



National Standards Authority of Ireland

IRISH STANDARD

ENV 12264:1997

ICS 11.020

National Standards  
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**MEDICAL INFORMATICS - CATEGORICAL  
STRUCTURES OF SYSTEMS OF CONCEPTS  
- MODEL FOR REPRESENTATION OF  
SEMANTICS**

*This Irish Standard was  
published under the  
authority of the National  
Standards Authority of  
Ireland  
and comes into effect on  
June 30, 1998*

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EUROPEAN PRESTANDARD  
PRÉNORME EUROPÉENNE  
EUROPÄISCHE VORNORM

**ENV 12264**

October 1997

ICS 11.020; 35.240.70

Descriptors: medicine, data processing, information interchange, models, terminology

English version

**Medical informatics - Categorical structures of systems of  
concepts - Model for representation of semantics**

Informatique de santé - Structures catégorielles des  
systèmes de concepts - Modèle de représentation de la  
sémantique

Medizinische Informatik - Kategoriale Strukturen von  
Begriffssystemen - Modell zur Repräsentation von  
Semantik

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 251 "Medical informatics", the secretariat of which is held by SIS

This European Prestandard has been prepared under a mandate (BT-IT-208) given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s)

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 0 Introduction

Computer-based processing and interchange of medical information use various kinds of **terminological systems**, such as controlled vocabularies, classifications, nomenclatures, terminologies and thesauri, either including or not coding schemes — to represent that information.

The peculiarities in the field of medical informatics are

- availability of a large number of specialised terminological systems;
- a large overlap among the subject fields involved;
- a large number of codes and rubrics, typically in the order of magnitude of 10 000 or 100 000 entries, in commonly used terminological systems;
- increasing re-use of coded data in different healthcare contexts.

The integration of computer-based medical records and administrative information systems require rationalisation in the field, and a uniform way to describe the information model and the content of codes and rubrics, with the additional constraint that it is not possible to impose a rigid uniform standardised language to the healthcare providers.

The organisation and content of a terminological system can be synthetically described by its global '**categorical structure**' as defined in this European Prestandard (a few high-level semantic categories and their organisation, instead of thousands of concepts), in order to

- facilitate maintenance of terminological systems;
- increase regularity and coherence of each terminological system;
- allow systematic cross-references between items of different terminological systems;
- facilitate convergence among terminological systems;
- provide elements for negotiation about integration of terminological systems into information systems between the respective developers.

For a faster achievement of these goals, a series of specific European Prestandards on various subject fields relevant to healthcare information processing will use the present European Prestandard to describe a set of categorical structures in partially overlapping subject fields. After adequate field testing, revision and integration, these European Prestandards will provide a comprehensive basis for systematic development of computer-based terminological systems in healthcare.

## 0.1 Role of terminological systems in the healthcare information systems

Terminological systems restrict and regularise routine language for more effective information processing and transmission. One class of terminological systems used in healthcare communication is the class of **coding systems**, although codes are not an essential component of modern computer-based terminological systems. Very many computer systems manage and transmit information as **coded fields** in data bases or **coded entries** in messages without regard for their meaning or their possible internal organisation. Such applications treat codes and rubrics as 'packed' information.

Packed information is considered by such applications as indivisible. It can be presented to the user, or it can be used as a pointer to tables containing further information but it cannot be unpacked.

This fact was recognised by the existence of data types such as 'coded entry' as distinct from other data types such as 'free text', 'date', or 'numeric' values in many information systems. Interpretation of the meaning of such packed data is left to the human users: information contained in a code can be unpacked and rearranged by specialised software.

There is a need for such specialised applications to be able to look 'inside the codes', i.e. to deal with more of the meanings that the codes involve. Newer computer-based information systems are increasingly extending the life-time and the availability of data. One of the major consequences of this change is that there is a demand for re-use of data generated in one application by other applications.

'Interworking' among heterogeneous applications is essential to the successful development of medical informatics. Different applications almost always need to organise information in different ways, and hence usually use specific terminological systems. To communicate, they need to code data according to various coding systems or possibly according to different views of the same coding system, i.e. different coding schemes.

Hence one must map coded data between environments with different underlying data models and different coding systems and maintain alternative views of the same coding systems. Such mappings and alternative views are large and complex; simple one-to-one correspondence is rare. Manually constructed look-up tables are large, error-prone to construct, and costly to maintain.

Furthermore, computer-based information systems are increasingly being extended into areas such as decision support, quality assurance, hazard warning, and intelligent user interfaces, which applications require access to the details of the information traditionally packed in 'codes'.

Such computer applications also demand more consistency and accuracy in the organisation of the terminological systems and the mappings among them than has been required of traditional terminological systems intended primarily for human interpretation. Human interpreters can often compensate for imprecision in organisation or mappings through their understanding of the meaning of the rubrics and of the overall context and use of the terminological system. Computers have no such understanding. Computer interpretation is entirely dependent on the formal representation of the **systems of concepts** (as defined by International Organisation for Standardisation, ISO) — on which the terminological systems are built.

Since more depends on them, and since there are fewer means to compensate for imprecision, there are now greater demands than before for accuracy and consistency in the representation of systems of concepts and in mappings between them. To achieve such accuracy and consistency, a formal account of the information encapsulated and the organisation of the systems of concepts is required.

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