

SNOMED CT as the ontology standard - the Hong Kong experience

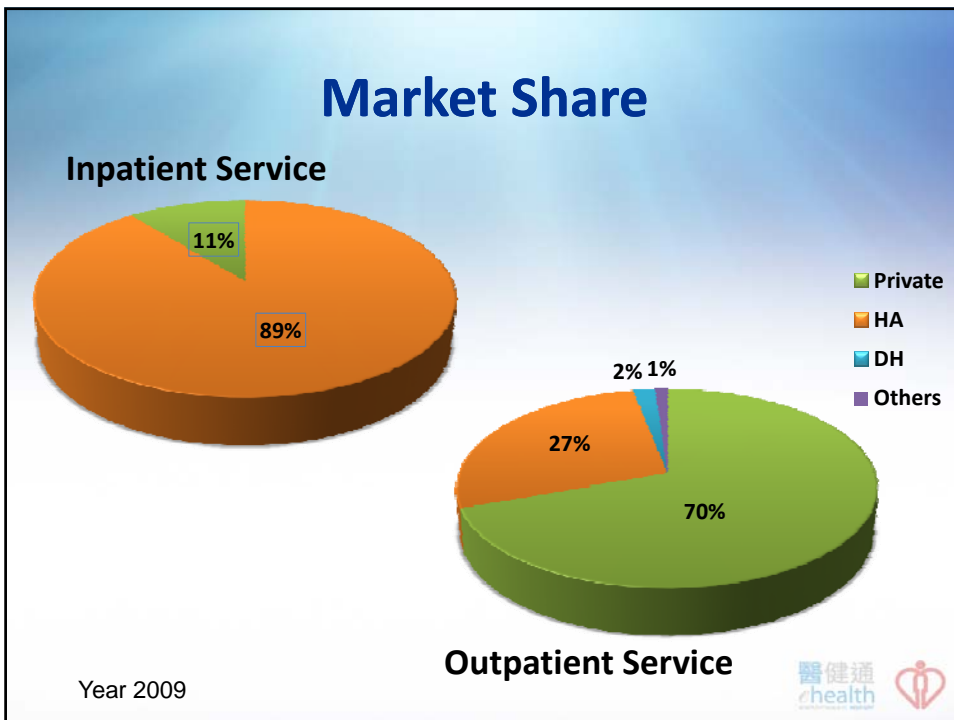
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Senior Health Informatician
Hong Kong Hospital Authority



Agenda

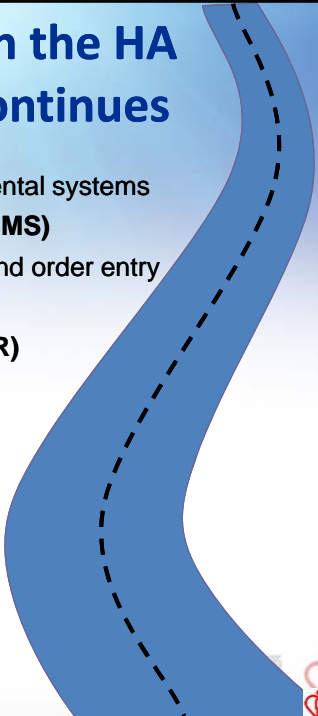

1. Introduction
2. Hong Kong experience with terminology
3. Hong Kong experience with SNOMED CT





Development in the HA The Journey Continues

- 1990** "Green fields"
- 1991** Patient administration + Departmental systems
- 1995** **Clinical Management System (CMS)**
 - Direct clinician documentation and order entry
- 2000** CMS Phase II
 - **Electronic Patient Record (ePR)**
- 2002** **CDARS**
- 2003** eSARS
- 2004** **ePR Image Distribution**
- 2006** PPI –ePR sharing
- 2008** CMS Phase III
- 2009** **Filmless HA**
Hong Kong wide eHR
- 2010** Inpatient MOE

Hospital Authority Clinical Vocabulary Table - History

1995


- **HA Master Disease Code Table (HAMDCCT)**
- ICD9CM diagnoses & procedures
- Extensions for locally added terms, alias, associated codes for reporting requirement

