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NHS
Connecting for Health

THE CLINICAL TERMS VERSION 3
(THE READ CODES)

CROSS MAPPING FILE

April 2008

Purpose of this document

This document is one of a series that, taken together, describe the contents, structure and function of Clinical Terms Version 3 (The Read Codes).

This introduction is intended to provide information on Clinical Terms Version 3. It is also a guide to the other available documents each of which is updated independently. For this reason, different chapters may have different version numbers.

INFORMATION

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1. Introduction

The NHS Executive has mandated the International Statistical Classification of Diseases and Related Health Problems Tenth Revision (ICD-10) and the Office of Population Censuses and Surveys Classification of Surgical Operations and Procedures, fourth Revision (OPCS-4), for use within the NHS as the classifications for diagnoses and procedures respectively. This document briefly describes the cross-mapping between Clinical Terms Version 3 (The Read Codes) – abbreviated to CTV3 in this document – and ICD-10 and OPCS-4, It is one of a series of documents describing the file structure of CTV3.

OPCS-4 and ICD-10 codes are used by the Department of Health to produce Hospital Episode Statistics and are used by providers and commissioners to produce parts of the Contract Minimum Data Set. ICD-10 and OPCS-4 codes are used to produce a statistically assured data set.

Clinicians summarise the condition and treatment of the patient. OPCS-4 and ICD-10 codes are derived from these statements. The statements can be held as Read Codes with ICD and OPCS-4 codes available as attached codes within the Read Codes.

In Version 2 of the Read Codes the disease chapters were modelled on ICD-9 and the procedures chapter on OPCS-4. This structure facilitated straight forward cross-mappings as there was usually a one-to-one or many to one relationship between the Read Codes and the target codes. Problems however arose with the introduction ICD-10 whose coding structure changed significantly, particularly in the coding of causes of accidents and mental health. This resulted in the coding framework of ICD-10 having to be "forced" into the structure of the Read Code Version 2 hierarchy that was based on ICD-9.

The terms in CTV3 have been derived from the work of three main projects (Clinical (Medical) Terms Project, Professions Allied to Medicine Terms Project and the Nursing, Midwifery and Health Visiting Terms Project). This has produced a terminology that reflects the natural language used by clinicians (more closely than Version 2) rather than the formalised language used in the classifications expressed by complex or combined terms with precise meanings. Consequently a more complex cross-mapping scheme is necessary, to ensure that the process of mapping to classifications from CTV3 remains as accurate as possible.

The general design of the cross-mapping scheme supports mappings from the relevant section of the Read Codes to ICD, OPCS-4, the British National Formulary and European Article Numbers.

2. Summary of the Cross-mapping Scheme

- When mapping from Read Codes, the map is from concepts (represented by Read Codes) rather than from the many different terms (linguistic labels such as '**Myocardial infarct**', '**Coronary thrombosis**' and '**Heart attack**') used to refer to concepts. This follows previous practice.

- Where a precise equivalent concept is found in the target terminology or classification, then the mapping is one-to-one.

- When the one Read concept may map on to one of several concepts in the target terminology, then:
    1. All these potential mappings are included in the cross-mapping table.
    2. One of these mappings is marked as a default mapping.
    3. The user can select from the default or alternative classification codes provided, on the basis of the content of the clinical record.

- Currently, the mappings are from core Read concepts (disorders, procedures, etc.) and do not take qualifiers into consideration. However, there are plans to extend the scheme so that qualifiers are taken into account in the future, to more fully automate the process.

3. Background

The mappings from Read Version 2 to OPCS-4 and ICD-9 codes, (which were the designated classification systems for central returns in the 1980') were, in large part, one-to-one mappings particularly when specific procedures were being mapped, or many to one mappings. This is because Version 2 was modelled on ICD-9 and OPCS-4, that is to say ICD-9 was the framework for the Version 2 Read coded disease chapter and OPCS-4 was the framework around which Version 2 operation codes were constructed.

