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Enhancing the effectiveness of medical device incident reporting

Final report of the EU pilot on the manufacturer incident reporting form (MIR form)

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Enhancing the effectiveness of medical device incident reporting
Use of globally harmonised nomenclature for adverse event reporting of medical devices is a key prerequisite for effective safety monitoring of devices in the interest of patient protection. This report analyses the results of an EU pilot project on nomenclature use and makes recommendations.

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Acknowledgements

The analysis presented in this document would not have been possible without cooperation and collaboration of various players across the EU and beyond.

We would like to acknowledge the strategic importance, for the purpose of this pilot study, of the **"Workshop on Data Structure" organised by the JRC** in 2013. The workshop focused on nomenclatures for categorised reporting (i.e. introducing data structure) for adverse event communications/notifications in view of enhancing signal detection and overall effective monitoring of the safety of medical devices. In particular, the discussion on terminologies regarding medical device problems and patient problems paved the way for this pilot study.

The **UK's Medicines & Healthcare Products Regulatory Agency (MHRA)** and our **European Commission's** partner Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) deserve specific acknowledgement. We would like to thank in particular Tony Sant and Paras Shah at MHRA who have been key drivers, in collaboration with Jean-François Roche (DG GROW) with regard to initiating and devising the pilot study. We further thank all colleagues in Directorate-General for Health and Food Safety (DG SANTE) and Directorate-General for Informatics (DG DIGIT) who provided IT and operational support with regard to receiving and collecting the pilot reports submitted by manufacturers.

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Finally, the work and dedication of all **manufacturers** which, on a voluntary basis, provided incident information using the pilot report template and the additional work of **colleagues of those National Competent Authorities** that committed to analysing and forwarding the relevant information to the single collection point at DG SANTE is gratefully acknowledged.

Executive summary

Aim of the report

This report provides a final assessment by DG JRC of the 'EU MIR form pilot' project, concerning the use of nomenclature for manufacturer incident reporting. The purpose of this analysis is to exploit the submitted data in view of addressing the following key questions:

1. Is reporting of adverse events using nomenclature feasible and helpful?
2. Are existing nomenclatures relating to device problems and evaluations of causes adequate?
3. Is there a need for introducing new terms, e.g. to cover novel technologies?
4. What are the lessons learned from the pilot study in terms of international harmonisation of nomenclatures (IMDRF) and development of future reporting tools (e.g. EUDAMED)?

Key findings

This report focuses on the use of adverse 'event-type' and 'evaluation' terms which relate to problems with the medical device. The device-related terms were used in a 'Manufacturer Incident Report' form, which was designed for the pilot study, and was called the MIR pilot form. 786 forms, which were submitted by 13 manufacturers reporting from 15 European countries, were analysed.

Concerning nomenclature usage, the report analyses whether incidents were reported adequately using (1) existing nomenclature (ISO/TS 19218), (2) newly introduced nomenclature (EDMA's IVD-related terms), and (3) newly proposed terms (by the participating manufacturers of the pilot study).

The analysis has shown a number of important issues which concern five main topics:

1. Pilot data relate to approx. 50% of device categories on the market

Due to voluntary participation, the submitted MIR pilot forms reflect only a certain proportion of medical devices on the market. This needs to be considered when interpreting and using the pilot data.

2. No participation of SMEs in the pilot project

Additional bias may be due to (1) the absence of SME participation; and (2) a single manufacturer submitting >60% of the total number of forms (bias towards a particular device category).

3. Adequacy of term selection by manufacturers

We assessed the adequacy of term use by comparing textual incident descriptions with the categorised terms chosen by reporters. It was based on a set of 100 randomly selected pilot forms representative of the pilot's overall device portfolio. Both, the event-type and evaluation terms chosen by manufacturers for reporting incidents were largely adequate.

Moreover, the analysis shows that three choices per level to describe the incident (event-type terms) or final investigation (evaluation terms) appear sufficient.

4. Available terminology (ISO/TS 19218) is not fully adequate

On the basis of the frequency of some proposed terms it appears that the existing ISO/TS 19218 terms are overall not sufficient. This is not surprising given the fact that the terms were derived from FDA's terminology in 2005 and have, since then, not been updated. To resolve the most frequently encountered issues in the analysis, the JRC has proposed several changes to terms used (cf. Fig. 18-24).

5. Proposals for new terms by manufacturers

ISO/TS 19218 uses a 2-level hierarchical coding structure for reporting adverse events. Though the pilot study allowed for new proposals at these levels (level 1, 2), it was particularly designed for new proposals at an additional more granular third level. In line with this is the observation that the majority of new terms proposed concern level three terms.

The analysis also showed that, although selection of existing terms was overall adequate, many of the new terms proposed by manufacturers are either redundant or do not reflect device problems but are, in fact, patient outcome terms. This clearly shows a need for reporters to have a better understanding of the terms and the reporting form used. Some of the confusion may stem from the simple fact that ISO's medical device problem terminology is called "Adverse Event Terms", i.e. seemingly suggesting that this nomenclature should be used to report *adversity*, i.e. clinical phenomena at patient / user level.

In cases where level one event-type terms have been proposed, these related mainly (>80%) to the orthopaedic device category (cf. Fig. 13). It therefore appears that there is a need for a more elaborate nomenclature in this device category.

Proposed terms that were deemed valid when compared with ISO/TS 19218 were subsequently compared with FDA's terms for device problems. This led to the identification of a number of proposed terms that could be proposed for incorporation into ongoing efforts in the development of a globally used nomenclature in the context of the work of the Adverse Event Terminology Working Group of IMDRF.

EDMA has proposed new terms to cover specific needs of reporting incidents with in vitro diagnostic medical devices (IVDs). These were meant to complement the ISO/TS 19218 terms, and several of them have been used in the submissions. A closer look at the definitions of some of EDMA's terms does, however, show that they would need to be revised, for example four terms (corresponding to level 2) have *identical definitions* adding unnecessary ambiguity to their use.

The report also provides in **Annex I** a summary of *agreements* reached during the workshop and topics that remain to be addressed when developing future tools for incident reporting including *concerns* voiced by stakeholders. Annex I also considers additional reflections made after the workshop and provides, as a synthesis, key recommendations for a way forward.

In summary, this report shows that the outcome of the 'EU MIR form pilot' project has proven to be extremely useful for three reasons.

1. It confirmed the general feasibility of categorised reporting of incidents by manufacturers.
2. It identified inadequacies of the existing ISO/TS 19218 nomenclature suggesting the need for increased efforts into the development of freely available, scientifically and technically satisfying and, from a regulatory and end-user point of view, adequate nomenclature for adverse event reporting of incidents and events also in the pre-market space.
3. It led to the proposal of several potentially useful terms in view of future developments of nomenclature for incident / adverse event reporting.

1 Introduction

This document provides the final assessment by JRC on nomenclature used in the 'EU MIR form pilot' project. The pilot project was launched in the framework of the Vigilance MDEG activity to **explore the use of predefined nomenclature for incident reporting of medical devices**. This is a prerequisite for a more effective monitoring in the future of the safety of devices on the market through signal detection and trend analysis.

The MHRA and the European Commission (DG GROW, DG JRC) devised and ran the project. It started on 1 May 2015 and ran for 9 months until 3 February 2016, coinciding with a workshop entitled: 'Developing a roadmap for the integrated MIR form' organised by the European Commission (DG GROW, DG JRC) and MHRA, and hosted by COCIR.

A **first interim report**, which analysed a smaller data set corresponding to the first 4 months of the pilot project was issued on 30 November 2015, while a **second more elaborate interim report** was issued on 7 April 2016 and analysed data acquired over 7 months of the project. During the pilot project, an evident delay of forms arriving at the single collection point at DG SANTE was observed, and to compensate for this, we concluded that the analysis for the **final report** would be based on forms submitted two months after the end of the project (1 April 2016).

In total, **786 forms, which were submitted by 13 manufacturers reporting from 15 European countries, were analysed.** Because a substantial and in-depth analysis of event-type and evaluation terms had already been carried out in the second interim report (based on 415 forms), and since there were no marked differences in the type of incidents being reported in the forms that followed, the relevant parts of this report are based on earlier analyses.

While the pilot project also allowed the use of available patient problem terms (e.g. MedDRA, SNOMED-CT, ICD 10, FDA), only a small fraction of submitted incident reports contained patient problem terms. The report hence focuses on use of adverse 'event-type' and 'evaluation' terms, which relate to **problems with the medical device**.

The insights gained from this assessment will:

(1) support the creation of a novel MIR form containing both provisions for textual and categorised reporting using nomenclatures;

(2) inform the development of an **outline ("blueprint") for a future fully electronic incident report template** to be designed in the context of the new European database on Medical Devices (EUDAMED); and

(3) provide **input to current efforts in the international harmonisation of adverse event and evaluation terms** (International Medical Device Regulators Forum, IMDRF), activities that are strongly supported by EU.

2 Background and aim

In view of an effective implementation of the new medical device regulation within the EU, the Commission has opted for a co-management of the regulatory framework involving DG GROW (policy lead) and DG JRC (scientific and technical aspects). To realise this, the JRC has built up capacities at Directorate F. 'Health, Consumers and Reference Materials' in Ispra, Italy that will provide scientific and technical support to this process.

One of the main areas of activity, which has been defined in the framework of co-operation between DG GROW and DG JRC (i.e. the so-called 'Administrative Arrangement') is the area of vigilance/market surveillance (AIRN-MD II project on 'Post Market Safety - Medical Devices (MDs) and In Vitro Diagnostic Medical Devices (IVDs)'; contract no. 33983). Focus areas include the analysis of incident reporting for medical devices relevant for the European market. The overarching aim is to contribute to the development of an effective EU vigilance system allowing for effective signal detection and trend analysis in incident reporting, thereby permitting rapid corrective response.

A key prerequisite for an effective analysis of incident data on medical device problems, and possible adverse events encountered as a consequence, is the use of structured, categorised data based on standardised nomenclatures and coding systems that allow capturing incidents/adverse events through pre-defined keywords (terms).

Without structured data, signal detection and trend analysis will be limited to a purely qualitative evaluation of reports and report clusters that need to be, in a rather laborious manner, analysed and grouped by Competent Authorities (CAs), including insertion in existing national databases.

Thus, the introduction of the mandatory use of nomenclatures by manufacturers for reporting medical device problems, evaluations into causes and adversity at patient/user level would greatly enhance data monitoring, querying, visualisation and overall analysis, facilitating signal detection on the basis of single reports or clustered data alike. Moreover, if such data structure/nomenclatures were introduced at EU level, it would give MS CAs a powerful tool (e.g. EUDAMED) for cooperating on medical device management across the single European market.

The pilot project is part of ongoing endeavours by CAs and Commission (DG GROW/JRC) to construct effective EU-level means of post-market reporting of incidents, serious incidents and adverse events. Notably, nomenclatures for post-market purposes could be equally used for pre-market reporting of Adverse Events and Serious Adverse Events encountered in the context of clinical trials.

The present analysis of the use of adverse 'event type' and 'evaluation' terms (ISO 19218) used by manufacturers in the context of this pilot, exploits these data in view of identifying the adequacy of existing terminology (ISO/TS 19218), the relevance and necessity of newly proposed terms and thus will inform future work towards development of a novel MIR form incorporating nomenclature use as well as future tools (e.g. EUDAMED) for incident reporting. The analysis made use of the "MIR additional information form" developed for the MIR pilot and allowing nomenclature use, but also of the existing MIR form that provides textual / narrative descriptions of incidents. The insights gained from this analysis will not only be relevant for the move to a more effective and fully operational EU vigilance system, but it will also provide valuable contribution to the international harmonisation of adverse event terms (International Medical Device Regulators Forum, IMDRF).

3 Method for assessing nomenclature

To carry out this analysis, the MHRA (Medicines & Healthcare products Regulatory Agency, UK) together with the European Commission has set up an 'EU MIR form pilot' with a collection point at DG SANTE and a specifically designed manufacturer incident report (MIR) form, the MIR additional information form (MIR pilot form). This form complements the current way that manufacturers report on incidents. The MIR pilot form pdf document is available at:

http://ec.europa.eu/growth/sectors/medical-devices/guidance/index_en.htm

(see: Guidance MEDDEVs/ 2.12 Market Surveillance/ EU Vigilance Pilot on Trending). It consists of various sections one of which is relevant for incident information (event type codes/terms) and another for the manufacturer's final investigation (evaluation codes/terms). In addition to predefined terms (in pull-down menus), free-text fields also exist allowing new (event type or evaluation) terms to be proposed for incident reporting. The terms used to describe incidents are categorised in two levels (level 1,2) with one being more detailed than the other. It is possible for manufacturers to propose an extra level of detail (level 3) to describe the incident or to propose new level 1 or 2 terms. More specifically, this logical tree of three branch levels allows for these three term use/ proposal scenarios, of which only the first is evident and user friendly:

1. The manufacturer can choose appropriate level 1 and 2 terms from the existing ISO/TS 19218 catalogue or from EDMA's newly proposed terms. However, to add more resolution/granularity, the manufacturer can suggest an additional third level term, branching off the respective level 2 term. This is in line with the current design of the MIR pilot form (dedicated space for 'Manufacturer event-type level 3 code', and similarly for 'Manufacturer evaluation level 3 code')

2. The manufacturer can choose an appropriate level 1 description, but if there is no appropriate associated level 2 description/ term, the manufacturer must do the following (user-unfriendly) procedure to suggest a new second level term: after choosing any of the available second level terms (pull-down menu) and subsequently entering the proposal for a new second level term in the free-text space dedicated for level 3 term, only then can the chosen (pull-down menu) second level term be changed back to 'unselect'.

3. The manufacturer can not find an appropriate level 1 term and chooses the category 'other' (e.g. code 2300 'An event type not otherwise included in this table resulting in a device related event'). Subsequently 'Other' is chosen again at level 2, and a new first level term is proposed in the space dedicated for level 3 proposals.

Box 1. Links to the terms, codes, and definitions used in the 'EU MIR form pilot'.

ISO/TS 19218 (part 1, 2) terms can be found via:

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54892

EDMA's IVD-related terms can be found via:

http://ec.europa.eu/growth/sectors/medical-devices/guidance/index_en.htm
(see: Guidance MEDDEVs/ 2.12 Market Surveillance/ EU Vigilance Pilot Toolkit for Users/ documents 7 and 8)

The method used to evaluate the new terms (EDMA's IVD-related terms), as well as the newly proposed (level 1, 2 and 3) terms was as follows:

1. **Eligibility of submitted data**

   a. Completeness check of the submitted MIR additional information form (MIR pilot form, xml format).

2. **Adequacy of used terms**

   a. A random set of 100 representative submitted pilot forms were analysed for the adequacy of terms selected by manufacturers for incident reporting. The evaluation consisted of a comparison of these terms with the descriptive text of the incident and the manufacturer's final investigation found within the (MEDDEV) MIR form.

3. **Analysis of proposed terms**

   a. ***Use frequency*:**

   Frequently proposed terms of the same type could indicate a systemic problem to describe the incident or it could reflect an often occurring event that is not described within the existing terms. The use frequency will need to be weighted relative to the number of manufacturers proposing the same/ similar term, with more weight being assigned if more manufacturers propose the term. At this point, with 786 submitted forms, the relatively low sample number does not allow for deep statistical analysis.

   b. Resolution/ hierarchical level:

   Does the proposed term match the proposed level (1, 2 or 3), in other words: is the hierarchical level adequate?

   e.g. for event-type terms:

   - *Level 1:* broadly defining the property of the device that the failure was observed to affect
   - *Level 2:* how the failure affected the properties of the device
   - *Level 3:* how the adverse event was observed to have occurred

   c. Overlap with already existing terms:

   Do already existing terms sufficiently describe what the newly proposed term describes? This could possibly be the result of a report being filled in by a reporter with insufficient knowledge of the existing codes.

   - *No overlap*: the term could be considered for addition to ISO/TS 19218-1&2 or more relevantly (if not present within FDA's device problem terms) for addition to the nomenclature intended for global use that is currently being developed by IMDRF (and is based on FDA's terms).
   - *Overlap*:
     i. Redundant if equivalent terms exist
     ii. Possibly request for change of existing terms (ISO/TS 19218-1&2, IMDRF nomenclature) if the proposed term is evaluated as better

   d. Definition:

   i. Is the proposed definition/description sufficiently detailed or described broadly enough? This would be a requirement for the development of clear and useful nomenclature.

4. **Cross-check of analysis by another evaluator within JRC's Medical Device Task Force**

4 Results of the assessment

4.1 Eligibility check and analysis of number of proposed terms

This analysis is based on 786 MIR pilot forms that DG SANTE received on 1 April 2016. This corresponds with a period of (1) the full 9 months of the pilot, which started on 1 May, 2015, and (2) two additional months to compensate for the delay observed in forms arriving at the collection point. The eligibility check of the MIR pilot forms resulted in the elimination of 45 submissions (5.7%) due to lack of sufficient, essential information needed to identify either the manufacturer or the device (Table 1). Of the remaining 741 eligible submissions, 718 (96.9%) contained proposals for new 'event-type' terms or used one of EDMA's newly introduced 'event-type' terms (Table1, Fig. 1). For evaluation terms, 549 (74.1%) submissions contained proposals for new terms and there were no submissions with EDMA's newly introduced evaluation terms (Table 1, Fig. 2).

Table 1. Number and percentage of eligible submitted MIR pilot forms with/without proposals for new 'event-type' and 'evaluation' terms. n/a: not applicable; total number of forms = 786 (741 eligible + 45 non-eligible); Indicated percentages reflect only eligible forms; Values are based on the first entry (choice) of terms which were the predominantly chosen ones (see Table 5; Fig.7,8).

