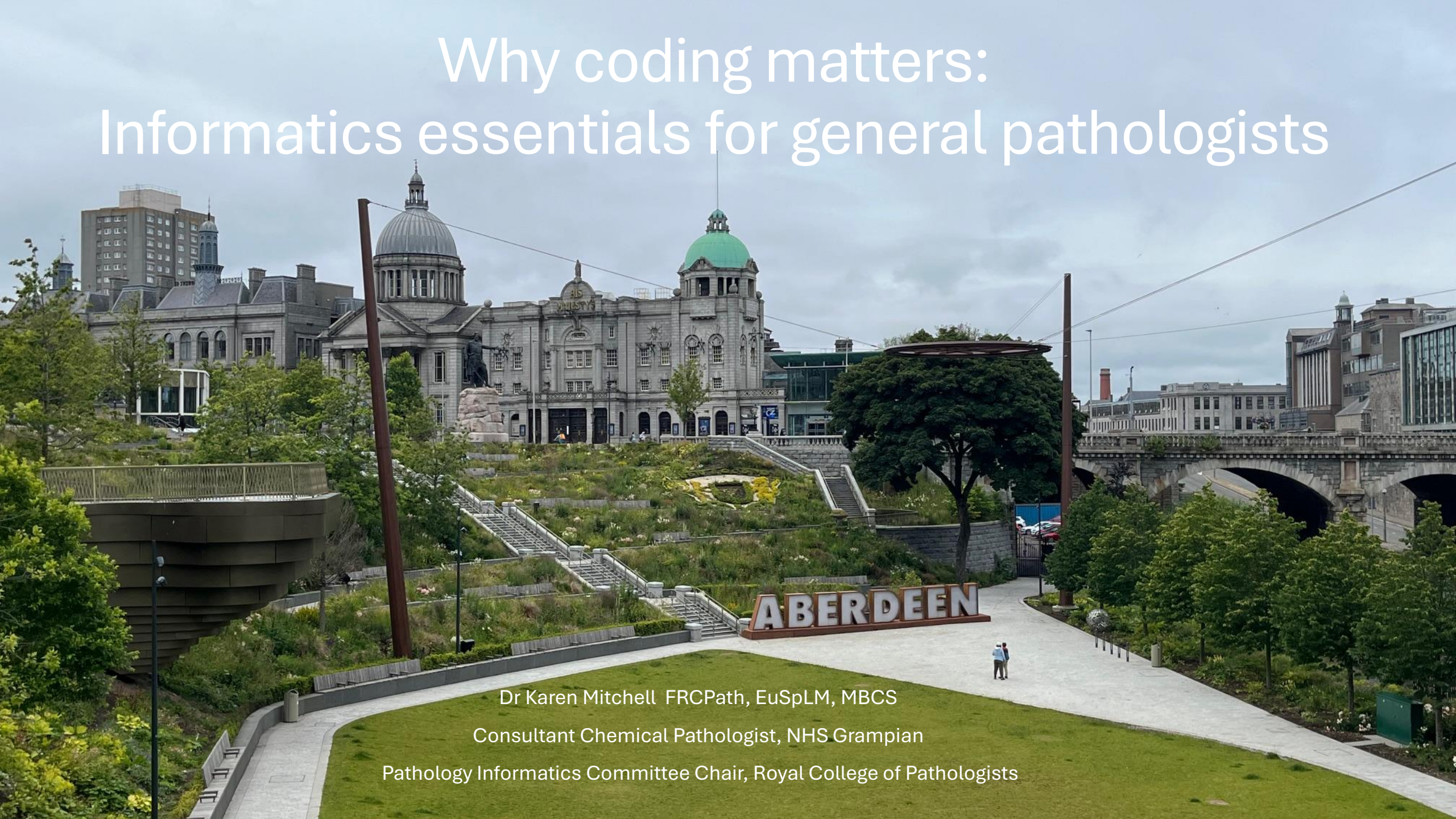
Why coding matters: Informatics essentials for general pathologists



Dr Karen Mitchell FRCPath, EuSpLM, MBCS

Consultant Chemical Pathologist, NHS Grampian

Pathology Informatics Committee Chair, Royal College of Pathologists

Outline

- Context and Value of coding
- Why start with chemistry?
- Evolution of the Pathology Informatics Committee
- SNOMED CT & PaLM coding
- Scotland ontology server
- Relevance for daily work
- Focus on move to digital
- What's next?

