Data Types in NEHTA Specifications

A Profile of the ISO 21090 Specification

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Final

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Document Information

Change History

The National Clinical Terminology and Information Service

Change History

Version	Date	Comments
1.0	7 Sep 2010	Initial public release.

List of Acronyms & Glossary

For a complete listing of all relevant Acronyms Abbreviations and a glossary of terms please refer to [NEHT2005a] .

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1 Introduction

The eHealth vision for Australia is to substantially improve the quality, safety and efficiency of healthcare services delivered to subjects of care (patients). To achieve these benefits, NEHTA's mission is to facilitate better ways of consistently collecting and securely exchanging health information electronically. Standards for data types, as addressed in this specification, are a key contributor to achieving this mission.

For instance: the code that is recorded for a 'Problem/Diagnosis' may be an element of the data that is included in a clinical document, such as a Discharge Summary, to be transferred from one system to another. It is in the interests of clinical safety that the receiving system and user of that element of data makes the exact same interpretation of it's meaning as applied in the source environment. Simply presenting the code only may leave such interpretation open/prone to error.

To mitigate this risk, a standard 'specification' can be defined whereby the code value is complemented by other essential information such as: the ID of code system (or reference Set) from which the code was retrieved for use as well as the version of the system (or Reference Set) used. Collectively, the value and the code system Id and the system version define the 'data type' (or properties) of the 'Problem/Diagnosis' data element.

1.1 Purpose of this document

The draft international standard 'ISO/FDIS 21090 Health informatics – Harmonized Datatypes for Information Interchange' [1](refer [ISO21090-2009]) is a specification of **technical** data types. The detail included is relevant to construction and implementation of software solutions. For example the ISO data types are adopted by technical standards such as HL7 V3.

(The ISO document is hereafter referred to in this specification as 'the draft ISO 21090 standard').

The data types included in this document are those required in the data group specifications that are used to compose NEHTA structured document templates (SDTs); these information products are at the logical level of specification.

The purpose of this document is to define the required NEHTA data types as a logical level profile[2] that conforms directly[3] to the draft ISO 21090 standard. Being at a logical level, the detail included in this specification is lesser than that specified in the ISO document; the ISO technical detail becomes relevant within the scope of this profile, during construction/implementation of NEHTA information products.

In this context, this document provides a conformance statement (see Appendix A). This statement addresses the requirements for direct conformance as published in Chapter 2 of the draft ISO standard.

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[1] Readers and reviewers of this document are advised that the ISO draft standard is expected to be put to ballot during 2010. Post-ballot changes may result in a revision to this profile.

[2] The draft ISO standard is technical and rich in detail intended for software construction and implementation. This profile of that standard has been created to ensure direct relationship, at an essential level of detail, between NEHTA's logical information products and the implementation of them. This 'profile' is selective and where required, constrained, to NEHTA's requirements. (Refer also to 'Appendix B Derivation of This Profile'

[3] Direct conformance and Indirect conformance is described in detail in Section 2 of the ISO 20190 document.

The properties (e.g. code value, code system ID, version) that are included in the specification of data types in this document are detail relevant to specification of clinical as well as administrative code sets/reference sets. Examples include use SNOMED, LOINC, ICD-10AM, units of measure (UCUM). Validation of this profile has been inclusive of NEHTA's work on code sets, in particular the specifications for CodeableText, CodedText and Quantity data types.

1.2 Structure of this document

To ensure cross checking with the draft ISO standard, the NEHTA data types are presented in the same sequence and using the same category groupings as are included in it. Also included, for each NEHTA data type are:

- The published ISO definition. The definition is complemented, where required, by additional NEHTA-specified information to convey the scope of constrained interpretation and use of the data type within NEHTA products;
- A list of the ISO attributes to be adopted, supported by usage/implementation guidance information. Most of the NEHTA data types will have fewer attributes than that defined in the draft ISO standard for it. The attributes selected are the minimal set of attributes required to ensure intended deployment and use of the NEHTA data group and SDT specifications;
- A summary mapping to the draft ISO standard that includes a reference to the equivalent section number in that document and any variance between the two; and
- A list of unresolved known issues which require further discussion. These issues have been registered in NEHTA's system (JIRA) for tracking the resolution of these. Once registered, each issue is allocated a JIRA reference ID and these are included in this document where relevant.

1.3 Intended audience

This specification is ultimately intended for external consumption including review and feedback by external stakeholders. These will include potential implementers of NEHTA specifications as well as participants in the health informatics arena in Australia.

The specification is reasonably technical in nature and expects the audience to be familiar with the language of health data specifications and have some familiarity with health information standards and specifications. Definition and examples are provided to clarify relevant terminology usage and intent.

Resolution of any 'known issues' recorded in this document will be addressed in collaboration with representative stakeholders including Standards Australia.

1.4 Background

The draft ISO standard for data types arises out of a Memorandum of Understanding (MOU) signed between CEN and HL7 organisations for further cooperation between them, with a particular emphasis on harmonisation and, where possible, convergence, of their standards for data types. Other areas of harmonisation include the HL7 CDA and CEN 13606 Reference Models and CEN/openEHR archetypes with HL7 Templates.

These areas of harmonisation have been, and continue to be, conducted under the auspices of the Joint Initiative on SDO Global Health Informatics Standardization (refer [SDO - NoDate]). That initiative was formed to enable common, timely health informatics standards by addressing and resolving

issues of gaps, overlaps, and counterproductive standardization efforts through:

- A mutually agreed decision process for international standardization;
- Coordinated standards strategies and plans, with the future goal of making all standards available through ISO;
- An integrated work program; and
- Focused, specific resolution of overlapping or counteracting standards within the participating SDOs existing work programs.

The ballot on the draft ISO standard is expected to take place during 2010. HL7 International has indicated an intention, that on completion of a successful ballot, the HL7 v3 data types will be migrated to the new data types.

This document will be reviewed, updated and re-issued to maintain alignment with updates to data types, relevant to NEHTA, as published by ISO.

2 Keywords

Where used in this document, the keywords **MUST**, **SHOULD**, **MAY**, **MUST NOT** and **SHOULD NOT** are to be interpreted as described in [RFC2119-1997].

Keyword	Interpretation
MUST	This word, or the terms '**REQUIRED**' or '**SHALL**', means that the definition is an absolute requirement of the specification.
SHOULD	This word, or the adjective '**RECOMMENDED**', means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
MAY	This word, or the adjective '**OPTIONAL**', means that an item is truly optional. One implementer may choose to include the item because a particular implementation requires it, or because the implementer determines that it enhances the implementation while another implementer may omit the same item. An implementation which does not include a particular option must be prepared to interoperate with another implementation which does include the option, perhaps with reduced functionality. In the same vein, an implementation which does include a particular option must be prepared to interoperate with another implementation which does not include the option (except of course, for the feature the option provides).
MUST NOT	This phrase or the phrase '**SHALL NOT**' means that the definition is an absolute prohibition of the specification.
SHOULD NOT	This phrase, or the phrase '**NOT RECOMMENDED**' means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications **SHOULD** be understood and the case carefully weighed before implementing any behaviour described with this label.

3 NEHTA data types: UML model

The diagram illustrates the scope of the NEHTA profile of the data types published in the draft ISO standard. Those shown in italics are abstract data types.

