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An American National Standard

Standard Guide for Construction of a Clinical Nomenclature for Support of Electronic Health Records[1]

This standard is issued under the fixed designation E 1284; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The first ASTM guide for the construction of a new clinical nomenclature was published in 1989 (Guide E 1284). It reflected the knowledge and insight of that time. Subsequently, substantial progress has taken place in this subject area, mostly as part of the efforts toward the development of electronic healthcare records. These efforts have indicated that a clinical nomenclature is a sine qua non (tool), the heart of the electronic patient records generation, and the experience gained has provided some new and some modified criteria for such a clinical nomenclature. These recent developments have prompted Subcommittee E31.12 to revise Guide E 1284 and to include the new knowledge and information that has accumulated during the last few years.

1. Scope

1.1 This guide covers the clinical terms used in everyday clinical communication.

1.2 This guide does not cover terminology listings prepared for other purposes such as those for reimbursement, literature retrieval or scientific reference encoding, because the criteria for these types of term listings are significantly different from those to be observed when a nomenclature is constructed for the support of clinical informatics activities.

1.3 This guide is intended to outline the nosologic concepts for a clinical nomenclature that is designed to support electronic healthcare records.

1.4 The purpose of this guide is to describe the desiderata (needed requirement) for a nomenclature that is dedicated to clinical use and can serve as a way for maintaining nationwide compatibility among electronic healthcare records generated in the United States.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 1384 Guide for Description for Content and Structure of an Automated Primary Record of Care[2]

E 1769 Guide for Properties of Electronic Health Records and Record Systems[2]

2.2 *ISO Standards:*

ISO 5218 Information Interchange[3]

ISO 2955 Information Processing[3]

ISO 8072 Network Standards[3]

ISO 8601 Data Elements and Interchange Formats[3]

ISO 8859 Information Processing[3]

ISO 5218 IS Representation of the Human Sexes[3]

ISO IS 704 Principles and Methods of Terminology[3]

ISO DIS 860 International Harmonization of Concepts and Terms[3]

ISO DIS 1087–1 Terminology Work-Vocabulary-Part I: Theory and Application[3]

ISO DIS 1087–2 Terminology Work-Vocabulary-Part II: Computational Aids in Terminology[3]

ISO DIS 1951 Lexigraphic Symbols and Typographical Conventions for Use in Terminography[3]

ISO TR 9789 Information System Technology—Guidelines for the Organization and Representation of Data Elements for Data Interchange—Coding Methods and Principles[3]

ISO IS 1024 International Terminology Standards—Preparation and Layout[3]

ISO DIS 12616 Translation-Oriented Terminology[3]

ISO DIS 12200 Terminology—Computer Applications—

[1] This guide is under the jurisdiction of ASTM Committee E-31 on Healthcare Informatics and is the direct responsibility of Subcommittee E31.01 on Controlled Health Vocabularies for Healthcare Informatics.

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[2] *Annual Book of ASTM Standards*, Vol 14.01.

[3] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

Machine Readable Terminology Interchange Format[3]
ISO DIS 12620 Terminology—Computer Applications—Data Categories[3]
2.3 *ANSI Standards:*
ANSI ASCX12 Version 3, Release 3[3]
ANSI X3.30 Representation for Calendar Date and Ordinary Date[3]
ANSI X3.43 Information Systems Representation of Local Time of Day for Information Exchange[3]
ANSI X3.51 Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange[3]
2.4 *Other Standards:*
HL7: Health Level Seven Version 2.2[4]
ACR/NEMA: DICOM Version 3.0
CEN ENV 12262 Model of Semantics

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* Term definitions in this section are limited to the characterization of the meaning of terms in context of this guide, namely, the meaning for construction of a clinical nomenclature for the support of automated creation of electronic health records.

3.1.1 *attribute selection for hierarchical classification*—choice of a characterizing feature of a class of concepts that allows partitioning, as defined by the architects of the classification system. (Three most successful classification systems used a single attribute: botany used binomial attribute, biology related classification to evolution, chemistry utilized the atomic weight.)

3.1.2 *class term*—a term that encompasses terms that are in one sense similar but in some another sense heterogeneous, dissimilar. A class term is clinically meaningfully partitioned, when this partitioning results in subclasses with increased similarity among the members of each subclass.