Coding in context

- UK pathology laboratories send more than 2 billion results back to GPs each year
- Each result arrives with a code, its term, value and unit.
- The top 300 tests are:
  - 53% Biochemistry
  - 18% Haematology
  - 16% Microbiology
  - 7% Immunology
  - 2% Cellular Pathology
- Coding is invisible – only noticeable when it **doesn't work**

What is the value of coding?

- Results are filed consistently with correct terminology
- Rules applicable for display in downstream systems
- Rules for requesting, clinical decision support
- Trend analysis for clinical interpretation
- Data for laboratory, network or population analytics
- Results are transferred to Primary care, EPR, National repositories, patient facing portals
- Results are used in research

Coding terms

EPR/EHR = Electronic Patient Record/ Electronic Health Record

LIMS = Laboratory Information Management System

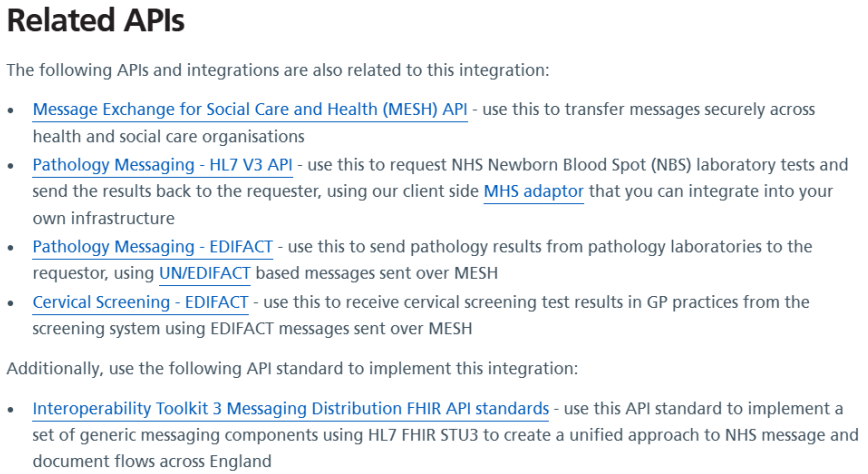
PBCL = Pathology Bounded Code List
PMIP EDIFACT = Pathology Messaging Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT)

SNOMED CT = Systematized Nomencalture of Medicine – Clinical Terms
HL7 = Health Level Seven International (organisation providing framework for exchange of electronic health information)

FHIR= Fast Health Interoperability Resources

API = application programming interface

LOINC = Logical Observation Identifiers Names and Codes



Related APIs

The following APIs and integrations are also related to this integration:

- Message Exchange for Social Care and Health (MESH) API - use this to transfer messages securely across health and social care organisations
- Pathology Messaging - HL7 V3 API - use this to request NHS Newborn Blood Spot (NBS) laboratory tests and send the results back to the requester, using our client side MHS adaptor that you can integrate into your own infrastructure
- Pathology Messaging - EDIFACT - use this to send pathology results from pathology laboratories to the requestor, using UN/EDIFACT based messages sent over MESH
- Cervical Screening - EDIFACT - use this to receive cervical screening test results in GP practices from the screening system using EDIFACT messages sent over MESH

Additionally, use the following API standard to implement this integration:

- Interoperability Toolkit 3 Messaging Distribution FHIR API standards - use this API standard to implement a set of generic messaging components using HL7 FHIR STU3 to create a unified approach to NHS message and document flows across England

In the pathology report sent from laboratories to primary care, the DAPB4101 Pathology and Laboratory Medicine Reporting Information Standard governs the use of SNOMED CT Observable entity concepts to represent pathology and laboratory medicine test result codes.

Why start with chemistry?

- Chemistry produces the highest volume of diagnostic data
- Our results are reused more than other disciplines
- Coding involves defining the test name, specimen type, units of measure, result.
- Coding enables reference ranges, alert flags, reflex rules, retest intervals – all computable and coded processes

- Small decisions have substantial impact nationally

Early days of Informatics Committee

- 2007/8 RCPath discussed developing National Laboratory Medicine Catalogue (NLMC) with support from HSCIC (pre-NHS Digital)
- 2012 Pathology Informatics committee involved key members working in this area: Bernie Croal, Rick Jones, Owen Johnson, Gifford Batstone plus SMEs
- 2015 Funding for NLMC finished
- 2016 PBCL Read v2 stopped being updated
- 2017 NHS Digital involved in developing replacement coding using SNOMED CT

CONTEXT

UK Path Labs send more than 2 billion lab results back to GPs each year.

