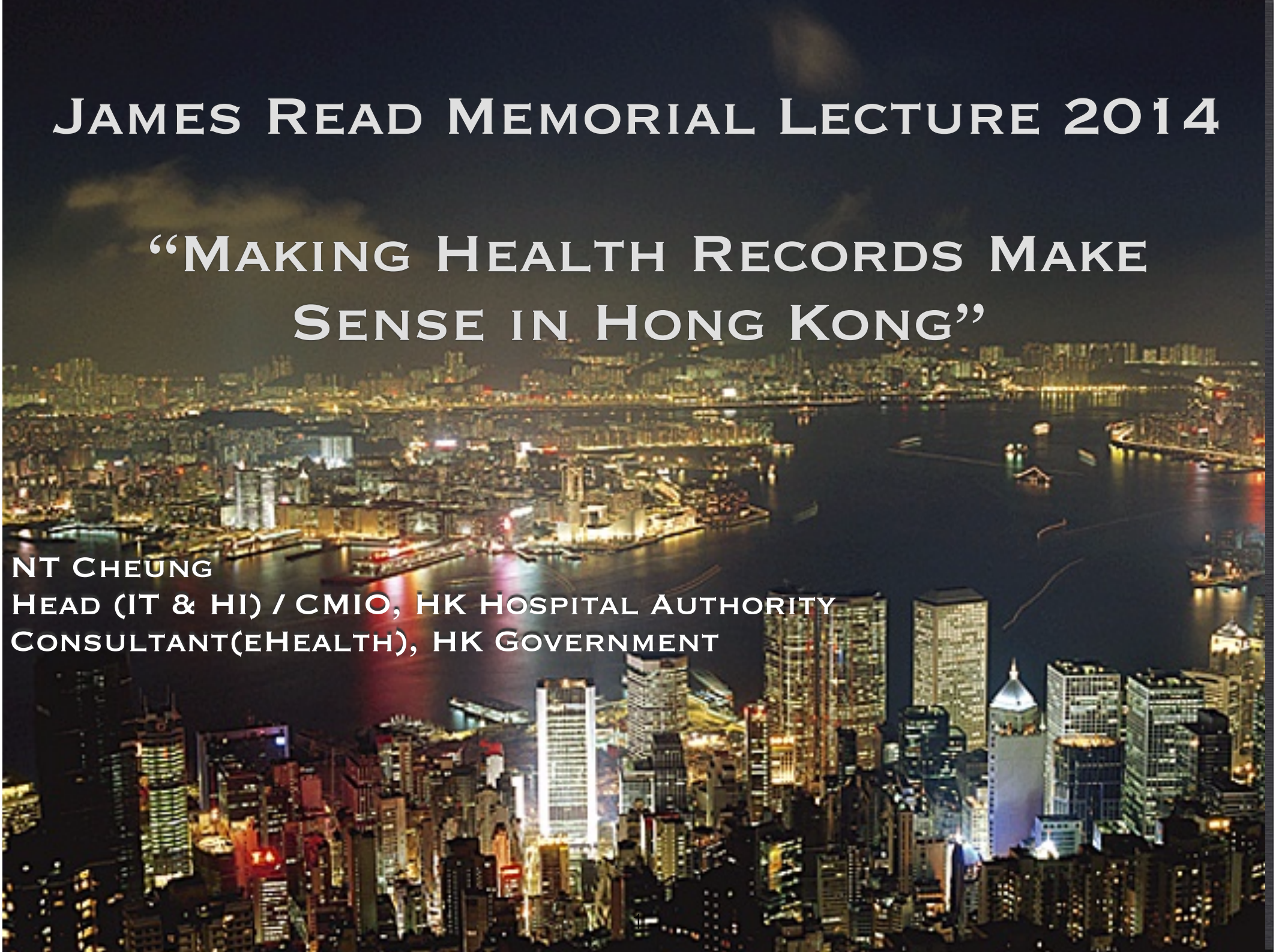
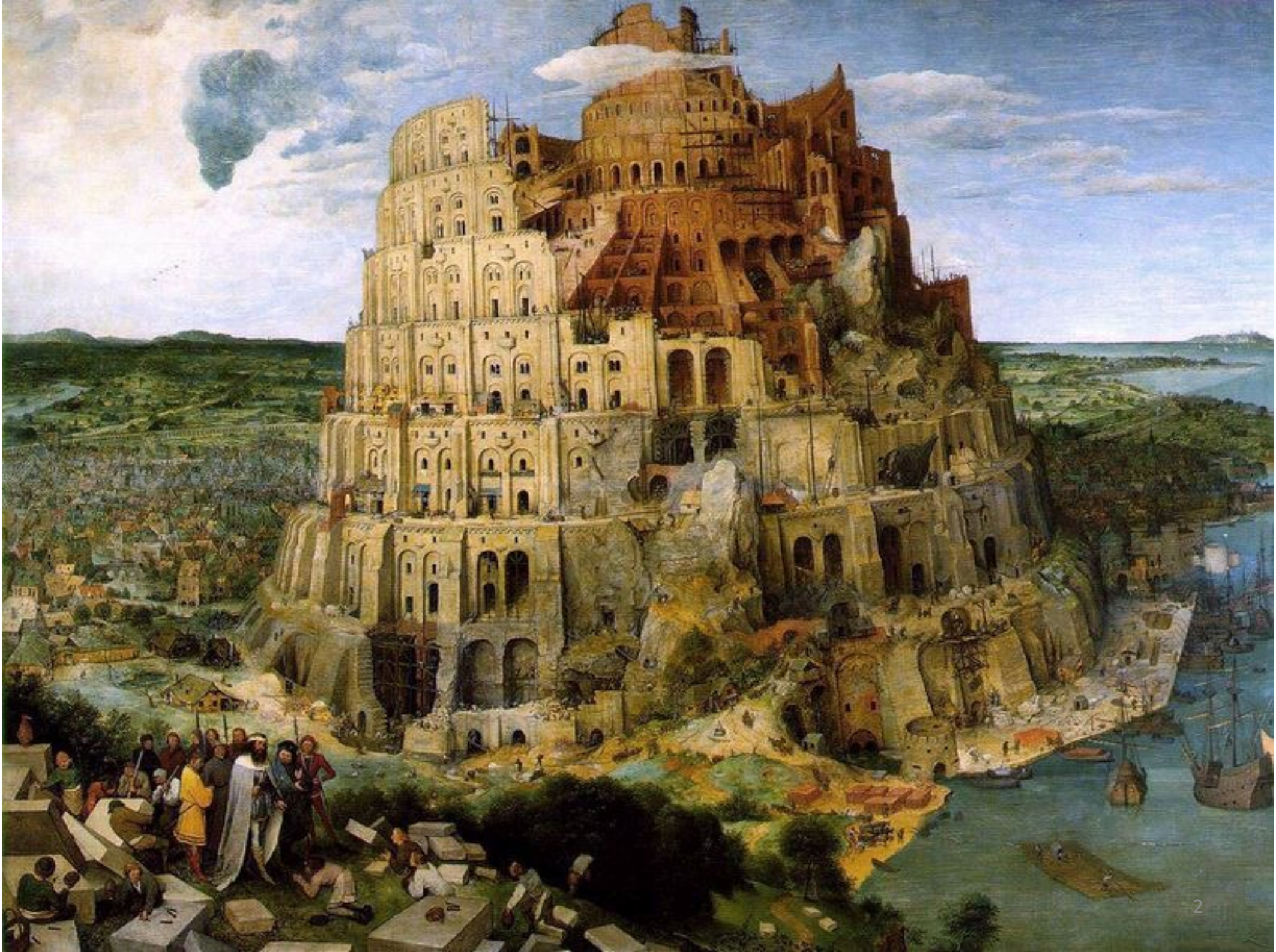
James Read Memorial Lecture 2014

"Making Health Records Make Sense in Hong Kong"



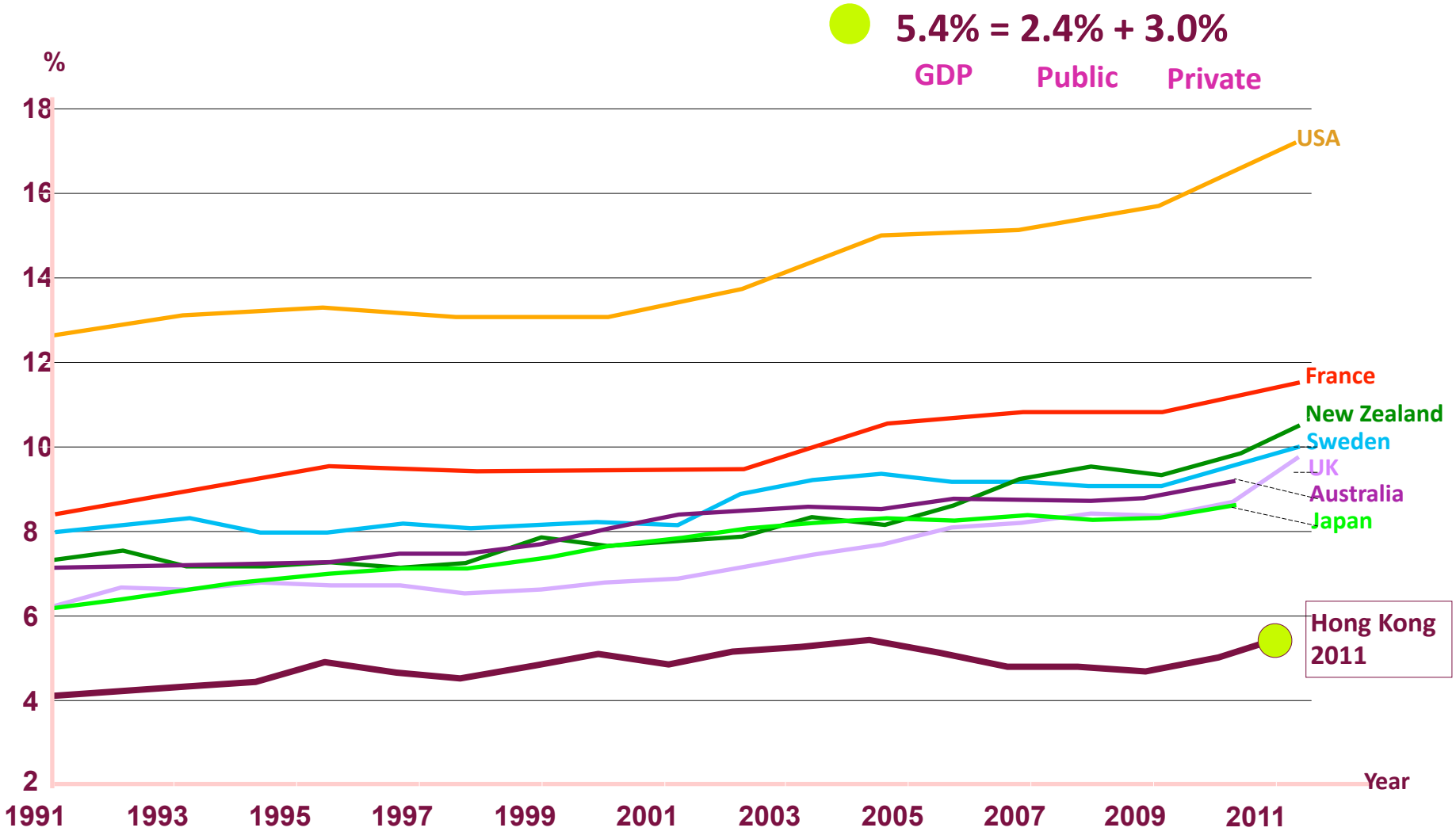
NT Cheung
Head (IT & HI) / CMIO, HK Hospital Authority
Consultant(eHealth), HK Government



B.C. 220

Standardised Chinese Characters

Total Expenditure on Health as Percentage of GDP



Sources: (1) Census and Statistics Department, 2011 GDP
(2) OECD Health Data October 2012

Walker et al, "The Value Of Health Care Information Exchange And Interoperability" Health Affairs 2005

"…net savings from national implementation of fully standardized interoperability between providers… could yield $77.8 billion annually"

"…We suspect that the clinical payoff in improved patient safety and quality of care could dwarf the financial benefits projected…"

Key Message

- **A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost**

Hospital Authority

- Established 1991

- 42 Public Hospitals
- 47 Specialist Outpatient Clinics (SOPD)
- 73 General Outpatient Clinics (GOPC)

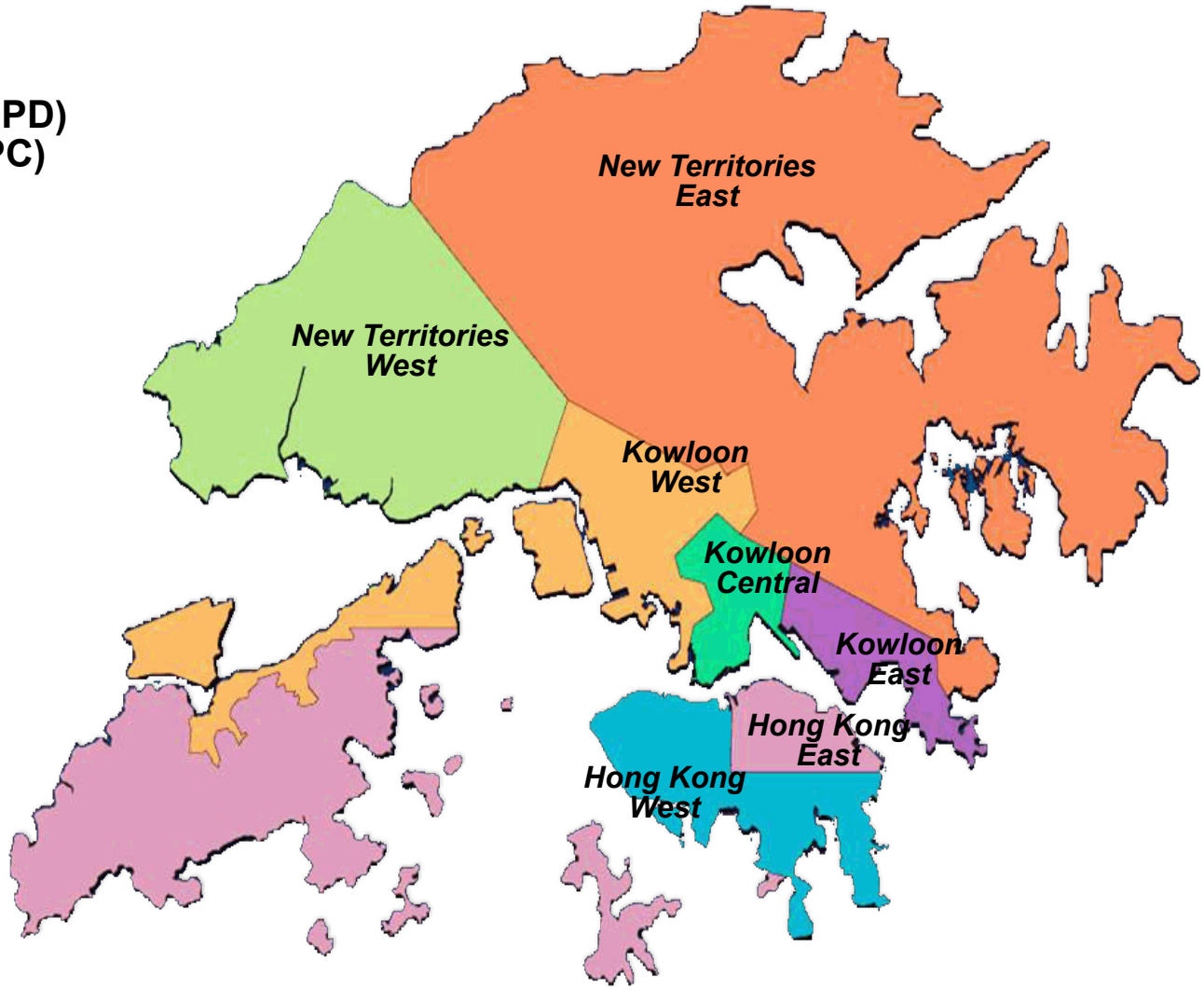
- Close to 27,500 Beds

- Around 67,600 Staff
- Around 22,700 Nurses
- Around 5,700 Doctors

- Around HK$ 46b Annual Operating Budget (~US$6 billion)

