Gap Analysis of MDD and MDR

The new MDR requirements have strengthened the need for clinical data, technical documentation, and labeling. The most notable change is the requirement for manufacturers to gather more extensive clinical data to demonstrate the safety and performance of their products.

DEFINITION ACCORDING TO MDD AND MDR:

MDD: The Medical Device Directive (MDD 93/42/EEC), commonly known as MDD or 93/42/EEC, was introduced in 1993 and amended in 2007 by 2007/47/EC. For over 25 years, the MDD served as the primary regulatory document for medical device registration in Europe. This directive, like all others, was transposed into national law by the EU Member States. As these laws often referred back to the directive, the MDD set forth the "essential requirements" and prerequisites for marketing medical devices in the EU **[1]**.

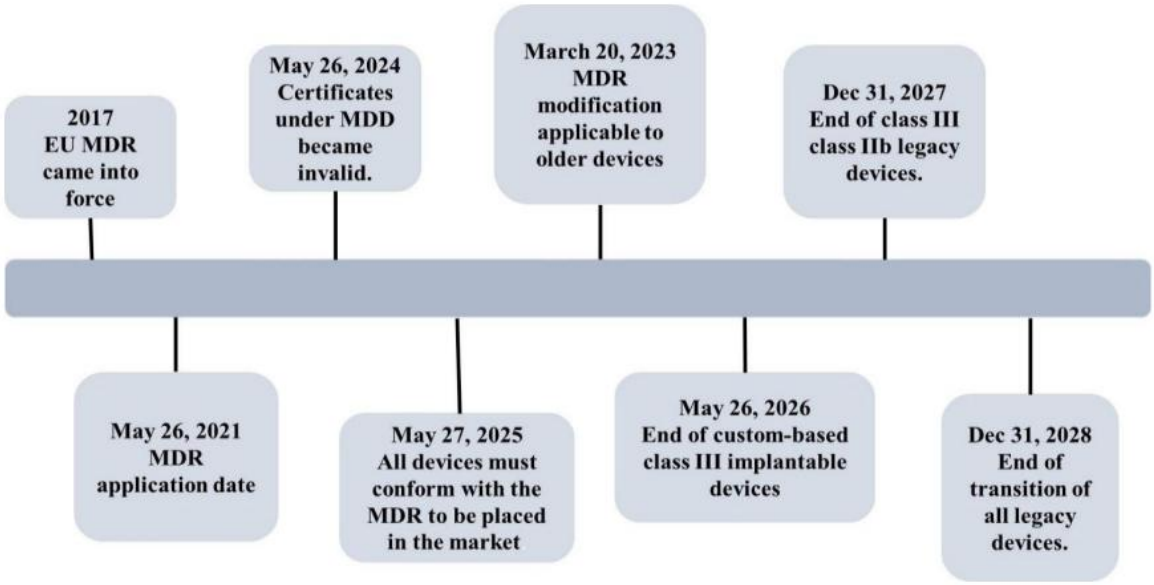
The main objectives of the MDD were to ensure the free movement of medical devices in Europe (e.g., MDD Articles 2 and 4, 2007) and to allow only safe products that meet EU-uniform requirements (e.g., MDD Article 3 and Annex I MDD, 2007).

MDR: The Medical Device Regulation (MDR) (Regulation (EU) 2017/745 on medical devices) was released in May 2017, replacing the MDD and the directive for Active Implantable Medical Devices (AIMD).

The main purpose of the MDR is to ensure a high standard of safety and quality for medical devices produced in or supplied to EU member countries (e.g., MDR (1) and (2), 2020) **[2]**. The following describes the difference in scope between the two regulations.

MDD	MDR
23 Articles	123 Articles
12 Annexes	17 Annexes
18 Rules	22 Rules
60 Pages	175 Pages

THE PROPOSED TIMELINE:



THE STRUCTURE OF THESE REGULATIONS AND THE KEY CHANGES:

The MDR (Medical Device Regulation) is a comprehensive 175-page document, significantly longer and more complex than its predecessors: the MDD (Medical Device Directive 93/42/EEC) with 60 pages and the AIMD (Active Implantable Medical Device Directive 90/385/EEC) with 20 pages. Chapter VI, Article 61, on clinical evaluation, highlights the requirement to conform to the general safety and performance requirements detailed in Annex I. Additionally, Chapter VI, Article 62, mandates that clinical investigations be conducted as described in Annex XV. Annex XVII outlines the correlation between the MDR, MDD, and AIMDD, serving as a valuable guide for transitioning from the directives to the Regulation.