Each result arrives as a code plus its term, together with a value and its unit

The code **must** be:
exactly 5 characters long
in the **P**athology **B**ounded **C**ode **L**ist (PBCL)

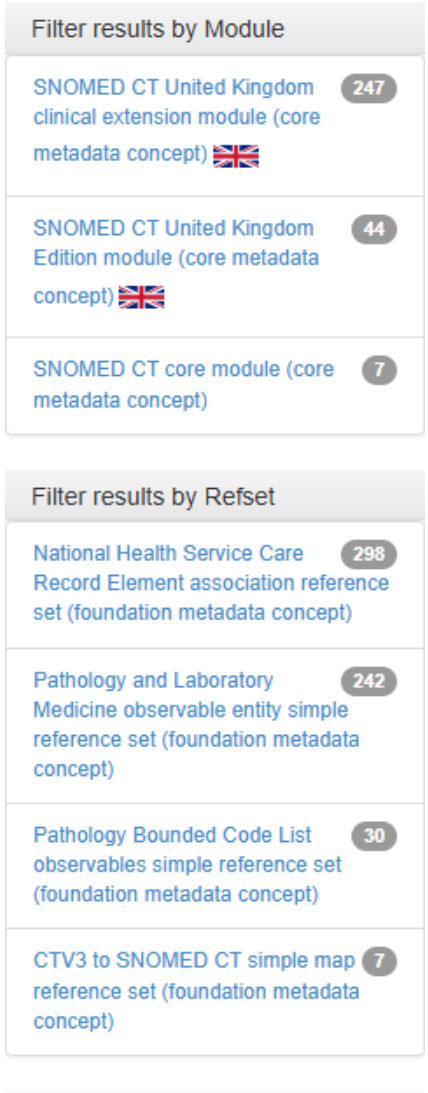
Example PMIP EDIFACT (NHS003) message fragment illustrating the use of PBCL Read v2 codes:

```
INV+MQ+424..:911::FULL BLOOD COUNT
SEQ++1
RFF+ASL:1
GIS+N
INV+MQ+42H..:911::Total white cell count
RSL+NV+4.8++:::10*9/L
RFF+ARL:1
S20+20
RND+U
GIS+N
INV+MQ+423..:911::Haemoglobin estimation
RSL+NV+150++:::g/L
RFF+ARL:1
S20+20
RND+U+115+165
GIS+N
INV+MQ+42P..:911::Platelet count
RSL+NV+200++:::10*9/L
RFF+ARL:1
S20+20
RND+U+150+450
GIS+N
```

CODE TERM VALUE UNIT

SNOMED CT: chemistry needs granularity

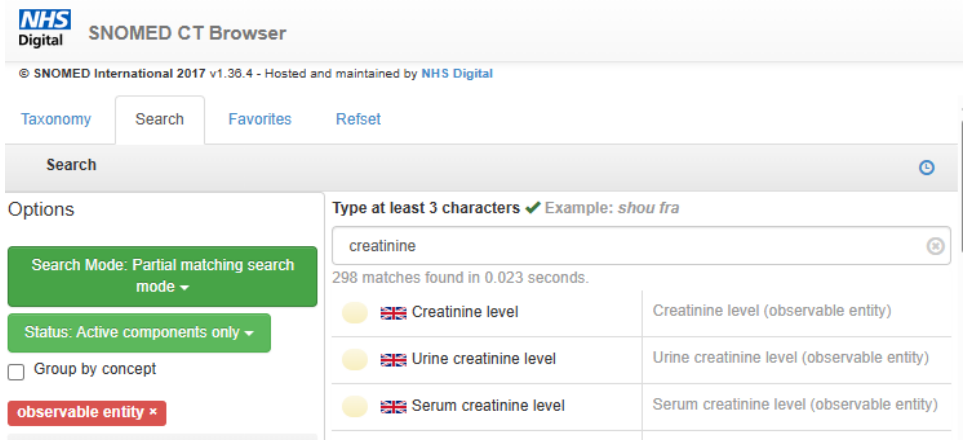
- Old code reported test name and sometimes sample type
- New codes can report test name, methodology, units, sample type
- Allows for differences in methodologies that are not comparable e.g. tumour markers, creatinine
- Unified Test List (UTL) became:-
- Pathology and Laboratory Medicine (PaLM) codes



