

# **Choosing a Coding System for Clinical Data**

*An approach to option appraisal*

SAGOR - Scottish Advisory Group on Read

Report of a SAGOR Working Group on Criteria  
for Clinical Coding Systems

First Edition

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## SECTION B PRACTICAL METHODOLOGY

• Chapter 4 on coding system criteria can be read in isolation. However, the working group considered that since any coding tools used in clinical systems should be selected specifically to assist in carrying out the primary aim — support of patient care — the nature, range and relationships of the required data should be understood first. So it is recommended that chapter 3, which describes ways of analysing the required information needs, is at least briefly reviewed, before embarking on detailed assessment of coding system criteria.

• Chapter 5, the economic appraisal section is relevant to the tasks covered in chapters 3 and 4.

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## Foreword

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This report is important and timely. Since clinical support systems are the growth point in health care computing, it should be required reading for all clinicians and managers who are involved, or who may be involved, in the selection of any health care system but particularly those that support clinical practice.

Most people agree that the core business of the NHS is providing health care for patients but most developments of information technology in the NHS in the past have been about administration. This has led some clinicians to feel disappointed and disillusioned about what IT can do for them and to look on it as a tool for management with little relevance to clinical practice.

Recently the situation has changed and much more emphasis is being placed on the development of systems that help doctors and nurses and other healthcare professionals give better care to patients and that help inform and empower patients. This shift has been encouraged by the introduction of systems that communicate and that are integrated so that real-time working is possible. This means that a clinician can see all the information that he or she needs on the PC on their desk or on the laptop at the bedside, even although the data may be held in different places and on different systems. Computers can help them do their job-order tests, prescribe drugs, do care assessments and care plans, maintain records, do discharge letters — all at the bedside. Computers can also give advice, alerts and warnings and links to sources of knowledge like the Internet as clinicians do their work.

However, these benefits can only be obtained at a cost, and that cost is increasingly complex systems that are increasingly expensive, that demand increasing standardisation and that need increasing training and maintenance. These additional costs mean that even more attention must be given to choosing systems that are best fitted for the purpose.

Underlying all communication is the sharing of information. This sharing implies shared standards both for the method of communication and for the meaning of the message. Standards for communication technology are highly developed and highly specialised. Standards for meaning are still developing even although a great deal of work has gone into the study of the meaning of terms from the point of view of nomenclature, coding and classification. Sharing clinical information demands clear thinking about the standards needed for clear and unambiguous communication.

The title of the report undersells its real value. It describes a way to tackle all these problems. It explains the need for clinical support systems and gives very useful advice on their choice. It introduces the idea of option appraisal to choosing clinical systems and gives a methodology and criteria for considering the choice of coding systems. Instead of making authoritarian assertions that coding system X should be mandatory no matter the circumstance, it recognises that different purposes might need different solutions and it gives a very useful approach to identifying the most appropriate system for the purpose.

The time is right for this report. I hope that clinicians and managers who need to make decisions about introducing clinical systems will benefit from its wise advice.

DR BILL DODD

Director, Electronic Patient Record Programme  
Department of Health

May 1997

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## Introduction

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The Scottish Advisory Group on Read coding (SAGOR) has a membership drawn from Trusts, Boards, the Management Executive and ISD Scotland. The group provides advice on issues related to standardisation of clinical coding, through the Director of ISD, to the Scottish Health Service. Originally set up to advise purely on the implementation of Read Codes, SAGOR recognises the wide variety of uses of clinical information and the range of systems through which it is collected and exploited and has tried therefore to broaden its approach to clinical coding systems to include a range of classifications and terminologies which may be appropriate for use in particular applications.

SAGOR is well aware of difficulties faced by anyone planning and developing a clinical information system in deciding how best to encode clinical data. These must be accessible for management of patient care, for communication between clinical staff, for audit and research and for the management of a unit or practice. Systems are expensive to develop and run and often represent a substantial long term investment. Making a decision about whether clinical data can be captured in a standard coded format, and about which method of standardisation to use can be particularly difficult.

National guidelines in Scotland have in the past concentrated primarily on recording summary data for statistical and management purposes, including central returns. While these are clearly important from epidemiological and management perspectives, patients, clinical staff and managers are increasingly likely to expect information technology to support and improve patient care more directly.

Support for patient care may come through electronic patient records; through communication systems designed to transmit requests and results; or to help generate letters between clinical staff. Systems may provide immediate access to evidence based information sources such as SIGN guidelines or help improve clinical management through rapid evaluation of research and audit data.

The rôle of classifications and standard terminologies in clinical information systems is a complicated issue. It is one which is probably best addressed by a combination of locally driven evaluation and central guidance and co-ordination. SAGOR felt there was an urgent need to raise these issues with clinical staff and information managers throughout the Scottish Health Service (SHS).

### Establishment of the Criteria Working Group by SAGOR

SAGOR has reviewed a variety of clinical coding tools such as the Read Thesauri, ICD9 and ICD10, OPCS4, GALEN and SNOMED. During the course of its discussions, the group recognised that there was no detailed guidance available in the SHS to help with the decisions that need to be made about coding issues as new systems are implemented and older ones upgraded. Each developer or procurement team has to decide what range and depth of clinical information is required for the purpose in hand, whether the data is to be coded and by what criteria available coding systems should be judged as to their suitability and quality. These are complex issues.

SAGOR established a small working group to develop recommendations on the evaluation of clinical nomenclatures and classifications and on approaches to selecting appropriate coding tools for new clinical systems or upgrades. From the start, SAGOR recognised that guidance of this nature must initially be based on knowledge of available products and evaluation studies since it could not yet benefit from practical experience in an extensive range of working systems. Development and use of standard terminologies in computerised patient records, decision support, audit data and management statistics is still at a relatively early stage of prototyping and testing in many locations. In this situation, guidance material can help lay down a basic framework of evaluation for terminology and coding products, but it needs to be constantly modified and updated as practical experience reveals the strengths and weaknesses of various approaches and coding systems.

The working group was therefore asked to produce some initial guidelines which could be offered to anyone in the SHS who needs to make decisions about which terminology or classification system to use in a new or developing clinical information system. They were to be released on the understanding that they represented the best advice that could be provided at the present stage of development and could serve as a prototype to be refined and extended in collaboration with users grappling with practical problems in real systems.

## **Aims of the Criteria Working Group**

In response to the general remit outlined above, the group initially looked at specific criteria that could be applied to clinical coding products. It soon became apparent that this in itself was inadequate, since it seemed to imply that decisions about ‘which coding method?’ could somehow be taken irrespective of the purposes and contexts of a particular clinical information system. For instance, a coded clinical terminology with a wide range of terminology and extensive detail, embodied in a technical product of great excellence and meeting numerous absolute criteria of quality, might still be inappropriate in terms of cost and practicality for a smaller system in a given clinical environment. So it seemed important to provide recommendations on how the purposes and contexts could be explored before dealing with details of coding systems.

It should be made clear that the group concentrated on the properties required of clinical coding systems for use by staff engaged directly in providing care for the patient. It is assumed throughout this report that ‘clinical staff’ refers to all staff providing care for the patient, including doctors, nurses and all professions allied to medicine (PAMs). The working group therefore established three primary aims:

- To provide guidance on the questions which should be asked about the purposes which a projected clinical information system will serve, the people who will use it and the organisational and technical context in which it will operate. As a result of answering these questions, the nature of the clinical information required, in terms of its range and detail should become apparent, as should the need to communicate with other users and other information systems. These insights may help to indicate the kind of clinical coding tools required.
- To provide a set of detailed criteria against which a clinical coding terminology or classification can be assessed to ensure that it fulfils the detailed design requirements of a particular system and meets general standards of technical quality, communicability and long term viability.
- To collect together examples of reference material such as SHS documents on coding policy and strategy; descriptions of available clinical coding products; lists of sites which are already using various clinical coding tools in clinical information systems; lists of contacts for particular types of information or assistance; and so on.

We must stress that this report is NOT a list of rules which define the way in which clinical information should be expressed and coded in electronic information systems. It is an exploration of the purposes of such systems and the contexts in which they must operate. It offers suggestions on ways of defining and exploring important issues about what information is needed and who will collect and use it. Finally it looks at the need for a critical evaluation of terminology and coding options.

The working group will be happy to receive comments on the content and suggestions for alternative approaches to planning clinical information systems. If this dialogue is successful and new perspectives emerge, SAGOR will recommend that an updated report is published, taking account of reactions and recommendations from the SHS.

TOM DIVERS  
Chairman, SAGOR  
May 1997

## Glossary of terms

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The following terms are used occasionally in the report. Attached are descriptions which may help to clarify their use in this context.

### **Terminology**

The recording on a computer record of clinical information using clinical terms selected from a standard terminology. The system will hold an associated code or codes.

### **Encoding**

The translation of terms into classification codes (ie ICD10 and OPCS4) for production of statistical returns such as Coppins SMR returns. The user/coder requires to select the appropriate code from a list of potentially matching classification codes which are held in 'mapping' tables behind the standard terminology. The selection of a specific classification code must be guided by the coding rules of the target classification.

### **Validating**

Validation is the process of checking whether the diagnostic or operation code selected for a particular case is consistent with other information in the patient record. An obvious example is a check which ensures that sex specific diagnosis and procedures match the sex recorded in the case record.

### **Grouping**

Amalgamation of sets of related classification codes into various groups for specific purposes such as contracting, resource management and care plans. Examples of standard grouping systems include HRG's and DRG's derived from ICD/OPCS.

### **Analysis**

The use of standard terminology codes or derived classification codes to provide structured lists of selected sets of cases or summary tables derived from selected datasets.

### **Messaging**

The transfer of coded clinical information electronically for purposes such as ordering/reporting of investigations, pharmacy prescribing and letters [discharge summaries and referrals to other departments/hospitals].

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## Outline of report

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### **1 The case for clinical support systems, a clinical effectiveness perspective**

The working group felt that it was important to describe ‘where it was coming from’, i.e. to indicate what it considered to be the clinical importance of clinical information systems .

The chapter says there is now convincing evidence that ‘clinical systems’ should mean ‘clinical support systems’, which can be defined as:

A computer which is directly used by clinicians in the patient care setting to help carry out clinical communication tasks and promote effective care.

Stress on clinical effectiveness is the main focus of the working group as it approaches its task. The chapter draws attention to the importance of organised presentation of information; to the potential of patient specific reminders to draw attention to agreed guidelines; to immediate feedback as a desirable form of audit; and to the crucial importance of getting the human factors right rather than concentrating on technicalities of systems.

*A draft of this chapter was circulated to delegates of the CRAG clinical information systems conference of September 1996.*

### **2 Use of computerised information in the health service**

This chapter provides further orientation with an overview of the kind of systems the working party had in mind when making its recommendations. These include patient administration systems, electronic patient records, clinical communications, decision support, clinical research and audit, contracting, unit and practice management and creation of central returns. It contains examples of content and of the coding systems which may be required. Finally it illustrates diagrammatically, the complexity of information management for an individual patient and then presents a fictional case showing how access to relevant information at the right time might make all the difference to the outcome.

### **3 Developing plans for information systems and deciding on information needs, costs and benefits**

This chapter contains advice on issues which have to be addressed when planning an information system. The working group presents some observations on a methodology for planning an information system in a way which allows facts and opinions about the context, the content, the costs and the benefits of the project to be assembled, evaluated and used in arriving at design or implementation decisions. This is regarded as a necessary process in any project and it is certainly an essential prelude to selecting and evaluating specific coding products.

### **4 Criteria for evaluating coded terms used in clinical systems**

The chapter on criteria for evaluating coding tools for use in a given system begins by looking at the differences in purpose between nomenclatures and classifications and by defining key concepts such as ‘terming’ and ‘encoding’. Next, attention is drawn to a series of characteristics of clinical coding systems

which need to be assessed to help decide whether a particular terminology or classification will be appropriate. Assessments include:

- How well the system copes with various elements of a case record such as the history and examination in completeness of terminology and an ability to deal with detail.
- How easily and naturally data can be input and retrieved via the coding system and its ability to support analysis.
- How well the system is designed to cope with new terms.
- How well the system meets modern technical standards.
- Whether the system can command a strong share of the market so that it becomes and remains a practical standard in its field.

## **5 The rational approach to evaluating options for standard terminologies**

In this chapter a method of cost-benefit analysis is recommended so that choices about which clinical coding system to use are evaluated logically. The steps in such an analysis are described and include a definition of objectives of the system; a list of alternative options for change including ‘do nothing’; definition of the expected benefits of each option for change and weighting their importance; estimation of all costs; and finally, comparison of the alternatives. ‘Can increases in marginal costs be justified by increases in utility?’ is the question which has to be answered when the facts have been marshalled.

## **6 In conclusion**

The “In conclusion” chapter briefly introduces two key areas for further consideration and comment. The need for standardisation of coding systems is considered and a “family” of compatible coding tools is recommended, comprising a terminology, a classification and a grouping system. Comments are requested. Then attention is drawn to the (hopefully logical — but as yet untested) nature of advice given in the report, along with an invitation to a collaborative case study to test its workability and effectiveness.

## Section

## A

# Orientation

*Readers with experience of developing and using clinical information systems may wish to omit this section.*

## 1 The case for clinical support systems — a clinical effectiveness perspective 3

*the working group's understanding of what clinical information systems should be trying to do; concentrates on information in the clinical process, from assessment of a patient through to evaluation of clinical management*

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# The case for clinical support systems — a clinical effectiveness perspective

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## Key messages

- 1 A clinical support system can significantly increase the efficiency and effectiveness of patient care.
- 2 Simply displaying relevant patient information in an organised way can greatly improve efficiency and even reduce the number of investigations performed.
- 3 Guideline dissemination alone is seldom sufficient to sustain physician behaviour change, even when physicians agree with the guideline recommendations.
- 4 Operational support in the form of patient-specific reminders offered via a clinical system is a critical factor in the likelihood of guideline compliance.
- 5 Clinical comment in the form of immediate feedback to the clinician is more effective than retrospective reports.
- 6 An IT-only approach will fail. Human and organisational aspects are of critical importance.

## Introduction

An accepted maxim in IM&T strategies is that ‘management information should where possible be a by-product of clinical information’. Behind this idea is the sensible desire to reduce bureaucratic duplication and increase accuracy.

Turning the idea into action within the Scottish Health Service has hitherto led to information technology systems which were ‘clinical’ in that they contained clinical data, yet such systems were in the main more of a repository than of an operational nature. With some notable exceptions such as the PRS system in Aberdeen, such systems were not designed for direct use by clinicians to help their day-to-day job. For example GPASS, clinical audit systems, and Clinical Resource and Information Systems (CRIS) were typically designed to have clinical data entered subsequent to the clinician/patient encounter. In the hospital setting this would typically be following the patient’s discharge, with analyses and reports being run off retrospectively. This approach has famously been described as ‘steering the ship by looking over your shoulder at the wake’.

There is now convincing evidence that ‘clinical systems’ should mean ‘clinical support systems’, which can be defined as:

A computer which is directly used by clinicians in the patient care setting to help carry out clinical communication tasks and promote effective care.

The case, set out below, is twofold. Firstly, considerable efficiency gains come from using computers to automate paper-based processes such as ordering lab tests and returning results. This is not surprising - in the UK hospital setting it has been estimated that doctors and nurses spend a quarter of their time on gathering and using information<sup>1</sup>. Secondly, and more importantly, there is growing evidence that clinical systems have a key role to play in bringing clinical guidelines into actual clinical practice.

This short paper seeks to go beyond the belief that clinical systems are a good idea by reviewing the research literature for well-established examples of benefit. The emphasis will be on benefit in terms of clinical effectiveness, i.e. where systems have contributed to better patient care. The main example of this is in relation to clinical practice based on guidelines and protocols.

The studies quoted are overwhelmingly from the medical domain. Nursing and paramedical examples exist, but are less evident due to fewer system implementations.

Finally, the scope of this paper is limited to examining the case for clinical support systems. The scope does not extend to making them happen and the obstacles such as people's preference for pen and paper. The Management Executive is preparing papers which will describe the national strategy and role in this regard (including aspects such as confidentiality and sponsorship for innovation).

## A model of clinical practice

A simple model of clinical practice can be used as a means of organising the material. The model is of four stages in the process of patient care:

- ASSESS
- PLAN
- ACT
- EVALUATE

The research literature shows that each of these simplified stages can be supported by clinical systems.

## Support for patient assessment

Patient assessment involves receiving and eliciting clinical information such as problems, symptoms, and test results. In a paper-based system much of this information will be contained within the casenotes, hence a very basic requirement is to have the casenotes to hand. Yet one study found that this did not happen in up to 30% of patient encounters<sup>2</sup>. A clinical support system addresses this.

Additional information concerning the patient comes from colleagues elsewhere. Like all forms of communication, the structure and language of these messages have an important influence on understanding. The commonest forms of such communication are referral letters and discharge summaries. SIGN<sup>3</sup> has published an agreed form for the latter and are working on the former. The significance for clinical systems of this kind of clear specification of such messages is that the 'sender' system can automatically generate much of the letter from data within the patient's record, while the 'receiver' system can accept that same data into waiting slots within that system's version of the patient's record.

The benefits from realising this scenario include saving time, improving accuracy, and aiding assimilation of content by the receiving clinician. Yet getting to that point means restricting the design of systems in order to incorporate standard data definitions within messages and secure transmission methods.