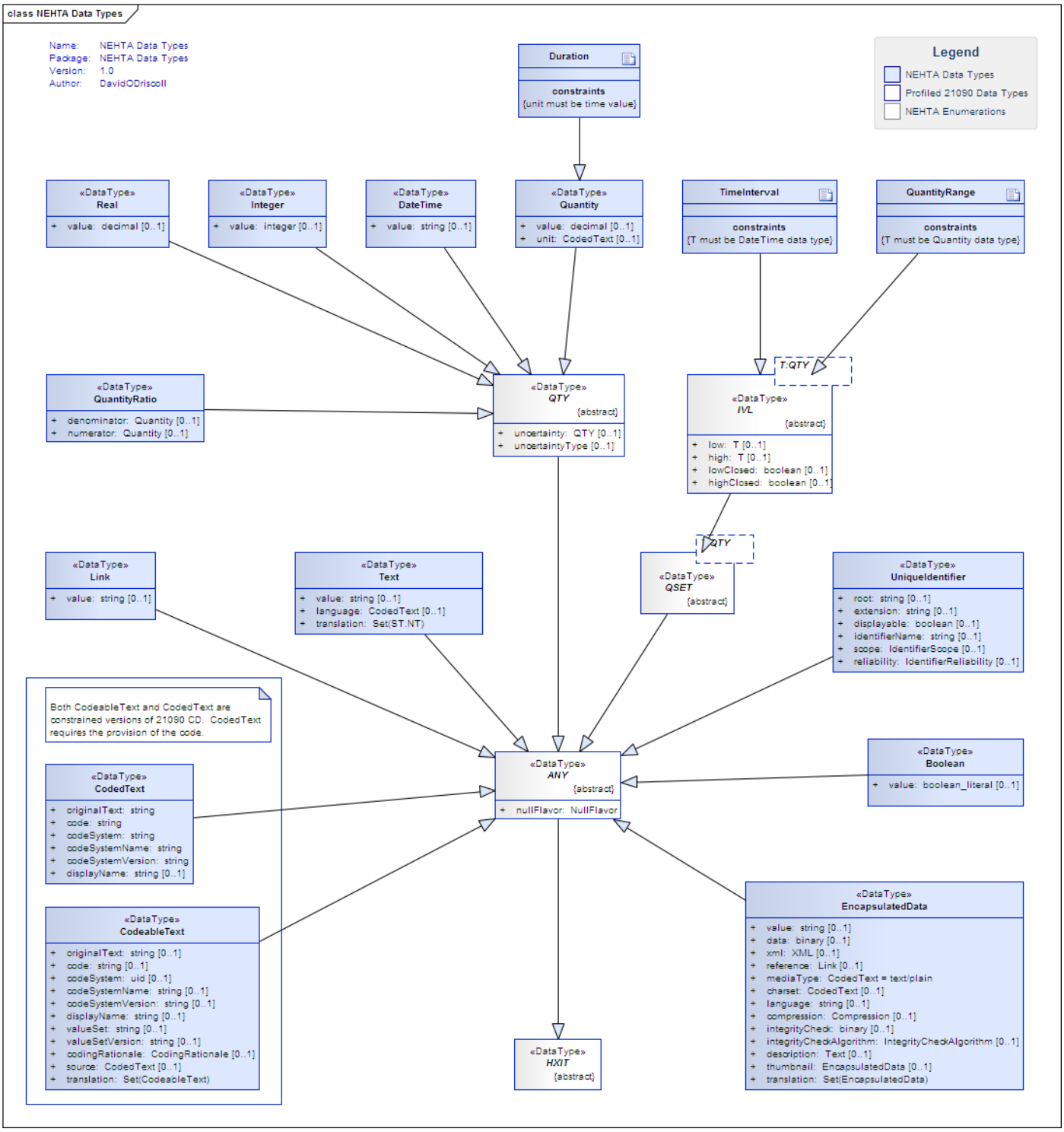


Figure 1 : NEHTA data types

4 Basic data types

4.1 Any

4.1.1 NEHTA iconography

any

4.1.2 Definition

NEHTA adopts the draft definition of ISO data type ANY with identified NEHTA constraints stated in the 'usage' section below

'Specialises HXIT. Defines the basic properties of every data value. This is conceptually an abstract type, meaning that no proper value can be just a data value without belonging to any concrete type. Every public concrete type is a specialization of this general abstract DataValue type.

However exceptional values (nullFlavored values) may be of type ANY, except for the exceptional values that imply the nullFlavor INV, since this requires a type to be meaningful. Note that not all nullFlavors may be used with the type ANY'.

4.1.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
nullFlavor: NullFlavor	If the value of a data element is null, a nullFlavor is indicates the reason the value is. (Refer to the list of nullFlavor enumerations in section 4.1.4.2).

4.1.4 Usage in NEHTA specifications

4.1.4.1 General guidelines

a. About HXIT

HXIT is an abstract and private data type (see Section 7.3.2 in the draft ISO standard) defined as 'Information about the history of this value: period of validity and a reference to an identified event that established this value as valid'.

At the time of issuing this version of the NEHTA Data Types Specification, no NEHTA specification makes any arrangements for the exchange of history and audit information of a specific data value. Therefore the four attributes of HXIT (validTimeLow : String; validTimeHigh : String: controlInformationRoot : Uid; controlInformationExtension : String) are all fixed to null in all usages.

However, a revision to this 'rule' may occur following detailed analysis of requirements in for example, context of an IEHR (Individual Electronic Health Record).

b. About nullFlavor

(The following is repeated as part of the conformance statement (section 12.6)).

All data types are specialisations of ANY and each inherits the attribute nullFlavor from ANY.

Whilst this specification will identify those data types for which use of nullFlavor is permitted, this may be further constrained in a NEHTA data group or SDT specification.

Occasionally there are business requirements where a true value is *always* required and nullFlavor may not be used. This document does not address these circumstances; they will be dealt with on a case-by-case basis in the appropriate information models.

4.1.4.2 Examples

a. Allowed nullFlavor Codes and use cases.

Below are nullFlavor codes and descriptions followed by use case examples, extracted from section 7.1.4 of the current version of the draft ISO standard. The entries in grey text are those nullFlavors that are not used in any context in NEHTA specifications.

Note: The numbers in the first column indicate a level in a hierarchy of code values.

NullFlavor Enumeration. OID: 2.16.840.1.113883.5.1008			
1	NI	No information	The value is exceptional (missing, omitted, incomplete or improper). No information as to the reason for being an exceptional value is provided. This is the most general exceptional value. It is also the default exceptional value.
2	INV	Invalid	The value as represented in the instance is not a member of the set of permitted data values in the constrained value domain of a variable.
3	OTH	Other	The actual value is not a member of the set of permitted data values in the constrained value domain of a variable. (e.g., concept not provided by required code system).
4	PINF	Positive infinity	Positive infinity of numbers.
4	NINF	Negative infinity	Negative infinity of numbers.
3	UNC	Unencoded	No attempt has been made to encode the information correctly but the raw source information is represented (usually in originalText).
3	DER	Derived	An actual value may exist, but it must be derived from the provided information (usually an expression is provided directly).
2	UNK	Unknown	A proper value is applicable, but not known.
3	ASKU	Asked but unknown	Information was sought but not found (e.g., patient was asked but didn't know).
4	NAV	Temporarily unavailable	Information is not available at this time but it is expected that it will be available later.
3	NASK	Not asked	This information has not been sought (e.g., patient was not asked).
3	QS	Sufficient quantity	The specific quantity is not known, but is known to be non-zero and is not specified because it makes up the bulk of the material. 'Add 10 mg of ingredient X, 50 mg of ingredient Y, and sufficient quantity of water to 100 ml.' The nullFlavor would be used to express the quantity of water.
3	TRC	Trace	The content is greater than zero, but too small to be quantified.
2	MSK	Masked	There is information on this item, available but it has not been provided by the sender due to security, privacy or other reasons. There may be an alternate mechanism for gaining access to this information. Warning: Using this nullFlavor does provide information that may be a breach of confidentiality, even though no detailed data are provided. Its primary purpose is for those circumstances where it is necessary to inform the receiver that the information does exist without providing any detail.
2	NA	Not applicable	No proper value is applicable in this context (e.g., last menstrual period for a male).

b. Uses Cases for nullFlavor

The following provide guidance on the intended allocation of nullFlavor codes.

Note: The entries in grey text align with the previous table.

Example Use Case	**NullFlavor of Choice**
User does not respond to input on a screen form.	NI
Source is not configured to encode plain text input to required codeSystem.	UNC
Source is unable to encode this particular plain text input to the required codeSystem because it cannot match the text.	OTH
Patient is unconscious and cannot provide name.	NAV
The system does not support this element.	NI
No proper dosage is provided, but an expression is provided so the destination system can calculate the proper dosage from the patient's weight.	INV
The patient does not have an address – No Fixed Place of Abode.	NA
Reporting the duration of an adverse reaction that is ongoing using an IVL<TS>.	IVL.high = NA because the reaction is ongoing – the concept of high does not apply
Reporting the duration of an adverse reaction using an IVL<TS> when it is not known whether the reaction has terminated. NEHTA note: For more information on TS and IVL refer sections 7.8.13 and 7.10.9 respectively.	IVL.high = UNK – we do not know
The source system is responding to a query for patient details, and has decided not to include the address because of applicable security and/or privacy policy.	MSK

4.1.5 Mapping to ISO/FDIS 21090:2009(E) Document

Section Reference & ISO Data Type Name:	7.3.3 ANY
Variation(s):	a. A data type specialisation of ANY where use of nullFlavor is allowed, will inherit the attribute nullFlavor from ANY – such allowed use is indicated in 'General guidelines' section for the data type.
	b. Its use may be further constrained to align with the intended use of specific NEHTA data groups and SDTs and will be documented as such in those specifications.
	c. The ISO attributes updateMode and flavorID are not permitted.

