TECHNICAL REPORT

ISO/TR 11147

First edition
2023-06

Health informatics — Personalized digital health — Digital therapeutics health software systems

Informatique de santé — Santé numérique personnalisée — Systèmes logiciels de santé pour la thérapeutique numérique

Reference number
ISO/TR 11147:2023(E)

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Published in Switzerland

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Foreword

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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

As the healthcare sector evolves, there is an increasing demand for the production and appropriate use of digital health technologies (DHTs) across patient care settings. DHTs represent a broad spectrum of products ranging from clinician-facing electronic prescribing systems, telemedicine platforms, and decision support systems, to patient-facing wellness apps, diagnostic tools, monitoring products, digital biomarkers, and therapeutics.

Given the diversity of digital products available, it is important for patients, clinicians, and healthcare decision makers to have the ability to clearly distinguish between the numerous types of DHTs on the market. Without harmonized international guidance, healthcare decision makers and users are often unable to differentiate between, assess, and optimize the appropriate use of DHTs in practice based on the intended use of each product.

Digital therapeutics (DTx), as defined in this document, represent a type of medical product that can be used as standalone therapy, incorporated into a multi-functional DHT, or integrate into clinical care pathways alongside clinician-delivered therapies, pharmaceuticals, medical devices, or other DHTs.

Standards exist for various non-DTx DHT product categories and varying DTx product definitions, best practices, and country-level standards exist at the industry level (see Annex A), yet no DTx-specific international standards exist. This document centres on the ability of DTx to generate and deliver validated and measurable medical interventions directly to patients. It is relevant to patients, clinicians, healthcare decision makers, and product manufacturers.

Health informatics — Personalized digital health — Digital therapeutics health software systems

1 Scope

This document lists characteristics of a category of health software: digital therapeutics (DTx). DTx products generate and deliver medical interventions that are based on clinical evidence, have demonstrable positive therapeutic impacts on patient health, and produce real-world outcomes. Product use cases (see Annex B) demonstrate the variety of products represented in this quickly growing industry.

This document provides an overview of how DTx relates to other ecosystem constructs, including medical devices, software as a medical device (SaMD), software in a medical device (SiMD), and other digital health technologies (DHT). It also addresses relevant health and medical device software standards that have various degrees of applicability to DTx.

The focus of this document is on therapeutic products that are used in the context of a disease, disorder, condition, or injury for human use. It does not address products that are intended for veterinary use or for general wellbeing. Additional exclusions of this document include DTx market access pathways (i.e. prescription, non-prescription pathways), medical device requirements, product risk assessment, clinical evidence requirements, data security, patient privacy considerations, and product authorization pathways.

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
digital health technology
DHT
system that uses computing platforms, connectivity, software, and sensors for healthcare and related uses

Note 1 to entry: These technologies span a wide range of uses, from applications in general wellness to applications as a medical device. They include technologies intended for use as a medical product, in a medical product, or as an adjunct to other medical products (devices, drugs, and biologics). They can also be used to develop or study medical products.

[SOURCE: BEST Resource[1]]

3.2
system
combination of interacting elements organized to achieve one or more stated purposes

[SOURCE: ISO/IEC/IEEE 15288: 2015, 4.1.46, modified — Notes to entry deleted.]

3.3
user
person using the system for a health-related purpose

Note 1 to entry: The user can be the subject of care directly, or an individual assisting (as proxy for) the subject of care.

[SOURCE: ISO 81001-1:2021, 3.1.14]

3.4
intended use
intended purpose
use for which a product, process or service is intended according to the specifications, instructions and information provided by the manufacturer

Note 1 to entry: The intended medical indication, patient population, part of the body or type of tissue interacted with, user profile, use environment, and operating principle are typical elements of the intended use.

[SOURCE: ISO/IEC Guide 63:2019, 3.4, modified — Added admitted term "intended purpose".]

3.5
digital therapeutic
DTx
health software intended to treat or alleviate a disease, disorder, condition, or injury by generating and delivering a medical intervention that has a demonstrable positive therapeutic impact on a patient's health

Note 1 to entry: Many jurisdictions consider DTx a medical device.

Note 2 to entry: DTx can integrate with ancillary components to form a DTx system by:

— using general purpose hardware or platforms (i.e. smartphone, tablet, computer, watch, headset), input or output components (i.e. wearables, sensors), pharmaceuticals, or patient or clinician support components necessary for DTx functioning;

— using patient- and context-specific data to generate a medical intervention.

Note 3 to entry: DTx can function independently or in addition to other interventions, such as integrating with:

— other DHT components (i.e. monitoring, diagnostic, clinical decision support) as part of a multi-functional DHT product;

— tandem medical interventions (i.e. clinician-delivered therapies, pharmaceuticals, medical devices, DHTs).

Note 4 to entry: DTx includes secondary prevention and tertiary prevention.

Note 5 to entry: DTx is produced in compliance with good product life cycle (PLC) management practices, through use of a quality management system which encompasses demonstrated safety and effectiveness, and post-market surveillance.

3.6
medical device
instrument, apparatus, implement, machine, appliance, implant, reagent for in vitro use, software, material or other similar or related article, intended by the manufacturer to be used, alone or in combination, for human beings, for one or more of the specific medical purpose(s) of

— diagnosis, prevention, monitoring, treatment or alleviation of disease,

— diagnosis, monitoring, treatment, alleviation of or compensation for an injury,

— investigation, replacement, modification, or support of the anatomy or of a physiological process,

— supporting or sustaining life,

— control of conception,

— disinfection of medical devices,

— providing information by means of in vitro examination of specimens derived from the human body,

and which does not achieve its primary intended action by pharmacological, immunological or metabolic means, in or on the human body, but which can be assisted in its intended function by such means

Note 1 to entry: Products which can be considered to be medical devices in some jurisdictions but not in others include:

— disinfection substances,

— aids for persons with disabilities,

— devices incorporating animal and human tissues,

— devices for in-vitro fertilization or assisted reproductive technologies.