Three significant events have changed the face of the problem. Firstly, the introduction of ICD-10 substituted many new concepts for older, now considered outdated ICD-9 concepts. An example is *Cellulitis* and *Abscess*. In ICD-9 both conditions were classified to the same three digit categories, 681 – *Cellulitis and Abscess of finger and toe*, and 682 - *Other Cellulitis and abscess*. As V2 was modelled on ICD-9 the Read terms reflect this combined terminology. ICD-10 however, classifies *Abscess* to L02- and *Cellulitis* to L03-, the site determining the fourth character. Using *cellulitis* and *abscess of finger* as an example this would have been classified to 681.0 (*Cellulitis and abscess of finger*) in ICD-9, but in ICD-10 requires two codes L024 (*Cutaneous abscess, furuncle and carbuncle of limb*) and L030 (*Cellulitis of finger and toe*).

Secondly, in the course of the Clinical Terms Projects, different clinical specialities have been specifying the concepts they consider important for recording the clinical process. In many cases, particularly with OPCS-4 procedure terms, the clinical concepts reflect rather different concerns than those considered important for central returns. This is perhaps not surprising, but highlights the point that health carers, epidemiologists, managers, politicians and research workers often need different types of detail.

Thirdly, there are differences between clinical and statistical analysis that require different forms of categorisation. Statistical classifications are drawn up according to the need to find a single pigeonhole for each diagnosis or procedure, so excluding the possibility of double counting, but clinical queries demand a quite different structure. A typical clinical query might be to retrieve all patients with *Respiratory disease* who have not had an *Influenza vaccine*. A clinician would expect to retrieve patients with *Pulmonary tuberculosis* even if these were also classified as *Infectious diseases*. Double counting becomes a feature rather than a problem. Likewise the classification of all *Hypertensive patients* would be expected to include even those who had *Hypertension in pregnancy,* even if these were also classified under *Disorders of pregnancy*. Now cross-mapping becomes more troublesome. Take an illustrative example: *Hypertension* (XE0Ub) is included among the set of clinical terms in CTV3, but ICD-10 includes two sets of terms for dealing with hypertension. First there is O10-O11, O13-O16 for Hypertension complicating pregnancy. Secondly there is the range of I10-I15 for hypertension occurring outside pregnancy. Hypertension is structured this way as these were considered useful pigeonholes for a particular statistical classification. A health carer, however, may use the Read Code XE0Uc to refer to any patient with *Essential hypertension*, whether or not they are pregnant, as this is normal clinical usage.
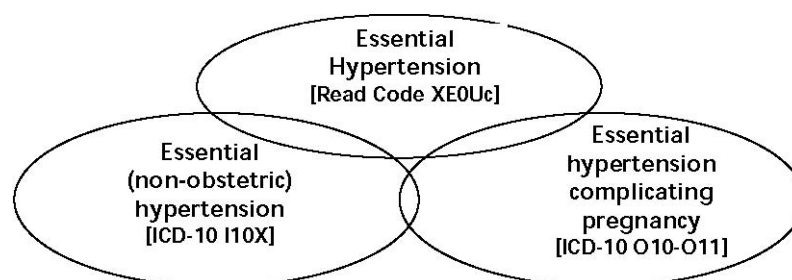
The new cross-mapping scheme allows mapping authors to cross map XE0Uc to ICD code I10X (*Essential hypertension*) and to mark this as the default mapping. However, XE0Uc will also be cross-mapped to O10-O11 (Pre-existing Hypertension complicating pregnancy) as an alternative, reminding those unfamiliar with the structure of ICD-10 that in the presence of pregnancy this condition is assigned a different code.

4. The Process of Cross-mapping in the Field

There are several stages in the process of producing classification codes from a clinical record.

There is the process of **clinical terming**. Using the keys, hierarchy or a checklist, the health carer creates a clinical record using the terms describing concepts available from CTV3. As in traditional records, the clinical record is summarised following the nationally agreed conventions to produce a Primary *Diagnosis* or *Main Procedure*. The content of these statements normally provides the basis for all subsequent coding requirements.

There is the stage of **classifying** for central returns. This encompasses:

- **Translating** from Read Codes into the target classification (typically ICD-10 and OPCS-4). This may involve selection from a number of alternative maps.

- **Validating** the cross-map by checking against a resource such as the ICD metadata file[1] that provides such information as age and sex constraints for diseases (e.g. men cannot get Hypertension in pregnancy).