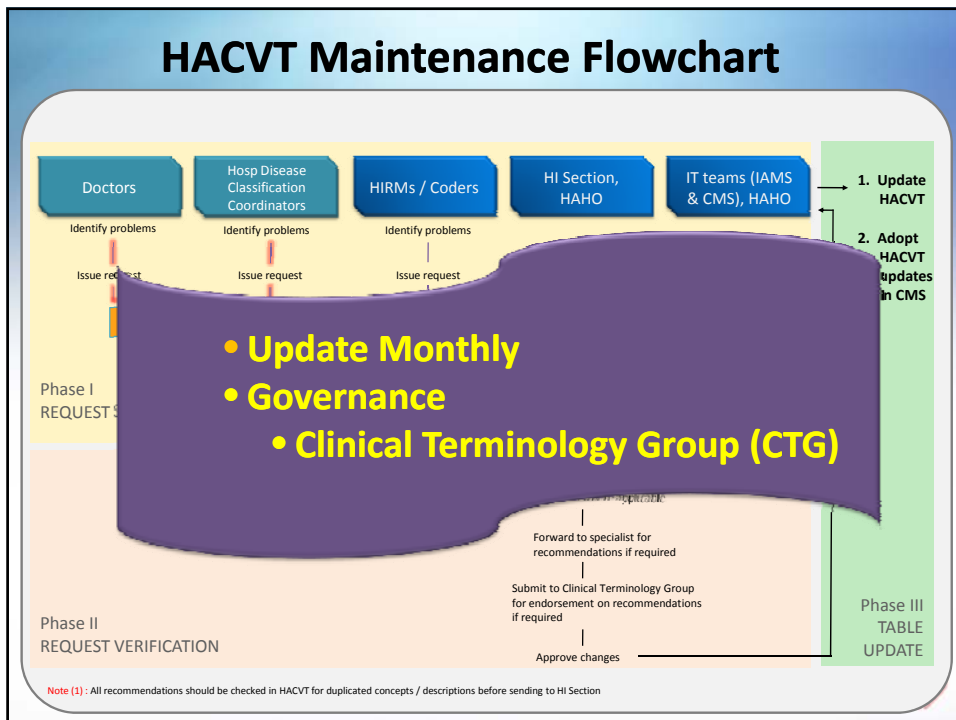
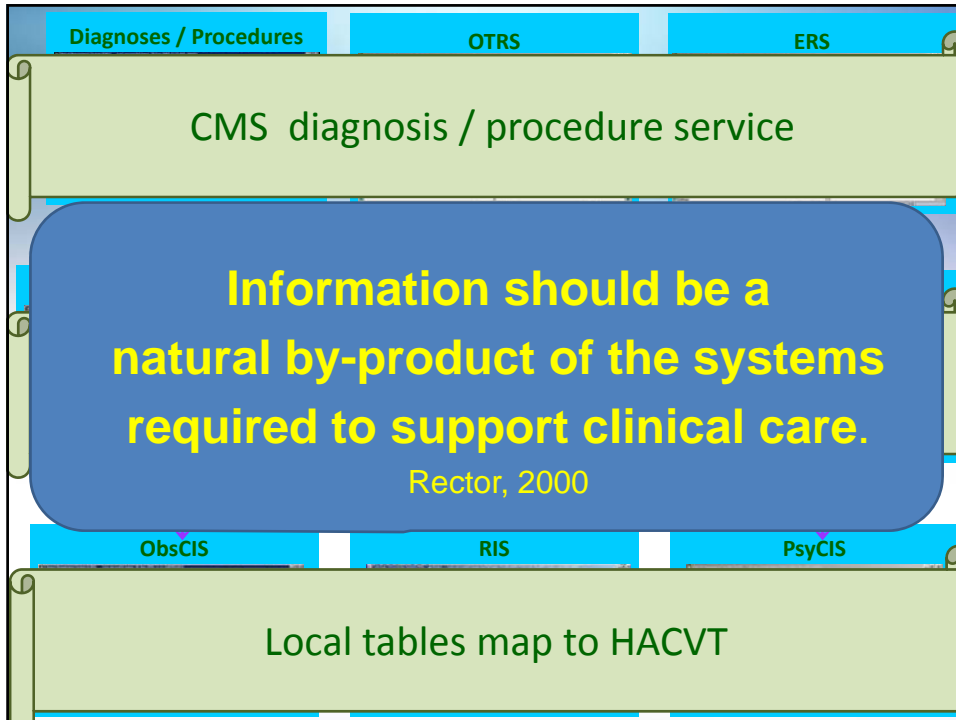
2001

- **HA Clinical Vocabulary Table (HACVT)**
- Unique TermID
- ICD9CM diagnosis & procedures, ICD 10 diagnosis

2009

- **HACVT in Information Architecture Management System (IAMS) – Concept module**
- Other terminologies/classifications, e.g. SNOMED CT
- Beyond diagnoses and procedures, e.g. organism, medication






HACVT Statistics on Diagnosis & Procedure (as at 31 January 2011)

	Active	Inactive	Total
Diagnosis	18,743	7,265	26,008
Procedure	7,244	1,953	9,197
Total	25,987	9,218	35,205

	Original ICD terms	Added terms	Total
Diagnosis	15,571	10,437	26,008
Procedure	4,431	4,766	9,197
Total	20,002	15,203	35,205

Patient Data in 2010

Care Type	Diagnosis		Procedure	
	Total number	Unique patient	Total number	Unique patient
Accident & emergency	1,446,101	746,429	10,479	6,214
Inpatient	4,092,234	689,812	1,963,779	518,365
Specialist Outpatient	492,063	313,188	238,627	144,388



