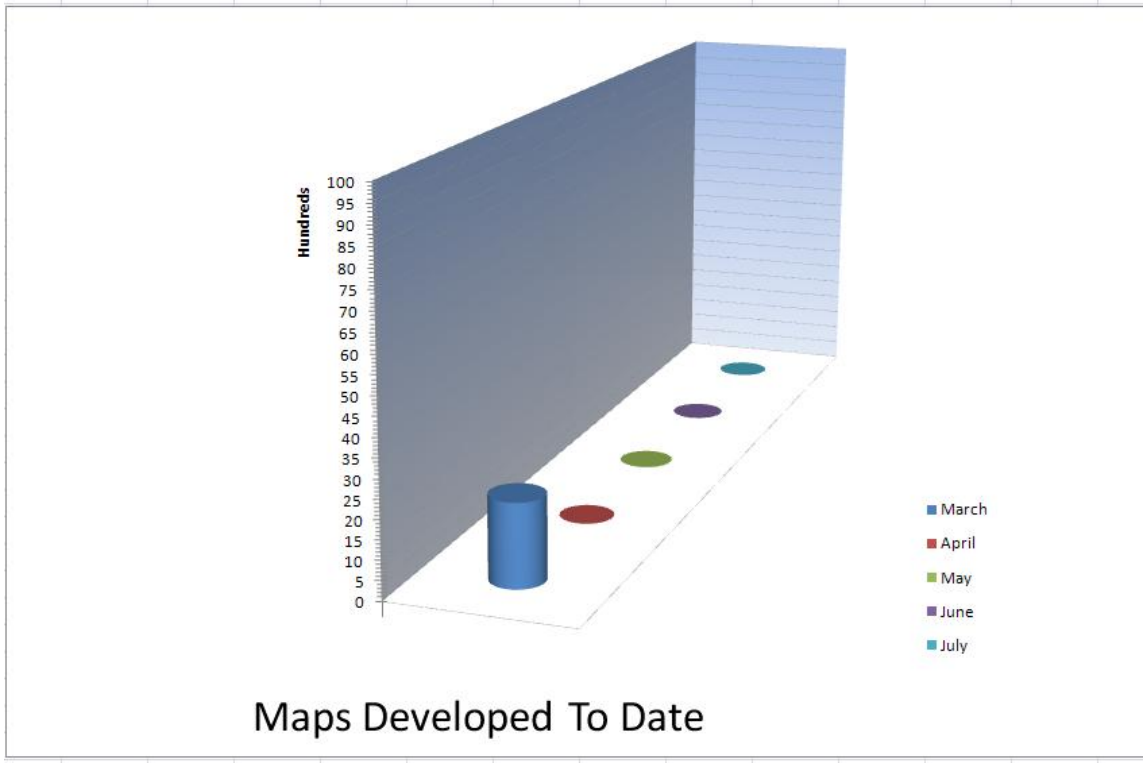
1 Consensus Facilitator

- 1 x part-time as required (agreed by consensus managers)

Co-ordinator/Statistician

- 1 x as and when (invaluable)

Month 1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Maps Developed To Date

