European monitoring of
Medically Assisted Reproduction (EuMAR)

D6.1 VALIDATION REPORT

Co-funded by
the European Union.

Project: 101079865— EU4H-2021-PJ2

Work package: 6 Deliverable: 6.1
Date of submission: 18.12.2025
Dissemination level: SEN

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Table of Contents

Index of Figures and Tables

Acronyms and abbreviations

2pn	2 pronuclei (embryo at early developmental stage)
API	Application Programming Interface
BMI	Body Mass Index
CSC	Clinic Switch Code
DPA	Data Protection Authority
EMR	Electronic Medical Record
EuMAR	European monitoring of Medically Assisted Reproduction
GDPR	General Data Protection Regulation
FET	Frozen Embryo Transfer
ICSI	Intracytoplasmic sperm injection
IRCC	Individual Reproductive Care Code
IUI	Intrauterine Insemination
IVF	In-vitro fertilisation
MAR	Medically assisted reproduction
NA	Not applicable
OPU	Oocyte pick-up
PGT	Preimplantation Genetic Testing
PSC	Project Steering Committee
ROPA	Reception of Oocytes from a PArtner
SoHO	Substances of Human Origin
WP	Work Package

Executive Summary

This report presents the outcomes of the pilot study of the European monitoring of Medically Assisted Reproduction (EuMAR) project, which aims to lay the foundations for a pan-European cycle-by-cycle registry of medically assisted reproduction (MAR) treatments. In the EuMAR pilot study, data was collected on treatments that took place in four different European countries between July and December 2024. More than 20,000 cycles were recorded, involving almost 28,000 individuals (main patients and partners). The pilot study demonstrated the feasibility of all data flow options that were tested. Several challenges were identified and learnings were derived for the continuation of the EuMAR registry in the future.

The pilot study was guided by the members of EuMAR Work Package (WP) 6:

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Introduction

The European monitoring of Medically Assisted Reproduction (EuMAR) project was initiated in 2023 with the aim to build the foundation for a pan-European prospective cycle-by-cycle registry of Medically Assisted Reproduction (MAR) treatments. The three objectives of the EuMAR project are 1) to construct a data flow model that is applicable in different contexts, 2) to create a set of core parameters to enhance data standardisation, and 3) to build a technical solution for the registry and for a unique European patient code that is compliant with the General Data Protection Regulation (GDPR). Detailed information on the rationale and objectives of the project has previously been published elsewhere (De Geyter et al., 2023).

The pilot study constitutes an important part of the EuMAR project, contributing to all three objectives by testing the feasibility of implementing the solutions developed for the different objectives in practice. This report provides a detailed description of the aims, methods and results of the EuMAR pilot study.

Aims

The aim of the EuMAR pilot study was to test the practical implementation of the EuMAR data collection system, with a view to determining the feasibility of collecting prospective and cumulative cycle-by-

cycle data on MAR treatments from different countries in a common European registry, including the possibility to link treatments of patients in different centres or countries.

Methods

Study design

This report describes a pilot study with data collection from national MAR registries and directly MAR clinics. The outcomes and methods were defined prior to the start of the study in a pilot study plan that was published on the ESHRE website in May 2024 (https://www.eshre.eu/Data-collection-and-research/EuMAR/For-professionals).

Study setting

The EuMAR pilot study took place in four different countries: Estonia, Germany, Portugal and Slovenia. The pilot countries were selected by the EuMAR Project Steering Committee based on information gathered through a survey and individual interviews with the institutions responsible for national data collection on MAR in EU Member States (Achótegui Sebastián et al., 2024). The selection of countries aimed to cover the diversity of national data collection systems to ensure a possibility to test all the different modalities of submitting data to the EuMAR registry and implementing the unique patient code.

Study population

The study population for the pilot study consisted of all individuals who had a MAR treatment that involves the ex vivo handling of gametes or gonadal tissues, including in vitro fertilisation (IVF), intracytoplasmic sperm injection (ICSI), intrauterine insemination (IUI), preimplantation genetic testing (PGT), and fertility preservation through gamete/embryo/gonadal tissue cryopreservation. Since oocyte donors go through the same procedure of ovarian stimulation and oocyte pick-up as IVF patients, they also formed part of the study population in countries where oocyte donation is performed. In contrast, sperm donors were not included in the pilot study. When patients sought MAR treatment as a couple, both partners were included, independent of their biological involvement (i.e., partners of recipients of a sperm donation were also registered).

All individuals who started a new cycle (IUI, OPU, IVF/ICSI, embryo transfer or fertility preservation) during the pilot study period were included in the study population, independent of whether the gametes or embryos used have been retrieved or created before the pilot study.

Study period

The pilot study commenced on 1 July 2024 and included all cycles that were initiated until 31 December 2024. Follow-up data was collected for all registered cycles until one of the defined cycle endpoints (cancellation of the cycle, OPU with no oocytes retrieved, IVF/ICSI with no fertilized oocytes or regularly developing embryos, cryopreservation of all oocytes/embryos, IUI/embryo transfer with no clinical pregnancy, pregnancy loss, delivery). The deadline to register pregnancies outcome was 30 September 2025.

Data collection

The parameters for the data collection were defined by a dedicated Work Package of the EuMAR project (WP4) and can be found in Annex 1. Table 1 provides an overview of the different modalities of the pilot

study in the four pilot countries. In countries with a national cycle-by-cycle registry (Germany and Portugal), data was collected through an Application Programming Interface (API), connecting the EuMAR registry with the national registry. In countries with no national cycle-by-cycle registry (Estonia and Slovenia), an API connection was built with the Electronic Medical Record (EMR) system of centres or data was collected via manual input from centre staff into an online platform.

Table 1: The EuMAR pilot countries

Country	Number of centres (participating/total)	Specific patient consent requested for EuMAR	Mode of IRCC requests	Mode of data submission
Estonia	1/6	Yes	Through API with EMR system	Through API with EMR system
Germany	8/144	No (only consent for the national registry)	Through API with EMR system	Through API with national registry
Portugal	26/28	No	Manually from the EuMAR portal	Through API with national registry
Slovenia	4/4	Yes	3 centres manually from the EuMAR portal, 1 centre through API with EMR system	3 centres through manual data entry, 1 centre through API with EMR system

IRCC=Individual Reproductive Care Code, API=Application Programming Interface (connection between two IT systems), EMR=Electronic Medical Record

Patient codes

To allow for cumulative data analysis, each individual was registered with a unique Individual Reproductive Care Code (IRCC), which needed to be provided when submitting data to the national registry or directly to the EuMAR registry. To increase data protection, the IRCC went through a one-way encryption process to be transformed into a different unique code when it was sent to the EuMAR registry, as seen in Figure 1. While oocyte donors received an IRCC, there was no link in the registry between donation cycles and the subsequent IVF/ICSI and embryo transfer in recipients, unless in the case of the Reception of Oocytes from a same sex PArtner (ROPA).

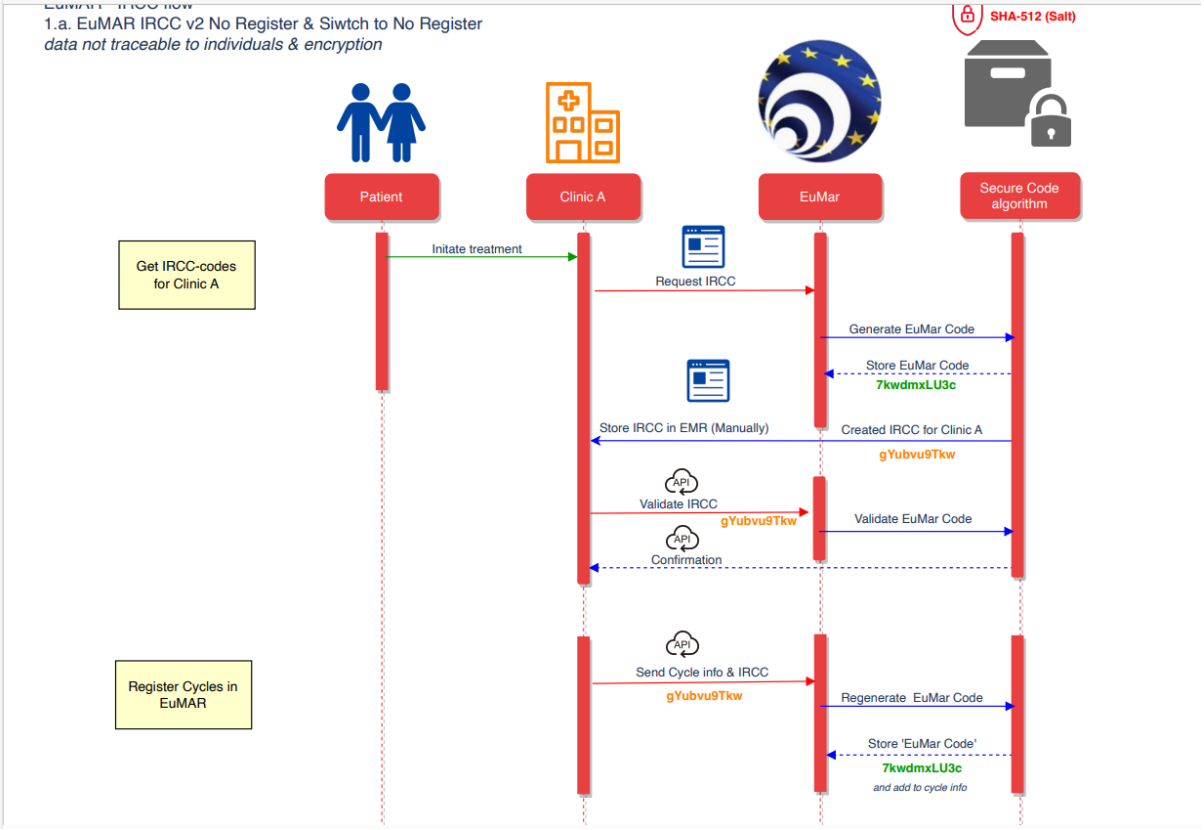

Figure 1: Encryption of the IRCC when sent to the EuMAR registry

The IRCC always needed to be requested by the centre, independent of whether the cycle data was submitted to EuMAR by the centres or by a national registry. There were two modalities for IRCC requests. If centres used an EMR software with an API connection to EuMAR, the IRCCs could be requested from the EMR software, either automatically when a new patient or cycle was created or by pressing a button. If centres did not use an EMR software with an API connection to EuMAR, the IRCCs were requested from the online EuMAR portal and had to be copied manually to a centre's internal records. All pilot study participants were given the opportunity to test the IRCC request system. To be able to identify test records, participants were asked to enter the birthdate January 1964. All cycles of patients with this birthdate were deleted prior to the data analysis.