HK's Experience with SNOMED CT

- 2003
 - Analysis of HACVT against SNOMED CT
 - 44% exact match, 14% concept match
 - Study group on SNOMED CT
- 2009
 - HA is tasked by HKSAR government to develop eHR, including terminology standard
 - HA commenced mapping HACVT to SNOMED CT
- 2010
 - Position paper on Terminology Management for eHR
 - To develop Hong Kong Clinical Terminology Table

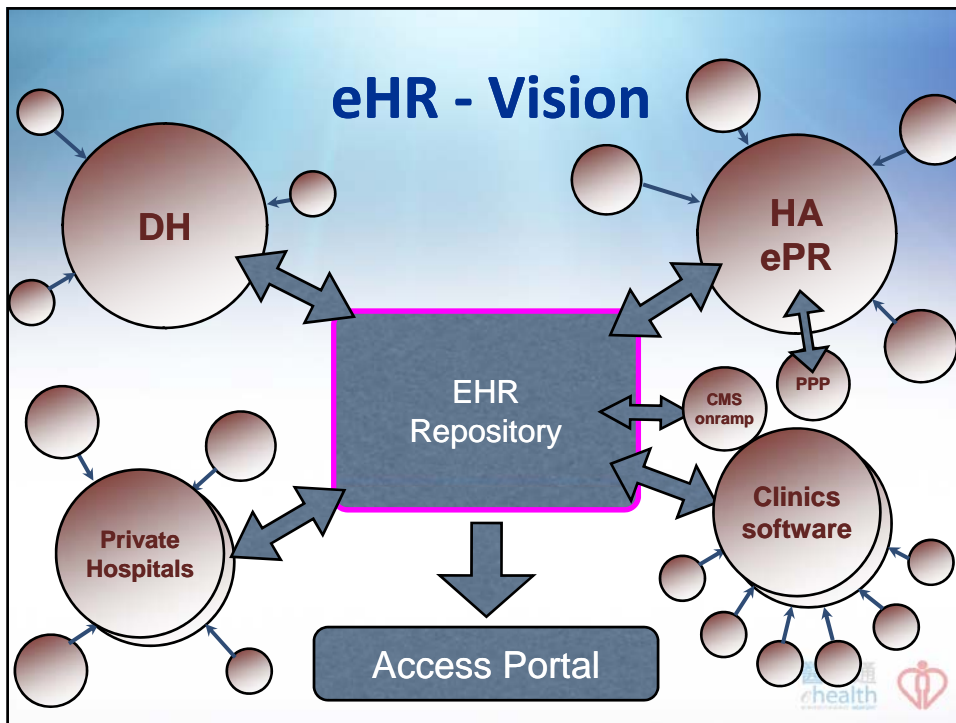


Meeting Local Needs

Comparison of HA Clinical Vocabulary Table vs SNOMED CT - 2003

Result	Implications
Term match - 44.5%	---
Concept match - 14.2%	Synonym required
Post-coordination match - 33%	Additional term required
Partially match - 6.8%	Additional term required
Not available - 0.5%	Additional term required





Areas

- Registries
 - Patient
 - Practitioner / Institute
 - Location (address)
- eHR content
- Terminology
- Messaging
- Management process



Practical Concerns

- Numerous standards
- No single terminology covers all domains in breadth & depth
- Local requirements
- Data migration
- Data retrieval
 - Multiple dimension
- Updating