4.1.6 Known Issues

Nil

4.2 Boolean

4.2.1 Iconography

4.2.2 Definition

NEHTA adopts the draft definition of ISO data type BL with any NEHTA constraints stated in the 'usage' section below.

'Specialises ANY. BL stands for the values of two-valued logic. A BL value can be either true or false, or may have a nullFlavor'.

4.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
value: boolean-literal [0..1]	Indicates the value of true or false where true does not equal false.

4.2.4 Usage in NEHTA specifications

4.2.4.1 General guidelines

Boolean is a primitive data type sometimes called the logical data type, having one of two values: *true* and *false*. Many systems represent true as *non-zero* (often 1, or -1) and false as *zero*.

4.2.4.2 Examples

An actual value entered by a user might be 'yes' or could be chosen by a mouse click on an icon such as ☑.

4.2.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.3.4 BL
Variation(s):	Nil

4.2.6 Known Issues

Nil

5 Text and binary data types

5.1 EncapsulatedData

5.1.1 Iconography

5.1.2

NEHTA adopts, without constraints, the draft definition of the ISO data type ED (encapsulated data)*.*

Data that is primarily intended for human interpretation or for further machine processing outside the scope of this specification. This includes unformatted or formatted written language, multimedia data, or structured information as defined by a different standard (e.g., XML-signatures)'.

5.1.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
Value: string [0..1]	A simple sequence of characters that contains the content.
data: binary[0..1]	A simple sequence of byte values that contains the content.
xml: XML [0..1]	The content represented in plain XML form.
Reference: LINK[0..1]	A telecommunication address such as a URL for HTTP or FTP, which will resolve to precisely the same binary content that could as well have been provided as inline content.
mediaType: CodedText [1]	Identifies the type of the encapsulated data and identifies a method to interpret or render the content. The media type must be a code as established by the IETF in [RFC2045-1996a] and [RFC2046-1996b]. mediaType has a default value of 'text/plain' and cannot be null.
charset: CodedText [0..1]	For character-based encoding types, this attribute specifies the character set and character encoding used in the value attribute that contains the content of the encapsulated data. The charset shall be identified by an Internet Assigned Numbers Authority (IANA) Charset Registration in accordance with [RFC2978-2000].

Attribute	Explanation
language: string[0..1]	The human language of the content. Valid codes are taken from the ITF [RFC3066-2001]. If this attribute is null, the language may be inferred from elsewhere, either from the context or from Unicode language tags, for example.
Compression: Compression	Indicates whether the raw byte data is compressed, and what compression algorithm was used. If populated, the value of this attribute shall be taken from the HL7 CompressionAlgorithm code system.
integrityCheck: binary [0..1]	The integrity check is a short binary value representing a cryptographically strong checksum that is calculated over the binary content.
integrityCheckAlgorithm: IntegrityCheckAlgorithm [0..1]	IntegrityCheckAlgorithm: Specifies the algorithm used to compute the integrityCheck value. If populated, the value of this attribute shall be taken from the HL7 IntegrityCheckAlgorithm code system [FIPS180-2008].
description: TEXT[0..1]	A stand-in for the full media for use as an alternative description of the media where the media is not able to be rendered.
thumbnail: EncapsulatedData [0..1]	An abbreviated rendition of the full content.
translation: set(EncapsulatedData [0..1])	Alternate renditions of the same content translated into a different language or a different mediaType.

5.1.4 Usage in NEHTA specifications

5.1.4.1 General guidelines

None

5.1.4.2 Examples

a. General examples

- JPEG Images
- HTML documents
- MIME Types

b. A range of other informative examples can be found at section 7.4.2.7.6 of the draft ISO standard [ISO21090-2009].

5.1.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.4.2 ED (encapsulated data)
Variation(s):	Nil

5.1.6 Known issues

Nil

5.2 Text

5.2.1 Iconography

T

5.2.2 Definition

NEHTA adopts the draft definition of the ISO data type ST (Character String) with any NEHTA constraints stated in the 'usage' section below.

'Specialises ANY. The character string datatype stands for text data, primarily intended for machine processing (e.g., sorting, querying, indexing, etc.) or direct display. Used for names, symbols, presentation and formal expressions.

A ST shall have at least one character or else have a nullFlavor'.

5.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
Value: string[0..1]	The actual content of the string.
language: CodedText[0..1]	The human language of the content. Valid codes are taken from the IETF [RFC3066-2001]. If this attribute is null, the language **may** be inferred from elsewhere, either from the context or from Unicode language tags, for example.
translation: set[string]	Alternate renditions of the same content translated into a different language. Translations **MAY** not contain translations

5.2.4 Usage in NEHTA specifications

5.2.4.1 NEHTA guidelines

a. This data type is sometimes referred to as free text. It comprises character strings, with optional language. Unless otherwise constrained by an implementation, Text can be any combination of alpha, numeric or symbols from the Unicode character set.

b. A ST shall have at least one character or else be Null.

c. Used for names, symbols, presentation and formal expressions.

5.2.4.2 Examples

a. An example from section 7.4.6.7 of the draft IAO document:

<example language='en' value='cellulitis of the left foot'/>

b. 'The patient is a 37 year old man who was referred for cardiac evaluation after complaining of occasional palpitations, racing heart beats and occasional dizziness.'

c. Language and translation should be retained for those instances where the user might want to send through the text in a language different to the language as stated/implied by the document context. For example, in an electronic prescription you may want to send through the dosage instructions and cautionary advice in both English (the document language) and the patient's normal language for printing on the label.

d. Data Group specifications and SDTs may make further rules about the use of language and translations.

5.2.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.4.6 ST (character string)
Variation(s):	A Text data type shall have at least one character or else be Null.

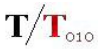
5.2.6 Known Issues

Nil

6 Coded data types (terminology)

6.1 CodeableText

6.1.1 Iconography



6.1.2 Definition

NEHTA adopts the draft definition of the ISO data type CD (concept descriptor) with any NEHTA constraints stated in the 'usage' section below.

'Specialises ANY. A CD is a reference to a concept defined in an external code system, terminology or ontology'.

Note: Section 7.5.1 of the ISO draft standard provides more substantial information to qualify the definition above. Whilst not diminishing the importance of all data types in this profile, 'Coded Data Types' are of particular significance to NEHTA specifications in that it addresses binding of terminology with the information models, the former being a key facet of achieving semantic interoperability. A sample of the ISO qualifying information is provided below.

'A CD may contain a simple code – that is, a reference to a concept defined directly by the referenced code system, or it may contain an expression in some syntax defined by the referenced code system that can be meaningfully evaluated. e.g., the concept of a 'left foot' as a post-coordinated term built from the primary code 'FOOT' and the qualifier 'LEFT'.

A CD may also contain an original text or phrase that served as the basis of the coding. This is preserved to allow for validation of the representation of the concept in various fashions.'

6.1.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
originalText: string[0..1]	The text as seen and/or selected by the user who entered the data.
code: string[0..1]	The plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept.
codeSystem: UID[0..1]	Specifies the code system that defines the code, or if no code was found, the codeSystem in which no code was found. Code systems shall be referred to by a UID, which allows unambiguous reference to standard code systems and other local codeSystems.
codeSystemName: string[0..1]	The common name of the coding system.
codeSystemVersion: string[0..1]	If applicable, a version descriptor defined specifically for the given code system.