3.1.3 *class term partitioning*—the act of separating a class concepts into subclasses, where the created subclasses include all members of the partitioned class term.

3.1.4 *classified system*—systematic arrangement of concepts into categories according to preset explicit criteria, following a chosen nosologic scheme, such a hierarchical or matrix arrangement.

3.1.5 *compound hierarchy*—a stepwise hierarchical arrangement where more than one attribute is used for partitioning. The most appropriate attribute to guide the act of partitioning is chosen by the architects of the nomenclature.

3.1.5.1 *Discussion*—Design of a particular equally good hierarchy tree is not to be viewed as necessarily the only acceptable partitioning scheme. An alternative is the matrix design. Furthermore, partitioning of some class terms is controversial. For example, the concept anemia, an obvious class term, may be partitioned on the basis of the size of the red cells (nomocytic, macrocytic and microcytic anemias), by the use of erythrokinetic differences (increased loss or insufficient production of red cells), or on the basis of the reticulocyte level. The "best" attribute chosen by the architects of the nomenclature should be critically evaluated in terms of the current view of clinical practice with regard to that particular class term partitioning (textbooks, monographs, etc.), and the impact of a particular class term partitioning upon the retrieval of that term or related terms in actual usage.

3.1.6 *concept*—a summarizing abstract idea derived from a generalizing process, following an abstracting mental process. Concept is a general notion to represent a class of objects.

3.1.6.1 *clinical concept*—a mental image generated and used within the domain of clinical activities, based on the characteristics of a class of real-world instances, including the features typically associated with or suggested by that image.

3.1.7 *health record*—the collection of data and information gathered, or generated, to document (clinical care rendered to an individual) the conditions of an individual and any health care planned, ordered, or rendered.

3.1.7.1 *electronic health record*—a comprehensive, structured set of clinical, demographic environmental, social, and financial data and information, in electronic form, documenting the health care planned, ordered, or rendered related to a single individual. The electronic health record may include health related information from non-clinical sources that may not fully conform to the standardized clinical nomenclature. Even so, when possible, such information should be interpreted and classified, according to the paradigm of the clinical nomenclature. This will allow handling such material effectively.

3.1.8 *hierarchical classified system*—a special subset of classified systems with stepwise ranking of the concepts where subordinated lower level concepts are the result of a partitioning process, based on a preselected and clearly stated attribute(s).

3.1.9 *lexical meaning*—the definition of the meaning, a word or phrase generally, out of context, as listed in appropriate lexicons, such as medical dictionaries.

3.1.10 *nomenclature*—comprehensive systematized terminology where the preferred terms are ordered into a classified system based on their meaning and where semantic kinships are held together.

3.1.11 *nosology*—the science and technology of naming and classifying clinical concepts, such as anatomic terms, biochemical and physiologic terms, symptoms, signs, clinical problems and diagnoses, terms of etiology and therapy, nursing, and others used by healthcare team members. Nosology is domain specific.

3.1.11.1 *nosologic sheme*—a currently accepted and prevailing thinking about organization of clinical concepts based on accepted classification theories (probabilistic reasoning, fuzzy set theory, etc.).

3.1.12 *single-key hierarchy*—also called directly hierarchy, is a stepwise hierarchical arrangement of concepts using the same single attribute (the key) for partitioning throughout the nomenclature.

3.1.12.1 *Discussion*—Theoretically, all clinical terms should be classifiable into a single-key hierarchy where all class terms and subclass terms are based on a single key such as etiology, or outcome, or some other preselected key attribute. Our present knowledge does not allow the creation of

[4] Available from Health Level 7, 3300 Washtenaw Ave., Suite 227, Ann Arbor, MI 48108.

such a pure direct hierarchy. For example, if etiology would be chosen as sole-key attribute, terms with multiple etiologies or considered idiopathic would create difficulties.

3.1.13 *tangled hierarchy*—a particular subset of hierarchical arrangements which permits the occurrence of certain terms in multiple but interlinked positions.

3.1.13.1 *Discussion*—Organ system-based systematization is traditional and deep-seated in clinical medicine, but this widely used organization may occasionally fail, for example, with the classification of the ovaries which belong both to the family of endocrine glands and to the female reproductive organs.

3.1.14 *term*—a word or phrase having a limiting and definite meaning in a particular branch of science or art. Linguistically, a term is a word or phrase representing a concept. Semantically, a term is a word or phrase with a defined lexical meaning. Clinically, a term is a word or phrase used in professional clinical communication that has a generally accepted valid clinical meaning.

