Implementation Report: Representing Codes in CDA

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Health Intersections

Representing Codes in CDA

- Work is based on current CDA implementation experience
- Based on document “Representing Coding in CDA Documents” issued by NEHTA
  - Practical advice with regard to coding
  - Developed in collaboration with GP Desktop vendor panel
  - url:
- Note: This presentation describes how to use CDA with current coding practices
  - Current coding practices need improvement

Codes in CDA

- Problems & Diagnoses
- Medicine Identification (& Immunizations)
- Allergies & Adverse Reactions
- Diagnostic Codes
  - Requests / Orders
  - Report & Atomic item Identification
  - Anatomical Locations
  - Observations & process information
- Procedures and Services
- Internal/Workflow/Sturctural Status codes
- Lots of minor classifications (Occupations, Clinical services, Institution types, Demographics)

CD Data Type

- CD =“Concept” Descriptor
- Most difficult type in HL7 data types

- “Concept” is not the same as a code
- One Concept – one unit of clinical meaning
- Can have zero or more codes that represent the concept variably well

CD Data Type

Group	Attributes	Meaning
Code	code : string codeSystem : string codeSystemVersion : string	Identifies the code system and code defined by it
Display	displayName : string	One defined display representation for the code
Text	originalText : ST (element)	Provides the text that the user said/typed/chose when picking the code or in place of the code
Translations	Translation (element)	Recursive reference to more of the same type.

CD Data Type

```
<x nullFlavor=”[NF]”
   code=”[code]” codeSystem=”[oid]”
   displayName=”[display]”/>
  <originalText>[text]</originalText>
  <translation nullFlavor=”[NF]”
    code=”[code]” codeSystem=”[oid]”
    displayName=”[display]”/>
</x>
```

NullFlavor

code	name	definition
NI	No Information	The value is missing for some unknown reason Note that `<x nullFlavor="NI"/>` is exactly the same as not including `<x>` at all.
UNK	unknown	The value is not known.
ASKU	asked but unknown	Information was sought but not found (e.g., patient was asked but didn't know)
NAV	temporarily unavailable	Information is not available at this time but it is expected that it will be available later.
NASK	not asked	This information has not been sought (e.g., patient was not asked)
OTH	Other	The concept is known, but it’s not a valid code

Overlapping codes & nullflavor

Code	displayName
1	Aboriginal but not Torres Strait Islander origin
2	Torres Strait Islander but not Aboriginal origin
3	Both Aboriginal and Torres Strait Islander origin
4	Neither Aboriginal nor Torres Strait Islander origin
9	Not stated/inadequately described

Rule of thumb: use the code

Code System

- Code system – definitional framework that defines the meaning of the codes
- Identified by OID or UUID (GUID)

  2.16.840.1.113883.6.96

  441D40AF-0A07-426C-96AA-00E9D4C4A713
- Code systems must be registered with the HL7 OID registry
- Codes must never have more than one meaning in the space of the identified code system
- If the definition of the code system is known, the code can be used for logic
- Code systems can have versions – should be filled out when possible

OIDs for common systems

Coding System	OID	Notes
SNOMED CT	2.16.840.1.113883.6.96	Includes SNOMED CT-AU
AMT	2.16.840.1.113883.6.96	codeSystemVersion =
Loinc	2.16.840.1.113883.6.1	
ICD-10	2.16.840.1.113883.6.3	
ICD-10-AM	2.16.840.1.113883.6.135	
MIMS	1.2.36.1.2001.1005.11.1	(MIMS Integrated Data Solution)
ICPC 2+	2.16.840.1.113883.6.140.1	
DOCLE	1.2.36.1.2001.1005.13	
PBS Code	1.2.36.1.2001.1005.22	
PBS Manufacturer Code	1.2.36.1.2001.1005.23	
MBS Code	1.2.36.1.2001.1005.21	
HL7 table N	2.16.840.1.113883.12.**N**	

Code System Version

- Should provide a codeSystemVersion
  - All coding systems have to redefine codes (even LOINC)
- Value is that specified by code system
  - Except that code systems are very inconsistent about this
- Snomed-CT has a complicated syntax under preparation:
  “urn:” “ihtsdo” “:”
  [“&c=“<componentId | UUID>]
  [“&m=“ <moduleId>]
  [“&v=“ <effectiveTime>]
- For example, 20110731 SNOMED CT International release
  urn:ihtsdo:m=900000000000207008&v=20110731
- and the 20110531 SNOMED CT-AU release
  urn:ihtsdo:m=32506021000036107&v=20110531

displayName

- Used by systems that don’t know the code system to display the code (if no originalText)