- 6.10m GOPC Attendances

- 9.37m SOPD Attendances
- 2.24m A&E Attendances
- 1.57m Inpatient and Day Patient Discharges



Source:
1. HA Statistical Report 2012/13
2. HA Information Fact Sheet Jun 2014
3. www.ha.org.hk

eHealth in the HA - The Road Less Travelled

1990 "Green fields"

1991 Patient administration + Departmental systems

1995 **Clinical Management System (CMS)**

2000 **Electronic Patient Record (ePR)**

2003 eSARS

2004 ePR Image Distribution

2006 PPI ePR sharing

2008 **CMS Phase III**

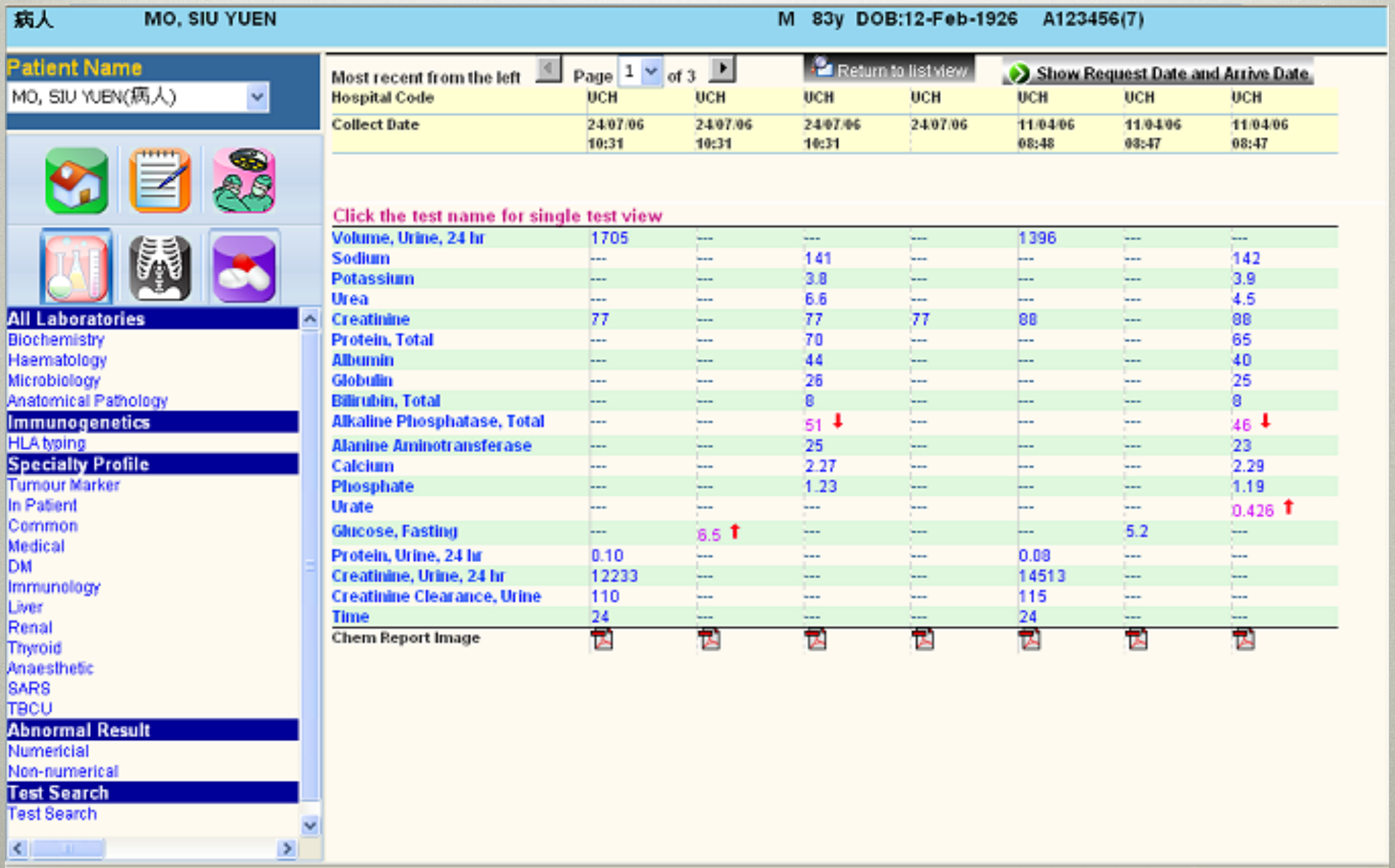
2009 Filmless HA

Hong Kong wide eHR

2010 Inpatient MOE

2013 Mobile CMS

Electronic Patient Record



病人 MO, SIU YUEN M 83y DOB:12-Feb-1926 A123456(7)

Patient Name

MO, SIU YUEN(病人)

All Laboratories
Biochemistry
Haematology
Microbiology
Anatomical Pathology
Immunogenetics
HLA typing
Specialty Profile
Tumour Marker
In Patient
Common
Medical
DM
Immunology
Liver
Renal
Thyroid
Anaesthetic
SARS
TBCU
Abnormal Result
Numericial
Non-numerical
Test Search
Test Search

Most recent from the left | Page 1 of 3 | Return to list view | Show Request Date and Arrive Date

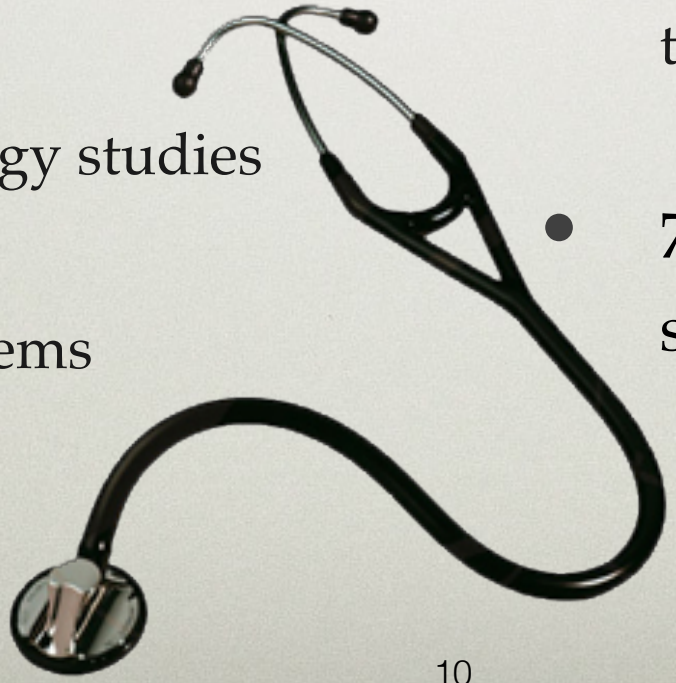
Hospital Code	UCH	UCH	UCH	UCH	UCH	UCH	UCH
Collect Date	24/07/06 10:31	24/07/06 10:31	24/07/06 10:31	24/07/06	11/04/06 08:48	11/04/06 08:47	11/04/06 08:47

Click the test name for single test view

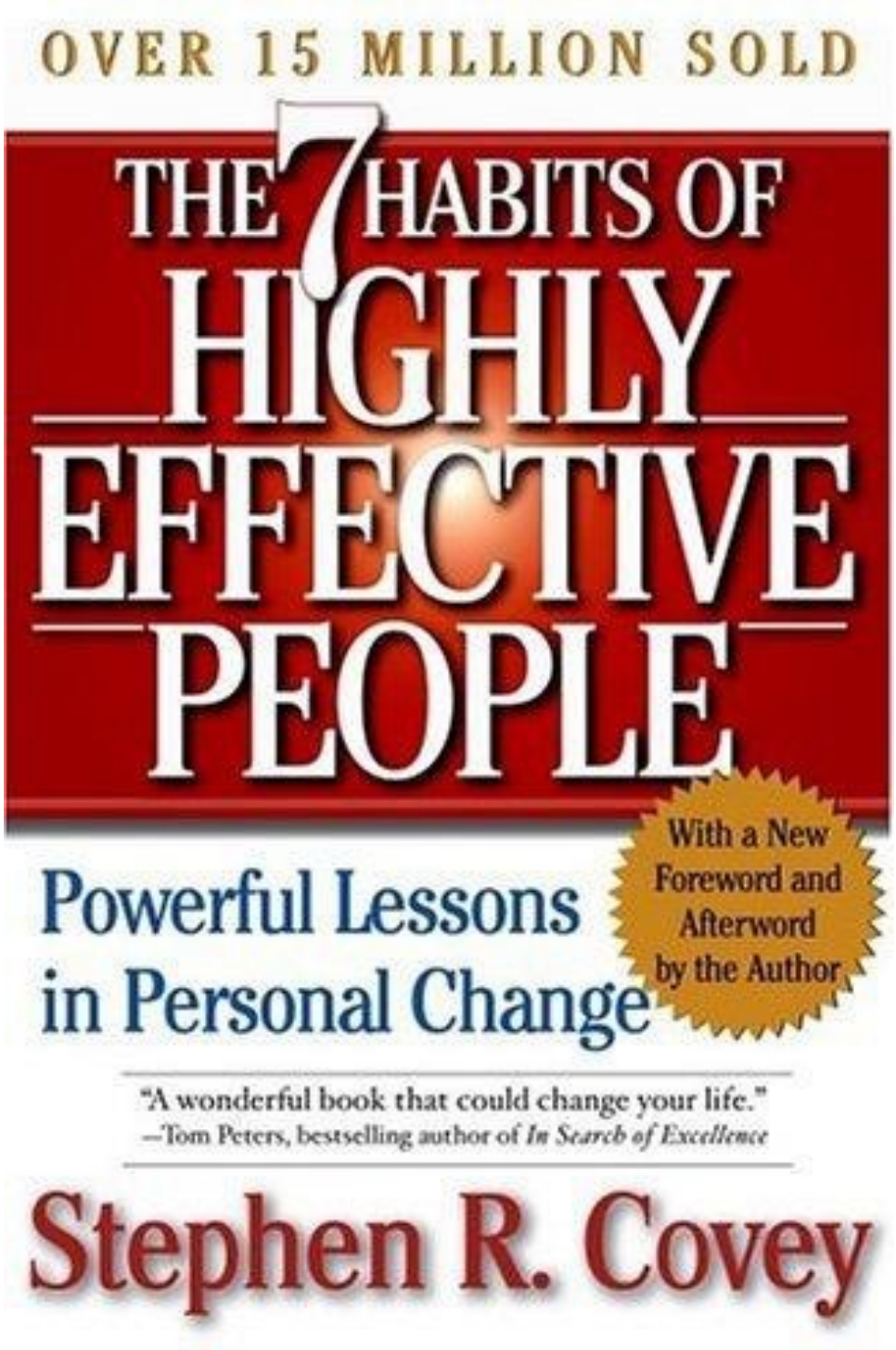
Volume, Urine, 24 hr	1705	---	---	---	1396	---	---
Sodium	---	---	141	---	---	---	142
Potassium	---	---	3.8	---	---	---	3.9
Urea	---	---	6.6	---	---	---	4.5
Creatinine	77	---	77	77	88	---	88
Protein, Total	---	---	70	---	---	---	65
Albumin	---	---	44	---	---	---	40
Globulin	---	---	26	---	---	---	25
Bilirubin, Total	---	---	8	---	---	---	8
Alkaline Phosphatase, Total	---	---	51 ↓	---	---	---	46 ↓
Alanine Aminotransferase	---	---	25	---	---	---	23
Calcium	---	---	2.27	---	---	---	2.29
Phosphate	---	---	1.23	---	---	---	1.19
Urate	---	---	---	---	---	---	0.426 ↑
Glucose, Fasting	---	6.5 ↑	---	---	---	5.2	---
Protein, Urine, 24 hr	0.10	---	---	---	0.08	---	---
Creatinine, Urine, 24 hr	12233	---	---	---	14513	---	---
Creatinine Clearance, Urine	110	---	---	---	115	---	---
Time	24	---	---	---	24	---	---
Chem Report Image							

HA's Clinical Management System - An essential clinical tool

- **9M** patients
- **223M** episodes of care
- **1B** laboratory results
- **115M** radiology studies
- **388M** drug items



- **3.5M** updates / day
- **700K** hits / day
- **Sub-second** response time
- 7x24 >**99.98%** uptime since live run


OVER 15 MILLION SOLD
THE 7 HABITS OF HIGHLY EFFECTIVE PEOPLE
With a New Foreword and Afterword by the Author
Powerful Lessons in Personal Change
"A wonderful book that could change your life."
—Tom Peters, bestselling author of In Search of Excellence
Stephen R. Covey

The Seven Principles of Highly Effective Informaticians

1. The customer is always right
2. Medicine is an art and a science
3. Win - Win - Win - Win - Win
4. One step at a time
5. Use it or lose it
6. Focus and prioritize
7. Embrace your informaticians