3.1.14.1 *deprecated term*—a word or phrase synonymous or near-synonymous with the preferred term but disapproved by the architects of the nomenclature, deemed to be obsolete, misnomered, incorrect, ambiguous, or potentially offensive.

3.1.14.2 *descriptive term*—a word or phrase referring to a characteristic attribute of the concept represented, such as regional enteritis.

3.1.14.3 *eponymic term*—a word or phrase linked to a particular person's name, such as Crohn's disease.

3.1.14.4 *preferred term*—the term that has been formally chosen by the architects of the nomenclature as the most appropriate representation of a particular concept. Generally, descriptive terms are preferred over eponymic terms.

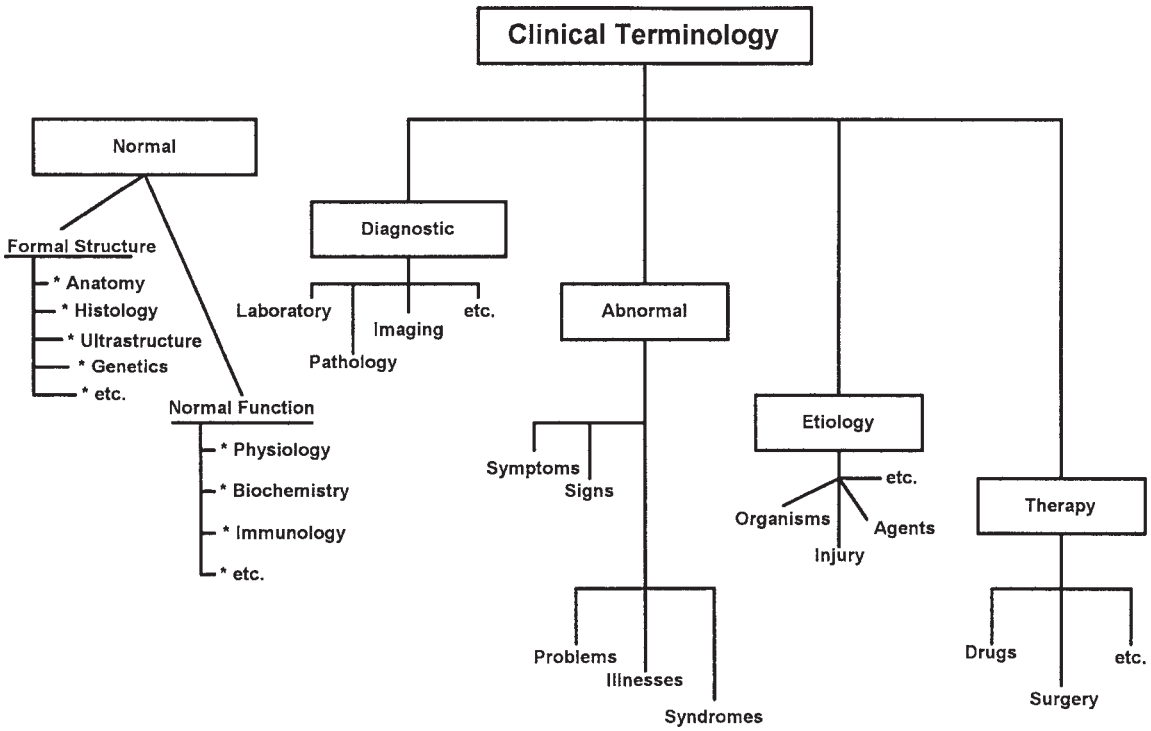
3.1.14.5 *synonymous term*—also called admitted term, means a term with identical meaning and usage as the preferred term, and deemed interchangeable with the preferred term.

3.1.14.6 *terminal term*—also called end term, is a term that cannot be further partitioned in order to gain increased similarity among instances. During a particular class term partitioning, attention must be focused upon the quality of retrieval of subclass terms in actual usage. Prudent selection of the key attribute for the partitioning of each class term should aim at the clinically most useful key, and this may be a recursive process, driven by the benefits gained by alternative partitionings. It is also an option to include all the several currently accepted partitions of a class term, such as in the case of anemia, and let the user select the partitioning of choice.

3.1.15 *terminology*—an aggregate of terms representing various concepts of a particular subject area.