	Eligible submitted MIR pilot forms (total: 741)			**Non-eligible submitted MIR pilot forms** (total: 45)
	With proposals for new terms	**With EDMA's new terms**	**Without proposals for new terms**	
Event-type terms	654 (88.3%)	64 (8.6%)	23 (3.1%)	n/a
Evaluation terms	549 (74.1%)	0	192 (25.9%)	n/a

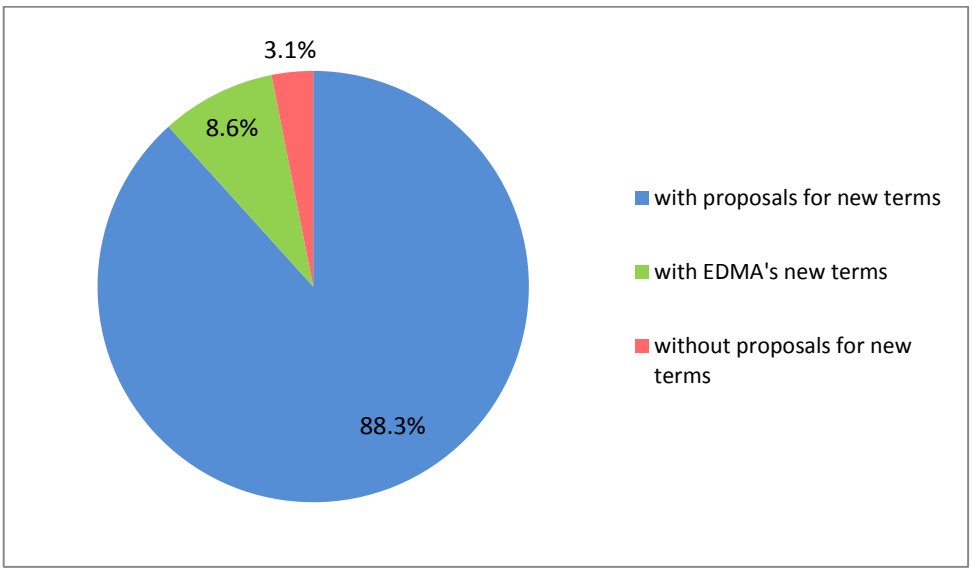

Figure 1. Percentage of eligible submitted MIR pilot forms with/ without proposals for new 'event-type' terms and with EDMA's new 'event-type' terms. Values are based on Table 1.

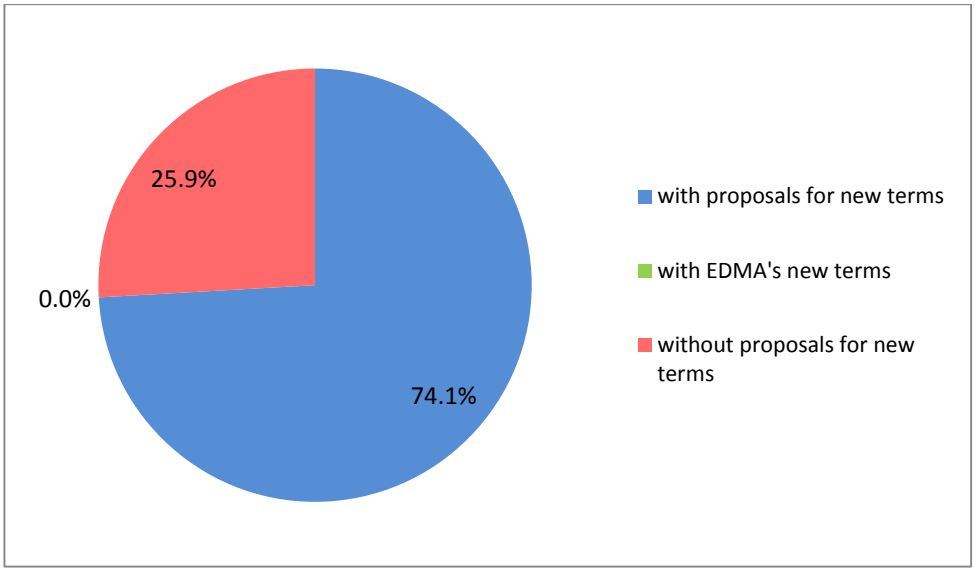

Figure 2. Percentage of eligible submitted MIR pilot forms with/ without proposals for new 'evaluation' terms and with EDMA's new 'evaluation' terms. Values are based on Table 1.

4.2 Medical device representation within the MIR form pilot

As a brief background, and as described in the 'Q&A document within the 'EU Vigilance Pilot Toolkit for Users', Competent Authorities had at the onset of the pilot suggested a potential focused participation where all companies in specific sectors would be encouraged to participate. The requested device types were: (1) cardiac rhythm management implants (e.g. pacemakers and leads); (2) infusion pumps; (3) blood glucose meters; (4) surgical staplers; (5) vaginal tapes and meshes; (6) lasers for eye surgery; (7) external defibrillators; and (8) annex II list A and list B products. The participating manufacturers were also encouraged to choose product areas of high volume if they did not wish to participate with their entire product range.

A key issue of the MIR pilot is the representativeness of devices in the pilot relative to the market. Bias could be introduced in this way and this needs to be considered in the interpretation of the results. There are in fact two relevant aspects to consider: (1) representativeness of devices in relation to market coverage; and (2) representativeness of different kinds of device manufacturers (i.e. large industries vs small and medium-sized enterprises (SMEs)). Concerning the latter, no SMEs participated in the pilot. Concerning the former, we searched for different ways of categorising medical devices, and chose to follow the device classification panels developed by FDA, which is based on medical specialities and appeared accessible for the specific purposes of the pilot (Table 2). Using these panels, we observed 50% coverage of the categories by device types, which were requested by competent authorities (CAs).

In reality, the manufacturers submitted MIR pilot forms to the collection point that to a certain extent differed from the device types requested by CAs. In this way several different categories were covered, and out **of the 741 eligible MIR pilot forms that were effectively submitted to the collection point, there was 50% coverage of the categories by device types** (Table 2). For our calculations we grouped the first three classification panels into an in vitro diagnostic medical device (IVD)-containing category, as the FDA classifies IVDs in these panels. The IVD-containing category

together makes up the category that is predominantly represented (>70%) in the pilot, with 'orthopaedic devices' (11%) following thereafter (Figure 3). The reason of the disproportionate number of devices in the IVD category is the significant amount of submitted forms by a single manufacturer in this field.

Table 2. Medical devices reported in the submitted MIR pilot forms. Device classification panels and risk levels developed by FDA. The number of devices reflect the number of MIR forms submitted and do not necessarily represent distinct devices. IVD: in vitro diagnostic medical device

	no.	FDA's device classification panels (based on medical specialities)	risk level	% devices	no. devices
IVD	**1**	Clinical chemistry & clinical toxicology devices	together:		
	2	Haematology & pathology devices	1, 2,3	76	561
	3	Immunology & microbiology devices			
	4	Anaesthesiology devices			
	5	Cardiovascular devices	2, 3	5.4	40
	6	Dental devices			
	7	Ear, nose, & throat devices			
	8	Gastroenterology-urology devices			
	9	General & plastic surgery devices			
	10	General hospital & personal use devices	2	5.4	40
	11	Neurological devices			
	12	Obstetrical & gynaecological devices			
	13	Ophthalmic devices	2	0.9	7
	14	Orthopaedic devices	2	11	83
	15	Physical medicine devices			
	16	Radiology devices	2	1.3	10

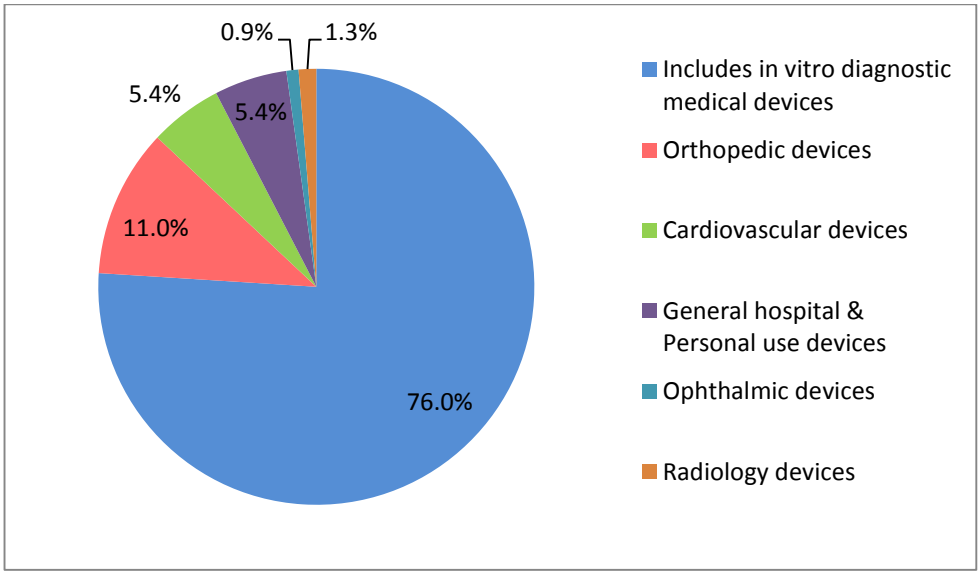

Figure 3. Percentage of devices reported within the indicated device categories. Values are based on Table 2.

More specifically, the device types reported within the 8 panels are shown in Table 3.

Table 3. Medical device types reported in the submitted MIR pilot forms. IVD: in vitro diagnostic medical device

	no.	FDA's device classification panels (based on medical specialities)	Device types
IVD	**1**	Clinical chemistry & clinical toxicology devices	- DNA detection/ quantification (nucleic acid amplification systems)
	2	Haematology & pathology devices	- Blood testing–antibody based (hepatitis B; IgG/ complement)
	3	Immunology & microbiology devices	- Insulin pump: glucose sensors - Blood glucose meters - other immunoassays
	5	Cardiovascular devices	- Catheter guide wires - Intra-aortic occlusion devices - Defibrillators - Cardiac ablation catheters - Implantable pacemakers
	10	General hospital & personal use devices	- Enteral feeding pumps - Infusion pumps - Intravenous solutions/ medication delivery systems
	13	Ophthalmic devices	- Microsurgery devices - Implantable lenses
	14	Orthopaedic devices	- Prosthesis (knee/ hip replacements) - interspinous implants - plate/ screw/ nail systems - craniotomies…
	16	Radiology devices	- X-ray systems (angiography) - digital radiography systems

4.3 Adequacy assessment of terms used by reporters

To analyse the adequacy of categorical terms used by manufacturers to capture incidents we analysed a random set of 100 submitted pilot forms which proportionally represented the different device categories/types (see Table 3 and Figure 3). The assessment was done by comparing to which extent the terms chosen reflected the narrative descriptive text found in the (MEDDEV) MIR form. More specifically, the selected event-type terms (pilot form) were compared with the narrative text on the incident (MIR form), and similarly the evaluation terms were compared with the text accompanying the results of the manufacturer's final investigation.

The adequacy assessment consisted of a sequential analysis where first the narrative text describing the incident with the conventional MIR form was studied. Secondly, the JRC assigned event-type level one and level two terms and codes. Thirdly, a comparison was made with the terms that the manufacturer selected. Finally, the same procedure was followed for evaluation terms and the text on the results of the manufacturer's final investigation (Figure 4).

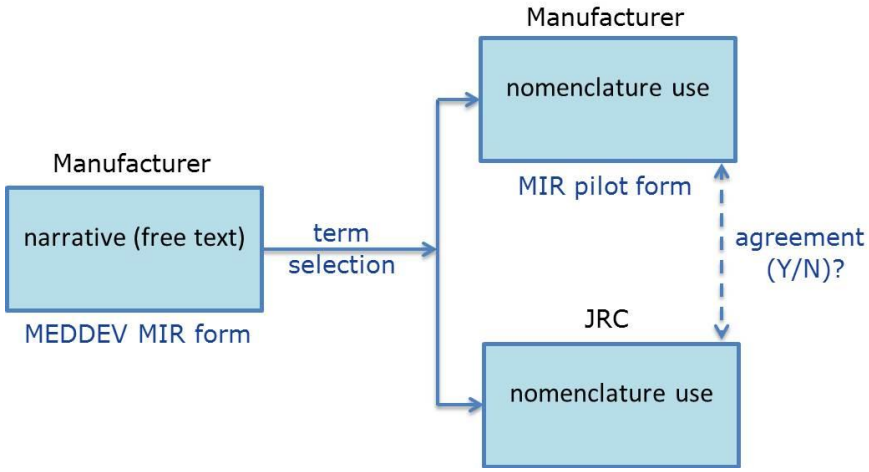

Figure 4. Procedure followed for the adequacy assessment.

The analysis showed that for event-type terms there was a high level of agreement of terms with 98% of level one terms matching and 89% of level two terms (Table 4). The discrepancies observed at level two were most frequently the result of the terms '1404, Power Source issue" and '1402, Circuit Failure' which were used interchangeably. Notably, for the orthopaedic device category, the event-type term '2300, Other' was used in the majority of cases. This could imply the need for a more elaborate nomenclature for describing incidents with these devices. In fact, the level one code '1600, Implantable device failure' only has 2 level two terms associated with it ('1601, Migration of device or device component' and '1602, Osseo-disintegration issue'). For this device category, it is therefore recommended to not only (1) further populate the nomenclature with new terms, but also to (2) maintain 'Other' as a valid term due to the variety and complexity of incidents with implantable medical devices.

Similarly, for evaluation terms the adequacy analysis showed a good agreement of terms with 90% of level one terms matching, and 76% of level two terms (Table 4). The most frequent discrepancies were observed with the evaluation terms '26802, No medical device failure detected' and '26801, No medical device problem', which were often used interchangeably.

Table 4. Representative samples used for the adequacy assessment. MFR L1: Level 1 term/code reported by the manufacturer; MFR L2: Level 2 term/code reported by the manufacturer; JRC L1: Level 1 term/code proposed by JRC; JRC L2: Level 2 term/code proposed by JRC; MD: medical device

ADVERSE EVENT-TYPE TERMS/ CODES							
Case No	**Text**	**MFR L1**	**Agree? (Y/N)**	**JRC L1**	**MFR L2**	**Agree? (Y/N)**	**JRC L2**
xxx-67	It is reported that 450ml of [BRANDNAME] feed was hung and 400ml set to be delivered at a rate of 60ml/hr using the above referenced [MD] Pump into a 4yr old male suffering with Pancreatic Dysmotility, Eosinophilic Duodenitis and Ehler-Danlos Syndrome. It is reported that after approximately 2 hours the pump was stopped whilst the patient was attended to; at which point around 150ml had been delivered as expected. Having restarted the pump for the remainder of the overnight feed to be delivered, it was noted the following morning that none of the remaining feed was delivered. It is also alleged the pump failed to alarm to indicate an occlusion.	[1800] Infusion/Flow	Y	-	[1806] Insufficient Flow or Underinfusion	Y	-
xxx -189	On 07/21/2015, the reporter contacted [MFR], alleging a DISPLAY (DAMAGED) issue with a cracked display lens. There was no health consequence to the patient associated with the reported incident, and no medical treatment or health care provider intervention was required. Therefore, there is no healthcare provider information to report.	[2000] Material	Y	-	[2002] Crack	Y	-
xxx -237	The customer reported that during a Transcatheter Aortic Valve Implantation (TAVI) procedure with an anaesthetized patient on the table, that when the table was put into a tilt position, the table top became unstable and immediately lurched uncontrolled in the direction of the tilt. The staff in the near vicinity managed to stop the patient / table before the patient came to any harm.	[2100] Mechanical	Y	-	[2107] Unintended Movement	Y	-
xxx -70	The [MD] System is intended for use in performing nucleic acid testing in clinical laboratories. It is comprised of the [MD] and [MD] instruments. The [MD] instrument is an automated fluid handling system for performing sample preparation for nucleic acid testing. The [MD] System Software is an automated system for performing fluorescence-based PCR that results in quantitative and qualitative detection of nucleic acid sequences. A Field Service Specialist (FSS) performed Lamp, Lamp Socket/Cable Assembly, Lamp-Gemini Cord with Connector replacement as per ISA 610-028. Visual verification showed a brown coloration of the Lamp Socket that required replacement. The PCA Microcontroller verification procedure shows significant signs of overheating (brownish) of the connector for the lamp power. Performed PCA Microcontroller replacement as per [MD] Service Manual. All checks and calibrations passed, instrument working per specification. There was no death or injury.	[1400] Electrical/Electronic	Y	-	-	N	[1402] Circuit Failure

xxx -214	[MFR] received a complaint from a customer about a radiation overexposure of a patient. The patient received 2,1 Gy during an examination. The customer decided to stop the procedure when they noticed the high dose. Until today there was no patient injury noticed by the customer.	[2900] Use Error	N	[2400] Output issue	[2905] Use of Device Issue	N	[2401] Energy output to patient tissue incorrect
xxx -294	On 08/29/2015, the reporter contacted [MFR], alleging a POWER (MOISTURE INGRESS) issue. Reportedly, the pump had intermittent power issue and moisture/corrosion was evident in the battery compartment. No damages to the battery compartment or cap were noted. There was no health consequence to the patient associated with the reported incident, and no medical treatment or health care provider intervention was required. Therefore, there is no healthcare provider information to report.	[1400] Electrical/Electronic	Y	-	[1402] Circuit Failure	N	[1404] Power Source issue