Attribute	Explanation
displayName: string[0..1]	A name or title for the code, under which the sending system shows the code value to its users.
valueSet: string[0..1]	Specifies the valueSet in which no code was found.
valueSetVersion: string[0..1]	Specifies the version of the valueSet in which no code was found. valueSetVersion shall be provided when a valueSet is provided, and otherwise shall be null.
codingRationale: set(CodingRationale)[0..1]	Provides a reason why a particular Concept Descriptor [CD] has been provided, either as the root concept or as one of the translations (Original, Postcoded, Required).
source: CodedText[0..1]	A reference to the Concept Descriptor [CD] that was the source of this translation, if this CD was created by translating it from another CD. This property is a reference, and if used, must be a reference to a CD within the same cluster of CDs that represent the same concept. Specifically, the source shall be provided within the scope of this CD's root CD and translations.
translation: set(CodeableText)	A set of other Concept Descriptors [CDs] that each represent a translation of this CD into equivalent codes within the same code system or into corresponding concepts from other code systems.

6.1.4 Usage in NEHTA specifications

6.1.4.1 General guidelines

a. Use of nullFlavor is permitted.

Additionally, the NEHTA profile of this CD (concept descriptor) ISO data type:

b. Is a NEHTA defined constrained version of the ISO CD (Concept descriptor) data type.

c. Is coded *with* exceptions. CodeableText is a flexible data type to support various ways of holding text - both free text and coded text. Whilst it is recommended that the values in this data type come from the bound value domain, it also allows other value domains to be used (with or without translations to the bound value domain) or free text alternatives.

d. Is a recognition that it may not be possible to define an entire value domain for a complex concept (e.g. Diagnosis) or that there may be alternate code sets in existence.

e. Is commonly used to support compliance for early adopters of the NEHTA data hierarchies.

f. **MAY** be constrained, when used in exchange specifications and/or message profiles, to mandate compliance with the bound value domain (excluding alternate code sets).

6.1.4.2 Examples

The following are extracted from section 7.5.2.8. of the draft ISO standard

a. ICD example

A simple example for code is the ICD-9 code for headache, which is '784.0'.

```
<example code="784.0" codeSystem=" "2.16.840.1.113883.6.42" "
        codeSystemName=" "ICD-9 ">
    <displayName value= "Headache "/>
    <originalText value= "general headache "/>
</example>
```

A possible ICD-10 equivalent is 'G44.1' (the ICD-10 classifications are slightly different).

```
<example code= "G44.1 " codeSystem= "2.16.840.1.113883.6.3 "
        codeSystemName= "ICD-10 ">
    <displayName value= "Headache "/>
    <originalText value= "general headache "/>
</example>
```

b. Sample of code failures

The simplest case is where the CD is not represented in the instance at all, or simply represented as no information.

```
<value nullFlavor= "NI "/>
```

However this isn't a very useful representation – frequently the source system knows more information, and it is still useful to convey that information to the destination system, while still labelling the coding as incomplete.

```
<value nullFlavor= "OTH " codeSystem= "2.16.840.1.113883.6.96 "/>
```

Or it may be encoded as

```
<value nullFlavor= "OTH " valueSet= "2.16.840.1.113883.19.11.1 "
valueSetVersion= "20070711 "/>
```

c. Expression examples

'Expressions generally arise with complex medical terminologies such as SNOMED. For example, SNOMED CT®[4] defines a concept 'cellulitis (disorder)' (128045006) an attribute 'finding site' (363698007) and another concept 'foot structure (body structure)' (56459004). SNOMED CT allows these codes to be combined in a code phrase:

```
128045006|cellulitis (disorder)|:{363698007|finding
site|=56459004|foot structure|}
```

[4] SNOMED CT® is a registered trademark of the International Health Terminology Standards Development Organisation.

The full CD form for this is:

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

The SNOMED compositional expression language allows for the inclusion of the term in the expression, as shown in the first example. These make the expression more readable for humans, and so are used throughout this section in the standalone expressions.

However, the terms are optional and do not improve readability for computers; instead, their optional presence creates needless processing complexity, such as for testing equality. For this reason the expressions in CD instances **SHOULD NOT** include the terms, and no CD examples include the terms in the expressions in this International Standard. Value sets may make rules about the presence or absence of the terms in the expressions'.

6.1.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.5.2 CD (Concept Descriptor) All ISO attributes of CD are adopted in full.
Variation(s):	a. Use of nullFlavor is permitted.
	b. **MUST** have one of displayName or original text where there is no null flavour

6.1.6 Known issues

a. (JIRA Reference CDTA-1). Definition/guidelines required from Clinical Terminology group on the meaning and use of partial mappings of SNOMED terms.

b. (JIRA Reference CDTA-2). Various SNOMED and non-SNOMED use cases are required from Clinical Terminology group that address:

   i What happens where there is a map to SNOMED but there is no appropriate SNOMED code and therefore the closest parent was chosen and further qualifying information is required?

   ii What happens where the text chosen by the user was from an alternative coding system and a mapping to SNOMED was performed?

   iii What happens when selecting the nearest proximal SNOMED concept and adding a note to further explain it?

6.2 CodedText

6.2.1 Iconography

6.2.2 Definition

CodedText, like CodeableText, is a NEHTA defined constrained version of the CD (Concept Descriptor) data type in the draft ISO standard.

See 'Usage in NEHTA Specifications' section below.

6.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
originalText: string[1]	The text as seen and/or selected by the user who entered the data.
code: string[1]	The plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept.
codeSystem: UID[1]	Specifies the code system that defines the code, or if no code was found, the codeSystem in which no code was found. Code systems shall be referred to by a UID, which allows unambiguous reference to standard code systems and other local codeSystems.
codeSystemName: string[1]	The common name of the coding system.
codeSystemVersion: string[1]	If applicable, a version descriptor defined specifically for the given code system.
displayName: string[0..1]	A name or title for the code, under which the sending system shows the code value to its users.

6.2.4 Usage in NEHTA specifications

6.2.4.1 General guidelines

The CodedText data type:

a. Is coded without exceptions.

b. Includes both text description and code mappings. Values in this data type must come from the bound value domain, with no exceptions and no mappings.

c. Often used for reference sets with only a small number of applicable values, e.g. Gender and Document Status.

6.2.4.2 Examples

a. Based on the attributes for the data type [AS5017-2006] specifies (the first two rows) the following value domain representing a type of address:

Attribute					
originalText: string[1]	Business	Mailing or Postal	Temporary Accommodation	Residential (permanent)	Not Stated/Unknown/Inadequately Described
code: string[1]	1	2	3	4	9
codeSystem: UID[1]	UIDxxx	UIDxxx	UIDxxx	UIDxxx	UIDxxx
codeSystemName: string[1]	Address Type Ref Set	Address Type Ref Set	Address Type Ref Set	Address Type Ref Set	Address Type Ref Set
codeSystemVersion: string[1]	V1.1	V1.1	V1.1	V1.1	V1.1
displayName: string[0..1]	null	null	null	null	null

6.2.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.5.2 CD (Concept Description). CodedText represents a NEHTA defined constrained version of the ISO CD (Concept Descriptor) data type.
Variation(s):	Nil

6.2.6 Known issues

Nil

7 Identification and Location data types

7.1 Link

7.1.1 Iconography

7.1.2 Definition

NEHTA adopts the draft definition of the ISO data type TEL (Telecommunication Address).with any NEHTA constraints stated in the 'usage' section below.

'Specialises ANY. A locatable resource that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL'.

7.1.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
Value: string [0..1]	A Uniform Resource Identifier (URI) specified according to [RFC2396-1998]. **MUST** point to a locatable resource that returns binary content.

7.1.4 Usage in NEHTA specifications

7.1.4.1 General guidelines

a. This is a general link, reference or pointer to an object, data, or application that exists logically or stored in a computer system.

7.1.4.2 Examples

a. URL (Uniform Resource Locator) – the World Wide Web address of a site on the Internet, such as the URL for the Google Internet search engine – 'http://www.google.com'.

b. An absolute or relative path within a file/directory structure – e.g. in Windows operating system, the 'link' or absolute path to a particular letter (Word document) may be:

'C:\Documents and Settings\guestUser\My Documents\Letter.doc'

7.1.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.6.2 TEL (Telecommunication Address)
Variation(s):	Prohibits the use of the TEL attributes useablePeriod and use.

7.1.6 Known issues

Nil

7.2 UniqueIdentifier

7.2.1 Iconography

ID

7.2.2 Definition

NEHTA adopts the draft definition of the ISO data type II (Instance Identifier) with any NEHTA constraints stated in the 'usage' section below.