For cross-institutional and cross-border follow-up, individuals who changed centres were asked to request a ClinicSwitch code (CSC) from their old centre and present it at the new centre to allow linking the data submitted by the new centre with the existing record of the person in the EuMAR registry. If a couple changed centres, a separate CSC needed to be provided for each partner. Centres were not able to see any data entered by other centres in the database by scanning the CSC. The option to request and scan CSCs was only available on the online EuMAR portal, as the implementation into the API with EMR systems was not possible on time. Therefore, this aspect of the EuMAR registry was only tested in Portugal and Slovenia.

Deadlines for IRCC requests and data submission

The IRCC could be requested by the centre as soon as the first treatment of a patient in the pilot study period was planned. For cycles with ovarian stimulation, it needed to be requested at the latest five days after the start of medication. For cycles without ovarian stimulation, the IRCC needed to be

requested at the latest on the day where the first step of the treatment was performed, i.e., for IUI cycles on the day of the IUI, for natural cycle IVF on the day of the OPU, for cycles with cryopreserved or donor oocytes on the day of the fertilisation of the oocytes, and for frozen embryo transfers on the day of thawing the embryos. Clinics sending their data to EuMAR through manual entry were asked to submit the data within a period of no more than two months after the treatment/outcome occurred.

Patient consent

Although an assessment of EuMAR's legal advisors yielded that the EuMAR data can be considered anonymised from the point of view of ESHRE and it is therefore not necessary to ask for patient consent, the local Data Protection Authority or Ethics Committee in Estonia and Slovenia required the centres to ask for consent before enrolling patients in the EuMAR pilot study. The German registry collects consent for some parameters in the national registry, but no additional specific consent was requested from German patients for the participation in EuMAR.

Support for participants

Professionals who used the EuMAR portal were offered online training sessions prior to the start of the pilot study. While Slovenian professionals received a full training on the platform including on manual data entry, separate sessions were held for Portuguese professionals, focusing only on the IRCC and CSC requests. These training sessions were supplemented with written instructions and video tutorials made available to participants.

Furthermore, two different leaflets were developed and sent to all pilot clinics that indicated an interest: one for professionals describing the aims of the EuMAR project and the role of the professionals more in depth, and one for patients, which centres could use to inform patients about the EuMAR project. The patient leaflet was reviewed by ESHRE's patient partner organisation Fertility Europe and revised according to their feedback. The leaflet was then translated into the local languages of clinics who requested them (Portuguese, Slovenian and Estonian) by a professional agency and cross-checked by a professional from the country. Printed copies were shipped to participating clinics and digital copies were made available on the website and sent to WP6 pilot country representatives.

A support helpdesk was set up to provide participating professionals with quick assistance on any issues or questions they may have during the pilot study.

Professionals survey

A feedback form was sent to professionals in participating MAR centres on 14 February 2025 to assess their experience in the pilot study. The survey had six sections: 1) Background information; 2) User experience; 3) Patient communication; 4) Use of patient codes; 5) Benefits and satisfaction; 6) Additional comments. MAR centres were invited to circulate the survey among all their staff members who had a role in the pilot study. Survey respondents had one month to complete the questionnaire, and they were given the option to indicate whether they would like to have a follow-up call with the EuMAR team to further analyse their experience in the pilot study. The survey was adapted to the context and data flow models tested in each country. The questions can be seen in Annex 2.

Logbook

Throughout the pilot study, a logbook was kept to document processes, challenges, and learnings. This live document began in January 2024, when formal invitations were sent to the pilot countries.

Data analysis

Data quality metrics were calculated as defined in the pilot study plan. While some metrics were provided directly in reports available for export in the EuMAR platform (namely the number of violations of validation rules, the number of IRCC and CSC requests in a specified timeframe, and the number of empty records), the other metrics (e.g., on data completeness and timeliness of IRCC requests) were calculated by the EuMAR team based on a full cycle-by-cycle dataset that was exported from the EuMAR platform and analysed in Stata 19. Descriptive statistics on the responses to the professionals survey were calculated in Excel.

Results

Process of data collection - feedback from participants and challenges encountered

Professionals survey

The survey sent to professionals in MAR centres participating in the pilot study was completed by users in all four countries and their responses have been analysed in seven different blocks, that range from participant profile to support, user-friendliness, patient communication and patient codes, benefits, and overall satisfaction.

Participant profile

We received responses from 35 professionals across 22 clinics in the four pilot countries, with the number of respondents per clinic varying from country to country. In the only pilot centre in Estonia, nine staff members responded to the survey. In Germany, only three out of the eight participating centres responded to the survey and there was one response per centre. The low response rate from Germany might be explained by the fact that very little changed for German centres due to the pilot study, since there was no need to ask for patient consent, IRCC requests were automatised, and data was submitted by the national registry. In Slovenia, five professionals across the four pilot centres sent responses and in Portugal we received 18 responses from 14 centres, of the 26 that joined the pilot study. Figure 1 shows the proportion of centres from each participating country in the pilot study that completed the survey. Most respondents were embryologists (46%), and a minority were gynaecologists (11%). This is true globally and for each country individually apart from Estonia, where a majority of administrative professionals responded to the survey.

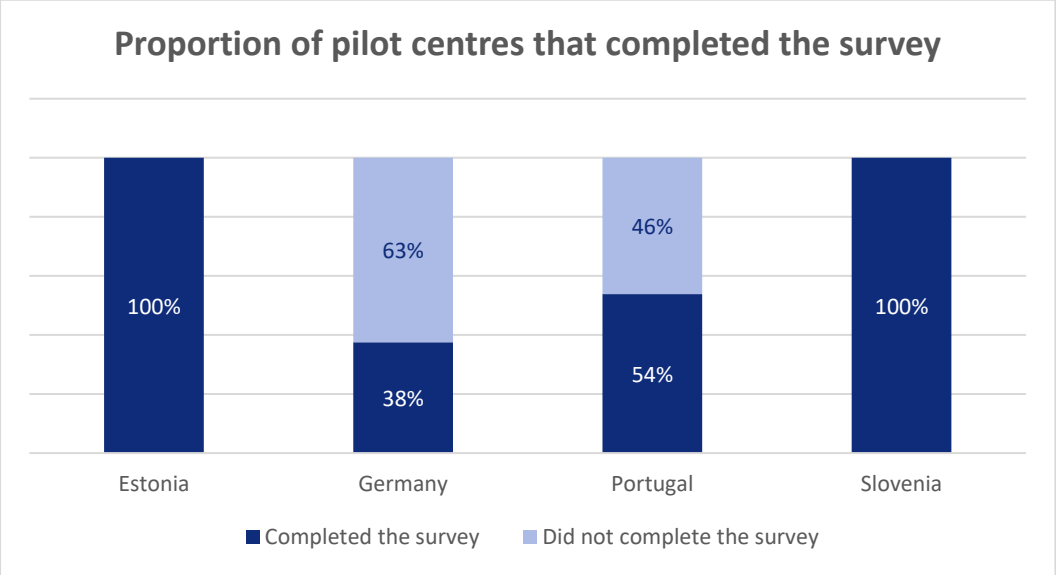

Figure 2: Proportion of pilot centres that completed the survey

Preparation and support

Regarding the support for participants before the pilot study started, MAR professionals were asked to assess the extent to which they were satisfied with the materials provided by the EuMAR team: online training sessions, written instructions, and video tutorials. Of the 91% of respondents who attended the online training sessions, 88% were satisfied or very satisfied. Ninety-six per cent of participants used the written instructions and 78% gave favourable satisfaction ratings, while video tutorials were the least used resource: 74% of respondents used them, and 65% reported high satisfaction levels. When asked if they would have liked to receive other support or information in preparation for the pilot study, only two out of 35 respondents said 'Yes', but did not specify.

On the support provided during the pilot study, the helpdesk was rated as helpful or very helpful by 87% of respondents who used it and 13% were neutral about it. Thirty-four percent of respondents never contacted the helpdesk. This percentage comprises the three German centres, one Slovenian clinic using manual data entry, and eight centres in Portugal.

Usability and user-friendliness

MAR professionals were also asked about the usability of the platform and the easiness to submit data and request EuMAR patient codes.

Overall, the majority of respondents (49%) did tasks related to EuMAR weekly; 37% did so daily and 14% monthly. If we cross-check the overall responses with the position of the respondent, it is possible to observe that, while the majority of nurses (67%) and embryologists (56%) indicated doing tasks related to EuMAR on a weekly basis, following the overall trend, administrative staff and gynaecologists indicated doing more tasks daily (44% and 75% respectively). Slovenia had the highest proportion of respondents performing EuMAR tasks daily, with 50% reporting regular daily engagement.

All professionals who used the EuMAR portal reported that logging in was easy, and they found the database to be fast when requesting IRCCs. The portal was described as intuitive to navigate by 77% of respondents, 78% found the IRCC request process easy, and 75% expressed satisfaction with the manual recording of parameters. All respondents agreed that the database operated quickly when

entering information. Additionally, 61% of professionals indicated that following the recommended timeframe for requesting IRCCs was straightforward. Identifying patients who met the inclusion criteria was considered easy by 74% of respondents and marking patient consent – completed outside the EuMAR platform, was viewed as easy by 62%.

As a part of the usability assessment, professionals were asked whether they had any issues during the pilot study and 74% of respondents reported no issues. Among the participants who indicated having issues, these referred namely to the extra work of doing manual data entry; the slow IT connections and other errors related to the API automatic connections (e.g., patient consent not checked correctly) and issues with the IRCCs requested manually (e.g., lost IRCCs).