EVALUATION TERMS/ CODES

Case No	Text	MFR L1	Agree? (Y/N)	JRC L1	MFR L2	Agree? (Y/N)	JRC L2
xxx -187	The device has been returned and evaluated by Product Analysis on 06/15/2015 with the following findings: A review of the last basal delivery was on 04/28/2015 and the last bolus delivery was on 04/27/2015. A review of the total daily dose history indicated that insulin delivery totals correctly reflected programmed values. The returned battery cap and returned cartridge cap were used to complete testing. During testing, there were no Errors, Alarms or Warnings that occurred during a 24 hour duration test. The pump passed the delivery accuracy test and delivered within required range and delivered accurately. The reported, “Inaccurate Delivery” complaint was not duplicated during investigation. [MFR] has conducted a review of the device history record for this pump and confirmed that it was operating within required specifications at the time of release.	[26800] No medical device problem or failure detected	Y	-	[26801] No medical device problem	Y	-
xxx -237	[MFR] investigated the reported issue with the table and found that table top had been replaced a week earlier. During that service event a part (tooth rack) had not been fitted to the new table top which should have been transferred from original table top before fitting. The table top fitted with all original parts has been reinstalled and tested, the table was working per factory settings and tolerances. This is an isolated incident.	[26000] Human factors	Y	-	[26007] Maintenance	Y	-
xxx -320	The device has been returned and evaluated by Product Analysis on 10/02/2015 with the following findings: Review of the black box data and download history revealed the last basal delivery was	[26800] No medical	Y	-	[26802] No medical	N	[26801] No

	recorded on 27 August 2015 at 3:02 PM. The total daily dose amounts added up to correctly reflect the user's programed basal rate target. Low battery and replace battery alarms were present in the alarm records. Several replace battery warnings appeared due to discharged batteries being placed in the pump. On investigation, Ez-Prime steps were successfully performed. There was no overheating, errors, alarms or warnings during the investigation. The delivery accuracy was found to within the required specifications and delivering within range. All electrical current draws were found to be within the required specifications and the pump performed as intended without malfunction. The pump was opened for investigation and did not reveal any evidence of damage, defect or contamination of the pump's interior components. Investigation did not duplicate the alleged temperature issue.	device problem or failure detected			device failure detected		medical device problem
xxx -310	The device has been returned and evaluated by Product Analysis on 10/09/2015 with the following findings: A review of the black box indicated that last basal delivery occurred on 09/15/2015 and the last bolus delivery occurred on 09/14/2015. The black box indicated that insulin delivery was interrupted on 09/14/2015 from 14:07 to 14:40 due to a cartridge change. The black box also indicated that on 09/12/2015 at 19:07 the pump emitted an "Exceeds Max 2 hour limit" warning and deliveries resumed at 19:40. A review of the total daily dose history indicated that insulin delivery totals correctly reflected programmed values. The pump powered on normally and successfully completed a rewind, load, and prime sequence. The pump was exercised for 24 hours on a 2unit per hour basal rate and at the end of testing, the basal history correctly showed 2units per hour and the total daily dose correctly showed 48units. The pump passed delivery accuracy testing and was found to be delivering within required specifications. No defects were found on investigation.	[26800] No medical device problem or failure detected	Y	-	[26802] No medical device failure detected	N	[26801] No medical device problem.
xxx -344	The device has been returned and evaluated by Product Analysis on 09/18/2015 with the following findings: Multiple call service 052 and 087 alarms were observed in the pump history. The returned battery cap was used for investigation. The pump was powered on with the display remaining blank. After approximately 15 minutes, the pump displayed a "Sleep Error" and the remaining steps were unable to be completed. The pump was opened and moisture damage was found on PCB. Moisture in the pump can be caused by cracks or damage to the pump casing, battery cap, display lens or keypad. In the absence of visible damage that would affect the moisture-proof features of the pump, a damaged dual vent could allow moisture ingress, and damage to internal components or pump structure may allow moisture to migrate between pump compartments. There are also user related factors such as the battery cap or cartridge cap not being secured to the pump properly which may lead to moisture ingress. This complaint does not constitute a new failure mode; similar confirmed complaints are evaluated via trend and control charting for escalation including CAPA. [MFR] has conducted a review of the device history record for this pump and confirmed that it was operating within required specifications at the time of release.	[27300] Other	N	[25500 Electrical]	[27301] Other	N	[25502] Electrical circuitry
xxx -394	The device has been returned and evaluated by Product Analysis on 08/21/2015 with the following	[27300] Other	N	[26700]	[27301]	N	[26703]

	findings: A review of the black box indicated no reboots had occurred. The battery cap was not returned with the pump for investigation; a test battery cap was used to complete testing. The battery compartment was found to be cracked in two places, and there was moisture/corrosion found in the battery compartment. Pumps are currently manufactured according to design and manufacturing specifications. However some technical modifications/improvements are under evaluation to reduce the probability of occurrence of this issue in the near future. One contributor appears to be the material of the battery cap O-ring in terms of dimension and hardness. Another potential secondary contributor is the battery spring force. The cracked battery compartment is due to environmental stress cracking of the polymer alloy housing caused by the cumulative effects of the inherent design (O-ring dimension and hardness) along with environmental factors (temperature, moisture, and contaminants). The failure modes can be reduced and/or eliminated by using an improved battery cap assembly, which reduces the design stress on the housing. [MFR]: This is a very complicated issue that requires extensive evaluation, fabrication and then verification. There is presently an effort to lower the durometer (hardness) of the battery cap O-ring, which will reduce hoop stress on the pump housing. This is strictly a change to the battery cap assembly and is neither a material or dimensional change. This potential change can reduce or eliminate the failure modes of the housing. This evaluation is ongoing and does not have a completion date identified at this time. Moisture was found as part of the investigation. Moisture in the pump from the pump casing being damaged/cracked may affect the internal electronics and may cause power problems. Moisture ingress does not constitute a new failure mode; similar confirmed complaints are evaluated via trend and control charting for escalation including CAPA. Leak testing revealed a leak at the battery compartment cracks. The pump powered on but would not hold prime. Additional testing for the alleged power issue could not be completed due to inability of the pump to hold prime. The pump casing was removed and there was evidence of moisture corrosion found throughout the pump.			Mechanical	Other		Fracture

4.4 Level 1, 2 & 3 terms: number submitted

Table 5 summarises the number of MIR pilot forms with proposals for new terms at all levels, i.e. existing levels one and two of ISO/TS 19218, as well as additional level 3 proposals. Briefly, of the 741 eligible submissions that contained proposals for new 'event-type' terms or used one of EDMA's newly introduced 'event-type' terms, 76.2% contained proposals for level 3 terms, 11.7% contained proposals for level 1 terms (based on using the term 'Other' at level 1 and 2, while proposing a new term), and there were 8.9% (66) proposals for level 2 terms (64 based on choosing EDMA's level 2 terms; 2 based on choosing the term 'Unselect' at level 2 and proposing a new term) (Table 5; Fig. 5).

For evaluation terms, 70.9% of submissions contained proposals for new level 3 terms, none for level 2 terms and 3.1% with proposals for level 1 terms (Table 5; Fig. 6). There were many more submissions for evaluation terms with no new proposals (26%) compared to those with event-type terms (3.1%) (Table 5; Figures 5, 6).

Table 5. Number and percentage of submitted MIR pilot forms with/without new 'event-type' and 'evaluation' terms. n/a: not applicable; total number of eligible forms= 741; indicated percentages reflect only eligible forms and values are based on the first entry of terms which were the predominantly chosen ones (see Table 6; Fig. 7, 8).

	Event-type terms			Evaluation terms		
	With proposals for new terms	**With EDMA's new terms**	**Without proposals for new terms**	**With proposals for new terms**	**With EDMA's new terms**	**Without proposals for new terms**
Level 1	87 (11.7%)	0	2 (0.3%)	23 (3.1%)	0	2 (0.3%)
Level 2	2 (0.3%)	64 (8.6%)	0	0	0	2 (0.3%)
Level 3	565 (76.2%)	n/a	21 (2.8%)	526 (70.9%)	n/a	188 (25.4%)

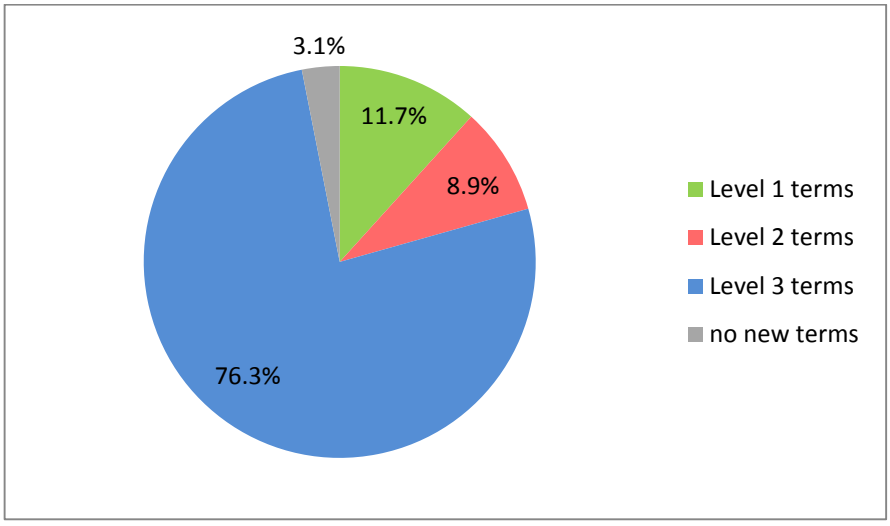

Figure 5. Percentage of submitted MIR pilot forms with proposals for new level 1, 2 or 3 'event-type' terms. Values include EDMA's newly proposed terms and are based on Table 5.

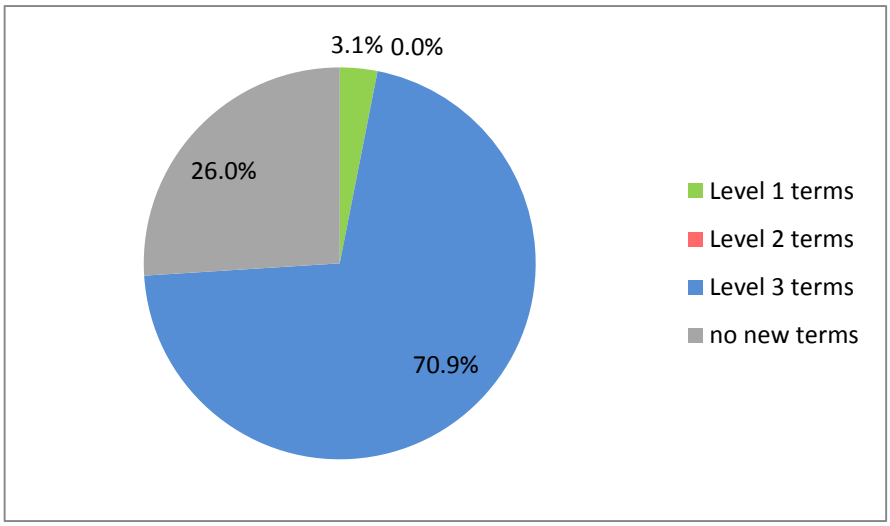

Figure 6. Percentage of submitted MIR pilot forms with proposals for new level 1, 2 or 3 'evaluation' terms. Values include EDMA's newly proposed terms and are based on Table 5.

For each incident, manufacturers can propose up to three terms in the MIR pilot form to describe the incident (event-type terms) or the manufacturer's final investigation (evaluation terms). The 1st choice should reflect the primary term, the 2nd choice the secondary term, and the 3rd choice the tertiary term. An analysis of the frequency of use of these choices gives an indication on how many are sufficient and will be essential for future designs of the MIR form. For the analysis of both event-type and evaluation terms it is clear that the first choice is predominantly used (Table 6; Figures 7, 8).

Table 6. Number and percentage of submitted MIR pilot forms with entries ('event-type' and 'evaluation' terms) at 1st, 2nd or 3rd choice. Total number of eligible forms = 741; indicated percentages reflect number of terms relative to the total number of possible terms within the choice level (= 741, number of eligible forms).

	Event-type terms			**Evaluation terms**		
	Level 1	**Level 2**	**Level 3**	**Level 1**	**Level 2**	**Level 3**
Choice 1	741 (100%)	737 (99%)	675 (91%)	741 (100%)	738 (99%)	550 (74%)
Choice 2	36 (4.8%)	36 (4.8%)	18 (2.4%)	69 (9.3%)	69 (9.3%)	48 (6.5%)
Choice 3	4 (0.5%)	4 (0.5%)	4 (0.5%)	21 (2.8%)	21 (2.8%)	18 (2.4%)

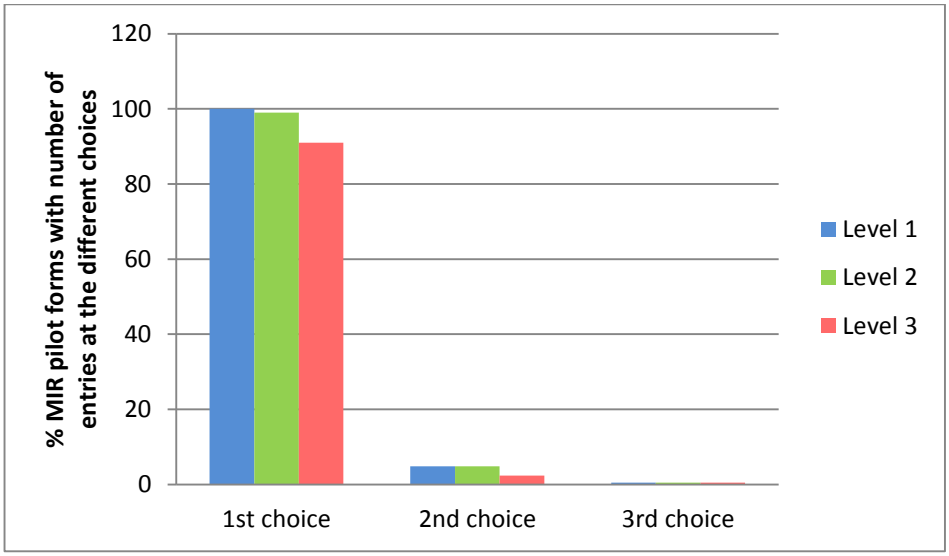

Figure 7. Percentage of submitted MIR pilot forms with entries of **'event-type' terms** for 1st, 2nd or 3rd choices. Values are based on Table 6.

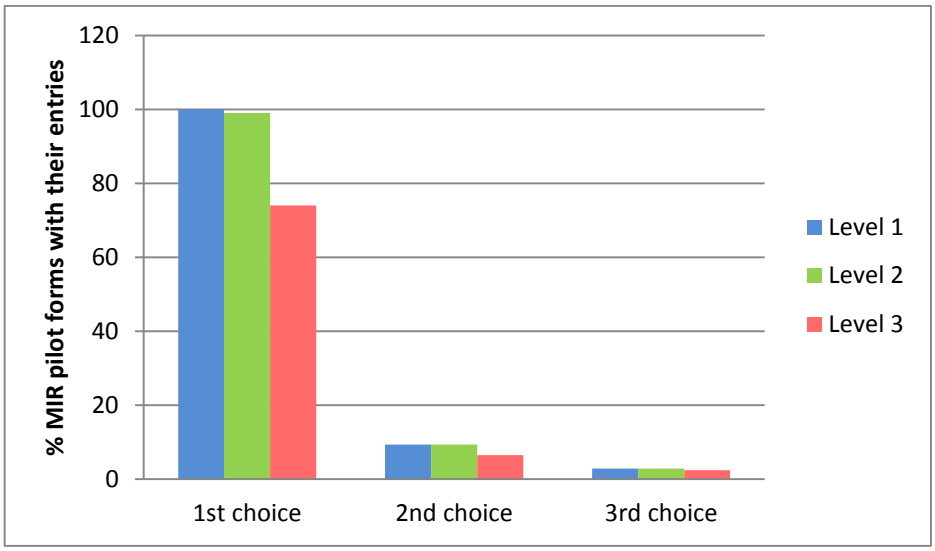

Figure 8. Percentage of submitted MIR pilot forms with entries of **'evaluation' terms** for 1st, 2nd or 3rd choices. Values are based on Table 6.

4.5 Submissions by manufacturer and country of incident

The 741 eligible submissions were submitted by 13 manufacturers, five of which have the same parent company (Table 7; Fig. 9). One manufacturer submitted significantly more MIR pilot forms when compared to others.

Table 7. Number and percentage of submitted MIR pilot forms by the different manufacturers. * indicates same parent company

Manufacturer	No. submitted	Percentage
Manufacturer 1 *	493	66.5
Manufacturer 2 *	42	5.7
Manufacturer 3 *	40	5.4
Manufacturer 4 *	23	3.1
Manufacturer 5 *	2	0.3
Manufacturer 6	32	4.3
Manufacturer 7	36	4.9
Manufacturer 8	22	3.0
Manufacturer 9	5	0.7
Manufacturer 10	3	0.4
Manufacturer 11	3	0.4
Manufacturer 12	39	5.3
Manufacturer 13	1	0.1

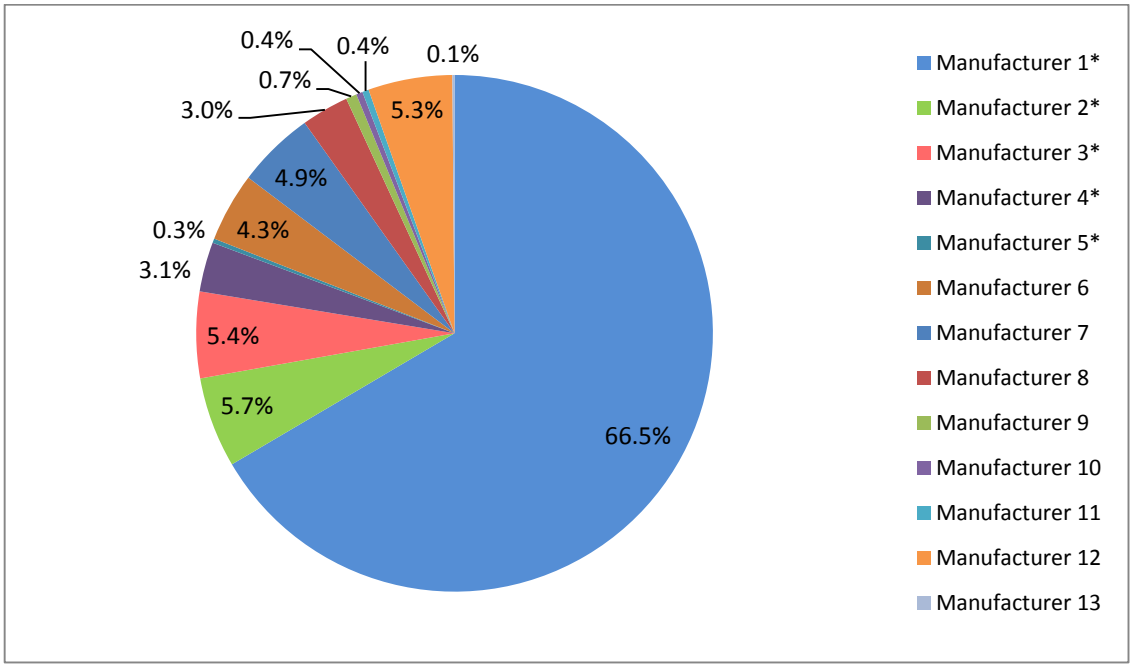

Figure 9. Percentage of submitted MIR pilot forms by manufacturer. Values are based on Table 7. * indicates same parent company

The 741 eligible submissions originated from 15 countries (Table 8; Figure 10). Noteworthy is the heterogeneity in number of files being sent from the various countries and the disproportionality between the number sent and the medical technology sales in the respective countries (Table 8).

