SNOMED CT-AU and AMT Subsets
Learning outcomes

- Describe why subsets are useful when working with terminology
- Compare the features of “reference sets” and “ValueSets”
- Explain (at a high level) how subsets can be implemented
- Provide examples of subsets available from the National Clinical Terminology Service (NCTS), the use cases they support, and how to access them
What are subsets?
Two main formats are available from the NCTS:

- **Reference sets**: subsets containing only SNOMED CT components, conforming to the SNOMED CT specification.
- **ValueSets**: conform to the FHIR® specification.
User interface example – search reference sets

### Allergies and Adverse Reactions

<table>
<thead>
<tr>
<th>Reaction Type</th>
<th>Causative Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agent</td>
</tr>
</tbody>
</table>

- **Food intolerance**
  - **Search Reference Sets**: *Goat’s milk*

<table>
<thead>
<tr>
<th>Date of Event</th>
<th>Clinical Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Search</strong>: <em>rash</em></td>
</tr>
</tbody>
</table>

- **Rash**
- **Hives**
- **Bullous rash**
- **Macular rash**
- **Pruritic rash**
- **Vesicular rash**
- **Blistering rash**
- **Morbiliform rash**
- **Maculopapular rash**
- **Rash of systemic lupus erythematosus**
Terminology binding to My Health Record documents

- Some subsets are bound to national specifications (as value domains), e.g. Shared Health Summary.
Why use subsets available from the NCTS?

• Provide small, usable chunks of SNOMED CT-AU and AMT.
• Some are co-developed by collaborating with subject matter experts.
• Based on source data (e.g. TGA, jurisdictions, peak bodies/colleges).
• Contain data not held in other files, such as:
  – Language reference set
  – Association reference set
  – Strength reference set
  – ARTG Id reference set
  – Dose route and form extended association reference set
• Or is not otherwise within the scope of SNOMED CT-AU, such as:
Why use subsets available from the NCTS?

• The NCTS also hosts and releases reference sets that are developed and owned by SNOMED CT-AU license holders, known as Third Party Reference Sets. These include:
  – Tasmania reportable Schedule 4 trade medications reference set
  – Victoria reportable Schedule 4 trade medications reference set
  – Royal Australasian College of Surgeons MALT surgical procedure reference set
  – Royal College of Pathologists of Australasia (RCPA) - Pathology Terminology and Information Models

• Reference sets are available in a variety of formats, along with a concise description of each.
Types of SNOMED CT-AU and AMT subsets
Which subsets to access?

The implementation type will influence subset choice.

For an RF2 implementation of SNOMED CT-AU (e.g., relational database) - reference sets are most appropriate.

Reference sets are available in a variety of formats (RF2, XML, JSON, TSV).

For a FHIR® implementation – ValueSets are most appropriate.

ValueSets are currently published on the NCTS where they directly support an Agency FHIR® profile.

In addition, consider your use case and context to determine which subset contains the relevant content.
Examples of reference sets available from the NCTS
What is SNOMED CT?

• A large ‘dictionary’ of clinical terms with a unique code that are machine-readable.
• Designed to capture clinical data within electronic records.
• Comprised of over 350,000 concepts, and covers content areas of:
  – Diseases, procedures, clinical findings and therapeutic products.
  – Plus additional content that helps define the meaning of these major content areas.

• SNOMED CT-AU is the Australian extension of SNOMED CT.
  – Contains SNOMED CT core files along with Australian developed content, such as:
    • Australian Medicines Terminology (AMT).
    • Australian dialect reference set.
    • Over 90 reference sets for clinical use.
What are SNOMED CT reference sets?

- Specific to SNOMED CT.
- Identify specific subsets of content and support a range of granularity and specificity.
- Some can be a mapping or association reference sets, where additional information is added to a component.
- The NCTS publishes reference sets to help with implementations.
Foundation reference sets

Provide the broadest possible terminology because they contain all concepts within a top-level hierarchy.