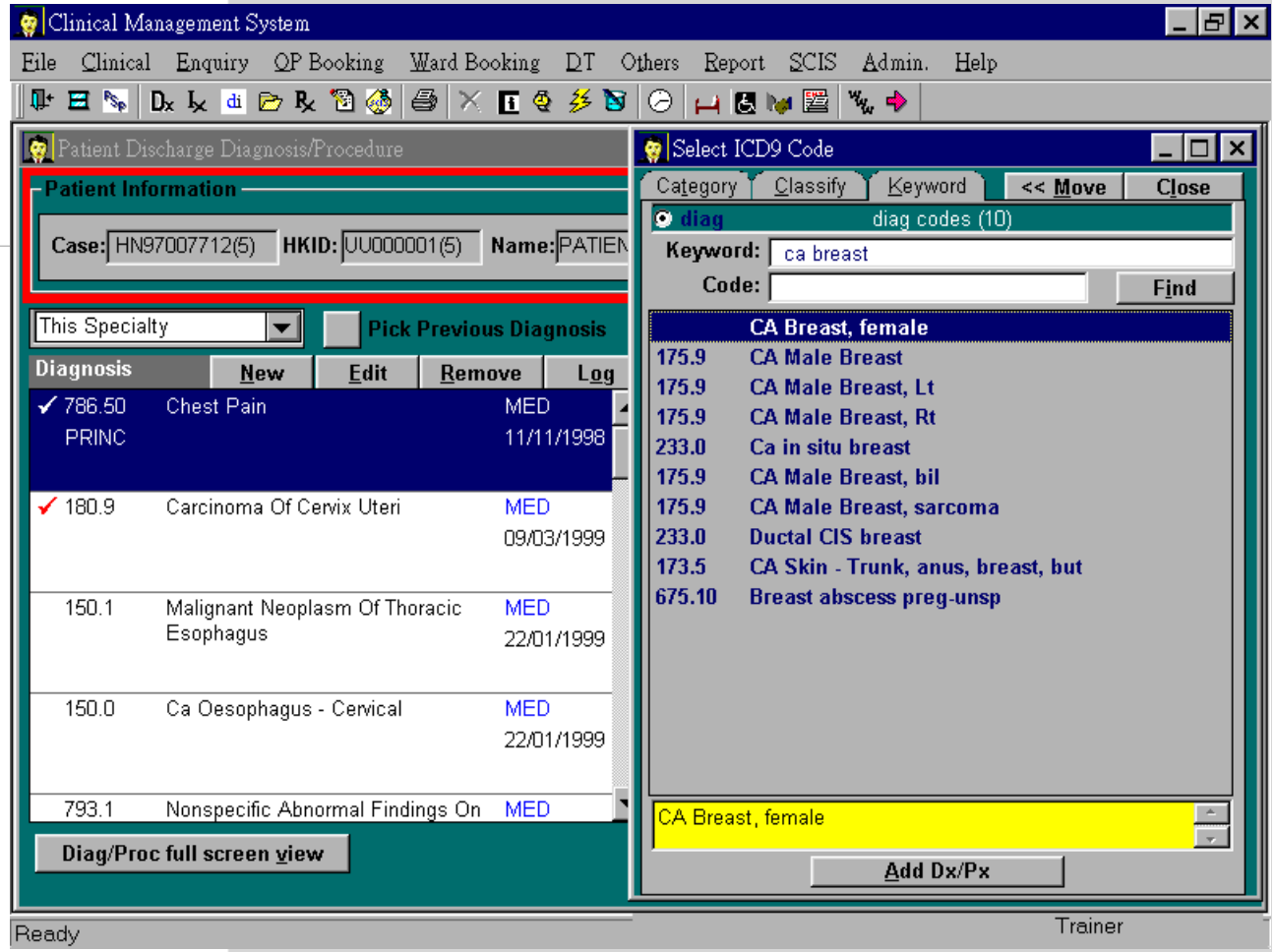
Principle 4: One Step at a Time

"Crossing the river, feeling one stone at a time"

Deng Xiaoping

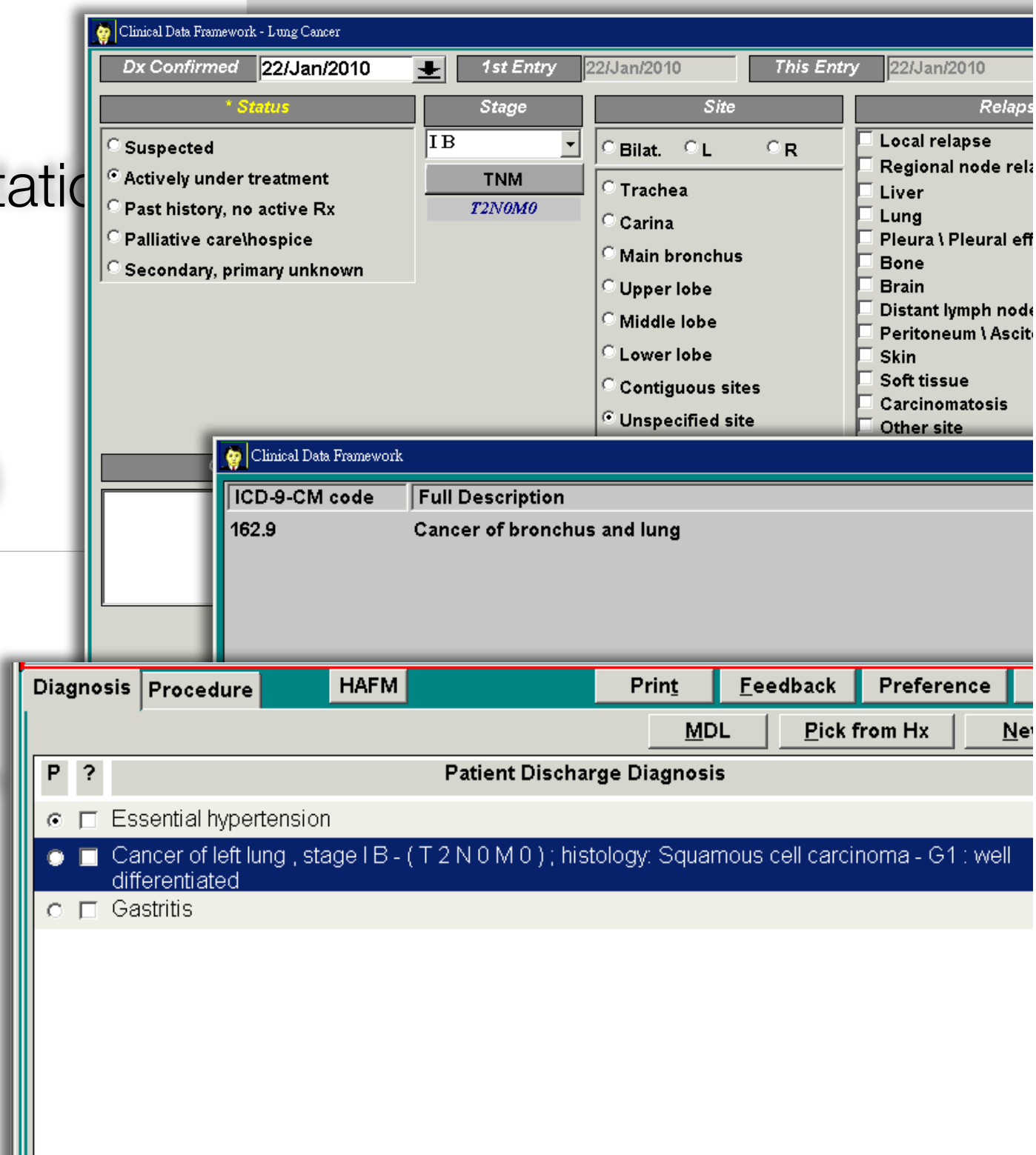
Clinical documentation in the CMS: (1st Generation) Clinical coding

- ICD codes with extensions
- Clinician friendly terms attached to these codes
    - Multiple input mechanisms



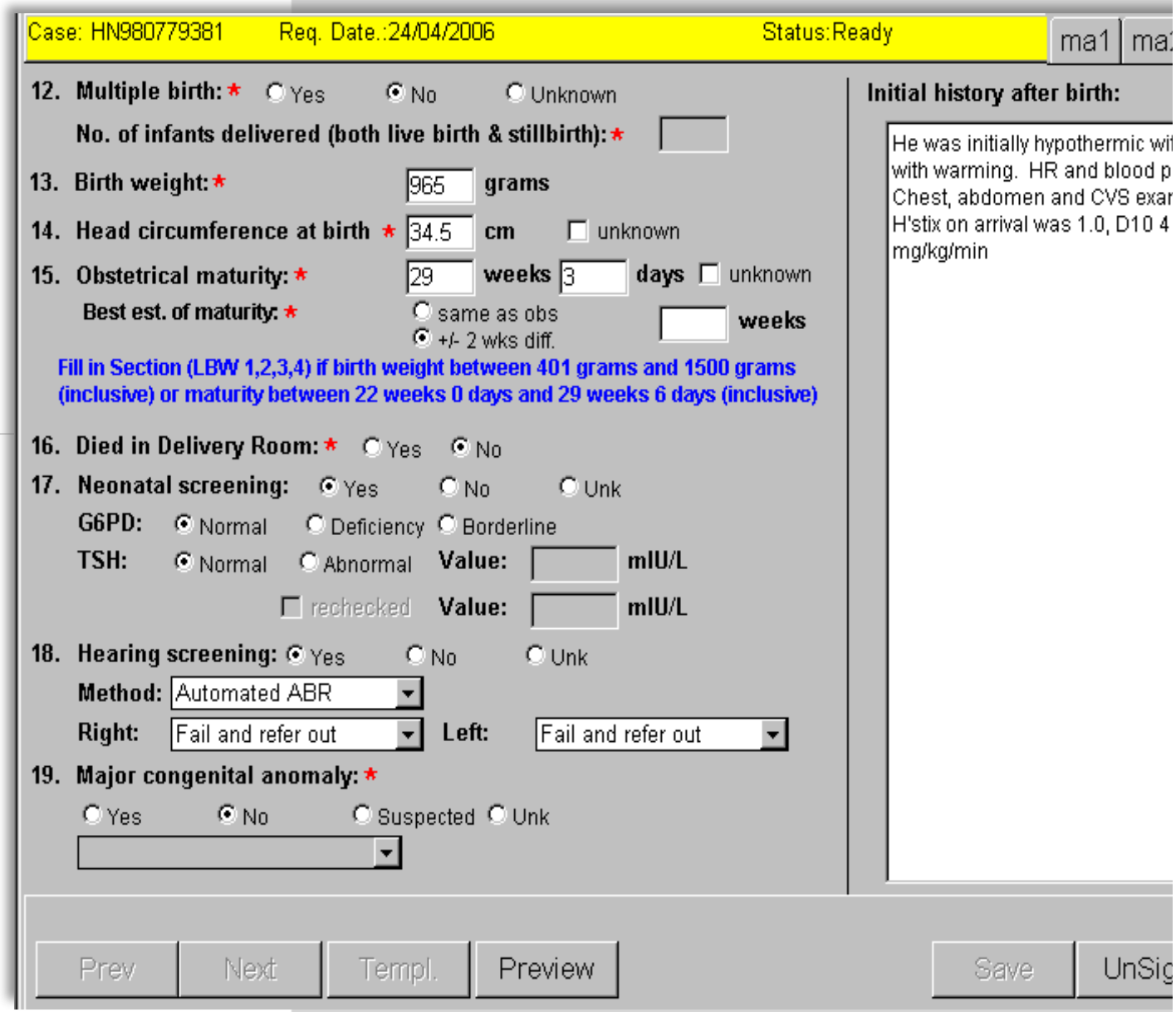
Clinical documentatic in the CMS: (2nd Generation) Clinical Data Framework (CDF)

- Document disease
  - No coding required
- Generic framework with disease specific data

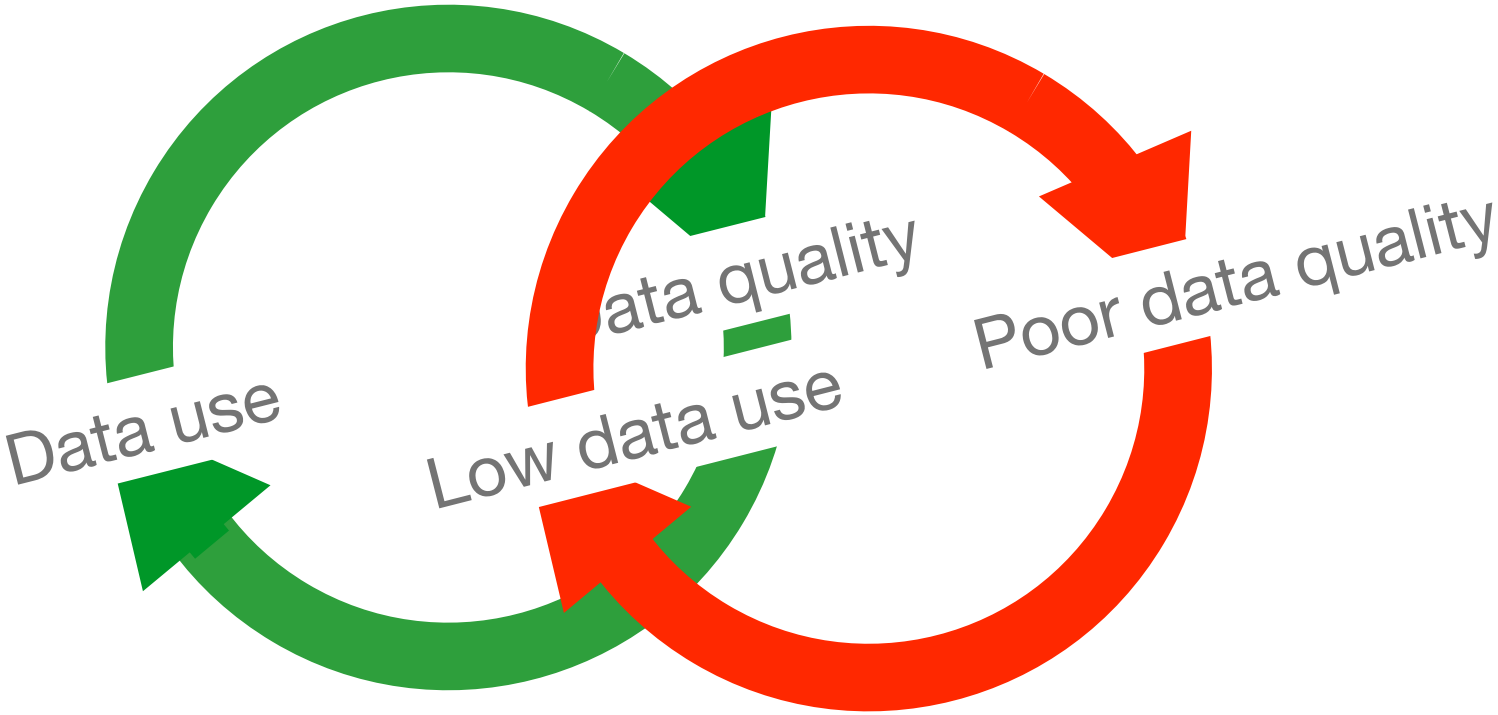


Clinical documentation in the CMS: (3rd Generation) Generic Clinical Documentation (GCD)

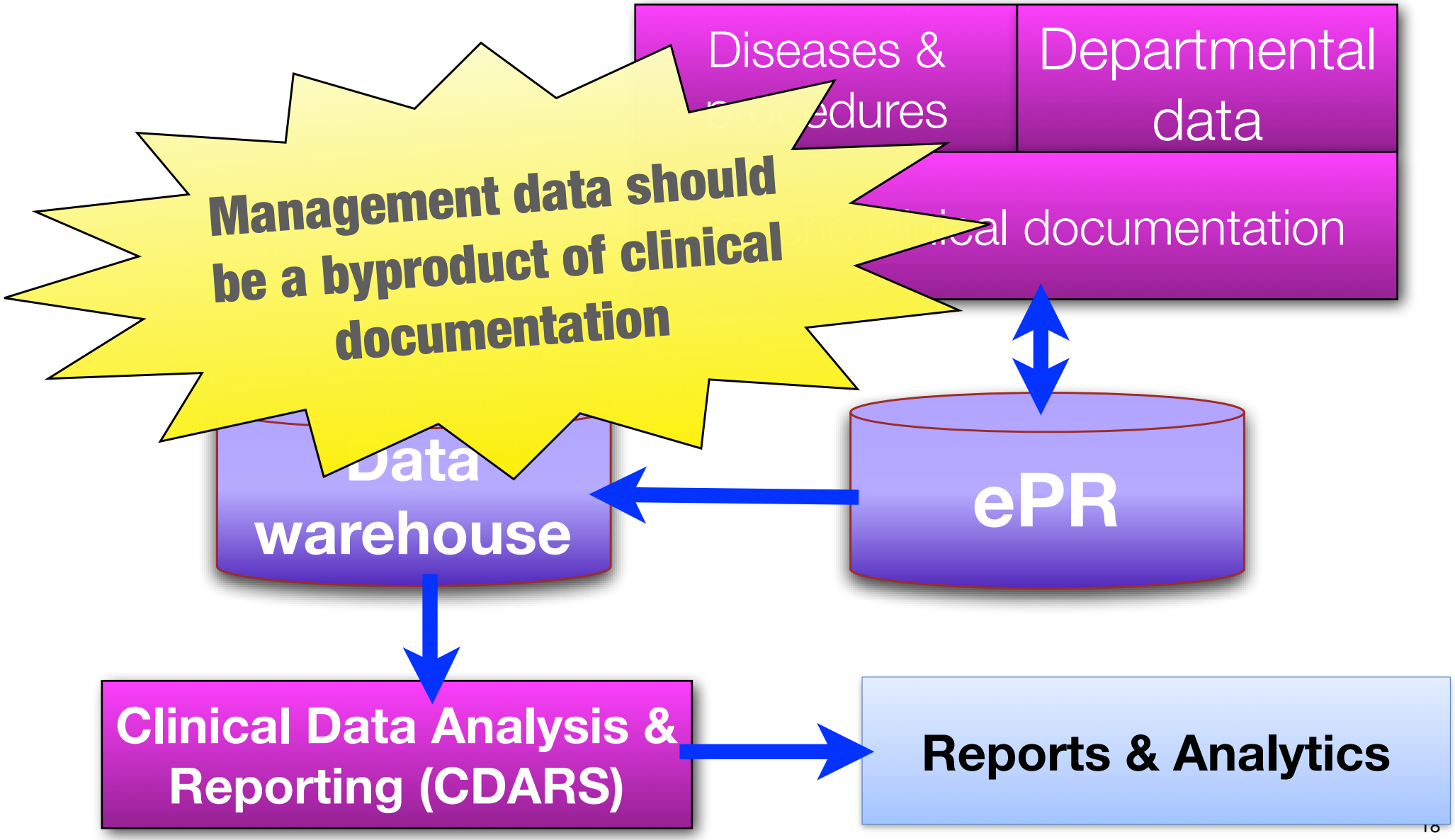
- Flexible forms
- Structured data linked to terminology
- Automatic documentation with code generation
- Reuse of data previously entered



