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Ministry of Food and Drug Safety

Artificial intelligence Medical Device(AIMD) – Regulatory Practice

Ministry of Food and Drug Safety

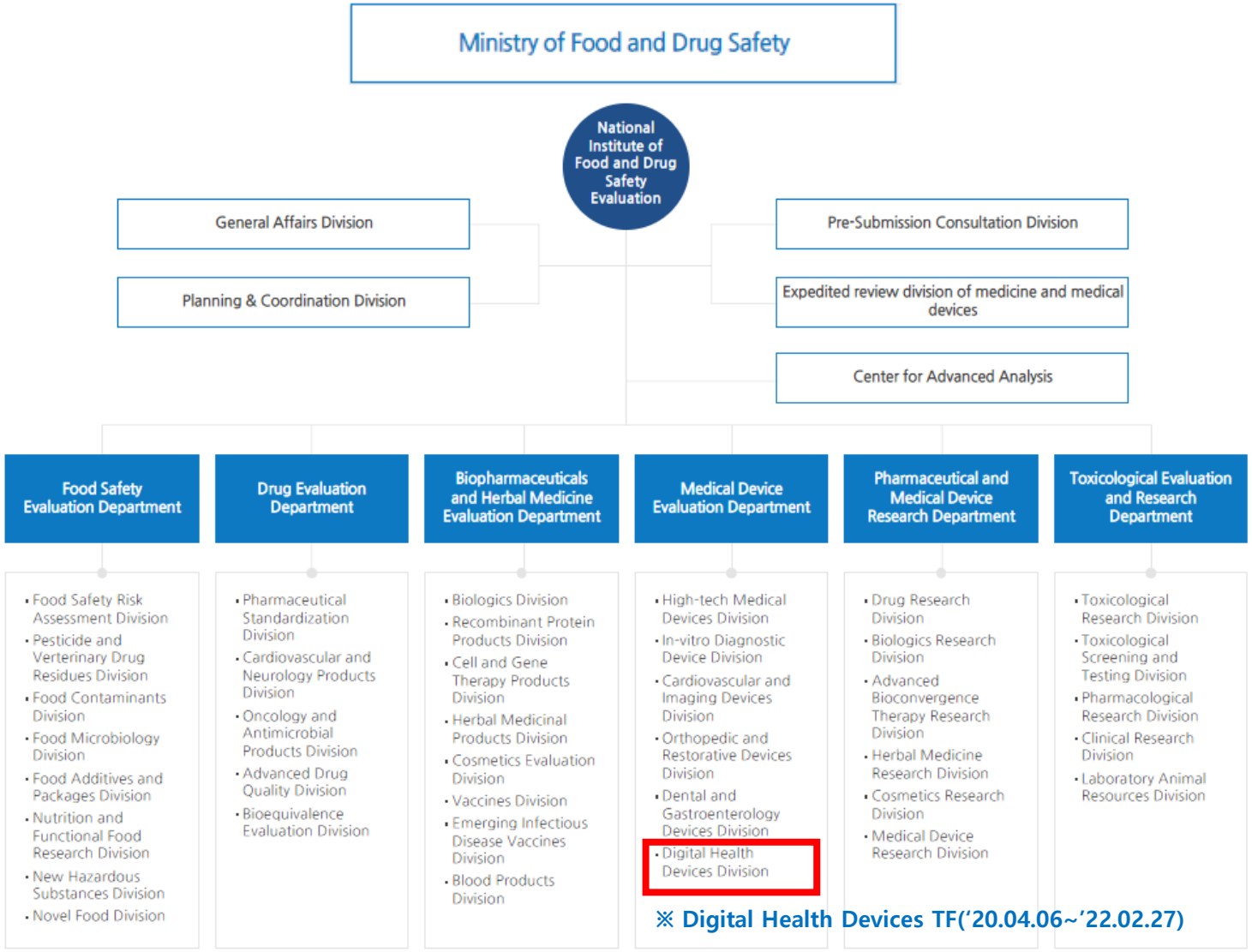
CONTENTS

01. Launch of Dedicated Division

1 - 1

Organization Chart, MFDS

「Digital Health Devices Division」 was established (2022-2-28)