Examples include:
- Clinical finding foundation reference set
- Observable entity foundation reference set
- Procedure foundation reference set

AMT product reference sets correlate with one of the seven notable concepts defined by the AMT model, such as:
- Medicinal product reference set
- Trade product unit of use reference set
- Containered trade product pack reference set

Support the following uses:

- Where reference sets are yet to be developed and the required hierarchy or conceptual idea of information has been identified.
- For example, the Procedure foundation reference set would be applicable for a data element that captures a surgical intervention.
- Used as the basis from which further use-case-specific reference sets can be developed, through a process of constraint.
Broad context reference sets

Provide the broadest possible terminology considered necessary to support the clinical information requirements within clinical groupings.

Examples include:
- Cardiovascular finding reference set
- Imaging procedure reference set
- Microorganism reference set

Support the following uses:

- Where reference sets represent a useful method of providing terminology for a clinical grouping.
- For example, concepts from the Mental health disorder reference set would be applicable for a data element that captures a mental health diagnosis.
- Used as the basis from which more specific reference may be developed through a process of constraint. This may be useful in constraining codes for a particular clinical setting or professional group.
Language reference sets

Most commonly used to indicate which descriptions are preferred or acceptable in a particular language, dialect or context.

- For example the *Australian dialect reference set*.

May also be used to specify description preferences within a specific context, such as a clinical specialty.
Mapping reference sets

- Allow relationships to be represented between code systems.
- Maps can be simple (one-to-one) or complex (e.g. many-to-many).
- The correlation between codes (how equivalent or not the concepts are) is often indicated.

Currently two mapping reference sets are available from the NCTS:

- Australian Register of Therapeutic Goods Identifier (ARTGID) reference set
- Substance to SNOMED CT-AU mapping reference set
Adverse reaction reporting

- Supports the recording of the agent (medicinal and non-medicinal) causing an adverse reaction to a patient, as well as the type and signs/symptoms of the adverse reaction.

<table>
<thead>
<tr>
<th>Reference Set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse reaction agent reference set</td>
<td>Supports the recording of the most common agents that may be responsible for causing adverse reactions.</td>
</tr>
<tr>
<td>Adverse reaction type reference set</td>
<td>Supports the recording of the type of adverse reaction that a patient has experienced.</td>
</tr>
<tr>
<td>Clinical manifestation reference set</td>
<td>Supports the recording of common clinical manifestations of adverse reactions within healthcare settings within Australia.</td>
</tr>
<tr>
<td>Non-medicinal adverse reaction agent</td>
<td>Supports the recording of non-medicinal agents that may be responsible for causing adverse reactions.</td>
</tr>
</tbody>
</table>
Dose based prescribing

- Supports non-product-based prescribing or medication ordering activity typically performed within acute care settings.

<table>
<thead>
<tr>
<th>Reference Set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose based prescribing dose form reference set</td>
<td>Supports the recording of dose forms for dose based prescribing.</td>
</tr>
<tr>
<td>Dose based prescribing dose frequency and interval reference set</td>
<td>Supports the recording of dose frequencies and dose intervals for dose based prescribing.</td>
</tr>
<tr>
<td>Dose based prescribing medication course type reference set</td>
<td>Allows identification of different medication course types in vendor systems.</td>
</tr>
<tr>
<td>Dose based prescribing route of administration reference set</td>
<td>Supports the recording of the route by which a medication is administered for dose based prescribing.</td>
</tr>
<tr>
<td>Dose route and form extended association reference set</td>
<td>Provides relationships between dose routes of administration, administered dose forms and manufactured dose forms required for the Prescribing Model described in the SNOMED CT-AU - Guide for Terminology Use in Prescribing.</td>
</tr>
</tbody>
</table>
AMT concrete domain reference sets

- Supports the defining of numeric medication attributes, i.e. they allow for the association of a concrete (numeric) value with a component.