Hong Kong Clinical Terminology Table

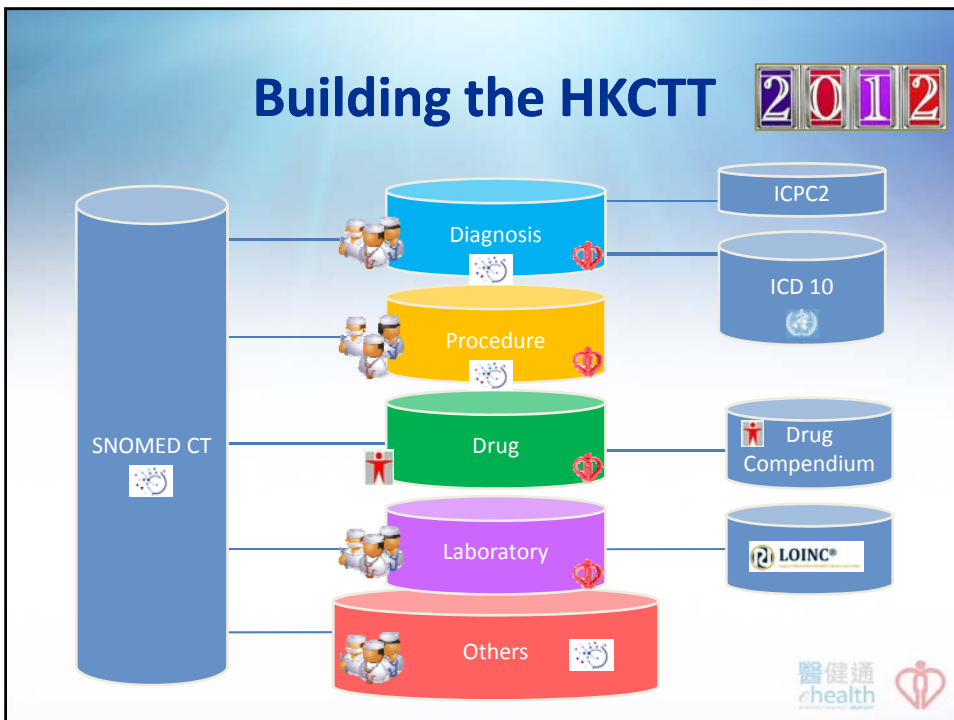
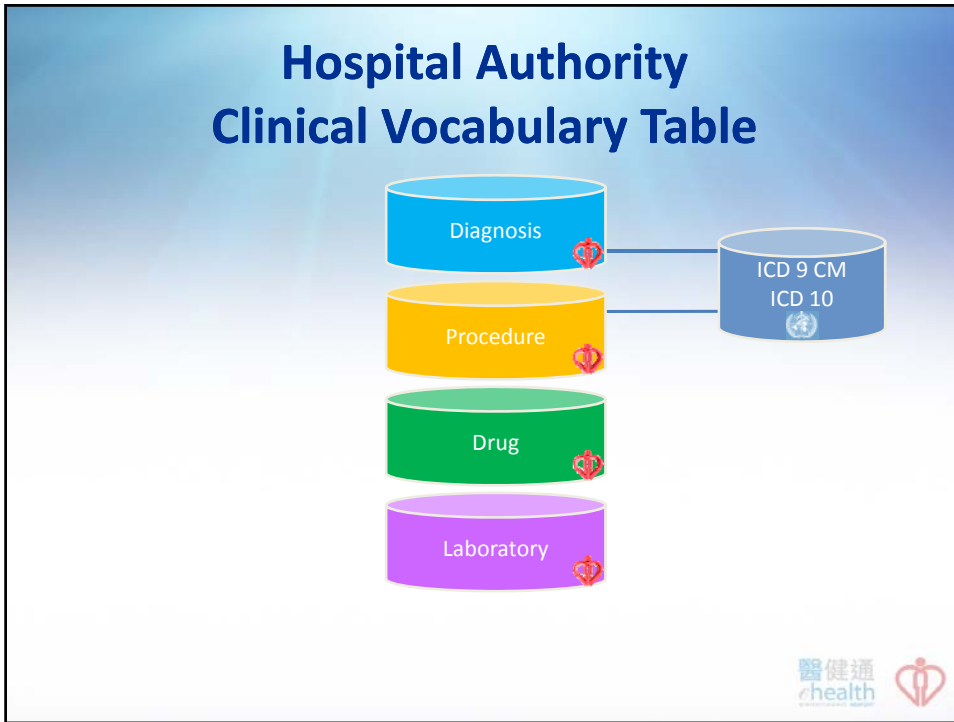
- To support eHR interoperability
- Adopt terminology principles
- Leverage on HA experience
- Incorporate international standards as reference terminologies
- Meet local requirements



Recognised Terminologies

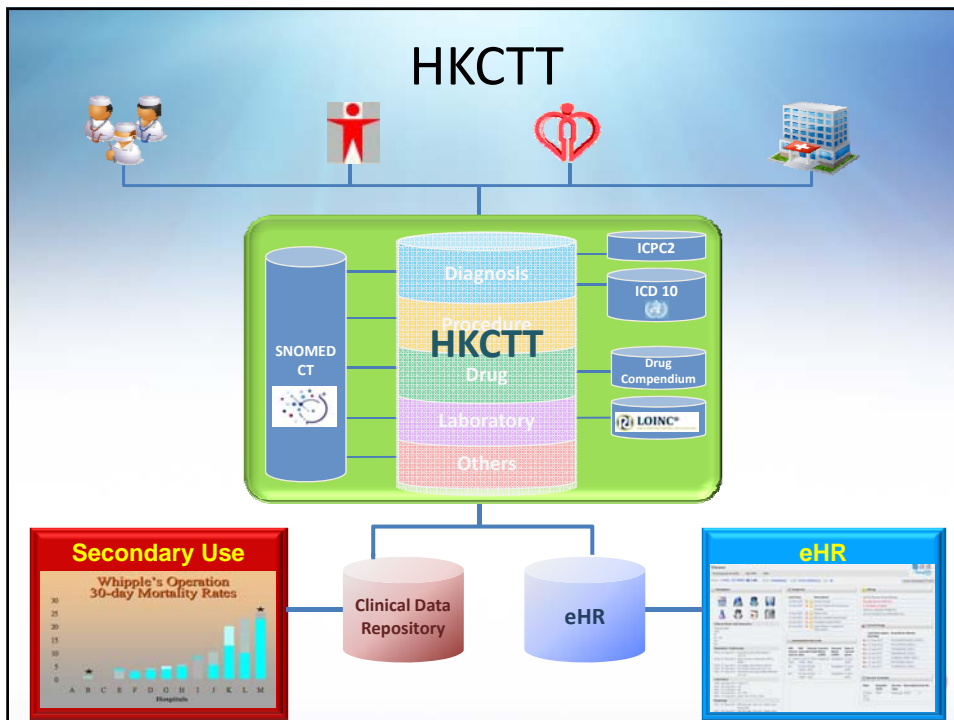
- Compendium of Registered Pharmaceutical Products (HK Drug Compendium)
- Hong Kong Clinical Terminology Table (HKCTT)
- International Classification of Diseases, 10th Revision (ICD 10)
- International Classification for Primary Care (ICPC)
- Logical Observations, Identifiers Names and Codes (LOINC)
- Systematized Nomenclature of Medicine, Clinical Terms (SNOMED CT)