※ Digital Health Devices TF('20.04.06~'22.02.27)

01. Launch of Dedicated Division

1 - 2

Primary Task

Review Technical Documents

- ✓ Software as a medical device (SaMD)
- ✓ AI-based medical devices
- ✓ Digital therapeutics (DTx)
- ✓ Medical devices with VR·AR technology
- ✓ Mobile medical apps
- ✓ Telemedicine devices
- ✓ Cybersecurity

Regulatory Support

- ✓ Regulatory support for digital health products
- ✓ Publication · revision of guidance for digital health products
- ✓ Review of pre-certification of innovative SaMDs manufacturers
- ✓ Designation of innovative SaMDs
- ✓ Providing training for certification bodies & cybersecurity companies on technical documents
- ✓ Leading & Contributing to international harmonization of Korean regulation

03. Achievements of Regulatory Improvement

3 - 1

Regulations, Organization, Guidance

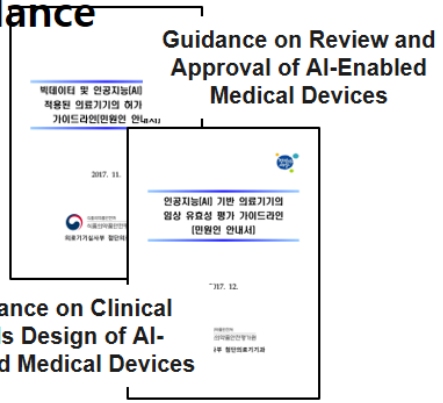
ACT & Regulation

- GMP exemption for exploratory clinical trial (revision)
- ACT ON NURTURING MEDICAL DEVICES INDUSTRY AND SUPPORTING INNOVATIVE MEDICAL DEVICES(enact)
- GMP exemption for exploratory clinical trial (revision)
- Add 90 SaMD Nomenclature(Description, Code, Classification) (revision)
- Introducing a negative system for SaMD change approval (revision)
- Mandatory submission of SaMD Usability for approval(draft)

Organization

- Digital Health Taskforce in Medical Devices Evaluation Department
- Innovative and Diagnostic Medical Devices Policy Division in Medical Device Safety Bureau
- Digital Health Devices Division in Medical Devices Evaluation Department

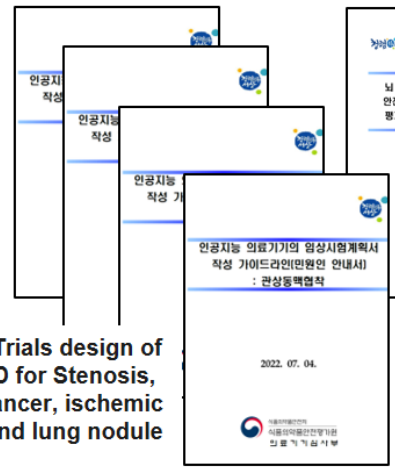
Guidance



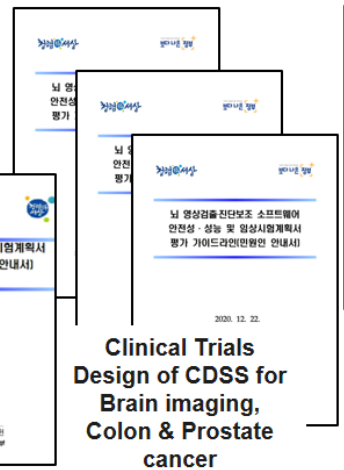
Guidance on Review and Approval of AI-Enabled Medical Devices

Guidance on Clinical Trials Design of AI-Enabled Medical Devices

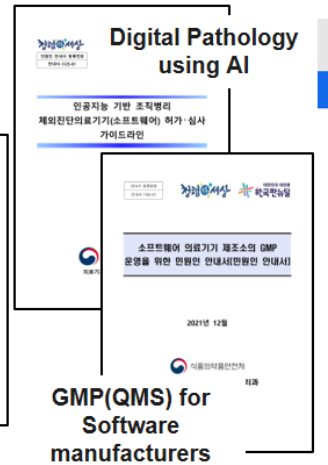
World 1st Guidance for AI/MLMD



Clinical Trials design of AI/MLMD for Stenosis, breast cancer, ischemic stroke, and lung nodule