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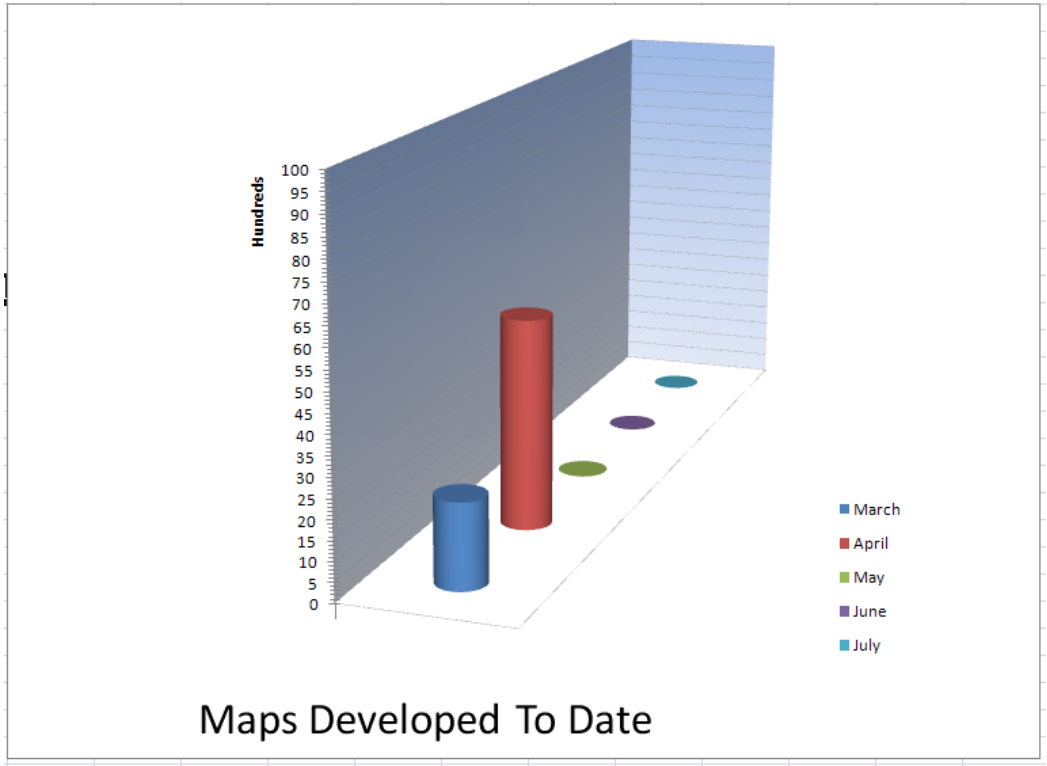
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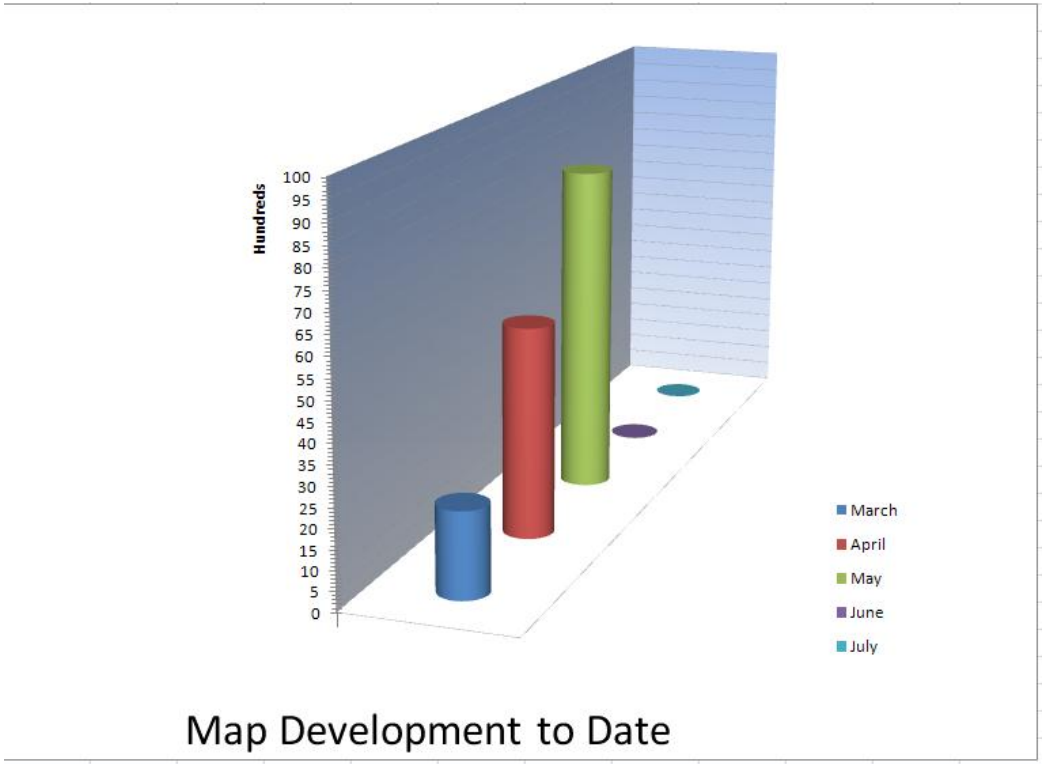
Month 3