Although computers combined with secure electronic networks may help to have the right information at the right time, the clinician can still be faced with a daunting mass of information to assimilate. Computers can help by being designed to logically organise and display information within the patient's record. Summaries can be offered of history, test results, and interventions related to particular clinical problems.

For example, once an abnormal blood pressure is detected the clinician has to interpret this finding in the

light of data such as cholesterol level in a hypertensive patient or blood glucose in a diabetic patient. Current medication and dietary analysis is important in each case. Having such data sensibly organised and displayed will reduce time to make decisions as well as promote accuracy of decisions. It is over 20 years since Fries<sup>4</sup> demonstrated the dramatic impact of varying the record format on the time taken to make clinical decisions.

If the case for action is strong from a clinical effectiveness viewpoint, so too is the financial one. Connelly et al<sup>5</sup> found a 32% reduction in laboratory test charges after introducing a clinical system to organise and display results. Tierney et al<sup>6</sup> also noted a significant reduction in test ordering by giving physicians access to displays of past test results along with probability estimates of an abnormal result and test costs.

## Support for planning care

There's establishing what's best, there's knowing what's best, there's doing what's best, and there's seeing how well it's been done - a crude summary of clinical guideline and evidence-based practice.

### Access to knowledge sources

The first requirement is to establish the best plan of care for the individual patient. Given the pace of clinical life, it is important to facilitate access to knowledge sources such as the Cochrane and similar databases which are increasingly becoming accessible on the internet. These databases typically contain knowledge which has been 'processed' into guidelines. However it is important to give the means to the clinician wishing to consult more fundamental sources such as MEDLINE. Clinical systems can help do this by extracting the search criteria from the patient's record, a feature which Cimino et al<sup>7</sup> found was both time saving and encouraging to clinicians.

Computers may therefore have an important role to play in dissemination of guidelines through some sort of internet or bulletin board arrangement. Yet as Elson et al<sup>8</sup> note, guideline dissemination alone is seldom sufficient to sustain physician behaviour change, even when physicians agree with the guideline recommendations. Even if what's best is known, repeated studies have demonstrated that what's best is not necessarily what's done<sup>9 10</sup>.

### Alerts and reminders

The local guideline implementation programme is obviously a critical factor in getting guidelines taken up, but of interest is the growing evidence that clinical systems have a particular role to play. The simplest role is to program the computer to offer patient-specific reminders and alerts based on given circumstances. For example, McDonald et al<sup>11</sup> found that 50% of patients eligible for influenza vaccine were actually given it by doctors using a patient record system which gave a reminder, while a rate of only 30% was found in the control group of doctors not receiving reminders. A recent critical review of many similar controlled trials concluded that there is strong support for this approach improving clinician guideline compliance<sup>12</sup>.

Grimshaw and Russell<sup>13</sup>, in an influential paper on evidence-based medicine, concludes that operational support in the form of patient-specific reminders was a critical factor in the likelihood of guideline effectiveness. Rind et al<sup>14</sup>, focusing exclusively on patient outcome, also showed a corresponding beneficial effect.

In the general practice setting, Sullivan et al<sup>15</sup> looked at 21 studies and found that all showed an improvement in clinician performance when a computer was used. Commenting generally on guideline implementation in general practice, Conroy et al<sup>16</sup> concluded that it is likely that computers may have an important role in providing reminders.

In the ward nursing setting, Newton<sup>17</sup> studied nursing documentation before and after a move from paper to computer. Two years later, recorded assessment had generally risen from 62% to 95% of patients. Taking the specific example of pressure sore risk assessment, rate of recording had risen from 22% to 92%.

## Acting on the plan of care

The most obvious support that a clinical system can offer is in the area of support for the administrative aspects of patient care. Use of clinical systems to support the administrative aspects of patient care has become an accepted benefit of clinical systems, at least in the hospital setting where the pressure is to improve and document health care quality while containing costs. These aspects include:

- referral, discharge, and follow-up management
- ordering, scheduling, and receiving results of investigations and procedures
- writing and dispensing prescriptions
- preparing and printing patient education material

All have been shown to take place more efficiently with the aid of a clinical system<sup>18</sup>. In Boston's Beth Israel Hospital as long ago as 1985, 81% of the 586 clinicians who used the clinical system felt that it definitely or probably made their work more accurate<sup>19</sup>. Benefits are also in time saving and reduction of unnecessary investigations. Kahl et al<sup>20</sup> looked at a ward nursing system implementation and found that quantifiable benefits included increases in productivity and time spent with patients as well as more accurate and timely patient documentation. Tierney et al<sup>21</sup> reviewed studies in this area and estimated that U.S. health care could save tens of billions of dollars - mainly in clerical jobs - if such systems were fully taken up.

Returning to guidelines implementation, a more recent development is to embed guidelines into the system in such a way that the clinical process is supported by adherence to an agreed pathway. This involves a particular presenting complaint 'triggering' a series of protocol-based events. For example by suggesting then printing a prescription, scheduling appropriate investigations, and printing a patient information sheet.

Studies of the use of nursing computerised care planning systems have shown that care plans produced by the system are of a higher quality than manual counterparts, and that it takes less time to produce them. Champion<sup>22</sup> reports that the care planning system used in Addenbrookes Hospital could save 1.46 WTE of nursing time currently devoted to manual documentation.

## Evaluate

Given that a computer is properly designed for the task and contains consistently-coded clinical data, analyses and reports can be performed with considerably greater speed and accuracy compared to manual review of paperwork. This is the established model of clinical audit. Of more interest, however, is how performance feedback and audit can be supported by the idea of guideline-based clinical support systems.

The extent to which feedback to clinicians is delayed has been shown to be an important element in the success of guideline adoption<sup>23</sup>. In addition, feedback which allows individual clinicians to assess their own practice is more likely to alter divergent behaviour<sup>24</sup>.

The model which is enabled by clinical support systems is one where the data used for audit and feedback is entered by the individual clinician and captured as part of the continuous care process. An example would be where an ICU system gives feedback on clinical data displayed as trends. When this process is in addition helped by guidelines embedded in the patient record, it becomes possible for actual care to be meaningfully assessed against the template of expected care. Feedback can be instant, for instance when

the clinician decides to deviate from the guideline - which they are and must always be free so to do. What becomes additionally useful are the reasons recorded for such deviations, since in this way the validity of the guideline itself can be audited.

**Footnote: is this big brother in thin disguise?**

If the view is taken that computers are increasingly ‘controlling’ the clinical process then the idea of clinical support systems will be threatening to clinicians.

In defence, it has been shown that as long as the clinical practice being encouraged by the computer is perceived as consistent with high-quality care then clinicians are more likely to accept being supported by the machine. Knight et al<sup>25</sup>, for example, found that most clinicians value computer-generated reminders and wish to continue receiving them.

But whatever the evidence, the important lesson for clinical systems is that it is just as important to get the human and organisational aspects right as it is to get the system right. In fact, it’s more important. A comprehensive study of a variety of information system projects was carried out in order to determine why some succeed and some fail<sup>26</sup>. The findings, represented in the diagram below, reveal that the excellence or otherwise of the computer system itself is of relatively little consequence. The overall ‘clinical system’ comprises all elements of the clinical process and people involved in it.

**Success and failure factors in information system projects**

<b>Factor</b>	_____	SUCCESS .....	FAILURE
<b>Change</b>	_____	<i>open to</i> .....	resisted
<b>Objective</b>	_____	<i>on business</i> .....	technical
<b>Ownership</b>	_____	<i>line managers</i> .....	IT department
<b>Resources</b>	_____	<i>sufficient</i> .....	inadequate
<b>Scope</b>	_____	<i>integrated</i> .....	technical only
<b>Involvement</b>	_____	<i>actual users</i> .....	‘removed users’
<b>Specification</b>	_____	<i>learnt</i> .....	too early

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## Use of computerised information in the health service

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There is a wide range of information systems currently in use in the health service and the range is likely to broaden as hardware becomes cheaper; communication networks become more sophisticated and extensive; and as we become increasingly aware and discerning in our use of electronic technology to support patient care and service management. The working group therefore has tried to develop guidance which will be of use to those implementing various types of clinical information systems, rather than limiting ourselves to discussion of a single aspect of information management such as creation of data for central returns.

This is important for two key reasons.

- The terming and coding requirements for systems serving different clinical or management purposes may also be quite different. A range of terminology and classification will probably be required.
- If we are to achieve the long term aim of collecting accurate information once only as part of the process of care, and making it accessible thereafter wherever required, we must be sure that our clinical coding tools are designed to help us collect, convert, transmit and reuse information in a variety of linked systems.

The systems described below may be developed in isolation and often have been 'standalone' systems in the past. There should be more integration in future, with each of these elements forming part of a combined system, centred on the patient, which brings together information needed for clinical decision making, clinical communications, research, audit and service management.

### Support for patient care

#### **Administration of care**

Patient Administration Systems contain electronic records of patients' contact with services and indicate types of contact, specialties and locations in which care is provided, types of admission and discharge etc., and may provide facilities to help with the management of care such as booking clinic appointments or waiting list administration. Frequently they also contain modules for creating statistical summaries such as central returns.

#### **Electronic patient case records**

Comprise a comprehensive store of accessible clinical and demographic information to plan & manage patient care and may replace written records in whole or in part. They usually contain linked records of episodes of care. Specific sections of the record such as investigations and operation notes may be generated by other linked systems in laboratories, radiology departments and theatres. Full electronic patient record systems will almost certainly have to operate a continuous record for the patient rather than provide episode linkage. The episodic data will have to be withdrawn from the patient record rather than the other way round. If the system primarily records episodes then occasionally important historical data may be missed and it is unlikely to be considered clinician friendly.

#### **Communications systems**

Include electronic referral letters; discharge and reply letters; requests for specific tests etc; results of tests; service management messages such as theatre lists, drug and equipment ordering and so on.

#### **Decision support systems**

Examples of potential systems of this type include on-line access to BNF, SIGN data and to other forms of evidence based guidance such as electronic textbooks and the Cochrane Library. Decision support can be separate or be linked to an electronic patient record.

**Clinical research and audit**

Computerised research or audit records may contain subsets of structured clinical data for each patient included in the research or audit database and be specifically designed to provide data for clinical research projects or to facilitate judgement of the quality of the care process and outcomes.

**Service management****Contracting Systems**

These are electronic systems designed to assist with charging for specific services and to help with planning for procurement and provision of services in line with Board, Practice and Trust budgets.

**Unit/Practice management**

These are information systems holding information about the process, outcome and costs of care. They are used to improve the efficiency and effectiveness of provider units.

**Central returns**

Contain information from episode summaries, collected by Trusts and forwarded to ISD Scotland. Analyses are made available to SODoH, ME, Boards, Trusts, Practices, research bodies, medical schools, the public etc. The data is used for monitoring provision, uptake and outcome of care, epidemiological monitoring, clinical research and audit.

The following tables ('Support for patient care' and 'Management statistics') give a brief summary of content, coding requirements and possible coding tools for each of the applications mentioned in the preceding paragraphs. The aim in compiling this tabular synopsis is to illustrate the range of applications which might exist as standalone systems in complete isolation or with limited capability to exchange information; or ultimately which might be fully integrated into a Clinical Support System.

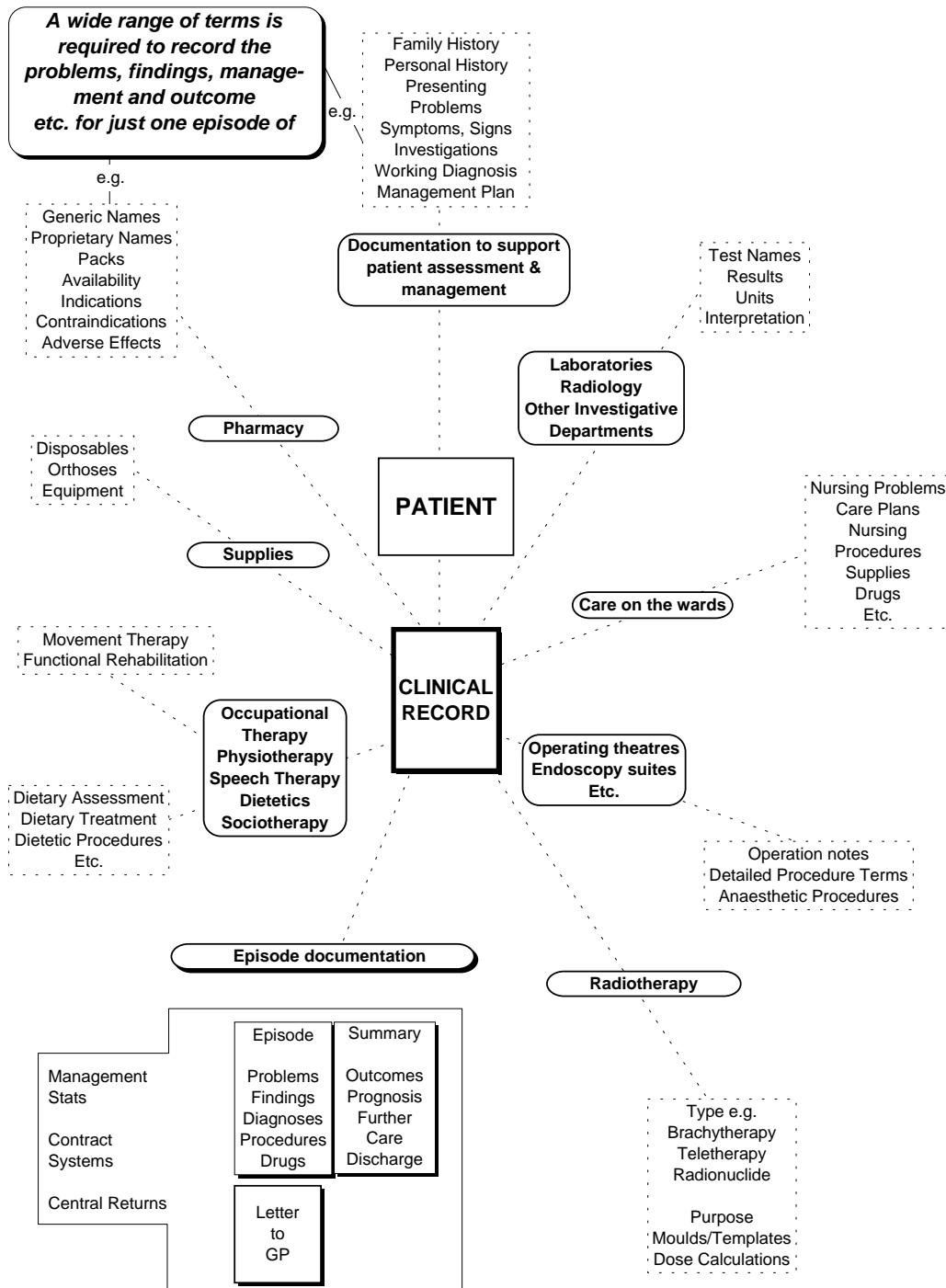
## Support for Patient Care

Task/Application	Examples of Information Content	Terming & Coding Requirements	Applicable standard terminology or classification
<b>Administration of care</b>	Type of contact or referral Types of admission & discharge Significant facilities in which care is provided Clinical disciplines involved Etc.	Sets of terms/codes such as: 'Home visit', 'Breast Screening', 'Admission to hospital', 'Referral for specialist consultation', 'Provision of certificate  Emergency admission, day case admission, transfer  ITU, Outpatient department, Health centre, etc  Medical, nursing and PAMs specialties	SMR series Read 3 GALEN
<b>Electronic Case Record</b>	Comprehensive store of accessible information to plan & manage patient care. Contains linked records of episodes for each spell.  Current & persistent problems Personal & family history History of present problem Specific symptoms & signs  Investigation requested, status, results & interpretation  Working diagnosis  Management plans-medical, nursing and PAMs  Procedures/operations/ anaesthetics  Therapies Drug specification & dosage  Progress of medical, nursing and PAMs care  Outcome & prognosis Further care Etc.	Full range of medical, nursing and PAMs terms  Essential features of terminology: Easy & 'natural' terming; Acceptable clinical structure; Both broad and precise terms; Clinical detail present;  Context of term can be recorded; (e.g. present, doubtful, absent)  Terms can be added  <b>Note</b> <i>The move towards an electronic patient record must reconcile the clinical need for a patient lifetime record with the central reporting requirement for episodic data. Interestingly, clinical audit also requires an episodic approach.</i>	GALEN Read 2 Read 3 SNOMED Lothian Audit
<b>Communications</b>	Referral letters Discharge and reply letters  Requests for specific tests etc.  Results of tests etc. Service management messages such as theatre lists  Drug and equipment ordering etc. E-mail	Subset of the terms required for records (see above) with addition of terms for equipment and supplies  As for electronic case record	Read 2 Read 3 SNOMED Lothian Audit GALEN
<b>Decision support</b>	On-line access to SIGN data  On-line access to other forms of evidence based guidance	Subset of the terms required for records (see above)  As for electronic case record	Read 2 Read 3 SNOMED Lothian Audit GALEN
<b>Research/audit</b>	A selection of the elements of the electronic case record (see above)	As for electronic case record	As for Decision support

## Management statistics

Task/Application	Examples of Information Content	Termining & Coding Requirements	Applicable standard terminology or classification
<b>Contracting</b>			
Charging for specific services provided. Planning for procurements and provision of services against board, practice and trust budgets.	Purchaser & provider identification	Purchaser/provider codes	SHS institution codes SHS contract series SMR series ICD10 OPCS4 HRGs/DRGs Read 2 Read 3 Lothian Audit GALEN
	Patient identification	Contract codes	
	Type of care (emergency, WL, day case, OP etc.	Specialty, admission codes etc	
	Contract specification	Diagnostic codes (severity index)	
	Specific service provided a. Condition b. Procedure/operation	Procedure/operation codes	
	Dates and duration etc. Price	Clinical product group codes (eg HRGs)	
<b>Unit/Practice</b>			
Management Information about the process, outcome and costs of care. Used to improve the efficiency and effectiveness of provider units.	Throughput	Specialty, admission codes etc.	SMR series ICD10 OPCS4 HRGs/DRGs Read 2 Read 3 Lothian Audit GALEN
	Casemix	Diagnostic codes (severity index)	
	Costing by department or item of service etc.	Procedure/operation codes	
	Performance on screening and immunisation for example or waiting times, stay, GP letters etc. by specialty and team	Clinical product group codes (eg HRGs) Item of service codes Postcodes	
	Area of residence of service clients		

Within a hospital, the range of possible systems and their linkages can be bewilderingly complicated as patients make use of a variety of services. The figure below provides a simplified diagram of some of the possible systems which might be established in a hospital and their links with general practice. It is intended to illustrate the possible range of information which could be accumulated in electronic records rather than on paper. It is not possible to illustrate also the interdependence of the systems and reuse of basic data such as identifiers, demographic facts, working and definitive diagnoses, procedures performed and so on, without making the diagram totally unintelligible. But these facilities are immensely important if data are to be accurate and shared in a way which makes them clinically useful and economic to capture and store.