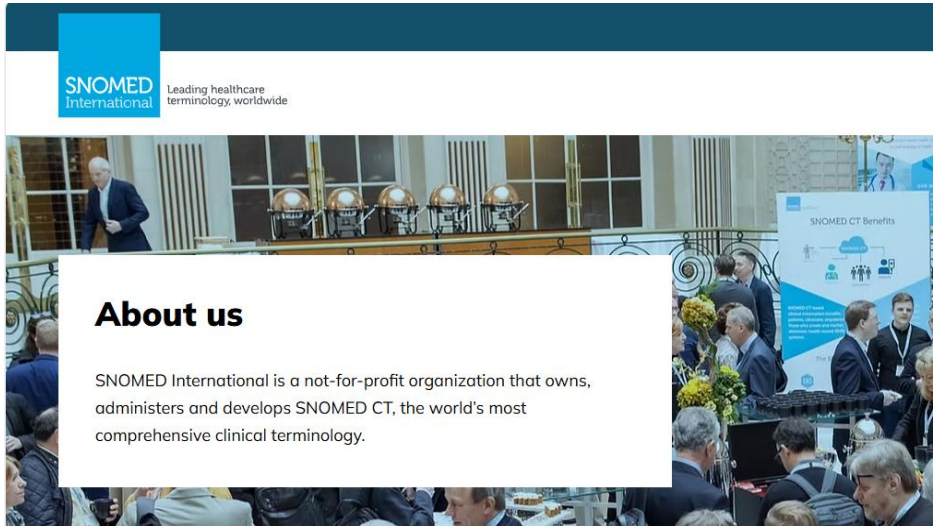
SNOMED CT Browser

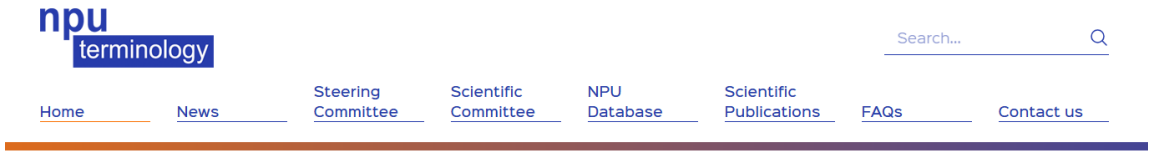
termbrowser.nhs.uk/?

Searching UK Edition



SNOMED International host the Laboratory Terminology Standards Working Group (via zoom), started by Karim Nashar from NHSE





NPU Laboratory Terminology

The NPU terminology is a coding system and terminology for identification and communication of examination results from clinical laboratories in the health area. It identifies types of result values, for use in reporting laboratory results. The definitions have a uniform structure and use a referenced vocabulary.

Read our full history

The NPU terminology covers many fields of laboratory medicine:

- Clinical allergology
- Clinical chemistry
- Clinical immunology and blood banking
- Clinical microbiology
- Clinical pharmacology
- Molecular biology and genetics
- Reproduction and fertility
- Thrombosis and hemostasis
- Toxicology

LOINC® from Regenstrief

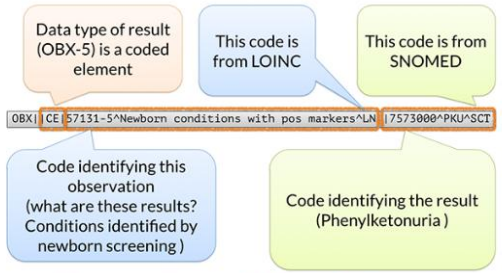
What LOINC is

LOINC is a common language (set of identifiers, names, and codes) for identifying health measurements, observations, and documents. If you think of an observation as a "question" and the observation result value as an "answer."

LOINC codes represent the "question" for a test or measurement

Where needed, codes from other standards (e.g. SNOMED CT) represent the "answer." Of course, you don't always need a code for the result value. For quantitative results, the "answer" is just the numeric value—with its associated units of measure.