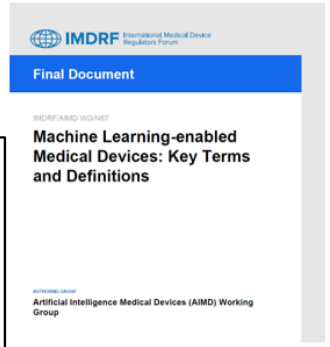


Clinical Trials Design of CDSS for Brain imaging, Colon & Prostate cancer



Digital Pathology using AI

GMP(QMS) for Software manufacturers



IMDRF guidance - MLMD: Key Terms and Definitions

2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023

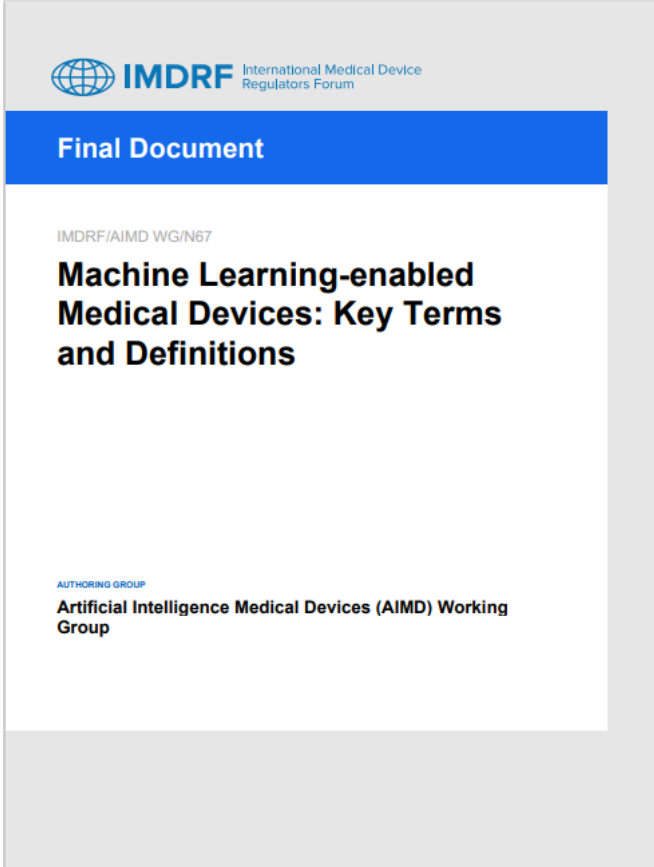
3 - 2

Global

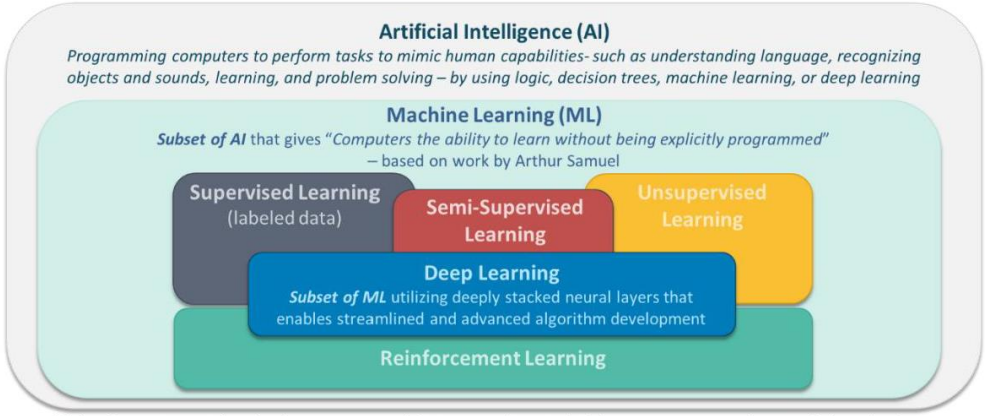
Harmonization

✓ Publication of IMDRF MLMD Guidance

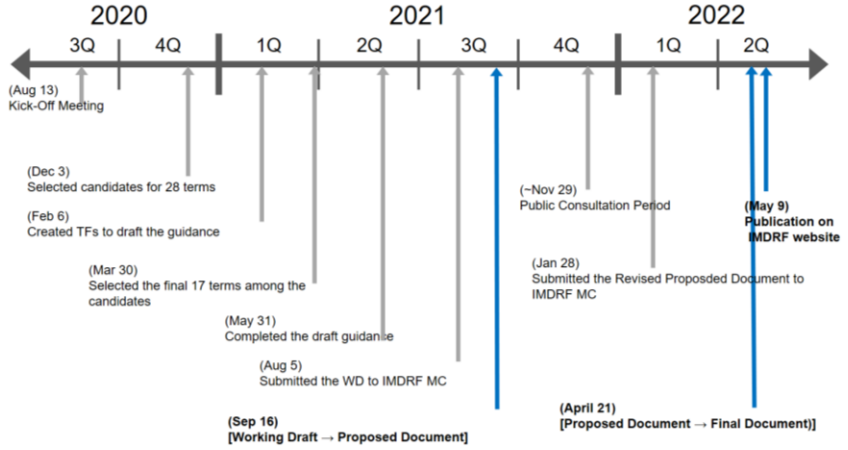
- MFDS chaired IMDRF AIMD WG and lead the development of the 1st international guidance for AIMD



< source : www.imdrf.org >



※ The descriptions within the diagram are not definitions, and are included to convey a general sense of the technology.



03. Achievements of Regulatory Improvement

3 - 3

Communication & Collaboration

Ministry of Food and Drug Safety

Discussion, Presentation ⇕ Coordination, Consultation