Patient communication

Most respondents indicated that they did not talk to patients about the EuMAR pilot study (71%), while a minority did (29%). Figure 3 below shows that the communication with patients depended on the role of the respondents, with doctors and nurses being more likely to have spoken to patients about EuMAR than embryologists and administrative staff. From the ten participants who spoke to patients about the pilot study, most of them felt sufficiently prepared to do so, while only two respondents did not. One of the respondents who did not feel sufficiently prepared to talk about EuMAR with patients suggested that having a more comprehensive information leaflet for the patient would have helped. Those who indicated talking to patients were also asked whether they encountered any specific issues, to which 60% indicated they did not. Some of the respondents who did have specific issues when talking to patients about EuMAR mentioned that some patients did not want to be involved or share their medical information.

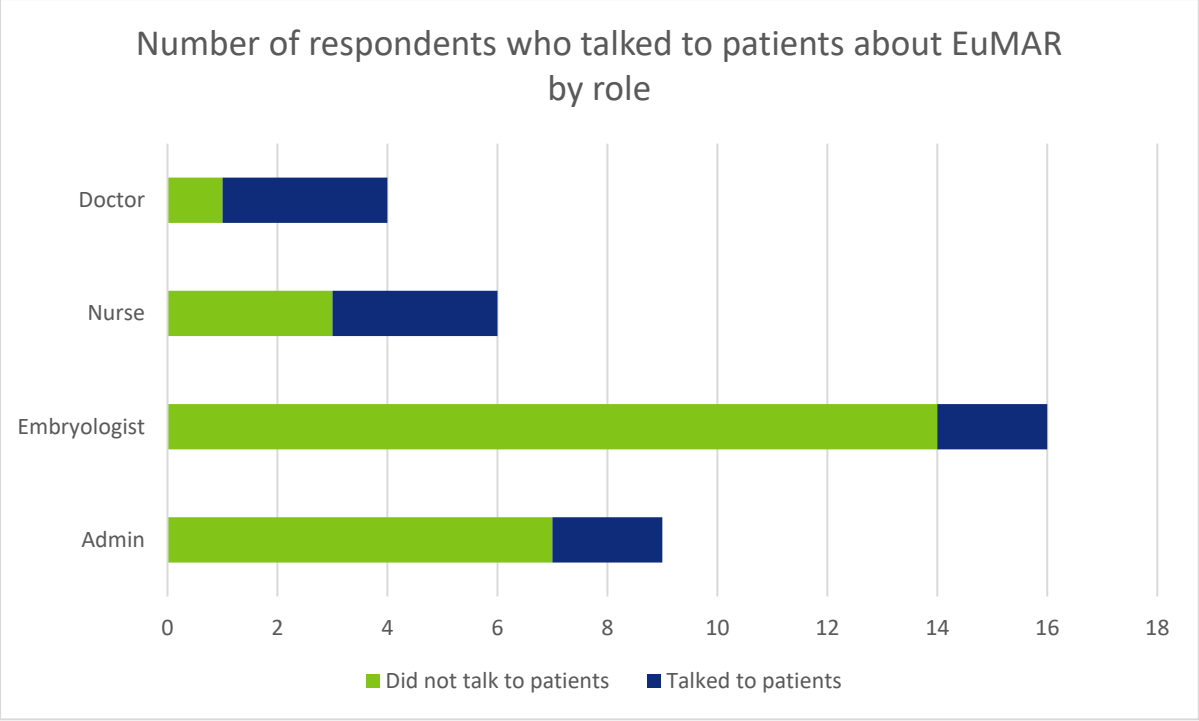

Figure 3: Patient interaction by role

Use of CSC

The CSC was not tested in Germany and Estonia and thus, professionals in these countries were not asked about it. Professionals from clinics in Portugal and Slovenia were presented with a dedicated section in the survey about it. The first question asked whether they had encountered any patients requesting a CSC during the pilot study. Among the 23 respondents, only three answered affirmatively. These three were subsequently asked whether they were able to generate the CSC; only two responded, both positively. Both respondents also agreed that requesting the CSC was straightforward and did not significantly disrupt their daily workflow.

One of the respondents reported difficulties due to the absence of an automated option for requesting the CSC. This was a specific case of a clinic that submitted data automatically from their own EMR system, which supported the automatic request of IRCCs but not that of CSCs, thus, staff at the clinic had to log into the EuMAR portal and request the CSC manually when asked by a patient.

Respondents who had not encountered any patient requesting a CSC were asked if they would have known how to request one. Fifteen answered 'yes' and five said 'no'.

All respondents were asked whether they routinely ask patients if they had received treatment at another clinic. Twelve reported doing so regularly, while ten indicated that it was not a common practice.

Most respondents (n=12) reported not treating patients previously seen in another EuMAR pilot clinic during the study period, while eight were unsure. They were asked whether they would have requested a CSC if a patient had previously been treated elsewhere, and whether they would have known what to do if a patient presented a CSC. The majority responded affirmatively to both questions (n=13, n=11). However, six stated they would not have asked for a CSC, and five indicated they would not have known how to proceed if presented with one. Of the only two who had treated patients coming from another institution, neither of them asked for a CSC. One respondent reported that a patient did present a CSC, but they were unable to scan it.

Table 2 Summary of survey responses related to the use of CSC					
Encountered patients requesting a CSC?	Yes: 3/23	Ability to generate a CSC	Yes: 2/3	Requesting CSC was straightforward	Agree: 2/2
				CSC was not a burden	Agree: 2/2
				Reported difficulty with CSC request process	Yes: 1/2
					No: 1/2
			No: 0/3		
	No: 20/23	Would you have known how to request one?	Yes: 15/20		
			No: 5/20		
Routine practice to ask patients if treated at another clinic?	Yes: 12/23				
	No: 10/23				
Treated any patients previously seen at another EuMAR pilot clinic?	Yes: 2/23	Did you ask for CSC?	Yes: 0/2		
			No: 2/2		
		Any patient presented a CSC?	Yes: 1/2	Able to scan CSC?	Yes: 0/1
					No: 1/1
				Difficulties scanning?	Yes: 0/1
					No: 1/1
			No: 1/2		
	No: 12/23 Unsure: 8/23 No answer: 1/23	Would you have asked for a CSC if patient had been treated elsewhere?	Yes: 13/21		
			No: 6/21		
		Would you know what to do if patient presented a CSC?	Yes: 7/21		
			No: 14/21		

Notes: Questions were presented using skip logic based on respondents' answers to preceding questions; therefore, not all participants were asked every question. For each response option, values are presented as n/N, where N is the number of participants who were shown the question and n is the number who selected that response. As a result, response totals may not sum to N due to non-response.

Benefits and interest

Pilot study participants were asked to rate how much they would find specific EuMAR benefits relevant or useful. Each of the specific benefits of EuMAR were rated from 'very important' to 'not at all important' by respondents. All the benefits presented were rated highly by respondents. Although EuMAR KPI and benchmark data for clinics was not accessible for MAR professionals during the pilot study, participants were asked to indicate the usability they would find in having these tools in the future. EuMAR KPI and benchmark data was marked as useful by 84% of respondents. Average of baseline characteristics and basic activity data of clinics, as well as average of clinical KPIs would be useful for 88% of respondents and 84% of them found average of lab KPIs useful. Participants were asked whether they would like to access national averages for participating clinics in their country, EU averages comparing different participating countries, or both. The majority of respondents (88%) said they would like to see both, EU and national averages, to compare their clinic's performance with others

in their country and in other participating countries. Additionally, standardised reports from patients who have previously been treated at another clinic were found useful by a vast majority of pilot clinic professionals (84%). The collection and calculation of cumulative outcome parameters were considered 'important' or 'very important' by 97% of participants. This was followed by monitoring trends and outcomes in MAR and having harmonised data across EU countries (94%), inter-institutional and cross-border data collection and availability of data for Open Science (91%). Only one respondent mentioned an additional benefit not listed in the question, highlighting EuMAR's potential to provide nationwide MAR data in countries lacking a national registry.

Overall satisfaction

In the pilot study, 70% of participants reported being satisfied or very satisfied with their experience, while 24% expressed a neutral stance. Only one participant reported dissatisfaction, and another reported being very dissatisfied. When evaluating specific statements regarding their participation in the pilot study, 64% of respondents indicated that EuMAR did not imply a significant burden on their daily work. A country-level analysis to this question revealed some variations: while all German centres (100%) reported that EuMAR did not constitute a burden, less than half (40%) of the Slovenian centres expressed the same view.

According to 58% of respondents, the EuMAR registry could be well integrated into the daily practice at their centre. While in Estonia, Germany, and Portugal over 60% of respondents agreed with this statement, only 20% of professionals in Slovenia agreed with it. Over half of respondents (58%) think that the EuMAR registry could bring improvements to the care performed in their clinic. Small variations between countries can also be observed on this statement, with 75% of professionals in Estonia and 59% in Portugal agreeing with it, while only 40% in Slovenia and 33% in Germany backing this statement.

Finally, participants were asked whether they would like to continue participating in EuMAR after the pilot study. Overall, 61% expressed a willingness to continue, 21% remained neutral, and 18% indicated that they would prefer not to continue. In Estonia, half of the respondents indicated they would be willing to continue participating in EuMAR, 67% of respondents in Germany and 71% in Portugal. In Slovenia, less than half of respondents indicated they would be willing to continue participating after the pilot study.