The MDR introduces new requirements and enhances key regulatory elements of its predecessors, with a major focus on strengthening clinical evaluation requirements. For instance, for high-risk class III and implantable devices, evidence of device safety and performance must be generated through clinical investigations. Additionally, for all devices, the Clinical Evaluation Report (CER) must be updated using Post-Market Surveillance (PMS) data and aligned with the risk management system. Several authors note that demonstrating compliance with these requirements poses significant challenges for medical device manufacturers **[3]**.

THE THREE MAIN KEY AREAS WHERE THERE IS A CHANGE BETWEEN MDD AND MDR WHILE DRAFTING A PMCF REPORT FOR CLASS III (LEGACY) DEVICE:

1. Acceptable quantity of clinical data

2. Acceptable quality of clinical data

3. Additional sources of clinical and non-clinical data **[4].**

CHANGE FROM DIRECTIVE TO REGULATIONS:

The conformity assessment rules are no longer in the directive form but in regulations form. EU directives set out guidelines and objectives for member states in terms of developing or amending the existing regulations within the member state; EU regulation, on the other hand, is a binding legislation act, which must be obeyed by the member states without adaptation. Unlike directives, regulations do not need to be transposed into national law. The MDR and the IVDR will, therefore, limit discrepancies in interpretation across the EU market. The MDR incorporates both general medical devices and active medical devices and fully replaces the MDD **[5]**.

ESSENTIAL REQUIREMENTS (ERs) VS GENERAL SAFETY AND PERFORMANCE REQUIREMENTS (GSPRs):

Unlike the directives, the MDR does not include essential requirements (ER). Instead, it introduces 'General Safety and Performance Requirements' (SPR). The MDD had 29 essential requirements (13 in MDD93/42/EEC and 16 in 90/385/EEC), which have been replaced by 23 SPRs in the new MDR (Annex I). While the scope of SPRs is similar to ER, the overall text and requirements have been expanded. Certain topics, such as clinical evaluation and medicinal consultation, have been moved from the requirements list to the articles, and new topics, like devices without a medical purpose and requirements for devices used by laypersons, have been added.

A significant update concerning joint replacement safety is the broadened requirements regarding biological effects and toxicity (MDR Annex I 10.6 and 12.2). Under the MDD, there was only one statement addressing material choice concerning toxicity and one statement on biocompatibility. The MDR, however, mandates a comprehensive risk assessment for particles that could be released into the patient's body **[6]**.

CLASSIFICATION RULES IN MDD VS MDR:

The classification rules encompass active implantable devices, nanomaterials, and substances introduced into the body. The new classification rule 11 addresses software. While there were originally 18 rules in the MDD, the MDR introduces four additional rules. According to MDR 2017 Annex VIII section 5.4 Rule 8, all total and partial joint replacements and spinal disc replacements are classified as Class III devices. Exceptions to this classification include additional components like screws, instruments, and other surgical tools. Crucially, the manufacturer must justify the classification according to MDR Annex II 1.1(f), a requirement that was not previously mandated under the MDD **[7]**.

RULES CHANGES FROM MDD TO MDR:

- **Rule 2**: Adds "cells and tissues" to the existing language. Blood bags are moved from Rule 18 of the MDD to Rule 2 of the MDR.
- **Rule 3**: Includes human tissues and cells along with blood, body liquids, and other liquids. Organ storage solutions and IVF media are now classified as Class III under this rule.
- **Rule 4**: Adds injured mucous membranes to the scope, replacing "wounds" with "injuries to skin." It also covers invasive devices that come into contact with injured mucous membranes.
- **Rule 6**: All devices intended specifically for direct contact with the heart or central circulatory system are now Class III, similar to devices in contact with the central nervous system.
- **Rule 8**: AIMDD devices and accessories are classified as Class III. Breast implants, surgical meshes, total and partial joint replacements, and spinal disc replacement implants or devices that contact the spinal column are also Class III, with some exceptions (e.g., screws, wedges, plates, and instruments).
- **Rule 9**: Active devices intended to emit ionizing radiation for therapeutic purposes, including those that control or monitor such devices or directly influence their performance, are classified as Class IIb. Active devices intended for controlling, monitoring, or directly influencing the performance of active implantable devices are classified as Class III.
- **Rule 10**: Adds "monitoring" to diagnosis. Active devices intended for diagnosis in clinical situations where the patient is in immediate danger are classified as Class IIb.
- **Rule 11**: Introduces a new rule specifically for software.
- **Rule 13**: Clarifies that medicinal products can be derived from human blood or plasma, removing the phrase "liable to act" on the human body with actions ancillary to that of the devices, and classifies them as Class III.
- **Rule 15**: Adds sterilizers to the scope of disinfectants. Disinfectants or sterilizers are classified as Class IIb only if used for invasive devices and as the endpoint of processing.
- **Rule 19**: Introduces a new rule that classifies devices from Class III to IIa based on the potential for internal exposure.
- **Rule 20**: Introduces a new rule for Classification IIa or IIb, with IIb if they impact the safety and performance of the medicine or are intended to treat life-threatening conditions.
- **Rule 21**: Introduces a new rule that classifies devices from Class IIa to III based on where they are used and whether they or their metabolic products are absorbed.
- **Rule 22**: Introduces a new rule for Class III, applying if such devices significantly determine patient management, including closed-loop systems or automated external defibrillators **[8]**.