Code System	Source of displayName
SNOMED CT-AU	Preferred name in the Australian English Language reference set
AMT	Preferred Name (or, for v3, Preferred name in the Australian English Language reference set)
HL7 code systems and v2 tables	The Print name for the code
ICD-10-AM	Preferred Name
ICPC2+	The ICPC2+ term for the code
MIMS	The display term provided by MIMS

Value Set

- Almost always, the choice of codes is limited to a set of pre-approved codes
- These are called “the value set”
- Usually a subset of one code system – can cover more
- Binding might be “With Exceptions” or “No exceptions”
  - “With exceptions” means that if the concept doesn’t match the defined codes, any other code can be supplied
- NEHTA specifying value sets from Snomed-CT and AMT
  - No one is actually using these in practice (much)

Original Text

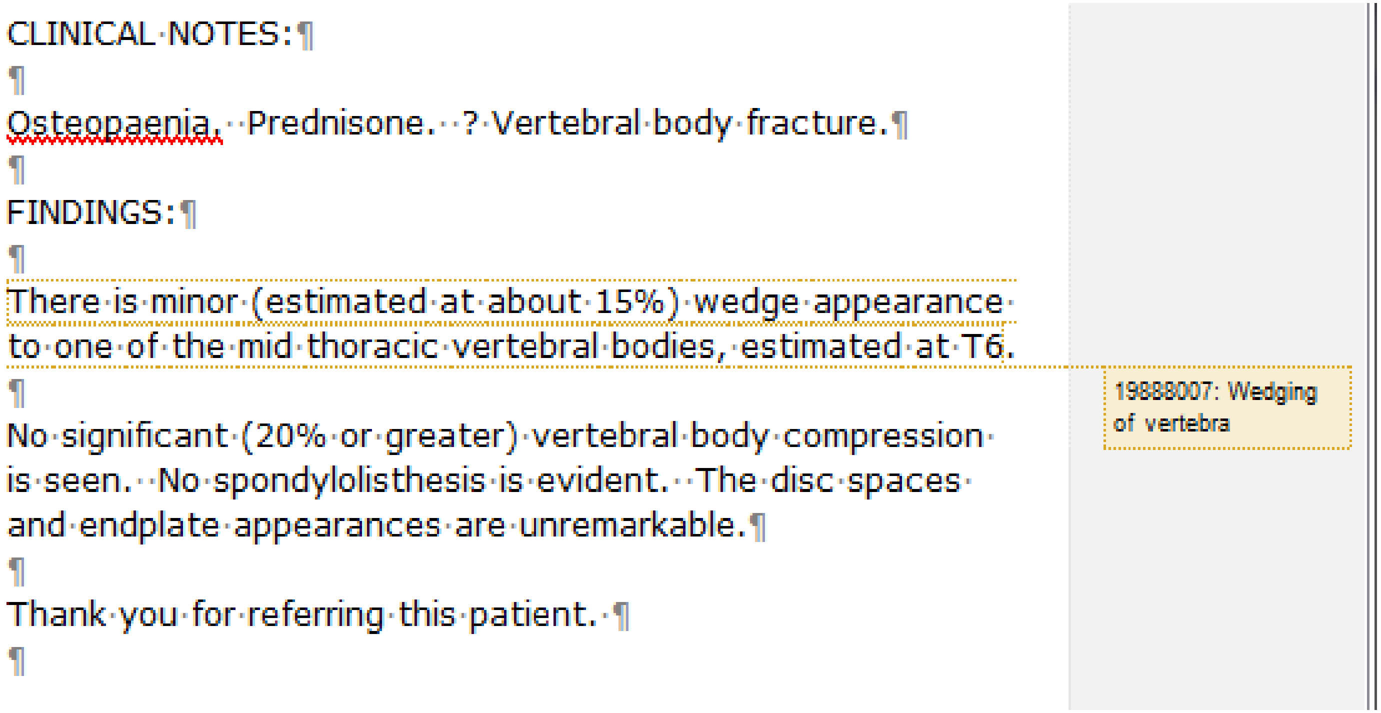
- Human processible representation of the concept
- The most correct representation of the concept

  "The text as seen and/or selected by the user who entered the data which represents the intended meaning of the user"
- Often the original text is just the defined description for the code (displayName)
- It can be hard to determine the originalText
- In CDA, the original text is what is used to represent the concept in that narrative

Original Text

Scenario	Original Text
User picks a code from a list of codes, displayed as the codes themselves (usually this only works with small lists of well known terms, particularly where the codes are meaningful)	None
User picks a code from a list of codes, displayed as text	Display text
User typed some text which was processed in the background	Text user typed
User typed some text which started a code look up	The text description of the code they picked
User typed some text which was processed into a suggested list of codes, and then the user typed more text to further narrow the suggested list	The choice of “original text” becomes a little arbitrary; in the case where the original text stands as part of a report (see image below), the first original text applies.
User chose a code from a list and typed more text to clarify further	The display name for the code, with the clarifying text appended.