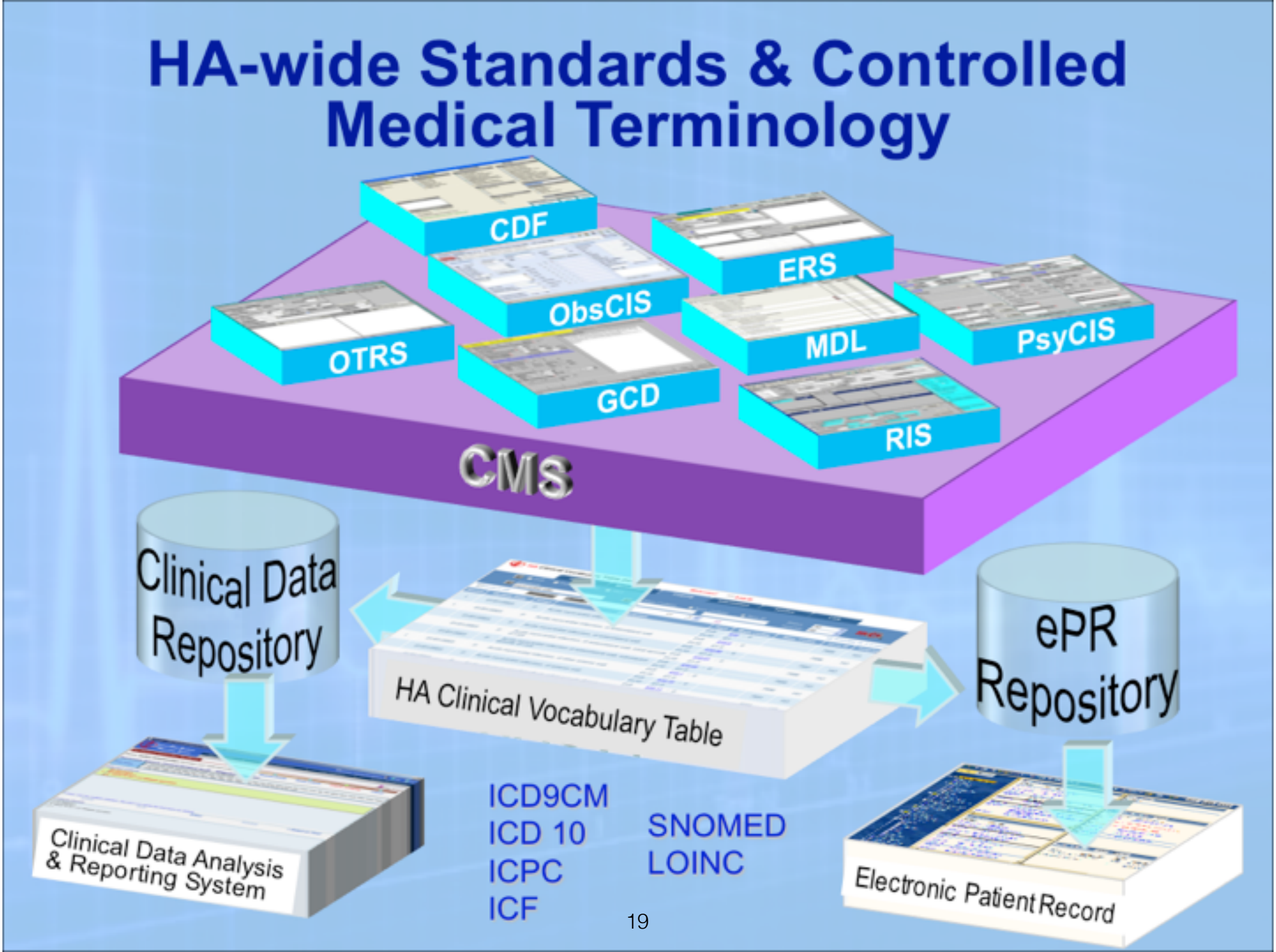
Principle 5: Use it or Lose it



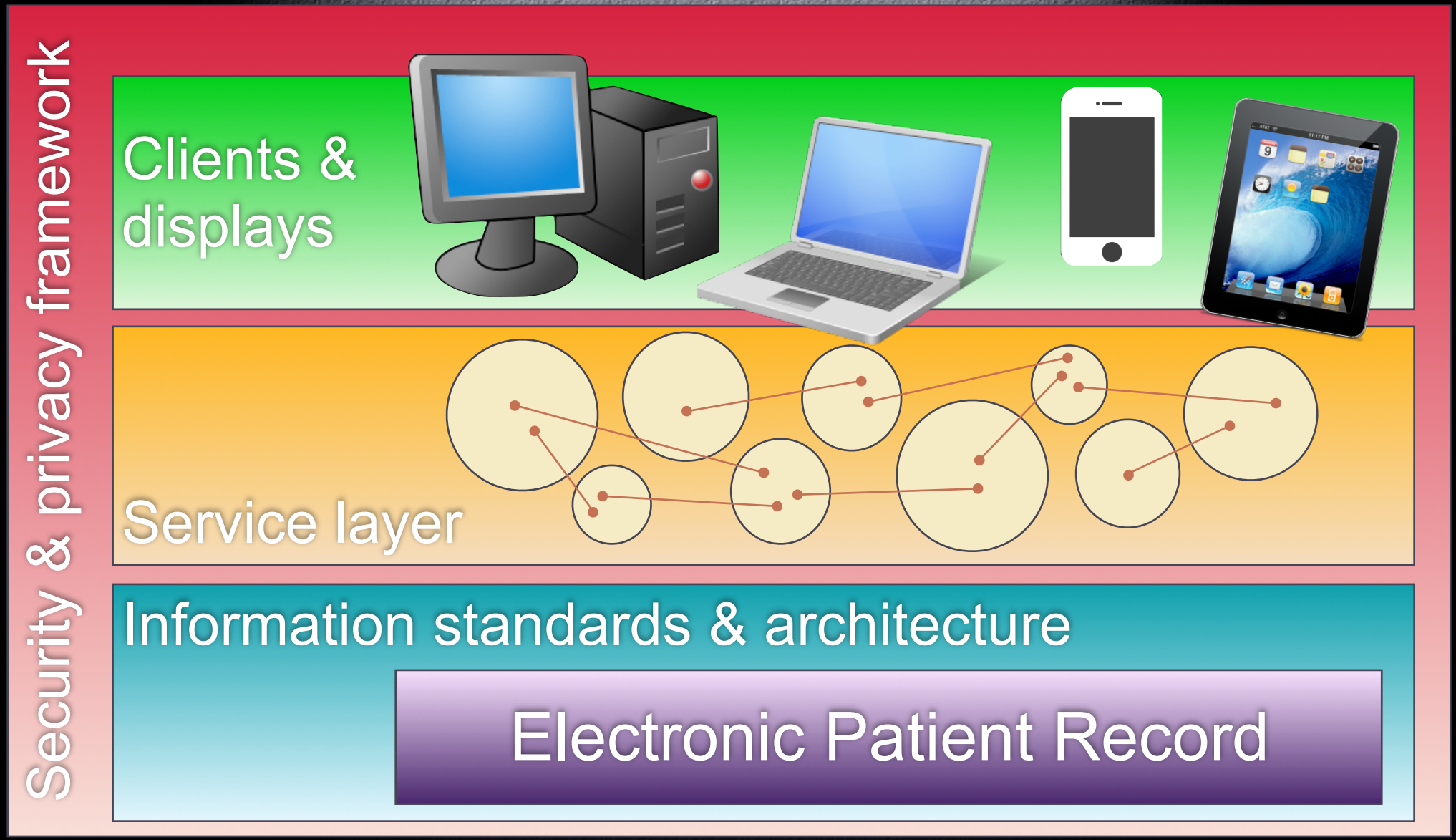
Documentation becomes knowledge



HA-wide Standards & Controlled Medical Terminology



CMS III: A sustainable architecture



HA Information Architecture

Entities - facts

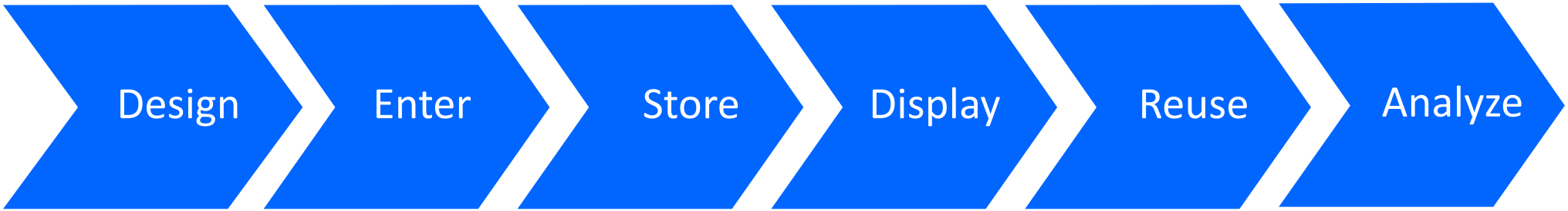
What does the data mean?

Forms - context

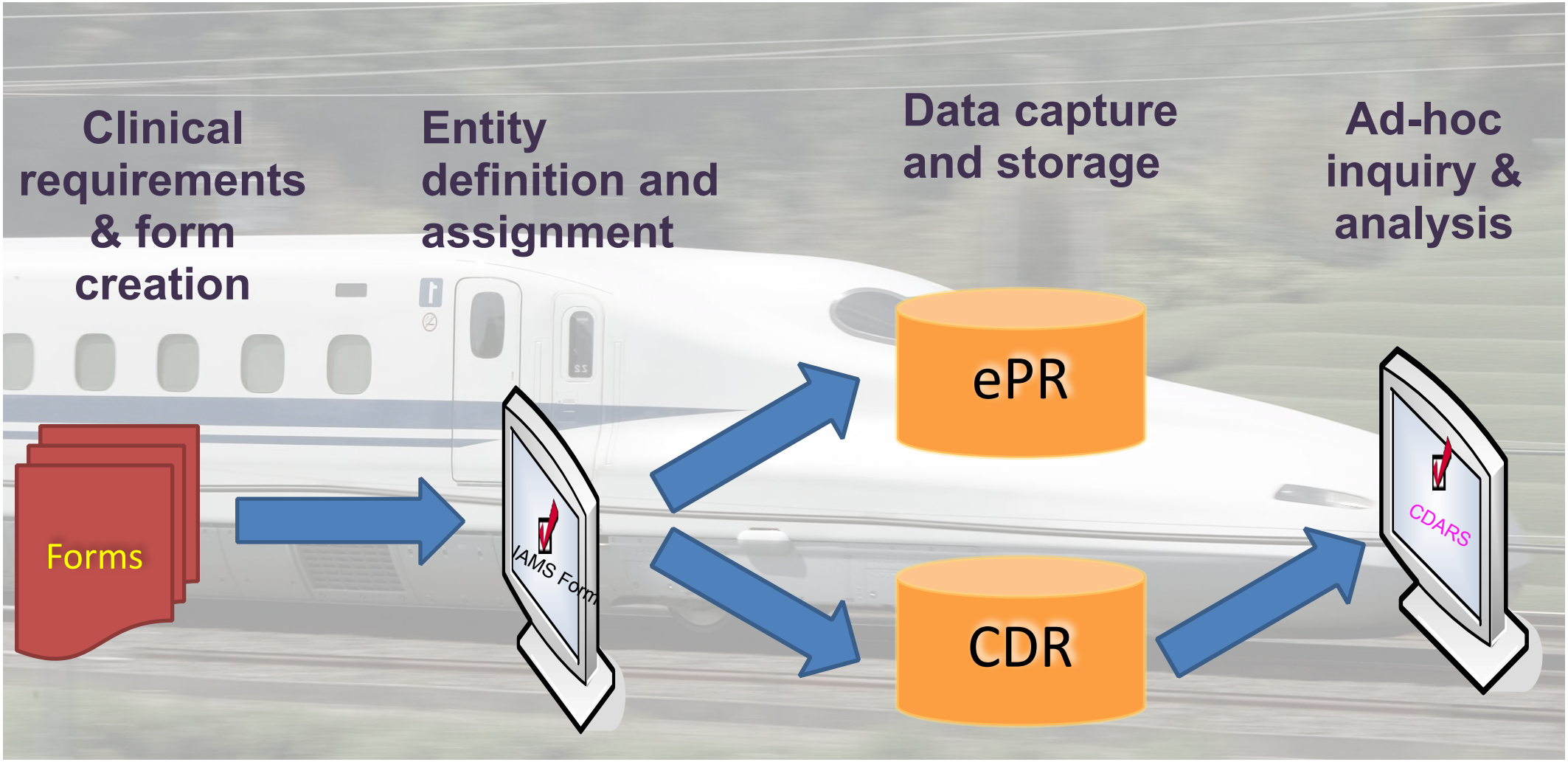
How should it be interpreted?