NAVER kakaohealthcare kt kakaobrain LG U+

Ministries

- Ministry of Science and ICT
- Ministry of Trade, Industry and Energy
- Ministry of Health and Welfare
- Ministry of Culture, Sports and Tourism

Agencies

- National IT Industry Promotion Agency
- Korea Internet & Security Agency
- Korea Medical Device Development Fund
- Korea Health Industry Development Institute
- Korea Evaluation Institute of Industrial Technology

Academy

- The Korean Society of Medical&Biological and Engineering
- The Korean Society of Medical Informatics
- Korean Society of Artificial Intelligience in Medicine
- Korean Society for Digital Therapy

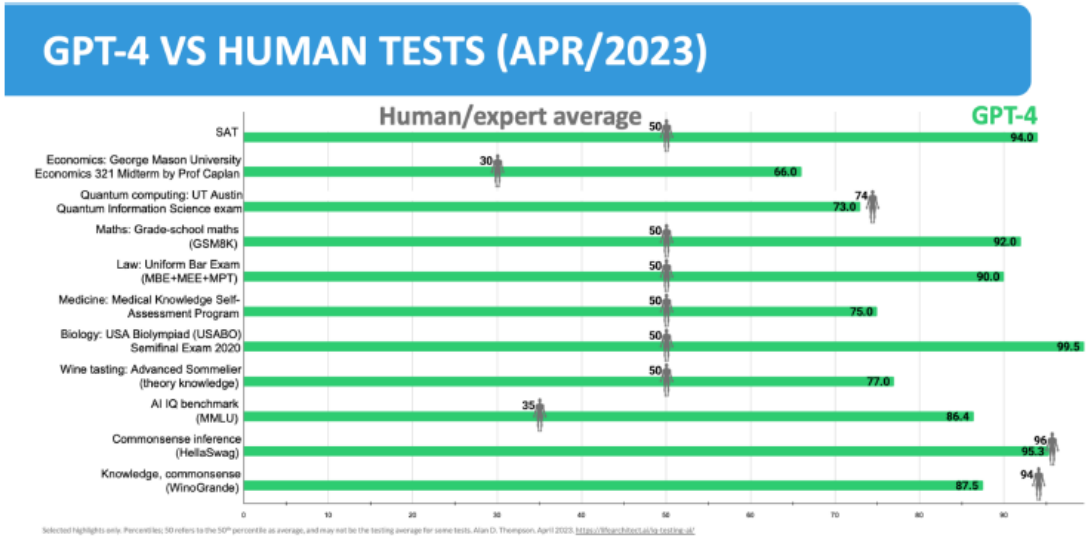
Industries

- Korea Medical Devices Industry Association
- Korea Medical Devices Industrial Cooperative Association
- Korea Smart Healthcare Association
- Korea Digital Health Industry Association