Map Development to Date

Remembering that Phase 1 is a 'Test' Phase

Early May - observations on first 1000 finalized MAPS Discussed:

- High discordance rate
- Difficult to apply exclusion rule criteria as set out in technical specification document
- Agreed a new exclusion handling rule procedure

New Exclusion Rule Procedure

Concepts with more than 10 descendants are labelled as high level concepts (hlc) and are flagged with the default map advice:

"DESCENDANTS NOT EXHAUSTIVELY MAPPED"

For high level concepts map specialists only assign a default ICD-10 target code or flag e.g. 'NC' . 'OS', 'AMB '

New Exclusion Rule Procedure

Concepts with 10 or less descendants are labelled as low level concepts (llc) and are mapped exhaustively:

- A default ICD-10 target or flag is assigned
- Each descendant of the source concept is examined and an exclusion rule created to reflect the meaning of the descendant concept.

…and the result of this change in procedure is…

- Original output expected for Phase 1 = MAPS for 9800 concepts on the priority list
- Expected output for Phase 1 following this change in procedure = approximately 20,000 MAPS

Preview Release of Cross-maps from SNOMED CT to ICD-10

Preview Release of cross-maps available on 6 September 2011:

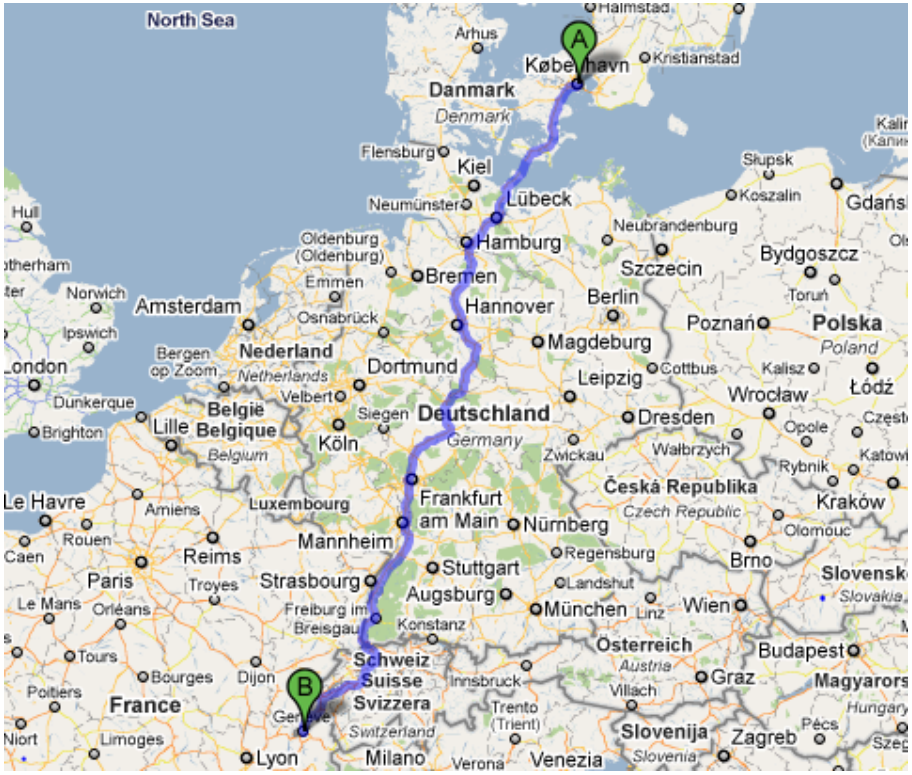
- First preview of work in progress
- Quality procedures not yet complete
- Feedback important to ensure the MAPS meet the needs of the community of practice
- Comments to be received by 31 October 2011

Status of Phase 1

- Total number of mapped concepts in publication queue = **7208**
- Total number of concepts unassigned = **275**
- Total number of concepts in conflict review = **1226**
- Total number in queue for review by consensus management panel = **18**

Timeline for completion of Phase 1 -

Lessons Learned



Lessons Learned

Mapping Team Objective

"To map the 9800 priority list concepts using the procedures and methodology outlined in the SNOMED CT to ICD-10 Mapping Technical Specification document."

What worked well?