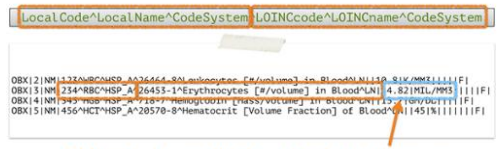
Most laboratory and clinical systems today are sending data out using the HL7 version 2 messaging standard. Looking at an example of the place in the HL7 message where the test results go, you can see how a LOINC code identifies the question and a SNOMED CT code represents the answer:



Related: Common questions about LOINC and other data standards

Sending local test codes and names along with LOINC codes

We think it is always a good idea to send your local concept identifier and name along with codes from a vocabulary standard. It makes troubleshooting a whole lot easier! Fortunately, this is easy to do within the HL7 message standard. The OBX-3 slot allows 2 sets of triplets, one for your local concept and one for the concept from the vocabulary standard:

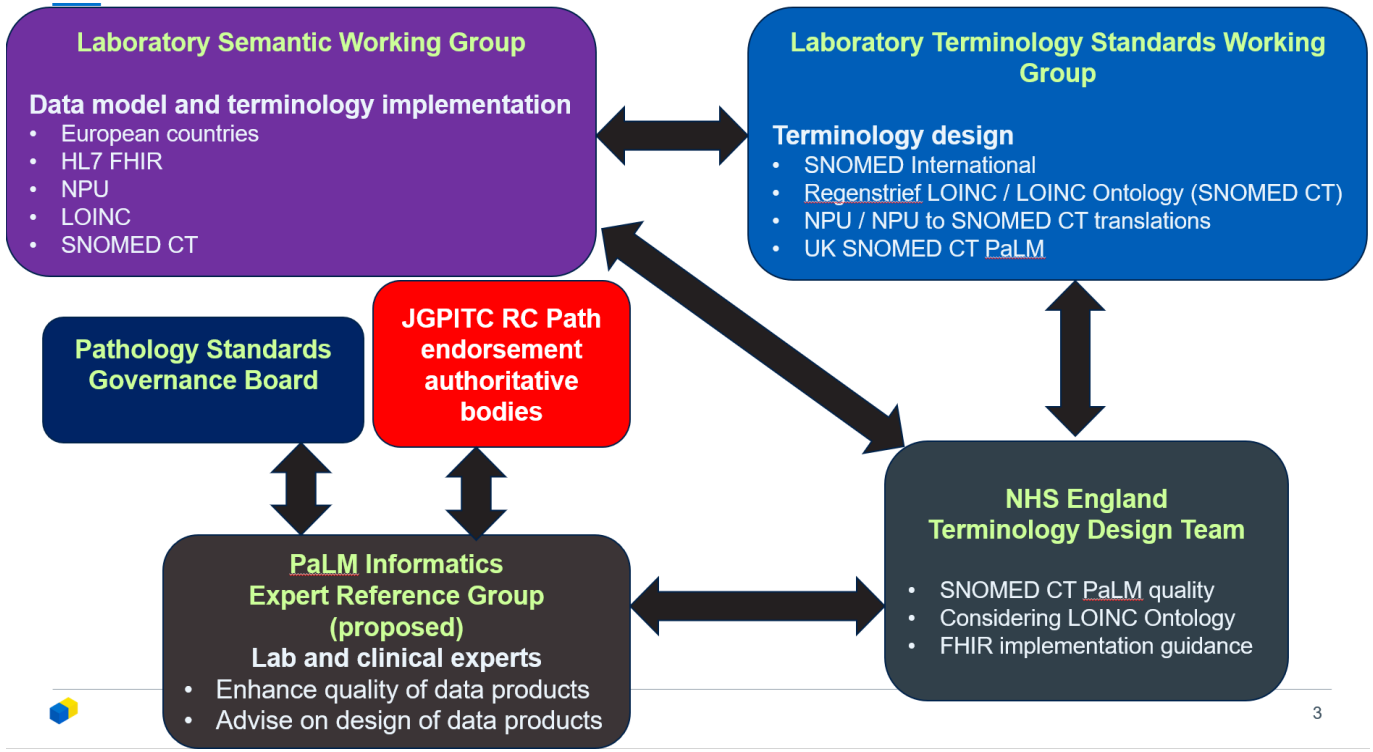


Related: Watch a presentation on HL7 standards

UK PaLM Informatics Expert Reference Group

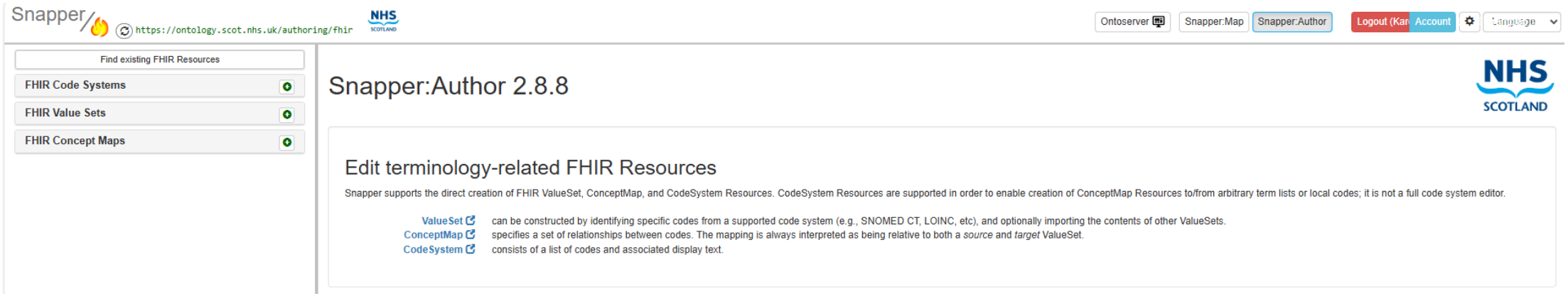
- Collaborative discussions between
- Pathologists
- Terminologists
- GPs
- Lab IT specialists
- NHSE