It is interesting to speculate on how a comprehensive and integrated information system might help in the management of a seriously ill patient in an emergency situation. There follows a fictional but not impossible 'before and after' case history, with electronic intelligence making the difference between life and death!

## **Electronic data exchange now and in dreamland**

### **Now**

Jim Smith is driving his car down the motorway and feeling a bit strange, he allows the car to wander slightly and he hits a bridge support. He was trying to get home for his tea but is running somewhat late having had to go and pick his boss up from a meeting. Jim is very badly injured.

A local GP arrives by chance very shortly afterwards. He has a mobile phone and calls for an ambulance immediately. The GP carries very little medical equipment with him but he knows to immobilise Jim's neck and maintain his airway.

The ambulance arrives together with the police. The police using the Police National Computer, within seconds, correctly identify Jim together with his address. This is confirmed by papers in his jacket. He actually lives just down the road from the GP's surgery.

It takes some time and the assistance of the fire brigade to release Jim from the wreckage. The local A&E department had been warned initially that a seriously injured patient was coming.

In the local hospital the trauma team stand by in A&E but gradually with time drift away when the patient doesn't arrive as other matters arise needing their attention.

Jim finally arrives in A&E and is met by the Specialist Registrar in A&E who immediately recalls the trauma team who attend promptly.

After establishing basic resuscitation Jim is taken to the CT scanner for a scan of his head as there is evidence of a serious head injury.

In the CT scanner Jim suffers convulsions followed by a cardiac arrest from which, with some difficulty, he is finally resuscitated. It appears that he was suffering from extreme hypoglycaemia. This is treated.

The scan shows Jim has an acute intracranial bleed. The results are discussed with the neurosurgeons at the regional centre and it is agreed to transfer Jim to their care. Hard copies of the scans are produced to take with the patient.

A hurried hand-written referral letter is produced which mentions the problems they have had with his blood sugar.

Jim's wife arrives and history is taken from her. It appears as though he is normally fit and well, although he did have an operation a few years earlier on his abdomen before she really knew him. The operation was done in the hospital in which he is currently situated.

An attempt was made to find the notes but they are not in the main records library and there is a tracer out to one of the consultant surgeons from three years previously.

Jim is paralysed and ventilated for the transfer to the regional neurosurgical centre.

At the regional centre the scans are reviewed by the surgeons and it is decided to proceed to immediate surgery. A brief attempt is made to read the referral letter but the writing is awful and it appears that it doesn't add very much to what they already know.

Jim finally gets to theatre when all the theatre staff turn up. During his surgery he has a further cardiac arrest. Finally he is again found to be hypoglycaemic and is given more sugar. The operation is completed and he is transferred back to the Intensive Care Unit where he is ventilated and it is discovered that he is persistently hypoglycaemic.

Jim doesn't wake up following surgery and is subsequently found to be brain dead. His life support machines are turned off.

### **Dreamland**

Jim Smith is driving his car down the motorway and feeling a bit strange, he allows the car to wander slightly and he hits a bridge support. He was trying to get home for his tea but is running somewhat late having had to go and pick his boss up from a meeting. Jim is very badly injured.

A local GP arrives by chance very shortly afterwards. He has a mobile phone and calls for an ambulance immediately. The GP carries very little medical equipment with him but he knows to immobilise Jim's neck and maintain his airway.

The ambulance arrives together with the police. The police using the Police National Computer, within seconds, correctly identify Jim together with his address. This is confirmed by papers in his jacket. He actually lives just down the road from the GP's surgery.

The GP, once freed from assisting the patient by the paramedics gets in his car and logs on to his portable computer. He doesn't recognise the patient but finds accessing the practice database (via paknet) that the patient is actually registered with his practice. He starts to look through the notes and discovers that three years earlier Jim had a partial pancreatectomy for an insulinoma. He then arranges to check his blood sugar and finds that he is hypoglycaemic. The paramedic provides glucagon which is administered to the patient.

This information is entered by the paramedic on his electronic report sheet and is passed back over the ambulance digital radio network to ambulance control from whence it is transferred to the local hospital.

At the local hospital the A&E consultant receives this data and accesses the hospital system which provides details of his operation three years ago and his subsequent follow up by one of the metabolic consultants since. It also details their concerns that he may get a recurrence. The consultant having very little experience of insulinomas is able to get data on line detailing recurrence rates and suggested treatment protocols for hypoglycaemia in this situation. Hard copy of the protocols is printed out.

It takes some time and the assistance of the fire brigade to release Jim from the wreckage.

In the local hospital the trauma team stand by in A&E but gradually with time drift away when the patient doesn't arrive as other matters arise needing their attention. They have a good idea of what the problems are, from the continuing updates from the paramedic's electronic record sheet which are forwarded automatically to the hospital by ambulance control. The A&E consultant realising that time is passing dispatches a registrar in A&E to the scene with glucose infusions, and taking copies of the protocols for treatment with him.

Jim finally arrives in A&E and is met by the Trauma Team as they were called again as soon as the reports indicated that Jim had been freed from the wreckage.

After establishing basic resuscitation Jim is taken to the CT scanner for a scan of his head as there is suspicion of a serious head injury. His glucose infusions which had been established on scene are continued as he continues to threaten to suffer from hypoglycaemia.

In the CT scanner the CT scan is performed rapidly without a problem.

The scan shows Jim has an acute intracranial bleed. The scans are passed electronically to the regional

neurosurgical centre and in discussion with the surgeons it is agreed to transfer Jim directly to the operating theatre for immediate surgery.

A referral letter is printed from the hospital information system with all relevant details. Hard copy of all his clinic letters and discharge summary are produced and accompany him in transfer. His electronic medical record is also passed over the NHS Net to the regional centre.

Jim's wife arrives and history is taken from her. She is not able to add anything to the medical records and indeed did not know why he had previously had an operation on his abdomen although she did know that he had had one.

Jim is paralysed and ventilated for the transfer to the regional neurosurgical centre.

At the regional centre the scans and the medical notes are reviewed by the surgeons and it is decided to proceed to immediate surgery.

Jim finally gets to theatre to find all the theatre staff ready & waiting. The surgery for removal of the blood clot is uneventful. The operation is completed and he is transferred back to the Intensive Care Unit where he is ventilated for a short period and then woken up.

After a few weeks Jim is discharged back to the original hospital where he has a further insulinoma removed.

He is ultimately discharged back home his GP receiving a full electronic copy of his discharge summary which is also passed to the community physiotherapy service who take charge of his rehabilitation.

He finally gets his driving licence back after a year and is able to return to his former job.

### **Comment**

Dreamland could in large part be implemented today, the technology is certainly available. Parts of the information technology infrastructure required already exist in some hospitals. Implementation of other elements need not be particularly expensive and certainly less than might be expected and could have many benefits. For example the Scottish Ambulance Service is in the process of completing implementation of a digital radio network across Scotland, as have many other ambulance services across the United Kingdom. The concentration has however been on considering live video links and the like. This is expensive and somewhat difficult to implement (although possible). The benefits have not clearly been evaluated, although this is happening to a certain extent down in Ipswich with the BT experiment from Martlesham. However the passage of text over the radio net would be very easy to accomplish as the band width required could comfortably be accommodated alongside the voice traffic. The information thus transmitted could have a multitude of uses.

While this scenario is fictitious it bears resemblance to many real events.

Hopefully there is an indication given that when developing or implementing information technology solutions there is a need to consider other areas of the Health Service at the time and plan for appropriate clinical integration. All too often the needs of contract monitoring and central returns take priority.

## Section

## B

# Practical Methodology

*Chapter 4 on coding system criteria can be read in isolation. However, the working group considered that since any coding tools used in clinical systems should be selected specifically to assist in carrying out the primary aim — support of patient care — the nature, range and relationships of the required data should be understood first. So it is recommended that chapter 3, which describes ways of analysing the required information needs, is at least briefly reviewed, before embarking on detailed assessment of coding system criteria.*

*Chapter 5, the economic appraisal chapter is relevant to the tasks covered in chapters 3 and 4.*

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# B

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## Developing plans for information systems; and deciding on information needs, costs and benefits

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Previous chapters have outlined and illustrated the range of electronic information systems which contain clinical data. They have underlined the need to consider how these systems inter-relate, through the exchange of information for communication and their dependence on a common core of identifying, demographic and clinical data. This chapter presents some observations on a methodology for planning an information system in a way which allows facts and opinions about the context, the content, the costs and the benefits of the project to be assembled, evaluated and used in arriving at design or implementation decisions. This is regarded as a necessary process in any project and it is certainly an essential prelude to selecting and evaluating specific coding products.

This chapter was produced in the light of the following precepts:

- There are many ways of planning an information project to implement a new system or revise an existing one. The following presentation is intended to illustrate the kind of issues that need to be addressed at the design stage and offers only one approach to dealing with them. The aim is to provide guidance on important concerns which have to be dealt with if a system is to meet its objectives and clearly there may be more than one way of approaching the assessment and evaluation of options.
- The size, complexity and cost of clinical information systems varies enormously from the small standalone clinical data system run by one or two clinical staff for a focused objective, to the Trust wide HISS which integrates numerous subsystems. In planning either of these, there are essential tasks which must be undertaken, such as clarifying the aims, ensuring the planned data set matches these aspirations, deciding how and by whom data are to be entered and making a realistic assessment of costs. While these tasks require quite extensive and elaborate procedures for a HISS system costing over a million pounds, a much shorter and simpler approach will usually suffice for a smaller system with less complexity and need for integration. What follows is therefore a guide to the methodology of evaluation, not a prescriptive process and users can modify these recommendations to suit their needs, or substitute their own.
- Making decisions about which coding system to use for clinical information should not be attempted until important issues have been considered, such as the range and detail of information required for the planned application and the potential sources and destinations of the data it holds.
- In creating a business case for a computerised system, a thorough review of current practice is necessary and an informed judgement is most likely to be arrived at if a series of practicable options is then worked out and compared in terms of costs and benefits.

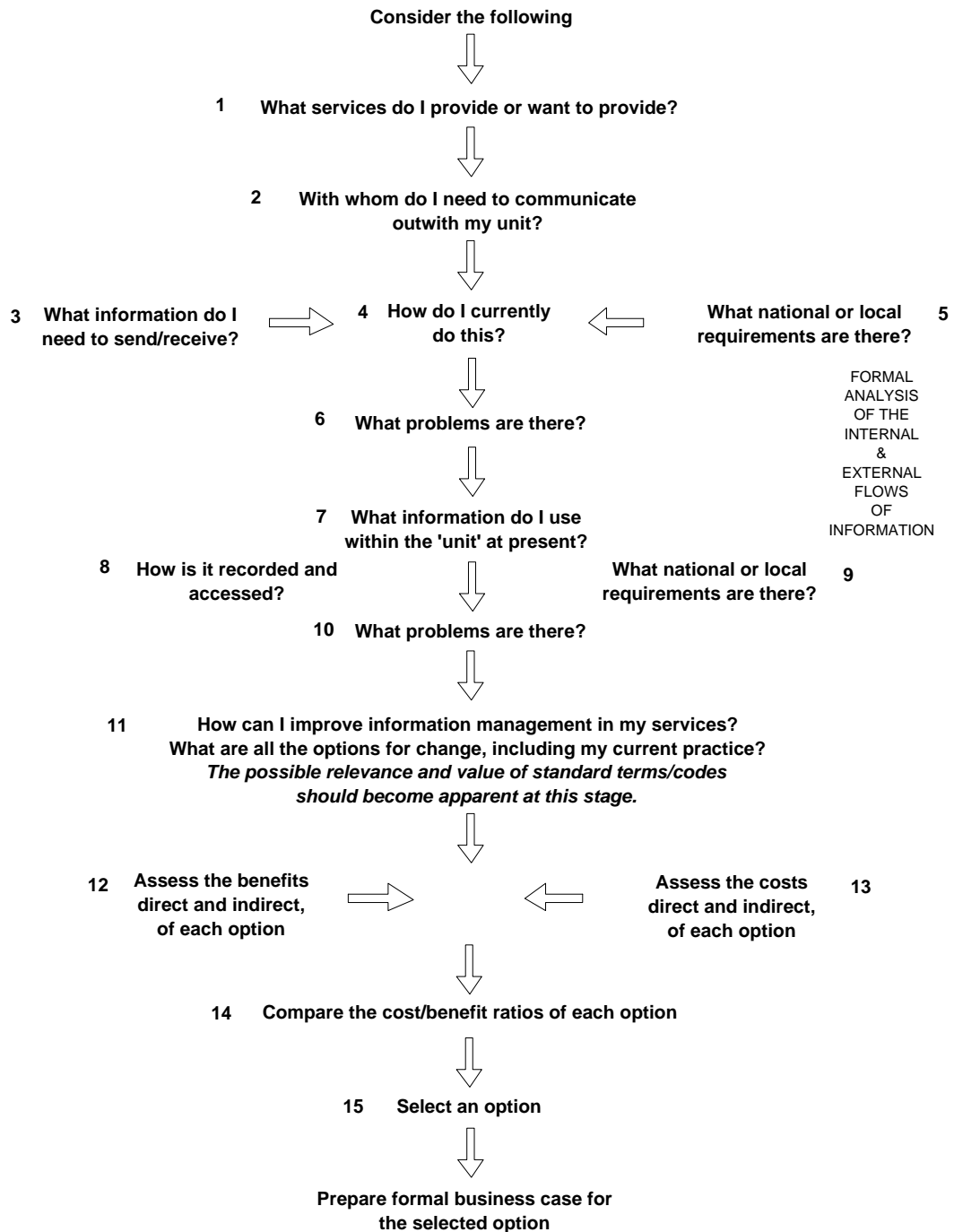
### A step-by-step methodology for decision making — diagram and key

To help present recommendations in a clear and concise manner, the outline of the process is shown in the following flow diagram. Examples of the purpose and targets of each step along with comments are contained in the accompanying key table.

## A methodology for decision making — flow diagram

### How can I ensure that the information needed to run Services is available?

The numbers in this figure indicate where illustrative examples of each step in the process appear in the key opposite.