- The face to face training was essential to demonstrate the different types of maps
- Also considered useful as an introduction to the support team
- Weekly and bi-weekly meetings helped with communication and decision making
- The tool is easy to navigate and use after very little experience with it
- Ongoing updates/improvements to the tool as the project progressed were very helpful and made the mapping process easier
- Automatic notification of updates helps ensure everyone is using the same version of the tool.

What could be improved?

- Exemplar document should be continuously and promptly updated
  - Create and post a list of issues and decisions from team discussions
- Feedback to map specialists should be routine and prompt as issues are discovered and resolved.
- Set a minimum work-time for map specialists

What surprises were encountered

- Work-flow activities were very time consuming (e.g. batch assignment requesting comparison and publication of batches)
- Mapping takes time – conflict resolution and validation takes almost as much time!
- A high number of MAPS flagged as discordant were due to simple issues such as ordering of advice and made no difference to the output

…and our survey said!

- The understanding of what the mapping is all about (behind the technical documentation, working tool etc.).
- I am most proud of the expertise I developed around mapping.
- Making a contribution to the changing of the mapping rules once we had collectively decided that mapping by exclusion was resulting in too much discordance. I found it rewarding and stimulating to take part in improving the process.
- Being a part of the team that is creating a world-wide project. With each phase completed; we are another step closer in uniting the entire world medical community.

…and our survey said!

- I am most proud of being part of an international mapping project that will facilitate the sharing of health information.
- Working with a team in which every one is participating actively and positively and being supportive of the project and of others.
- Working with a team who had an initial goal of mapping 9800 concepts but instead completed mapping of approximately 20,000 concepts.
- Seeing the many hours of MapSIG and PG project work become a reality!

Suggested Amendments for Phase 2

- Set a minimum work-time for a map specialist (whole time would be best practice)
- Expect a long learning curve for mapping team
- Expand options for training and team communications
- Plan the project to allow time for regular team discussions to address conflicts

Suggested Amendments for Phase 2

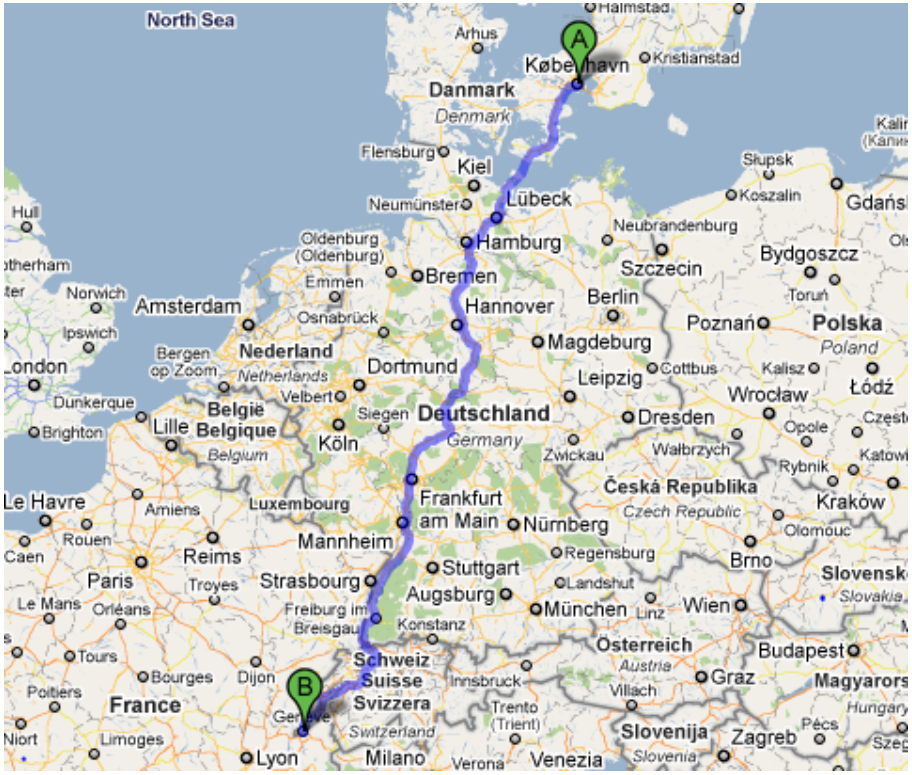
- Improve the technical specifications and create an evolving handbook specifically for the map specialist posting issues and decision from team discussions
  - Update the technical specifications/exemplars based on the team discussions and post in a timely fashion

- Use map team experience of working with the tool to create essential requirements for enhancement to the mapping tool for Phase 2.