Table 8. Number and percentage of submitted MIR pilot forms by country of incident

Country of incident	No. submitted	Percentage
United Kingdom	334	45.1
Czech Republic	70	9.4
Italy	42	5.7
Switzerland	33	4.5
Ireland	36	4.9
Sweden	59	8.0
Spain	49	6.6
France	57	7.7
Belgium	14	1.9
Portugal	7	0.9
Austria	11	1.5
Croatia	7	0.9
Denmark	12	1.6
Cyprus	2	0.3
Norway	1	0.1
not mentioned	7	0.9

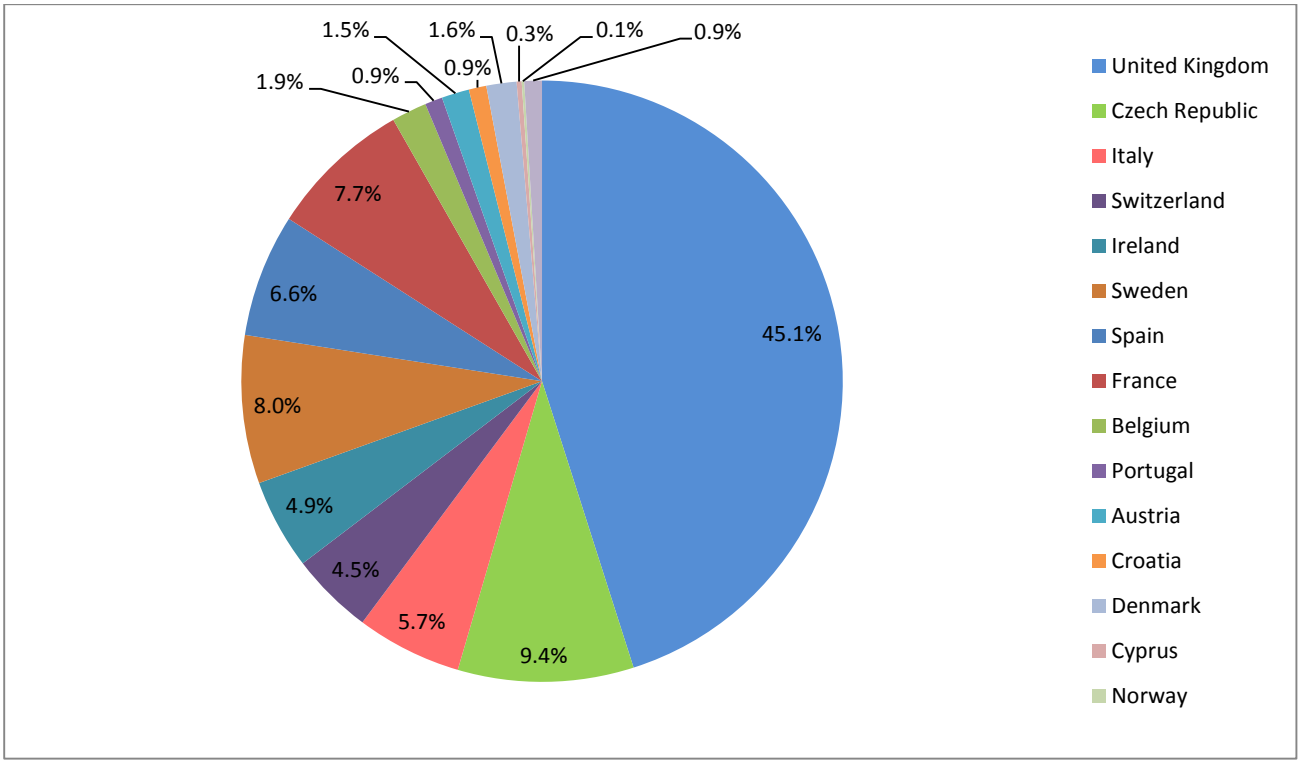

Figure 10. Percentage of submitted MIR pilot forms by country of incident. Values are based on Table 8.

4.6 Analysis of similar incidents and devices on the market

In contrast to the current MEDDEV MIR form, the MIR pilot form contained a section on 'Similar incidents and devices on the market'. Information on similar incidents is expected to help regulators with regard to signal detection and their risk assessment.

The section's purpose was to allow assessment of the following questions: (1) is the identification of similar incidents, according to similarity criteria provided, feasible? This includes provision of the number of devices placed on the market and involved in similar incidents (also known as sales or denominator data); (2) are such data helpful for signal/ risk detection and analysis and, in particular, for coordinated activities in the context of a future European database?

In the context of the pilot, similar incidents are defined as:

> *'Incidents occurring with the **same device type / variant** of a given manufacturer, and (1) having the same root cause and the same event type, if the root cause of the original incident is known; or (2) having the same event type if the root cause of the original incident is unknown; notwithstanding the outcome for the patient, user or other person'.*

To determine how widespread similar incidents have occurred, manufacturers were requested to provide similar incident and sales data: (1) in the country in which the event occurred; (2) EEA + candidate countries + CH; and (3) worldwide. Additionally, these data were requested at specific time periods, which by default were quarters that extended over the last year, thereby allowing for determining device problem rates (including failures, meaning complete non-performance).

A brief analysis of the section on 'Similar incidents and devices on the market' showed the following:

- **Provision of data**

  32% of submissions (234 of the 741 eligible) provided similar incident and/or sales data.

- **Completeness of data**

  Incomplete time period data

  Of the submissions with data, some did not consistently contain incident or sales data for each given time period.

  Incomplete sales data

  Not all geographical sales data was provided. Notably, worldwide data was frequently missing.

- **Format of data**

  Variable data: cumulative vs. period-based

  The number of devices placed on the market was often, but not always, cumulative (as requested at the onset of the pilot).

  Variable time periods chosen

  When data was provided, the default quarterly time period was most frequently used. With agreement of the Competent Authority this could be changed to other time periods, and understandably, yearly time periods were observed for a manufacturer of orthopaedic devices. However, two-month time periods were also observed for no evident reason.

- **Issues with the submitted data**

  Unclear basis of similar incident numbers

  1. It is unclear how similar incidents were calculated, especially if more than one event-type or evaluation term was entered to describe the adverse event. Are the similar incident numbers based on the first entered term or the sum of all individual terms? It would be interesting to have numbers relating to each entered term.

  2. Additionally, in some entries the similar incident data generated appear (from the comments given) to be generated using the evaluation term independent of the event-type term, and this does not comply with the definition and the requested data.

  3. Manufacturers were given the opportunity to use their in-house terms (defined as 3rd level term in the pilot) for determining with more specificity the similar incidents. Despite this, and based on comments given in several submissions, ISO level 2 codes were still used for the basis of the counts.

Geographical data anomalies

In a fraction of submissions, the entered data (for both similar incidents and sales data) did not make sense, for example, where the number for a given period from 'World' or 'EEA + candidate countries + CH' was smaller than that 'in the country in which the event occurred'.

Sales data peculiarities

Repetition of identical sales data in different time periods in the same submissions appear to indicate weaknesses of reporting as it seems highly unlikely that exact same numbers are due to chance. One explanation is that reporters simply rounded the sales data and that the numbers hence are estimates rather than true 'denominator data'.

4.7 Assessment of new event-type terms proposed by manufacturers and EDMA

Because a substantial and in-depth analysis of event-type terms had already been carried out in the second interim report (based on 415 forms of which 395 were eligible), and since there were no marked differences in the type of incidents being reported in the forms that followed, this part of the final report is based to a large degree on the earlier analysis.

4.7.1 Event-type level 1 terms proposed by manufacturers and EDMA

As mentioned earlier, manufacturers can propose new level 1 event-type terms by first choosing 'Other' (term code: 2300) and then proposing a new term.

Table 9 summarises the analysis of newly proposed event-type level 1 terms. The reporter can enter up to three terms to describe the incident. These are defined as choices and the 1st choice is used for the primary description.

Taking all choices together, the analysis shows that 14% of all eligible entered terms were proposals by manufacturers for new event-type level 1 terms. An additional 2% of entered terms were level 1 event-type proposals that were based on EDMA's newly proposed terms (entries for '3000, Operator issue') (Fig. 11).

Table 9. Number and percentage of submitted MIR pilot forms with new event-type proposals for level 1 terms. Total number of eligible forms = 395; indicated percentages reflect only eligible forms and are based on entry of terms for all choices (1, 2 & 3).

	Event-type terms		
	Total number of proposed terms in level 1	**No. of newly proposed level 1 terms**	**No. of EDMA's newly proposed level 1 term**
Choice 1	395	56	0
Choice 2	30	3	8
Choice 3	3	1	0
sum	428	60 (14%)	8 (2%)

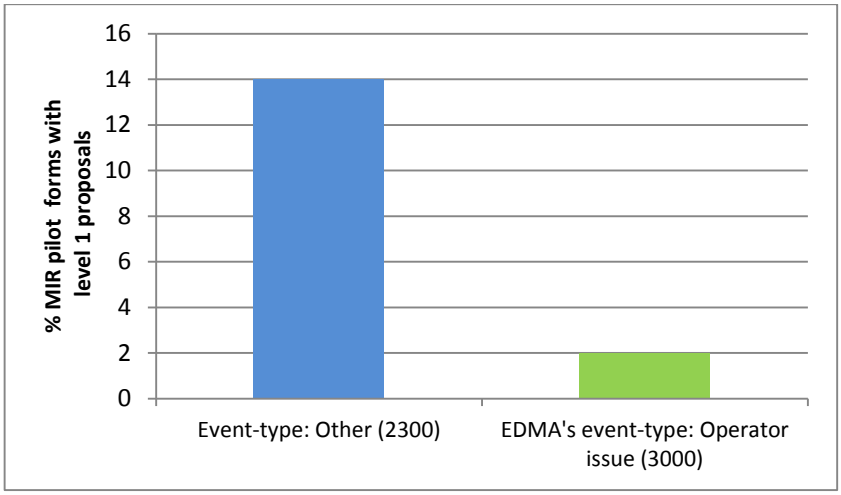

Figure 11. Percentage of submitted MIR pilot forms with proposals for level 1 event-type terms. Values are based on Table 9.

An analysis of newly proposed level 1 event-type (Table 10) terms is shown below. Besides identifying the need for a more elaborate nomenclature, it also shows that a number of terms are in fact redundant or patient outcome terms. This implies that the reporter of the incident may not have been aware of already existing terms or may have associated the 'event-type' term with the patient instead of the device.

Table 10. 'Event-type' level 1 terms proposed by manufacturers (based on choosing 'Other' at level 1&2). L2: level 2; L3: level 3; sum of L1 terms = 54; colour coding: red ≥10 entries (≥18% of L1 terms); orange ≥5 entries (≥9% of L1 terms); yellow ≥3 entries (≥4% of L1 terms).

Level 1	Level 2	Proposed term	No.	Existing term(s)	Comment
2300, Other	2301, Other	(Implant) loosening	3x	L2: 1601, Migration of device or device component L2: 1602, Osseo-disintegration Issue	Possibly valid as level 3 term under 1601: 'Loosening of implant'
		Component loosen/broken	1x	L2: 1601, Migration of device or device component L2: 1602, Osseo-disintegration Issue	
		(Implant) breakage	7x	L1: 2000, Material	Possibly valid as level 2 term under 2000: 'Break'
		Disassociate/Dislocation	2x	L2: 1601, Migration of device or device component	Likely redundant to 'loosening of implant'
		Osteolysis	2x		Patient outcome term
		ARMD	1x		Patient outcome term
		Bone fracture	2x		Patient outcome term
		Pain	2x		Patient outcome term
		Corneal burn	1x		Patient outcome term
		Patient/Surgical	12x		Unclear

		Contamination/ Foreign material	1x	L2: 2504, Item contaminated during shipping	Likely redundant
		Infection	2x	L2: 2901, Inadequate or inappropriate disinfection or sterilization	Likely redundant
		Implant noise: clicking/squeaking noise (while walking/moving knee…)	3x	L1: 2100, Mechanical	Possibly valid as level 2 term under 2100: Audible noise
		No product failure indicated; Revision	2x		unclear
		Implant-Implant Fit : Cement-implant non-bonding (no adherence to bone after polymerisation of cement)		L2: 2802, Failure to adhere or bond	Likely redundant; 2802 to be used together with components section
		Joint mechanics, poor fit, reduced range of movement, esp. knee extension	1x	L2: 2105, Mechanical Jam	Possibly valid as level 3 term under 2105: Reduced range of movement
		Implant Fit: Mating parts don't fit together	2x	L2: 2803, Misassembled	Likely redundant
		Left Knee; AE/fixed flexion deformity >30 degrees - to attempt MUA	1x		unclear
		No information provided; … insert components replaced during surgery due to bending upon insertion	1x	L2: 2103, Dislodged or dislocated	Likely redundant
		Display: cloudy	1x	L2: 2400, Output issue	Possibly valid as level 3 term under 2400 and a new level 2 term 'Incorrect display'
		Display: line through display	1x	L2: 2400, Output issue	
		History/Settings: time/ date reset	1x		unclear
		Air bubbles/ leak	1x	L2:2104, Leak	Possibly valid as level 3 term under 2104: 'Gas leak'
		Aspiration issue	1x	L1: 1800, Infusion/Flow	Possibly valid as level 3 term under 1800 and a new level 2 term ('Suction Issue')
		Casing condition: cracked/ damaged	1x	L2: 2002, Crack	Likely redundant; 2002 to be used together with components section
		Other, unusual issue	1x		unclear
		Not a device problem	1x		possible evaluation term

It is interesting to note that new event-type level 1 terms were most frequently proposed in the orthopaedic device category (83% of terms in this category). However, Table 10 shows that most of the proposed level 1 terms were judged rather to be proposals for level 2 or 3 (instead of level 1). Figure 12 provides insight into terms used and proposed in this device category.

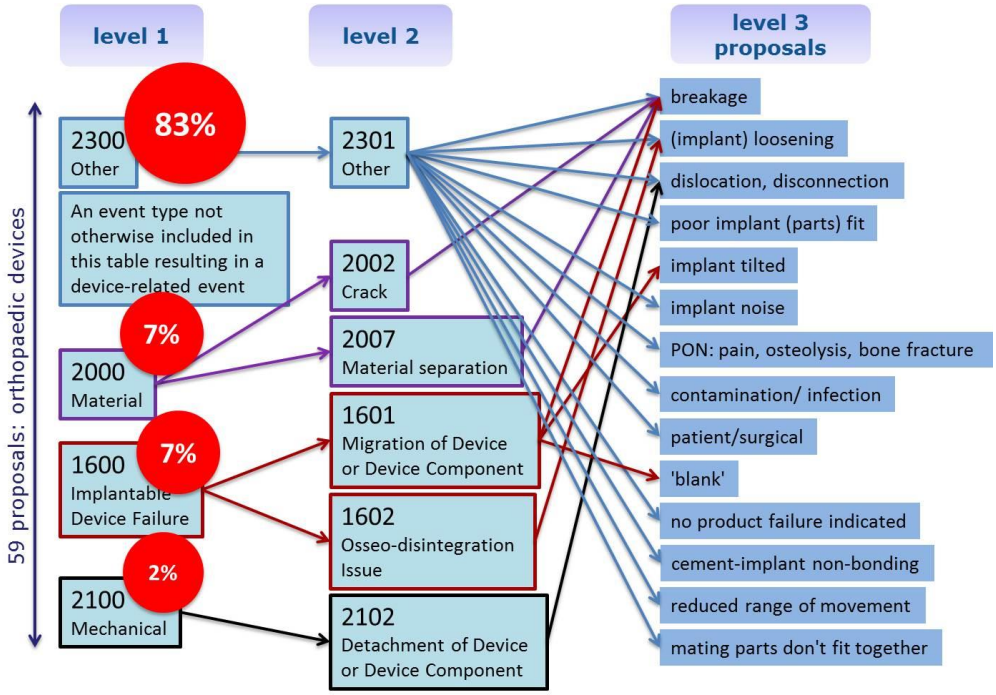

Figure 12. Event-type level 1 terms were predominantly proposed in the orthopaedic device category. This was based predominantly on choosing 'other' as level 1 term (83%) and 'other' at level 2. Some level 3 proposals, however, also branch off existing level 2 terms (e.g. crack, material separation etc.). PON: patient outcome nomenclature.

The most frequently used event-type level 1 term proposals relate to (Tables 10 & 11; Fig. 13):

- 'breakage'
- 'loosening'
- 'dislocation'

Variations hereof exist like:

- 'Post-operative/ breakage implant'
- 'Component loosen/broken'
- 'Implant loosening'

In total, 22% of level 1 event-type proposals were for these terms. The term 'patient/surgical' was the single most frequently proposed term (21%). 16% of proposed terms were patient outcome terms (Table 11; Fig. 13).

Table 11. Grouping of event-type level 1 term proposals by manufacturers

Terms	No. submitted	Percentage
patient outcome term instead of event-type term	9	16
breakage-associated term	7	13
loosening-associated term	5	9
infection/contamination- associated term	4	7
'patient/surgical' term	12	21
other terms	19	34

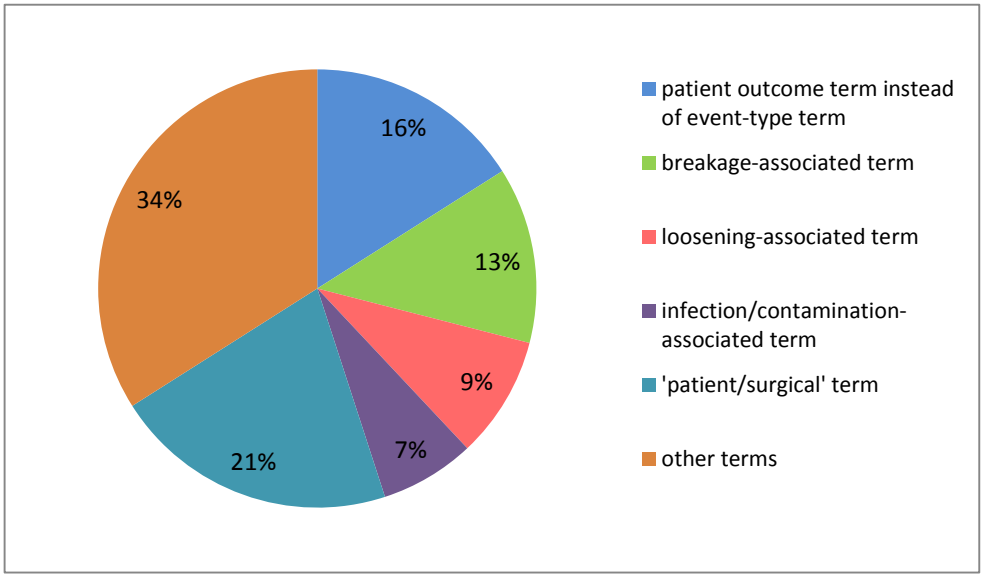

Figure 13. Percentage of grouped event-type level 1 term proposals. Values are based on Table 11.

4.7.2 Event-type level 2 terms proposed by manufacturers and EDMA

As mentioned earlier, manufacturers could propose new level 2 event-type terms by first selecting the appropriate level 1 term, then selecting any available second level term (pull-down menu) and after entering a proposal for a new second level term in the free-text space (space dedicated for level 3 term proposals), the chosen second level term had to be changed to 'unselect'. Because this procedure is not particularly user-friendly it may explain why few or no proposals were made by manufacturers.

Table 12 summarises the analysis of newly proposed event-type level 2 terms. Only 1 event-type level 2 term proposal was made by a manufacturer (Table 13), while 35 other new level 2 proposals (8%) originated from EDMA newly proposed terms (Tables 12 & 14).

Table 12. Number and percentage of submitted MIR pilot forms with new event-type proposals for level 2 terms. Total number of eligible forms = 395; indicated percentages reflect entries from eligible forms and are based on entries at all choices (1st, 2nd and 3rd).