<table>
<thead>
<tr>
<th>Reference Set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strength reference set</strong></td>
<td>Provides a machine-readable strength representation of the Medicinal Product Unit of Use (MPUU) as the stated HAS AUSTRALIAN BoSS relationship to Substance.</td>
</tr>
<tr>
<td><strong>Unit of use size reference set</strong></td>
<td>Denotes the size of each unit of use of the MPUU as the stated relationship HAS UNIT OF USE relationship to Unit of Use. It also denotes the size of each unit of use of the TPUU as an inferred relationship.</td>
</tr>
<tr>
<td><strong>Unit of use quantity reference set</strong></td>
<td>Defines the quantity or number of MPUUs within a Medicinal Product Pack (MPP) as described by the MPP HAS MPUU relationship to MPUU.</td>
</tr>
<tr>
<td><strong>Subpack quantity reference set</strong></td>
<td>Defines the quantity or number of subpacks contained within a sequential multi-component item at the product pack level, for example oral contraceptive products.</td>
</tr>
</tbody>
</table>
### Adverse reaction type reference set

#### RF2 structure – for implementations

<table>
<thead>
<tr>
<th>id</th>
<th>effectiveTime</th>
<th>active</th>
<th>moduleId</th>
<th>refsetId</th>
<th>referencedComponentId</th>
</tr>
</thead>
<tbody>
<tr>
<td>1039608-e48e-4a86-9335-bcd2-d6bd3bb888b</td>
<td>2012-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>79895007</td>
</tr>
<tr>
<td>9871f205-8d6d-4067-bc6a-3106d2f3a49b</td>
<td>2015-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>291647001</td>
</tr>
<tr>
<td>3206a2ba-2b5c-43a8-9e3e-5dd1955e8cc5</td>
<td>2012-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>293013007</td>
</tr>
<tr>
<td>37eab41e-7c8b-4788-9116-a986f88538aa</td>
<td>2015-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>754780001</td>
</tr>
<tr>
<td>4a35eb6c-466c-4256-b970-6002-k4ad7303b</td>
<td>2012-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>122600007</td>
</tr>
<tr>
<td>639480b4-d0d4-41ea-b76d-b0ca-c27726557a</td>
<td>2012-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>402170934</td>
</tr>
<tr>
<td>6367b8a6-5060-4632-924d-4c2e-107d98a8</td>
<td>2012-05-31 00:00:00</td>
<td>1</td>
<td>32506021000036107</td>
<td>11000036103</td>
<td>754780000</td>
</tr>
</tbody>
</table>