## KEY to flow diagram

Number	Area of interest	Illustrative examples	Comments
1	What services do I provide?	Full range of DGH services Specific physiotherapy service Social work in General Practice Specialised hand surgery	The approach to assessing information needs shown in fig 2 is applicable to both large and small service requirements.
2	With whom do I need to communicate outwith my own service?	General practitioners Investigative services Purchasers Specialist colleagues	Important to identify lines of communication since this information may help to guide decisions on appropriate methods of information management.
3	What information do I send and receive?	Referral and reply letters Full or part case records Requests for investigations/results Information for contracting/central returns	Important to review exhaustively, all information received and sent out to run the service. Improvements here could greatly assist effectiveness and efficiency.
4	How do I currently do this?	Typed and/or semi-automatic letters Telephone calls Faxes E-Mail, electronic messaging	A detailed study of current practice will identify the types, range and volume of messages and the resources used in sending and receiving them.
5	What national or local requirements are there?	National/local Policy on coding clinical data National/local standards for networks National/local standards for message content National/local standards for message protocols	These standards may guide users towards options which will help them exchange data more securely and consistently with others using similar standards.
6	What problems are there in communicating outwith the unit?	Slowness of sending and receiving Inconsistent and less than adequate messages Cannot transmit message as clients demand Poor cost efficiency	This is a key exercise. Although emphasis here is on problems, the strengths of current practice should also be noted. There may be a few problems!
7	What information do I use within the unit at present?	Patient records Decision support information Data to support audit/research Data for contracts/central returns	Study of the range and detail of information collected and used is obviously critical. The relationship of each data set to the others and to clinical messaging must be defined.
8	How is it recorded and accessed?	Written semi-structured text Specifically designed clerical checklists Text dictated for typing Free & coded data on computer with access and analysis facilities	Usually there will be a mixture of capture, access, reporting and analysis methods. The appropriateness of each type of data entry etc. to the data type, and their overall integration should be reviewed in detail.
9	What national or local requirements are there?	National/local Policy on clinical terming/coding National/local guidelines on content for specific clinical data sets (e.g. GP letter)	These standards may guide users towards options which will help them record necessary clinical information in a precise and 'universally' acceptable way.
10	What problems are there in these methods of data recording in the unit?	Repeated recording of some items Variation in terms for same information Difficulties in access and analysis Lack of clinical 'ownership' of coded data	This is a key exercise. Although emphasis here is on problems, the strengths of current practice should also be noted. There may be a few problems!
11	What are the options, including my current practice, for recording, interpreting and communicating information in support of services?	Consider methods of entry and access Consider type of input: free text, standard terminology via computer, codes for defined items etc. Consider clerical & computer 'systems'	This should be an exhaustive review of the options for information collection and use in your unit. It should include all variations and combinations of systems for which there are significant differences in benefits or resource use.
12	Assess the benefits of each option	Coverage of information needs Ease of input/output Ease of maintenance/updating Retention of useful elements in present set-up	Use of a recognised methodology for assessment of benefits is advised and a common options appraisal approach is described in section 7.
13	Estimate the costs of each option	Capital costs Running costs Staff time/Opportunity costs Discounted costs	There are specific costing procedures, and techniques such as discounting, which are essential for adequate assessment. See section 7.
14	Compare cost/benefit ratios	Marginal cost review Increments in benefits and costs per option Additional benefit units Risk and Uncertainty analysis	This review is the culmination of all the effort which has gone into analysing and evaluating options. Guidance on formulating questions in 7. section
15	Prepare a business case for selected option	Specific aims Local context Option definition Option appraisal Outline plan for developing chosen option	Formal business case will vary with local requirements. Much of the content will be available from the steps outlined above.

## Explanation and discussion of the suggested evaluation

Note that in the paragraphs which follow, reference is made to internal and external communications. These terms are not used in any rigid technical sense. The working group felt that it was worth trying to differentiate communications within a unit that was using a particular system from those that were exchanged with other units in the same hospital for instance, or with the 'outside world'. Information which is collected and exchanged within the user service may be much more controllable than that coming from outside. There may be specific technical problems associated with exchanging data with other users' systems. The separation of 'internal' and 'external' communications may be somewhat artificial in practical terms but may be helpful when trying to carry out a comprehensive analysis of information flows.

**Step 1** Since this document is concerned with systems which hold clinical data, it is assumed that the information collected will describe some aspects of a clinical service.

In the majority of new applications, a clinical information system is likely to be designed to help with patient management. The first essential therefore is to have a very comprehensive description of the patients who will use the service, its objectives, its processes and its expected outcomes. This service description should, for example, identify:

- What range of disease or disability is catered for?
- What types of care are provided?
- What medical, nursing and PAMS specialties are involved in provision of care?
- What types of investigative and therapeutic procedures are involved?
- Where are the services provided?
- What criteria exist or are being developed to help assess the quality of care?

The importance of Step 1 cannot be stressed too strongly. A service description focuses attention on the patients, their care and their clinical providers. In doing so, it establishes the *raison d'être* of the proposed information system and helps to avoid a narrow view of information requirements and the range of staff who will collect and use it.

**Step 2** Steps 2 to 5 draw attention to the importance of communication between the service and outside agencies. If a planned system will receive data from these sources, or transmit information to them, it is important to review the data flows in some detail. In step 2, an inventory of the information flows in and out of the service is drawn up. Identifying the usual contacts may well draw attention to a need for collaboration in system design to ensure efficient data exchange with colleagues who may already have computerised their own information.

**Step 3** Here, it is recommended that an inventory is prepared of the actual documents which move in and out of the service. These letters, requests, results, statistics and so on may be a source of essential elements of the projected database and the system may be in part be aimed at improving communication through electronic data transfer of some kind. A comprehensive inventory may help to identify good sources of data and suggest extension to the range of useful output from the system.

**Step 4** It is important to look at the way in which communication is done at the moment. A new system should improve communication, making it certain, swift and convenient and at a reduced cost, or at least without any disproportionate increase. Letters may still be required but it may be possible to generate most of their content from the database. Some telephone calls will still be necessary but it may be possible to reduce pressure on the switchboard by re-routing some types of information through the system network. Unless a formal attempt is made to identify the detail of current methods, these possibilities may be overlooked.

**Step 5** At present, there are only a few rules or guidelines in the SHS governing the content and format of data exchange. The SIGN guidelines on content of the immediate discharge letter and the SMR series data set for central returns are two examples. Locally, purchasers and providers may agree the content of contractual

data and there are nationally defined operations for which practices may be charged. Electronic messaging is in its infancy, but soon protocols may have to be agreed to determine the formatting of data for transmission of clinical messages such as requests and results. Clearly it is important to ensure that any new system is compatible with local and national standards for content or transmission where these exist or are under consideration.

**Step 6** Finally, an attempt should be made to identify any problems with present methods of communication. There may be instances where GP letters are not getting out within the contractual time limits. There may have been failures to provide patients with important instructions. Investigation results may be slow in arriving or be poorly integrated into the record so that their implications may not be fully appreciated. The planned system will need to alleviate these difficulties.

In some instances, problems may be few and the present communication methods may be working very well. In this case it is important to identify the factors which contribute to the success and ensure that these are taken into account in the design of the new system.

**Step 7** In Steps 7 to 10 a similar exercise to that recommended for external communication is described for the information currently used within the unit to run the service. Although the system being planned may have relatively limited scope, it will be worthwhile reviewing the full range of information collected and used in the target services. This will help to ensure that the system is designed to provide maximum clinical gain with a minimum of duplication or interference with other information collection. It may also suggest some small but useful extensions to the proposed system. For large comprehensive databases, the analysis of range and content of information used to run the service needs to be correspondingly wide and thorough.

**Step 8** In many services, information is collected in a variety of ways, from writing or dictating completely free text, through written structured records and checklists to computerised data entry using keyboards, touch screens and even a limited amount of voice recognition. A review of the current methods of entry and access may serve to indicate whether the planned system can replace or reduce some types of data acquisition by providing general access to core data. It may reveal a need to have mixed types of data collection where, for instance, some services are provided out of direct range of the planned system.

**Step 9** As with assessment of external communications, national and local data requirements and standards should be considered to determine whether they help in determining data structure or communication protocols.

**Step 10** Problems associated with current record keeping practice should be identified. Is there a large amount of duplication of recording? Are there difficulties and waste of time in accessing information when it is needed for patient care? Is there confusion at the analysis stage because of variations in terminology or coding? Do clinical staff feel a lack of 'ownership' of the derived statistical abstracts of clinical data? In some instances, as with communications, problems may be few and the present records system may be working very well. Again it is important to identify the factors which contribute to the success and ensure that these are taken into account in the design of the new system — if, at this point, a new system is still considered necessary!

**Steps 11-15** At this stage, the information content of the system should be well understood; the staff who will contribute to and use the data will have been identified; and essential communications within and outwith the service will have been determined. It will be possible to begin to develop the options for change and these will include plans for systems varying in comprehensiveness, with different ways of data capture and so on. It is extremely difficult to assess the benefits and costs of various options in a manner which makes them truly comparable and capable of providing realistic cost-benefit ratios. But the effort will be worthwhile for all projects and clearly is an absolute necessity for plans which require a great deal of resources and which will affect the work of numerous staff.

After the next chapter, which deals with criteria for selecting terminologies or classifications for clinical data, the final part of the report consists of an example of the methods which have been developed by health economists for evaluating the costs and benefits of products designed to assist in provision of health care. Although it is written with the evaluation of standard terminologies in mind, the methodology is equally applicable to the wider questions just addressed, surrounding the choices and options involved in setting

up or revising a clinical information system. Carrying out such an analysis of costs and benefits is not easy and of course consumes resources. How extensive and formal the analysis needs to be will depend on the extent and costs of the planned system and this is clearly a matter for local judgement.

- Step 16 The review outlined above should provide a considerable amount of hard information to support the business case in its review of options and selection of the preferred one. One further key decision still remains to be taken: if evidence points to the need for a standard method of coding (at least some elements of the clinical data), options for a coding system will have to be critically evaluated.

The preceding paragraphs drew attention to some of the important questions that should be asked about the jobs that a clinical information system is expected to do and alternative ways in which this can be achieved. The aim in drawing attention to these issues in a document concerned with choosing a standard terminology, is to avoid giving the impression that such a choice can be made in isolation. Selecting the right terming and coding tool is critically important, but should only be attempted when its role and the environment in which it will be used are fully understood.

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# Criteria for evaluating coded terms used in clinical systems

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Previous chapters have described ways in which the purposes and content of a clinical information system can be described and evaluated, and how the requirements and preferences of users can be ascertained. This chapter introduces the subject of recording clinical data and points out some of the characteristics which developers should consider before selecting a particular coding system. It was briefly alluded to in table 1, where applicable coding systems were mentioned. Here, the topic is considered in some detail.

## Introducing basic concepts and terms

Before embarking on a discussion of coding system criteria, it may be helpful to clarify some of the terms and concepts that are referred to or implied.

The first and probably most important issue concerns the differences between nomenclatures (or terminologies) on the one hand and classifications on the other. These differences in content and structure are a direct consequence of the different purposes which nomenclatures and classifications are designed to serve. Most practical coding instruments lie on a spectrum between pure nomenclature and pure classification.

### Nomenclatures

Nomenclatures are designed to support the standard recording of concepts, phenomena and actions in case records; in formal communications between professionals; and in research and audit documents. Nomenclatures must be updated constantly if they are to remain capable of supporting the recording demands posed by changes in clinical knowledge and care.

At its simplest, a nomenclature is a list of terms for all the concepts and phenomena associated with a particular discipline such as intensive care nursing or the diagnosis and care of patients with psychological illness. It may be highly restrictive and formal, containing only those terms which a set of acknowledged experts consider to be the most precise and accurate descriptors of the concepts, phenomena and activities relevant to their discipline. It may be made less restrictive by the recognition of agreed variants, such as abbreviations, synonyms, acronyms and eponyms for some of the formal terms.

To assist with the manipulation, storage, retrieval and analysis of the terms by computer, each term in a nomenclature may be given a code.

To help users select the precise terms they wish to use in records, letters requests etc., and to support later case finding and analysis of stored terms, a nomenclature is usually structured. The structure may be as simple as arrangement in alphabetical order, but is usually more sophisticated. Often the nomenclature is arranged into one or more hierarchies, with concepts which are similar being clustered together and the relationship between highly specific terms (e.g. postsurgical hypoparathyroidism) and their more general 'ancestor' terms (e.g. hypoparathyroidism) being shown in some way. Depending on the purposes for which the hierarchies are created, a particular term may appear in only one hierarchy or in several.

### Classifications

Classifications are designed to organise and summarise the knowledge of a particular subject by creating a set of mutually exclusive categories into which all relevant concepts can be fitted.

Specific classifications such as the International Classification of Diseases, may be developed with the express purpose of providing a basis upon which we can collect standard and therefore comparable statistics of disease incidence and prevalence in specific populations.

Classification categories are usually arranged into hierarchies and identified by a code to assist with the manipulation, storage, retrieval and analysis by computer. In general, a specific concept (e.g. a particular injury) will appear only once under a single category in a classification, so that the categories can remain mutually exclusive.

In some classifications, each section and sub section of the hierarchy is provided with residual categories such as “Acute myocardial infarction unspecified” to allow inclusion of less precise concepts, or “Other specified arthrosis” to permit inclusion of concepts not specifically referred to in any classification term. These residual categories allow a classification to remain stable over a long period between revisions since they can accommodate new concepts, albeit without allowing them to be specifically coded and retrieved.

### **Comment**

Distinctions between nomenclatures and classifications become blurred when, for instance, the structuring of a nomenclature tends towards a comprehensive outline of the knowledge in a particular area. Similarly, classifications such as ICD10 have extensive indexes arranged in alphabetical order and these may go some way towards providing a fairly formal nomenclature in the subjects covered by the classification.

When a clinical user selects a term from a computerised nomenclature to add to a patient record, to complete a request form or to help describe the patient to a colleague and so on, this action will be described as ‘termining’. Usually, the system will manipulate the term by means of the attached code. But users do not have to see the code nor do they have to be aware that the code is being used for computer manipulation.

When a clinical user or a coding expert attempts to allocate a term to a specific category in a classification such as ICD10, OPCS4 or BNF, and to obtain the appropriate classification code for storage and analysis this action will be described as ‘encoding’. Here the purpose is to get precisely the right code, taking into account all the circumstances defined in the rules and conventions of the appropriate classification.

If nomenclatures and classifications are both being used in a health service facility to manipulate information about diseases, procedures and drugs for instance, relevant items in the given nomenclature used for terming should be capable of allocation to a category in the matching classification. Mechanisms should be built into both to help with easy and accurate progression from terming to encoding.

## **Arguments for a standard terminology**

Arguments for a Standard Terminology for computer processed data in the NHS include:

- Improved patient care through the development of electronic patient records and decision support systems
- Improved certainty, convenience and flexibility of electronic communication
- Availability of standard data for clinical research, epidemiology and audit
- Provision of accurate information for management of services

## Current Scottish Health Service (SHS) policy

The last formal advice to the SHS, contained in MEL(1994)92 recommended the use of either the second revision of Read codes (Read Version 2 ) or the third revision of Read codes, (Read Version 3), to complement standard classifications such as ICD10 and OPCS4 on central (SMR series) returns.

A number of pilot implementations are now providing information about use of elements of the Read Version 3 thesaurus such as the 'core terms' for specific purposes such as encoding discharge summaries. References to information from these projects is given in Appendix 1. However, neither Read Version 3 nor any of its competitors such as SNOMED, have yet been fully implemented and evaluated in a live clinical information system (CIS) in Scotland in a way which *comprehensively* tests its effectiveness as a means for clinical staff to compile records and exchange messages. It is therefore difficult for groups who are developing systems which are designed to hold clinical information generated by clinical staff, to make an objective assessment of the potential of Read Version 3, for instance, and to compare it with alternative systems of clinical terming and encoding.

In the following section, an attempt is made to outline some of the areas which should be investigated and to ask some of the questions which are likely to arise. This is not a definitive guide to assessment of computerised clinical nomenclatures and classifications but hopefully it will help anyone trying to make decisions about terming and encoding systems and suggest some of the issues they should investigate. Comments on the approach taken and the content outlined below will be very welcome. Only when the problems faced by developers making hard decisions about real systems will it be possible to put together a more comprehensive guide to assessment and evaluation.

## Criteria for an acceptable standard terminology

The following sections list some important characteristics of terming tools that are designed to allow a wide range of clinical data items to be captured on computers. It is unlikely that each and every criterion mentioned below will be important for every clinical information system development. The criteria included here serve as examples of a range of issues which should be investigated by intending users and their system developers. Within each of the sections discussed below, users will probably find criteria described which are unimportant for their system and will have to add others which they consider relevant. The criteria have been written with a general electronic patient record in mind so they cover a wide range of clinical information.

It is not possible to anticipate all the subtle differences in coding requirements for all types of clinical information systems, so few 'must have' criteria have been specified in the following paragraphs. Expressions such as 'possible terming requirements' are used to indicate that these will certainly be needed in some systems though perhaps not in all. The aim is to lead users to establish a list of criteria which is relevant to their needs by giving examples and by discussing the issues involved,

The list of criteria is arranged into six broad sections as follows: Coverage; Input/Output; Retrieval/Analysis; Implementation; Maintenance; and Product Viability. To check whether the criteria are fulfilled by a particular standard terminology, users will have to have access to a demonstrator or browser which provides easy access to the full content.

## Coverage

### Elements of a clinical record

Note that throughout the following sections it is assumed that a full electronic patient record system and other clinical information systems will have the facility to hold uncoded information such as free text,

diagrams, and so on, in addition to the information which is coded through the standard terminology. The range of information which can be held as Read Version 3 or SNOMED terms for instance, is large and they can accommodate a lot of detail. It is for developers to decide how far they wish to use standard terms and how far they wish to allow details or even whole sections to be expressed as free text. In each section there is an outline of some of the topics which may be covered and the terms required. Users should decide whether the topics are relevant to their purposes, whether the terming requirements cited are important and whether they are covered by the nomenclature under assessment.

### **Past medical history, family history and personal circumstances**

Content may include a lifetime summary of significant medical conditions and procedures for patients and relatives; patients' personal and social histories; and information about their current personal situation. The range of terms which may be required is very broad and information recorded here may come from patients, relatives, friends, case records, letters etc. Some of these data will be definite and capable of expression in professional terminology in some detail. Others may be described in broad but accurate terms such as 'stomach operation', 'gall bladder x-ray' or 'breast lump' and may well be included in a standard terminology. Direct quotation of patients' or informants' statements may be necessary and it is expected that this will be dealt with through provision of free text fields rather than expecting a standard terminology to cope with an extended list of lay descriptions of disorders and procedures.