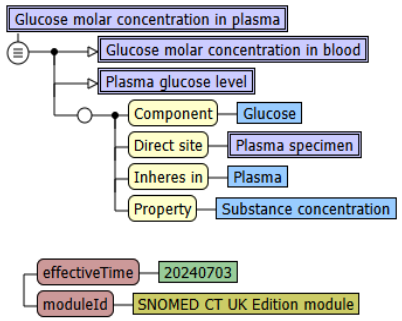
- Discuss terminology & process which is relevant to UK pathology needs and expanding the PaLM and PBCL replacement content.

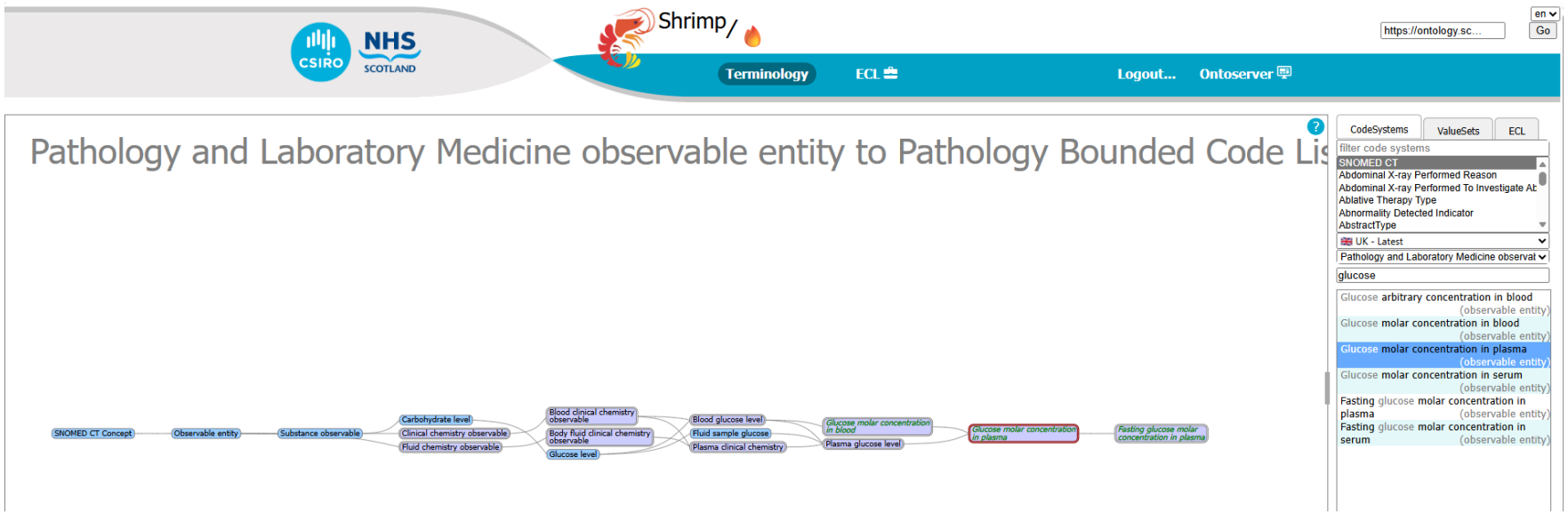


Scotland's National Terminology Server for SNOMED CT

- In 2022, NHS Scotland were commissioned to implement SNOMED CT as primary structured clinical vocabulary used in electronic clinical systems
- The implementation of this through the deployment of the national LIMS solution involves mapping and translation of concepts for transition period and lifecycle of the wider system
- SNOMED CT is used as direct replacement for READ v2 coding laboratory procedures and observables.
- Processing and tooling used to enable adoption of SNOMED CT in laboratory medicine at a national scale using the Scotland National Terminology Server
- Created lists for new SNOMED CT laboratory tests which have been accepted
    - Identified through laboratory experts (working on LIMS) and discussion with Terminology team in Public Health Scotland
- Groups of tests with no agreed representation
    - Discussed at International group