#### A reference to the SNOMED CT concept

<table>
<thead>
<tr>
<th>Concept ID</th>
<th>Fully Specified Name</th>
<th>Preferred Term</th>
<th>Acceptable Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td>404204005</td>
<td>Drug interaction with drug (finding)</td>
<td>Drug interaction with drug</td>
<td>Drug interaction,Intoxication,Intoxication poisoning,Intoxication by,Intoxication syndrome,Intoxication effect,Intoxication of,Intoxication toxic</td>
</tr>
<tr>
<td>75478009</td>
<td>Poisoning (disorder)</td>
<td>Toxicity</td>
<td>Intoxication,Intoxication poisoning,Intoxication by,Intoxication syndrome,Intoxication effect,Intoxication of,Intoxication toxic</td>
</tr>
<tr>
<td>235719002</td>
<td>Intolerance to food (finding)</td>
<td>Food intolerance</td>
<td>Intolerance to food</td>
</tr>
<tr>
<td>281647001</td>
<td>Adverse reaction (disorder)</td>
<td>Adverse reaction</td>
<td>Adverse reactions</td>
</tr>
<tr>
<td>419076005</td>
<td>Allergic reaction (disorder)</td>
<td>Allergic reaction</td>
<td>Allergic reactions</td>
</tr>
<tr>
<td>28031001</td>
<td>Cell-mediated immune reaction (disorder)</td>
<td>Hypersensitivity reaction type IV</td>
<td>Cell-mediated immune reaction,Delayed hypersensitivity reaction,Gell and Coombs reaction type IV</td>
</tr>
<tr>
<td>75989007</td>
<td>Drug interaction (finding)</td>
<td>Drug interaction</td>
<td>Drug interaction,Medication interaction</td>
</tr>
<tr>
<td>402170934</td>
<td>Medication side effects present (finding)</td>
<td>Medication side effect</td>
<td>Has shown side effects from medication,Medication side side</td>
</tr>
<tr>
<td>90097004</td>
<td>Pseudoallergic reaction (disorder)</td>
<td>Non-allergic reaction</td>
<td>Pseudoallergic reaction</td>
</tr>
<tr>
<td>83693005</td>
<td>Hypersensitivity reaction mediated by antibody (disorder)</td>
<td>Hypersensitivity reaction type III</td>
<td>Gell and Coombs reaction type II,Hypersensitivity reaction mediated by antibody,Type II reaction</td>
</tr>
<tr>
<td>12263007</td>
<td>Type I hypersensitivity response (disorder)</td>
<td>Hypersensitivity reaction type I</td>
<td>Gell and Coombs reaction type I,Gell and Coombs reaction type I,UGF homocytotropic antibody reaction,Type I hypersensitivity response,Type I</td>
</tr>
<tr>
<td>95997004</td>
<td>Drug interaction with food (finding)</td>
<td>Drug interaction with food</td>
<td>Food interaction with drug,Medication interaction with food</td>
</tr>
</tbody>
</table>
Using reference sets

- Reference sets filter the core components for the desired content, or add non-defining information to core components.
- Therefore, reference sets cannot be used in isolation.
- Several reference sets may be used at once:
  1. Start with concepts.
  2. Add on descriptions.
  3. Narrow down the concepts with a grouping reference set.
  4. Overlay the Australian dialect reference set to find the preferred terms.
Refining reference sets

- Custom intersects can be created to filter on even more specific content.
  1. Start with concepts.
  2. Narrow down the concepts with a grouping reference set, such as the Emergency department reference set.
  3. Narrow down the concepts further with the Fracture finding reference set.
Examples of ValueSets available from the NCTS
FHIR® terminology – big picture

- FHIR® is the next-generation HL7 standard for electronic healthcare data exchange.
- It is also a way that terminology can be maintained and distributed.
What are FHIR® ValueSets?

The key purpose of a ValueSet is to specify the allowable content for coded elements.

The ValueSet resource can also be used to give context to a ConceptMap resource, which describes the relationship between codes in different ValueSets.

To retrieve the codes and displays included in a ValueSet, an ‘$expand’ operation may be performed on a FHIR® Terminology Server. This is known as ‘ValueSet Expansion’.

Some NCTS ValueSets define the same content as an NCTS reference set, except it conforms to the FHIR® specification.

The NCTS also publishes ValueSets that support clinical information specifications and implementations.
Adverse reaction type reference set – FHIR® ValueSet rendering


The expansion contains references to the CodeSystem, code and preferred term
Implicit FHIR® ValueSets

- All simple type reference sets are available as a rendering of a FHIR® value set expansion.
- We also publish in JSON and XML format, again for human accessibility.