	Event-type terms		
	Total number of proposed terms in level 2	**With newly proposed level 2 terms**	**With EDMA's new level 2 term**
Choice 1	392	1	25
Choice 2	29	0	9
Choice 3	3	0	1
sum	424	1 (0.2%)	35 (8%)

Table 13. 'Event-type' level 2 terms proposed by manufacturers (based on choosing 'Unselect' at level 2)

Level 1	Level 2	Proposed terms	No.	Alternative terms	Comment
1400, Electrical/Electronic		Signs of overheating (Issue associated with overheating of device or parts of the device e.g. melted, discoloured (brownish))	1x	L1: 2700, Temperature L2: 2701, Burned Device or Component L2: 2705, Overheat of Device or Device Component	Redundant to 2705

Of the 12 new 'event-type' terms proposed by EDMA, 5 were used by manufacturers (Table 14; Fig. 14).

Table 14. EDMA's 'event-type' level 2 terms selected by manufacturers. Sum of all entries = 424 (see Table 11); indicated percentages reflect entries from eligible forms and are based on entries for all choices (1st, 2nd, and 3rd).

	No. submitted	**Percentage**
Discrepant negative (2406)	10	2.4
Discrepant positive (2404)	1	0.2
Discrepant high (2405)	10	2.4
Reproducibility issue (2408)	6	1.4
Splash (3001)	8	1.9

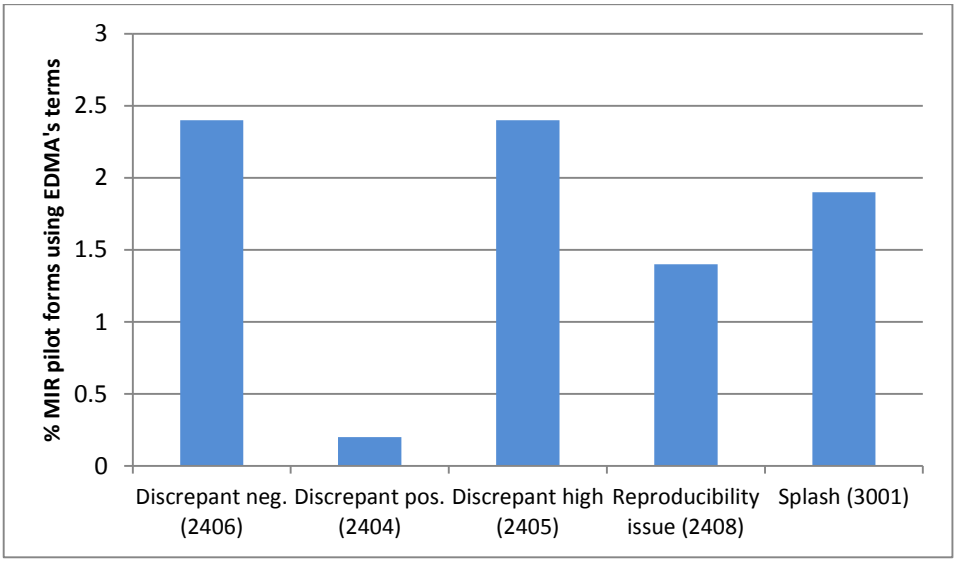

Figure 14. Percentage of submitted MIR pilot forms using EDMA's new 'event-type' terms. Values are based on Table 13.

A closer look at the terms indicated in Table 14 and Figure 14, as well as their respective definitions, clearly shows the need for a revision of the definitions. The terms 'Discrepant negative (2406)', 'Discrepant positive (2404)', and 'Discrepant high (2405)' are defined identically: 'Issue associated with end results provided by the device'. Additionally, the term 'Discrepant low' (2407), which was so far not used in the pilot, has the same definition.

4.7.3 Event-type level 3 terms proposed by manufacturers

After choosing appropriate level 1 and 2 terms the manufacturer can propose new event-type level 3 terms in a dedicated space.

Some of the level 3 event-type terms proposed (Table 15) appear to be more frequently used than others. In some cases, this is related to the high number of MIR pilot forms submitted by one single manufacturer and which also concern the same device.

Table 15. 'Event-type' level 3 terms proposed by manufacturers. L2: level 2; L3: level 3; sum of L3 terms = 295; colour coding: red ≥15 entries (≥5% of L3 terms); orange ≥7 entries (≥2.4% of L3 terms); yellow ≥3 entries (≥1% of L3 terms).

Level 1	Level 2	Proposed terms	No.	Alternative terms	Comment
1000, Activation or Positioning or Separation	1002, Failure to Activate	Button/keypad: tactile changes/ unresponsive	45x		Possibly valid: 'Failure to touch activate button/ key' under 1002
		Button over responsive	1x		Possibly valid: In combination with a new L2 ('Over-activation') under 1000

		Button/keypad: tactile changes with moisture	3x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		Button damage prior to tactile change	2x		Appears as an evaluation term
		Blank display screen	5x	2403, No Device Output	Possibly valid as 'no display' but only as L3 under 2403
		Failure To Shock Or Properly Shock	1x	1404, Power source issue	Possibly valid as L3 ('Failure to properly shock') under 1404
		Failure to power up	1x	1404, Power source issue	Possibly valid as 'Failure to power-up' under 1404
	1003, Failure to Separate	Unfolding issue	3x		Possibly valid: 'Failure to unfold' under 1003
	1005, Delayed Activation	Button/keypad- tactile changes/ unresponsive	12x		Unclear if proposed term relates to a delayed activation (see 1005) or failure to activate (unresponsive)
1300, Connection or Fitting	1301, Connection issue	Power- damage	1x	1404, Power source issue	Unclear
		SITE/SET/CART: O-ring leak	1x		Possibly an evaluation term
	1305, Loose or intermittent connection	Intermittent power	1x		Possibly valid: 'intermittent power' under 1305
1400, Electrical/ Electronic	1402, Circuit Failure	No power	4x	1404, Power source issue	Possibly valid as 'Failure to power-up' under 1404
		Intermittent power	4x	1404, Power source issue	Possibly valid: 'intermittent power' under 1402
		Intermittent power with moisture ingress/intrusion	3x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		No power – damage with moisture ingress	1x		
		Power – damaged with moisture ingress	2x		

		Power – moisture ingress	1x		
		Power – damage	1x		Unclear
		Circuit Failure	1x		Likely redundant
	1403, Device Sensing Issue	Failed to alarm occlusion	1x	2601, Device alarm system issue 1802, Improper flow or infusion	Possibly valid but to be entered separately: L3 under 2601: 'Defective alarm' and L3 under 1802: 'Obstruction within device'
		Loss of signal	1x		Possibly valid: 'Failure to detect signal'
	1404, Power Source Issue	Power issue	1x		Likely redundant
		No power	7x		Possibly valid as 'Failure to power-up'
		Intermittent power	8x		Possibly valid as 'Intermittent power'
		Power-(damage with) moisture ingress	11x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		Power - damage	5x		Unclear
		Premature battery depletion/ longevity	1x		Possibly valid as 'Internal battery of device prematurely depleted'
1600, Implantable Device Failure	1601, Migration of Device or Device Component	implant: tilted (migration/tilting of cup)	1x		Possibly valid as 'Unintended tilting of implant cup'
		Implant tilted	1x		
		Break	1x		unclear
	1602, Osseo-disintegration Issue	Loosening of implant	1x	1601, Migration of Device or Device Component	Possibly valid as 'loosening of implant' under 1601
1700, Incompatibility	1703, Patient-Device Incompatibility	Visual Disturbance: anomalies as experienced by patient in their field of vision	1x		Patient outcome term
		Loss of capture	1x	1400, Electrical/ electronic	Possibly valid as new Level 2: 'Failure to capture' under 1703
		Pacing threshold pro	1x		unclear

1800, Infusion/Flow	1802, Improper Flow or Infusion	History/Settings issue- Inaccurate delivery	13x	1202, Programming issue	Possibly valid but should be entered separately as (1) L3 ('Inaccurate delivery' under 1802) and (2) L2 (1202, 'Programming issue')
		Catheter shaft, restricted flow	1x		Possibly valid as L3: 'Restricted flow rate' under 1802
	1805, Excessive Flow or Overinfusion	Overdelivery	1x		Likely redundant
		Overinfusion (> 30% above expected rate)	1x		
	1806, Insufficient Flow or Under-infusion	Underdelivery	1x		Likely redundant
2000, Material	2001, Burst	Balloon, rupture	2x		Burst is defined as rupture
		Rupture	1x		
	2002, Crack	Catheter shaft, crack	1x		Likely redundant
		Display damaged	6x		Likely redundant: component codes to be used together with 2002
		Display: damage with moisture ingress	1x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		Power: damage with moisture ingress	1x		Unclear: power source cracked with moisture ingress?
		Break	3x		Possibly valid as level 2 term under 2000: 'Break'
	2003, Degrade	Line through display	8x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'
		Display: segments missing	8x		
		Display: damage	2x		Needs to be further specified
		Display: dim/ fading/ colour spectrum	2x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect

					display'
		Display: blank screen	2x	2403, No Device Output	Possibly valid as 'no display' but only as L3 under 2403
		Display: cloudy	1x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'
		Display: cloudy with moisture	1x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		Display: scratched	1x		Possibly valid L3 as 'Scratched material' under a new L2: 'material deformation'; Components code should define affected component
	2004, Material discoloured	Display: dim/ fading/ colour spectrum	48x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'
		Display: fading/ colour spectrum	2x		
		Display: dim/ fading/ colour spectrum with moisture	4x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture damage') under a new L2 ('moisture or humidity problem') under 1500.
		Cloudy with moisture	1x		Needs to be further specified
		Cloudy	1x		Needs to be further specified
		Display: inkspot	1x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'
		Display: cloudy	1x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'
	2005, Material Fragmentation	Display: segments missing	2x	2400, Output issue	Possibly valid as L3 under L1 2400, and new L2: 'Incorrect display'

		Brea	1x		Possibly valid as level 2 term under 2000: 'Break'
	2007, Material separation	Instrument breakage	1x		
		Detachment of device component	4x	L1: 2100, Mechanical L2: 2102, Detachment of device or device component	Likely redundant to L2: 2102
		Display: damage	1x		Needs to be further specified: break?
		Core separation	1x		Unclear
2100, Mechanical	2102, Detachment of Device or Device Component	Disconnection of the Implant	1x	1602, Osseo-disintegration Issue	See above: 'Loosening of implant' under 1602, Osseo-disintegration Issue
	2104, Leak	Catheter shaft, Leakage blood	1x		'blood leakage' needs to be further explored
		Leak	8x		Likely redundant
	2105, Mechanical Jam	Mechanical jam	1x		Likely redundant
2400, Output Issue	2402, Incorrect or Inadequate Result	History settings issue	2x	1202, Programming issue	To be entered separately: 1) 2402, incorrect result; 2) 1202, programming issue
		time and date issue	1x	1200, Computer software	Possibly valid under L1: 1200
		Call service alarm issue	5x	2601, Device Alarm System Issue	Possibly valid under 2601
		Audio tone/ Vibration issue	4x	2100, Mechanical 2107, Unintended movement	Possibly valid under 2100: noise; and under 2107: vibration
	2406, Discrepant negative	Cross-match	8x		L2:2406 EDMA's IVD-related term. Possibly valid L3.
2600, Protective	2601, Device Alarm System Issue	Audio tone/ Vibration issue (no sound; weak or intermittent vibration)	4x		Possibly valid: 'Not audible alarm' 'Weak alarm vibration' under 2601
		Frequent/ persistent occlusion	1x	1802, Improper Flow or Infusion	To be filled in separately: 2601 & 1802
2700, Temperature	2705, Overheat of Device or Device	Temperature – Moisture ingress	1x	1500, External conditions	Moisture issue could be entered separately as new L3 ('moisture

	Component				damage') under a new L2 ('moisture or humidity problem') under 1500.
		Temperature – physical damage	1x		Possibly valid: Overheating with physical damage
		Temperature – no physical damage	1x	2704, Insufficient cooling	Possibly valid: Overheating with no physical damage
2800, Unintended Function	2802, Failure to adhere or bond	Implant-Implant Fit : Cement-implant non bonding	1x		Likely redundant; 2802 to be used together with components section
2900, Use Error	2906, Device inoperable	Device displays error message	7x	2801, Device displays incorrect message	Possibly valid: Device displays error message
	2905, Use of Device Issue	SITE/SET/CART: air bubbles filling	1x		unclear

4.7.4 The need for a modular approach regarding hierarchical structure of nomenclatures

The analysis of newly proposed terms prompted us to reflect on a key issue regarding the structure of nomenclatures. It is important to pursue a **'modular approach'** when proposing new terms and when maintaining nomenclatures, otherwise one risks to develop an overly detailed set of terms for describing incidents.

A good example relates to terms concerning power (Table 15). The power-related level 3 event-type proposals are shown in Figure 15. Often proposals consist of combinations of single terms. For example, both 'no power' and 'no power with moisture ingress' can be found within the proposals. The same applies for the case of 'intermittent power'. As there is the possibility to enter up to three terms to describe the event (choices 1-3), the modular approach implies to separate the described event into separate modules (or choices) (Figure 16).

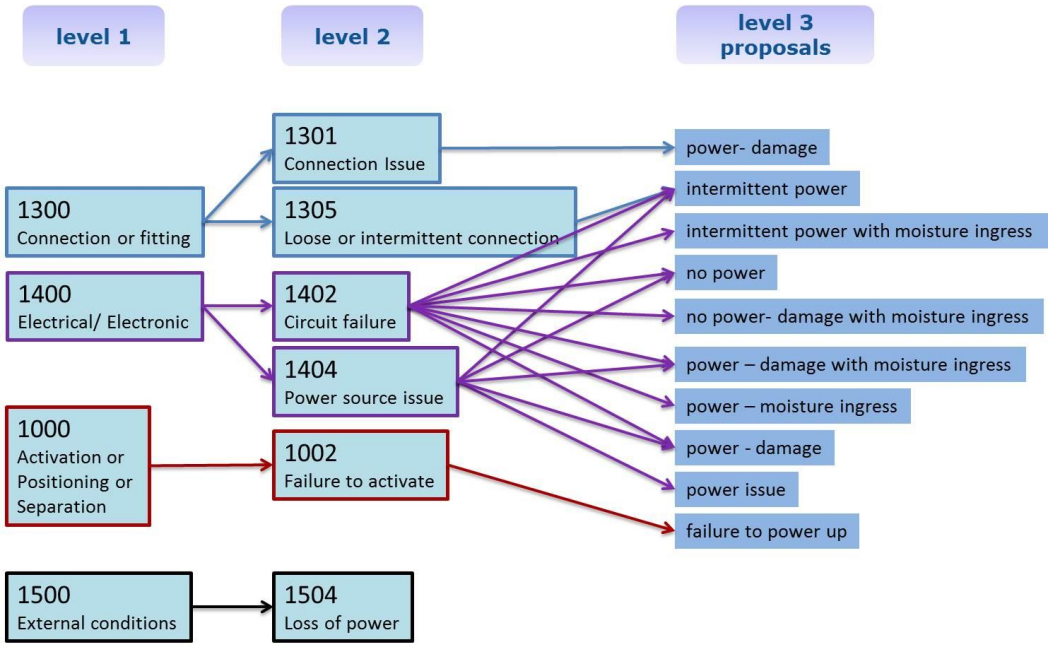

Figure 15. Event-type level 3 term proposals related to power.

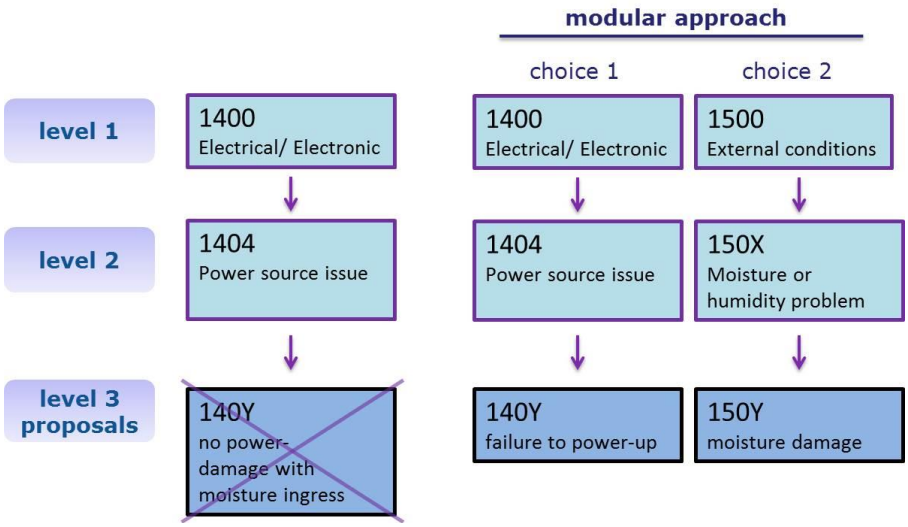

Figure 16. The modular approach explained using a proposed level 3 event-type term relating to an electrical power issue (no power- damage with moisture ingress). For the sake of not creating an overly detailed set of terms, a guiding principle for nomenclature development/maintenance would be to aim for a modular architecture of the terminology, i.e. splitting the described issues into ***separate modules***: 'failure to power-up' AND 'moisture damage'.

4.8 Assessment of new evaluation terms proposed by manufacturers and EDMA

Because a substantial and in-depth analysis of evaluation terms had already been carried out in the second interim report (based on 415 forms, of which 395 are eligible), and since there were no marked differences in the type of incidents being reported in the forms that followed, this part of the final report is largely based on the earlier analysis.

4.8.1 Evaluation level 1 terms proposed by manufacturers and EDMA

Manufacturers can propose new level 1 evaluation terms by first choosing 'Other' (term code: 27300) and then proposing a new term.

Table 16 summarises the analysis of newly proposed evaluation level 1 terms. The reporter can enter up to three terms to describe the results of the manufacturer's investigation. These are defined as choices and the 1st choice is used for the primary description. Taking all choices together, the analysis shows that 3% of all eligible entered terms were proposals by manufacturers for new evaluation level 1 terms. This is much less when compared to event-type terms (14%; Table 9, Figure 17)

Table 16. Number and percentage of submitted MIR pilot forms with new proposals for level 1 terms. n/a: not applicable; total number of eligible forms = 395; indicated percentages reflect only eligible forms and are based on entry of terms for all choices (1, 2 & 3).