'Specialises ANY. An identifier that uniquely identifies a thing or object

EXAMPLES: object identifier for HL7 RIM objects, medical record number, order id, service catalogue item id, vehicle identification number (VIN), etc. Instance identifiers are usually defined based on ISO object identifiers'.

Note: Section 7.6.7 of the ISO draft standard additional information to qualify the definition above. That information is reproduced below for context because of the importance of this data type to NEHTA's work on the IHI and HPI (Individual Healthcare Identifier and Healthcare Provider Identifier respectively).

"An identifier allows someone to select one record, object or thing from a set of candidates. Usually an identifier alone without any context is not usable. Identifiers are distinguished from concept descriptors as concept descriptors never identify an individual thing, although there may sometimes be an individual record or object that represents the concept.

Information processing entities claiming direct or indirect conformance shall never assume that receiving applications can infer the identity of issuing authority or the type of the identifier from the identifier or components thereof".

7.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
root: string[0..1]	If root is populated, and there is no nullFlavor or extension, then the root is a globally unique identifier in its own right. In the presence of a non-null extension, the root is the unique identifier for the 'namespace' of the identifier in the extension. This does not necessarily correlate with the organisation that manages the issuing of the identifiers. A given organisation may manage multiple identifier namespaces, and control over a given namespace may transfer from organisation to organisation over time while the root remains the same. This field can be a DCE UUID, an Object Identifier (OID), or a special identifier taken from lists that may be published by ISO or HL7.

Attribute	Explanation
extension: string[0..1]	A unique identifier within the scope of the root. The root and extension scheme means that the concatenation of root and extension shall be a globally unique identifier for the item that this II value identifies.
displayable: boolean[0..1]	If the identifier is intended for human display and data entry (displayable = true) as opposed to pure machine interoperation (displayable = false).
identifierName: string[0..1]	A human readable name for the namespace represented by the root that is populated with the issuer or identifier type values, or a concatenation of both as appropriate. The content of this attribute is not intended for machine processing and **SHOULD NOT** be used as such. Note: It is a descriptive name for the actual namespace. e.g. 'Australian Medicare Card Number'.
Scope: identifierScope[0..1]	Scope is constrained the geographic span or coverage that applies to or constrains the identifier. It is directly equivalent to the geographic area element. The content of this attribute is not intended for machine processing and **SHOULD NOT** be used as such.
reliability: identifierReliability[0..1]	Specifies the reliability with which this identifier is known. This attribute may be used to assist with identifier matching algorithms.

7.2.4 Usage in NEHTA specifications

7.2.4.1 General guidelines

The NEHTA UniqueIdentifier data type:

a. Is a general unique identifier to identify a physical or virtual object, or, a concept;

b. Is an identifier for information objects (i.e. Database records), medical record number, order id, service catalogue item id, vehicle identification number (VIN), etc. Instance identifiers are usually defined based on ISO/FDIS object identifiers; and

c. Does not assume that receiving applications can infer the identity of issuing authority or the type of the identifier from either the identifier or components thereof.

7.2.4.2 Examples

a. Identifiers from the Healthcare Identifier [HI] service.

As designed within the scope of the HI program, the three unique, 16 digit identifiers for use within Australia will be/are:

i **IHI** (Individual's Healthcare Identifier) – allocated to patients/clients of healthcare service providers;

ii **HPI-O** (Healthcare Provider Identifier – Organisation); and

iii **HPI-I** (Healthcare Provider Identifier – Individual).

Construction and issue of these identifiers is designed according to prevailing international and Australian best practices and standards, as acknowledged in relevant NEHTA specifications for the HI program available via the NEHTA Healthcare Identifiers web page at [NEHT2010a].

In NEHTA data group and SDT specifications, an HI will, when available for use, be the candidate value to use where required when creating an instance of a clinical document such as a Prescription or a Discharge Summary.

In a NEHTA SDT, unique identifiers of the HI type are specified against the 'Entity Identifier' data element in the 'Participant' data group, where a participant is either a person or an organisation.

In the event that a HI value is to be used to identify a Participant in an SDT, the following use applies.

root: string[1]	**MUST** be an OID – that is all HI will be an OID
extension: string[0..1]	Not to be used
displayable: boolean[0..1]	**OPTIONAL**
identifierName: string[0..1]	**OPTIONAL**
Scope: identifierScope[0..1]	**OPTIONAL** and as defined above
reliability: identifierReliability[0..1]	**OPTIONAL**

Other examples where the NEHTA UniqueIdentifier data type is used are:

b. Local hospital medical record number which is turn is an identifier of a subject of care (patient) at that hospital.

c. Australian Medicare Number.

7.2.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.6.7 II (Instance Identifier)
Variation(s):	Nil

7.2.6 Known Issues

Nil

8 Quantity data types

Quantity data types record measurements, observations and the amounts or number of 'things'.

Note about scope: As yet, NEHTA has not scoped a monetary ratio to support financial processes. This data type will be introduced when required (i.e. when a use case is able to be demonstrated).

8.1 Quantity

8.1.1 Iconography

8.1.2 Definition

NEHTA adopts the draft definition of the ISO data type PQ (physical quantity) with any NEHTA constraints stated in the 'usage' section below.

'Specialises QTY. A dimensioned quantity expressing the result of measuring'.

8.1.3 Attributes

In addition to the inherited attributes, the following are required for use of this data type in NEHTA data groups and SDTs.

Attribute	Explanation
value: Real[0..1]	The value of the Real if not null.
unit: CodedText[0..1]	The unit of measure specified in the Unified Code for Units of Measure (UCUM).
uncertainty : QTY[0..1]	Inherited from abstract class Qty. The uncertainty of the quantity using a distribution function and its parameters.
uncertaintyType : UncertaintyType[0..1]	Inherited from abstract class Qty. A code specifying the type of probability distribution in uncertainty.

8.1.4 Usage in NEHTA specifications

8.1.4.1 General guidelines

a. Use of nullFlavor is permitted.

b. The NEHTA Quantity data type is used for recording many real world measurements and observations. Includes the magnitude, value and the unit.

c. A NEHTA data group or SDT may specify the 'kind' of unit to be utilised, for example: mass, volume, length.

d. Uncertainty is allowed for representation of clinical uncertainty in observations. NEHTA recommends that the Uncertainty Type to use, from the list included in section 7.8.2.3.4 of the draft ISO standard, be limited to the 'Normal' code.

8.1.4.2 Examples

The following are taken from section 7.8.9.7 of the draft ISO standard:

a. Plain value, e.g. 1.0 mg/mL

```
<example xsi:type= "PQ " value= "1.1 " unit= "mg/mL "/>
```

b. Uncertain range: Specifying that patient should take 1 to 2 tablets. This might be part of a prescription order such as 'By mouth, take 1-2 tablets every 4-6 hours when needed for severe pain to a maximum of 8 per day'.

```
<doseQuantity xsi:type='PQ' units='1'>
  <uncertainRange>
    <low xsi:type='PQ' value='1'/>
    <high xsi:type='PQ' value='2'/>
</uncertainRange>
```

8.1.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.8.9 PQ (Physical Quantity)
Variation(s):	a. codingRationale and translation are prohibited.
	b. unit – within ISO/FDIS21090 is this shown as a characterstring.

8.1.6 Known issues

a. (JIRA reference CDTA-3). UCUM has a foundation within engineering and SI units. It is rich in those areas, has the capacity to allow computational calculation of equivalence and can be used in many circumstances

However, clinical practice will always contain clinical not engineering/SI type units of measure and as such an alternative coding scheme (Paul Frosdyck would suggest SNOMED CT) must be allowed.

This NEHTA profile of the draft ISO/FDIS 21090 standard, adopts the recommendation that the UCUM is to be used for this data type. Original feedback (now documented in JIRA) indicated potential weakness of UCUM to support NEHTA's clinical information requirements. Additionally under IHTSDO®[5] processes, investigations are in progress with respect to the matter of units of measure. Review and resolution of the original feedback on UCUM (now documented in JIRA) is expected to be considered within the broader IHTSDO program.

[5] IHTSDO® is a registered trademark of the International Health Terminology Standards Development Organisation.

8.2 Integer

8.2.1 NEHTA iconography

8.2.2 Definition

NEHTA adopts the draft definition of the ISO data type INT (integer) with any NEHTA constraints stated in the 'usage' section below.