Challenges for the future

- Completing the mapping for 90,000 concepts!
  - Funding!
  - Prioritization!!
- Maintenance
  - Changing versions of SNOMED CT and ICD-10
- Synchronization of release schedule
- Mapping requires specific knowledge and skills e.g., thorough understanding and experience with the source and target system,
  - Challenging to recruit with the required skill set – may need to home grow.

Future Work – Phase 2



Future Work – Phase 2

- Two main threads
  - Update and maintain existing Phase 1 maps
  - Complete the map for remaining SNOMED CT concepts that are within mapping scope (approx.90,000)
- Planning based on
  - Experience, statistics and feedback gathered in Phase 1
  - Capacity available – funding, expertise, tools
  - Value to community of practice

Map maintenance

- Maintenance of published maps should be an on-going task with well-defined
  - Processes and methodology
  - Publication cycle of map updates - in relation to releases of the 2 terminologies
  - Resource commitments – funding, manpower, tools

Changes in SNOMED CT

- Retired concepts that are mapped – find replacements through historic relationships (e.g. SAME AS)
- Newly added descendants of low level concepts that are exhaustively mapped
- Changes in:
  - Fully-specified names
  - Tree position
  - Defining relationships
- Update cycle (proposed) – release new maps within 3 months of new SNOMED CT release
- Possibility of synchronous release?

Changes in ICD-10

- Phase 1 maps based on 2008 release of ICD-10
- Major release in 2010
- Update criteria
  - Retired codes
  - New codes – which maps to look at (? all new code's parent and siblings, only .8 (NEC) codes)
  - Other changes
    - Rules/conventions
    - Inclusions/exclusions
- Availability of electronic copy of ICD-10 – a prerequisite

Mapping remaining SNOMED CT concepts

- Defined mapping scope, 3 hierarchies 110,000 concepts
  - Clinical finding
  - Event
  - Situation with explicit context
- Phase 1 covered about 20,000 concepts
- 90,000 concepts remaining

Multi-year planning

- Realistically, need to spread work over 3-4 years
- Budget should cover fully-funded
  - Map Leads
  - Map Specialists
  - Project manager
  - Technical and organizational support staff
- Fixed term mapping staff (vs. short term contracts)
  - Reduce cost
  - Better quality
  - Cover both map maintenance and expansion

Prioritization of concepts

- priority given to content that supports existing community of practice use cases
- Candidate priority lists:
  - FP/GP refset
  - NLM Problem list concepts - outside the 95% cutoff
  - UK Emergency medicine subset
  - Australian Emergency Department Reference Set
  - Other subspecialty subsets – from Canada, donated CMT content

Related activities

- Content validation
- Usage validation
- Feedback from users
- Help desk mechanism
- Implementation guidance

Content Validation - Results

Part of the journey from the home of SNOMED CT in Copenhagen to the home of WHO-FIC in Geneva is to develop understandable, reproducible and useful maps to test the pathway to our mutual destination – AHIMA is honored to facilitate this content validation project

Overview of procedures and accomplishments

- Worked from foundational documents to develop the project plan for content validation
  - Relied on “Mapping SNOMED CT to ICD-10 Phase 1 content validation exercises” (and taking into account) “SNOMED CT to ICD-10 Map Quality Assurance Plan”
  - Used foundational guidance from “Mapping SNOMED CT to ICD-10 Technical Specifications”

Preparation phase for map validation

- AHIMA selected by WHO-FIC and IHTSDO to perform validation services in July, 2011
- Recruiting began in mid July for a four person team
- Call to participate was very broad to find qualified personnel
  - AHIMA global network including IFHIMA
  - WHO-FIC committee chairs
  - WHO-FIC collaborating centres
  - IHTSDO community

Preparation phase for map validation

- 4 person team confirmed in early August, 2011
- 3 map validation specialists – highly qualified with an expert knowledge base of both SNOMED CT and particularly with ICD-10
  - 2 Clinicians (UK and Thailand)
  - 1 HIM Professional (Australia)
  - 1 Statistician (United States)
  - +1 Project Manager (United States)

