
**Health Informatics — Categorical
structure for representation of 3D
human body position system —**

**Part 1:
Bones**

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 215, *Health informatics*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Anatomical descriptions can be very abstract, requiring long narrative descriptions. These descriptions can lead to ambiguity and coding inconsistency. Text-based expressions lack expressiveness and accuracy, medical information is not captured and re-used sufficiently and there are also issues in interoperability. There is currently no unified way of expressing anatomical concepts.

However, recent advancements in imaging technology are dramatically revolutionizing the field. For instance, the spatial resolution in a CT scan is less than 1 mm. Regarding accuracy and expressiveness, it is believed that the gap between medical imaging and clinical terminology is increasing over time. Patients are also having problems understanding their disease because visualization is not given by standard terminology.

Healthcare workers are seeking to achieve additional expressiveness by adopting 3D data in the medical field. Radiation therapies are designed by 3D systems to generate optimal intensities while protecting adjacent tissue. In operating theatres, operations are often guided by 3D navigation systems. For example, arthroplasties are designed and simulated before surgery using 3D technology. Researchers are also studying ways to simulate operation tactics using 3D data by 3D printing, such as AR (augmented reality) and VR (virtual reality). Since 3D systems can deliver accurate spatial information in the human body, it is evident that a standard terminology infrastructure will provide additional expressiveness, accuracy and comparability when 3D data is adopted in medical informatics. Since anatomy is a key piece of information in many clinical descriptions, 3D data can increase the accuracy and expressiveness of clinical terminology. 3D data are numbers that can be processed by mathematical functions providing more computability in research, software production and artificial intelligence.

3D systems provide a consistent way of expressing anatomical concepts in a precise manner. Accurate data can improve data exchange between electronic health records, epidemiological analysis and quality. Increased accuracy also means better clinical decision support systems for patient safety, reducing medical errors and improving efficiency. It also provides visual information for patients and caregivers when conventional standard terminology system does not. HBPS (Human body position system) is intended to be used in electronic health records, personal health record and various medical research purposes.

HBPS is a way of expressing clinical concepts by combining 3D data and text-based terminology. Although the main purpose of 3D is graphical expression, it can play a terminological role in many ways as it has accurate anatomical concept. It can have attributes that are similar to codes in semantic terminological system. It can be pre- or post-coordinated, just as conventional terminological concepts. Since the data inside a 3D system is purely numeric, it can be captured and retrieved better than semantic medical information.

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Health Informatics — Categorial structure for representation of 3D human body position system —

Part 1: Bones

1 Scope

This document describes the high-level concepts required for representation of 3D data in health information systems from a terminological perspective. It is intended to be used in analyzing, developing and managing terminologies in HBPS. The use cases include clinical findings, disorders, problem lists and procedures.

Topics considered in the scope of this document:

- description of terminological concepts for representation of 3D data for human body;
- establishing of the relationships needed for 3D data in terminological systems;
- use cases.

Topics considered outside the scope of this document:

- 3D data structure, implementation and software functionality.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 General

3.1.1

3 dimensional

3D

computer graphics that define an object by its width, length and depth

Note 1 to entry: See [Figure 1](#).

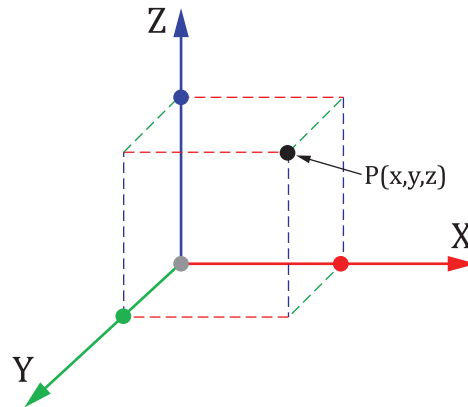


Figure 1 — Three-dimensional space and coordinate of a point

3.1.2

3D data element

unit of 3D data for which the definition, identification, representation, and permissible values are specified by means of a set of attributes

Note 1 to entry: A 3D data element include vertex (a single point that has three-dimensional position and corner of a 3D model), edge (where two faces meet), face (surface of 3D model defined by vertices and edges) and polygon (straight-sided shapes, defined by vertices and edges).

Note 2 to entry: See [Figure 2](#).

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3.1.3

human anatomy

study of structures in the human body and how the body parts are organized, physical substance of the human organism

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Note 1 to entry: Human anatomy is composed of living cells and extracellular materials and organized into tissues, organs and systems.

3.1.4

anatomical site

formal representation of a sanctioned characteristic composed of the semantic link {HasAnatomicalSite} with an associative relation to the characterizing category including but not limited to <Anatomical structure>

[SOURCE: ISO/TS 22789:2010, [3.2.1](#)]

3.1.5

terminology

structured, human and machine-readable representation of concepts

3.1.6

concept

unit of knowledge created by a unique combination of characteristics

[SOURCE: ISO 1087:2019, 3.2.7, modified — Notes to entry removed.]

3.1.7

clinical terminology

terminology describing health conditions and healthcare activities

3.2 Characterizing categories

3.2.1

3D model

three-dimensional model in virtual space composed of *3D data elements* (3.1.2)

Note 1 to entry: The 3D model covers the human body model and the 3D site model representing these concepts virtually.