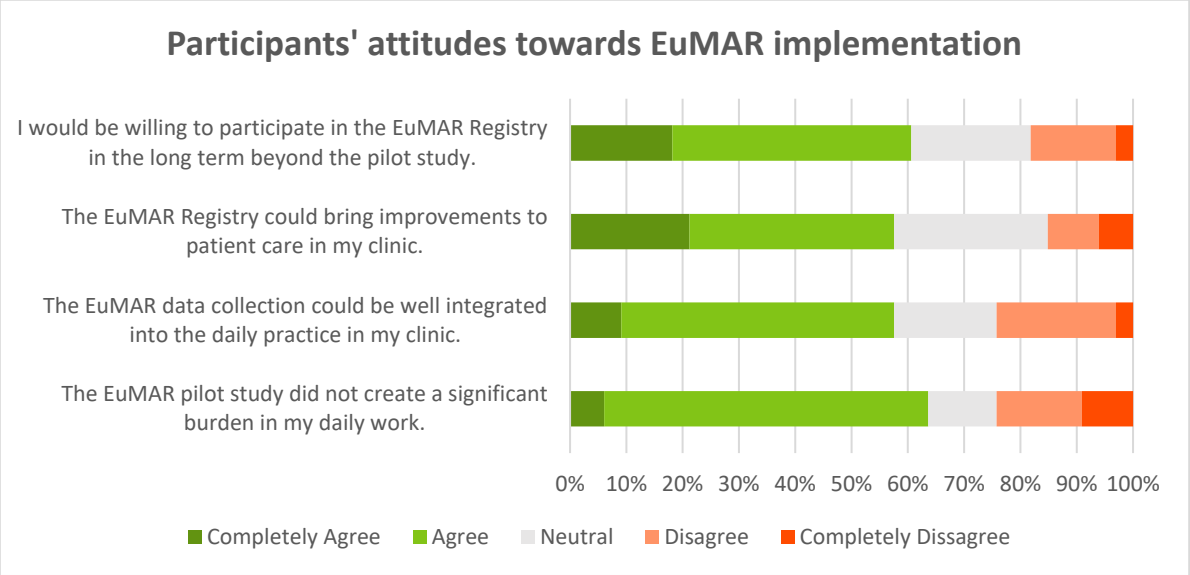

Figure 4: Participants' attitudes towards EuMAR implementation

Respondents were also asked to select their main motivations to participate in EuMAR out of a list of five topics. Being part of an international project with other MAR professionals was the most highly rated (64%), followed by improved patient care and statistics and KPIs for their clinic (61%), public recognition for the clinic (36%), and individual professional recognition (21%). No other motivations were reported. Responses to this question disaggregated by country follow a similar trend except for two instances: both Germany and Slovenia rated improved patient care as the lowest motivator to contribute to EuMAR.

Finally, respondents had the opportunity to suggest any improvements to the registry. Only four respondents completed this question, and the answers mentioned improvements to the system of requesting and storing EuMAR patient codes, to the patient leaflets and information materials, and the preference of automatic data submission over the manual data entry for clinics.

Logbook

The pilot study of the EuMAR registry provided valuable insights into the practical, technical, and organisational challenges of implementing an EU-wide, cycle-by-cycle MAR registry. The documentation of the pilot study process in the logbook revealed several categories of issues, ranging from delays in regulatory approvals and contractual agreements, to misunderstandings related to parameters, technical difficulties with API connections, and heterogeneity in data submission models. These challenges highlight critical areas that must be addressed before scaling up the registry to all European countries.

Delays with approvals

One of the main obstacles encountered during the pilot was the delay in obtaining approvals. Regulatory requirements, particularly those from Data Protection Authorities (DPAs) and Ethics Committees, extended the timeline significantly. In some cases, this meant later participation in the pilot study (i.e., Estonia joined officially in September instead of July 2024). Furthermore, in two countries that initially showed an interest, (foreseen) difficulties with obtaining the necessary approvals contributed to preventing participation altogether. Additional delays arose from the process of accepting the registry's terms of use. This was particularly the case for clinics that were not required to

use the registry for manual data submission and only needed to log in once to accept the terms. The lack of a streamlined mechanism for this step slowed overall progress, although this had no impact in the connection process and the data submission per se.

Misunderstandings related to parameters and unavailability of data

Several points were identified in the interpretation and recording of parameters. A notable example was the "date of start of ovarian stimulation," which was not consistently defined or recorded across clinics. In Portugal, this parameter was not documented at all, limiting the ability to assess whether IRCCs were requested in a timely manner. The "cycle identification" parameter caused confusion for some participants. For example, an API connection to receive data on oocyte donor cycles was not established in Portugal, as this information did not appear explicitly within the cycle identification. Other parameters were mentioned by other countries as creating confusion or not being recorded, such as "female indication for treatment", "smoking status" or "BMI". Additionally, only 50% of professionals in clinics participating in the pilot study found the EuMAR parameters easy to understand. These and other findings related to the parameters will be addressed by WP4 in a complete update of the parameter list.

General API issues affecting data entry and quality

Significant technical challenges emerged during the use of APIs for data entry and integration. Common issues included, for instance, the limited capacity of the registry that slowed the data submission down because it was only possible to receive 100 cycles per minute. Another issue was related to an IT vendor entering API keys in an incorrect format, which led to failures in data transfer until the issue was identified and corrected.

The most complex technical challenges arose from the establishment of API connections with the EMR software of individual clinics. Several layers of logistical and technical requirements contributed to prolonged delays. Firstly, authentication details had to be obtained from each participating clinic, IP addresses had to be whitelisted, and in one case, the use of a non-static IP by the clinic complicated the process further. Each clinic's server required individual access arrangements, often necessitating scheduled appointments, which led to non-synchronous implementation across sites. For instance, API connections for IRCCs were established in most clinics in Germany only by August and in Slovenia by December 2024, allowing for the retroactive creation of IRCCs, as the pilot study officially started in July 2024. In addition, there were other complications that included the temporary inability to manually copy IRCCs created within the EMR system and ensuring that a EuMAR-specific consent checkbox was created in the EMR system, as the absence of a consent checkbox could lead to the creation of IRCCs for patients who did not consent. The changes to the clinics' EMR systems required a period of adjustment, which created a further delay into automatising the process.

Delays also affected the submission of data via APIs. In Estonia, for example, cycle data had not been transferred by April despite a January deadline for the reception of cycle data. Even after submissions were attempted, technical failures occurred. Moreover, the functionality of the CSC option for cross-border and inter-institutional data collection could not be tested at all in clinics using an API connection to their EMR system because this functionality could not be developed within the pilot study timeline.

Challenges with EuMAR codes

Challenges were also encountered with the use of EuMAR codes. Although CSC letters had been translated into the languages of pilot countries, in the registry they were only available in English, which limited their accessibility in some contexts. Furthermore, IRCCs were not stored within EuMAR due to

data protection requirements, creating practical difficulties for participants. In particular, IRCCs created by mistake, such as those created before the introduction of the consent checkbox in the EMR system could not be deleted, because there was no function created to delete patient records or IRCCs. Also, if users did not store the IRCCs immediately in their own records, they were unable to retrieve them from the registry. In this case, users had to request new IRCCs and were unable to delete the previous records they had created, leading to empty records in the system.

Financial and procedural questions

Financial and organisational issues also emerged. One country reported unexpected expenses that had not been anticipated during planning, highlighting the importance of accurate budgeting and contingency planning. More broadly, the pilot revealed considerable heterogeneity across countries and clinics in the models of registry use. These differences encompassed, for instance, the modes of data submission (API submission from a national registry, from clinics, or manual entry), the requirement for patient consent (mandatory or optional), or the generation of IRCCs (automatic or manual via API, or manually through the registry). This variability complicated efforts to standardise procedures and monitor compliance, and it also presented significant differences in implementation costs.

Overall, the pilot study validated the feasibility of the registry but also revealed substantial obstacles, particularly in the process of establishing connections with countries and providing accurate capacity building to users.

Table 3 List of issues encountered and solutions found		
Topic	Issues encountered	Possible solutions
Patient codes (IRCCs and CSCs)	The ClinicSwitch code feature was not available for clinics submitting data directly through an API via their own EMR system	This feature can be integrated in the next phase by the EMR vendors.
	Some professionals stated a lack of knowledge on how to request a ClinicSwitch code	More regular trainings can be provided and regular information sent to registry users.
	Some professionals mentioned unavailability of devices to scan ClinicSwitch codes	More regular trainings can be provided and regular information sent to registry users to raise awareness on the possibility of scanning with a mobile phone and the fact that the CSC letter also provides a numerical code that can be copied from a PDF file or typed in manually in case there is no other option.
	CSC multilingual letters for patients were not available	This feature will need to be incorporated in the next phase.
	IRCCs not being stored for privacy reasons meant that if an IRCC was not immediately and properly stored in the clinics' records, a new one had to be created, duplicating efforts for staff and inflating the number of empty IRCCs	A system to manage IRCCs in a way that is both privacy-compliant and efficient will need to be revised after the introduction of consent. Revisit the possibility of storing IRCCs in the EuMAR registry.
Delays	Delays with national approvals	Include the application for approvals at national level from the start of stakeholder engagement and encourage national representatives to start this early on.
Parameters	Misunderstandings related to parameters and definitions	The parameters and definitions will be updated based on pilot study participants' feedback to improve clarity and understanding.
	Empty fields, sometimes due to unavailability of data	When data is not available, EuMAR can encourage national stakeholders and clinics to gradually introduce the parameters that are considered scientifically relevant. Other parameters can be made compulsory in the registry to avoid empty fields for parameters that

		are available in national registries and clinics.
Technical	Limited capacity of bulk data submission	Improve the limitation of 100 calls per minute when submitting data via an API.
	Delays in achieving API connections. IP addresses had to be whitelisted and individual access arrangements done (e.g., scheduled appointments with each clinic)	Request a written guide per EMR vendor or national registry IT team on the needs and a timeline to achieve the final connection and parameter matching to better estimate the process.
	Consent checkbox not ready from the start	Compulsory feature in next phase.
	Data errors due to API misunderstandings	Improve manuals and established communication channels, where information can be traced back all in one place.
Financial and procedural	Considerable heterogeneity across countries and clinics in the models of registry use made it difficult to communicate and manage cooperation	Development of a toolkit to facilitate onboarding; development of API guidelines for EMR connections and instructions for manual entry.