Original Text



CLINICAL NOTES:

Osteopaenia. Prednisone. ? Vertebral body fracture.

FINDINGS:

There is minor (estimated at about 15%) wedge appearance to one of the mid thoracic vertebral bodies, estimated at T6.

19888007: Wedging of vertebra

No significant (20% or greater) vertebral body compression is seen. No spondylolisthesis is evident. The disc spaces and endplate appearances are unremarkable.

Thank you for referring this patient.

Original Text

Scenario	Original Text
User picks a code from a list of codes, displayed as the codes themselves (usually this only works with small lists of well known terms, particularly where the codes are meaningful)	None
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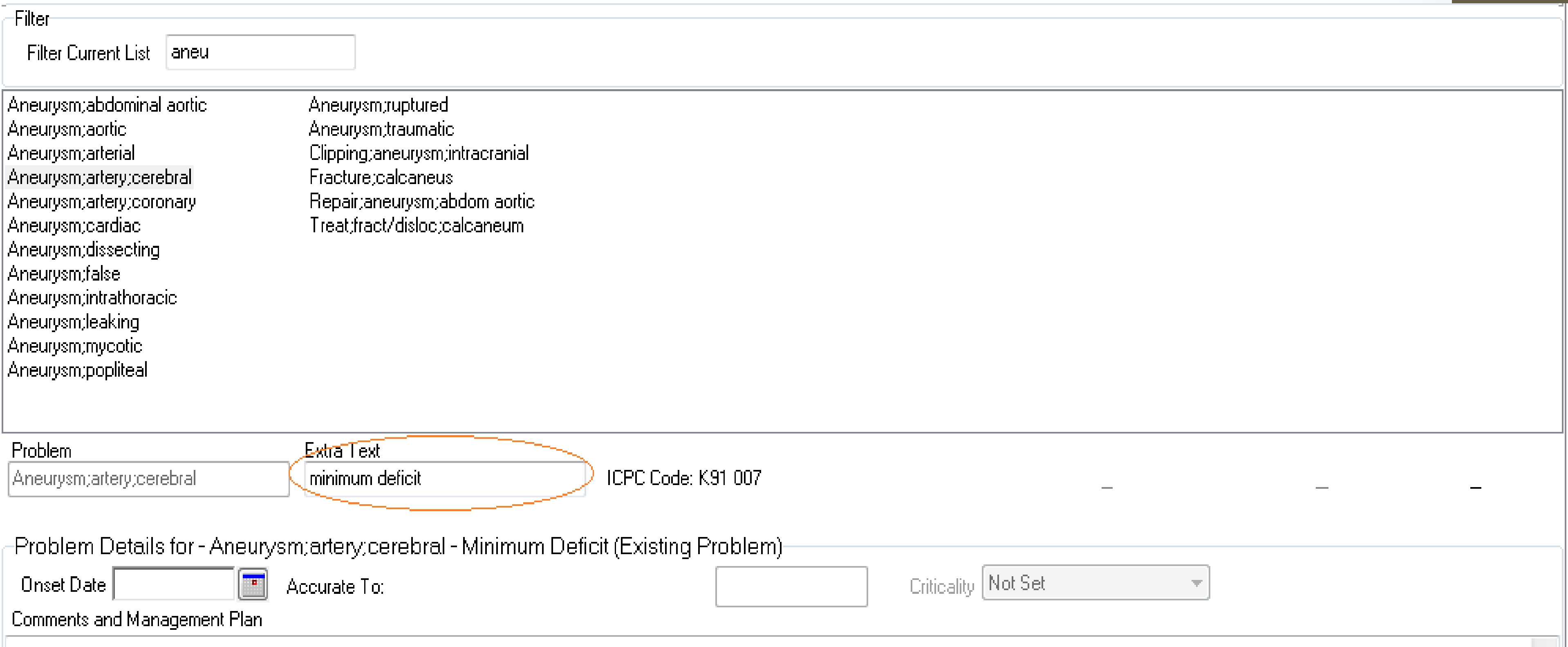
User typed some text which was processed into a suggested list of codes, and then the user typed more text to further narrow the suggested list	The choice of “original text” becomes a little arbitrary; in the case where the original text stands as part of a report (see image below), the first original text applies.
User chose a code from a list and typed more text to clarify further	The display name for the code, with the clarifying text appended.