'Specialises QTY. Integer numbers (1,0,1,2, 100, 3398129, etc.) are precise numbers that are results of counting and enumerating. Integer numbers are discrete, the set of integers is infinite but countable. No arbitrary limit is imposed on the range of integer numbers'.

8.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
value: integer[0..1]	The value of the integer if not null. Note that this specification imposes no limitations on the size of the integer, but most implementation will map this to a 32 or 64-bit integer.

8.2.4 Usage in NEHTA specifications

8.2.4.1 General guidelines

a. Use of nullFlavor is permitted.

b. NEHTA Integer is the mathematical data type comprising the exact integral values [ISO11404-2007].

8.2.4.2 Examples

a. Common instances: 1; -50; 125

Examples extracted from section 7.8.3.7 of the draft ISO standard:

b. **Plain value** - the integer 23.

```
<example xsi:type= "INT " value= "23"/>
```

c. **Unknown value** - The patient was not asked for this value. For instance, the patient has never been pregnant, so that patient was not asked how many children she has.

```
<example xsi:type= "INT " nullFlavor= "NASK"/>
```

8.2.5 Mapping to ISO/FDIS 21090:2009(E) Document

Section Reference & ISO Data Type Name:	7.8.3 INT (Integer)
Variation(s):	Uncertainty attributes of its abstract class *QTY* not allowed.

8.2.6 Known Issues

Nil

8.3 Real

8.3.1 NEHTA iconography

8.3.2 Definition

NEHTA adopts the draft definition of the ISO data type REAL (real) with any NEHTA constraints stated in the 'usage' section below.

'Specialises QTY. Fractional numbers. Typically used whenever quantities are measured, estimated or computed from other real numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision'.

8.3.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
Value: decimal[0..1]	The value of the Real if not null.

8.3.4 Usage in NEHTA specifications

8.3.4.1 General guidelines

a. Use of nullFlavor is permitted.

The NEHTA Real data type:

b. **SHOULD NOT** be used to specify a 'quantity' such as. '10 people' or '2.4 children'. These are not true examples of Real; they are composites that comprise a Real (10, 2.4) and a unit (person, child).

c. Is a computational number that approximates to the standard mathematical concept of a Real. These are often called floating point numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision.

8.3.4.2 Examples

a. 1.075

b. -325.1

c. 3.14157

8.3.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.8.7 REAL (real)
Variation(s):	Uncertainty attributes of its abstract class *QTY* not allowed.

8.3.6 Known issues

Nil

8.4 QuantityRatio

8.4.1 NEHTA iconography

A/B

8.4.2 Definition

NEHTA adopts the draft definition of the ISO data type RTO (ratio) with any NEHTA constraints stated in the 'usage' section below.

'Specialises QTY. A quantity constructed as the quotient of a numerator quantity divided by a denominator quantity.

Common factors in the numerator and denominator are not automatically cancelled out'.

8.4.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
numerator: physical quantity[0..1]	The quantity that is being divided in the ratio
denominator: physical quantity[0..1]	The quantity that divides the numerator in the ratio.

8.4.4 Usage in NEHTA specifications

8.4.4.1 General guidelines

a. Use of nullFlavor is permitted.

b. The NEHTA QuantityRatio data type is a relative magnitude of two Quantity values (usually expressed as a quotient).

c. Ratios of Integers and Reals are not required at all.

d. With reference to the ISO definition for a ratio, a ratio is something that cannot be collapsed. A concept like 1/3 should be a Real (0.333) which is a more precise way of representing it.

8.4.4.2 Examples

a. Representing 25 mg / 500 mL.

```
<example xsi:type= "RTO ">
     <numerator xsi:type= "PQ " value= "25 " unit= "mg
"/>
     <denominator xsi:type= "PQ " value= "500 " unit=
"mL "/>
</example>
```

The inner xsi:type declarations are always required.

8.4.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.8.8 RTO (ratio)
Variation(s):	Uncertainty attributes of its abstract class *QTY* not allowed.

8.4.6 Known issues

Nil

8.5 Duration

8.5.1 Iconography

8.5.2 Definition

NEHTA adopts the draft definition of the ISO data type PQ.TIME with any NEHTA constraints stated in the 'usage' section below.

PQ.TIME is 'a flavour that constrains PQ. PQ.TIME constraints PQ so that it **shall** have units that describe a period of time'.

8.5.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
Value: Real[0..1]	The value of the Real if not null.
unit: CODEDTEXT[0..1]	The unit of measure. Constrained to a time value for this data type.

8.5.4 Usage in NEHTA specifications

8.5.4.1 General guidelines

a. Use of nullFlavor is permitted

Additionally, the NEHTA Duration data type:

b. Is a length or period of time, consisting of a value and a time-based unit, e.g. hours, months.

c. Does not allow compound durations involving more that one unit of measure, e.g. '10 days 3 weeks' or '5 hours 15 minutes'.

8.5.4.2 Examples

a. 3 hours

b. 6 months

c. 1 year

8.5.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.8.10 (PQ.TIME) Duration is a specialisation of PQ.TME.
Variation(s):	a. codingRationale and translation are prohibited.
	b. Uncertainty attributes of its abstract class *QTY* not allowed.

8.5.6 Known issues

Nil

8.6 DateTime

8.6.1 NEHTA iconography

8.6.2 Definition

NEHTA adopts the draft definition of the ISO data type TS (point in time)… with any NEHTA constraints stated in the 'usage' section below.

'Specialises QTY. A quantity specifying a point on the axis of natural time. A point in time is most often represented as a calendar expression'.

8.6.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
value: string[0..1]	The value of the DateTime if non Null. Value is a string with the format: 'YYYYMMDDHHMMSS.UUUU[+|-ZZzz]' that conforms to the constrained [ISO8601-2004] that is defined in [ISO8824-2008]. The format should be used to the degree of precision that is appropriate.

8.6.4 Usage in NEHTA specifications

8.6.4.1 General guidelines

a. Use of nullFlavor is permitted.

b. DateTime is used for specifying a single date and/or time. It can indicate a level of precision, and define estimated or partial dates.

c. String representations of known dates should conform to the non-extended format within the draft ISO standard i.e. YYYYMMDDHHMMSS.UUUU[+|-ZZzz.]

8.6.4.2 Examples

a. Estimated or partial dates: 2008, 200810. Can indicate a level of precision, and that the date/time is estimated.

b. To indicate 1:20 pm on May the 31st, 1999 for a time zone which is 5 hours behind Coordinated Universal Time (UTC): 19990531132000-0500.

c. Appendix C contains examples of various date and time representations based on [ISO8601-2004].

8.6.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.8.13 TS (point in time).
Variation(s):	Uncertainty attributes of its abstract class *QTY* not allowed.

8.6.6 Known issues

Nil

9 Continuous set data types

9.1 QuantityRange

9.1.1 NEHTA iconography

9.1.2 Definition

NEHTA adopts the draft definition of the ISO data type IVL (interval) with any NEHTA constraints stated in the 'usage' section below.

'Specialises QSET. Parameter: T:QTY.

A set of consecutive values of an ordered base datatype'.

9.1.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
low: Quantity[0..1]	The minimum (or lower bound) quantity value in the range.
High: Quantity[0..1]	The maximum (or upper bound) quantity value in the range. If the upper bound is not known, a nullFlavor may be specified. The high limit **SHALL NOT** be negative infinity, and shall be higher than the low limit if one exists.
lowClosed: boolean[0..1]	Specifies whether low is included (is closed) or excluded (is open) in the range.
highClosed: boolean[0..1]	Specifies whether high is included (is closed) or excluded (is open) in the range.

9.1.4 Usage in NEHTA specifications

9.1.4.1 General guidelines

a. Use of nullFlavor is permitted.

b. The unit of measure for both high and low are required to be compatible and represent the same kind of unit, for example mass, volume, length.

c. This is used for recording many real world measurements and observations. This includes the magnitude value and the units. It contains two Quantity values that define the minimum and maximum values, i.e. lower and upper bounds. This is typically used for defining the valid range of values for a particular measurement or observation. Unbounded quantity ranges can be defined by not including a minimum and/or a maximum Quantity value.