Snapper
https://ontology.scot.nhs.uk/authoring/fhir
NHS SCOTLAND
Ontoserver
Snapper:Map
Snapper:Author
Logout (Kar
Account
Language
Find existing FHIR Resources
FHIR Code Systems
FHIR Value Sets
FHIR Concept Maps
Snapper:Author 2.8.8
NHS SCOTLAND
Edit terminology-related FHIR Resources
Snapper supports the direct creation of FHIR ValueSet, ConceptMap, and CodeSystem Resources. CodeSystem Resources are supported in order to enable creation of ConceptMap Resources to/from arbitrary term lists or local codes; it is not a full code system editor.
ValueSet can be constructed by identifying specific codes from a supported code system (e.g., SNOMED CT, LOINC, etc), and optionally importing the contents of other ValueSets.
ConceptMap specifies a set of relationships between codes. The mapping is always interpreted as being relative to both a source and target ValueSet.
CodeSystem consists of a list of codes and associated display text.

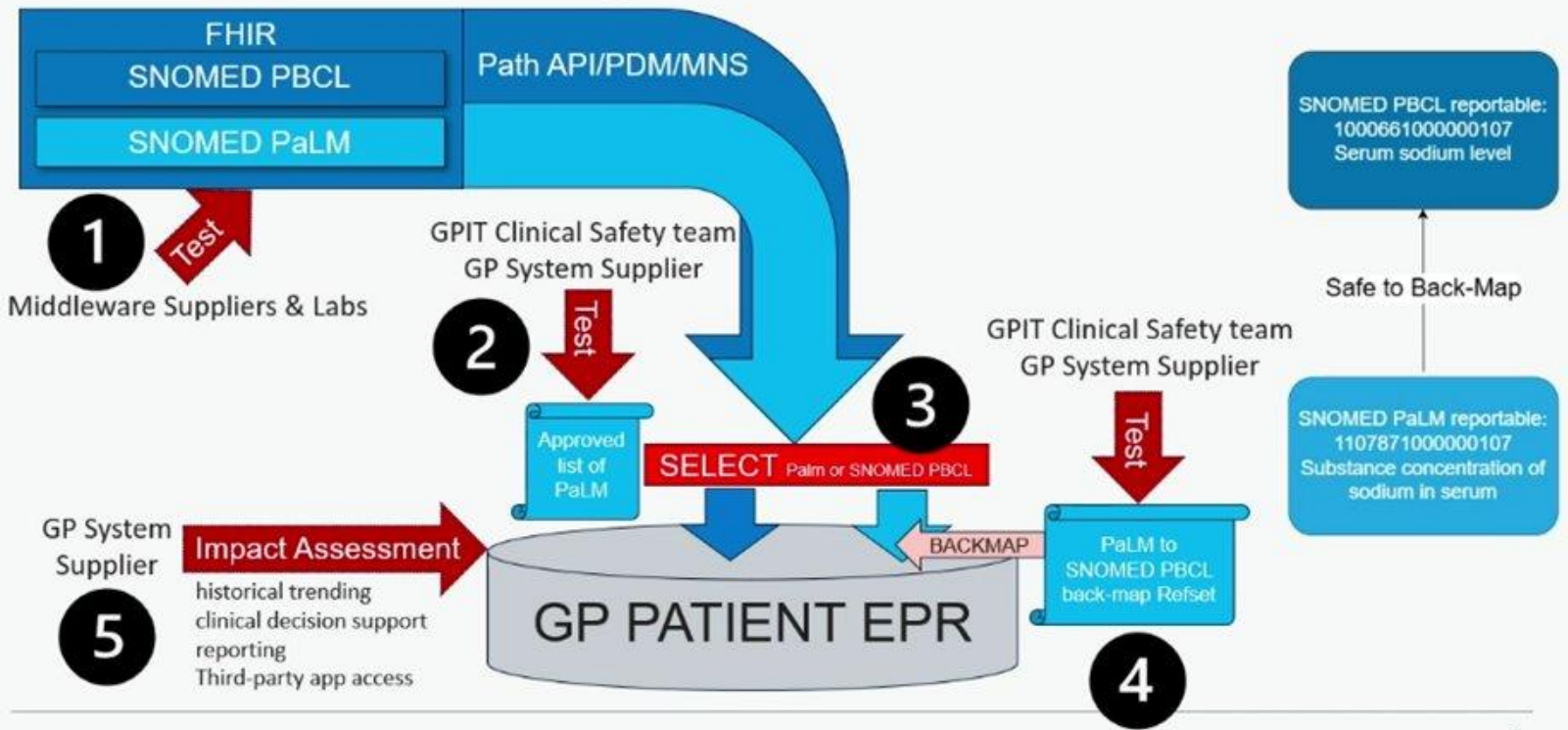

Glucose molar concentration in plasma
Glucose molar concentration in blood
Plasma glucose level
Component
Glucose
Direct site
Plasma specimen
Inheres in
Plasma
Property
Substance concentration
effectiveTime
20240703
moduleId
SNOMED CT UK Edition module


CSIRO
NHS SCOTLAND
Shrimp
https://ontology.sc...
Go
Terminology
ECL
Logout...
Ontoserver
Pathology and Laboratory Medicine observable entity to Pathology Bounded Code Lis
SNOMED CT Concept
Observable entity
Substance observable
Carbohydrate level
Clinical chemistry observable
Fluid chemistry observable
Blood clinical chemistry observable
Body fluid clinical chemistry observable
Glucose level
Blood glucose level
Fluid sample glucose
Plasma clinical chemistry
Glucose molar concentration in blood
Plasma glucose level
Glucose molar concentration in plasma
Fasting glucose molar concentration in plasma
CodeSystems
ValueSets
ECL
filter code systems
SNOMED CT
Abdominal X-ray Performed Reason
Abdominal X-ray Performed To Investigate Ab
Ablative Therapy Type
Abnormality Detected Indicator
AbstractType
UK - Latest
Pathology and Laboratory Medicine observal
glucose
Glucose arbitrary concentration in blood (observable entity)
Glucose molar concentration in blood (observable entity)
Glucose molar concentration in plasma (observable entity)
Glucose molar concentration in serum (observable entity)
Fasting glucose molar concentration in plasma (observable entity)
Fasting glucose molar concentration in serum (observable entity)

DAPB4101
(NHS England only)