Data quality

Data completeness

Coverage of MAR centres

Only in Slovenia, 100% of the MAR centres in the country reported data to EuMAR. In Portugal, the national competent authority asked all centres to request IRCCs during the pilot study period, which was done by 26 of the 28 centres in the country (92.9% participation rate). In Estonia, all centres were invited to participate in EuMAR, but only one centre accepted the invitation and sent data to EuMAR (16.7% participation rate). This low participation rate can be explained by a lengthy approval process with the local Data Protection Authority, leaving too little time to build API connections with all EMR systems used in the country. The centre that participated in the pilot study in Estonia used an EMR system that was also in use in other pilot countries, so the API connection was already under development. In Germany, the national IVF registry decided to initially only invite eight centres to participate in the EuMAR pilot study, since the roll-out of new software features to all German centres takes substantial time and resources. All invited centres in Germany sent data to EuMAR (5.5% of the centres in the country, 100% participation rate).

Coverage of cycles

In total, 21,093 cycles from the pilot study period were registered in EuMAR. To assess data completeness, all pilot study participants were asked in June 2025 to provide data on the total number of cycles, the number of cycles with an IRCC, and where applicable the number of cycles with EuMAR

consent from the pilot study period in their national registry or clinic records. Table 2 provides an overview of the data provided and the comparison with the number of cycles received by EuMAR.

Table 4: Coverage of cycles in EuMAR by country

Country	Total number of cycles in participating centres	Cycles with an IRCC in own records	Cycles with EuMAR consent recorded by centre	Consent rate	Cycles received by EuMAR	Percentage of cycles covered in EuMAR (among all cycles)	Percentage of cycles covered in EuMAR (among cycles with consent)
Estonia	58	42	42	72.4%	39	67.24%	92.9%
Germany	8,218	8,205	NA*	NA	8,205	99.8%	NA
Portugal	12,127	11,211	NA	NA	11,117	91.7%	NA
Slovenia	2,304	1,812	1,812	78.7%	1,841**	78.2%**	99.4%*

*NA: not applicable because no specific consent for EuMAR was requested

**In two Slovenian centres, the number of cycles received by EuMAR was higher than the number of cycles with EuMAR consent based on the centres' own records. To avoid inflating the overall percentages of cycles covered in Slovenia, the excess cycles of these centres were not included in the calculation of the overall coverage rates.

In Germany and Portugal, where data was sent from a national registry, the main reason why data was missing in EuMAR was that cycles were sent to the national registry without an IRCC. In addition, 94 Portuguese cycles and one German cycle were lost due to API issues in the data submission. In Estonia and Slovenia, where patient consent was requested and data was sent directly from clinics, the main reason why data was not sent to EuMAR was a lack of patient consent. All cycles with patient consent also had an IRCC. In Estonia, three cycles with an IRCC and consent were lost in the data submission due to API issues. In Slovenia, two of the centres that entered data manually reported having had fewer cycles with EuMAR consent than cycles were received in EuMAR. It could not be resolved whether this was caused by errors in the counting of cycles in the centres' own records, by an entry of cycles without consent into EuMAR, or by multiple entry of cycles from patients who gave consent.

Completion rates per parameter

Supplementary table 1 provides the rate of data completion per parameter on 11 December 2025. An overview of the number of parameters achieving different completion rates is provided in figure 4. The denominator used for calculating completion rates was the number of applicable cycles, e.g., only cycles with an embryo transfer were taken into account to calculate the completion rate of the parameters "embryo transfer date" and "number of embryos transferred". Of the 81 parameters for cycle data, more than half (n=41) had a completion rate of 80% or above. Among these, 35 parameters had a completion rate above 90%, including 2 parameters with a completion rate of 100%. The 2 parameters with full completion were the two mandatory parameters needed to create a new cycle in the registry (start date and cycle identification, i.e., type of cycle). In contrast, 17 parameters had a completeness rate below 50%. Among these, there were 4 parameters with a completeness rate of less than 10%, including 2 that were not completed in a single cycle (reason for IUI cancellation and details on diamniotic twin pregnancy). It needs to be noted that for both of these parameters, there were only

very few applicable cycles (two cycles with known IUI cancellation and two cycles with a known diamniotic twin pregnancy).

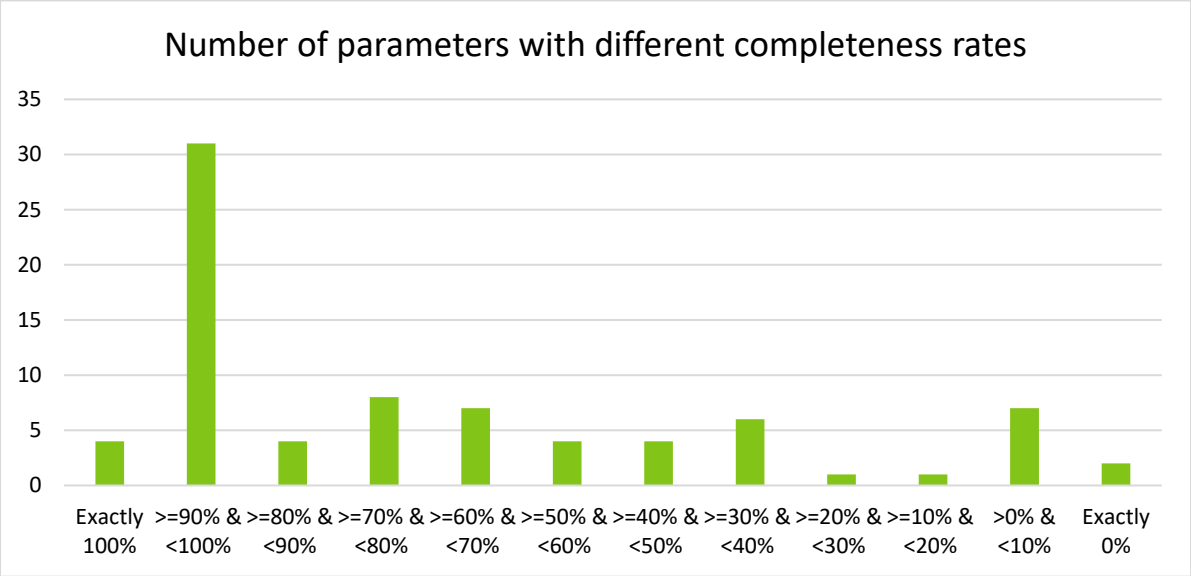

Figure 5: Number of parameters with different completeness rates

There are different possible reasons for low completeness rates. For some parameters, it is likely that it was not fully clear to participants when they were applicable, which may have led them to leave parameters blank instead of entering "0" or "none". Another explanation for a low completeness rate is that data on some parameters was not available to participants, either because it was not collected by national registries (e.g., the timing until which luteal support is prescribed, which was available in neither the German nor the Portuguese registry) or, where the data was sent directly by clinics, the information is not known to the clinic staff (e.g., male BMI, which had a very low completeness rate in the Slovenian clinics that entered data manually).

IRCC and CSC requests

Overall, a total of 31,017 IRCCs were requested from July to December 2024, for main patients and partners combined. However, many IRCCs requested during the pilot study period were never linked to any patient data. Moreover, several IRCCs for patients who had treatment during the pilot study were requested after the end of the pilot study period, mostly because the API connections with two pilot centres with automatic IRCC requests were only finalised in 2025 and all IRCCs for these centres were requested retroactively. In total, the 21,093 cycles from the pilot study period reported to EuMAR involved 15,477 unique main patients, since a substantial number of IRCCs (4,291) reported more than one cycle during the pilot study period. As not all cycles involved a partner, the number of unique partners (12,691) was lower than the number of unique main patients.

In total, 27 CSCs were requested during the pilot study. Eleven CSC requests were explained as a mistake by one pilot centre who initially misunderstood the purpose of the CSC. For the remaining 16 CSCs, no such information was provided, so it is assumed that these were requested in actual cases of patients planning to switch centres. However, only four CSCs (main patients and partners of two couples) were scanned during the pilot study, all within Portugal.

Timeliness of IRCC requests

To assess compliance with the expected IRCC request deadlines, all unique IRCCs corresponding to main patients with at least one registered cycle (n = 15,477) were analysed according to whether the IRCC was requested within the timeframes defined in the pilot study protocol. Overall, 17.7% of IRCCs were requested on time, while 82.2% were generated after the recommended deadline.

The timeliness metric was calculated based on the protocol definition: IRCCs were expected to be requested within 5 days of ovarian stimulation start of a patient's first cycle during the pilot study, or before the procedure (e.g., IUI, FET) was performed if the first cycle was a non-stimulation treatment. The "treatment start date" entered in the system served as the reference point for this calculation across all participating countries.

In the case of Portugal, the start date of ovarian stimulation was not recorded in the national registry. Thus, in the analysis on the timeliness of IRCC requests for patients whose first cycle was a stimulation cycle, the deadline was adjusted to five days before the oocyte pickup (OPU) date, although the deadline of 5 days after start of ovarian stimulation was communicated to the clinics at the start of the pilot study. Consequently, IRCC requests submitted more than five days after the actual stimulation start may still have appeared as "on time" in the system. This approach was adapted to how data were recorded in Portugal's system; however, the assessment of the timeliness of IRCC requests slightly differs from other countries.