Classifying is usually done by coding clerks, though occasionally by interested clinicians or their secretaries. Knowledge of the principles and coding conventions underpinning ICD-10 and OPCS-4 is essential if consistent and accurate mappings are to be produced unless these are adequately built with the encoding software – this is not the case at present. The maps in the cross mapping scheme have been produced in accordance with NHS coding standards. Consequently, the user will be presented with a correct default mapping between Read and the respective classification. There will be occasions when it will be necessary for the user to select one of the alternative classification codes because a modifier required by the classification may not be explicitly represented in the clinical term.

Access to the clinical records when needed is essential because there may be a need for extra information about the patient, which can be obtained from the medical notes or from clinicians (e.g. gender, whether or not they are pregnant).

A major role of ICD-10 and OPCS-4 is as a specification for the grouping of information that is required centrally. (Providing all of the detailed information present in a Read coded medical record might overwhelm the data handling capability of central resources).

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[1] This file is available from the NHS Connecting for Health

5. Principles behind the Cross-mapping Scheme

The cross-mapping scheme is based on a number of general principles.

The accuracy of the cross-mapping is of prime importance

While providing a simple one-to-one mapping scheme may lighten the task of system designers, the ultimate goal is for accurate and meaningful statistical data, based upon clinical recordings. The statistical data then becomes more useful for all (including clinical) parties.

Read terms always retain their clinical meaning

CTV3 is distinguished from most other terminologies in current use as being specifically collated and designed for recording the clinical process. It is only in the cross-mapping links that clinical information is organised into statistical categories. Read terms such as *Essential hypertension* will always retain their natural clinical meaning and not their ICD meaning.

Exact matches to target classifications will be represented by a one-to-one mapping

One-to-one mappings have the advantage that they allow the cross-mapping process to be automatic (this is the case in approximately 70% of cases). Where alternatives must be considered for optimal mapping, these should be presented to the user for choice.

Default mappings will be provided in cases where there is no one-to-one mapping

Where there is a list of alternative mappings, one of these will always be marked as the default mapping. In the case of ICD-10 there is a default mapping from every CTV3 disorder concept. Alternatives fall into two classes. Some must be checked or a clear error would be committed (e.g. the mapping from *Essential hypertension* to the ICD code for *Essential hypertension outside pregnancy*). On other occasions, the default mapping may be to a NOS (Not otherwise specified) code (for example) and the alternatives might allow a more informative target code to be chosen in the presence of more information in the case record.

The mapping may be to a target code that must be further refined

Some Read Codes will be mapped to a high level target code (e.g. an ICD 3rd level code) that need to be further refined before it is an allowable submission for central return purposes. This occurs:

1. When the mapping is from a broad or parent Read term (e.g. Hypertension or

2. When the axis of interest in ICD at the more detailed level is of little clinical interest or

3. When the detailed codes are of clinical interest, but the information is contained in some other Read Code (perhaps a qualifier, perhaps a code like *Pregnant).*

When the target code must be further refined, this is flagged. Software designed for "encoding" must have access to target codes and rubrics (terms) to do this job[2].

Navigational Read concepts are not mapped

There are a few high level CTV3 concepts that are useful for searching records and retrieving terms (e.g. *Other endocrine gland diseases*), but which would not be used for describing a patients' care. These are "heading" terms only and are used for organisational purposes only and are not mapped.
Read qualifiers will be ignored in the initial set of cross mappings

The cross-mappings are only from core clinical concepts such as disorders, procedures, clinical history and observations. Qualifiers attached to these terms are currently ignored when mapping. This will result in some information being entered twice (once as a qualifier, once for producing an optimum cross-map). However, an additional file is being planned to allow mappings from qualifiers to be included in the future.

6. The Cross-mapping File Structure

The cross-mapping file structure is outlined below. The structure is generic, but separate files exist for cross-mappings to each target classification (e.g. ICD-10, ICD-9[3], OPCS-4, BNF). After the raw detail of the **master mapping file** structure, a number of worked examples are described to:

- Illustrate the use of the cross-mapping file, and

- Clarify the detail of the cross-mapping file structure.

In the following file layout:

num(n)	An integer n digits in length
char(n)	Is a fixed length string n characters long
varchar(n)	Is a variable length string with a maximum length of n
M	Means that the field is mandatory i.e. will always contain a value (or not null in SQL terminology). It does not mean that the field must be used.