#### Possible terming requirements include:

A full range of terms to record previous problems, diagnoses, symptoms and signs, investigations, operations, drugs etc.

Terms for a full family history of disorders, at least in broad terms, e.g. 'family history of ischaemic heart disease'

Terms to define family relationships and to identify 'carers' or specific family members.

Terms to allow significant developmental milestones to be recorded in children's records

Terms for life events such as loss of job or bereavement, and to describe relevant social circumstances, ethnic group and occupation etc.

### **History of current problem(s) [and continuation notes]**

Content may include descriptions of the problems experienced by the patient and their development to the point where this episode began; and of the development of specific symptoms as proffered by the patient or elicited in history taking.

#### Possible terming requirements

Terms for 'problems', i.e. recognised ways of describing difficulties in managing everyday tasks, loss of some faculty or function or the presence of unpleasant sensations. Examples might include, 'difficulty climbing stairs', 'tired on the least exertion', 'cannot control bladder', 'feeling distressed' or 'gone off legs'.

Terms to record clinical symptoms in comprehensive detail with full range of professional terminology including expressions for clinically significant features such as severity, site, timing and precipitating factors. Examples might include 'severe and intermittent throbbing occipital headache, worse on exertion and relieved by rest', 'recurrent scalding pain on micturition' or 'nocturnal dyspnoea'.

### **Examination [and continuation notes]**

Content may include all the findings elicited during a general or system specific physical or mental examination by medical, nursing or PAMs practitioners.

#### Possible terming requirements include:

Terms for all professionally acceptable descriptions of specific elements of the examination, plus the facility to indicate that 'no abnormality was found' or to describe abnormal findings in full detail. For example, findings may include: 'localised rebound tenderness in right iliac fossa', 'ankle clonus absent' or 'Glasgow coma scale eye opening observations: eye opening to speech (score=2)'.

Where observations yield numerical values, a standard terminology may provide a means whereby the figures can be entered and linked to the code for each specific examination. For example, 'manual recording of BP, supine position, right arm=183/95 mm Hg' may be capable of being entered and manipulated by a series of linked codes drawn from the standard terminology. System developers and users may prefer to simply allow the clinical information system to deal with linkage of numerical findings to particular observations, rather than having to use a set of codes from a standard terminology to provide a 'bundle' indicating the observation and values. It is an issue which should be explored carefully.

### **Investigations [and continuation notes]**

The content may include any investigation carried out on a patient beyond the standard physical examination. Examples include laboratory tests in haematology, microbiology, immunology, biochemistry and histopathology; diagnostic imaging and nuclear medicine procedures; and a full spectrum of specialty specific tests such as gait speed in physiotherapy, tonometry in ophthalmology and so on.

#### Possible terming requirements

Terms to identify each test requested, reported or specifically omitted such as 'haemoglobin concentration', 'thoracic inlet x-ray', 'blood culture', 'ocular muscle balance test' and so on.

Linked terms for broad interpretation, such as 'normal', 'equivocal', 'abnormal' etc., and specific findings such as the bacteria isolated and their sensitivity.

Where tests provide numerical results it may be possible to link the result with the test identifier and interpretation. The comments in the above section, on dealing with numerical results, are equally relevant here.

### **Problem Lists and Diagnoses**

Content may include lists of active and inactive problems; working diagnoses or differential diagnoses and diagnoses that have been specifically excluded. A standard terminology may have to support either Problem Oriented Medical Record (POMR) formats or diagnostic oriented medical record format.

#### Possible terming requirements

Terms for full range of both broad and more detailed diagnostic concepts, e.g. 'stroke' and 'major anterior cerebral circulation infarction in left parietal lobe due to cardiac embolism and associated with right hemiplegia'.

Linked terms to record the status of each condition. e.g. 'established', 'provisional', 'probable', 'doubtful', 'unlikely' or 'excluded' etc.

Facilities to record relevant characteristics of diseases such as site, severity, extent and chronicity. For severity, a standard terminology may include both elementary descriptions such as 'mild', 'moderate', and 'severe', and, in addition, may provide access to coded versions of standard international grading systems where these exist and are widely acceptable.

Terms to record causes and contexts of trauma and poisoning to ICD10 ('External Cause code') level at least and possibly more clinically useful terminology. Examples include 'pedal cyclist injured in collision with car', 'bitten by dog', or 'deliberate self mutilation with knife'.

Facilities to link diagnostic statements with phrases such as 'due to' and 'associated with'.

Facilities for 'Mapping' diagnostic terms and codes in a standard terminology to their equivalent standard classification code or codes (e.g. ICD10, nursing or PAMs classifications etc.).

### **Management plans and records of treatment**

Content may include specification of further management such as referral; other investigations; a programme of drugs and other therapeutic agents; a therapeutic procedure or procedures; psychotherapy; behaviour therapy; physiotherapy; occupational therapy; social therapy; supply of appliances and so on. The spread of demand for terms in this section is enormous and only the briefest outline is provided below. A very detailed scrutiny of a standard terminology is recommended to ensure that requisite range and detail are available.

Possible terming requirements include:

Terminology to indicate referral and to identify where and for what the patient is being referred.

Terms to cover generic and proprietary names of drugs or agents, their routes of administration, dosage, scheduling and costs.

Maps to standard drug classifications such as the British National Formulary.

Terms for surgical procedures.

[N.B. In settings such as large hospitals, the range of procedures for which terms are required may be enormous and can include: surgical operations; resuscitation; major invasive investigative procedures; radiotherapy; blood transfusion; ward procedures; screening; immunisation; nursing procedures; and PAMs procedures.

For surgical operations and invasive procedures in general, a standard terminology may be required to provide for specification in broad terms (e.g. amputation of toes), for theatre lists for example, but also in comprehensive detail, even for the most complex operation if operation notes are to be electronically generated. Anaesthetists may wish to have terms to specify premedication, anaesthesia post operative pain relief etc. ]

Terms for non invasive regimes and therapies which include psychotherapy; various types of counselling and advice; some aspects of rehabilitation medicine; physiotherapy, speech therapy, and occupational therapy, including assessment and treatment; dietary regimes; orthoptic therapy; and so on.

Terms for results expressed according to accepted rating scales.

**Summaries of contact episodes or spells of care**

Content may include selected elements of the clinical record contained in a clinical information system (CIS). Details of content will vary according to the purpose and type of summary which could be a synopsis to be held in the clinical information system to provide rapid review during clinical care; a communication with another professional to describe findings and treatment and to return responsibility or ask for referral; and a statistical return for management, contracting or central returns etc.

Possible terming requirements include:

For case record synopses and communications such as GP letters, clinical terms are required. The level of detail may differ from that which is necessary in particular sections of the case record where complete specification of findings and actions is essential. A selection of the key findings and actions, will usually be necessary for the clinical summary. If the information required for the summary can be extracted from the full clinical record it will save considerable effort. The content and structure of a standard terminology may help to make this possible, if, for instance, terms are constructed and coded in such a way as to differentiate the basic concepts from the more detailed information. A standard terminology should be scrutinised very carefully so that users are aware of its potential to support automated construction of summaries by allowing access to various levels of detail.

Data may have to be extracted from the clinical record for use in statistical abstracts. This may require encoding of diagnoses, operations etc. to classifications such as ICD10, OPCS4, British National Formulary, Healthcare Resource Groups and Diagnosis Related Groups etc. This process can be made both efficient and accurate if the standard terminology has its relevant sections mapped correctly to the appropriate classifications. The structure and content of a standard terminology should allow automatic conversion from clinical terms to classification codes as far as possible. But this may be a quite complex procedure, given the rules and conventions of a classification.

**Information to support patient, practice and unit administration**

Content may include a wide range of information about the type of contact made by the patient; the facilities and specialties in which a patient is cared for; SMR series type data items describing the sort of admission and discharge etc.; an extensive sweep of general practice administrative data of which patient registration, item of service management, staff management, issue of certificates and management of screening services are a small sample.

Possible Terming Requirements include:

Terms which identify hospital departments, specialties and facilities in which care is provided; indicate the urgency and route of outpatient attendance, admission or transfer and describe the condition of the patient on discharge from care.

For GP systems, terms to identify specific services required of general practitioners through the regulations contained in the 'Red Book' (NHS General Statement of Fees and Allowances payable to General Practitioners Scotland); allow the current progress of various actions such as production of a certificate or the request for an investigation and receipt of results to be recorded and so on.

### Information to clarify the context in which terms are used

Terms can alter their meaning according to the context in which they are used. For instance, 'Ischaemic heart disease' may be one of a group of differential diagnoses; an established current diagnosis; a diagnosis that was the main condition recorded in a previous episode of care; a diagnosis affecting significant family members; or a diagnosis that has been excluded. A symptom, such as 'abdominal pain' may serve as 'diagnosis' if no underlying disease process is found so that it may appear in both the history section of a case note and the diagnostic summary section. There are other similar context effects which have to be addressed. One way of tackling the context problem is to have several separate terms for the various context defined meanings of a term such as 'ischaemic heart disease', e.g. 'suspected IHD', 'confirmed IHD', 'IHD excluded', 'family history of IHD' and so on. This way will increase the number of terms and hierarchies. An alternative is to have separate terms and codes for contextual concepts and attach them to the term or terms whose context is being defined.

For complex systems where for instance information is being passed around between records with different layouts, it may be important to have the capability to attach a context indicator to data that are being transferred. Once again, this is an issue which should be carefully explored for each development.

## Input/Output

A standard terminology will only be useful if it can be set up in a clinical information system in a way that makes it easy for clinical staff to find the terms that they want to use in various parts of their records, letters or requests etc. Later they will want to search for records with particular clinical features and perhaps produce lists or tables. The ease and naturalness of input and output will be determined by a combination of system design and the content and structure of the standard terminology. In this section relevant aspects of a standard terminology are discussed.

### Input

As described under 'Coverage', a standard terminology must contain all the acceptable terminology necessary for a particular application for each clinical discipline involved. To assist with terming, it will be helpful if synonyms and recognised abbreviations are provided in addition to 'formal' terminology. However, synonyms and abbreviations have to be identifiable by mechanisms within a standard terminology and they must be linked to the most clinically precise term to which they are equivalent. Clinical staff should be able to choose the synonym they prefer i.e. they should be able to describe an entity in the way they like best.

A large number of terms used to identify concepts in classifications such as ICD10 or OPCS4 are often criticised as being awkward and very different from everyday clinical language. This is usually due to the fact that they have to be precisely constructed to express very accurately the content of their particular rubric. A standard terminology is not constrained by the same functional demands and its content should be designed to reflect current clinical usage as nearly as possible. Therefore the clinical staff who will be expected to use a system should have an opportunity to browse any standard terminology which is being considered as the principal terming tool and to report their findings to the system development team and the standard terminology providers. If important terms or synonyms are missing a standard terminology should be able to incorporate them quickly (see section on 'maintenance').

The structure of the standard terminology *must* support various search options for finding a term, such as entry of the full phrase, 'keywords' or word fragments in any order, or recognised abbreviations. If the

standard terminology has specific 'keywords' already included to assist users in getting quickly to particular clinical terms, check to ensure that the keys are effective, i.e. they reflect important elements of the term you are looking for and they help at least to narrow the search to a short 'shortlist'.

The differing amount of detail required for various elements of the record has been briefly discussed under 'Coverage'. Here attention is drawn to the way in which detail is provided in a standard terminology and the points can be listed as follows:

Since the level of detail will vary from record to record and between different parts of a record, there has to be some way in which a 'basic' element of concept can be identified and given a term, and then other qualifying or extending elements, i.e. 'detail', can be optionally added.

It is extremely difficult to envisage how a standard terminology could be constructed to include all combinations of 'basic' and 'detail' elements of terminology as used by different clinical staff for their almost infinitely variable activities. It is inevitable that standard terminology developers have to impose some discipline on their methods of providing detail. Users must therefore decide whether the detail they want is present in the standard terminology they are reviewing and whether a system can be devised to help them get at the detail in an efficient manner.

Different users may have different preferences for their method of access to detail. Some may wish to type in comprehensive descriptions and have the computer 'map' these onto both 'basic' and 'detail' terms in the standard terminology. Others may prefer rapid access to 'basic' terms with an offer of relevant 'detail' which they can select or ignore at will. Combinations of these two poles of approach can be envisaged where systems can be designed to 'map' from a phrase to 'basic' terms and some frequently used 'detail' terms such as site or laterality, with offers of further relevant detail.

We consider that resolution of this kind of issue is critical for successful use of a standard terminology. It is a matter for the combined intelligence of users, system developers and standard terminology providers. The content and structure of a standard terminology should be closely examined to see what level of detail is provided and how various levels can be accessed easily and efficiently.

Sometimes it is a great help to users if they can look at a set of terms around a topic such as 'atrial tachycardia', see what terms are available for specific types and get an idea of the extra detail available. The structure of the standard terminology can assist in provision of a facility to present clusters of related but subtly different terms for selection. This will usually mean that the terms are arranged in some form of hierarchy which represents the way in which a given clinical discipline sees the conceptual relationships of the disorders it treats or the procedures it uses etc. What is important in assessing the standard terminology is that once again users, developers and standard terminology providers should look at this issue together to help ensure that when users need to browse a little to find the best way of expressing their findings, the system gives them effective help. This facility is often referred to as 'hierarchical searching'.

Finding terms may be easier and quicker in some systems if the search can be focused initially on subsets of terms which are relevant to the particular application or are frequently used. It is often helpful for instance to have the means within a standard terminology to identify, when appropriate, the main clinical discipline or disciplines to which each concept primarily 'belongs'; or even to have the option to indicate a particular small subset of terms to be presented initially.

An important issue for input and output of clinical information is how to cope with the need for introducing new terms to a standard terminology. The fact that a terminology is 'standard' presupposes that its content is controlled by the producer and that potential new terms will be vetted to determine their provenance and added to the standard terminology with due regard to hierarchical structures and so on. This process may take an appreciable time. Thus a standard terminology may have to provide facilities for adding local temporary terms and dummy codes. There should be a foolproof mechanism for reviewing requests for additions and replacing the temporary terms and codes with definitive ones.

An associated question is whether there should be a facility to add local terms and codes which are not

acceptable in the standard set. Clearly, unless these can be kept separate in some way, they will devalue the standardisation of the terminology. A standard terminology however might have some means of adding local vernacular, keeping it separate from standard terminology but providing mechanisms for it to be linked to the most relevant standard term. This is a controversial issue which should be debated locally. It is considered by some users to be an absolutely essential facility in the working environment.

### Output

Users must be confident that they can get out of the system near enough what they put in. In a standard terminology, where there are several acceptable synonymous terms for a particular concept, it is usual for one of them to be defined by the standard terminology provider as the 'preferred term'. This is usually a term which most formally describes the concept in a manner approved by the experts who adjudicate on the content. An standard terminology should furnish the means whereby synonyms can be entered and then these chosen synonyms be retrieved for output. Thus if a user selects the term 'pityriasis capitis' at input, he or she should have the choice of getting out the same term in records and letters etc., not being forced to see it output as 'seborrhoeic dermatitis of scalp'. For other purposes such as reports for research or central returns, it may be desirable to transmit all information as preferred terms'. The standard terminology should be compatible with all these options.

An standard terminology should have a coding structure which is compatible with standard communication protocols such as EDIFACT, to facilitate electronic communication as this develops.

Analysis of stored data involves selecting sets of records with particular clinical features. These may then be displayed for scrutiny or various elements may be enumerated and presented as tables or graphs etc.

The structure of a thesaurus, and in particular the structure of the hierarchies for signs, symptoms, diseases, procedures, drugs and so on should be designed to help as much as possible with record selection and tabulation. Classifications are often designed with analysis in mind. There are rigid hierarchies and categories are generally mutually exclusive. The structure of the classification is usually built into the coding system for the categories. Thus the 3 digit ICD10 code 'M80' will retrieve all cases with 'Osteoporosis with pathological fracture': 'M80.0' will retrieve cases with 'Postmenopausal osteoporosis with pathological fracture': and 'M80.05' will specifically recover cases with 'Postmenopausal osteoporosis with pathological fracture of the hip'. This is very convenient for some searches but the rigid hierarchies and single pigeon holes for a given concept can lead to difficulties in specifying broad searches. To find records of patients with respiratory disorders using ICD10 you have to select codes from at least half a dozen chapters.

The structure of some standard terminologies and their coding systems may be analogous to that described above for classifications. In others, such as Read version 3, the hierarchies are multiple; concepts can appear in several hierarchies; the concept codes do not themselves indicate where the concepts fit; the hierarchical structure and the 'parent child' relationship of each concept is defined in separate hierarchy tables; and fine detail for a given concept is accommodated via a defined set of add on 'qualifiers'. This different approach to structure reflects the belief that clinical terminology is so extensive, complex and dynamic that special mechanisms are needed to manipulate it.