3.2.2

3D human body model

3D model (3.2.1) that represents a normal anatomical structure

Note 1 to entry: See [Figure 2](#).

Note 2 to entry: A human body model, which defines systems, organs and body regions, is composed of multiple 3D models.

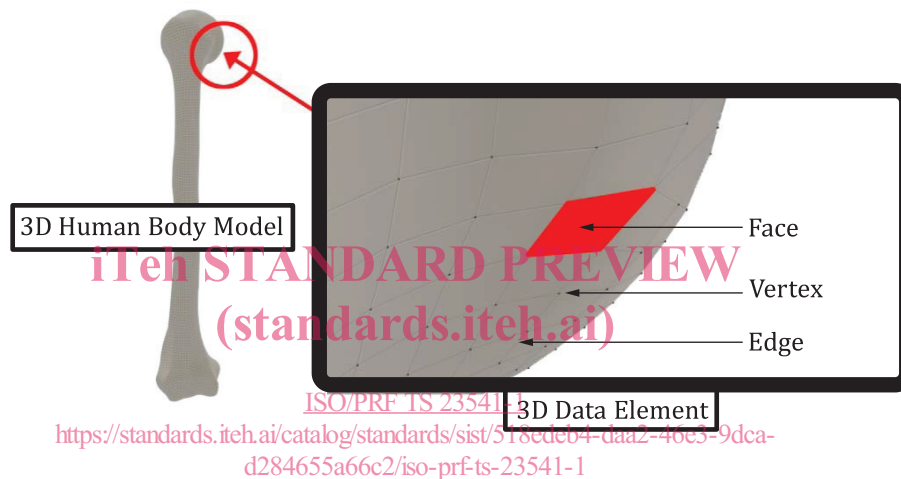


Figure 2 — 3D human body model and 3D data element

3.2.3

3D site model

3D model (3.2.1) that represents *anatomical sites* (3.1.4)

Note 1 to entry: It is used to annotate clinical concepts, such as disorder, symptom and finding. It describes the location, size, shape and volume of anatomical areas in which health professionals are interested.

3.2.4

virtual medical entity

entity that represents a medical concept in virtual space

Note 1 to entry: A virtual medical entity is composed of a 3D model and a descriptive entity. The medical *concept* (3.1.6) can be pre-coordinated, i.e. predefined within a formal (concept representation) system, with an equivalent single unique concept identifier, or post-coordinated, i.e. represented using more than one concept from one or many compositional systems, combined using mechanisms within or outside the compositional systems, with a corresponding 3D model.

3.2.5

virtual body part

medical entity (3.2.4) that constitutes part of a human body in virtual space

Note 1 to entry: It represents body structure or normal anatomy part in virtual space

EXAMPLE Virtual Body Part “L3 Vertebra” (see [Figure 4](#)).

3.2.6

virtual clinical finding

virtual medical entity (3.2.4) that constitutes a clinical finding

Note 1 to entry: It includes diagnosis, symptom, nursing diagnosis.

EXAMPLE Virtual Finding “L4 body osteomyelitis” (see [Figure 5](#)).

3.2.7

virtual clinical intervention

virtual medical entity (3.2.4) that constitutes clinical interventions or clinical activities that help treat or cure a condition

EXAMPLE Virtual Intervention “L4 laminectomy, right” (see [Figure 6](#)).

3.2.8

virtual observation

virtual medical entity (3.2.4) that constitutes an observation or assessment of patient condition

EXAMPLE Virtual Observation “Blood pressure measured at right upper arm” (see [Figure 7](#)).

3.2.9

virtual object

virtual medical entity (3.2.4) that constitutes an object in the human body that originates outside the body

Note 1 to entry: Virtual objects can be found in human body by intervention, accident or operative procedure.

EXAMPLE Virtual Object “hip implant device, right” (see [Figure 8](#))

3.2.10

descriptive entity

text-based description of a *virtual medical entity* (3.2.4)

Note 1 to entry: It provides description to a 3D model to form a *virtual medical entity* (3.2.4). It can be used as a pre-coordinated concept representation, i.e. predefined within a formal (concept representation) system, with an equivalent single unique concept identifier or post-coordinated, or as a post-coordinated concept representation, i.e. using more than one concept from one or many compositional systems, combined using mechanisms within or outside the compositional systems, with a 3D model (3.2.1).

3.2.11

text body part

descriptive entity (3.2.10) that constitutes a part of the human body

Note 1 to entry: It represents concepts of body structure or normal anatomy.

- Bone structure of right tibia (SCTID: 719491009)
- Structure of mid-palmar space (SCTID: 58841000)
- Structure of epiphyseal line (SCTID: 84157002)
- Knee joint cavity (SCTID: 305003004)
- Entire tuberosity of phalanx (SCTID: 727352007)

3.2.12

text finding

text-based entity that represents a judgment on clinical status

Note 1 to entry: It contains diagnosis, symptom, nursing diagnosis.

- Fracture of Bone (SCTID: 125605004)
- Pain in left leg (SCTID: 287047008)