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[2] The rubrics for ICD-10 and OPCS-4 are available from the NHS Connecting for Health
[3] The ICD-9 map is not maintained or released as it has now been superseded by ICD-10.

Underlined fields   Denote the unique key for a table. Some tables have concatenated keys.

Note that throughout the examples a dot is included between the 3rd and 4th characters of ICD-10 and OPCS-4 codes as is traditional to help legibility, <u>though the distributed Read data files do not contain such dots</u>.

6.1 Master Mapping file

read code	char(5)	M	The Read concept identifier
target code	varchar(20)	M	The target code (e.g. OPCS-4, ICD-9, ICD-10). Each database row only ever contains a single target code. Where one Read Code maps onto several target codes, there are several corresponding database rows. ICD-9, ICD-10 and OPCS-4 codes in CTV3 contain no 'dots' or other punctuation (e.g. H123 rather than H12.3).
mapping_status	char(1)	M	Denotes the nature of the mapping. This may be: E = Exact one-to-one mapping. There is an exact match between host and target codes. There are no alternatives. G = Target concept more general. The mapping is correct, but Read coded concept is more detailed. There are no alternatives. D = Default mapping. Indicates either an alternative that is most acceptable in the absence of other information or a partial mapping in cases where one Read Code maps onto a pair of target codes. There is not necessarily a default among a set of alternatives (other than in OPCS-4 and ICD-10). R = Requires checking. This alternative mapping must be checked against the default that

			has also been supplied in the table. (Different rubric from default). A = Alternative mapping. All alternatives that are not marked as D or R fall into this category. (Same rubric as default). U = Unspecified. **Not used.**
refine_flag	char(1)	M	Denotes whether or not the target code is sufficiently detailed to be acceptable. 3-character ICD codes are usually not acceptable for example. Covers addition of 4th and 5th digit extensions in ICD, 4th character in OPCS-4. C = Completely refined. M = Mandatory to refine further. P = Possible but not mandatory to refine further
additional_code_flag	char(1)	M	Denotes whether or not the target system specifies that extra codes might be added to the target code (e.g. aetiology codes in ICD and site codes in OPCS-4). C = Complete. No further codes need be added. M = Mandatory to add a further code. P = Possible but not mandatory to add a further code.
element number	num(1)	M	A Read Code may need several target codes for a complete mapping, but each of these may have alternatives. Therefore each set of alternatives is given a distinct element number. Element numbers start at 0, incrementing by 1. There are rarely more than two sets.
block number	num(2)	M	A block is a complete set of target codes for a mapping from any one Read Code (including all

			alternatives to the suggested codes). There are a number of occasions where more than one block exists for a Read Code. This occurs, for example, when a Read Code maps to either a single target code or to a target code plus a second code (which may itself have alternatives). Blocks are numbered successively 0, 1, 2.. <u>Note that elements exist within blocks and that usually there is only one block</u>.

7. Illustrative Examples

A number of examples are set out below to illustrate the detail of the cross-mapping scheme. The examples illustrate mappings to ICD-10 and OPCS-4. One, (*Tuberculous meningitis NOS*, A13z) is an 'optional' concept in CTV3, but illustrates the fact that both current and optional concepts are mapped. This ensures that medical concepts recorded some time in the past which have been optional in CTV3 can still be included in subsequent analyses done using ICD-10 and OPCS-4 mappings.

7.1 Example 1 – Endometriosis of ovary

An extract Read concept to target concept mapping

This example involves a traditional one-to-one mapping from the Read Code for **Endometriosis of Ovary** (XE0eX) to the ICD-10 code for the same disease (N80.1). This is an exact match (mapping status = E) and therefore there are no choices. Only one target code is required (element_number = 0); the code cannot be further refined as there are no 5th character codes under N801 (refine flag = C) nor can any extra codes be added (additional code flag = C); and only one block is required (block_number = 0).

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
XE0eX	N801	E	C	C	0	0

7.2 Example 2 – Ovarian streak

The target concept is more general

In this case **Ovarian streak** (PC03.) maps on to ***Other congenital malformations of ovary*** (Q503) in ICD-10. Though the Read concept is more detailed than the target concept (marked below by mapping status = G), there is no problem and the mapping is one-to-one. Only one target code is required (element_number = 0); and only one block is required (block_number = 0).