04. Challenges

4 - 1

Ever-Evolving AI Technology



Comment

https://doi.org/10.1038/s41591-023-02412-6

Large language model AI chatbots require approval as medical devices

Stephen Gilbert, Hugh Harvey, Tom Melvin, Erik Vollebregt & Paul Wicks

Chatbots powered by artificial intelligence used in patient care are regulated as medical devices, but their unreliability precludes approval as such.

Every new technology must satisfy concerns of safety, performance and risk/benefit to flourish. Large language models (LLMs) are neural network language models that include OpenAI's Generative pre-trained transformer (GPT) and Google's Pathways Language Model (PaLM)[1,2]. ChatGPT is an LLM chatbot launched in November 2022 that has remarkable conversational capability and the capacity to near-instantly and creatively mimic different human conversational styles on request[2,3]. Its underlying LLM was updated from GPT-3.5 to GPT-4 in March 2023[3]. It has been proposed that LLM chatbots can be applied in medicine, in which information exchange, advice and the linking of information flows are crucial parts of service delivery[3,4]. Today, however, developers of LLM chatbots acknowledge that they often generate highly convincing statements that are verifiably wrong, as well as sometimes 'hallucinating' information or providing inappropriate responses to questions[2,3] (Table 1).

LLM chatbots produce a 'reasonable continuation' of text, starting from a prompt, using their tokenized encoding of language extracted from billions of unidentified general web pages and books[5]. Their development includes both non-supervised and supervised learning, with numerous trial-and-error human decisions to optimize their plausibility and reasonableness. Today there is no way to be certain about the quality, evidence level or consistency of clinical information or supporting evidence for any LLM response. LLMs simply reassemble what was most commonly written by humans[5], and when asked to produce a source, they will frequently invent a plausible, but nonexistent, citation[6].

Table 1 | Challenges in the regulatory approval of large language models

Challenge	Details
Verification	Near-infinite range of inputs and outputs, including hallucinated outputs, make these models untestable
Provenance	No control over provenance when used as an underlying model on which a medical device is built
Changes	Not a fixed model, as the generative approaches and the manual and automated constraining of outputs (for example, to limit harmful advice) can be adapted on market
Usability	Near-infinite range of user experiences, depending on the input
Risks	No proven method to prevent harmful outputs
Surveillance	A near-infinite number of outputs make surveillance impossible

Because they have a near-infinite range of inputs and outputs, it is challenging to test the usability and on-market performance of LLMs, and so it is questionable whether their tendency to suggest harmful or false – yet highly plausible – information can ever be controlled (Table 1). In their current state, LLMs do not ask for missing information needed to provide an accurate answer, provide no accompanying indication of relative certainty or confidence, and generally provide no genuine sources. This rules out their use in the USA for non-device clinical decision support. It also makes it extremely challenging to verify the outputs of the design process, mitigate all identified risks and demonstrate valid clinical association between inputs and outputs, both prior to approval and in ongoing monitoring after their market release; these issues effectively rule out their valid marketing as medical devices under current EU law.

03. Challenges

4 - 2

Issues to be addressed

Pathway for Safety and Effectiveness of General AI-based Medical Devices

- Decision making criteria on the scope of medical devices/non-medical devices
- Assessment criteria and verification methods
- Essential principles for clinical trials
  (quantitative・objective assessment of AI-Human interaction), etc

Pathway for Safety Management of Continuous Learning-based Medical Devices

- Methodology for change approval (subject of change approval, assessment methods)
- Performance monitoring of AI-based medical devices used in the real word
  (key index, monitoring strategies, R&R)
- Need for developing certain platforms to be used in managing performance of the products for the public

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