3.1.15.1 *clinical terminology*—an aggregate of terms representing currently accepted clinical concepts.

3.1.15.2 *Discussion*—A clinical term is the linguistic representation of a clinical concept, or a healthcare-related concept, such as "cerebral concussion" or "activities of daily living," and includes all healthcare-related terms. Bioclinical terminology is larger in scope, also including many basic science terms such as "electron donor" or "genetic transcription." Generally,



NOTE 1—The field of nosology is still in an evolutionary phase, and other classification schemes may be equally effective.

FIG. 1 An Optional Classification Scheme for Clinical Terms

such bioclinical terms are clinically pertinent, but infrequently used in clinical communication.

4. Criteria for a Clinical Nomenclature to Support Generation of Electronic Health Records

4.1 The following are some essential criteria:

4.1.1 *Comprehensive*— The nomenclature supporting electronic health records shall list all the clinical terms used by all members of the healthcare team involved in record writing. Moreover, the nomenclature shall list all preferred terms, synonyms, near-synonyms and vernacular expressions that may be encountered in a health record.

4.1.2 *Source and Context Sensitive*—Ambiguous clinical terms must be resolved by appropriate codes. For example, "dyspnea" may be a symptom or a sign. After interpreting the source or context, or both, the nomenclature must be able to differentiate such ambiguities.

4.1.3 *Nosologically Sound*—The nomenclature classification system should be logical, in line with modern nosology put forward in related current textbooks and scientific publications.

4.1.4 *Current*—Clinical terminology shall be viewed as a dynamic aggregate of terms with a constant addition of new terms and with adjustment of altered meaning or classifications. This calls for frequent purposeful updating. However, such updating shall conserve continuity between the term previous to the change and the post-change term(s), in order to protect the database. Updating should be regular, publicized, and frequent.

4.1.5 *Computer-Based*— For effective support of clinical text analysis, and for efficient updating, the nomenclature should be computer-based.

4.1.6 *Software Supported*—The nomenclature should have explicit data format designed for use in a computerized environment, and the nomenclature software should permit efficient and easy retrieval and matching of any clinical term.

4.1.7 *Integrated*—The nomenclature should be able to be cross-referenced with other terminology listings currently in use and future terminology listings such as the International Classification of Diseases (ICD-9CM), Current Procedural Terminology (CPT), SNOMED III and various specialty terminologies such as the Diagnostic and Statistical Manuals of Mental Disorders (DSM-IV) or the various nursing vocabularies.

4.1.8 *Coded*—The code should uniquely and permanently represent the corresponding term. This code scheme should not carry information about the term. In addition, a meaningful code may be attached, based on the clinical meaning and the nature of the parental terms; such a code may be valuable in keeping semantic kinships together, which may be particularly helpful for flexible retrieval.

4.1.9 *Clinical Communication Oriented*—The nomenclature should not only list the canonical (pure concept-based) clinical terms, but also phrases, abbreviations, idioms, and other expressions that may be present in a clinical record.

4.1.10 *Compatible*—The nomenclature should maintain compatibility with all healthcare system records, throughout the United States, for longitudinal record file creation and for information transfer.

4.1.10.1 The nomenclature should also be compatible with other text processing tools such as nonclinical word/phrase lexicons.

4.1.10.2 The nomenclature should also be compatible with the various knowledge managers such as the National Library of Medicine's search listings initiative, knowledge coupling databases, and other clinical information distributors.

4.1.10.3 Compatibility of the clinical nomenclature should also include the terminology of periclinical terminology domains such as psychology, sociology, legal, and clinical terms, because these terms may also occur in the clinical record.

5. Significance and Use

5.1 Terminology guidelines are essential for precise interhuman communication. A guide for clinical terminology has an additional task: to maintain compatibility among health records generated at different times, and at different geographic locations. Current lack of such clinical terminology guidelines is a barrier that prevents progress in the development of electronic health records.

RELATED MATERIAL

(**1**) American Medical Association, *Standard Nomenclature of Diseases and Operations*.

(**2**) College of American Pathologists, *The Systematized Nomenclature of Medicine*, SNOMED International, 1993.

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(**9**) McCloskey, J. C. and Bulechek, G. M., eds., *Nursing Interventions Classification*, Mosby-Yearbook, St. Louis, MO, 1992.

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