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PRE-CONFIGURED POST-COORDINATION: AN APPROACH FOR IMPLEMENTING SNOMED CT IN AN EPR SYSTEM

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Outline

- SNOMED CT
- LORENZO
- User interface challenge
- Information model design
- Limitations and summary

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SNOMED CT



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SNOMED CT

- Comprehensive clinical terminology
- Each SNOMED CT concept represents a unit of clinical information and is associated with
 - Fully Specified Name
 - Descriptions
 - Preferred term
 - Synonym(s)
 - Relationships
 - Hierarchy
 - Defining
 - Qualifying

SNOMED CT Relationships

- Relationships is one of the key features which distinguishes SNOMED CT from most other clinical terminologies
- SNOMED CT relationships are used for many features
 - Hierarchical parent-child linkages between SNOMED CT concepts are expressed as IS-A relationships
 - Definitional relationships are used to represent the meaning of a SNOMED CT concept in relation to other concepts
 - Qualifying relationships are used to refine the meaning of a SNOMED CT concept by using a number of qualifiers

Post-coordination

- Another key feature of SNOMED CT is post-coordination
- It provides the ability to express detailed clinical information in a structured manner without having to create a concept code for each such item of detail (pre-coordination)
- A post-coordinated expression is created by combining a SNOMED CT concept with any specified defining and/or qualifying relationships with their corresponding SNOMED CT concept codes

Sample Clinical Data using SNOMED CT

- While it is easy to understand pre-coordinated concepts, it is important to understand and recognise the complexity associated with post-coordinated expressions
- E.g. *Gradual onset of mild to moderate age-related cataract in the left eyeball* can be expressed as
 - 39450006 | age-related cataract | :
272741003 | laterality | = 7771000 | left | ,
363698007 | finding site | = 81745001 | eyeball | ,
246112005 | severity | = 371923003 | mild to moderate | ,
263502005 | clinical course | = 61751001 | gradual onset |
- E.g. *Phacoemulsification of left eye cataract of intraocular lens implantation* can be expressed as
 - 415089008 | Phacoemulsification of cataract with intraocular lens implantation | :
272741003 | laterality | = 7771000 | left | ,
363698007 | finding site | = 78076003 | lens of eye |

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LORENZO



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LORENZO

- LORENZO is CSC's strategic electronic patient record system
- Multi-professional multi-specialty multi-care setting
- Comprises both administrative and clinical functionality
- Deployed in UK and the Netherlands to date
- All structured patient clinical data underpinned by use of clinical terminologies

SNOMED CT in LORENZO

- First release of LORENZO targeted for NHS in England
- National Programme for Information Technology (NPfIT) in England stipulated use of SNOMED CT
- Hence SNOMED CT was chosen as clinical terminology for clinical data in LORENZO in NHS England
- Specifically this presentation will focus on the use of SNOMED CT for recording problems and procedures in LORENZO

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USER INTERFACE CHALLENGE



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SNOMED CT for Problems and Procedures

- At the very outset, it was decided to ensure that LORENZO was capable of recording information needed to produce valid post-coordinated expressions
- Problems could come from two SNOMED CT domains – Clinical Findings and Disease
- Procedures could come from one SNOMED CT domain – Procedure
- Each of these domains was associated more than 15 defining and/or qualifying attributes
- Furthermore two concepts from the same SNOMED CT domain could have different number of attributes

Clinical Finding / Disease / Procedure Attributes

Clinical Finding	Disease	Procedure
After	After	Access
Associated morphology	Associated morphology	Access instrument
Associated with	Associated with	Approach
Causative agent	Causative agent	Component
Course	Course	Direct device
Due to	Due to	Direct morphology
Episodicity	Episodicity	Direct substance
Finding site	Finding site	Has focus
Has definitional manifestation	Has definitional manifestation	Has intent
Has interpretation	Has interpretation	Has specimen
Interprets	Interprets	Indirect device
Occurrence	Occurrence	Indirect morphology
Onset	Onset	Measurement method
Severity	Pathological process	Method
Stage	Severity	Priority
Subject of information	Stage	Procedure device
	Subject of information	Procedure morphology
		Procedure site
		Procedure site – Direct
		Procedure site – Indirect
		Property
		Recipient category
		Revision status
		Scale type
		Time aspect
		Using

Source of User Interface Challenge

- The only way to facilitate the recording of data for a complete post-coordinated expression would be to dynamically configure the user interface based on the selected problem or procedure
- This poses a significant challenge from many perspectives
 - Design
 - Engineering
 - Training
 - Point of care use
- Furthermore the sheer number of attributes poses a real estate challenge

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INFORMATION MODEL DESIGN



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Information Model Design

- In order to overcome the user interface challenges described earlier, it was decided to use list of the SNOMED CT attributes to inform the design of the LORENZO information model
- Clinicians involved in the design of LORENZO examined all the attributes and chose the key ones which became attributes of Problem and Procedure in the LORENZO information model
- The LORENZO information model also includes other necessary attributes
- The LORENZO user interface is based directly on the LORENZO information model and is a fixed user interface
- This helped to overcome the user interface challenges