Record retrieval using standard terminologies with more complicated structures clearly requires help from the computer. Intending users must ensure that the structure of the standard terminology under review can support a facility that allows a user to select a term at any level in any hierarchy and retrieve records which have the codes for the selected concept and all its 'children'. If, for instance, the user asks for records with terms and codes indicating 'endocrine tumour morphology', he or she will expect to recover records referring to Insulinomas, Glucagonomas, Gastrinomas, Vipomas, Carcinoid tumours, Islet cell tumours, Chromophobe tumours and Follicular tumours and all their sub-types.

In addition to these 'hierarchy dependent' searches, it will be extremely helpful if the standard terminology structure and associated software make it possible to select cases by specifying details such as site, e.g. 'knee', to pick up all knee disorders, or knee operations, etc. irrespective of hierarchical relationships.

Non technical users should be able to access and select cases from a database by specifying single characteristics or combinations of several characteristics, in a manner determined by the local system, but without having a full and detailed technical knowledge of the data structures in the thesaurus.

Defining the format of analytic output may be complicated, particularly where multi-dimensional tables are required with totals and subtotals. A formal exploration of design of analytical tables would be too extensive for this overview. Suffice to say that each cell in a table has to be defined in terms of the characteristics of the objects or events whose number or frequency appear there, and each cell has to be named so that users can identify the cell contents. To design tabulations and define cell contents and labels requires access to hierarchies and facilities to select the appropriate terms at various levels. Requirements for tabular analyses should be carefully considered by users, system developers and standard terminology providers.

## **Maintenance and updating of a standard terminology**

A key characteristic of a standard terminology is its ability to grow with professional practice. Two basic features are necessary, thesaurus and file structures designed to allow new terms to be added and integrated with what is there; and a change control management system which ensures that changes are made rapidly and correctly and are communicated to registered users.

### **Basic requirements for updating**

The standard terminology hierarchy structure has to be designed so that it can always incorporate unique new terms for new concepts.

It should be possible to add new synonyms or eponyms to existing concepts without having to modify the structure or coding.

In a standard terminology such as Read Version 3, a particular concept can appear in several parts of the terminology. For instance, a congenital hernia of the diaphragm would be found in the 'Hernia' section and also under the 'Congenital malformations' section. In a standard terminology of this type, mechanisms for ensuring that a new term is incorporated into all relevant areas of the standard terminology are important both for terming and for later case finding and analysis. It is therefore worth checking the arrangements with the standard terminology provider.

### **Management of changes**

There should be an agreed procedure for submitting requests and guaranteed response within an agreed time limit. If a new term is one which is likely to be used fairly frequently, such as a fresh variant of a common operation or a new drug, a user may build up a lot of records with temporary codes. These all have to be recovered and replaced when the definitive terms and codes are available, so it is obviously of considerable importance to know how quickly changes can be handled. The standard terminology provider should be able to indicate what the expected times are likely to be and other users can report on actual experience.

A standard terminology provider must have guaranteed long term access to authoritative professional experts to make decisions about the acceptability of recommended new terms and their place in the scheme of the thesaurus.

There must be agreed procedures for releasing updated versions of a standard terminology thesaurus to all users on acceptable media. There should be a choice between provision of only those term and code changes that have occurred since the last release or of a full standard terminology set which incorporates these changes.

## Technical quality of the standard terminology

In order to meet users' needs, system developers will probably wish to use a range of generally available software tools and routines that they have developed. To some extent, their ability to create a good system will depend on the technical quality of the standard terminology product. One or two general points are raised below simply to introduce the topic, which should be thoroughly examined by the system developer and standard terminology provider.

There should be a data model to describe formally the logical structure of the various elements of the thesaurus and their relationships. It should be comprehensive, free of ambiguity and conform to current standards of construction and presentation. The adequacy of the data model is an issue which should be reviewed by the system developer and user, to confirm that user requirements are not likely to be impeded.

The standard terminology database should be constructed in such a way that it can be exploited flexibly by a wide range of modern software tools and easily updated with new releases of the thesaurus.

## Product viability

A clinical information system for a large unit or practice may be expensive. It will be expected to last a long time and almost certainly be modified along the way. Users will therefore wish to be reassured that a standard terminology chosen to fill the pivotal role of providing terming and analysis facilities for clinical content has a long term future and that it is truly a standard. By its very nature, a 'standard terminology' should be unique within its area of application. To attain uniqueness and maintain it, the major components of a standard terminology system should be seen to be of pre-eminent quality and durability. The following qualities are likely to be necessary. Some are a matter for subjective judgement, but it is recommended they are all considered and both standard terminology provider and system developer should be asked to provide assurances and evidence to confirm that the conditions are being adequately met.

The standard terminology:

- meets a substantial number of the criteria outlined in earlier sections
- has the confidence and support of the clinical professions
- has been shown to work in a pilot project or projects
- has acceptable costs of implementation and maintenance

Potential customers must be convinced that an organisation developing something as complex as a standard terminology, has the financial stability, organisational expertise, appropriate skill mix, management structure and long term viability to ensure a fully tested and sustainable product of high quality.

## Evaluating alternative nomenclatures and classifications

Making decisions about which standard terminology or classification to use in a particular system may be quite simple. Your requirements, e.g. to provide information on diagnoses and operations for central returns from written case summaries using trained coding staff may point very clearly to a particular coding tool such as ICD10. However, when more complex systems are being planned, which, as indicated earlier, may involve a range of detailed clinical data collected, used and communicated by different clinical staff, you may find decisions about which coding tools to use a good bit more difficult.

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# The rational approach to evaluating options for standard terminologies

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## Why we need to be rational

A decision to buy anything with NHS resources, or to implement anything which involves the use of staff, facilities etc., even if no money changes hands, requires us to devote resources which have numerous alternative uses. To ensure that we get maximum benefits from limited resources, we should subject all such decisions to cost-effectiveness analysis. That is to say, we consider the alternative uses of the money or resources and work out what is the cost per unit of effect. The lowest cost per unit of effect represents the best value for money.

If units of effect can be measured in homogeneous units such as life years gained, number of patients screened or square metres of floor area cleaned, the exercise is relatively straightforward. It is much more difficult to evaluate complex products and systems designed to help us with recording and use of clinical information, especially since they are only indirectly related to the over-riding objective of the NHS which is to improve the health of the population. Nevertheless we need to bear this objective in mind when evaluating clinical information systems and standard terminologies by asking whether this feature or that will ultimately benefit patient care. We have to be even more than usually careful about spending on projects which do not directly benefit patient care than about spending money on a proven new form of treatment for instance.

There is a method which can be used to evaluate these complex products and compare them. Usually we consider benefits of competing systems and then go on to consider the costs. Before we do this however, we have to be clear about our overall objectives in developing a new clinical information system (CIS), changing an existing one or adopting a standard terminology (ST).

## Objectives of clinical information systems and standard terminologies

To determine this, we first need to decide what the problems are that a clinical information system with or without a standard terminology will solve. These might include:

The information in our clinical records could be more easily and quickly scanned and absorbed if it were accessible through an advanced computerised database and expressed in consistent and unambiguous terms.

We ought be able to use our case record information more intensively, effectively and cheaply for clinical research and audit. This would be possible only if data were easily accessible and recorded consistently, in adequate detail and in a coded form suitable for analysis.

We need accurate clinical data for statutory returns such as SMRs; for contract management and for unit management and planning. At present our clinicians record it and coders often have to record it again and code it. The duplication is wasteful and leads to errors and omissions. An electronic record designed to assist with patient care and clinical research, and recorded at the clinical interface, should be capable of providing information for generating returns in a coded form ready for conversion to whatever classifications is required.

## List the available alternatives

The next step is to list the options. Remember that the 'do nothing' or 'do the minimum' should always be included in the evaluation. They may be the most cost effective!

## The benefits of standard terminologies and classifications

The first task is to list all the features of these products which may be of benefit to us. These will include:

- Number of users of the 'standard' coding method
- Coverage of the clinical information content needed by the services
- Ease of getting information into the system
- Ease of getting information out of the system for review and communications
- Facility with which analysis can be carried out
- Ease and reliability of maintenance and updating
- Ease of implementation and technical quality of the product

Each of these sections may be subdivided so we would probably finish up evaluating many more features than just these general 'topic headings'. Thus coverage may be split into particular aspects of the record such as history, problems, symptoms, diagnoses, investigations, operations, drugs etc. Ease of input may be split into consideration of 'clinical friendliness' of terminology, arrangements for finding terms and so on.

Having created a full list of features which are important for the planned system, we have to attach some weighting to indicate the importance of each feature. While there is no objective metric which we can use to make these measurements, a group or panel of end users and designers can usually come to some consensus on rough but useful estimates of the relative importance of each feature. These relativities need to be converted into weights on a scale of, say, 10 or 100.

Now we review the alternative coding systems searching for the features identified above. We will probably find the systems vary considerably in the strength of each feature. Again, we have to try and allocate a rough score out of 10 say, for the strength of each feature in each system.

By multiplying together the weightings and scores for each feature and adding the weighted scores together, we will finish up with an overall score for each coding system which will give a rough but useful indication of the benefits to be expected.

A fictitious example of the resulting table is shown below with the criteria artificially reduced to the 'topic headings' mentioned earlier.

Criteria	Weights	Do Nothing		System A		System B	
		Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Users	8	-6	-48	5	40	7	56
Coverage	24	4	96	6	144	8	192
Input	16	7	112	8	128	6	96
Output	19	-5	-95	7	133	7	133
Analysis	9	-4	-36	3	27	5	45
Maintenance	12	8	96	5	60	5	60
Implementation	12	10	120	5	60	6	72
Totals	100		245		592		654

Note that we can give negative scores where these seem sensible. In this example, System A is clearly an improvement on the status quo and System B is better than System A.

## Estimating the costs

We must assess the full costs of implementing and maintaining each alternative. We must ensure we include all costs, both capital costs or charges and running costs. Staff time and other resources involved in using the system must be estimated. Remember that this includes any costs associated with existing or do nothing systems. The principle is to include anything which has an opportunity cost. To make life easier we may be able to estimate simply the difference in staff time between the existing system and system A, and between the existing system and system B.

Costs should be given a monetary value equal to their opportunity cost. This is usually their market price. If there is no clear market price, we have to estimate the opportunity cost of their use. Costs should be at a constant prices (i.e. ignore inflation), and the financial year in which they are incurred should be identified, so that we can discount costs. Sunk costs should be ignored: what matters are the opportunity costs we shall incur in the future, not those of the decisions already made.

Costs should be calculated over the full period of expected use of the system. If this entails buying assets such as office equipment, we have to include the residual value of these assets as a cost saving (i.e. a negative cost) in the year in which we expect to realise it.

Cost savings which occur should be included as negative costs.

Some costs will be difficult to value such as the costs of errors. We should try to value them, but if we cannot, we should list or include them as part of the criteria on the benefits side, but making sure they are described so that higher scores mean lower costs.

## Discounting the costs

A typical system might incur high costs during the implementation (say year 0) and lower, running and maintenance costs during years 1 to 10. We need to convert these to a common time basis, since £100 costs incurred in the future is preferable to £100 costs incurred today. We therefore need to discount costs into the future to present value. A discount rate of 6% should be used (N.B. This is nothing to do with inflation).

Once future costs have been converted into current costs, they are summed. This whole process of calculating the present value of costs can be expressed mathematically as follows:

$$PV(C) = \sum_{t=0}^T \frac{C_t}{(1.06)^t}$$

where t=Years; T is the final year,  $C_t$  are the costs incurred in year t and cost savings are given as negative costs.

## Comparing the alternatives

Once the costs have been estimated for each option, we can compare the costs and benefits of each. This could look as follows:

**Comparison of costs and benefits of alternative CTs**

	Do nothing	System A	System B
PV (costs)	£5,000	£50,000	£70,000
Benefit score	245	592	654
Increment in costs		£45,000	£20,000
Increment in benefits		347	62
Marginal cost <i>per</i> additional unit of benefit		£130	£323

What we have is that in comparing A with doing nothing, we get an extra 347 benefit units, at a cost of £45,000 or at a marginal cost per benefit unit of £347. To buy another 10 benefit units, we would have to buy system B, at an extra £20,000, or another £323 per benefit unit. Is this value for money, i.e. is it worthwhile?

## Risks and uncertainty

- **Uncertainty:** We must identify areas of uncertainty and likely ranges for estimates. This involves doing a sensitivity analysis of the results to the ranges of uncertainty.
- **Risks:** We must ask ourselves whether we have overstated the benefits, whether for example, it will prove more difficult to implement in practice.
- Have we understated the true costs?
- Are there likely to be any delays?
- Does the presence of risk incur extra managerial costs?
- Can the risk be transferred (to the private sector for instance)?

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## In conclusion

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### Is standardisation of coding methods essential or at least desirable?

The previous chapters and draft guidelines reflect an acknowledgement of the widely accepted principle that clinical data in clinical information systems are most likely to be accurate, relevant and timely if they are collected by clinical staff in the course of, and in support of, patient care and that repeated recording and transcription of the same clinical data is wasteful of scarce resources and can increase the likelihood of error and confusion. This may be summarised in the following maxim:

*Clinical data should be recorded by clinical staff in real time and as near to the clinical interface as possible. Thereafter they should be accessible, with due regard to patient confidentiality, wherever they are needed for clinical assessment and care planning; for communication and decision support; and for clinical research and management purposes.*

These principles define strategic objectives which will take some time to achieve, while the integrated systems which are required are designed and implemented. If they are ultimately to be attained, it will be up to clinical staff, managers, system designers and policy makers to remind themselves that each and every new clinical information system should be planned with these design criteria in mind.

The wide variety of care provided in an equally wide range of settings creates the demand for collection and manipulation of numerous kinds of information. The content of each clinical information system, the way in which data are coded and the hardware and software used are matters for local decisions aimed at obtaining the best possible support for patient care with the available resources. The previous chapters have been concerned with ways of arriving at these difficult decisions.

There is a real need to communicate information within and between practices, hospitals and community trusts, health boards, academic departments of medicine and so on, to support real integration of health care provision and avoid wider duplication of data entry. Exchange of information is necessary to manage patients, to manage services and to conduct audit and research, and well designed electronic information systems should allow data to be transferred easily and without distortion.

Much of the data in such systems is coded in one way or another to assist with processing and analysis. Exchange of coded data may become unnecessarily complicated and inefficient if numerous coding systems are used in different health service facilities and data have to be constantly transposed from one set of codes to another. Mapping takes time, particularly if human intervention is needed, and there are sometimes problems in matching a code in one system with its precise equivalent in another. Data corruption can result or detail may be lost. The probable advent of terminology servers may reduce, but not entirely eliminate, many of these problems.

It is important to reiterate yet again that prime consideration must be given to using the right tool for the principle job of a particular information system. Without this, clinical utility and hence clinical support will almost certainly be lacking.

The report has also drawn attention to the range of systems which use clinical data and the different levels of detail and aggregation at which they work. Nomenclatures, classifications and grouping tools may all be required at the various levels. The table below provides some examples of coding tools and their applications.

The objectives outlined above are more likely to be achieved if the coding tools used at different levels are

compatible, i.e. that more detailed concepts and codes can be combined to create more general ones. Data collected at the patient interface can then be progressively classified and aggregated to provide research, audit, epidemiological and management information.

Type of Coding Tool	Examples of Content and Applications	Systems in use
Coded nomenclatures or terminologies	Wide range of terms for signs, symptoms, problems, investigations, diagnoses, procedures, drugs, etc. <i>Creation of electronic clinical records.</i> <i>Implementation of integrated care pathways.</i>	Read Version 3, SNOMED Lothian Surgical Audit Codes Read Version 2
Classifications of various types of clinical data	Clearly defined categories of diseases, operations, drugs, etc. <i>For statistical summaries, management reports, structuring information for access, etc.</i>	ICD10, OPCS4, BNF, ATC Read Version 2
Grouping systems	Groups of patients with various combinations of clinical features requiring similar resource commitments. <i>For casemix analyses and costing.</i>	HRGs and DRGs

If these arguments are accepted, the SHS should be aiming towards a consensus on the family of compatible coding tools it will use for clinical data in clinical information systems. Progressive conversion of data from precisely detailed to highly aggregated should allow full exploitation of the information collected during management of patient care, and communication of data at any level should be facilitated.

At present, contenders in Scotland are Read Version 3 at the most detailed level with Read Version 2 as an interim solution: ICD10, OPCS4 and their extensions at the next level: and Healthcare Resource Groups for the most aggregated data. SAGOR invites comment and recommendations on the issue of standard coding systems so that it can formulate advice. There is no doubt that ICD and OPCS codes in their various generations are now established as the mid range standard. There remains considerable uncertainty as to the best way forward at the detailed level and the need for extensive interchange of information between systems at this level.

## Testing methods of information needs analysis and option appraisal

The recommendations contained in the working group report represent an attempt to draw together ideas and issues that have to be addressed when planning new clinical information systems and redeveloping existing ones. It would be naïve to assume that such a synthesis, as yet untested in practice, will provide a fully operational methodology for system development. Hopefully the recommendations are logically constructed and draw attention to areas of real concern which have to be addressed for systems to be successful. Inevitably there will be omissions and also difficulties in implementing some of the recommendations in practice.

To some extent such shortcomings can be overcome by incorporating new ideas and changing elements that are justifiably criticised by practical users. Ideally, however, this draft guidance should also be rigorously tested in a real case study or studies. It would for instance be helpful to know how practicable and effective the methodology is when applied to the development of a detailed but very localised clinical system, and also to one which was hospital or practice wide.

