

Recommendations for ECG diagnostic coding

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Introduction

The Oxford dictionary defines code as "a body of laws so related to each other as to avoid inconsistency and overlapping". It is obvious that natural language with its high degree of ambiguity does not qualify as a code in the sense of this definition. Everyday experiences provide ample evidence that natural language, because of its richness and lack of uniqueness, is subject to multiple interpretations and thus not suitable for conveying ideas or data in an unequivocal, uniform and concise manner. For this reason codes have been developed and used in several areas of medicine [1-3] to describe, document, and transmit qualitative medical data. It is rather surprising that electrocardiography has been able to exist for so long without any formalized language to describe its findings. Increased use of electrocardiograms in epidemiology, large scale electrocardiographic studies and last but not least computerized ECG interpretation have provided incentives to develop codes. Initial efforts in this direction [4-6] were primarily guided by local needs for improved storage, retrieval and handling of information; without major modifications they do not, however, satisfy all the requirements one expects from an ECG code today. Nevertheless, the experience gained in the use of these early ECG codes provides an important source of information on which

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to build specifications for a new or expanded code. It is significant that several members of this working group have been extensive users of the Booth—Hull code [4] and the Utrecht coding system [5].

Justification of ECG code

Several reasons explain the recent interest in coding of ECG diagnosis. The 2 most prominent justifications of an ECG code are considered to be:

1. To facilitate communication between providers and users of ECG diagnostic information, and to assist in documentation of ECG information.
2. To facilitate interaction between human and computer in computer-assisted ECG systems, especially to allow human input into the processing mechanism.

The justification described in Item 1 has been present ever since ECGs have been used in clinical medicine; it apparently was not sufficiently motivating to produce a widely accepted ECG code. Justification 2 has appeared only recently. Since some type of coding system is essential in any computer-based ECG system, it now forces every system developer to implement either individually, or jointly and in coordination with others, a coding system for human-to-computer communication. It is especially this latter aspect of code development which was of concern to the working group.

Specification of ECG code

The terms of reference for the working group included setting specifications for an ECG code based on present and future applications of such a code.

The following characteristics are considered essential:

1. The limitations of present computer ECG programs should not determine the scope of a code and should not exert a constraining effect on the vocabulary to be used between human and computer. In order to retain the capabilities of the human language and to allow the computer to grow and match the human vocabulary it is recommended that

a vocabulary of root terms with specified syntax be employed.

2. In order to accommodate the requirements of the different users of electrocardiograms

a viable ECG code has to cover all aspects of the ECG considered relevant.

In particular, the code must be able to represent diagnostic statements of categories A, B and C [7] defined as:

- (i) Type A statements define a degree of likelihood for the presence of a specific disease or clinical condition.

(ii) Type B statements identify electrophysiologic conditions defined and detected primarily by the ECG itself. In some instances the condition can be confirmed by invasive electrical probes.

(iii) Type C statements describe features in the electrocardiogram which may or may not be related to anatomic lesions or the physiologic state. Although they may have importance in the context of other clinical information, taken by themselves their specificity is low or unknown.

In addition, the code should also accommodate measurements of selected ECG waveforms, especially when used in connection with computers.

3. Although it is mandatory to define the root term in the code explicitly, the code should be usable by the different 'schools' of electrocardiography. It is therefore required that

the code be transparent with respect to the criteria used for the diagnosis.

4. Electrocardiography continues to evolve as a medical science. New terms and definitions are constantly being introduced. A code describing electrocardiographic findings has to be like a living language, able to adapt to evolutionary changes. It is therefore recommended that

the code be flexible and allow (i) expansion; (ii) correction; (iii) modification.

It is however strongly recommended that expansion should always be based on new knowledge. Trivial modifications or additions obviously should be avoided.

5. The success of a code is critically dependent on user acceptance. To ensure the code's utility value it should be

(i) efficient of time, labor or expense

(ii) easily understood

(iii) suitable for easy storage and retrieval

6. One of the anticipated uses of an ECG code is to facilitate comparison of an individual's ECGs which have been recorded for different purposes and over an extended period of time.

In order to permit such a use, the

code has to be suitable for all settings of clinical medicine.

In order to be able to use the code effectively

the code should indicate environmental factors which affected the code generation.

The most important factors are

(i) characteristics of ECG input data (e.g. whether recorded according to AHA specifications)

(ii) ECG system characteristics (e.g. lead system, computer analysis program, human interpreter)

(iii) the target for which the diagnosis is made (e.g. clinical-disease oriented, epidemiological and/or research).

A knowledge of the target is especially important, since diagnostic criteria may have been altered to suit the code's use for clinical care or population studies, adjusting sensitivity and specificity according to prevalence.

It is obvious that there remains much work to be done on the definition of diagnostic statements, as started by the World Health Organization [8] and the American College of Cardiology [9]. An ECG code will achieve efficiency and simplicity if it can be based on generally accepted and preferred terminology, minimizing the need for synonyms.

In the final analysis, a viable language (or code) is one that transcends distance, geopolitical or even medical boundaries and remains a living and useful vehicle through the passage of time. Modifications may enrich and shape the language but not prevent its understanding by all those choosing to use it.

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