9.1.4.2 Examples

a. -20 to 100 °C

b. 30-50 mg

c. >10 kg

9.1.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.10.9 IVL (interval). The QuantityRange data type is a specialisation of the abstract IVL (interval) data type
Variation(s):	Width is prohibited from use.

9.1.6 Known issues

Nil

9.2 TimeInterval

9.2.1 Iconography

9.2.2 Definition

As for QuantityRange, NEHTA adopts the draft definition of the ISO data type IVL (interval with any NEHTA constraints stated in the 'usage' section below.

'Specialises QSET (continuous set). Parameter: T : QTY. A set of consecutive values of an ordered base datatype'.

9.2.3 Attributes

The following are included in the NEHTA profile for the data type.

Attribute	Explanation
low: DateTime [0..1]	The minimum (or lower bound) quantity value in the range. The unit attribute is constrained to a time value for this data type.
high: DateTime [0..1]	The maximum (or upper bound) quantity value in the range. The unit attribute is constrained to a time value for this data type. If the upper bound is not known, a nullFlavor may be specified. The high limit **SHALL NOT** be negative infinity, and shall be higher than the low limit if one exists.
lowClosed: boolean[0..1]	Specifies whether low is included (is closed) or excluded (is open) in the range.
highClosed: boolean[0..1]	Specifies whether high is included (is closed) or excluded (is open) in the range.

9.2.4 Usage in NEHTA specifications

9.2.4.1 General Guideline

a. Use of nullFlavor is permitted.

b. TimeInterval contains a Start DateTime and (optionally) an End DateTime.

c. In cases where 'width' of a time interval needs to be recorded, this can be handled by the Duration data type.

9.2.4.2 Examples

a. Start:01/01/2008; End:31/12/2008

9.2.5 Mapping to ISO/FDIS 21090:2009(E) document

Section Reference & ISO Data Type Name:	7.10.9 TS (interval)
Variation(s):	Nil

9.2.6 Known Issues

Nil

10 References

[AS5017-2006] Standards Australia 2006, AS5017 (2006), *Healthcare Client Identification,* Accessed 3rd March 2010, <http://infostore.saiglobal.com/store/Details.aspx?ProductID=320426>

[FIPS180-2008] National Institute of Standards and Technology 2008, FIPS PUB 180-3, *Secure Hash Standard,* Accessed 3rd March 2010, <http://csrc.nist.gov/publications/fips/fips180-3/fips180-3_final.pdf>

[ISO11404-2007] International Organisation for Standardisation 2007, ISO1104 (2007), *Information Technology – General Purpose Datatypes*, Accessed 3rd March 2010. <http://www.iso.org/iso/home.htm>

[ISO21090-2009] International Organisation for Standardisation 2009, ISO/FDIS 21090:2009(E), *Health informatics – Harmonized Datatypes for Information Interchange*. Accessed 4th March 2010 <http://www.iso.org/iso/home.htm>

[ISO8601-2004] International Organisation for Standardisation 2004, ISO8601 (2004), *Data Elements and Interchange Formats – Representation of dates and times, Edition 3.* Accessed 3rd March 2010. <http://www.iso.org/iso/home.htm>

[ISO8824-2008] International Organisation for Standardisation 2008, ISO8824 (2:2008), *Information technology – Abstract Syntax Notation One (ASN.1): Information Object Specification.* Accessed 5th March 2010. <http://www.iso.org/iso/catalogue_detail.htm?csnumber=54015>

[NEHT2005a] National E-Health Transition Authority, 25 May 2005, *NEHTA Acronyms, Abbreviations & Glossary of Terms*, Version No. 1.2, Accessed 3rd March 2010. <http://www.nehta.gov.au/component/docman/doc_download/8-clinical-informationglossary-v12>

[NEHT2005b] National E-Health Transition Authority, Terminology Services NEHTA Glossary, Version No. 1.0, Accessed 3rd March 2010. <https://www.nehta.net.au/confluence/download/attachments/29459354/Terminology+Services+NEHTA+glossary+v1.0.doc?version=1>

[NEHT2009a] National E-Health Transition Authority, Data Specifications and SDTs - Guide for Use, Version No. 1.0 7/08/2009, Accessed 23rd March 2010. <http://www.nehta.gov.au/connecting-australia/terminology-and-information/clinical-information-mi>

[NEHT2010a] National E-Health Transition Authority, Healthcare Identifiers Web Page, Accessed 22nd March 2010.
< http://www.nehta.gov.au/connecting-australia/healthcare-identifiers>

[RFC1521-1993] Internet Engineering Task Force, *MIME (Multipurpose Internet Mail Extensions) Part One*, Accessed 3rd March 2010.
<http://tools.ietf.org/pdf/rfc1521.pdf>

[RFC2119-1997] Internet Engineering Task Force, *Key words for use in RFCs to Indicate Requirement Levels*, Accessed 3rd March 2010.
<http://www.ietf.org/rfc/rfc2119.txt>

[RFC2045-1996a] Internet Engineering Task Force, *MIME (Multipurpose Internet Mail Extensions) Part One*, Accessed 3rd March 2010.
<http://www.ietf.org/rfc/rfc2045.txt>

[RFC2046-1996b] Internet Engineering Task Force, *MIME (Multipurpose Internet Mail Extensions) Part Two*, Accessed 3rd March 2010.
<http://www.ietf.org/rfc/rfc2046.txtt>

[RFC2396-1998] Internet Engineering Task Force, *Uniform Resource Identifiers (URI): Generic Syntax*, Accessed 3rd March 2010.
<http://www.ietf.org/rfc/rfc2396.txt>

[RFC2978-2000] Internet Engineering Task Force, *IANA Charset Registration Procedures*. Accessed 5th March 2010.
<http://tools.ietf.org/pdf/rfc2978.pdf>

[RFC3066-2001] Internet Engineering Task Force, *Tags for the identification of languages*, Accessed 3rd March 2010.
http://www.ietf.org/rfc/rfc3066.txt

[SDO - NoDate] Joint Initiative on SDO Global Health Informatics Standardization, No date, *Joint Initiative (Home Page),* Accessed 4th March 2010.
<http://www.global-e-health-standards.org/>

11 Appendix A: ISO 21090 conformance statement

11.1 General

This specification is primarily concerned with the semantics of the data types. The implementation, such as the XML format or character encoding, is not the scope of this document, though the XML format is used in the examples. As a consequence, this conformance statement does not make any rules concerning the use of any particular representation for the data types. Some NEHTA implementation specifications may make use of ISO 21090 directly with full conformance at this level, and others may provide mappings to this document.

11.2 Unicode

The character encoding is always Unicode in all contexts of use.

11.3 Language

The default language is en-AU.

11.4 Attribute and collection ordinality

Currently all multiple attributes and collections are deemed to be ordered lists. The 'physical' ordering of such items in any given message is significant and is to be used to determine ordinal positioning, i.e. the item with ordinal 1 must be the first in the message, the item with ordinal 2 must be second, &c.

Below is a known issue regarding potential impact of ordinality with respect to clinical safety. This is documented in Appendix 1 of the ePrescription SDT-V1.0 – 20091120: Release1 Daft For Comment).

ePrescription Data Groups	Known issue
Prescription Note Detail and Prescribed Item Note Detail	**All multiple occurring data groups and data elements are implicitly ordered (see page 15 in the 'Guide for Use'** [NEHT2009a] **(a document within the Clinical Information Support Material section)). As such it is the responsibility of the sender to insert the items into the document in the correct order and the receiver to extract them in the correct order. However, we are concerned that this mechanism may not have sufficient clinical safety in the case of the NOTES data group. Consequently we are investigating changes to the mechanism to further reduce the risk that items in lists may be ordered incorrectly.**

11.5 Data types

The specialisation of the ANY data type that are not profiled in this document or described by another NEHTA data group should never be used in the context of a NEHTA specification that depends on these data types, although some fixed values of type CS may be encountered in implementation guides.