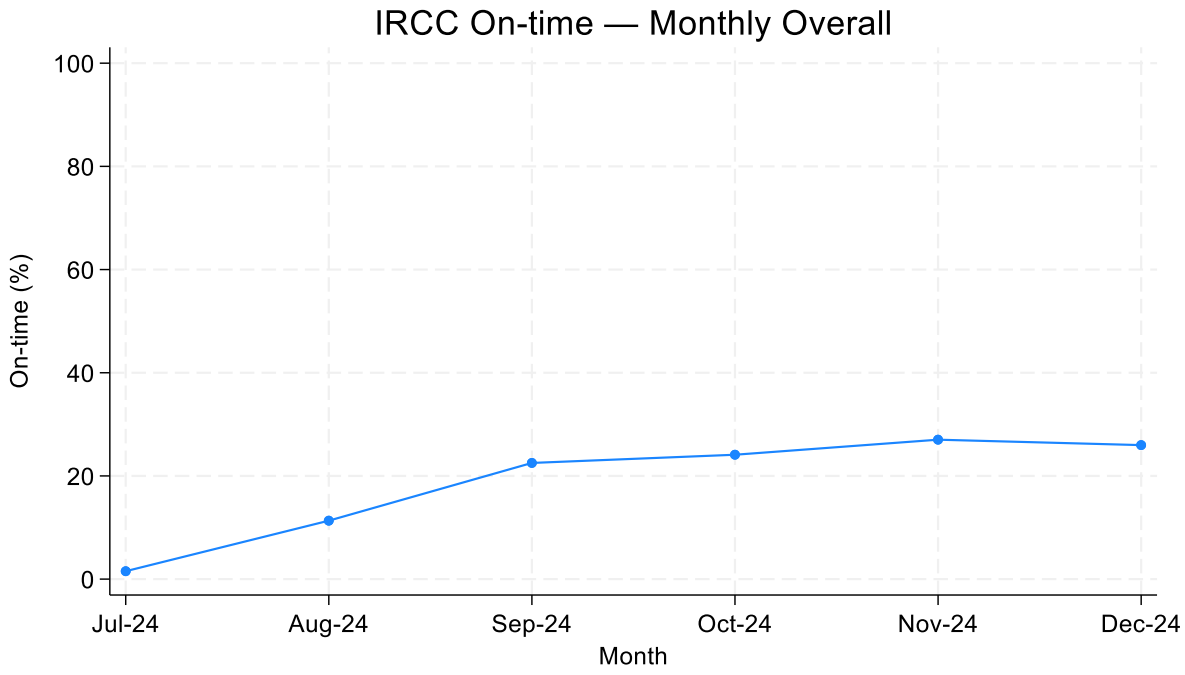

Figure 6: Percentage of IRCC requests submitted on time by month

Figure 5 displays the percentage of IRCC requests submitted on time for each month of the pilot study. While in July 2024, the first month of the pilot study, almost no IRCC requests were submitted on time, the percentage of IRCC requests submitted on time reached 22.5% in September 2024 and plateaued at that level for the remainder of the pilot study.

The timeliness of IRCC requests and the trend how timeliness changed throughout the pilot study differed based on the IRCC request mode. The proportion of IRCC requests that were on time among centres that requested IRCCs automatically through an API connection increased steadily throughout the pilot study, mostly due to the fact that more centres were connected gradually throughout the six-month period. Once a centre was connected, the IRCCs for all previous patients were created retroactively, i.e., none of the IRCCs of patients who had their first cycle at a centre that was not yet connected to the API were created on time. However, once a centre was connected, the percentage of IRCCs requested on time was much higher compared to centres that requested IRCCs manually. With the exception of one centre, all centres that requested IRCCs automatically stayed within the deadline for 80% or more of their IRCC requests once their centre was connected to the API. For centres that requested IRCCs manually, the on-time rate remained stable between 10% and 20% after July 2024.

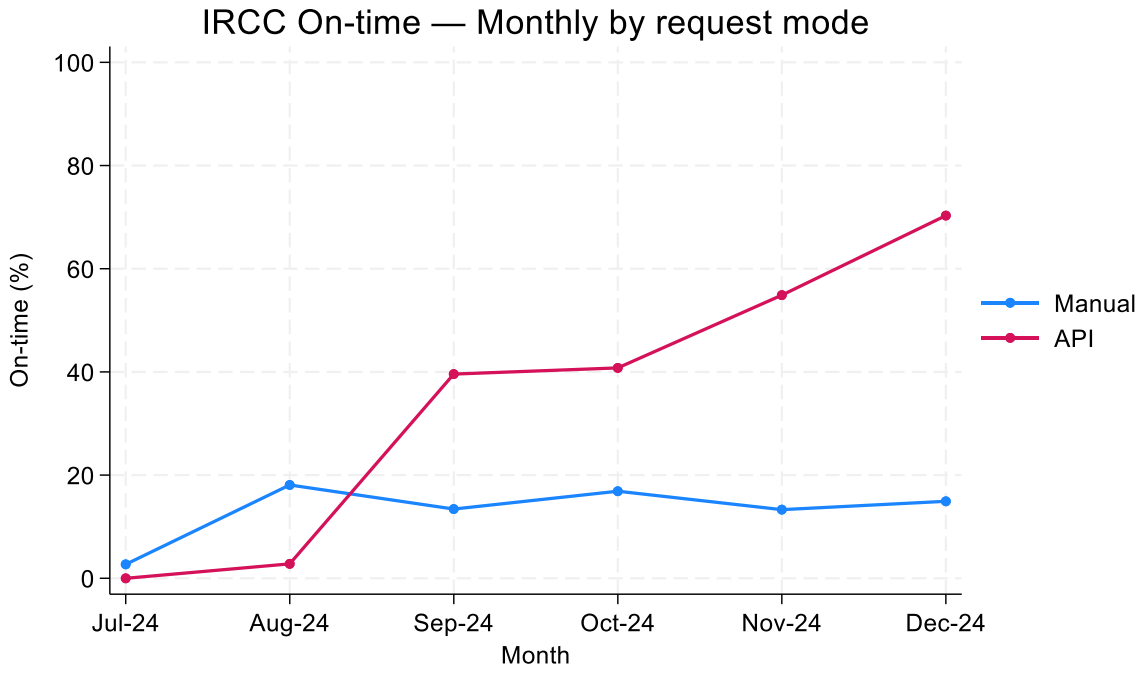

Figure 7: Percentage of IRCC requests submitted on time by month and request mode

Timeliness of data submission

Unfortunately, it was not possible to assess the timeliness of data submission, since the timepoint of data submission was stored in the registry.

Internal consistency

Deviations from pre-set validation rules

Supplementary table 2 provides the number of violations of pre-set validation rules per parameter and data source. For manually entered data, the consistency with pre-set validation rules was very high. There was only a single cycle that violated two validation rules, most likely caused by a mix-up of the day and month in the fresh embryo transfer date.

For data sent through API connections, more than half of the validation rules were not violated in a single cycle (66 out of 118), whereas many rules were violated in a high number of cycles (33 rules violated in 100 or more cycles), hinting to issues in the API implementation rather than incorrect data being entered by centres. Upon closer review, almost all violations could be explained by the API implementation, such as the entry of default values for fields that were not applicable to the respective cycle, e.g., an entry of 0 oocytes retrieved for IUI cycles, or the provision of data in a different format than requested, e.g., sending 01/01/1900 for missing date specifications rather than an empty field.

Empty records

The analysis of empty records (i.e., IRCC requests that led to the creation of a patient record in the EuMAR database with no associated cycle data) provided revealing insights into the pilot study's progression. Overall, a total of 31,017 IRCCs were requested from July to December 2024, based on the consolidated report. Of these, 25,759 (83%) have data and 5,258 (17%) remained empty. Two clinics in Germany requested all IRCCs retrospectively in 2025, which are not part of this report.

The graphic below (Figure 4) shows the percentage of empty IRCCs out of the total of the IRCCs requested in each two-week time interval of the pilot study. From July to August (intervals 1-5) it is possible to observe a short increase in the percentage of empty IRCCs, quickly followed by a progressive decrease. This suggests a positive learning curve among the initial users as the empty IRCCs rate goes down from 15% to 4%. It is important to note that during July and August, only clinics in Portugal and Slovenia were able to request IRCCs.

This trend was altered from August to September (intervals 5-7). During this time, the EMR provider began to gradually implement the API for requesting IRCCs in German clinics. The proportion of empty IRCCs suddenly increased as a consequence of the retroactive IRCC requests of German clinics for previous months that could not be populated. This upward trend continued in October (intervals 8-9), as the API for IRCC requests reached Estonia, culminating in a peak of 23% empty IRCCs. After a brief stabilization, a second, higher peak of 25% occurred in December, coinciding with the API's implementation in the clinic in Slovenia doing automatic data submission.

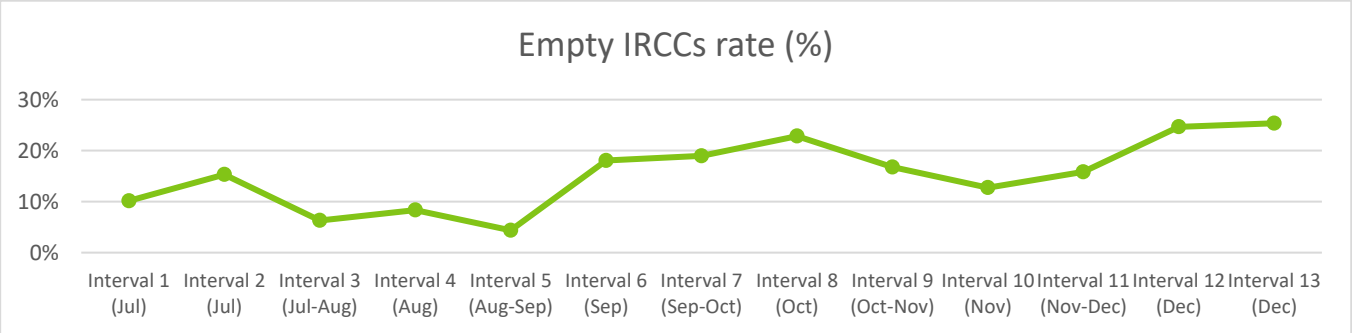

Figure 8: Empty IRCCs rate (%)

A minor difference of ten empty IRCCs between the bi-weekly analysis (n=5,268) and the final consolidated report (n=5,258) can be observed. This discrepancy, originating from Portugal, is due to data submitted after the analysis and it is an expected effect of working with a dynamic report, where intervals capture temporary states, whereas the consolidated report reflects the final picture. This is

explained by the fact that the established rules for data submission were not always possible to be followed by MAR centres due to the short duration of onboarding and participation. Additionally, the data analysis started before all data was submitted, due to the time requirements of reporting to the funders (i.e., European Commission).

The proportion of empty IRCCs per country ranges from 8% in Portugal, 13% in Slovenia, 29% in Germany and 90% in Estonia. The reasons for these are diverse and vary from country to country. For instance, in Estonia and Slovenia, where informed patient consent was being used, IRCCs were wrongly created for patients who did not consent, therefore, no data was sent for them. In clinics requesting IRCCs manually in Portugal and Slovenia, a number of IRCCs were created by mistake as users were getting used to the system.