CONFORMITY ASSESSMENT PROCEDURES:

Conformity assessment procedures have been updated compared to Annex VI of the MDD. For certain Class IIa and most Class III devices, additional procedures are now required, and notified bodies must consult expert groups. The various conformity assessment procedures are comprehensively detailed in the Annexes of the MDR Proposal. For substance-based medical devices, Annex VIII is particularly significant.

For devices classified as IIa, IIb, and III, appropriate involvement of a notified body is essential. In the case of Class IIa and IIb devices, the notified body examines the quality management system (e.g., compliance with the harmonized standard EN ISO 13485:2012 and additional MDR requirements) and, for representative samples, the technical documentation that demonstrates compliance with all applicable essential requirements. Regarding manufacturers of Class IIa devices, notified bodies must assess the design and technical documentation of at least one representative device for each category of devices **[9]**.

A CHANGE THAT WILL BE CHALLENGING FOR THE MANUFACTURERS:

To enhance market traceability and transparency, the EU has introduced a unique device identification (UDI) system and a European database (EUDAMED). Post-market surveillance paperwork must be continuously updated throughout the device's life cycle in accordance with MDR requirements. The new MDR will have several impacts, one of which is the potential slowdown in innovation within the medical device sector. The stringent clinical data requirements and the need for continuous clinical review may result in more challenging and costly development and introduction of new medical devices to the market **[10]**.

On April 9, 2018, the Medical Device Coordination Group (MDCG) released three guidelines, available on the European Commission's website. These guidelines focus on medical device terminology, the design of the UDI database, and the definitions, descriptions, and formats of the UDI core elements. They are intended to facilitate the implementation of the new Regulation's UDI requirements.

According to Article 2 of the new European Medical Device Regulation (MDR) (EU) 2017/745, the UDI is defined as a series of numeric or alphanumeric characters that enable the unmistakable identification of a specific device on the market by registering it in the UDI Database. The UDI consists of two components: the device identifier (DI), or UDI-DI, which is a unique code specific to the device's model and serves as the primary key for records in the UDI database; and the production identifier (PI), or UDI-PI, which identifies the unit of the manufactured device and, if applicable, the packed devices as described in Annex VI Part C. A new UDI-DI should be introduced whenever there is a modification that could lead to confusion in device identification or traceability. Such modifications include changes to the device's trade name, brand name, model, the number of devices included in a package, and the necessity for disinfection prior to use **[11]**.

Summary of MDD Vs MDR

Aspect	MDD	MDR
Document length	60 pages (MDD 93/42/EEC)	175 pages (Regulation (EU) 2017/745), with significantly more detailed requirements.
Legal nature	Directive: Required transposition into national laws by EU member states, leading to potential variations in implementation.	Regulation: Directly applicable across all EU member states without transposition, ensuring uniformity.
Scope	Focused on medical devices only.	Broader scope, including medical devices, active implantable devices, and devices without a medical purpose (e.g., cosmetic implants).
Classification rules	18 rules: Focused on non-invasive, invasive, and active devices.	22 rules: Introduces new rules for software, nanomaterials, and devices with medicinal substances. Expands classification for high-risk devices like joint replacements.
Essential Requirements vs GSPRs	Essential Requirements (ERs): 29 requirements covering basic safety and performance.	General Safety and Performance Requirements (GSPRs): 23 requirements with expanded scope, including biological safety, clinical evaluation, and devices used by laypersons.
Clinical Evaluation Requirements	Limited requirements for clinical evaluation; reliance on equivalence data was common.	Stricter requirements for clinical evaluation and evidence of safety and performance, especially for Class III and implantable devices. Clinical investigations are mandatory for high-risk devices.
Post-Market Surveillance (PMS)	Basic PMS requirements with limited emphasis on continuous monitoring.	Enhanced PMS requirements, including Post-Market Clinical Follow-Up (PMCF) plans, periodic safety updates, and integration with risk management systems.
Conformity Assessment Procedures	Annex VI conformity assessment procedures with fewer requirements for Class IIa and III devices.	Updated procedures requiring notified bodies to consult expert panels for Class IIa and III devices. Greater scrutiny of technical documentation and quality management systems.
Unique Device Identification (UDI)	No UDI system	Introduced UDI system to improve traceability and transparency. Devices must be registered in the