LORENZO Information Model – Key Problem Attributes

- Problem type
- Problem name – SNOMED CT Clinical Finding or Disease
- Onset date
- Subtype
- Body site + laterality – SNOMED CT Finding Site – Body Structure
- Course – SNOMED CT Clinical Course
- Certainty – SNOMED CT Certainty
- Severity – SNOMED CT Severity
- Comments

LORENZO Information Model – Key Procedure Attributes

- Procedure – SNOMED CT Procedure
- Performed date and time
- Body site + laterality – SNOMED CT Finding Site – Body Structure
- Approach – SNOMED CT Approach
- Direct device – SNOMED CT Direct Device
- Method – SNOMED CT Method
- Priority – SNOMED CT Priority
- Comments

Allowable Qualifier Values

- User selects problem and/or procedure from the respective SNOMED CT subset
- All other SNOMED CT-related attributes are refined as per their definition in the SNOMED CT Concept Model
- This is either done by getting the list of allowable values from the SNOMED CT definition of the chosen problem/procedure, or by associating a subset with the attribute
- Attributes such as Laterality are conditionally mandatory based on the 'mandatory to refine' refinability property
 - If the user chooses a body part which needs laterality, then user must choose a laterality as well

Recording Problem Name + Body Site + Laterality

LORENZO - Windows Internet Explorer provided by CSC Healthcare

Help Back Forward Refresh Print Hide Pane Not specified Exit

NHS

Action My work Patients Ward view Enquiry

Standard LORENZO

Patients

Enter Identifier to search

Patient lists
Find record
Break seal
Override Dissent
Override sensitive ...
Manage PDS consent
Expressed consent...
Add patient to list
Convert to full regi...
Linked records

Seen(1) Remaining(0)

GREEN , Gavin (Master) Male DOB: 12-Nov-2004 8 Yrs Patient ID: HPSID-000000000386
Allergies/ADRs - None Recorded (Not Checked On 27-Sep-2013)

Encounter contexts: Inpatient, Burton Emily, PAEDIATRICS, PAEDIATRIC ... EPR filtered by: (None)

Information is only available from your own organisation because this patient is locally registered.

Problems Registers Allergies/ADRs Alerts Advance Directives

Display inactive problems Display struck out problems

Master problem list

	Problem name	Problem code	Problem type	Status	Onset date	Main procedure
	Acute Q fever	409553007	Diagnosis	Active	03/08/2013	

Working prob

Procedures

Overview
Care Events
Clinical Charts
Forms
General Details
Procedures Interventions
Health Issues
Observations
Related People
Patient services

Details Additional details Status Links Scope Modification history

Problem type: Scope: All encounters and episodes

Inactive:

Problem name /code:

Onset date: Not known

Bodysite	Laterality
<input type="checkbox"/> Eyeball	Left

Sub type:

Problem description:

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Return to Wizard

DANIEL, Williams, administrator Role

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Recording Problem Course + Certainty + Severity

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Working prob

Details Additional details Status Links Scope Modification history

Course: Gradual onset

Certainty: Definitely present

Severity: Mild to moderate

Expected conclusion date: Enter date

On expected conclusion date:

On behalf of:

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Return to Wizard

DANIEL, Williams, administrator Role

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- Overview
- Care Events
- Clinical Charts
- Forms
- General Details
- Procedures Interventions
- Health Issues
- Observations
- Related People
- Patient services



Recording Procedure + Body Site + Laterality

Record procedure - LORENZO - Windows Internet Explorer provided by CSC Healthcare

GREEN , Gavin (Master) Male DOB: 12-Nov-2004 8 Yrs Patient ID: HPASID-00000000386
Allergies/ADRs - None Recorded (Not Checked On 27-Sep-2013)

Record procedure

Record procedure

Performed date and time
Complete date: 27/09/2013
Not specified: []

Procedure
Phacoemulsification of cataract with intraocular lens implantation

Approach
Term not selected

Direct device
Term not selected

Method
Term not selected

Priority
Term not selected

Performed service point
[]

Performed by
daniel,williams

Body site
Lens of eye

Laterality
Left

+ Add Update Remove

Body site	Laterality
There are no records to show	

Problems (Onset date)

<input checked="" type="checkbox"/>	Age-related cataract(27/09/2013)
<input type="checkbox"/>	Acute Q fever(03/08/2013)
<input type="checkbox"/>	Allergic asthma

Comments
[]

Suspend Reassign Finish now Cancel

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CONCLUSION



Limitations

- LORENZO information model only supports some of the SNOMED CT defining and qualifying attributes based on clinician feedback
- As a result, incoming post-coordinated data which uses other defining and/or qualifying attributes will need to be degraded to text to import the data into a LORENZO patient record

Summary

- Designing user interfaces to collect post-coordinated data is potentially complex due to their dynamic nature and number of possible attributes
- LORENZO has simplified this by aligning its information model to the most clinically relevant SNOMED CT defining and qualifying attributes
- As a result, LORENZO has a consistent fixed, simple and usable user interface which easily supports users in recording post-coordinated data at the point of care



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