Adopting HKCTT

	CTT App (On-ramp / Adaptation)	CTT Offline	CTT Download
Details	CTT content + terminology engine + search panel	CTT content + terminology engine	CTT content only
Usage	<ul style="list-style-type: none"> • Replace current application, or • Implement a new application 	Able to search HKCTT in provider's current application	Design own eMR on how to adopt HKCTT (technical / mapping)
Effort to HKCTT by HCP	+	++	+++
Remarks	As part of : <ul style="list-style-type: none"> • eHealth Adaptation (on request) • eHealth Onramp 	HCP to develop <ul style="list-style-type: none"> • program to interface with terminology engine using a standard protocol • Search panel 	HCP to decide own searching method




A Concept in HKCTT

Term ID 37395	IN USE					
Nature	Diagnosis (Dx)					
Full Description	Dilutional thrombocytopenia					
Short Description	Dilutional thrombocytopenia					
Stage In Use	CMS Ref. No.	<table border="1"> <tr> <td>Validation Rules</td> <td>Sex N/A</td> </tr> <tr> <td>Age N/A</td> <td>Principal Yes</td> </tr> </table>	Validation Rules	Sex N/A	Age N/A	Principal Yes
Validation Rules	Sex N/A					
Age N/A	Principal Yes					
System Used						
Status	Active					
Remarks						
Alias	- Secondary thrombocytopenia (Source HACVT)					
ICD9Dx	287.4 - 5	E879.8 - 0				
ICD10Dx	D69.5	Y84.8				
SNOMED CT	51624005					



HKCTT Concept not in SNOMED CT

Term ID 5700386	IN USE	Entity
Nature	Specimen	
Full Description	Air sample	
Short Description		
Stage In Use	Status Active	
Remarks		
Alias		
SNOMED CT		(HKSCT: 5700386)



Mapping

- Finding the most appropriate term/code in the target terminology / classification
- Mapping
 - Mapping between standards
 - Mapping between local terms and standards
- Know the terminology well

Anemia in SNOMED and ICD 10

SNOMED

- 271737000 Anaemia
 - Subsumes chronic blood loss anaemia

ICD 10

- D64.9 Anaemia, NOS
 - Excludes chronic blood loss anaemia (D50.0)



Mapping Process – 1

- Step 1 : Planning
 - Prepare own terminology set
 - Understand how the terms are being used
 - Which version (frozen the mapped set)
 - Unique identifier for each term (create one if none)
 - Understand the target terminology/classification
 - Is it a terminology (HKCTT, SNOMED CT, LOINC) or a classification (ICD, ICPC) ?
 - Know the structure
 - How to locate the right concept
 - Any data capturing rules in the target terminology /classification?
 - Access to the target terminology
 - License
 - Which version
 - Right tool, right person