	Evaluation terms		
	Total number of proposed terms in level 1	**No. of newly proposed level 1 terms**	**No. of EDMA's newly proposed level 1 term**
Choice 1	395	12	n/a
Choice 2	35	1	n/a
Choice 3	9	0	n/a
sum	439	13 (3%)	

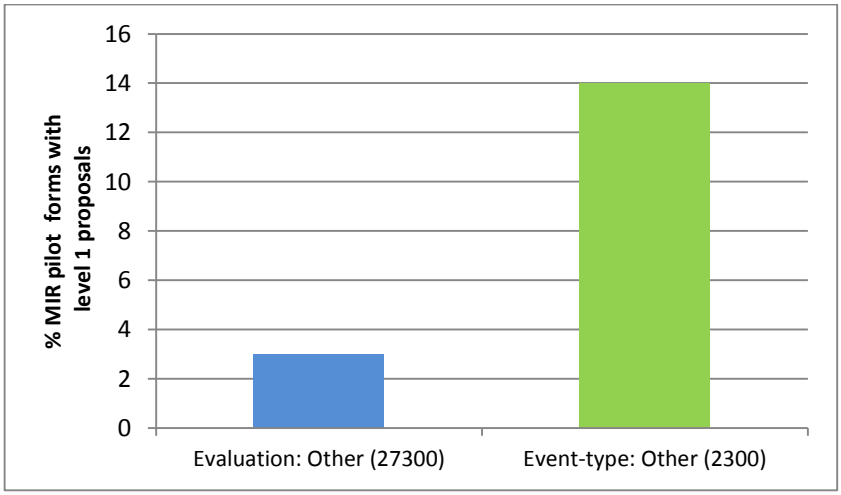

Figure 17. Percentage of submitted MIR pilot forms with proposals for level 1 evaluation terms. For comparison, event-type terms were included. Values are based on Table 9 and 16.

An analysis of newly proposed level 1 evaluation terms is shown below (Table 17). There were 12 new proposals, however, they often appeared redundant or to be event-type terms. The most frequently proposed level 1 evaluation term was 'Moisture in pump'. It may be better to redefine it as 'moisture issue' and to categorise it as a level 3 term under 26704, 'Leakage/seal'. Alternatively, it could be rephrased to 'Improper humidity' and placed under a new L1: 'Environment problem'.

Table 17. 'Evaluation' level 1 terms proposed by manufacturers (based on choosing 'Other' at level 1 & 2). L2: level 2; L3: level 3; Sum of L1 terms = 12; colour coding: red ≥3 entries (≥25% of L1 terms); orange ≥2 entries (≥16% of L1 terms).

Level 1	Level 2	Proposed term	No.	Alternative terms	Comment
27300, Other	27301, Other	Other - packaging	2x	L2: 26506, Packaging problem L2: 25303, Packaging	Likely redundant
		Loosening	2x		Event-type term
		Component loosen/ broken	1x		Event-type term
		Inaccuracy confirmed	1x		Needs to be further specified
		Moisture in pump	5x	L2: 26704, Leakage/ Seal	Possibly valid as level 3 term under 26704; Component codes to be used to identify pump
		Lines in Display	1x		Event-type term

4.8.2 Evaluation level 2 terms proposed by manufacturers and EDMA

No 'evaluation' level 2 terms were proposed by manufacturers. As for event-type terms (Table 11), the relative lack of proposals is likely a result of the cumbersome procedure to introduce new level 2 term proposals, which proved to be not very user-friendly. Additionally, no forms were submitted with EDMA's new evaluation terms (Table 18).

Table 18. Number and percentage of submitted MIR pilot forms with new proposals for level 2 terms. total number of eligible forms = 395; indicated percentages reflect entries from eligible forms and are based on entries for all choices (1st, 2nd and 3rd).

	Evaluation terms		
	Total number of proposed terms in level 2	**With newly proposed level 2 terms**	**With EDMA's new level 2 term**
Choice 1	395	0	0
Choice 2	35	0	0
Choice 3	9	0	0
sum	439	0 (0%)	0 (0%)

4.8.3 Evaluation level 3 terms proposed by manufacturers

Some of the level 3 evaluation terms proposed by manufacturers appear to be more frequently used than others. For example, the term 'device not returned to manufacturer' and variations thereof ('device not returned for investigation' or 'product not returned') were used in a significant number of the submissions (Table 19).

Table 19. 'Evaluation' level 3 terms proposed by manufacturers. L2: level 2; L3: level 3; Sum of L3 terms = 265; colour coding: red ≥15 entries (≥5.6% of L3 terms); orange ≥7 entries (≥2.6% of L3 terms); yellow ≥3 entries (≥1.1% of L3 terms).

Level 1	Level 2	Proposed terms	No.	Alternative terms	Comment
25500, Electrical	25501, Electrical component	Defective capacitor	1x		Likely redundant to 25501; capacitor to be defined in component codes
	25502, Electrical circuitry	Moisture in pump	1x	L2: 26704, Leakage/seal	Better placed under 26704
	25503, Electrical contact	Damaged battery cap	1x	L2: 26601, Degradation problem L2: 26703, Fracture	Likely redundant; battery and cap to be defined in component codes and damage needs to be further specified (if worn out then 26601,…)
	25507, Power source — loss of power	Power Source Problem	1x		Likely redundant
26000, Human factors	26001, Abnormal use	Abnormal use	1x		Likely redundant
	26006,Installation problem	User error	1x	L2: 26014, Use error	Likely redundant to 26006; 26014 could be entered separately
	26009, Patient anatomy/ physiology	User error: orientation of implant; Orientation of implant not optimal	1x		Possibly valid L3 under 26009: Non-optimal orientation of implant
	26014, Use error	Orientation/ alignment of implant	1x		
26600, Materials, chemistry	26601, Degradation problem	Dim/discoloured display	19x		Event-type term
		Unidentified Display Failure	4x	L2: 29001, Unidentified	Likely redundant: 29001 could be entered separately
		Unidentified display failure (Faded Colour/Dim Display)	3x		
		Moisture in pump	2x	L2: 26704, Leakage/seal	Better placed under 26704
		Peeling display lens cover	1x		Event-type term
		Display damaged	1x		Event-type term
		Scratched display lens (scratches on lens)	1x		Event-type term

		Battery compartment crack	1x	L2: 26703, Fracture	Event-type term
	26604, Reactivity problem	The most probable root cause is sample-related, the antibody being weak and/or at detection limit of the reagents & technique used, associated with the preparation of the cell suspension or a combination of both.	2x		Possibly valid as L3 under 26604: Discrepant reaction likely due to weak antibody and/or sample preparation
		The root-cause of the discrepant negative reactions in crossmatch obtained for plasma from patient with donor is determined to be a use error. The customer manually altered a condition code posted by the analyser	1x	L2: 26014, Use error	Possibly valid as L3 but under 26014: Manual alteration of device condition codes
		The root-cause of the discrepant negative reaction in crossmatch obtained for plasma from patient with donor could not be determined, although it could not be excluded it is either sample-related, the antibody being weak and/or at the detection limit of the reagents and technique used or it is associated with the preparation of the cell suspension from the donor cells or a combination of both.	2x		Possibly valid as L3 under 26604: Discrepant reaction likely due to weak antibody and/or sample preparation
26700, Mechanical	26701, Component malfunction	Vibration motor alignment	1x		Possibly valid as L3 'vibration problem' under new L2 'stress problem' under 26700; Motor to be defined separately in component codes
		Cold/cracked Solder on Piezo	1x		Better placed under 26702
		inverted button contact	1x	L2: 26501, Assembly problem	Possibly valid under 26501; button to be specified under component codes
		Failed Display Connector	1x	L2: 26202, Disconnection	Likely redundant to 26202; Display to be specified using component codes
		Damaged Display Screen	1x		Possibly event-type terms
		component failure	1x		Likely redundant to

			26701
	bolus button damage	1x	Possibly event-type terms
26702, Fatigue	Material fatigue	1x	Likely redundant to 26702
	Cold/cracked Solder on Piezo	1x	Possibly valid as L3 under 26702
	Battery compartment crack	2x	Better placed under 26703, fracture; battery to be defined in component codes
	Damaged battery compartment	1x	Possibly an event-type term; battery compartment to be specified using component codes
	Damaged Pump Case	3x	Possibly event-type term; Pump case to be specified using component codes
	scratched display lens	1x	Possibly event-type terms
	Damaged display screen	2x	Event-type term
26703, Fracture	battery compartment cracked	7x	Likely redundant to 26703; Battery compartment to be specified separately using component codes; L2: 26703 better placed as L3 under new L2: 'stress problem'
	battery compartment cracked with moisture intrusion	1x	Moisture issue to be entered separately possibly under 26704, or alternatively it could be rephrased to 'Improper humidity' and placed under a new L1: 'Environment problem'
	Bolus button cover detached/missing	1x	Possibly valid as 'missing device component'
26704, Leakage/seal	Moisture in pump	5x	Possibly valid as L3 'Moisture issue' under 26704. Pump to be specified using component codes; Alternatively 'moisture issue' could be rephrased to 'Improper humidity' and placed under a new L1: 'Environment problem'
	Display Lens Leak	1x	Likely redundant, display and lens to be

					defined via component codes
	26705, Wear	Damaged Battery Cap	1x		Likely redundant, battery and cap to be specified in component codes
		Button Contact Defect	1x		Likely redundant, button to be defined in component codes
26800, No medical device problem or failure detected	26801, no medical device problem	- No defect found - No defect found on testing - No device problem determined - Undetermined: no product problem identified -complaint not duplicated -not able to reproduce issue	55x		Possibly valid, L1 and L2 terms needs to be redefined to account for device having been tested/ investigated with no evidence of failure
		Actual Device Not Evaluated	1x		Possibly valid, Term needs to be redefined to account for device not having been returned for investigation
		Battery compartment cracked	1x		Better placed under 26703
	26802, no medical device failure detected	- Device not returned - Device not returned for investigation - No device returned for investigation - Product not returned - No Results Available Since No Evaluation Performed	40x	-	Possibly valid, terms need to be redefined to account for device not having been returned for investigation
		No sample	8x		Possibly valid, term needs to be redefined to account for device/sample not having been returned for investigation
		- Undetermined: insufficient information - Unable to investigate - Not confirmed	9x	-	Possibly valid, Appears as a result of device not being returned for investigation. Need for redefining terms
		Retain Product Tested -- Missing or inadequate information	1x		unclear
		-No fault found on testing -no defect found	57x		Possibly valid, Terms needs to be redefined to account

		-unable to reproduce during investigation - Undetermined : No Product Problem Identified - no systematic failure of product or analyser to perform as intended - Undetermined : No Product Problem Identified			for device having been tested/ investigated with no evidence of failure
		Unable to adequately investigate due to an unrelated failure	1x		Possibly valid
		Low voltage in replacement battery and/or unacknowledged Warning/Alarm/Reminder observed in black box	1x	L2: 27101, Alarm	Possibly better placed under 27101
29000, Unidentified	29001, Unidentified	- Undetermined	3x		Likely redundant
		- Root cause could not be identified			Likely redundant
		- Sample not returned - Device not returned - no evaluation could be performed	3x		Possibly valid, Terms need to be redefined to account for device not having been returned for investigation
		-Unable to reproduce during Investigation -Device is tested for functionality and pass. -Unable to confirm or duplicate the complaint during investigation	6x		Possibly valid, Terms needs to be redefined to account for device having been tested with no evidence of failure
		Pump alarmed preventing testing; Unable to test owing to an unrelated fault	1x		Possibly valid

Table 19 shows that the most frequently proposed level 3 evaluation term relates to the term 26800, 'No medical device problem or failure detected'. This seems to indicate either a need for higher resolution (granularity) or an inadequacy of these terms and their definitions. This prompted us to take a closer look at them.

4.9 Resolving the most frequently encountered nomenclature issue

Figure 18 shows that the most frequently encountered terms within the MIR pilot form relate to the evaluation term 26800, 'No medical device problem or failure detected' (65% of terms), and the two terms branching off this level 1 term: 26801 (18% of terms) and 26802 (46% of terms).

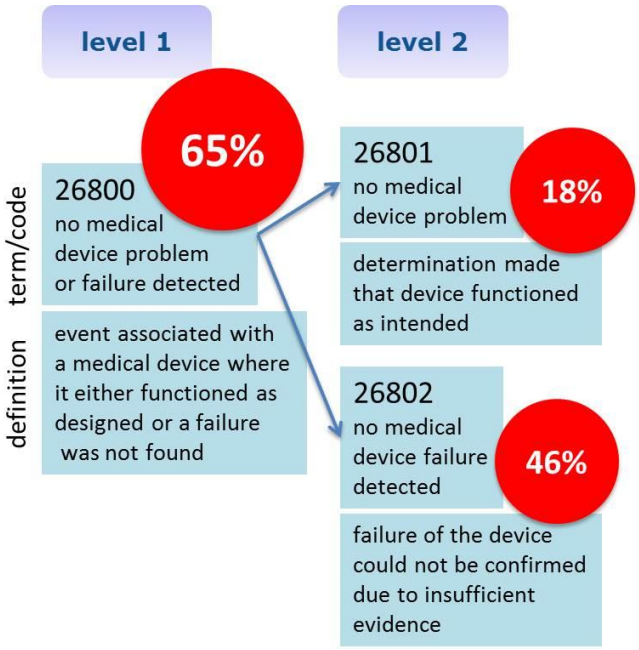

Figure 18. Most frequently encountered terms within the MIR pilot form relate to the level 1 evaluation term 26800.

Figures 19 and 20 show the different level 3 evaluation terms proposed by manufacturers which relate to the level 1 term 26800, and to its respective level 2 terms 26801 (Fig. 19), and 26802 (Fig. 20). Their frequency of use is also shown (percentage of MIR pilot forms with the proposed term). The terms have also been rearranged in Figure 21 as an effort for a better fit for similarity.

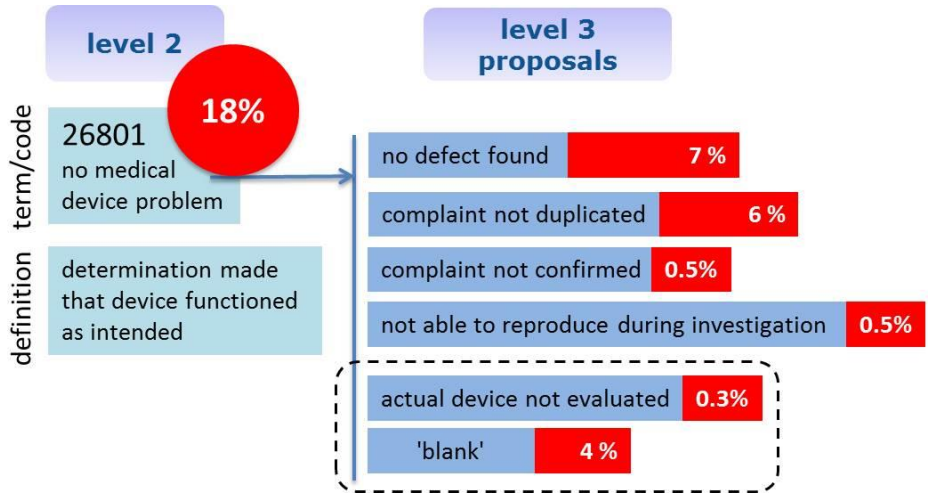

Figure 19. Proposed level 3 evaluation terms related to the level 2 term 26801. Boxed are terms that are distinctly different from the others and possibly imply that no investigation took place.

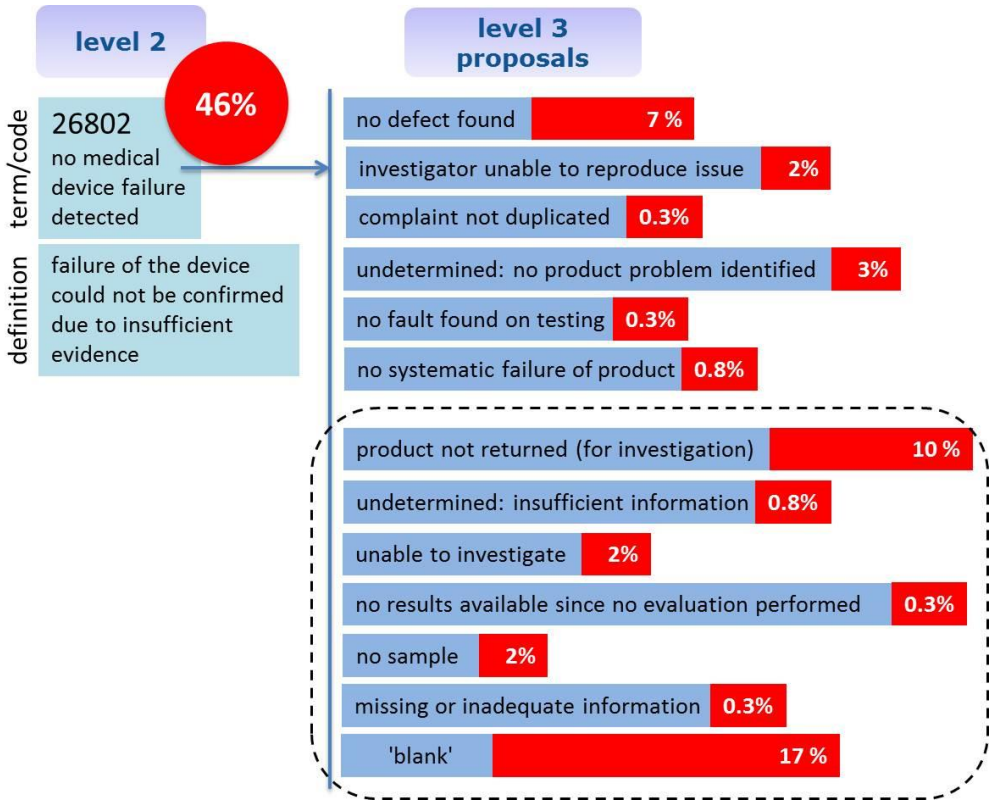

Figure 20. Proposed level 3 evaluation terms related to the level 2 term 26802. Boxed are terms that are distinctly different from the others and possibly imply that no investigation took place.