Format - display

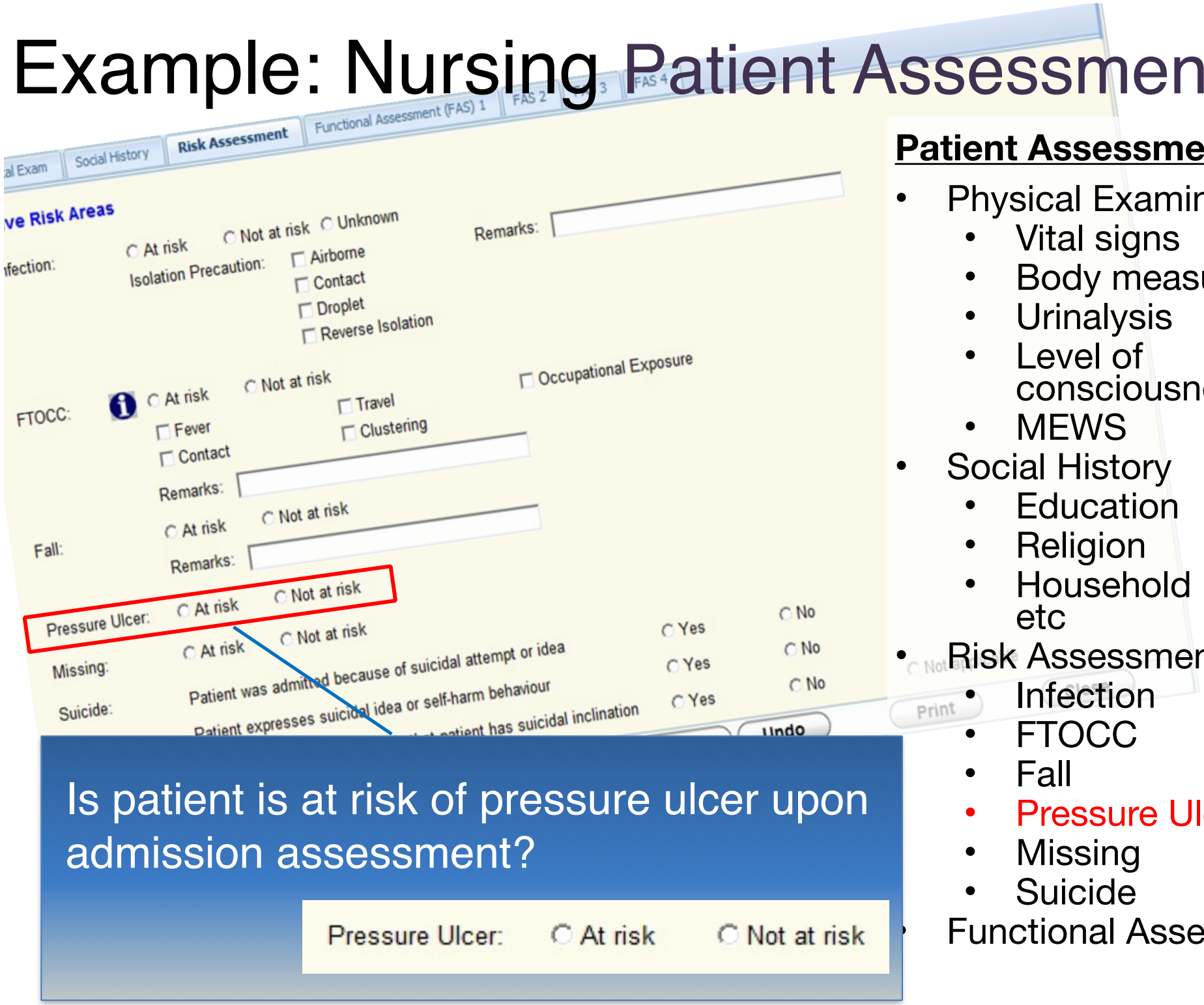
How should it be displayed?



Generic Clinical Documentation (GCD) Thru' Train

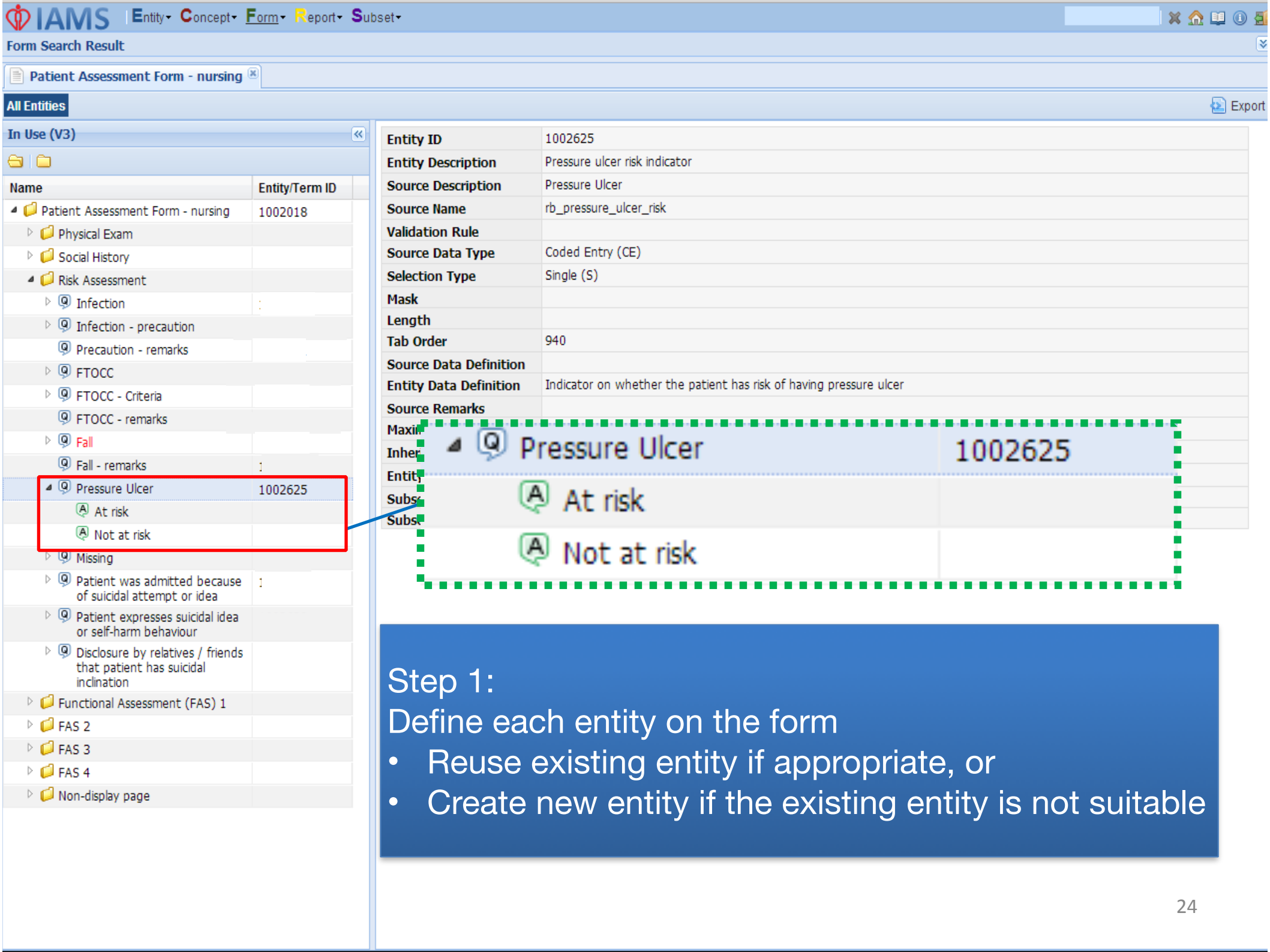


Example: Nursing Patient Assessment



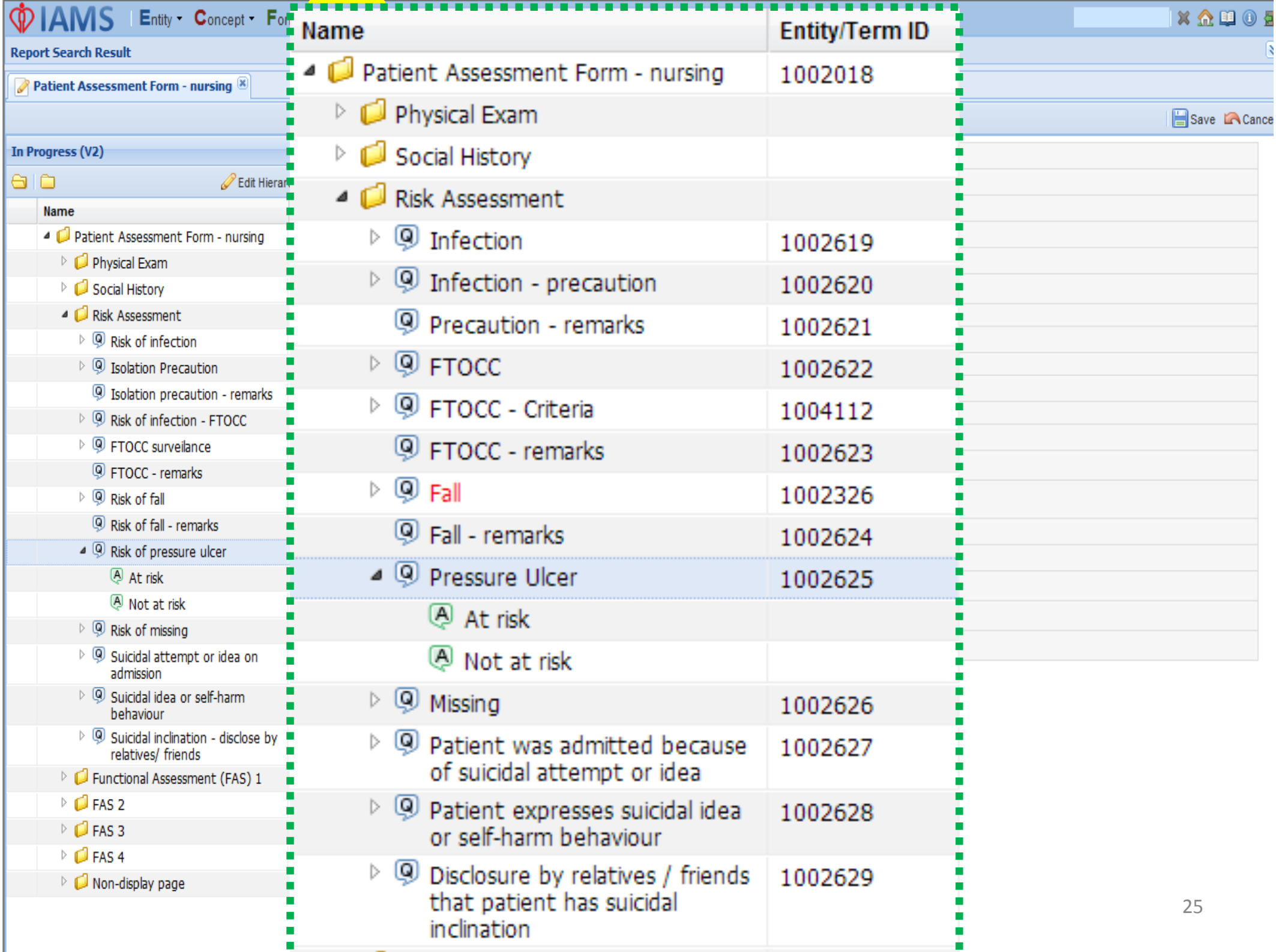
Patient Assessment Form

- Physical Examination
  - Vital signs
  - Body measurement
  - Urinalysis
  - Level of consciousness
  - MEWS
- Social History
  - Education
  - Religion
  - Household members, etc
- Risk Assessment
  - Infection
  - FTOCC
  - Fall
  - Pressure Ulcer
  - Missing
  - Suicide
- Functional Assessment



Step 1:
Define each entity on the form

- Reuse existing entity if appropriate, or
- Create new entity if the existing entity is not suitable


IAMS
Entity
Concept
Report Search Result
Patient Assessment Form - nursing
In Progress (V2)
Edit Hierar
Name
Patient Assessment Form - nursing
Physical Exam
Social History
Risk Assessment
Risk of infection
Isolation Precaution
Isolation precaution - remarks
Risk of infection - FTOCC
FTOCC surveilance
FTOCC - remarks
Risk of fall
Risk of fall - remarks
Risk of pressure ulcer
At risk
Not at risk
Risk of missing
Suicidal attempt or idea on admission
Suicidal idea or self-harm behaviour
Suicidal inclination - disclose by relatives/ friends
Functional Assessment (FAS) 1
FAS 2
FAS 3
FAS 4
Non-display page
Save
Cance
Name
Entity/Term ID
Patient Assessment Form - nursing 1002018
Physical Exam
Social History
Risk Assessment
Infection 1002619
Infection - precaution 1002620
Precaution - remarks 1002621
FTOCC 1002622
FTOCC - Criteria 1004112
FTOCC - remarks 1002623
Fall 1002326
Fall - remarks 1002624
Pressure Ulcer 1002625
At risk
Not at risk
Missing 1002626
Patient was admitted because of suicidal attempt or idea 1002627
Patient expresses suicidal idea or self-harm behaviour 1002628
Disclosure by relatives / friends that patient has suicidal inclination 1002629

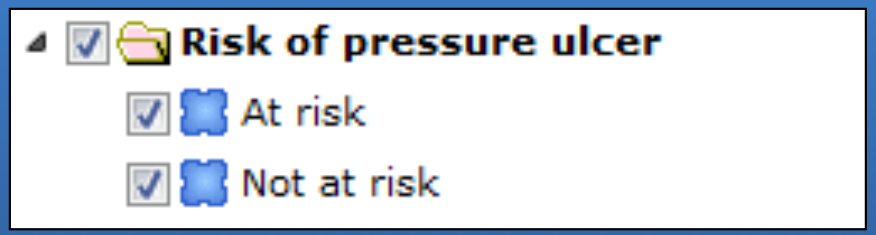
Patient Assessment Form - nursing

Help

Criteria List

- Patient Assessment Form - nursing
  - Signed (Y/N)
  - Physical Exam
  - Social History
  - **Risk Assessment**
    - **Risk Assessment**
      - Risk of infection
      - Isolation Precaution
      - Risk of infection according to FTOCC indicator
      - Risk of fall
      - **Risk of pressure ulcer**
        - At risk
        - Not at risk
      - Risk of missing
      - Patient was admitted because of suicidal attempt or idea
      - Patient expresses suicidal idea or self-harm behaviour
      - Disclosure by relatives / friends that patient has suicidal inclination
  - Functional Assessment (FAS) 1

Select the criteria in 'Criteria List'

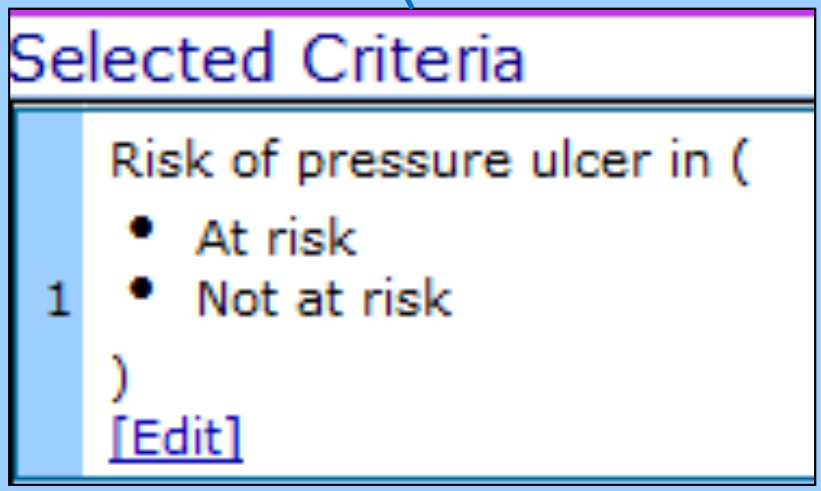


>> Add

<< Remove

Selected Criteria

Risk of pressure ulcer in (
1 • At risk
• Not at risk
)
[Edit]



Key: Column Group / Folder | Column | Value / Query
allow multiple values | do not allow multiple values

*Press 'Ctrl' for multiple selection.