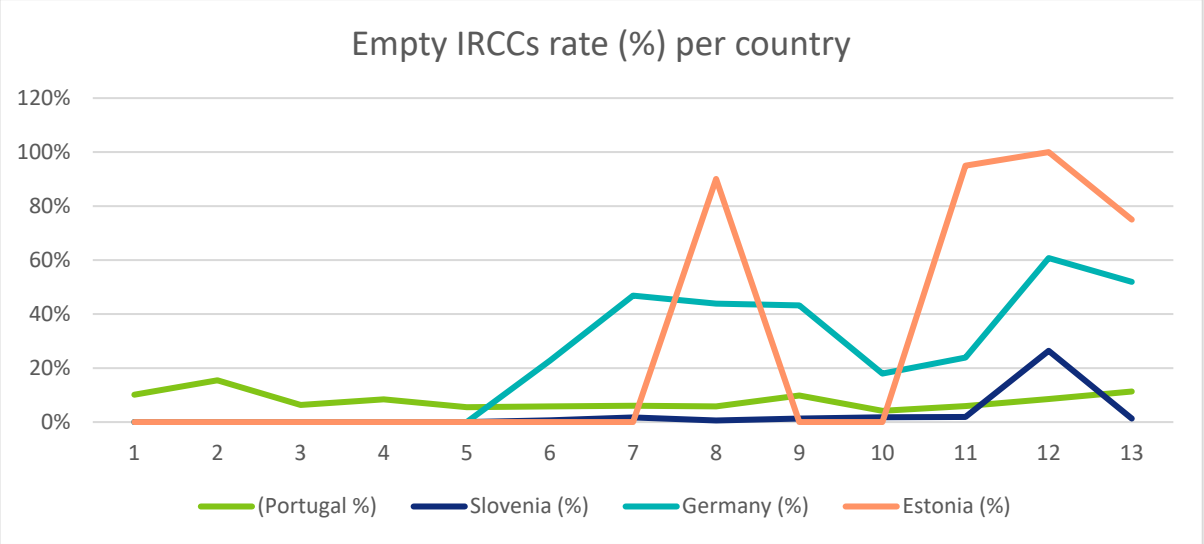

Figure 9: Empty IRCCs rate (%) per country

External consistency

Supplementary table 3 provides an overview of all derived parameters calculated from the pilot study data. These outcome parameters were reviewed by the WP6 members and the EuMAR Project Steering Committee (PSC) who confirmed their plausibility for most outcome parameters. There were some outcomes with implausible values, due to missing data in some parameters. For instance, the parameter on whether a child was live- or stillborn was not completed in the Estonian data, leading to a value of 0 for the number of liveborn children despite several deliveries.

Discussion

The implementation of EuMAR revealed both promising outcomes and significant learnings related to the setup of a European cycle-by-cycle MAR registry and the key elements that sustain its functioning, including participant engagement, data quality and completeness, as well as the technical system.

The overall completion rate reached an encouraging 92%, proving the feasibility of collecting cycle-by-cycle data from different countries into a central registry. However, this figure marks important

differences between countries and data flow models when having a closer look. In Germany and Portugal, which submitted data through national registries and did not require patient consent, we can observe almost complete datasets (98.5% and 91.7%, respectively), whereas in Slovenia and Estonia, where consent forms were used and clinics submitted data directly to EuMAR, either through an API or manually, the completion rate lowers significantly to 78.2% and 72.4% respectively. This difference raises questions about the impact of the data flow model on data completeness (national registry or clinic submission to EuMAR), as well as how national legal background for health data collection and requirements influence the ability of obtaining a complete dataset. It also highlights the potential for selection data biases that can originate from obtaining data only from a defined cohort of patients, namely those who provide consent. On a more technical level, the requirement for mandatory informed patient consent for the submission of data to EuMAR raises the importance for technical safeguards. These safeguards should ensure that only data for which consent has been granted is submitted; for example, verifying the appropriate recording of consent or invalidating IRCC requests when consent has not been given.

A point for attention is the frequency of late or empty IRCC requests. The high number of IRCCs requested later than suggested shows the difficulty of applying EuMAR recommendations in the daily clinical practice. In many cases, the clinic staff member requesting the IRCCs is not involved in all steps of the patient's treatment (e.g., an embryologist), and many times EuMAR reporting is integrated in the already established ways of working and timelines of the clinic, which do not always blend with what was recommended as EuMAR best practice. This, in turn, has an impact on prospectivity. Prospectivity in data collection can only be achieved if all IRCCs are requested within a limited time period from the treatment start and follow-up on empty IRCCs is systematically ensured. Otherwise, clinics can omit reporting cancelled or unsuccessful cycles, especially given that it is not mandatory to report to EuMAR. All in all, the number of empty and late IRCCs highlights one of the limitations of voluntary data reporting, showing that, for transparency reasons, the EU could enforce such reporting.

The feedback collected from professionals also shows the implications of staff roles in shaping both data quality and engagement. Nearly half of respondents (46%) were embryologists, most of whom collected data for EuMAR on a weekly basis (56%), which could help explain the high number of IRCCs requested outside of the recommended timeframe (i.e., if they had, for instance, one day a week to dedicate to EuMAR, it would not always be possible to follow the advised timelines). Additionally, given that embryologists typically have limited direct patient contact, it is perhaps unsurprising that only a very small number of participants reported speaking to patients about EuMAR. This does not imply that patients were not informed about EuMAR, as they might have been informed by the doctors, who did not respond to the survey. However, this highlights the importance of patient communication;. patients shall be appropriately informed about EuMAR, to ensure valid consent for their data to be sent to the registry and for them to be aware of the use of the CSCs for a complete cumulative overview of treatments across centres. The fact that only four CSCs were scanned during the study period reflects both the limited time available for testing the recording of inter-institutional treatments, as well as a possible lack of understanding of the process by both professionals and patients. Additionally, many clinics reported not asking patients whether they had been treated previously, indicating that the timing and integration of the CSC procedure may need to be revisited. Based on these results, it becomes evident that clearer communication, training, and guidance are needed to ensure patients are informed, which is not only ethically advisable, but also a necessity to achieve EuMAR's goals.

Some of the expected outputs for stakeholders, such as the dashboards and specific lab and clinical indicators, were still under development during the pilot study. As a result, participating centres were unable to see the results of their work through calculated KPIs and benchmarks. This may have influenced some of the responses, such as the usefulness of KPI and benchmark data (reported as useful by 88% of respondents) or the belief that the EuMAR registry could bring improvements to care in their clinic (58% of respondents). Once these tools are fully implemented, the benefits of EuMAR may be seen by professionals as even more valuable.

The usability of EuMAR's parameters also emerged as a point of consideration, with 21 out of the 79 parameters having completion rates below 50%, and only 50% of respondents finding them easy to understand. Regarding the completion rates, it is worth noting that it can be challenging for established national registries to report the complete list of EuMAR parameters, as several parameters will be different and some may not be collected at all in the national registry. The number and type of parameters collected in a national registry and those in EuMAR vary slightly, since the objectives of each registry are different. In EuMAR, for instance, one of the intentions is to build a tool for participating centres to calculate their KPIs, which explains why there are slightly more parameters set that are not covered by existing national registries from which data was submitted to EuMAR.

Concerning the difficulties to understand the parameters, this appears to affect primarily those entering data manually, who interacted directly with the EuMAR platform. For clinics with automatic data submission, the process of parameter matching is conducted outside of the clinic, allowing users to continue working within their familiar systems. This shows that automatising the process not only reduces workload for participants but also facilitates conceptual alignment between countries' data collection systems and the EuMAR registry. Nonetheless, the benefits of the automatic process were counterbalanced by minor technical complications: while manual data entry produced almost no validation rule violations, numerous errors were observed in automatic submissions, which highlighted the need to provide clearer guidance to partners involved in the API matching of parameters. Accurate initial mapping and validation of datasets are essential to prevent systematic errors and maintain data quality. Moreover, the findings from the pilot study will be used to revise the EuMAR parameters and the definitions of the glossary to enhance usability.

That said, the data submission method did have a clear impact on participants' perceptions of burden. Manual entry was viewed as time-consuming, and this perception correlated with lower willingness to continue participating. In contrast, clinics with automatic data connections experienced fewer barriers and greater continuity of engagement. Manual data entry was offered to clinics where an API connection was not possible due to a lack of EMR at the clinic and it is, therefore, favourable to continue offering this option. However, in the pilot study, EuMAR was automatically filled in from only two information systems (the EMR used by the clinic in Estonia and the German registry, and the platform of the Portuguese registry). The situation regarding available IVF programs and registries in European countries is likely very heterogeneous, which may pose a major technical challenge for broader integration into EuMAR. As a result, Excel uploads via API, an in-between option, will be explored in the next phase of the EuMAR registry as an attempt to adapt to clinics without EMR systems, while seeking to minimise the workload of participants. Despite these challenges, the perceived benefits of participation were considerable. The vast majority of respondents (84%) expected EuMAR's key performance indicators and benchmarking functions to be valuable tools for clinical improvement, and establishing this should be a priority for the next phase. The ability to compare both European-level and national-level KPIs was seen as an important advantage, although it is crucial that cross-country

comparisons are interpreted carefully to ensure comparisons are correct and avoid information biases in the results due to differences in the data that is available from different clinics and countries. Patient reports were also regarded as beneficial, thus the EuMAR team will need to work on their practical implementation, which will depend on how they are integrated within the existing reporting workflow, particularly when data submission is done through a national registry with their own timelines.

Some operational issues, such as the inability to delete or store IRCCs in the EuMAR portal and the generation of empty IRCCs without patient consent, revealed important areas where technical and legal safeguards must be strengthened. These instances underline the need for built-in system protections to prevent unauthorised data reaching EuMAR. Similarly, planning for the API connections should consider appropriate timelines and budget estimations to avoid delays or financial deficits, and ensure sufficient time for testing before going into production mode.