Aspect	MDD	MDR
		EUDAMED database with both device identifiers (UDI-DI) and production identifiers (UDI-PI).
EUDAMED Database	No centralized database for device registration or post-market surveillance data.	Establishes EUDAMED as a centralized European database for device registration, vigilance reporting, PMS data, and UDI information.
Software as a Medical Device (SaMD)	Limited classification rules for software; many were considered low-risk.	Introduces Rule 11 specifically for software, classifying many as higher-risk based on their intended use in patient management or diagnosis.
Devices Without Medical Purpose	Not covered under MDD regulations.	Includes non-medical devices such as cosmetic implants or contact lenses under regulatory oversight to ensure safety and performance.
Biological Safety Requirements	Minimal focus on biological risks; limited statements on toxicity or biocompatibility.	Comprehensive risk assessment required for biological safety, including toxicity of materials and particles released into the body (Annex I).
Market Access Timeline	Faster market access due to less stringent requirements for clinical data and conformity assessment.	Longer timelines due to stricter clinical evaluation requirements and more rigorous conformity assessments by notified bodies.
Notified Bodies' Role	Less oversight; fewer requirements for notified bodies in conformity assessments.	Increased oversight; notified bodies must meet stricter accreditation standards and consult expert panels for high-risk devices like Class III implants.
Transition Period	Transitioned to MDR by May 2020; legacy MDD certificates valid until May 2024 under certain conditions.	Fully replaces MDD; all devices must comply with MDR by the end of the transition period unless exempted under specific provisions.
Post-Market Clinical Follow-Up (PMCF)	Limited PMCF requirements; often overlooked by manufacturers.	Mandatory PMCF activities integrated into PMS systems to continuously evaluate device safety and performance throughout its lifecycle.
Labeling Requirements	Basic labeling requirements focused on essential information for safe use of the device.	Expanded labeling requirements, including UDI information, detailed instructions for use, and warnings tailored to laypersons where applicable.

References:

1. *Medical Device Regulation MDR*. 2023 [cited 2025 March 03]; Available from: https://www.johner-institute.com/articles/regulatory-affairs/medical-device-regulation/.

2. Zilch, T.W., *The impact of the transition from Medical Device Directive to Medical Device Regulation*. 2022.

3. McDermott, O. and B. Kearney, *A review of the literature on the new European Medical Device Regulations requirements for increased clinical evaluation.* International Journal of Pharmaceutical and Healthcare Marketing, 2025. **19**(1): p. 1-21.

4. Makeenko, M. and T. Chevallier. *Post-market Clinical Follow-up (PMCF) GAP Analysis for Legacy Devices Class III between the Medical Device Directive (MDD 93/42/EEC) and the Medical Device Regulation (MDR 2017/745)*. in *15th International Joint Conference on Biomedical Engineering Systems and Technologies. Special Session on Dealing with the Change in European Regulations for Medical Devices*. 2022. Vienne, Austria: SCITEPRESS - Science and Technology Publications.

5. Vasiljeva, K., B.H. van Duren, and H. Pandit, *Changing Device Regulations in the European Union: Impact on Research, Innovation and Clinical Practice.* Indian Journal of Orthopaedics, 2020. **54**(2): p. 123-129.

6. Macomber, L.S., Alexandra, A., *General safety and performance requirements (Annex I) in the new medical device regulation.* BSI online, 2017.

7. Majety, R.P.D., et al. *New Era in Medical Device Regulations in the European Union*. 2021.

8. Maven. *Medical device classification & rules and key changes in MDD to MDR*. 2021 [cited 2025 March 04]; Available from: https://mavenprofserv.com/medical-device-classification-rules-and-key-changes-in-mdd-to-mdr/.

9. Zeller-Adam, R., *The European Councils Partial General Approach to the Proposal for a Medical Device Regulation: Its potential implications on demarcation, classification, and conformity assessment of substance-based medical devices*. 2016, Universität Bonn.

10. Siddiqui, Z., V.K. Shukla, and N. Sharma, *A Review of the New European Medical Device Regulations.* 2024.

11. Bianchini, E., et al., *Unique device identification and traceability for medical software: A major challenge for manufacturers in an ever-evolving marketplace.* J Biomed Inform, 2019. **93**: p. 103150.