*SAGOR would like to hear from clinicians and managers who are in the process of developing clinical information systems and who would be interested in using and testing the methods outlined in the report. Support would be available through ISD Scotland for a collaborative enterprise designed to help with the planning analyses for a clinical information system development and, at the same time, to test the recommended methodology.*

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## Examples of classifications, terminologies and clinical coding products

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This appendix contains information about some examples of classifications, terminologies and clinical coding products which may be of interest to anyone planning a clinical information system. It is not an exhaustive list and failure to include either a coding system or a particular product does not imply that it should be excluded from consideration. Inclusion does not imply that a given product is specifically endorsed or guaranteed by the Working Group, nor that it will provide all the functionality required for a particular application. The contents are simply a sample of current systems, products and projects which were noted during research. The aim is to provide examples of various kinds of coding tools so that users will be encouraged to consider a wide range of options during the planning stage. The contents can be updated and extended in response to recommendations concerning either coding tools or software products.

### TERMINOLOGIES AND CLASSIFICATIONS

#### Aintree Hospital Coding System

Aintree Hospital Coding System is being developed by the clinical coding consultant, Dr John Thomson, and is an example of an extension to the structure and content of standard classifications, such as ICD10 and OPCS4. It is designed to provide greater clinical detail and a terminology which clinical staff find more 'natural', i.e. nearer to the terminology generally used in records, letters etc. While not designed to support the development of a full electronic record, it is intended to cover a range of episode summary data including history, symptoms and signs, diagnoses and procedures. The system will support communications to GPs for instance, casenote summaries, audit and research data, workload and other management statistics and central returns. The structure of the hierarchies makes it possible to design a system which prompts users to enter as much detail as possible and which also reminds them of ICD10 or OPCS4 rules. Dr Thomson is creating an associated multiaxial analytic code which is generated as data are entered and which enables a wide range of analyses. The system is being implemented in the Conquest Hospital in Hastings and in part of Aintree Hospitals Trust.

For further details contact Dr John Thomson, Clinical Coding Consultant, Aintree Hospitals NHS Trust, Fazakerley Hospital, Lower Lane, Fazakerley, Liverpool, Merseyside, L9 7AL Tel. 0151 529 2231.

#### Drug coding systems

There are three widely used classification systems specifically for therapeutic drugs. Multipurpose terminologies such as Read Version 3 have their own codes for drugs and therapeutic agents, but may also include cross references to these more specific drug classifications.

##### British National Formulary

The British National Formulary, published by the British Medical Association and Royal Pharmaceutical Society of Great Britain, provides classified notes on drugs and preparations. A chapter refers to drug treatments relevant to body systems, such as the gastro-intestinal system, endocrine system etc. or to specific types of care such as the treatment of infections and malignant disease, immunological products and anaesthesia. Within each chapter (e.g. Infections-Ch.5), there are sections (e.g. Antibacterial drugs-Ch.5.1), split into paragraphs (e.g. penicillins-Ch.5.1.1) and sometimes sub-paragraphs (e.g. broad spectrum penicillins-Ch.5.1.1.3). This provides a 4 level classification system which can be extended to further subdivide categories by chemical substance, product, strength/formulation and equivalent. In Scotland the BNF code is used by Pharmacy Practice Division for the Scottish Prescribing Analysis (SPA) and the Prescribing Information System for Scotland (PRISM).

**Anatomical Therapeutic Chemical Classification System (ATC)**

The Anatomical Therapeutic Chemical Classification System (ATC) is an international enterprise co-ordinated by WHO Collaborating Centre for Drug Statistics Methodology in Oslo. In the ATC system, drugs are classified according to the body system upon which they act and/or therapeutic and chemical characteristics. There are 5 levels. Level 1 divides drugs into 14 main groups on the basis the body system (e.g. B-Blood and blood forming organs). Levels 2 and 3 define therapeutic/pharmacological subgroups (e.g. B03-antianaemic preparations, B03A-iron preparations). Level 4 identifies a therapeutic/pharmacological/chemical subgroup (e.g. B03A A-iron bivalent oral preparation). Finally level 5 indicates a given chemical substance (e.g. B3A A07-ferrous sulphate). ATC is used in preparation of international statistical reports on drug therapies.

**European Article Numbering (EAN) system**

The European Article Numbering (EAN) system is maintained by EAN international and is used to identify products by manufacturers, distributors, wholesalers and retailers. It consists of 13 characters and identifies companies and items. The company code (7 digits) is standard and the item codes (5 digits) are allocated by the companies themselves. A check digit is calculated. It does not provide any information about the product other than the manufacturer and product name.

**GALEN**

Generalised Architecture for Languages, Encyclopaedias and Nomenclatures in Medicine (GALEN) represents a fundamental exploration of clinical language, including both its content and the rules which govern the creation of meaningful clinical expressions. As the vocabulary and grammar are assembled, they provide a basis for the development of intelligent interfaces between clinicians and their clinical information systems. GALEN is not simply a nomenclature or classification, though it can be used to generate terminology and provide access to existing material. It is developed by the Medical Informatics Group led by Dr Alan Rector in the Dept. of Computer Science in Manchester and has been supported both by NHS and EEC funding. One of the team's current projects is the development of an interface for a clinical information system for use in general practice. It is difficult to summarise this complex and exciting approach but a couple of recent publications are mentioned below. A comprehensive set of references can be obtained from the address also shown below.

The GALEN High Level Ontology, A L Rector et. Al. Medical Informatics Group, Department of Computer Science, University of Manchester, Manchester, M13 9PL - Published in Medical Informatics Europe 1996. Note — This paper has useful references to other published documents on GALEN and associated concepts.

The GALEN-IN-USE Project A L Rector et. Al. Published in EHTO Journal March 1996 (European Health Telematics Observatory Journal).

General information is available from Chris Brand, GALEN Project Administrator, Medical Informatics Group, Department of Computer Science, University of Manchester, Manchester, M13 9PL Tel: +44-161-2756133, Fax +44-161-275-6932.

Internet: galen@cs.man.ac.uk WWW:http://www.cs.man.ac.uk/mig/galen/

**HRGs**

Healthcare Resource Groups (HRGs) are representative of classifications designed to bring together cases which use similar amounts of resource for similar types of management in particular specialist services. They bridge the gap between the more clinically detailed coding of, say, Read3, SNOMED, ICD10 and OPCS4, and less clinically oriented descriptions of casemix by say specialty and age. They attempt to link specific clinical activity with resource use to assist in management and planning of clinical services, costing, contracting, benchmarking, resource management and so on. They have been designed to be more relevant to UK practice and information systems than Diagnosis related Groups (or DRGs) imported from America.

HRGs are defined by combinations of operation, diagnosis, comorbidities and age. They can therefore be derived from data which have already been coded to ICD10, OPCS4 and Read etc. These casemix measures are developed and licensed through the National Casemix Office in Winchester, part of the Information

Management Group of the NHS Management Executive. HRGs are widely used in the NHS for resource management, costing and some aspects of contracting. Their use within the Scottish Health Service is also expanding partly due to further development of the National Costing Project.

While the initial set of HRGs are designed to describe casemix in inpatient care, HRGs are also being constructed to provide the same facility for outpatient management. These are being developed in England at present by a series of clinical working groups. Their success will to a considerable extent depend on the development of efficient data collection systems for high volume outpatient activity.

The following papers are a small sample of the range of documentation available and the address for further information is given below.

'Turning Data into Information' is a general introduction to Healthcare Resource Groups (HRGs) published by the National Casemix Office (IMG No. G7059).

The Grouping Philosophy of the NCMO and how it relates to the needs of the NHS (IMG No. G7073)

Healthcare Resource Groups - How They Should be Used (NCMO No. G7088)

Community Healthcare Resource Groups (NCMO G7090)

What's The Difference - A comparison of Healthcare Resource Groups and Diagnosis Related Groups (NCMO No. G7086).

Buckland R W, Healthcare Resource Groups; A more sensitive and less costly approach to contracting. *BMJ* 1994; 308 p.1056.

Sanderson H, Reeves C, Ross P, Counting the cost. *British Journal of Healthcare Computing* 1993; 10(5) pp. 13-14.

Sanderson HF, Anthony P, Mountney LM, Healthcare Resource Groups-Version 2. *Journal of Public Health Medicine* 1995; 17(3), pp 349-354. OUP

A list of NCMO documentation is available from the SCCC. For information direct from the NCMO contact, Marion Cookson, Information Officer, NCMO, NHS Executive headquarters, Highcroft, Romsey Road, Winchester, SO22 5DH. Tel No. 01692 844588. Fax No. 01962 844711.

## ICD10

ICD10 is the latest edition of the International Classification of Diseases produced by WHO. ICD is used throughout the world to collect morbidity and mortality data. It is a comprehensive classification of all types of disease and injury. There are separate sections for complications of medical and surgical care; symptoms, signs and abnormal findings to be recorded in the absence of diagnoses or in addition; factors which influence the health status or contact with health services; and a classification of morphology of tumours to be used in association with a main chapter defining site and behaviour. The section on mental and behavioural disorders includes an agreed description of the phenomena characteristic of each disorder. There are rules to guide users towards a consistent and standard application of the codes and these are contained in volume 2. Volume 1 is the tabular list in hierarchical order and volume 3, the comprehensive index.

ICD10 is the most widely used classification for epidemiological studies and is also frequently applied to summary data to provide workload and other management statistics. In Scotland it is the obligatory recording tool for diagnostic data on central returns and in contract systems. A general description of the International Statistical Classification of Diseases and Related Health Problems is contained in volume 2 of the Tenth revision.

Specialty specific extensions to ICD10 include:

ICD10 Mental and Behavioural Disorders - published 1992;

ICD10 NA (Neurology) - publication date not yet confirmed;

ICD10 DA (Dentistry & Stomatology) - published 1995;

ICD 0 (Oncology) - published 1990;

International coding index for Dermatology - publication date not yet confirmed;

ICD R & O (Rheumatology & Orthopaedics) - publication date not yet confirmed.

The ICD10 Paediatric adaption - Royal College of Paediatrics and Child Health (RCPCH), published December 1996 (previously British Paediatric Association) is available from RCPCH, 5 St. Andrew's Place, Regents Park, London. Tel 0171 486 6151. Fax 0171 486 6009.

The ICD10 Diagnostic and Procedure Codes in Urology (1996) is published by the British Association of Urological Surgeons. For more information please contact The British Association of Urological Surgeons at the Royal College of Surgeons, 35/43 Lincoln's Inn Fields, London, WC2A 3PN. Tel 0171 405 1390. Fax 0171 404 5048.

ICD 10 Terms and Definitions Group International Federation of Gynaecology and Obstetrics (FIGO) is in the preparation stage.

The current supplementary classifications are available from Her Majesty's Stationery Office (HMSO) bookshops unless stated otherwise.

For information on ICD10 and supplementary classifications please contact NHSCCC help desk on 01509 264072. The Classifications section at NHSCCC acts as the UK centre for training and advice on ICD10.

## Lothian Surgical Audit Codes

The coding system for surgical operations devised by the Lothian Surgical Audit Committee, defines procedures on 3 axes, organ, disease and operation. The codes are mapped to ICD10, OPCS4 and Read Version 2. This system has been in use in Lothian and other areas of Scotland since 1984 and has provided a basis for effective clinical audit in a number of services. Further information can be obtained from Mrs Molly Stewart, Co-ordinator, Lothian Surgical Audit, University Department of Surgery, The Royal Infirmary of Edinburgh. Tel: 0131 536 3840. Fax: 0131 536 3927.

## OPCS4

The Office of Population Censuses and Surveys Classification of Surgical Operations and Procedures is used throughout the UK for recording summary clinical data for statistical returns and in a variety of research and audit applications. It comprises 23 anatomically based chapters mostly relating to whole or part of a body system. Within these are, where appropriate, sections devoted to specific organs and within each such section, a sequencing in rough order of significance of resource use. There are extra chapters at the end which cover respectively: operations or procedures which do not easily fit into the classification, including operations involving multiple systems, amputations for instance, and procedures such as dialysis or transfusions: a subsidiary classification of methods of operation such as various types of laser therapy: and finally a chapter of site codes to allow more precise specification. A general description of this classification is contained in the introduction to the tabular list published by HMSO, third impression 1991. An index (volume 2), second edition 1993 is also available from the NHSCCC.

A major problem with a classification of operations and procedures is the rapidity which new techniques are developed. It is usually possible to code these new interventions but only with increasing loss of specificity. The possibility of updating the classification is being actively investigated so that, for instance, minimal invasive surgery can be recorded more precisely.

The classification is now the responsibility of NHSCCC and further information can be obtained by contacting the Centre through the helpdesk line shown above under the ICD10 entry.

## Read Codes

Read codes have developed from the initial 4 character codes devised by Dr James Read to help rationalise coding in general practice systems into an extensive standardised terminology for clinical information across medical, nursing and PAMs disciplines.. Prior to the initial development, a variety of coding systems was used for different elements of the GP record content, each with its own format and structure. After the

initial success of the '4 byte set', Read and his colleagues expanded the Operations (OPCS4) and full range of information covered to include operations as described in the OPCS Classification of Surgical coverage of diseases included in ICD9 and latterly in ICD10. Ultimately these developments culminated in 5 character coding system described as Read Version 2, covering occupations, history, investigations, disorders, procedures, drugs, practice administration etc. Its wide use in hospital practice and satisfaction with the general approach led on to establishment by the Information Management Group of the NHS Management Executive, of the Clinical Terms Project supported by the Royal Colleges through the Conference of Colleges Information Group (CIG). This was followed by the PAMs Terms Project and Nursing Terms Project. These initiatives have resulted in the creation of Read Version 3, an attempt to provide a comprehensive coded standard terminology across all the clinical disciplines.

In Scotland, Read Version 2 and 3, are recommended by the Management Executive as the primary system for coding clinical data. Other codes such as ICD10 and OPCS4 can be derived from both versions, although the translation from 3 is more complex and currently requires intervention from skilled coders.

The Read thesaurus (Version 3) comprises 220,000 terms, arranged in the following sections:

#### Occupations

History and observations (includes symptoms, signs, investigations, interpretation of results etc.)

Disorders ( includes system by system disorders, tumours, transplant & multisystem disorders etc.)

Operations, procedures and interventions (includes, operations, non operative procedures, a range of therapies and regimes, PAMS therapies etc.)

Causes of injury and poisoning

Tumour morphology

Staging and scales (including tumours, histological grading systems, symptom ratings and assessment scales)

Administration (including a wide range of general practice administrative items such as registration, item of service administration, screening, immunisation etc.)

Drugs

Appliances and equipment

Units (includes range of internationally recognised units for a wide variety of clinical and physical measurements)

Organisms

Anatomical concept (includes a comprehensive list of anatomical terms, covering body structures, regions, and special references such as ECG lead sites.)

Additional values (this is a miscellaneous group which includes terms for various pensions and benefits, agencies such as AA, descriptions of foreign bodies, chemicals, dietary items, and biochemical analytes).

[The last three items mentioned are examples of important concepts collected here pending moving out to "chapters" of their own.]

Context dependent categories (This is an extremely important section currently under development. It will allow users to specify the context in which terms such as 'myocardial infarction' are used. For example as a family history, a previous occurrence, a definitive diagnosis or an excluded diagnosis.)

Attribute (This section defines a range of characteristics which are included in Read Version 3 as details to be recorded as 'qualifiers'. Examples are 'direction of displacement', 'associated finding', 'severity' 'erosiveness' etc.)

Journal References for Read codes include:

Chute CG, Cohn SP, Campbell KE, Oliver DE, Campbell JR The Content Coverage of Clinical Classifications *J Am Med Inform Assn* 1996; 3: 224-233

O'Neil MJ, Payne C, Read JD. Read Codes Version 3: A User Led Terminology. *Methods of Information in Medicine* 1995; 34: 187-92

Buckland R The Language of Health. *BMJ* 1993; 306: 287-8

Tabaqchali MA, Venables CW. The Clinical Terms Project: Its Potential for Computerised Surgical Audit. *Acad Med* 1995; 70: 499-505

Cimino JJ, Clayton PD, Hripcsak G, Johnson SB. Knowledge-based Approaches to the Maintenance of Large Controlled Medical Terminology. *J Am Med Inform Assn* 1994; 1: 35-50

Chisholm J. The Read Clinical Classification *BMJ* 1990; 300: 1092

Pringle M The New Agenda for General Practice Computing. *BMJ* 1990; 301: 87208

Read JD, Benson TJR. Comprehensive Coding *BJHS&IM* 1986; 3: 22-5

Hampton RH, Clark DJ. Version 3 of the Read Codes-A Vital Step Towards the Computerised Patient Health Record *Informatics* 1994; 12-13

Bentley TE, Price C, Brown PJB. Structural and lexical features of successive versions of the Read Codes. In Teasdale S (Ed) *Proceedings of the Annual Conference of the Primary Health Care specialist Group*. Worcester, PHCSG, 1996; 91-103.

Schulz EB, Barrett JW, Brown PJB, Price C. The Read Codes: Evolving a Clinical Vocabulary to Support the Electronic Patient Record. In : *Conference Proceedings: Towards the Electronic Patient Record Europe*. Newton: CAEHR, 1996:131-140.