Close | Reset | Add Criteria

Pending update

CDARS Report

PAS: Risk of pressure ulcer (Patient Assessment Form - nursing (PAS) (By Date of assessment))	At risk	Not at risk	Row Total
Institution (EIS)	No. of Forms - Patient Assessment Form - nursing (Patient Assessment Form - nursing (PAS) (By Date of assessment))	No. of Forms - Patient Assessment Form - nursing (Patient Assessment Form - nursing (PAS) (By Date of assessment))	No. of Forms - Patient Assessment Form - nursing (Patient Assessment Form - nursing (PAS) (By Date of assessment))
	1 4944	2 41737	46681
Grand Total :	4944	41737	46681

No. of forms with Pressure ulcer risk = 4944

No. of forms with no Pressure ulcer risk = 41737

1 + 2

Standardisation for better presentation

	TMH 15/01/2011	NDH 16/02/2011	PWH 18/04/2011	AHN 13/05/2011	PYN 16/07/2011	KWH 11/09/2011
Sodium	---	134 ↓	140	---	138	142
Potassium	---	4.6	4.7	---	5.0	4.6
Chloride	---	102	107	---	106	110
Urea	---	6.2	7.9 ↑	---	8.1 ↑	7.8 ↑
Creatinine	---	77	75	---	76	80
Protein, Total	51 ↓	---	50 ↓	47 ↓	---	44 ↓
Albumin	26 ↓	---	26 ↓	25 ↓	---	22 ↓
Bilirubin, Total	6	---	6	4	---	6

Without Standardisation						
	TMH	**NDH**	**PWH**	**AHN**	**PYN**	**KWH**
BIL	6					
BIL						
TB				4		
TBIL			6			6

Roles of Terminology in HA

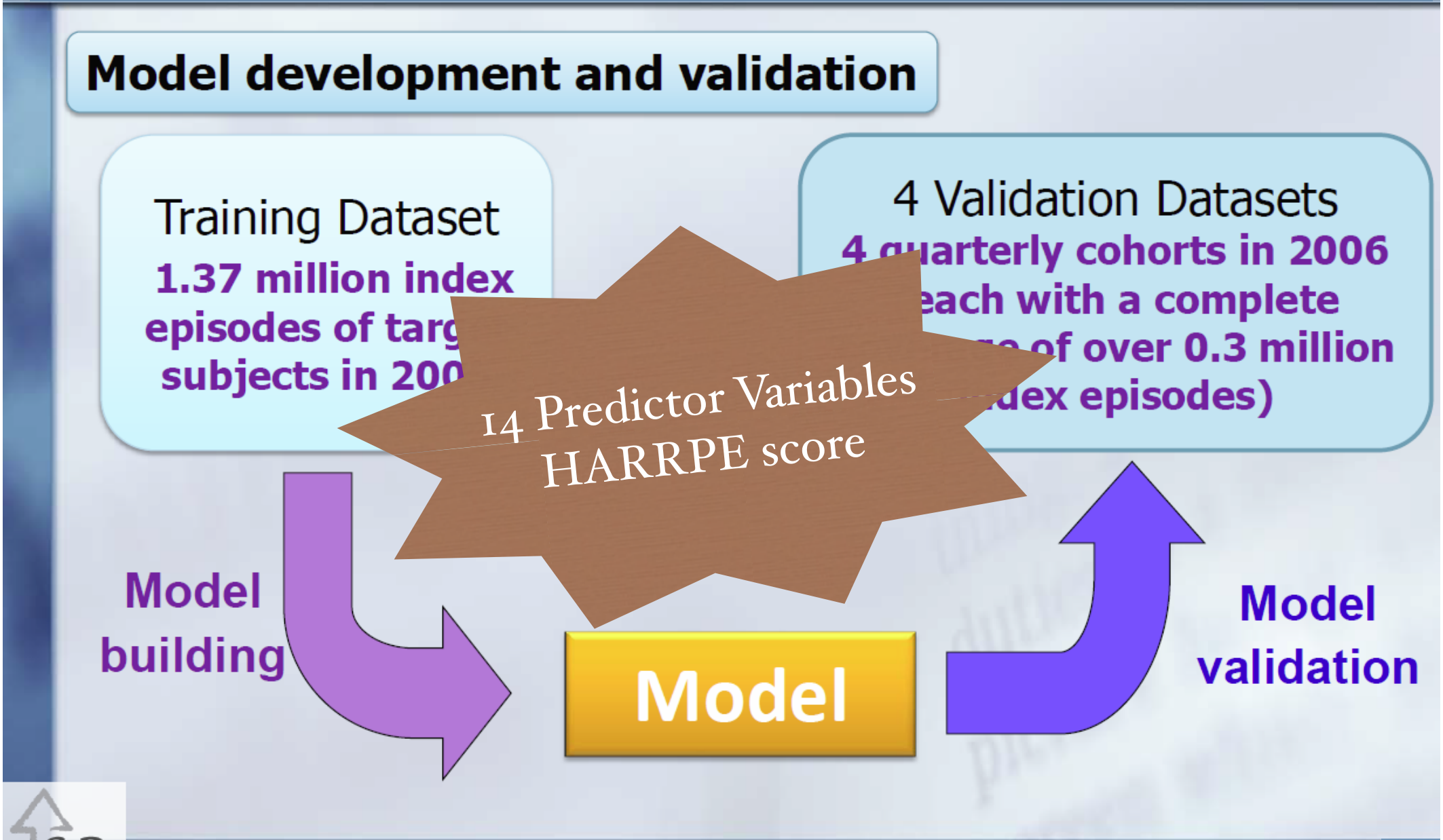
- Supports information architecture
- Improves data presentation
- Assist data retrieval/reporting
- Facilitate decision support
- Facilitate hospital management
- Enables new modes of care delivery

HARRPE
(Hospital Admission Risk Reduction Programme for the Elderly)

Risk stratification for elderly Patients

Targeted intervention by call centre nurses

Hospital Admission Risk Reduction Programme for the Elderly (HARRPE)



Community Health Call Centre (CHCC)

- Identifying at-risk patients from the total population
- Delivering the patient lists to appropriate care providers in a timely fashion
- Enabling new models of care delivery

Community Health Call Centre (CHCC)

2007 High risk elderly (HARRPE)

2011 Mental Health Direct

2012 Chronic Disease Management

2013 Defaulter tracing

Data Retrieval Using SNOMED Hierarchy

Search Organism by:	Operator	Keyword	
Keyword	Contain	FUNGUS	☑ Display Organism Defined In HA Only

Search Result:(Organism Defined In HA Only)

- Organism (Defined In HA Only)
  - Fungus
    - Acremonium alabamen
    - Acremonium blochii
    - Acremonium falciforme
    - Acremonium kiliense
    - Acremonium potroni
    - Acremonium recifei
    - Acremonium roseogris
    - Acremonium species
    - Acremonium strictum
    - **Ajellomyces capsula**
      - **Histoplasma caps**
    - **Alternaria species**
      - Alternaria alternata
      - Alternaria infectoria
    - Anxiopsis fulvescens
    - Anxiopsis sterocaria

Keyword matched result
Related search result
* Organisms are defined in SNOME

Selected Organism Criteria List:

Organism in (
1 • Fungus

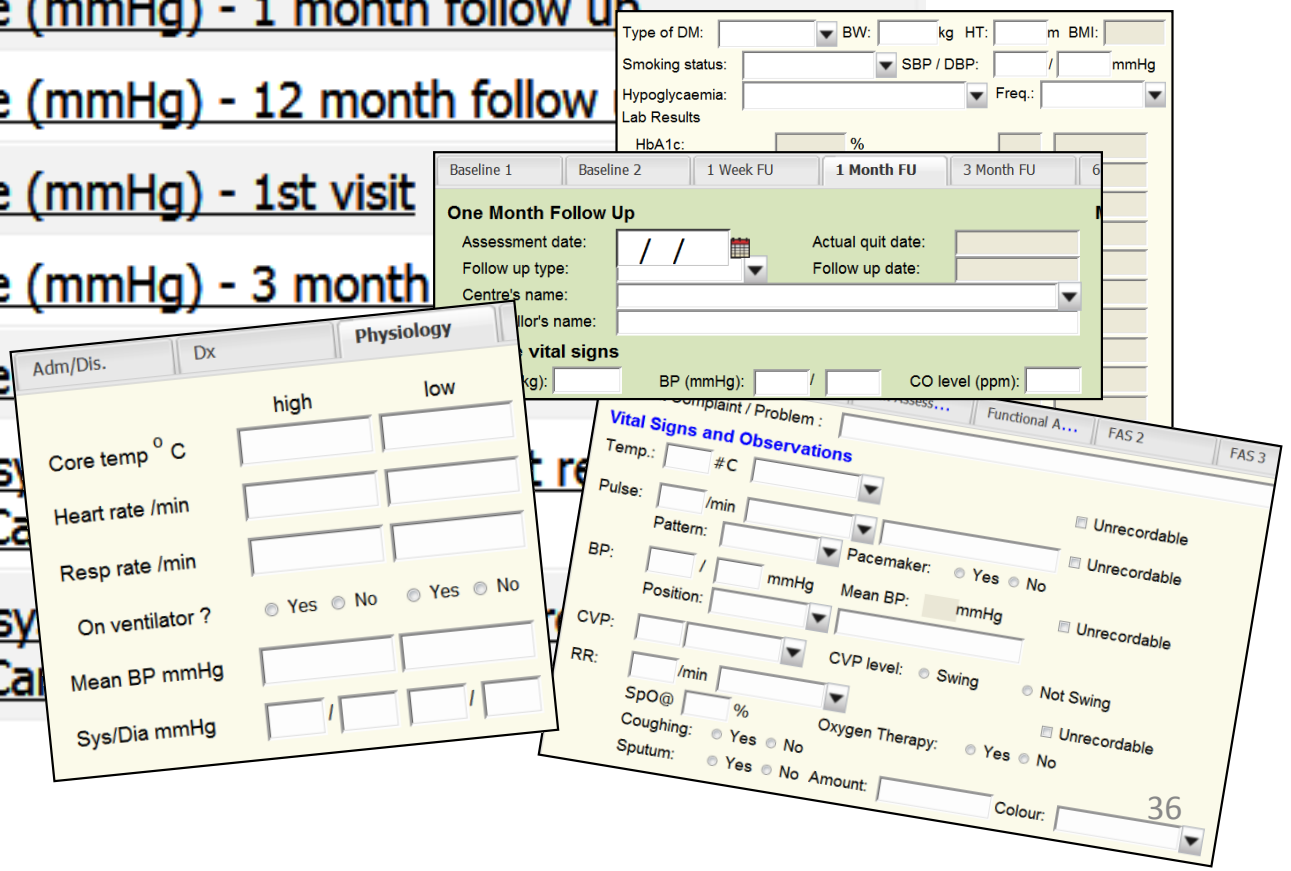
LIS Culture - Reference Date (Calendar Year)	2010		2011
LIS Culture - Organism (ePR Description)	No. of Episodes	No. of Episodes Headcounts	No. of Episodes
Aspergillus niger			1
Aureobasidium species			1
Candida albicans	94	91	84
Candida dubliniensis			1
Candida famata	1	1	
Candida glabrata	34	34	48
Candida guilliermondii			2
Candida krusei	2	2	3
Candida lipolytica			1
Candida lusitaniae	1	1	1
Candida parapsilosis	31	27	19
Candida species			3
Candida tropicalis	27	27	25
Cryptococcus neoformans	12	11	4
Fusarium solani	1	1	
Histoplasma capsulatum	1	1	
Malassezia pachydermatis			1
Malassezia species			1
Penicillium marneffei	14	14	8
Trichosporon species			1
Grand Total :	214	206	198

Moving Forward

- SNOMED CT for clinical decision support
  - e.g. antibiotic stewardship
- To explore referencing all clinical data and entities using SNOMED CT / LOINC

Multiple similar entities

Entity ID	Full Description
1001726	Home systolic blood pressure (mmHg) monitoring - maximum
1001725	Home systolic blood pressure monitoring (mmHg) - minimum
102215	Systolic blood pressure (mmHg)
102396	Systolic blood pressure (mmHg) - 1 month follow up
102495	Systolic blood pressure (mmHg) - 12 month follow
102334	Systolic blood pressure (mmHg) - 1st visit
102429	Systolic blood pressure (mmHg) - 3 month
102462	Systolic blood pressure
104109	Worst blood pressure sy hours after Intensive Ca
104110	Worst blood pressure sy hours after Intensive Ca

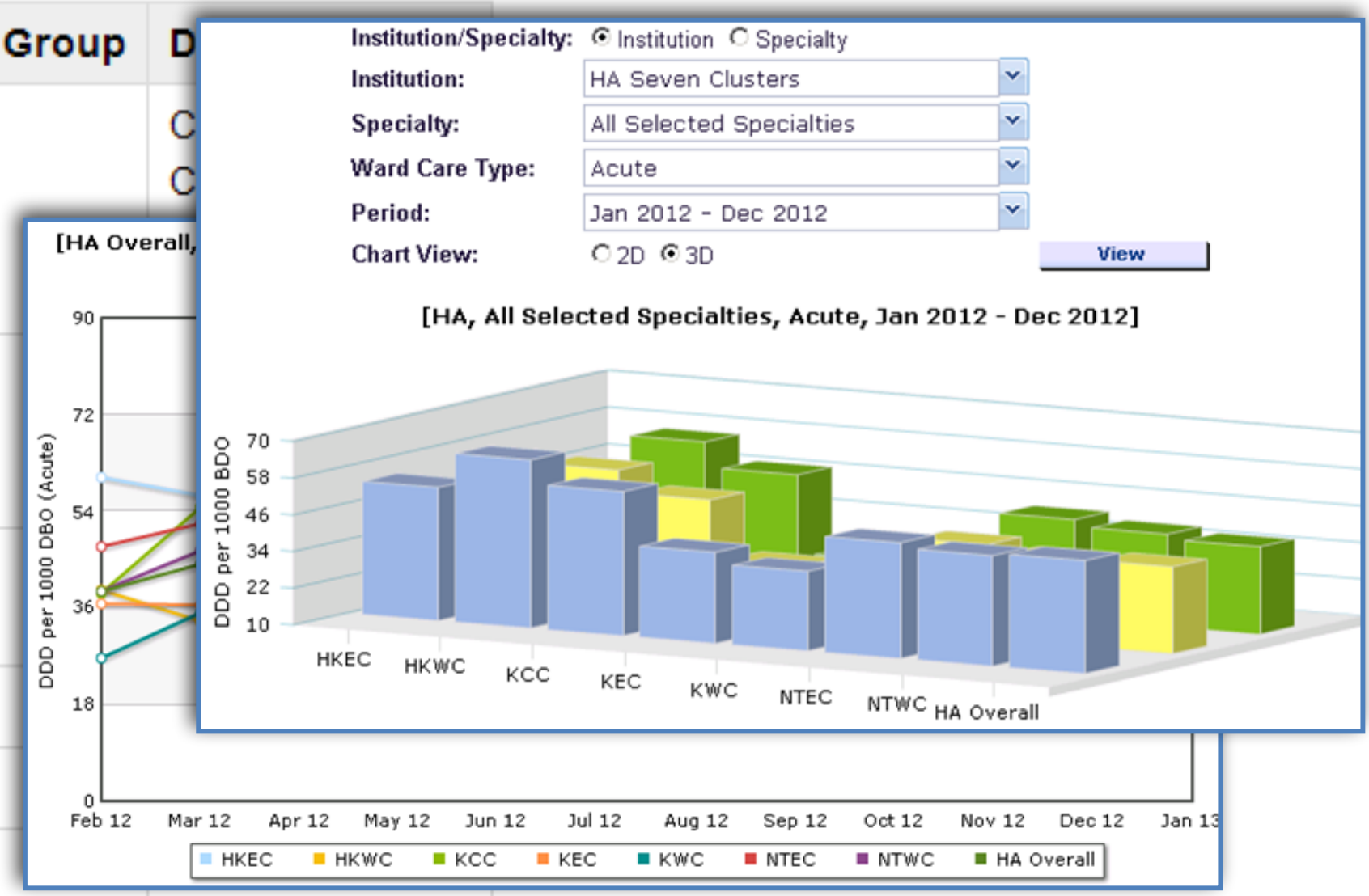


Big Gun Antibiotics Utilization

- Moving from retrospective to prospective review

Big gun antibiotics refer to:

Antibiotics Group	D
Cefepime	C
	C
Ceftazidime	
Meropenem	
Sulperazon	
Tazocin	
Tienam	



The Hong Kong Wide Electronic Health Record

Without eHR

HA

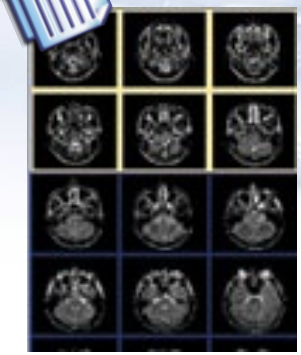
Doctors and Nurses

Other healthcare professionals

Private Hospitals

Private Clinics

DH



X-ray

Laboratory

With eHR

Doctors and Nurses

Other Healthcare Professionals

HA

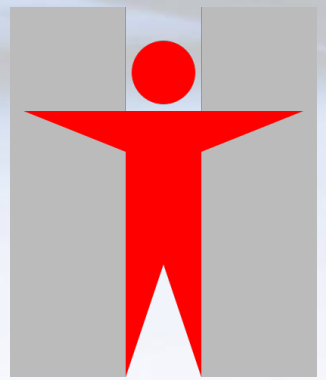
Patients

Family Medicine

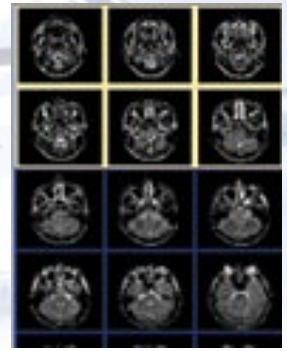
Primary Care

eHR

Private Hospitals



DH

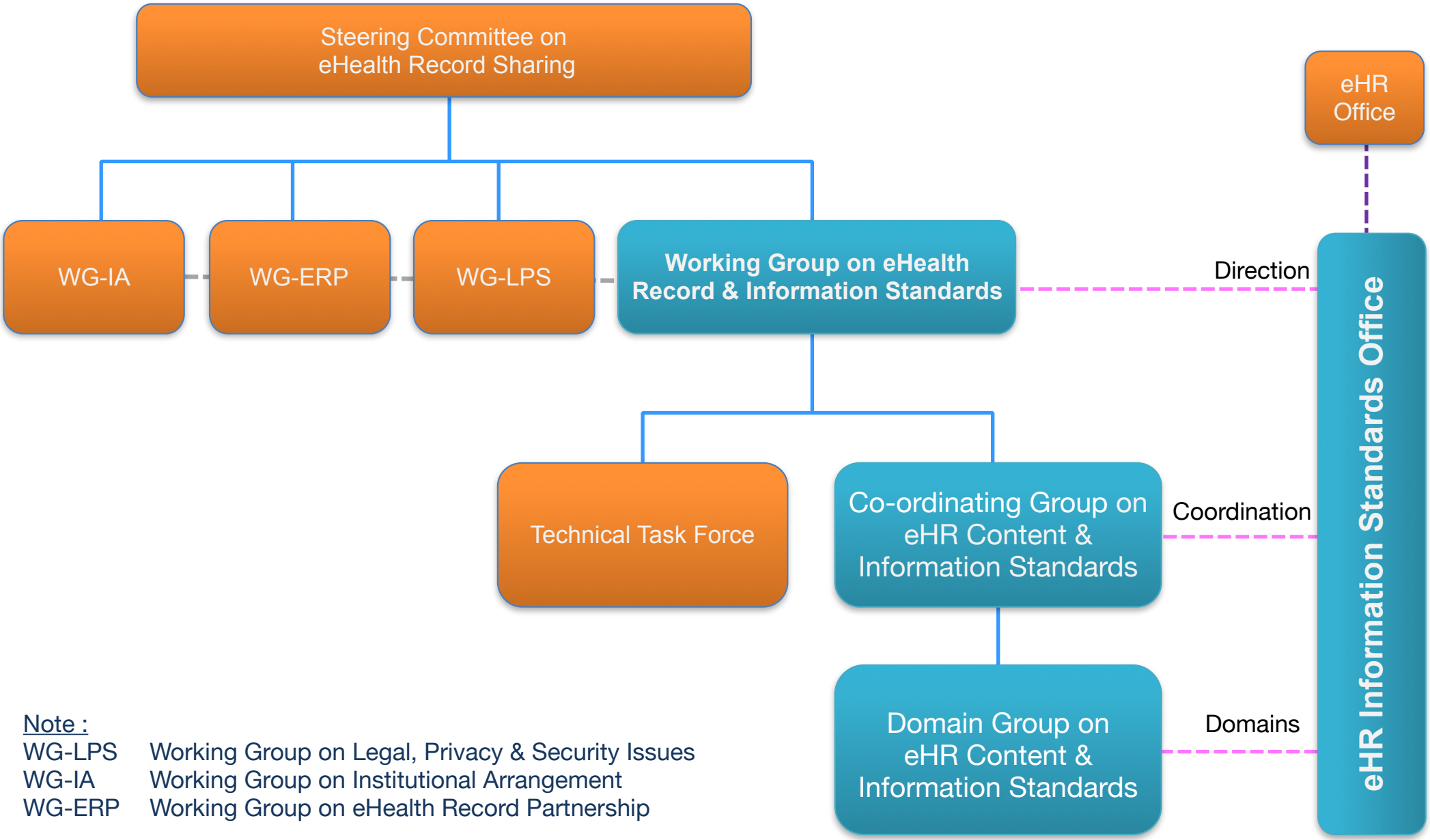


X-ray

Private Clinics

Laboratory

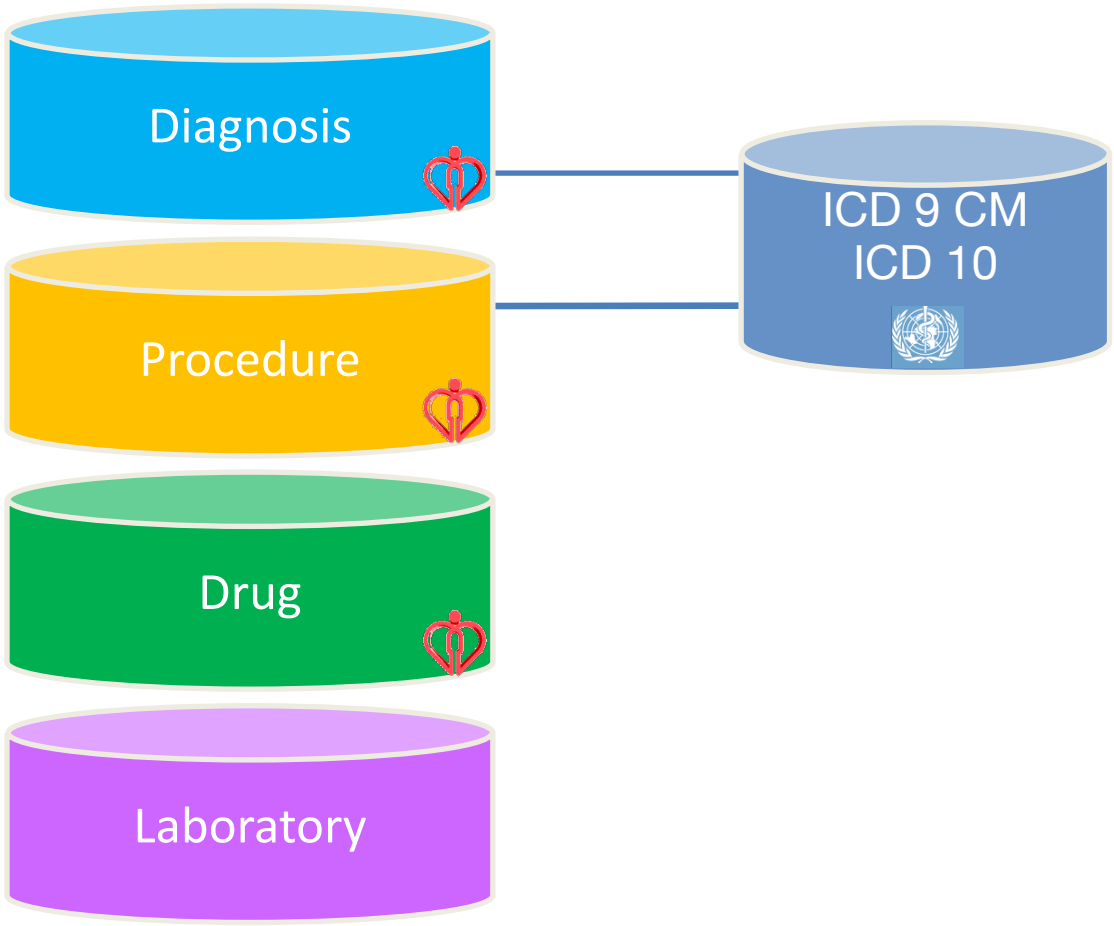
Organisation Structure for eHR Information Standards



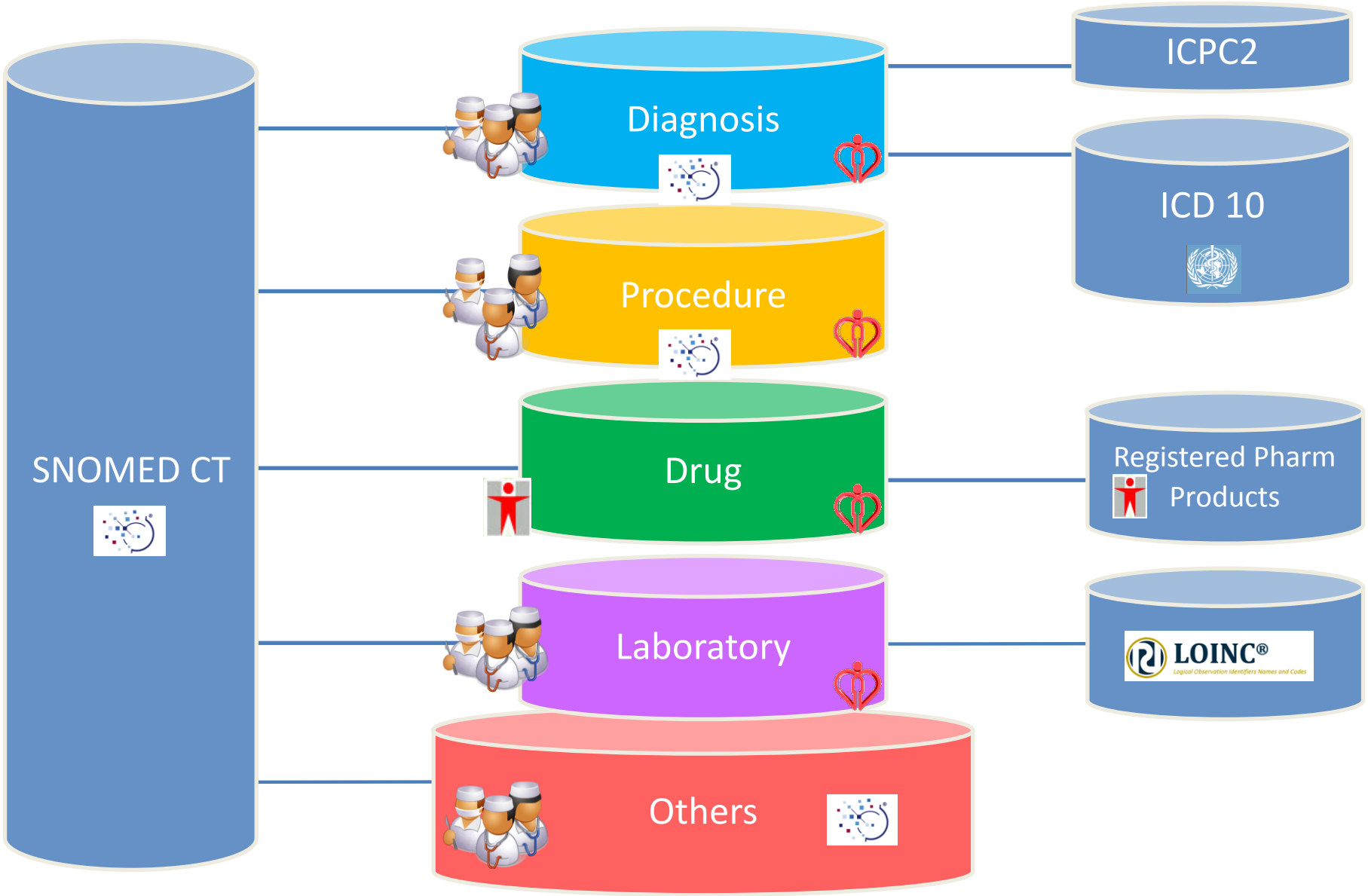
Note :

WG-LPS	Working Group on Legal, Privacy & Security Issues
WG-IA	Working Group on Institutional Arrangement
WG-ERP	Working Group on eHealth Record Partnership

Hospital Authority
Clinical Vocabulary Table (HACVT)



Hong Kong Clinical Terminology Table (HKCTT)



Hong Kong Clinical Terminology Table (HKCTT)

SNOMED CT

Diagnosis

Procedure

Drug

Laboratory

Others

HKCTT

ICPC2

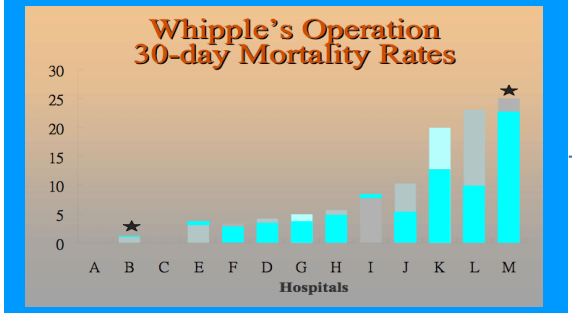
ICD 10

Registered Pharmaceutical Products

LOINC®

Logical Observation Identifiers Names and Codes

Secondary Use



Clinical Data Repository

eHR

eHR

Roles of Terminology in eHR

- Support clinical documentation
- Facilitate decision support
- Provide organised data in eHR Viewer
- Assist data retrieval/reporting

Defining eHR Sharable Data using SNOMED

eHR Allergy Form

Name	Entity/Term ID
eHR Allergy	1003131
Page 1	
Type of allergen code	1003138
Type of allergen description	1003139
Type of allergen local description	1003140
Allergen - recognised terminology name	1003133
Allergen identifier - recognised terminology	1003134
Allergen description - recognised terminology	1003135
Allergen local code	1003136
Allergen local description	1003137
Level of certainty code	1003369
Level of certainty description	1003370
Level of certainty local description	1003371
Allergic reaction code	1003372
Allergic reaction description	1003373
Allergic reaction local description	1003374
Delete allergen reason	1003145
Allergen remark	1003146
Allergy note	1003147