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
PC03.	Q503	G	C	C	0	0

7.3 Example 3 – Asthma

Read Code maps onto target code precisely but target code needs refining

The Read concept ***Asthma*** (H33..) maps onto the ICD concept ***Asthma*** (J45) precisely, but this code is not acceptable to ICD as in this case there are 4th digit ICD extensions. Therefore, firstly we map to ***Asthma NOS*** (J459), marking this as the default mapping (mapping status = D). Secondly we map to the whole range (J45) which also includes codes for ***Predominantly allergic asthma*** (J45.0) and ***Nonallergic asthma*** (J45.1). The range J45 is flagged as alternative (mapping status = A). Another flag (refine flag = M) indicates that it is mandatory to refine the target code J45 if chosen to obtain an allowable code. Only one target code is required (element_number = 0); and only one block is required (block_number = 0).

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
H33..	J459	D	C	C	0	0
H33..	J45	A	M	C	0	0

7.4 Example 4 – Anaemia in neoplastic disease

The target code must be augmented by a second code

Anaemia in neoplastic disease is both an ICD-10 (D63.0A) and a Read concept (D212.). It therefore has an exact mapping. It cannot be further refined, but an additional code to specify the site of neoplasm is mandatory. To indicate this, the additional code flag is set to M. Only one target code is provided (element_number = 0); and only one block is required (block_number = 0).

Currently, no help is provided as to the range of possible extra codes. However, it is planned to make available ranges of acceptable codes at some stage in the future (see the note on the **additional code file**, discussed in example 5).

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
D212	D630A	E	C	M	0	0

7.5 Example 5 – Tuberculous meningitis

Two or more target codes are required to represent the Read Code

This example involves a mapping from the Read Code for **Tuberculous meningitis** (F004.). Two ICD-10 codes are required. Firstly the code A170 for **Tuberculosis** (dagger – D) and secondly the code G01.X for **Meningitis in bacterial diseases classified elsewhere** (asterisk – A). This is handled by two lines in the table, each giving one half of the cross-mapping and each given a different element number (0 and 1). As neither target code separately is equivalent to the Read concept, they are both given the mapping status of D.

The refine_flag refers to each part of the cross-mapping only (see the **Tonsillectomy and adenoidectomy** example for an example where these are different). In the example below, each of the two codes is complete – neither can be further refined.

The additional code flag, in contrast, will always be the same for both halves of the pair as any extra codes are to be added to the whole mapping. The value of this flag is C (Complete) as no codes need to or can be added to the ICD pair. Only one block is required and therefore the block_number = 0.

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
F004.	A170D	D	C	C	0	0
F004.	G01XA	D	C	C	1	0

7.6 Example 6 – Tonsillectomy and adenoidectomy

One mapping must be selected from each set of potential cross-mappings

In the case of the Read concept of **Tonsillectomy and adenoidectomy** (75306) two target (OPCS-4) codes are required, as in the previous example, one to cover the **Tonsillectomy** (F34.9 or F34) and the other to describe the **Adenoidectomy** (E20.1). One of F34.9 or F34 must be chosen, but if it is F34 that is chosen then it must be refined to a 4th digit OPCS-4 code so it is given refine flag = M (Mandatory).

Each set of choices is given its own element number and one choice must be made from each set. Only one block is required and therefore the block_number = 0.

read_code	target_ code	mapping_ status	refine_ flag	additional_ code_flag	element_ number	block_ number
75306	F349	D	C	C	0	0
75306	F34	A	M	C	0	0
75306	E201	D	C	C	1	0

7.7 Example 7 – Operations on tonsil and adenoid

Read concept is too general to map onto target terminology

This Read concept is too general to successfully map onto a target (OPCS-4) code. Typically these are chapter or grouping headings. There is no sensible default mapping and the set of alternatives is potentially very large, therefore these concepts are omitted from the mapping table. In the extremely unlikely event of one of these being chosen for a notes entry, the user should be prompted to refine the Read Code concept further before cross-mapping is attempted.

7.8 Example 8 – Hypertensive disease

The chosen default mapping may be erroneous and must be checked

This example highlights a problem that occurs when trying to map from a clinical terminology onto a classification system.