Price C, Bentley TE, Brown PJB, Schulz EB, O'Neil M. Anatomical Characterisation of Surgical Procedures in the Read Thesaurus. In Cimino JJ (Ed) *Proceedings of the 1996 AMIA Annual Fall Symposium (formerly SCAMC)*. Philadelphia, Hanley & Belfus, 1996:110-114.

Schulz EB, Price C, Brown PJB. Symbolic Anatomical Knowledge Representation in the Read Codes Version 3: Structure and Application. *J Am Med Inform Assn* 1997; 4:38-48.

The NHSCCC publishes a series of documents providing guidance on conceptual and technical issues surrounding Read codes. A current list is available from Mr Peter Walters, NHSCCC, Woodgate, Loughborough. Tel: 01509 211411, Fax: 01509 211 611.

Computer Aided Medical Systems Ltd (CAMS) have an agreement with the Scottish Health Service to distribute and support the use of Read codes within Scotland. Following a request for the use of Read codes through the SCCC, CAMS will provide updates quarterly along with a Scottish Newsletter and supporting documentation. CAMS can also provide information on the availability of Read code compatible software, and where agreement has been given by the supplier a listing of the applications Read code functionality. For further details please contact CAMS, Tannery Buildings, 58-60 Woodgate, Loughborough, Leicestershire, LE11 2TQ. Tel. 01509 611006. Fax. 01509 235560. E-mail support@cams.co.uk

## SNOMED

The Systematised Nomenclature of Human and Veterinary Medicine (SNOMED International). Roger A Côté, MD, FCAP et. Al., College of American Pathologists and American Veterinary Association, April 1993. Electronic versions (ASCII) available from College of American Pathologists, 325 Waukegan Road, Northfield, ILLINOIS, 60093-2750. Tel. No. 708\446-8800, Fax No. 708\446-8807.

SNOMED is widely used in Scotland in pathology systems. It would be useful to hear from anyone using SNOMED to encode other types of clinical information system in Scotland.

SNOMED has a range of terminology as described below:

The SNOMED International classification system contains 11 separate Modules, listed below. There are over 144,000 terms and term codes included in the system; the numbers in parentheses below indicate the number of records contained within each module.

Topography-A Functional Anatomy for Human and Veterinary Medicine. (12,803)

Morphology-Terms used to name and describe structural changes in disease and abnormal development. (5,672)

Function-Terms used to describe the physiology and pathophysiology of disease processes. (18,027)

Living Organisms-Living organisms of etiological significance in human and animal disease. (24,480)

Chemicals, Drugs, and Biological Products-Including pharmaceutical manufacturers. (14,275)

Physical Agents, Activities, and Forces-A compilation of physical activities, physical hazards, and the forces of nature. (1,410)

Occupations-Developed by, and used with permission from, the International Labour Office in Geneva, Switzerland. (1,947)

Social Context-Social conditions and relationships of importance to medicine. (845)

Diseases/Diagnoses-A classification of the recognised clinical conditions encountered in human and veterinary medicine. (34,377)

Procedures- classification of health care procedures(28,685)

A General Linkages/Modifiers-Linkages, descriptors, and qualifiers to link or modify terms from each module's Microglossaries (1,373)

The following are a few selected references taken from the latest information at the Internet SNOMED site (<http://snomed.org/>)

Altman R. B. and Oliver D. E. (1994) Extraction of SNOMED Concept from Medical Record Texts. Proceedings of JAMIA Eighteenth Annual Symposium on Computer Applications in Medical Care. November 5-9, Washington D.C. pg. 179.

Barrows R. C., Cimino J. J. and Clayton P. D. (1994) Mapping Clinically Useful Terminology to a Controlled Medical Vocabulary. Proceedings of JAMIA Eighteenth Annual Symposium on Computer Applications in Medical Care. November 5-9, Washington D.C. pg. 211.

Campbell J. R. and Payne T. H. (1994) A Comparison of Four Schemes for Codification of Problem Lists. Proceedings of JAMIA Eighteenth Annual Symposium on Computer Applications in Medical Care. November 5-9, Washington D.C. pg. 201.

Cimino JJ. Vocabulary and health care information technology: state of the art. *Journal of the American Society for Information Science*; 1995;45(10):777-782

Dodd W. (1988) Korner, Nomenclature, and SNOMED [letter] *Br Med J (Clin Res Ed)*, Apr 23; 296(6630):1198-9.

Fox K. Ed. (1993) Computer Language for Medical Records. *Science*, Nov;

Henry S. B., Campbell K. E. and Holzemer W. L. (1993) Representation of nursing Terms for the Description of Patient Problems Using SNOMED III. *Annu Symp Comput Appl Med Care*; In press.

## IMPLEMENTED SYSTEMS

*the following section provides examples of systems which hold clinical information and use various coding tools.*

### General Practice Administration Systems

#### EMIS

EMIS provides a range of practice administration tools, decision support, search and audit facilities and communications software options such as laboratory links and E-mail. For clinical data, EMIS currently uses either a 4 character Read Code set or, more commonly, Read Version 2. For further information about EMIS, contact Liz Watts, EMIS, Park House Mews, 77 Back Lane, Horsforth, Leeds, LS18 4RF. Tel 0113 258 2454

#### EXETER

EXETER is a general practice administration system. Its facilities include registration and item of service links, integrated clinical records, prescribing, appointments, fundholding and dispensing. Clinical data are coded to Read Version 2. The system can be implemented in a range of settings from single handed practices up to multiple user sites using various computer system configurations. The Scottish contact is Mr William Moyes, Scottish and Northern Ireland System Partner, Fechlin IT Services, 57, Hamilton Street, Larkhall, South Lanarkshire, ML9 2AT. Tel No. 01698 887590

#### General Practice Administration System Scotland (GPASS)

General Practice Administration System Scotland (GPASS) is developed, distributed and supported by GPASS which is a branch of the CSA Scottish Healthcare Supplies. It provides a range of practice administration and audit facilities. Currently, the system uses a partial implementation of Version 2 Read Codes, for clinical items, such as history, symptoms, diagnoses etc. It is being upgraded at present (NewGPASS) and part of the redevelopment will be the introduction of full Read Version 2. This will provide greater clinical detail for diagnoses, procedures, drugs etc. and for communication with hospitals. Whilst Read Version 3 is not being implemented immediately, the file structures necessary to support it are being installed, so that GPASS can move to Version 3 as it becomes established in general use. For further information on GPASS redevelopment contact Mr Martin Irving, GPASS, Seaforth House, Seaforth Rd., Hillington, Glasgow G52 4SQ. Tel 0141 882 9996. Fax: 0141 882 9997

#### MEDITEL

MEDITEL currently supplies System 5, a practice administration system and patient record with facilities for word processing, repeat prescribing etc. A new Windows based product, System 6000 with enhanced analysis and clinical decision support is due for commercial release in May. System 5 uses a 4 character Read set whereas System 6000 will support Read Version 2 or Version 3. For further information about MEDITEL contact Steve Payne, AAH Meditel, Rigby Hall, Rigby Lane, Bromsgrove, B60 2EW. Tel. 01527 579414 Fax: 01527 837287

#### VAMP

VAMP is a Windows based clinical management system. It is RFA accredited to the latest NHS standards and is available with a Read Version 2 'dictionary'. For further information about VAMP, contact Kay Sutton, VAMP Health Limited, Reuters Health Information, The Bread Factory, 1, Broughton Street, London. SW8 3QJ. Tel. 0171 498 1330. Fax. 1071 498 1300.

### Law Hospital Trust

Law Hospital Trust has implemented Read Version 2 as the primary form of coding for inpatient discharge data. Initially, the coding was carried out using the Medicode Readscan encoder attached to COMPAS. The encoder has now been interfaced with the HBO HISS. So far the project has shown the feasibility of terming clinical data in Read Version 2 format using on-line encoding and that information quality is maintained, as judged from the derived ICD10 and OPCS4 data. The project has helped to refine both the Readscan

encoder and Read Version 2 for use in a Scottish context. Evaluation of its potential for improved clinical feedback will be possible when the casemix module of the HISS is fully functioning.

For further information on the Law project, contact Mr Richard McEwan, Information Manager, Training and Development Centre, Law Hospital, Carluke, Lanarkshire. Tel. 01698 361100

## **LRI Clinical Workstation**

LRI Clinical Workstation is a Clinical Information System developed by a consultant physician at the Leicester Royal Infirmary (LRI). It is specifically designed for 'live' use by the clinician at the patient interface, and has been used in outpatients and on the wards of a variety of medical departments at the LRI for several years. The software runs in Microsoft Windows (v3.1, '95 or NT) and is available for standalone PC or for shared Network use. The software is based around a clinical problem list and drug list and all clinical correspondence is generated and retrieved by the software and displayed by linking to Windows word processor applications using DDE or OLE. Free text 'notes' are stored, and may be attached to particular diagnosis or problems, and other datasets can be linked (including OLE links with Windows spreadsheets) giving the basis for a summary electronic clinical record. Specialty specific subroutines have been developed particularly for diabetes and endocrinology. Admission and outpatient attendances are recorded by real-time use, and summary reports of activity are included, but the entire thrust of the system is storage and usage of clinical information rather than collection of administrative data.

LRI Clinical Workstation upgraded to the Read Clinical Thesaurus v3.1 in August 1995, and we therefore have extensive experience of successful use of the Thesaurus in 'live' clinical use. The ability to use RCT qualifiers ins included, and extensive 'context' qualification (severity, certainty, history, qualitative results) is also enabled by software-specific mechanisms whilst awaiting release of RCT context qualifiers. Work is currently underway to enhance the complexity of RCT-based queries on the dataset for clinical research purposes.

Software is available for free evaluation by NHS hospitals and clinicians, using the database runtime engine. Full installation for clinical use is possible, but would require discussion. Contact the author, Dr Trevor Howlett on Bybrook@CompuServe.com.

## **MEDICAID**

MEDICAID is a clinical information system, based around version 3 of the Read Thesaurus this version also includes the qualifiers' and the system makes full use of them. There are interfaces to the hospital PAS and pathology system. Patient data captured, forms the basis around which all patient/GP correspondence is generated. The system has over 300 users which comprise of secretaries, surgeons, physicians, ward clerks and nurses. For further information contact Mr Alex Rodda, Senior Technical Manager, South Manchester University Hospitals NHS Trust, Withington Hospital, Nell Lane, West Didsbury, Manchester, M20 2LR. Tel. 0161 291 4148. Fax. 0161 291 3785.

## **Pathology Systems**

There are several systems in pathology laboratories in Scotland which use SNOMED to record histopathology and cytopathology data, including Pinnacle, ACT Apex, Masterlab and Telepath. These systems support the processing of requests and specimens and generation of reports. Data on topography and morphology of tumours for instance, is coded to SNOMED and can be stored to provide continuous pathology records and statistical reports etc., and can be fed to other systems such as the Scottish Cancer Registry. Since there are several systems and suppliers involved, there is no single point of contact:

### **ACT Apex**

ACT Apex is produced by ACT Medisys Ltd, Cornhill House, Trinity Park, Bickenhill Lane, Birmingham, B37 7ES. Contact Mr Keith Kirtland, Pathology Sales Manager -Tel. 0121 782 2232, Fax. 0121 782 2125.

**Masterlab**

Masterlab is produced by Berkeley Services Ltd., Savoy House, Savoy centre, Sauchiehall St., GLASGOW, G2 3DH. Tel. 0141 332 0891. Fax. 0141 333 9300. Contact is Keith Manning, Sales and Marketing Director. Direct Phone/Fax: 01344 291408.

**Pinnacle**

Pinnacle is an integrated hospital laboratory system which incorporates modules for: cervical cytology, histo/pathology, biochemistry, haematology and bloodbank. The system does include SNOMED codes which are in use at some sites, and ignored by others. For further information contact Stephen Maloy, Tel. 0141 566 6377 or E-mail sm@foremost.co.uk.

**Telepath 2000**

Telepath 2000 is an integrated laboratory system produced by CDS Telepath, Institute of Research and Development, University of Birmingham Research Park, Vincent Drive, Birmingham, B15 2SQ. Contact Mr John Brookes, Sales Manager - Tel. 0121 414 1232, Fax. 0121 414 1458.

## Queen Margaret Hospital

Queen Margaret Hospital in Dunfermline has been involved in the commercial development of two major items of software. These are a high level theatre system with innovative data capture systems, and a fully integrated clinical and management information system. Both these systems can be seen working on site. There is however a wealth of experience of the problems of acting as a development site and its implications. At the time of writing it is probably the only site in Scotland with up to date experience of this type. The hospital is committed to moving the systems on to eventually providing complete electronic patient records. They are taking novel approaches to clinical coding. For further information contact, Dr Peter Curry, Consultant Anaesthetist, Queen Margaret Hospital, Whitefield Road, Dunfermline 01383 23623.

## Renal Medicine System

Renal Medicine System developed by Dr Keith Simpson in Glasgow Royal Infirmary, allows clinical data to be recorded progressively as patients are managed throughout the course of their illness. It acts as a comprehensive electronic patient record in which clinical elements such as diagnoses and procedures are coded using an early version of Read. It is currently being updated to use Read Version 2. A similar system is used by 8 Renal Medicine departments in Scotland. For further information contact Dr Simpson at The Renal Unit, Royal Infirmary, 84 Castle Street, Glasgow, G4 0SF or E-mail: KEITH\_SIMPSON@COMPUSERVE.COM

## Withybush Hospital

Withybush Hospital in Haverfordwest, Pembrokeshire, began using Read Version 3 within its Clinical Management Systems in April 1995, replacing Read Version 2 that had been used since 1992. Read Version 3 provides all the Trust business and clinical inpatient and daycase information in the specialties of general surgery, orthopaedics, general medicine, paediatrics, geriatrics and gynaecology with obstetrics and pain relief in the process of being implemented.

A demonstration initiative was subsequently established in partnership with the NHSCCC and the Welsh Office to explore how Read Version 3 could be used to support developments in clinical and managerial practice. This has now included a formal evaluation of the completeness of Read Version 3 in respect of procedures and diagnosis, signs and symptoms. This evaluation will be available in the next few months which will also incorporate a review of the processes used to record clinical terms. It has also been agreed with NHS CCC that further work will now be undertaken in the use of Read Version 3 to support developments in clinical and managerial practice. This will include work in the areas of electronic prescribing, direct use by clinicians to produce discharge letters, a query database, use in clinics by clinicians and for production of clinic letters. The project has resulted in additional terms being added to Read Version 3, particularly synonyms to help accommodate the wide range of acceptable terminology used in active clinical records. Cross mapping to ICD10 and OPCS4 has been refined. Further information about the project can be obtained from Mr Gary Owen, Information Services Manager, Withybush General Hospital, Pembrokeshire and Derwen NHS Trust, Haverfordwest. Tel No. 01437 764545.

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## Criteria Working Group members

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### **Dr Marion Bain**

A Consultant in Public Health Medicine in ISD, appointed in October 1995. Graduated from Edinburgh University in 1988. Trained in Public Health Medicine at Borders Health Board and ISD. Main responsibilities within ISD - medical aspects of the collection, analysis and development of hospital information.

### **Miss Gillian Boyle**

Secretary of SAGOR and of the Criteria Working Group. Worked in medical records in various Scottish hospitals mainly in clinical coding departments. Currently a Health Information Scientist in ISD with responsibilities which include organisation of Read code licensing and support in Scotland.

### **Dr John Clarke**

Consultant in Public Health Medicine formerly employed in Information and Statistics Division managing Scottish Morbidity Record systems and development of SCRIPS consultant feedback. Currently acting as clinical advisor to Scottish Clinical Coding Centre in ISD.

### **Dr Peter Curry**

Consultant Anaesthetist with special interests in trauma and intensive care. Long term interest in the practical uses of I.T. Project Doctor for Trust RM Project since summer 1994. Involved in many aspects of the development of two major software developments arising out of the RM Project. Involved in consideration of implementation of real clinical coding across an entire hospital and the practicalities and benefits of various options. This has led to national involvement (Scotland & UK) in consideration of Read version 3 and other coding solutions.

### **Mrs Karen Hancock**

Economic Advisor in the Scottish Office Department of Health, Management Executive, where she has been working since 1991. She has been an economist in a wide variety of public and private sector organisations for 16 years. Her current responsibilities include economic advice on policy issues, primary care and resource allocation.

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## **Mrs Margaret Hastings**

Superintendent Physiotherapist at Lomond Healthcare NHS Trust. She is Chairperson of the Scottish TIARA Group and a member of the Chartered Society of Physiotherapy Information management group. She is currently developing the use of Read Thesaurus clinical terms within the profession.

## **Dr M D Hendry**

Dr Hendry is a general practitioner in Cupar. He has served on the local Area Medical Committee, and is one of Fife LMC's two representatives on the BMA Scottish General Medical Services Committee and chairs the GPASS User Group. He has considerable experience of developing and using software to support patient care and general practice management. He has written accessory programs which provide a simple means of reporting a practice's performance to GPASS users. Dr Hendry is now heavily involved in the development of the 'New GPASS'.

## **Dr Alan Hyslop**

Currently working as Computing and IT Strategy Manager for the Scottish Health Service, Management Executive. Early career in Nursing and Health Service. Gained a degree in Psychology and PhD along the way.