ISO Data Type	NEHTA conformance position
HXIT	No NEHTA specification makes any arrangements for the exchange of history and audit information of a specific data value. Therefore the four attributes of HXIT (validTimeLow : String; validTimeHigh : String: controlInformationRoot : Uid; controlInformationExtension : String) are all fixed to null in all usages.
ANY	Profiled as Entity See note below concerning nullFlavor usage. updateMode and flavorID are fixed to null in all usages.
BL	Profiled as Boolean.
ED	Profiled as EncapsulatedData.
ST	Profiled as Text.
CD	Profiled as CodeableText.
CS	To be reviewed..
SC	To be reviewed..
II	Profiled as UniqueIdentifier.
TEL	Profiled as Link for simple URL references. A data group exists that defines the semantics of human and organisational communication information, which specifies how these are mapped to TEL.
AD	A data group exists that defines the semantics of human and organisational postal addresses, which specifies how these are mapped to AD.
EN	A data group exists that defines the semantics of human, organisational and other kinds of names, which specifies how these are mapped to EN.
QTY	Not included in the NEHTA profile., though see PQ
INT	Profiled as Integer. All the attributes inherited from QTY are fixed to null.
REAL	Profiled as Real.
CO	Not included in the NEHTA profile.
PQ	Profiled as Quantity. The originalText and expression attribute inherited from QTY are fixed to null, as are codingRationale and translation. Note that in some cases, Duration will map to PQ.TIME, which also has these same attributes fixed to null.
MO	Not included in the NEHTA profile.
TS	Profiled as DateTime. All the attributes inherited from QTY are fixed to null.
RTO	Profiled as QuantityRatio. All the attributes inherited from QTY are fixed to null.
COLL	Not included in the NEHTA profile. The ISO 21090 collection types are not used.
BAG	Not included in the NEHTA profile.
LIST	Not included in the NEHTA profile.
DSET	Not included in the NEHTA profile.
SLIST	Not included in the NEHTA profile.

ISO Data Type	NEHTA conformance position
GLIST	Not included in the NEHTA profile.
QSET	Not included in the NEHTA profile, though see IVL.
QSS / QSC / QSI / QSD/ QSU / QSP	Not included in the NEHTA profile.
IVL	Profiled as TimeInterval and QuantityRange. The width attribute is fixed to null for these two uses. Note that in some cases, Duration will map to IVL.WIDTH, where low, high and any attributes will be fixed to null.
EIVL	Not included in the NEHTA profile.
PIVL	Not included in the NEHTA profile.
UVP/NPPD	Not included in the NEHTA profile.
SN.TEXT / SN.TITLE	Not included in the NEHTA profile.

11.6 nullFlavor

The following is as stated in section 4.1.4.1 above:

All data types are specialisations of ANY and each inherits the attribute nullFlavor from ANY.

Whilst this specification will identify those data types for which use of nullFlavor is permitted, this may be further constrained in a NEHTA data group or SDT specification.

Occasionally there are business requirements where a true value is *always* required and nullFlavor may not be used. This document does not address these circumstances; they will be dealt with on a case-by-case basis in the appropriate information models.

Additionally:

- Where NEHTA allow use of nullFlavor, this is stated in the 'General guidelines' section for each data type; when so stated it may not be used in any context where the data type is applied.
- QS and TRC may only be used with the Quantity data type.
- The MSK nullFlavor can only be used if the relevant SDT or implementation guide describes its use.

11.7 Name and address

The draft ISO standards include enumerations covering for example:

- Entity name part type
- Entity name use
- Address part type
- Address use
- Telecommunication address use.

In NEHTA specifications such details are modelled as components of data groups.

The requirements that drive development of NEHTA reveal that such information is often of value to decision making at the human interface. Consequently this information is being modelled as data elements within data group specifications,. This modelling is consistent with the implied concepts for name and address in the draft ISO standard.

12 Appendix B – Derivation of this profile

12.1 Scope of the draft ISO/FDIS standard

The draft ISO 21090 standard defines a data type as: "… a set of distinct values, characterised by properties of those values, and by operations on those values (ISO/IEC 11404:2007, 3.12).

A datatype consists of three main features:

- a value space;
- a set of properties; and
- a set of characterizing operations".

Note: In the draft ISO document an operation is defined as 'a service that an instance of the class may be requested to perform'. Although operations are not included in this specification they need to be addressed at the implementation level. The operations specific to NEHTA data types can be retrieved via the references provided in this document to the draft ISO standard

12.2 Inclusions in the NEHTA profile

12.3 Exclusions in the NEHTA profile

12.4 Compatibility with other standards for data types

NEHTA are aware there are healthcare information systems that, for a variety of reasons, have not as yet adopted the ISO data types.

The NEHTA data types described in this document are conceptual or logical in nature. NEHTA has chosen to specify its data types as a profile of ISO 21090 in order to provide a strong foundation for developing deterministic transformations to whatever data types may need to be supported at the platform layer, e.g. HL7 v2.X, HL7 v3 R1/2 data types, openEHR, CEN 13606, etc.

13 Appendix C – Examples of DateTime representations

13.1 Date

Calendar date — 12 April 1985

Basic format	Extended format	Explanation
19850412	1985-04-12	Complete

Ordinal date — 12 April 1985

Basic format	Extended format	Explanation
1985102	1985-102	Complete

Week date — Friday 12 April 1985

Basic format	Extended format	Explanation
1985W155	1985-W15-5	Complete

Calendar week — 15th week of 1985

Basic format	Extended format	Explanation
1985W15	1985-W15	Reduced accuracy

Calendar month — April 1985

Basic format	Extended format	Explanation
1985-04	not applicable	Reduced accuracy

Calendar year — 1985

Basic format	Extended format	Explanation
1985	not applicable	Reduced accuracy

13.2 Time of day

Local time — 27 minutes and 46 seconds past 15 hours

Basic format	Extended format	Explanation
152746	15:27:46	Complete
1528	15:28	Reduced to hour and minute
15	not applicable	Reduced to hour

Local time with decimal fractions — 27 minutes and 35 and a half second past 15 hours

Basic format	Extended format	Explanation
152735,5	15:27:35,5	Complete, with decimal fraction

Midnight — The beginning of a day

Basic format	Extended format	Explanation
000000	00:00:00	Complete
0000	00:00	Hour and minute only

Midnight — The end of a day

Basic format	Extended format	Explanation
240000	24:00:00	Complete
2400	24:00	Hour and minute only

UTC of day — 20 minutes and 30 seconds past 23 hours

Basic format	Extended format	Explanation
232030Z	23:20:30Z	Complete
2320Z	23:20Z	Reduced to hour and minute
23Z	not applicable	Reduced to hour

Local time and the difference from UTC —
27 minutes 46 seconds past 15 hours locally in Geneva (one hour ahead of UTC)

Basic format	Extended format	Explanation
152746+0100	15:27:46+01:00	Complete
152746+01	5:27:46+01	Time difference expressed in hours only

27 minutes 46 seconds past 15 hours locally in New York (five hours behind UTC)

Basic format	Extended format	Explanation
152746-0500	15:27:46-05:00	Complete
152746-05	15:27:46-05	Time difference expressed in hours only

13.3 Date and time of day

Combinations of calendar date and local time

Basic format	Extended format	Explanation
19850412T101530	1985-04-12T10:15:30	Complete

Combinations of ordinal date and UTC of day

Basic format	Extended format	Explanation
1985102T235030Z	1985-102T23:50:30Z	Complete

Combinations of week date and local time

Basic format	Extended format	Explanation
1985W155T235030	1985-W15-5T23:50:30	Complete

13.4 Date and time format representations

Date

Basic format	Extended format	Explanation
YYYYMMDD	YYYY-MM-DD	complete calendar date
±YYYYYYDDD	±YYYYYY-DDD	expanded ordinal date with two digits added
YYYYWww	YYYY-Www	week date with accuracy reduced to week

Time of day

Basic format	Extended format	Explanation
hhmmss	hh:mm:ss	complete local time
hhmm,mZ	hh:mm,mZ	reduced accuracy UTC of day with one digit decimal fraction for minutes
hhmm±hhmm	Hh:mm±hh:mm	local time and the difference from UTC — reduced accuracy

Date and time of day

Basic format	Extended format	Explanation
YYYYDDDThhmm	YYYY-DDDThh-mm	complete ordinal date — reduced accuracy time of day
YYYYMMDDhhmm,m	YYYY-MM-DDhh:mm,m	complete calendar date — reduced accuracy time of day with one digit decimal fraction for minute — no time designator
YYYYWwwDThh,hhZ	YYYY-Www-DThh,hhZ	complete week date — reduced accuracy UTC of day with two digit decimal fraction for the hour