In CTV3, all "NOS" containing concepts will be flagged as optional and users are encouraged not to use them. This is because the Read Codes are seen not as a statistical classification, but as a terminology for recording the process of care. However, a user may choose a vague term such as *Hypertension* (*Hypertensive disease* – XE0Ub) if primary and secondary causes have not been distinguished. This term may occasionally and correctly in the Read Codes, be used when hypertension occurs in pregnancy.

However in ICD-10, whereas the codes for hypertension in pregnancy are 010-011, 013-016, the code for hypertension occurring outside pregnancy lies in the range from I10X to I15 (I10.X is *Essential hypertension*, I15 is *Secondary hypertension* and the others hypertension with some complication).

We must ensure that the Read (or clinical) concept of Hypertension maps onto all of these ICD options. Many of these are 3 character codes, that must be refined once chosen (refine flag = M). In the absence of further information, the default is I10.X (*Essential hypertension*) as suggested by ICD rules or convention. The mappings to Hypertension in pregnancy are marked as mapping status = R; that is, this alternative must be checked before the

default is chosen. Only one block is required and therefore the block_number = 0.

read_code	target_code	mapping_status	refine_flag	additional_code_flag	element_number	block_number
XE0Ub	I10X	D	C	C	0	0
XE0Ub	I11	R	M	C	0	0
XE0Ub	I12	R	M	C	0	0
XE0Ub	I13	R	M	C	0	0
XE0Ub	I15	R	M	C	0	0
XE0Ub	O10	R	M	C	0	0
XE0Ub	O11X	R	C	C	0	0
XE0Ub	O13X	R	C	C	0	0
XE0Ub	O14	R	M	C	0	0
XE0Ub	O15	R	M	C	0	0
XE0Ub	O16X	R	C	C	0	0

7.9 Example 9 – Candidiasis

Mapping from a Read Code requires one target code in some cases, but two in others

The mapping from *Candidiasis* is an example of the most complex type of mapping situation. The default code is the ICD-10 code for *Candidiasis NOS* (B37.9), but it may map to any item in B37 (*Candidasis*) and to *Neonatal candidiasis* (P37.5) – if patient is of the appropriate age. So far this is a simple set of alternatives, but a third alternative is that it maps onto the dagger-asterisk pair *Candidiasis of vulva and vagina* (B37.D) and V*aginitis vulvitis and vulvovaginitis in infectious and parasitic diseases classified elsewhere* (N77.1A).

Now we need to ensure that the asterisk code (N77.1A) only goes with B37.3D and not any of the other alternatives. We therefore place the simple alternatives in block 0 and the pair in block 1. (In fact there are other blocks for other dagger-asterisk pairs that also need to be considered, omitted from the table below for simplicity). Block 0 is the default block.

read_code	target_code	mapping_status	refine_flag	additional_code_flag	element_number	block_number
AB2...	B379	D	C	C	0	0
AB2..	B37	A	M	C	0	0
AB2..	P375	R	C	C	0	0
AB2..	B373D	D	C	C	0	1
AB2..	N771A	D	C	C	1	1

8. Conclusion

Terminologies for describing clinical care and classifications designed for statistical analysis have different properties to reflect different requirements.

- Concepts in a statistical classification are designed to be mutually exclusive and to exclude the possibility of double counting.

- Clinical terms (and their underlying concepts reflect the vocabulary needs of clinicians who are describing what they do and are not necessarily mutually exclusive. This is particularly true at the category level. Clinical queries (e.g. retrieve all patients with *Respiratory disease* or retrieve all patients with *Infectious diseases*) usually <u>require</u> double counting.

Therefore both clinical terminologies and statistical classifications support analysis, but of a different kind.

The cross-mapping scheme starts from the premise that the meaning of terms and concepts in CTV3 is given by their normal clinical use. Any one clinical concept may therefore map to a number of statistical codes (or pigeonholes) and requires a one-to-many mapping scheme. Users may distinguish which is the best of the alternative categories by using other known information about the patient (e.g. the patient is a newborn or is pregnant).

The CTV3 mapping scheme describes various classes of alternatives and allows system designers to build software that presents all of the relevant target classification categories to users who are cross-mapping. It therefore goes some way towards incorporating the rules of classifications such as ICD-10 and OPCS-4 into a database.