[SOURCE: ISO/IEC Guide 63:2019, 3.7]

3.7
medical intervention
activity intended to maintain or improve an individual's health or functioning, or to alter the course of a disease, disorder, or condition for the better, or to restore function lost through disease or injury

3.8
health software
software intended to be used specifically for managing, maintaining or improving health of individual persons, or the delivery of care

Note 1 to entry: Health software fully includes what is considered software as a medical device.

[SOURCE: IEC 82304-1:2016, 3.6, modified — Note 2 to entry deleted.]

3.9
evidence
directly measurable characteristics of a process or product that represent objective, demonstrable proof that a specific activity satisfied a specified requirement

[SOURCE: ISO/IEC 21827:2008, 3.19]

3.10
software as a medical device
SaMD
software intended to be used for one or more medical purposes that performs these purposes without being part of a hardware medical device

Note 1 to entry: SaMD is a medical device and includes in-vitro diagnostic (IVD) medical device.

Note 2 to entry: SaMD is capable of running on general purpose (non-medical purpose) computing platforms.

Note 3 to entry: "without being part of" means software not necessary for a hardware medical device to achieve its intended medical purpose.

Note 4 to entry: Software does not meet the definition of SaMD if its intended purpose is to drive a hardware medical device.

Note 5 to entry: SaMD can be used in combination (e.g. as a module) with other products including medical devices.

Note 6 to entry: SaMD can be interfaced with other medical devices, including hardware medical devices and other SaMD software, as well as general purpose software.

Note 7 to entry: Mobile apps that meet the definition above are considered SaMD.

[SOURCE: IMDRF 2013,[7] modified — 'may' changed to 'can'.]

3.11
software in a medical device
SiMD
software that is used as an integral part of a specified hardware medical device or is intended to drive a hardware medical device

3.12
health
state of complete physical, mental and social well-being and not merely the absence of disease or infirmity

[SOURCE: WHO 1948[8]]

3.13
risk
combination of the probability of occurrence of harm and the severity of that harm

Note 1 to entry: The probability of occurrence includes the exposure to a hazardous situation and the possibility to avoid or limit the harm.

[SOURCE: ISO/IEC Guide 63:2019, 3.10]

3.14
privacy
freedom from intrusion into the private life or affairs of an individual when that intrusion results from undue or illegal gathering and use of data about that individual

[SOURCE: ISO/TS 27790:2009, 3.56]

3.15
positive therapeutic impact
favourable or useful response to, effect resulting from, or outcome of a medical intervention

3.16
component
collection of system resources that a) forms a physical or logical part of the system, b) has specified functions and interfaces, and c) is treated (e.g. by policies or specifications) as existing independently of other parts of the system

[SOURCE: IETF RFC 4949,[10] modified — Note 1 deleted.]

3.17
tandem medical intervention
two or more medical interventions, each capable of producing a positive therapeutic benefit, when implemented together, which are expected to produce a higher level of benefit than either one alone

3.18
secondary prevention
intervention for individuals or groups that demonstrate early psychological or physical symptoms, difficulties, or conditions (i.e. subclinical problems), which is intended to prevent the development of more serious dysfunction or illness

[SOURCE: APA [11]]

3.19
tertiary prevention
intervention for individuals or groups with already established psychological or physical conditions, disorders, or diseases

Note 1 to entry: Tertiary interventions include attempts to minimize negative effects, prevent further disease or disorder related to complications, prevent relapse, and restore the highest physical or psychological functioning possible

[SOURCE: APA [11]]

3.20
quality management system
part of a management system with regard to quality

Note 1 to entry: Requirements for a quality management system are given in ISO 9001.

[SOURCE: ISO 9000:2015, 3.5.4, modified — Note 1 to entry replaced with new note 1 to entry.]

3.21
safety
freedom from unacceptable risk

[SOURCE: ISO/IEC Guide 63:2019, 3.16]

3.22
effectiveness
ability to produce the intended result

[SOURCE: ISO 81001-1:2021, 3.2.5]

4 Context

The digital health landscape encompasses a broad range of technologies, with each serving a specific purpose. While some DHTs are used for wellness, medication adherence, monitoring, or patient diagnosis, DTx products use software to generate and deliver a medical intervention that directly impacts a disease, disorder, condition, or injury. Without a common international DTx definition, healthcare decision makers are not able to consistently identify DTx products and distinguish them from other DHTs and medical devices to determine which products best meet patient and population needs and expectations.

National regulatory, assessment, and reimbursement frameworks are increasingly emerging to better enable DHT market and patient access:

— In 2010, the U.S. Food and Drug Administration (FDA) granted its first Class II 510(k) medical device clearance to a DTx product,[15] and in 2017, its first de novo product clearance[16].

— In 2013, the International Medical Device Regulators Forum (IMDRF) published 'Software as a Medical Device (SaMD): Key Definitions' to establish a common framework for regulators to incorporate converged controls into their regulatory approaches for SaMD[7].

— In 2018, the Belgian Federal Government launched the mHealthBelgium platform for mobile apps that are CE-marked as a medical device[17].

— In 2019, England's National Institute for Health and Care Excellence (NICE) released the Evidence for Effectiveness functional classification of DHTs that categorizes three tiers of DHTs based on potential risk to users. The framework was updated in 2022[18].

— In 2020, Germany launched a Fast-Track Process for Digital Health Applications [digitale Gesundheitsanwendungen (DiGA)],[19] with Class I or Class IIa medical devices under the European Union's Medical Device Regulation (MDR) qualifying for DiGA recognition.