Entity

Allergic reaction code	1003372

HKCTT Concepts for Allergic Reaction

Term ID	Nature	eHR Description	ICD10	ICD10 Asso	SNOMED CT
33388	Diagnosis	Allergic contact dermatitis	L23.9		238575004
8394	Diagnosis	Allergic rhinitis	J30.4		61582004
30561	Diagnosis	Angioedema	T78.3	Y34	41291007
4545	Diagnosis	Aplastic anaemia	D61.9		306058006
8502	Diagnosis	Asthma	J45.9		195967001

Aliases supporting clinical data capture

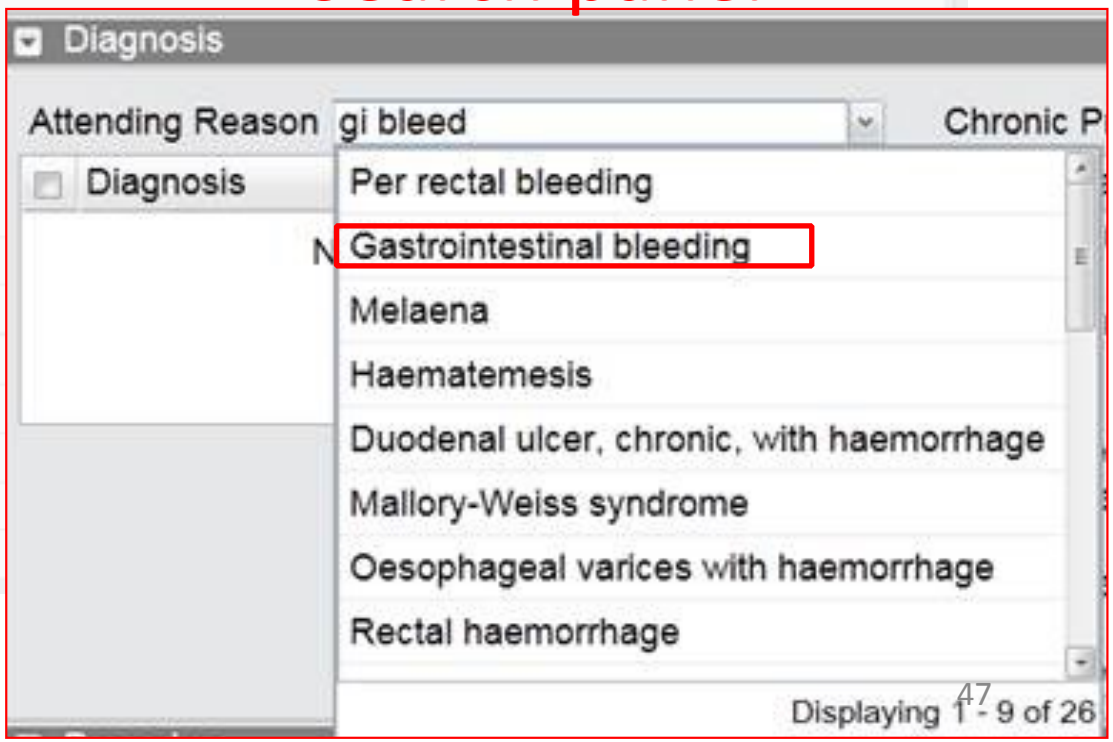
Hong Kong Clinical Terminology Table (HKCTT) — Search Terminologies

Term ID	9659	**Nature**	Diagnosis (Dx)
Description	Gastrointestinal bleeding		

Alias	
GI - Gastrointestinal bleed	Source : SNOMED CT
GI - Gastrointestinal haemorrhage	Source : SNOMED CT
GI - Gastrointestinal hemorrhage	Source : SNOMED CT
GI bleed	Source : SNOMED CT
GI bleeding	Source : SNOMED CT
GI bleeding, NOS	Source : SNOMED CT
GI hemorrhage	Source : SNOMED CT
GI hemorrhage, NOS	Source : SNOMED CT
GIB	Source : HACVT
GIH - Gastrointestinal haemorrhage	Source : SNOMED CT
GIH - Gastrointestinal hemorrhage	Source : SNOMED CT
GIT - Gastrointestinal tract haemorrhage	Source : SNOMED CT
GIT - Gastrointestinal tract hemorrhage	
Gastrointestinal bleed	
Gastrointestinal bleeding, NOS	
Gastrointestinal haemorrhage	
Gastrointestinal hemorrhage	
Gastrointestinal hemorrhage (disorder)	
Gastrointestinal hemorrhage, NOS	

Status	Active				
Validation Rule	**Principal**	Yes	**Sex**	N/A	
Remarks					
ICD10 (2001)	K92.2	**Asso. Code**			
ICD10 (2010+MBD)	K92.2	**Asso. Code**			
ICPC2					
SNOMED CT	74474003				

Search panel



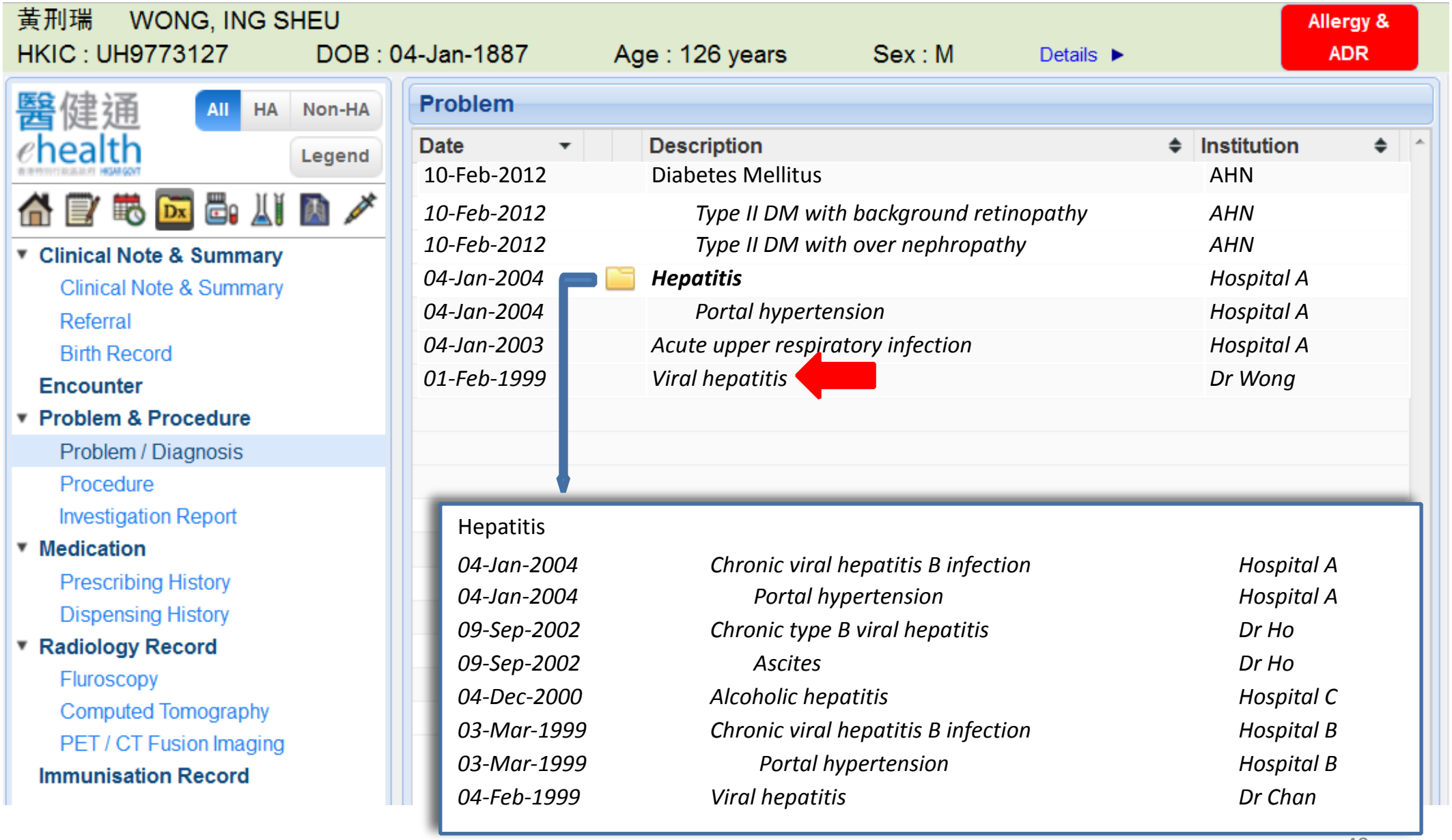
HKCTT for eHR Viewer

For Grouping in eHR Viewer

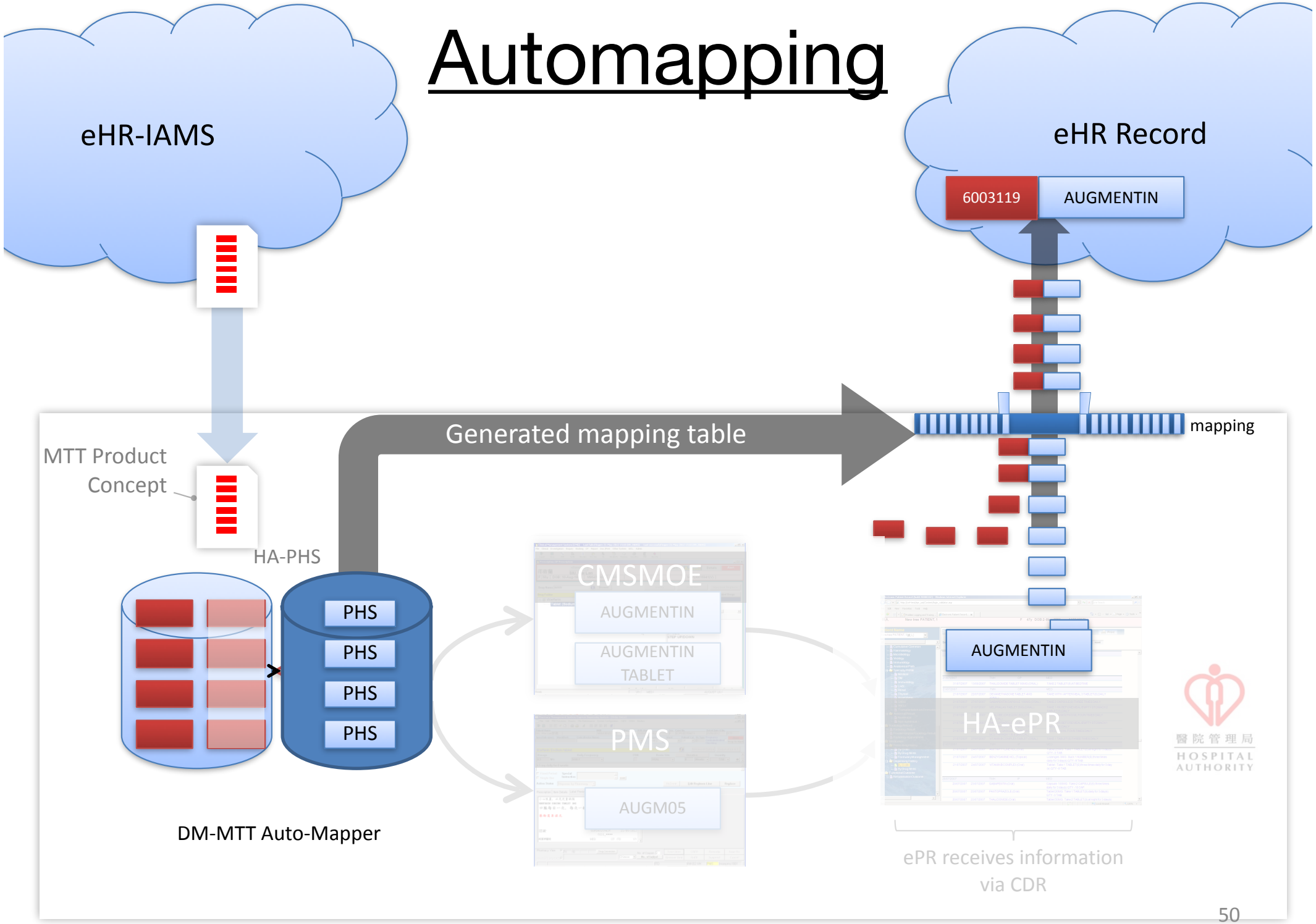
Date	Provider	Description	Code	System	Term ID	Group
3 Jan 2004	*Hospital A*	*Chronic viral hepatitis B infection*	***B18.1***	***ICD10***	***1008***	***Hepatitis***
9 Sep 2002	*Dr Ho*	*Chronic type B viral hepatitis*	*61977001*	***SNOMED CT***	*1008*	
4 Dec 2000	*Hospital C*	*Alcoholic hepatitis*	***K70.1***	***ICD10***	***29392***	***TermID 41635 = SCTID 128241005***
3 Mar 1999	*Hospital B*	*Chronic viral hepatitis B infection*	*1008*	***HKCTT***	*1008*	
4 Feb 1999	*Dr Chan*	*Viral hepatitis*	***D72***	*ICPC2*	*1023*	
1 Feb 1999	*Dr Wong*	*Viral hepatitis*	*V hep*	*---*	*---*	

Local Description

eHR Viewer


黃刑瑞 WONG, ING SHEU
HKIC : UH9773127
DOB : 04-Jan-1887
Age : 126 years
Sex : M
Details ▶
Allergy & ADR
醫健通 ehealth
All
HA
Non-HA
Legend
Clinical Note & Summary
Clinical Note & Summary
Referral
Birth Record
Encounter
Problem & Procedure
Problem / Diagnosis
Procedure
Investigation Report
Medication
Prescribing History
Dispensing History
Radiology Record
Fluroscopy
Computed Tomography
PET / CT Fusion Imaging
Immunisation Record
Problem
Date
Description
Institution
10-Feb-2012 Diabetes Mellitus AHN
10-Feb-2012 Type II DM with background retinopathy AHN
10-Feb-2012 Type II DM with over nephropathy AHN
04-Jan-2004 Hepatitis Hospital A
04-Jan-2004 Portal hypertension Hospital A
04-Jan-2003 Acute upper respiratory infection Hospital A
01-Feb-1999 Viral hepatitis Dr Wong
Hepatitis
04-Jan-2004 Chronic viral hepatitis B infection Hospital A
04-Jan-2004 Portal hypertension Hospital A
09-Sep-2002 Chronic type B viral hepatitis Dr Ho
09-Sep-2002 Ascites Dr Ho
04-Dec-2000 Alcoholic hepatitis Hospital C
03-Mar-1999 Chronic viral hepatitis B infection Hospital B
03-Mar-1999 Portal hypertension Hospital B
04-Feb-1999 Viral hepatitis Dr Chan

Automapping



Final remarks

- Standardization and terminology are essential for modern healthcare
- SNOMED is useful in a single provider EMR environment, but is indispensable in a multi-provider EHR environment
- This is difficult and we are all learning - global sharing is required

Key Message

- **A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost**

Bold Claim

- A standardised eHealth system can achieve better, safer, more efficient care delivery on an industrial scale at a reasonable cost
- In fact it may be the only thing that can do so