Original Text



Filter

Filter Current List: aneu

Aneurysm;abdominal aortic
Aneurysm;aortic
Aneurysm;arterial
Aneurysm;artery;cerebral
Aneurysm;artery;coronary
Aneurysm;cardiac
Aneurysm;dissecting
Aneurysm;false
Aneurysm;intrathoracic
Aneurysm;leaking
Aneurysm;mycotic
Aneurysm;popliteal
Aneurysm;ruptured
Aneurysm;traumatic
Clipping;aneurysm;intracranial
Fracture;calcaneus
Repair;aneurysm;abdom aortic
Treat;fract/disloc;calcaneum

Problem: Aneurysm;artery;cerebral

Extra Text: minimum deficit

ICPC Code: K91 007

Problem Details for - Aneurysm;artery;cerebral - Minimum Deficit (Existing Problem)

Onset Date:

Accurate To:

Criticality: Not Set

Comments and Management Plan

Translations

- Allow in place mappings between different code systems
- Translations are often not exact
- Allow for transition from one coding system to another
- No original text on translations
- No need for translations in CDA if root code comes from Snomed-CT, AMT, or LOINC.

Expressions

Snomed:

```
<value code="128045006:{363698007=56459004}"
    codeSystem="2.16.840.1.113883.6.42">
  <originalText>Cellulitis of the foot</originalText>
</value>
```

ICD-10:

```
<value code="J21.8 B95.6"
    codeSystem="2.16.840.1.113883.6.260">
  <originalText>Staph aureus bronchiolitis</originalText>
</value>
```

- Requirement arises intrinsically
- All aspects of implementation are difficult
- Let’s walk before we go high-diving

Scenarios

Coded Text (No extensions) - code is known or not

Codeable Text (With extensions):

1. The Concept is not known at all
2. User picks code directly from the value set
3. User enters text
4. User picks a code provided by some other code system (e.g. MIMS, ICPC2+, ICD-10, DOCLE, etc).
5. User picks a code from another code system and then provides additional clarifying text
6. User chooses a code they have defined themselves
7. The CDA document is being prepared on an interface engine from a v2 CWE type, and it is not known which of processes #4 - #8 applied.

Codes (No exceptions)

Known:

```
<x code=”01” codeSystem=”1.2.36.1.2001.1001.101.104.16299”
  displayName=”None known”/>

<x code=”01” codeSystem=”1.2.36.1.2001.1001.101.104.16299”
  displayName=”None known”>
  <originalText>There are no known medications</originalText>
</x>
```

Unknown:

```
<x nullFlavor=”UNK” codeSystem=”2.16.840.1.113883.3.879”/>

<x nullFlavor=”UNK” codeSystem=”2.16.840.1.113883.3.879”>
  <originalText>Chinese Malay / Aboriginal</originalText>
</x>
```

The concept is unknown

Didn’t even ask the patient:

```
<x nullFlavor=”NASK”/>
```

Don’t know why it’s unknown:

```
<x nullFlavor=”NI”/>
```

- Can’t provide a nullFlavor and an originalText (that’d mean it wasn’t unknown)

User picks correct code directly

User picks Snomed-CT code from drop-down:

```
<x code=”263063009” codeSystem=”2.16.840.1.113883.6.96”
  displayName=” Fracture dislocation of joint”>
  <originalText>Fracture dislocation of joint</originalText>
</x>
```

User picks from code list:

```
<x code=”M” codeSystem=”oid for gender”
  displayName=”Male”/>
```

User enters Text

User enters text:

```
<x>
  <originalText>Fracture/dislocation</originalText>
</x>
```

Text is coded later (by a person or a machine):

```
<x>
  <originalText>Fracture/dislocation</originalText>
  <translation code=”263063009” codeSystem=”2.16.840.1.113883.6.96”
    displayName=” Fracture dislocation of joint”/>
</x>
```

User picks other code

Code:

```
<x code=”L76013” codeSystem=”2.16.840.1.113883.6.140.1”
   displayName=”Fracture: other”>
  <originalText>Fracture: other</originalText>
</x>
```

Translated to Snomed-CT:

```
<x code=”L76013” codeSystem=”2.16.840.1.113883.6.140.1”
  displayName=”Fracture: other”>
  <originalText>Fracture: other</originalText>
  <translation code=”263063009” codeSystem=”2.16.840.1.113883.6.96”
  displayName=” Fracture dislocation of joint”/>
</x>
```

- Note: this case implies extra knowledge from elsewhere in order to provide a more specific Snomed-CT code.