Mapping Process – 2

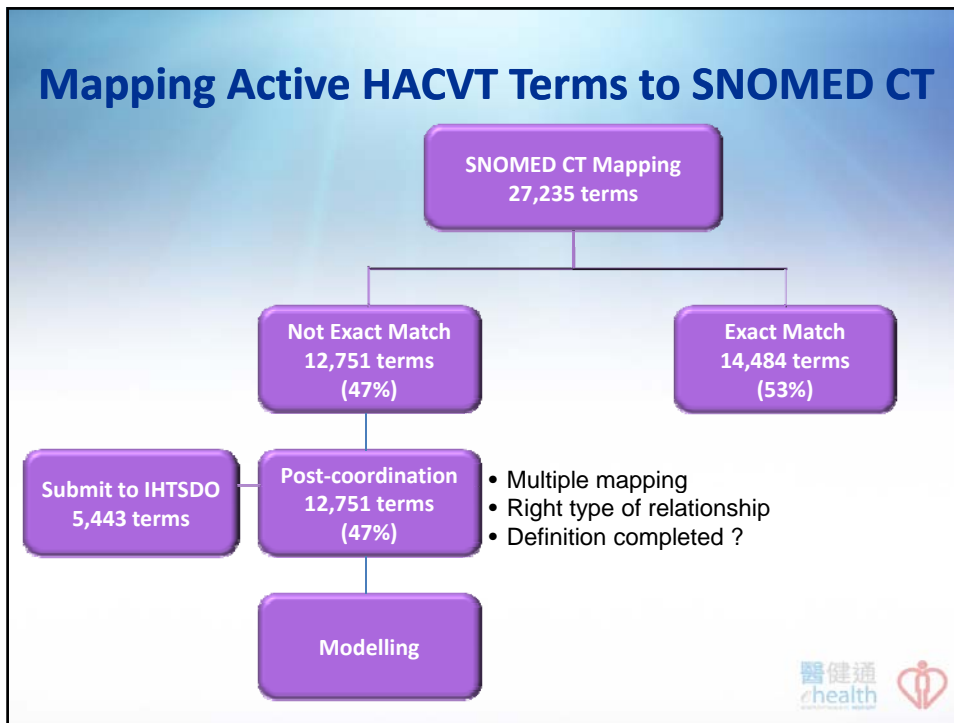
- Step 2 : Mapping
 - Check the meaning of the terms in own & target sets
 - **DON'T assume : What you see, what you get**
 - Tool
 - Be careful if using spreadsheet : easily mis-position
 - SNOMED CT : need a 'tool' for post-coordination / modeling
 - Apply terminology management principles
- Step 3 : **Quality control**
 - Computer helps a lot
 - Verified by 2nd person
 - Involve clinician / specialist, if possible
- Step 4 : Repeat steps 2 & 3 till the latest version is all mapped
- Step 5 : Ongoing maintenance



Mapping

Do it with
Extra Care





Submission to IHTSDO

Overall	Status	Diagnosis	Procedure	Organism	Specimen	Anatomical pathology	Total	%
Settled 3,882 79%	Accepted	109	47	36	74	135	401	7%
	To add to SNOMED CT with alternate description	915					915	17%
	Found		399				399	7%
	Suggest Post-coordination	1066	136	142	115	63	1522	28%
	Rejected	4	540	10	21	70	645	12%
Pending 1,561 21%	Pending further reply		393				393	7%
	Awaiting Policy	1060					1060	19%
	Pending reply		1				1	0%
	Scaled Up	4	25				29	1%
	Question for submitter		78				78	1%
Total		3158	1619	188	210	268	5443	100%
		58%	30%	3%	4%	5%	100%	

Considerations in Post-coordination

- Consistency – guidelines is needed
- Tool is required to handle description logic
- Communicate with IHTSDO for mutual benefit
- Follow up
 - Complete the maintenance cycle
 - Identify ‘fully defined’ vs ‘primitive’ for future follow up
 - Impact of SNOMED CT updates
 -
- Consider implementation issue : how data will be documented /used



5 Post-coordination Examples

5.1 Dx

- Dx1 and Dx2
- Dx1 with / related to Dx2
- Dx with (other specified / unspecified)
- Dx with (other specified / unspecified)

5.2 Dx: post-condition

- Dx1, post-Dx2 (infection)
- Dx, post-infection
- Dx, post-traumatic
- Dx, post-Px (procedure)
- Dx, post-operative
- Dx, post-

5.3 Dx: congenital (congenital disease)

- Dx1 due to
- Dx, in X
- Primary
- Mixed

3.13 Primary / Secondary Dx

Pattern	Post-coordination pattern	Example	SCT Reference
Primary Dx Secondary Dx	<ul style="list-style-type: none"> Definition: Primitive is a Dx 	<ul style="list-style-type: none"> Secondary gouty arthritis Definition: Primitive is a gouty arthritis 	<ul style="list-style-type: none"> primary dysthymia (disorder) Definition: Primitive is a dysthymia secondary hyperlipidemia (disorder) Definition: Primitive is a

3.16 Dx, congenital (congenital disease)

Pattern	Post-coordination pattern	Example	SCT Reference
Dx, congenital (congenital disease)	<ul style="list-style-type: none"> is a Dx is a 66091009 congenital disease (disorder) occurrence 255399007 congenital (qualifier value) finding site (body structure) 	<ul style="list-style-type: none"> Epilepsy - congenital is a epilepsy (disorder) is a congenital disease (disorder) occurrence congenital (qualifier value) finding site cerebral structure (body structure) 	<ul style="list-style-type: none"> congenital diplegia (disorder) is a diplegic cerebral palsy is a congenital disease occurrence congenital finding site limb structure finding site cerebral structure