Overview of procedures and accomplishments

- The outline of approach is documented in the validation exercise documentation
  - The project statistician assisted the leadership team in selecting an appropriate sample size for the validation pilot – 294 concepts
  - Each concept was assigned to two people for concordance assessment – 196 maps to each validator
  - Errors were inserted in fraction of the maps (fudged) to allow assessment of overall accuracy

Overview of procedures and accomplishments

- Leveraged the availability of the standalone mapping tool hosted by IHTSDO for view of completed maps
- Kept the process simple by using Excel spreadsheets to capture the results to facilitate analysis and percentage of discordance/concordance
- Error types were structured to allow for categorization
- Pilot project was completed with analysis finished by August 31st

Pilot results overview: assess process

- 45 concepts randomly assigned
- 3 reviewers – 30 concepts each
- Agreement of conclusion for 76% (34/45) of concepts
- Where two reviewers agreed the discordance rate was 6.7% (3/45); 2/45 were in fact introduced errors for overall discordance with map of 2.2%

Pilot Results	Reviewer			
Error	A	B	C	Agreed Discordance
Error 1- Map Group is not relevant	1	1	0	1
Error 2- Map Group has been omitted	0	0	1	0
Error 5- Target code selection for a map record is in error	1	3	3	1
Error 8- Age rule is not relevant	0	1	1	1
Error 10- A concept exclusion rule is not relevant	0	0	1	0
Error 11- A concept exclusion rule has been omitted	0	4	0	0
No Error	28	21	24	
Total Concepts	**30**	**30**	**30**	**45**
Discordance Rates	**6.7%**	**30.0%**	**20.0%**	**6.7% (2.2)%**

Joint Advisory Group

- Virtual conference convened 6 September following pilot study to share and discuss pilot results
- JAG recommendation to pause at mid-point in the sample for team discussion (23 September)
- Error types were refined and one added to the data collection process for the remainder of the reviews

Error list

- **Error 1** — **Map Group is not relevant**
- **Error 2** — **Map Group has been omitted**
- **Error 3** — **Sequencing of Map Groups is incorrect**
- **Error 4** — **The number of map records per group is incorrect**
- **Error 5** — **Target code selection for a map record is in error or absent**
- **Error 6** — **Gender rule is nor relevant**
- **Error 7** — **Gender rule has been omitted**
- **Error 8** — **Age rule is not relevant**
- **Error 9** — **Age rule has been omitted**
- **Error 10** — **A concept exclusion rule is not relevant**
- **Error 11** — **A concept exclusion rule has been omitted**
- **Error12** — **Map category assignment is in error ~~other than 'NC' or 'OS')~~**
- **Error 13** — **Low level concept (less than or equal to 10 descendents) not mapped**

Appendix A "Mapping SNOMED CT to ICD-10 Phase 1 content validation exercises"

Recent content validation work

- Consolidated analysis of results in process from the 3 separate sessions completed by each validation specialist: Pilot (30) Set 1,(68) Set 2 (98) All reviews were completed by 30 September (294 concepts)

- Final analysis, statistical results and report is in process – draft to be completed mid-October and finalized by end of this month

Preliminary validation results

- Reviewers agreed on the conclusion of error/no error in 79% of the concepts included in the study.
- For the non-fudged maps, where two reviewers agreed on both the presence of an error and the type, the agreed discordance rate was 3.3% of 273.
- For the concepts where the two reviewers agreed on both the presence of an error but not necessarily the type, the discordance rate was 5.5%.

Lessons learned so far

- More than one training session is needed for full orientation of validation staff new to the process
- Learn more about the nuances of standalone mapping tool and authentication requirements
- Project preparation should include hands on practice before starting the actual project (new personnel)
- Important to leverage pre-recorded training sessions to “show and tell” map process and heuristics

Lessons learned so far

- Batch assignment sequence order for reviewers and data collection spreadsheets should be the same to minimize posting errors of concept numbers in the data collection process
- Additional documentation and educational support materials required for content validation team
- Statistician services are essential to the process
- Allow more time for data preparation and quality checks in the timeline

Questions?