- **the ability to code new pathology tests** - new reportables can be created using a standardised, interoperable terminology
- **modern, event-based, standards-compliant, 'platinum' service architecture** – allows for more direct communication of vital clinical data, providing more options for consumption without the need for complex integrations, and better payload validation with message-by-message error handling
- **improved clinical safety** - pathology results can be shared and accessed by clinicians across the NHS in a format that is clear and unambiguous
- **improved data quality** - standardised, semantically interoperable and unambiguous pathology result data that supports machine-readability will enable AI-aided analytics, research and clinical decision support
- **reduction of costs** - clear, unambiguous pathology reporting will reduce the need for duplicate testing by clinicians and enable providers to review commissioning costs
- **adoption of modern, internationally recognised standards** - SNOMED CT and FHIR will replace the outdated, localised, non-maintainable suite of data products, future-proofing the interoperable flow of pathology reports

Test #3 – Dual Coding of the same lab test result



Coding for the generalist

Coding is a clinical decision

Allows accurate, safe and standardised reporting and interpretation of pathology tests

Chemistry has been used to set standards

Professional stewardship – understanding the use of pathology data

More experts are needed now and in the future

Pathology Informatics Committee

- Currently advises RCPath Council on digital aspects relevant to Pathology
- Part of new Digital Strategy Board
- Deals with structural / design components of electronic pathology
- Input from IBMS, LabMed, X-lab
- Updates from SHOT IT group
- Updates from Devolved Nations
- Currently working on guidance for reporting results to patients
- Coding requests in SNOMED CT

Analogue to Digital

- Guidelines for standards for laboratory reports
- Business continuity planning

- Digital champions for each specialty
- Updating LIMS
- Updating order comms
- Introduction of AI/ intelligent algorithms
- Digital learning, training, exams, CPD

What's next

Subject matter experts (SME's) to be involved with SNOMED CT coding

Individuals with experience and interest in Informatics working in:

- Microbiology and/or Serology
- Immunology
- Haematology
- EPR or LIMS implementation
- Other relevant Informatics experience

Coding decisions are Clinical decisions.

Thank you.