<table>
<thead>
<tr>
<th>Query portion</th>
<th>Identifier</th>
<th>This returns…</th>
</tr>
</thead>
<tbody>
<tr>
<td>?fhir_vs</td>
<td><a href="http://snomed.info/sct/32506021000036107/version/20190731?fhir_vs">http://snomed.info/sct/32506021000036107/version/20190731?fhir_vs</a>  ** Note this expansion may not work against the NTS because it is intensive to process</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All codes within Australian edition, July 2019 version (includes inactives)</td>
</tr>
</tbody>
</table>
Composed FHIR® ValueSets

- A large number of FHIR® ValueSets have been published to support HL7 AU FHIR® profiles, Agency FHIR® profiles and future Agency CDA specifications supporting My Health Record.
- Some examples include:
  - Australian States and Territories
  - Individual Healthcare Identifier Status
  - Australian Medicare Benefit and Claim Category
  - Reason Vaccine Not Administered
  - Organ Donation Body Site
Composed FHIR® ValueSets

• Some additional examples are the Australian Medicines Terminology Vaccine ValueSet and the Australian Immunisation Register Vaccine ValueSet, which are bound in the Australian FHIR® Immunisation resource.

Using FHIR® ValueSets

- ValueSets can be interrogated using FHIR operations.
- ‘$expand’ allows you to retrieve the ValueSet expansion subject to a number of parameters.
  - Result is a Value Set with an ‘expansion’ element.
  - This method can be used to return a set of values matching the parameters supplied, so that a user can select a value for data entry in the UI.
  - Parameters include: filter, count, offset, includeDesignations, includeDefinition, activeOnly, excludeNested, excludeNotForUI, excludePostCoordinated, displayLanguage, limitedExpansion, profile.

Using FHIR® ValueSets

- ‘$validate-code’ allows you to determine if a coded value is in the set of codes defined by a value set.
  - The code to be validated can be supplied in the parameters code, coding, or CodableConcept (multiple).
  - The operation returns a true or false result.
  - Optionally can determine whether the provided display text is the correct display text for a code.
  - This is the main method for validating coded data.

To access the NCTS Postman environment and example queries:
Accessing NCTS subsets
Different ways to access SNOMED CT-AU subsets

• Browse using the Shrimp terminology browser.
• Download from the NCTS website.
  – Reference sets
    • TSV format
    • FHIR® format
  – RF2 bundles
    – Requires an NCTS licence
• Connect to the National Terminology Server.
  – ValueSets
  – Requires an NCTS licence and a conformant terminology server (e.g. Ontoserver) or an API client (e.g. Postman)
• National Syndication Server.
  – Programmatic syndication interface which enables automation of content downloads
Choosing a reference set to view its content

1. Select a reference set from the dropdown to view its members.
2. Click on a member/concept to bring up the hierarchy view.
3. The concepts in green text are also members of the selected reference set.
1. In ‘Access’ tab, navigate to ‘Reference Sets’.
   • Note that you need to log in for access.
3. Select item in ‘View’ column to read more.
SNOMED Release Format 2 (RF2) bundles

1. In ‘Access’ tab, navigate to ‘Release Bundles’.
   • Note that you need to log in for access.

2. Expand the release you are interested in.

3. Download the file.

Refer to the SNOMED CT release file specifications for information about the file structure.
National Terminology Server

• Click [here](#) to view FHIR® ValueSets available on the National Terminology Server.
  – The program allows a view of ValueSet summary (including URI, version, status and OID), the ValueSet FHIR® resource, and the expansion of the Value Set.
  – Please note that some ValueSets are unable to be expanded.

• National Terminology Server can also be accessed via an API client, e.g. Postman.
Resources

• The NCTS contains a number of useful documents: (https://www.healthterminologies.gov.au/learn?content=documentlibrary), including:
  – SNOMED CT-AU Development Approach for Reference Sets
  – SNOMED CT-AU Australian Technical Implementation Guide
  – SNOMED CT-AU Sample scripts

• And presentations, including:
  – SNOMED CT-AU hierarchies
  – Introduction to the FHIR® specification
  – Basic FHIR® terminology services

• For more information on FHIR® ValueSets: https://www.hl7.org/fhir/valueset.html
Contact us

Help Centre  1300 901 001
Email       help@digitalhealth.gov.au
Website     healthterminologies.gov.au
digitalhealth.gov.au
Twitter     twitter.com/AuDigitalHealth

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