Headache related to Hypertension Post-coordination

SNOMED CT

Search SNOMED CT: Update Cancel

Official SNOMED CT: Update Cancel

Submit to IHTSDO: No Yes Submission Status: Release Date:

HK SCT ID: IHTSDO SNOMED CT ID:

Fully specified name:

Preferred name:

Status: Definition:

IS_A Headache (finding)

Group	Attribute	Value
---	Finding site (attribute)	Head structure (body structure)

Parent's information

Group	Attribute	Value
---	Associated with	<input type="text" value="38341003"/> Hypertensive disorder, systemic arterial (disorder)

Post-coordination

Headache related to Hypertension Stated & Inferred Views

SNOMED CT

SCT Concept ID	7530	Status	Current	Hierarchy	Clinical finding
SCT Concept Description	Headache related to hypertension ~ finding		Terminology	HK SCT_STG	

Description Type	Description ID	Term
Full	N/A	Headache related to hypertension ~ finding
Preferred	N/A	Headache related to hypertension

Inferred View ⓘ

- ❖ Fully defined
 - Is a
 - Headache (finding)
 - Associated with (attribute)
 - Hypertensive disorder, systemic arterial (disorder)
 - Finding site (attribute)
 - Head structure (body structure)

From parent

Stated View ⓘ

- ❖ Fully defined
 - Is a
 - Headache (finding)
 - Associated with (attribute)
 - Hypertensive disorder, systemic arterial (disorder)

SNOMED & LOINC

Term ID 5200001 **IN USE**

Nature Lab. Test

Full Description 5-Fluorocytosine [Susceptibility] by Minimum inhibitory concentration (MIC)

Short Stage

Remain Alias

Test C

SW

CP

LO

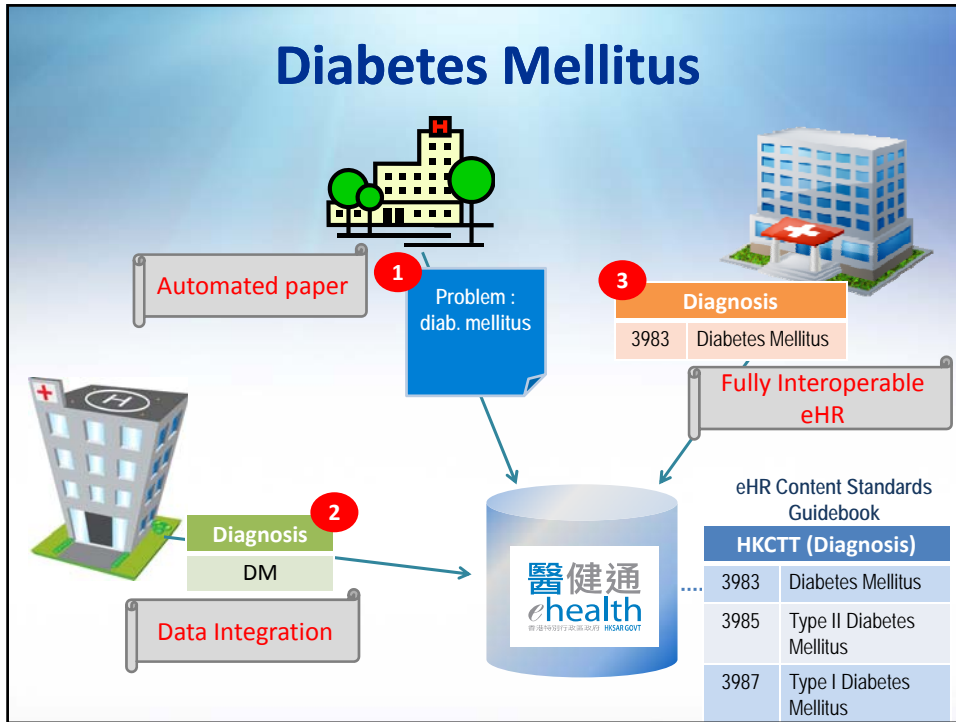
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LOINC		
SNOMED CT Value		
Attribute	Code ID	Concept Name
Component	28506006	- Flucytosine (product)
Has property	118588007	- Susceptibility (property) (qualifier value)
Has time aspect	123029007	- Single point in time (qualifier value)
Has specimen	119303007	- Microbial isolate specimen (specimen)
Has scale type	117365007	- Ordinal OR quantitative value (qualifier value)
Measurement method	39334004	- Broth microdilution susceptibility test (procedure)
Is a	39334004	- Broth microdilution susceptibility test (procedure)