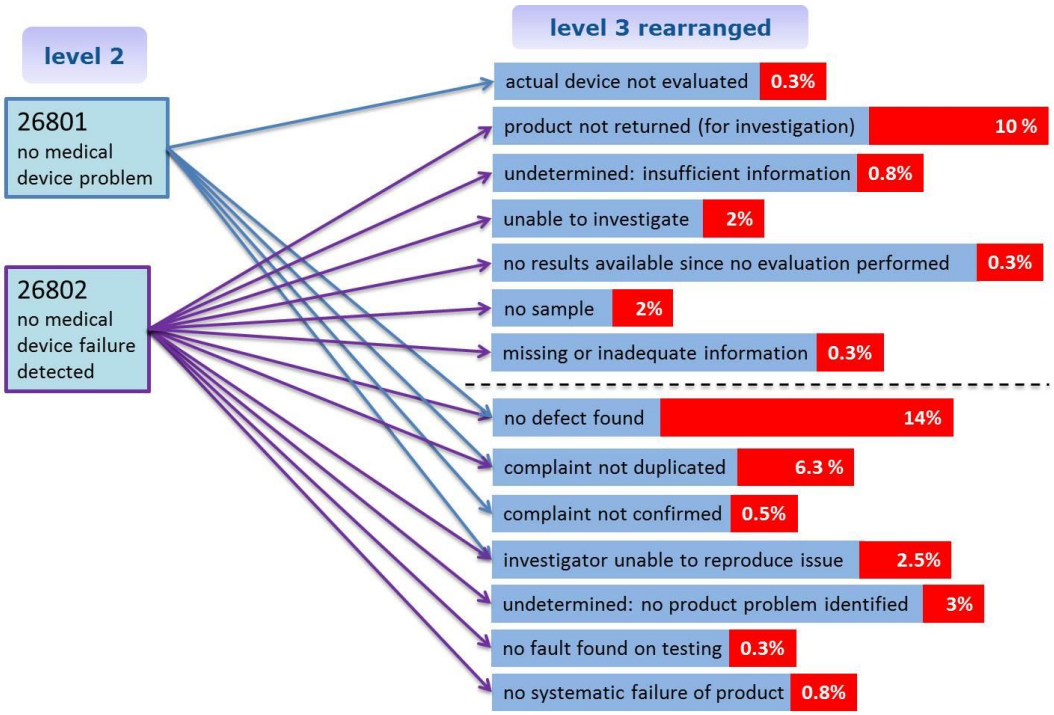

Figure 21. Rearrangement of level 3 terms into two distinct categories, defining whether or not an investigation took place.

A closer look at the relevant evaluation terms (26800, 26801, & 26802) and their definitions shows that there is room for improvement in their naming and definition. A strategy, which lies at the basis of new terminology proposed by JRC to resolve this issue is shown in Figure 22. This strategy would be in line with the philosophy embodied in the current FDA's evaluation terms and it remains unclear why ISO decided, when using the FDA evaluation terms as a basis for their technical specifications, to abolish terms that, unambiguously, allow to report whether or not an investigation of the device or the batch has taken place.

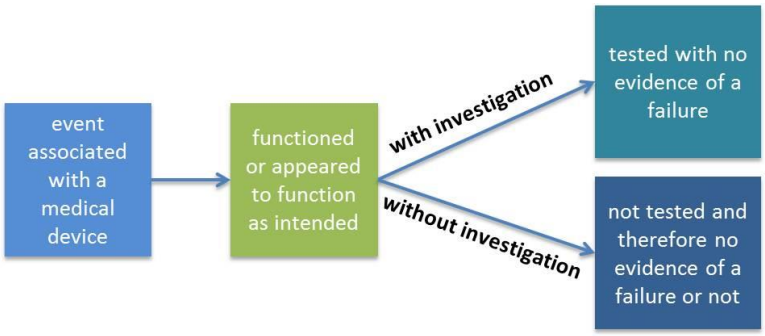

Figure 22. Strategy used for JRC's new terminology proposal (modifications to 26800, 26801 & 26802).

Figure 23 shows the proposed new terminology by JRC for level 1, 2 and 3 evaluation terms and their definitions, which could provide more clarity for manufacturers when reporting incidents using the level 1 term 26800, and its respective level 2 terms 26801 & 26802.

At a first level, there should be a clear distinction made between a device that functioned as intended and a device that did not function as intended. At the second level, there should be a clear distinction made on whether an investigation for gathering evidence of a failure took place or not. At the third level, a new evaluation term could be introduced to provide an added level of detail describing that no investigation took place because the device was not returned to the manufacturer.

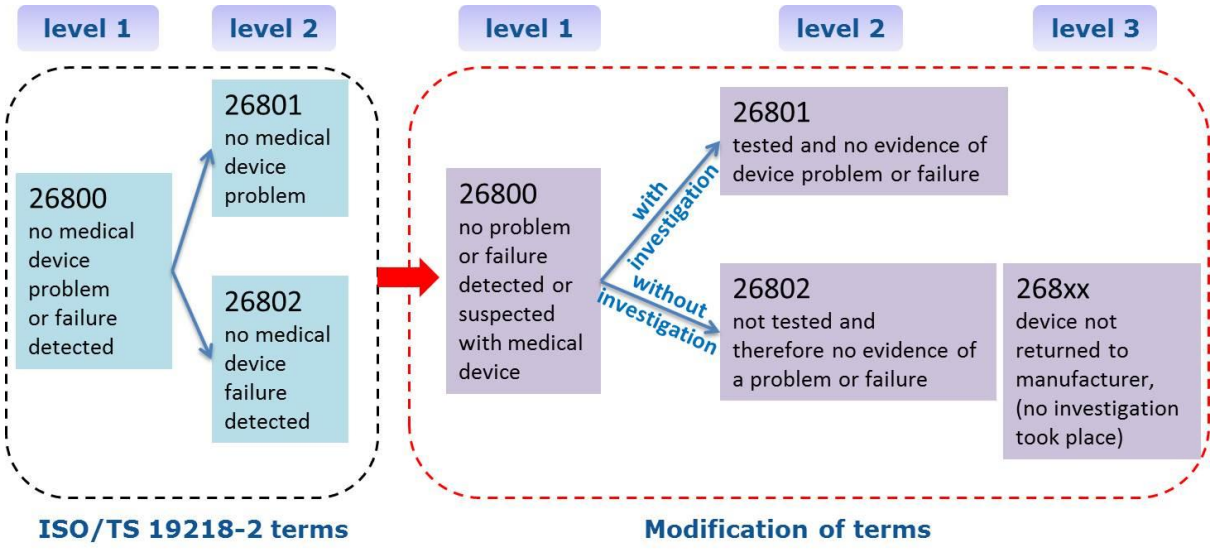

Figure 23. JRC proposal for modifications and additions to the level 1 term 26800 and its respective level 2 terms 26801 & 26802.

These new terms and their definition should resolve some of the issues faced by manufacturers, and should remove redundancies as shown in the following figure (Figure 24).

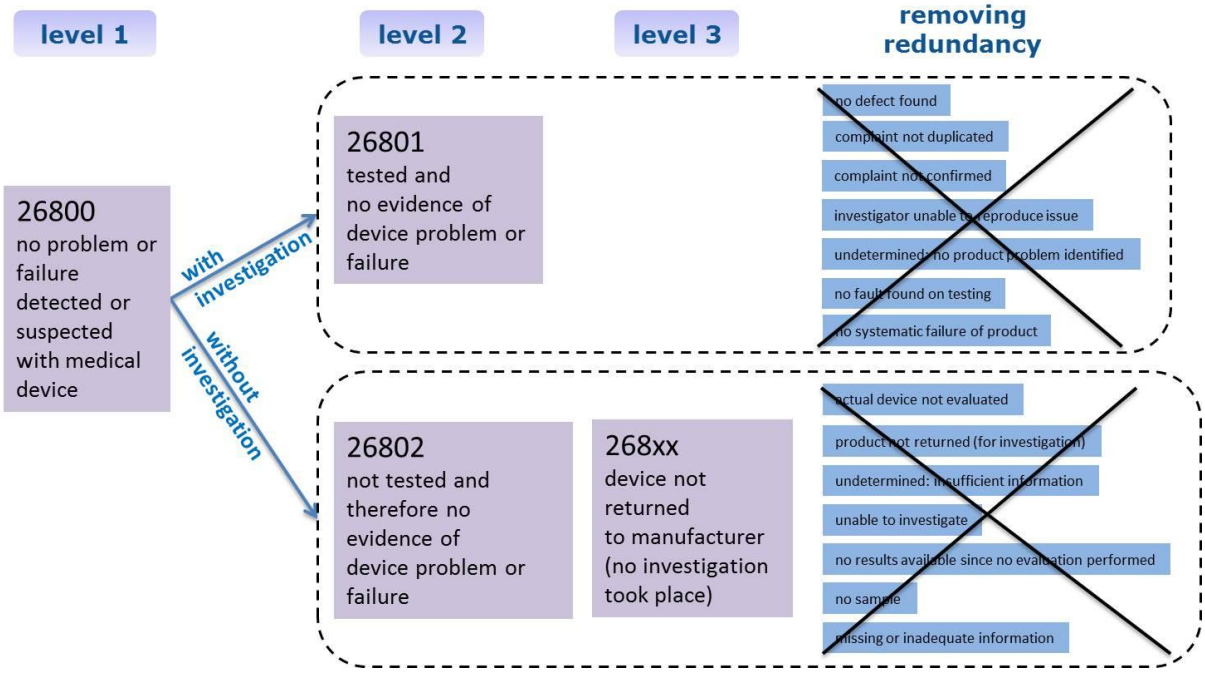

Figure 24. Regrouping of terms proposed by manufacturers using new terms/ definitions proposed by JRC and the removal of redundancy.

4.10 Terms to be considered for incorporation in the future global nomenclature for describing incidents with devices (IMDRF initiative)

As part of ongoing efforts to develop a globally used nomenclature (International Medical Device Regulators Forum [IMDRF] nomenclature) for describing incidents with devices, the proposed terms of the pilot that have been deemed valid when compared to ISO/TS 19218 have subsequently also been compared to FDA terms to identify possibly missing/better terms (Figure 25).

The event-type terms were compared to FDA's device problem terms (Table 20), while the evaluation terms were compared with FDA's evaluation result and conclusion terms (Table 21). FDA's terms were last accessed on 31 March 2016 at:

http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/PostmarketRequirements/ReportingAdverseEvents/EventProblemCodes/ucm134751.htm

Additionally, EDMA's event-type and evaluation terms were compared with FDA's terms (Table 22).

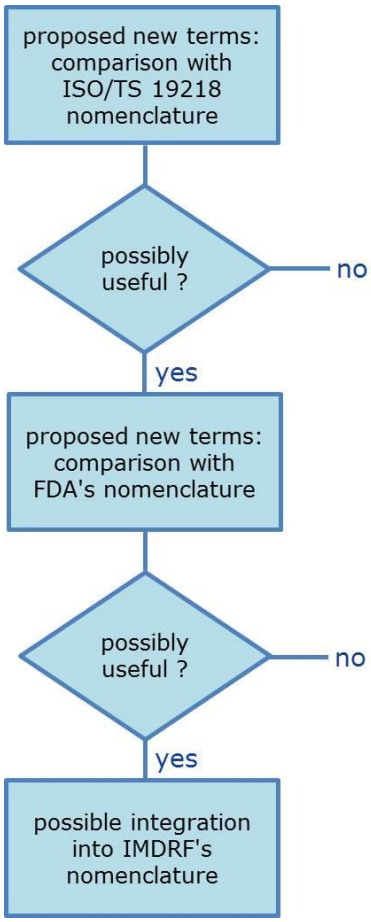

Figure 25. Workflow used to identify terms that could be incorporated into the ongoing development of IMDRF's nomenclature.

Table 20. Event-type terms proposed by manufacturers and considered to be valid (when compared to ISO/TS 19218-1), which were subsequently compared to FDA's device issue terms and evaluated for consideration for use in a future globally used nomenclature. Cells with identical/ similar terms are shaded.

Pilot			Comparison with FDA's terms			
Level 1	**Level 2**	**Proposed level 3**	**Level 1**	**Level 2**	**Level 3**	**Comment**
Activation or Positioning or Separation (1000)	Failure to activate (1002)	Button/keypad: tactile changes/ unresponsive	Deployment Issue C63013; FDA 2906	Failure to Deploy C63183; FDA 1158		'Failure of touch activation of button' could be considered as L3.
		Button over responsive		Self-Activation or Keying C62844; FDA 1557		'Touch activation of button leads to over-responsiveness' could be considered as L3
		Button/keypad: tactile changes with **moisture**	Environmental Control or Utility Issue C63209; FDA 2929	Moisture or Humidity Problem C62909; FDA 2986	Moisture Damage C62910; FDA 1405	Moisture issue could be entered separately or together as 'failure of touch activation with observable moisture ingress'
		Blank display screen	Output Issue C62941; FDA 3005	No Device Output C62900; FDA 1435	No Display or Display Failure C62904; FDA 1183	Likely redundant
		Failure to power up/ Failure to properly shock	Electrical Issue C63007; FDA 1198	Failure to Shock or Properly Shock C63158; FDA 1573	Failure to Discharge C63181; FDA 1169	Likely redundant
	Failure to separate (1003)	Unfolding issue	Deployment Issue C63013; FDA 2906	Failure to Separate C63159; FDA 2547		'failure to unfold' could be considered as L3
Connection or Fitting (1300)	Loose or intermittent connection (1305)	Intermittent power	Connection Issue C62952; FDA 2900	Decoupling C63256; FDA 1145		'Loose connection with intermittent power' could be considered
			Device Operates Differently than Expected C62955; FDA 2913	Decoupling Device Stops Intermittently C62924; FDA 1599		
Electrical/Electronic (1400)	Circuit failure (1402)	No power	Electrical Issue C63007; FDA 1198	Power Source Issue C63025; FDA 3010	Failure to Power-Up C62992; FDA 1476	Likely redundant
		Intermittent power				'intermittent power' may in addition to

						'connection issue' (see above) be considered as a L3 under 'power source issue'
		Intermittent power with moisture ingress/intrusion	Moisture or Humidity Problem C62909; FDA 2986	Moisture Damage C62910; FDA 1405		Moisture issue could be entered separately or together
		No power – damage with moisture ingress	Electrical Issue C63007; FDA 1198	Power Source Issue C63025; FDA 3010	Failure to Power-Up C62992; FDA 1476	No power is likely redundant;
			Moisture or Humidity Problem C62909; FDA 2986	Moisture Damage C62910; FDA 1405		Moisture issue could be entered separately or together
	Device sensing issue (1403)	Failed to alarm occlusion	Device Sensing Issue C63238; FDA 2917	Failure to Sense C63160; FDA 1559		Valid L3: 'failure to sense and alarm occlusion'
		Loss of signal		Invalid Sensing C63061; FDA 2293	Failure to Select Signal C63161; FDA 1582	Likely redundant
	Power source issue (1404)	No power	Electrical Issue C63007; FDA 1198	Power Source Issue C63025; FDA 3010	Failure to Power-Up C62992; FDA 1476	Likely redundant
		Intermittent power				Possibly valid
		Power-damage with moisture ingress	Moisture or Humidity Problem C62909; FDA 2986	Moisture Damage C62910; FDA 1405		Moisture issue could be entered separately
		Premature battery depletion/ longevity	Power Source Issue C63025; FDA 3010	Battery Issue C63030; FDA 2885	Premature Discharge of Battery C62864; FDA 1057	Likely redundant
Implantable device failure (1600)	Migration of device or device component (1601)	Implant tilted	Mechanical Issue C62961; FDA 1384	Unintended Movement C62814; FDA 3026	Migration of Device or Device Component C62917; FDA 1395	Possibly valid
	Osseodisintegration issue (1602)	Loosening of implant	Mechanical Issue C62961; FDA 1384	Osseointegration Issue C62886; FDA 3003		Possibly valid: osseodisintegration with loosening of bone-implant interconnection
Incompatibility (1700)	Patient-device incompatibility (1703)	Loss of capture	Electrical Issue C63007; FDA 1198	Capturing Issue C63027; FDA 2891	Failure to Capture C62993;	Likely redundant

					FDA 1081	
Infusion/Flow (1800)	Improper flow or infusion (1802)	Catheter shaft, restricted flow	Infusion or Flow Issue C63075; FDA 2964	Improper Flow or Infusion C63110; FDA 2954	Restricted Flowrate C62849; FDA 1248	Likely redundant
		History/ settings issue-inaccurate delivery			Inaccurate Delivery C63104; FDA 2339	To be entered separately: 1) delivery issue; 2) settings issue
			Computer Software Issue C63269; FDA 1112	Application Program Issue C63305; FDA 2880	Programming Issue C62839; FDA 3014	
Material (2000)	Crack (2002)	Display damaged	Material Integrity Issue C62968; FDA 2978	Crack C62971; FDA 1135		See FDA's component codes to define display being cracked
		Display: damage with moisture ingress				Moisture issue could be entered separately or together
			Moisture or Humidity Problem C62909; FDA 2986	Moisture Damage C62910; FDA 1405		
	Degrade (2003)	Line through display	Output Issue C62941; FDA 3005	Improper Device Output C63108; FDA 2953	Incorrect Display C63088; FDA 1184	Possibly valid as Level 4
		Display segments missing				Possibly valid as Level 4
		Display: dim/ fading/ colour spectrum				Possibly valid as Level 4
		Display: blank screen		No Device Output C62900; FDA 1435	No Display or Display Failure C62904; FDA 1183	Likely redundant
		Display cloudy		Improper Device Output C63108; FDA 2953	Incorrect Display C63088; FDA 1184	Possibly valid as Level 4
		Display: scratched	Material Integrity Issue C62968; FDA 2978	Material Deformation C63248; FDA 2976	Scratched Material C62846; FDA 3020	Likely redundant; 'Parts & Components' specify affected component
	Material discoloured (2004)	Display: dim/ fading/ colour spectrum	Output Issue C62941; FDA 3005	Improper Device Output C63108; FDA 2953	Incorrect Display C63088; FDA 1184	Possibly valid as Level 4
		Display:				Possibly valid as

		inkspot				Level 4
	Material fragmentation (2005)	Display segment missing				Possibly valid as Level 4
Output issue (2400)	Incorrect or inadequate result (2402)	History settings issue		Incorrect or Inadequate Result C62848; FDA 1535		To be entered separately: 1) incorrect result; 2) settings issue (= programming issue)
			Computer Software Issue C63269; FDA 1112	Application Program Issue C63305; FDA 2880	Programming Issue C62839; FDA 3014	
		Time and date issue	Computer Software Issue C63269; FDA 1112	Date-related software issue C67508; FDA 2582		
		Call service alarm issue	Protective Measure Issue C62932; FDA 3015	Device Alarm System Issue C63033; FDA 1012	False Alarm C63152; FDA 1013	Possibly valid as Level 4
		Audio tone/ vibration issue (no sound; weak or intermittent vibration)	Mechanical Issue C62961; FDA 1384	Noise, Audible C99179; FDA 3273		Likely redundant
				Unintended Movement C62814; FDA 3026	Vibration C62806; FDA 1674	Likely redundant
Protective (2600)	Device alarm system (2601)	Audio tone/ vibration issue (no sound; weak or intermittent vibration)	Protective Measure Issue C62932; FDA 3015	Device Alarm System Issue C63033; FDA 1012	Improper Alarm C63112; FDA 2951	Audio issue: redundant, see level 4: Not Audible Alarm C63310; FDA 1019; Vibration issue could be new L4
		Frequent/ persistent occlusion				To be filled in separately: redundant
			Improper Flow or Infusion C63110; FDA 2954	Obstruction within Device C62897; FDA 2423	Occlusion within Device C62896; FDA 1423	
Temperature (2700)	Overheat of device or device component (2705)	Temperature-physical damage	Temperature Issue C62922; FDA 3022	Overheating of Device or Device Component C62883; FDA 1437		Possibly valid L3 term: overheating with physical damage
		Temperature-no physical damage				Possibly valid L3 term: overheating with no physical

						damage
Unintended function (2800)	Failure to adhere or bond (2802)	Implant-implant fit: cement-implant non bonding	Device Operates Differently than Expected C62955; FDA 2913	Failure to adhere or bond C63032; FDA 1031		Possibly valid: Cement-implant non-bonding
Use error (2900)	Device inoperable (2906)	Device displays error message	Device Operates Differently than Expected C62955; FDA 2913	Device displays error message C63205; FDA 2591		Likely redundant

Table 21. Evaluation terms proposed by manufacturers and considered to be valid (when compared to ISO/TS 19218-1), which were subsequently compared to FDA's device issue terms and evaluated for consideration for use in a future globally used nomenclature. Cells with identical/ similar terms are shaded.