Special Case: MIMS

```
<code code="83510101" codeSystem="1.2.36.1.2001.1005.11.1"
   codeSystemName="MIMS Standard Code set" codeSystemVersion="20110900"
   displayName="Ganfort 0.3/5 Eye drops …">
   <originalText><!--insert originalText here--></originalText>
   <translation code="7883501100036104" codeSystem="1.2.36.1.2001.1004.100"
     codeSystemName="Australian Medicines Terminology (AMT)"
     codeSystemVersion="2.25"
     displayName="GANFORT 0.03% / 0.5% eye drops: solution, 3 mL"/>
</code>
```

- Original Text is required (should be MIMS displayName)
- Original Text goes in the narrative
- Display and maintain the originalText

User provides additional text

Code:

```
<x code=”K90001” codeSystem=”2.16.840.1.113883.6.140.1”
  displayName=”Aneurysm;artery;cerebral”>
  <originalText> Aneurysm;artery;cerebral – minimum deficit</origina
  <translation code=”128608001” codeSystem=”2.16.840.1.113883.6.96”
    displayName=”Cerebral arterial aneurysm”/>
</x>
```

- Could use more specific snomed code in translation
  - Including post-coordinated code if tooling exists

User self defined code

Code:

```
<x code=”AA1001”
    codeSystem=”441D40AF-0A07-426C-96AA-00E9D4C4A713”
    displayName=”Cerebral arterial aneurysm with minimum deficit”>
  <originalText>Minimal deficit Cerebral arterial
    aneurysm</originalText>
</x>
```

- Code system ID can be autogenerated (CoCreateGuid etc)
- Code system still needs to be registered in HL7 OID Registry
  - Automated registration coming

V2 → CDA on Interface Engine

CWE Component	CD attribute	Notes
1: identifier	x.code	
2: text	x.displayName	
3: coding system	x.codeSystem	Conversion from Name to OID required
4: Alternate Identifier	x.translation.code	
5: Alternate Text	x.translation.displayName	
6: Alternate Coding System	x.translation.codeSystem	Conversion from Name to OID required
7: coding system version	x.codeSystemVersion	
8: alternate coding system version	x.translation.codeSystemVersion	
9: original text	x.originalText	

V2 → CDA on Interface Engine

- If “No exceptions” applies, a nullFlavor is required if no component 1 (or 4).
  - If there is a third or sixth component nullFlavor is “OTH” else “UNK”
- If there is no component 1, and a component 2, then component 2 is originalText not displayName
- Mapping is in error if both components 2 and 5 are populated and components 1 and 4 are not populated.
  - It is also an error if component 9 is populated and either components 2 or 5 are populated without a matching identifier. (not illegal in v2, but nonsensical)
- Components 7 and 8 map directly to codeSystemVersion
- Generally components 1-3 map to the root code, and components 4-6 map to a translation
  - But check examples and and the v2 implementation guides carefully
- No length limits in CDA – but often ignored in v2 anyway

Advice for Receivers

- Displaying the concept to the user
  - If you get an originalText, display this to the user
  - Otherwise, if you get one, the displayName
  - Otherwise, if you can, look up the code
  - Otherwise, the code, if you get one
  - Otherwise the nullFlavor description in brackets
  - If you don’t get anything then (“blank” or “—“) or equivalent
  - It is sometimes useful to display the code in brackets if assigned (alerts the user that the concept is coded, if the work flow depends on the code)

Advice for Receivers

- Storing the concept
  - Codes, displayNames, and originalText may be arbitrarily long. (>255 chars is possible)
  - They should never be truncated
  - Some unlimited type storage is appropriate.
    - most implementations choose some variation of storing the entire document as a blob, indexing the parts of the document that are used for searching/matching, and marking in those indexes where content has been truncated.
- Making decisions based on the code
  - Check the root and the translations for the preferred code
  - It may not matter whether the code is an expression or not (need to consult documentation on terminology service/library)

Conclusion

- Coding in CDA requires more attention to details – it has to be done properly
- Doing coding well improves prospects for interoperability
- CDA is not really suitable for local exchange
- Experience is starting to build through the country
- Hopefully this will gradually improve coding in v2 as well