LOINC Axis	LOINC Value	SNOMED CT Attribute	SNOMED CT Value	Show Name
Component	5-Fluorocytosine	Component	28506006	
Property	Susceptibility	Has property	118588007	
Time Aspect	Point in time	Has time aspect	123029007	
System	Isolate	Has specimen	119303007	
Scale	Quantitative or Ordinal	Has scale type	117365007	
Method	MINIMUM INHIBITORY CONCENTRATI	Measurement method	39334004	
		Is a	39334004	

Usage of SNOMED CT in eHR – An Exploration

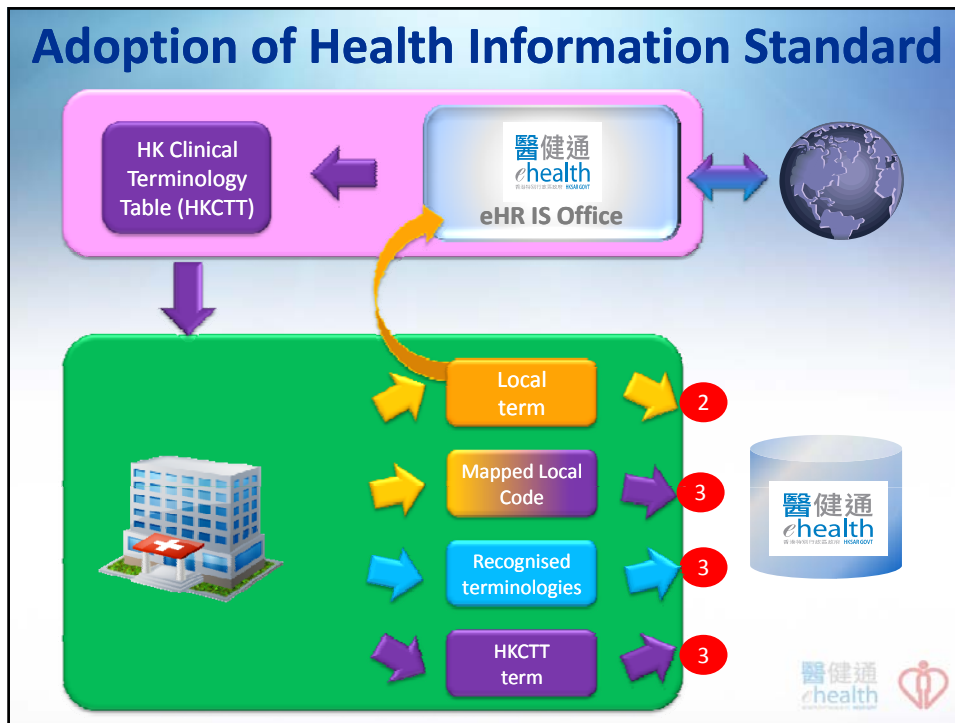
- Clean up HKCTT
- Assist searching
- Link laboratory order, test and result
 - LOINC-SNOMED CT mapping
- Group data for presentation
 - Semantic proximity
- Define decision support checking data using structure similar to SNOMED CT
- Data retrieval based on SNOMED CT relationship
 - Start with 'is-a' for organism



Type 1 Diabetes Mellitus in eHR

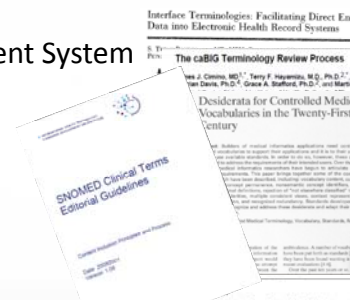
Date	Provider	Description	Code	System
3 Jan 2004	Hospital A	Insulin-dependent diabetes mellitus without complications	E10.9	ICD10
4 Feb 2001	Dr Chan	Diabetes mellitus type 1	46635009	SCT
3 Mar 1999	Hospital B	Type 1 diabetes mellitus	3987	HKCTT
5 May 2003	Hospital C	Pneumonia	8471	HKCTT
6 Dec 2002	Dr Wong	Pneumonia, unspecified	J18.8	ICD 10
9 Sep 2002	Dr Ho	Insulin-dependent diabetes mellitus	DM1	Ho's List

neatn



Management of HKCTT

- Governance
 - eHR IS CG, eHR IS DGs, HKCTT EG
- Development
 - Terminology management principles & editorial rules
 - Special handle : nonspecific / vague terms
- Maintenance
 - Information Architecture Management System
 - Quality management
 - Feedback mechanism
 - Regular update
 - Distribution



Implementation of SNOMED CT Personal Opinion

- Top management support
- Governance : content, administration
- Resources : funding, people
- Policy & principles
- Training & education
- Design, develop, implement, & maintain
 - Always have the purpose(s) in mind
 - Know the limitation(s)
 - A good tool helps a lot
- Implementation in application : data capturing & retrieving
- Network, communicate & feedback
- Change management
- Expectation management



Have patience
Keep learning
Keep dreaming



Thank You