Pilot			**Comparison with FDA's terms**			
Level 1	**Level 2**	**Proposed level 3**	**Level 1**	**Level 2**	**Level 3**	**Comment**
26000, Human factors	26009, Patient anatomy/ physiology	Non-optimal orientation of implant	Human Factors Issue - C91874 19	Device Incorrectly Prepared For Use Or Modified - C91876 14		Possibly valid as L3
	26014, Use error					
26600, Materials, chemistry	26604, Reactivity problem	Discrepant reaction likely due to weak antibody and/or sample preparation	MATERIALS AND CHEMISTRY PROBLEM C92078; FDA 174	REACTIVITY PROBLEM C92103; FDA 3231		Possibly valid: weak antibody reactivity And to be entered separately: sample preparation interference
26700, Mechanical	26701, Component malfunction	Vibration motor alignment	MECHANICAL PROBLEM C92079; FDA 180	STRESS PROBLEM C92120; FDA 3243	VIBRATION PROBLEM C92129; FDA 649	Likely redundant
	26702, Fatigue	Cold/cracked Solder on Piezo			FATIGUE PROBLEM C92053; FDA 3251	Likely redundant as to be used with component: 'solder joint'
	26703, Fracture	battery compartment cracked			FRACTURE PROBLEM C92055; FDA 3252	Likely redundant & to be used with component part
		Bolus button cover detached/missing				Possibly valid but to be categorised elsewhere as 'missing device component'
	26704, Leakage/	Moisture in pump	ENVIRONMENT PROBLEM	IMPROPER HUMIDITY		Likely redundant; Pump to be specified

	seal		C92051; FDA 331	C92061; FDA 332	under components
26800, No medical device problem or failure detected	26801, No medical device problem	No defect found (on testing); No device problem determined; Undetermined: no product problem identified; complaint not duplicated; Not able to reproduce issue	Unable To Confirm Complaint - C91894 67	No Failure Detected, Device Operated Within Specification - C91890 71	Likely redundant
	26802, no medical device failure detected	Device not returned; Device not returned for investigation; No device returned for investigation; Product not returned; No results Available Since No Evaluation Performed; no sample		Device Not Returned - C91883 92	Likely redundant
		Undetermined: insufficient info; Unable to investigate; Not confirmed			Unclear; Likely redundant
		No fault found on testing; no defect found; unable to reproduce during investigation; Undetermined : No Product Problem Identified; no systematic failure of product or analyser to perform as intended; Undetermined: No Product Problem Identified		No Failure Detected, Device Operated Within Specification - C91890 71	Likely redundant
		Unable to adequately investigate due to an unrelated failure			Possibly valid
29000, Unidentified	29001, Unidentified	Sample not returned; Device not returned - no evaluation could be performed		Device Not Returned - C91883 92	Likely redundant
		Unable to reproduce during Investigation; Device is tested for functionality and pass; Unable to confirm or duplicate the complaint during investigation		No Failure Detected, Device Operated Within Specification - C91890 71	Likely redundant

Table 22. EDMA's event-type and evaluation terms used in the pilot and compared to FDA's device issue terms for consideration for use in a future globally used nomenclature. Cells with identical/ similar terms are shaded.

Pilot		Comparison with FDA's terms				Comment
Level 1	**Level 2**	**Level 1**	**Level 2**	**Level 3**	**Level 4**	
Output issue (2400)	Discrepant negative (2406)	Output Issue C62941; FDA 3005	Incorrect or Inadequate Result C62848; FDA 1535	False Negative Result C63149; FDA 1225		Likely redundant
	Discrepant positive (2404)			False Positive Result C63147; FDA 1227		Likely redundant
	Discrepant high (2405)			High Readings C63123; FDA 2459		Likely redundant
				Incorrect or Inadequate Test Results C62829; FDA 2456	High Test Results C63122; FDA 2457	Likely redundant
	Reproducibility issue: Non-reproducible result (2408)			False Reading from Device Noncompliance C63145; FDA 1228		Possibly redundant; needs to be further explored
Operator issue (3000)	Splash (3001)	Use of Device Issue C63318; FDA 1670	Device Handling Issue C95879; FDA 3265			Needs to be further explored

5 Conclusions

The submitted MIR pilot forms **represent only a subset of all device categories** (based on e.g. FDA classification panels or GMDN categories), and as such do not cover the entire spectrum of devices present on the market. This is due to the design of the pilot where (1) Competent Authorities suggested a focused participation of companies in specific sectors, and (2) manufacturer participation was voluntary. This potential data bias needs to be considered when interpreting the results of the pilot and in any nomenclature development that results from the pilot. Additional **bias** may come from the observations that (1) no SMEs participated in the pilot, and (2) a single manufacturer has submitted > 60% of the total number of forms. This has also led to the over-representation of one of the device categories with >70% of the total number of pilot forms.

Important lessons have been learned from the pilot relating to the **design of the reporting form**. If there is the intention to allow proposals of new terms in the context of incident reporting templates, this should concern ***all*** **levels and be implemented in a user-friendly manner**, which was not the case with the MIR pilot form. The pilot results showed that the majority of new terms proposed concern level three terms. We suspect that this was due to the fact that it was technically rather difficult to propose new level 1 or level 2 terms. Additionally, the analysis showed that not more than three choices per level appear to be needed to describe the majority of incidents or final investigation.

An analysis of the terms and definitions used in the pilot showed that the **ISO/TS 19218 terms are not fully adequate**, and though EDMA has proposed new terms to complement these terms, the **definitions accompanying EDMA's new terms would need revision**: four level 2 codes (#2404→2407) concerning discrepant results (i.e. discrepant positive, high, negative, low) have identical definitions ('Issue associated with end results provided by the device').

Even on a relatively small scale study as the one analysed here (741 eligible submissions from manufacturers), it is clear that the ISO/TS 19218 terms show severe drawbacks that lead us to conclude that the terminology, in its present state, is inadequate for purposes of medical device problem and evaluation reporting. The **JRC has proposed modifications of and additions to ISO/TS 19218 terms** to resolve the most frequently encountered nomenclature issues that have been proposed by manufacturers. These proposals, however, are not only applicable to ISO but will inform nomenclature development on international level through the IMDRF's Adverse Event Working Group. For evaluation terms, they relate primarily to the level 1 term 26800, 'No medical device problem or failure detected'. By making a clear distinction on whether an investigation took place or not, it is possible to regroup commonly proposed terms and represent them with a single term. It is noteworthy that ISO appears to have abolished the relevant terms when composing their terminology based on that of US FDA since the latter makes this crucial and highly informative distinction.

This final report provides some insight into the nomenclature proposed by manufacturers. The number of newly proposed terms has surpassed expectations. However, **some reporters** of incidents using the MIR pilot form **did apparently have insufficient knowledge of the ISO/TS 19218 terms or incomplete understanding of the subsections of the form**. Common flaws were the proposal of redundant terms (at all levels) or the reporting of 'patient outcome' terms for purposes of describing device problems ('event-type' terms). Some of the confusion may stem from the rather unfortunate name that ISO chose for the nomenclature for medical device *problem* reporting ('adverse event type') which appear to suggest that also adversity (i.e. at patient level) is reported with this nomenclature, which is however not the case. It is also possible that a **more elaborate nomenclature needs to be developed for** certain device categories like for orthopaedic devices.

Finally, we have compared the proposed terms to those contained in the FDA terminology on medical device issues since the latter serves as a basis for the development of internationally harmonised nomenclature of medical device problems in the context of IMDRF's Adverse Event Working Group. Our analysis will feed into the work of this group.

6 Annex 1

This annex contains three parts:

- Part 1 outlines, on the basis of parts 2 and 3, **key recommendations** for future work towards effective tools of incident reporting by manufacturers in the EU.

- Part 2 highlights the key agreements reached during the workshop ('Developing a roadmap for the integrated MIR form') hosted by COCIR in Brussels on the 3rd of February 2016, as well as some open issues that remain to be addressed in future work.

- Part 3 summarises the proposals raised in communications made thereafter, including at the MDEG Vigilance meeting (Brussels) on the 8th and 9th of March 2016, as well as via emails and teleconferences.

6.1 Recommendations

JRC summarises the following key recommendations for future work towards developing effective tools of incident reporting by manufacturers in the EU:

1) Towards an integrated MIR form and recommendations for future electronic reporting tools (e.g. EUDAMED)

To enhance the effectiveness and usefulness of manufacturer incident reporting, it is now important to develop a new MIR form that combines the existing one (narrative text) with reporting tools assessed during the pilot, i.e. nomenclatures, similar incidents, etc. A working group composed of regulators and stakeholders and the European Commission should develop this integrated MEDDEV MIR *form* and, in addition, develop recommendations for the design of the future MDR EUDAMED reporting template. The group should operate in the context of the MDEG vigilance group.

As a first step, terms of reference should be drafted to frame the group's work in a transparent manner, e.g. (1) mandate & scope, (2) composition, (3) deliverables, and (4) timelines. Ideally the integrated MEDDEV MIR should be issued in late 2016 or early 2017. The form should remain stable for the next years until the future MDR EUDAMED is fully functional. Manufacturers shall be encouraged to implement the new form in a timely manner.

2) Use of IMDRF nomenclature as a mandatory reporting requirement

In order to reduce the burden for industry with respect to different reporting "languages", the EU should commit to globally applicable nomenclatures currently developed by IMDRF with participation of EU experts. In the summer of 2016, the relevant IMDRF working group has finalised the first element of the Adverse Event Terminology on medical device problems. It is expected that, following endorsement by the IMDRF management committee, this nomenclature could become available in Q1 2017 – free of charge. Moreover, commitment to a globally applicable nomenclature will have substantial benefits for competent authorities and health practitioners (reduction of ambiguity, exchange of data) with ensuing benefits for patients.

Thus, the new MIR form should foresee four dedicated placeholders for the upcoming IMDRF terminologies. While the form would be implemented only once, the terminologies would be populated and activated as they become available. The nomenclatures will be: (1) Medical device problem; (2) Patient problem; (3) Cause investigation; and (4) Components.

Consequently, the ISO/TS 19218 nomenclatures should not be used for reporting in the EU. This report shows that the nomenclatures are not fully adequate and that the rate of updates is insufficient in view of the pace of innovation in the medical technology field.

IMDRF is already considering effective ways of maintaining regulatory nomenclatures drawing on possible proposals from competent authorities, industry associations and health practitioners.

3) Voluntary use of in-house terms by manufacturers

In addition to the mandatory use of IMDRF terms, manufacturers should be encouraged to provide in the future integrated MIR form and on a voluntary basis, in-house terms. Use of in-house terms could be helpful for describing the actual incident as well as for describing similar incidents that have occurred.

6.2 Workshop agreements and open issues

6.2.1 Workshop agreements

This section highlights the key agreements reached during the workshop 'Developing a roadmap for the integrated MIR form' organised by the European Commission (DG GROW, DG JRC) and MHRA, and hosted by COCIR in Brussels on 3 February 2016.

1. **Finalisation of the pilot:** To end the pilot as from the workshop date, being 3 February, 2016.
2. **Development of a new integrated MIR form:** To further develop the new MEDDEV MIR form, which in essence would integrate the MIR pilot form with the current MEDDEV MIR form. More specifically, it would:
   - complement the sections requesting narrative descriptions on 'Incident information' and 'Results of the manufacturer's final investigation' with sections for the mandatory reporting of adequate terms and codes (see point 3);
   - include the provision of data for all similar incidents.
3. **Use of IMDRF nomenclatures in the integrated MIR form:** To incorporate as nomenclatures, the one currently being developed by IMDRF, specifically because it is being developed for use at a global level, and because the ISO/TS 19218 nomenclature, which was used in the MIR form pilot, proved to be inadequate. Additional drawbacks to ISO/TS 19218 include that it is not being updated regularly and not being compliant with the new regulation in terms of being freely available.
4. **Introduce placeholders for nomenclatures whilst these are under development:** To introduce placeholders in the new MEDDEV MIR form for the future IMDRF terms/codes. Four placeholders will need to be foreseen as four sets of nomenclature will be developed that relate to (1) medical device problems; (2) patient problems; (3) cause investigation; and (4) components of the device, which are affected. The first set on medical device problems is expected to be issued by IMDRF in March 2017.
5. **Mandatory use of future regulatory IMDRF nomenclatures:** To stipulate the use of nomenclatures for adverse event reporting as a mandatory requirement.
6. **Voluntary use of in-house data for additional purposes:** To encourage manufacturers to use their in-house terms in the dedicated space for the provision of similar incident data.

6.2.2 Open issues identified during the workshop

The major open issues identified during the workshop include:

1. **Incidents involving more than one device:** To consider adaptations to the future MIR template in view of enabling the reporting of incidents involving more than one device, or one device but in combination with a reagent(s) (for IVDs).
2. **Incidents involving more than one event:** To resolve the procedure to report the same incident with multiple events using the pdf-based MIR form. An additional issue

to tackle is whether the first event described should be the most serious one to consider or not.

3. **Similar incident - reporting periods:** To define the time periods for reporting similar incidents. Should the time period be device-dependent? Consider the case of implants being present in the body for extended periods of time: should survivorship curves be included as an incident can happen any time during the lifespan of the device? To clarify how similar incident data are calculated, particularly in the case when more than one event or evaluation term is provided, e.g. when more than one issue has occurred in the same event.
4. **Reporting of sales data for use as denominator data:** To further discuss the reporting of denominator data (i.e. number of devices on the market). While it appears clear that denominator data need to be based on cumulative sampling of devices sold (sales data) over a given period or several periods, it is precisely the number and duration of these periods that needs to be defined. Further, it needs to be considered whether the requirements for provision of sales data should be differentiated based on the type of device: consider for instance the case of *implants*, their sales data and the active installed base number (including the difficulties in determining the latter).
5. **Reporting investigations - causes versus suspected causes:** Further discussions are needed to resolve issues concerning the reporting of investigations into the causes of given incidents. For instance, the form should distinguish between causes identified as a result of an investigation of the device (or the relevant batch) *versus* 'suspected causes' that are not fully evidence-based but derived from plausibility reasoning.
6. **IVD-specific issues:** Specifically, for IVD medical devices: to foresee (1) sufficient terms within the nomenclature for incident reporting, and (2) sufficient space to enter terms not only for the device but also the reagent. For the latter case: is the reporting procedure and method for searching similar incidents clear?
7. To encourage manufacturers to provide more complete and consistent reports, as requested by competent authorities.

6.3 Post-workshop proposals and concerns

6.3.1 Post-workshop proposals

1. **Setting up a Working Group for developing the integrated MIR form & framing proposals for the EUDAMED reporting template:** To set-up a working group chaired by MHRA and DG JRC to further develop the new MEDDEV MIR pdf form. The group will include experts from competent authorities and stakeholders (e.g. industry) and will operate in the context of the MDEG Vigilance Working Group. The group will also develop proposals for the future reporting template of the MDR EUDAMED database, which in contrast to the current pdf form will be web-based. The recommendations of the working group can be taken up by the EUDAMED Steering Committee and the EUDAMED Working Group on the electronic vigilance/market surveillance modules.
2. **Implementation of the integrated MIR form:** To implement the new integrated MEDDEV MIR form with placeholders for the future IMDRF nomenclature in Q4 2016/ Q1 2017. This would in effect be a one-time implementation and should remain stable for the next four years until the future MDR EUDAMED is activated, thereby promoting optimal resource use. As soon as the IMDRF nomenclatures will become available (in a sequential manner), they can be implemented as modules of the form. The form however would be implemented only once.
3. **Timely implementation of nomenclature:** To encourage manufacturers to timely implement the new nomenclature in their incident reporting systems.
4. **Follow-up on new Regulation:** To follow up on any new developments in the upcoming regulation relevant for incident reporting using the MIR form or the future EUDAMED system.

6.3.2 Post-workshop identification of open issues

The major post-workshop discussions have identified the following open issues:

1. There was a proposal to continue using with the ISO/TS 19218 nomenclature in the new MEDDEV MIR form until IMDRF terms become available. This was contentiously discussed. A key drawback identified relates to the potential disproportionate cost of implementing such a short term activity by manufacturers.
2. To reduce the time foreseen by manufacturers (6 to 12 months or more requested) for the implementation of new nomenclature in their automated incident reporting systems.
3. To speed up the development of IMDRF's nomenclature. This could be done via a 'push' involving activities by the European members. Such a push could, however, come at the cost of a suboptimal nomenclature being developed and requiring a more extensive maintenance of the nomenclature in the future.

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List of abbreviations and definitions

CA	Competent Authority
COCIR	European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry
DG	Directorate-General
DG GROW	DG for Internal Market, Industry, Entrepreneurship & SMEs
DG DIGIT	DG for Informatics
DG JRC	DG Joint Research Centre
DG SANTE	DG for Health and Food Safety
EDMA	European Diagnostic Manufacturers Association
EUCOMED	European Medical Technology Industry Association
EUDAMED	European Databank on Medical Devices
FDA	Food and Drug Administration (USA)
GMDN	Global Medical Device Nomenclature
IMDRF	International Medical Device Regulators Forum
ISO/TS 19218	ISO/Technical Specification 19218
IVD MD	In Vitro Diagnostic Medical Device
MDEG	Medical Devices Expert Group
MDEG Vigilance	Medical Devices Experts Group on Vigilance
MEDDEV	Medical Devices guidance documents
MedTech Europe	Alliance of European medical technology industry associations
MFR	Manufacturer
MHRA	Medicines and Healthcare Products Regulatory Agency (UK)
MIR	Manufacturer Incident Report
MS	Member States
SME	Small and Medium-sized Enterprises

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