Overall, the findings suggest that the EuMAR developments offer substantial potential for improving the collection of harmonised MAR advancing research and enhancing patient care and vigilance across the EU. Nevertheless, its success will depend on addressing the operational, legal, and communication challenges identified during this project and highlighted in this report. Ensuring that all clinics have the technical and procedural capacity to maintain the EuMAR data collection, strengthening consent processes, and improving communication with patients are crucial next steps. Furthermore, investment in automated data integration, together with defined validation protocols and clear user support, will be key to reducing workload and increasing both data quality and participant engagement.

Conclusion

The EuMAR pilot study demonstrated the feasibility of collecting cycle-by-cycle MAR data from different countries with different contexts in a single European registry. Despite promising results, several challenges were identified that can affect the participation of countries in the registry and the completeness and quality of the data. Based on this experience, a number of learnings were identified for the continuation of the EuMAR registry in the future.

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Annex 1: EuMAR parameters and definitions

Part 1: Parameters to be included in the register

Validation crosslink: **none**

Definition:

The centre code will need to be defined by the system and will also be used to be connected to the login for benchmarking.

The identification code for the centers will include the country.

A center list per country will be provided to allow selecting specific centers per region or category.

Module 1 - Identification

1. **EuMAR IRCC**

Definition:

Each individual will be defined in EuMAR through an Individual Reproductive Care Code (IRCC). The IRCC will be created automatically by the registry. The code will stay with the individuals as long as treatments are continued at the same center. If the individual moves to another center, a new IRCC will be created but it will be linked to the same individual in the background.

2. **Cycle identification**

   a. **FRESH cycle with own gametes**
   b. **FRESH cycle with donated gametes**
   c. **Frozen-thawed embryo transfer (FET) cycle with own gametes**
   d. **Frozen-thawed embryo transfer (FET) cycle with gamete/embryo donation**
   e. **Intra-uterine insemination (IUI) with partner gametes**
   f. **Intra-uterine insemination (IUI) with donor gametes**
   g. **Fertility Preservation (FP)**

Definitions:

FRESH cycle: **A MAR procedure in which cycle monitoring is carried out with the intention of transferring to a woman fresh embryo(s)/blastocyst(s). or cryopreserving all oocytes/embryos (adapted def IG)**

Frozen-thawed embryo transfer (FET) cycles **: An ART procedure in which cycle monitoring is carried out with the intention of transferring to a woman, frozen/thawed or vitrified/warmed embryo(s)/blastocyst(s). Note: A FET cycle is initiated when specific medication is provided or cycle monitoring is started in the female recipient with the intention to transfer an embryo (IG)**

Intra-uterine insemination (IUI): **A procedure in which laboratory processed sperm are placed in the uterus (in the ovulatory stage of the cycle) to attempt a pregnancy. (IG)**

Fertility Preservation (FP)**: Various interventions, procedures and technologies, including cryopreservation of gametes, embryos or ovarian and testicular tissue to preserve reproductive capacity. (IG)**

Module 2 – Patient variables

3. Country of current residence[1]

Definition:
Residence: The place where one actually lives, which may be different from one's domicile.
(https://www.law.cornell.edu/wex/residence#:~:text=1.,to%20residents%20of%20the%20state.)

4. Female Date of Birth

Definition:
The date of birth for the person undergoing the treatment (IUI, OPU, ovarian tissue collection, ET,…)

5. Female Body Mass Index (BMI)

Definition:
Body Mass Index (BMI) is *a person's weight in kilograms (or pounds) divided by the square of height in meters (or* feet).
(https://www.cdc.gov/healthyweight/assessing/bmi/index.html)

[1] https://www.iso.org/iso-3166-country-codes.html

6. **Female current smoking status**

    a. **Yes**

    b. **No**

    c. **Unknown**

    Definition:
    A recoded variable based on several questions about cigarette smoking

7. **Male Date of Birth**

    Definition:
    The day of birth for the male undergoing the ejaculated or surgically retrieved sperm collection.

8. **Male Body Mass Index (BMI)**

    Definition:
    Body Mass Index (BMI) is *a person's weight in kilograms (or pounds) divided by the square of height in meters (or* feet). (https://www.cdc.gov/healthyweight/assessing/bmi/index.html)

9. **Male current smoking status**

    a. **Yes**

    b. **No**

    c. **Unknown**

    Definition:
    A recoded variable based on several questions about cigarette smoking

10. **Indication for treatment**

    a. **Female**
        a. **Unexplained infertility**
        b. **Tubal pathology**
        c. **Ovulatory disorder**

d. **Endometriosis**

e. **Psychosexual (can be an indication for IUI and occasionally IVF)**

f. **Premature Ovarian Insufficiency (POI)/oocyte issue (these are women who need donor eggs)**

g. **Uterine absence or dysfunction (female who needs surrogacy)**

h. **Medical contraindication to pregnancy (surrogacy for medical disorders)**

i. **Other**

b. Male

a. **Unexplained**

b. **Sperm factor**

c. **Psychosexual (can be an indication for IUI and occasionally IVF)**

d. **Other**

c. Relationship status

a. **No male partner (same-sex or single women)**

b. **No female partner (same-sex or single males)**

d. Genetic reasons

a. **Genetic disorder (Need Preimplantation Genetic Testing - PGT)**

Definitions:

***Unexplained infertility*: Infertility in couples with apparently normal ovarian function, Fallopian tubes, uterus, cervix and pelvis and with adequate coital frequency; and apparently normal testicular function, genito-urinary anatomy and a normal ejaculate. The potential for this diagnosis is dependent upon the methodologies used and/ or those methodologies available (IG)**

***Tubal pathology*: Tubal abnormality resulting in dysfunction of the Fallopian tube, including partial or total obstruction of one or both tubes (proximally, distally or combined), hydrosalpinx and/or peri-tubal and/or peri-ovarian adhesions affecting the normal ovum pick-up function. It usually occurs after pelvic inflammatory disease or**

pelvic surgery. Tubal disease due to endometric adhesions is classed as endometriosis. (IG)

Ovulatory disorder: a group of disorders in which ovulation fails to occur, or occurs on an infrequent or irregular basis. *Shadygrovefertility.com/infertility-causes/ovulatory-disorder*
PCOS guideline ?

Endometriosis: A disease characterized by the presence of endometrium-like epithelium and stroma outside the endometrium and myometrium. Intrapelvic endometriosis can be located superficially on the peritoneum (peritoneal endometriosis), can extend 5 mm or more beneath the peritoneum (deep endometriosis) or can be present as an ovarian endometriotic cyst (endometrioma) (IG) Guidelines

Psychosexual (can be an indication for IUI and occasionally IVF):

Premature Ovarian Insufficiency (POI): A condition characterized by hypergonadotropic hypogonadism in women younger than age 40 years (also known as premature or primary ovarian failure). It includes women with premature menopause.

Uterine absence or dysfunction (female who needs surrogacy - males needing surrogacy): congenital anomalies, adenomyosis,…

Medical contraindication to pregnancy (surrogacy for medical disorders eg severe renal disease, heart disease, Turner syndrome,…)

Genetic disorder (Need PGT-M or PGT-SR): An inherited medical condition caused by a DNA abnormality.

Surrogacy: gestational carrier

Module 3 – Cycles with ovarian stimulation (If 2a, 2b, 2e, 2f, possibly 2g)

11. Ovarian stimulation
    a. Yes
    b. No

Definition:

Pharmacological treatment with the intention of inducing the development of ovarian follicles. It can be used for two purposes in ART, to obtain multiple oocytes at follicular aspiration. (IG)

12. Date of start cycle

Definition:

first day of menstruation when no ovarian stimulation is used and first day of drug when ovarian stimulation is used

This date is important to define time-to-pregnancy, but also to at least have a date in case of cancellation.

13. Treatment Protocol

Pre-Treatment

a. **None**
b. **Oestrogen**
c. **Progestogen**
d. **Oestrogen progestogen (OCP)**
e. **Gonadotrophin Releasing hormone (GnRH) antagonist**
f. **Other**

LH Suppression Protocol

a. **None**
b. **GnRH Agonist**
c. **GnRH Antagonist**
d. **Progestagen**
e. **Other**

Stimulation Drug

a. **None (Natural cycle) Modified natural cycle**
b. **Oral agent only (Anti-oestrogen, Aromatase Inhibitor)**
c. **Oral agent and gonadotropin**
d. **Gonadotropin only**

Gonadotropin (if used)

a. **Urinary**
b. **Recombinant**
c. **Urinary and Recombinant**

Starting dose of Gonadotropin (if used)

a. **<150 IU**
b. **150-300 IU**
c. **>300 IU**

Triggering of final oocyte maturation

a. **Human chorionic gonadotropin (hCG) urinary**
b. **hCG recombinant**
c. **GnRH Agonist**
d. **Dual trigger (hCG and GnRH agonist)**
e. **Other**

Luteal support

a. **None**
b. **hCG**
c. **Progesterone**
d. **Other Progestogenes**
e. **Combination**

Luteal support prescribed until

a. **Pregnancy test**
b. **Viability scan (6-8 weeks)**
c. **End of first trimester**

Other

14. Cancellation prior to Ovum Pick Up (OPU)

a. **Yes**
b. **No**

Definition: **Cycle that was abandoned before OPU, at the stimulation stage**

15. OPU Cancellation causes

a. **Insufficient ovarian response**
b. **Premature Luteinizing Hormone (LH)**
c. **Other medical reasons**

d. **Non-medical reason**

Definition:

Insufficient ovarian response: **Recruitment of a low number of follicles, fewer than expected and/or considered clinically possible**

***Premature Luteinizing Hormone*: Conventionally, premature LH surge is defined as an LH level of ≥ 10 mIU/mL, and a progesterone level of ≥1.0 ng/mL occurring before the criteria of hCG administration is met**

OHSS: **An exaggerated systemic response to ovarian stimulation characterized by a wide spectrum of clinical and laboratory manifestations. It may be classified as mild, moderate or severe according to the degree of abdominal distention, ovarian enlargement and respiratory, hemodynamic and metabolic complications (IG)**

16. Date of OPU

Definition **: The date when ovum pick up (OPU) occurred.**

17. Number of cumulus oocytes retrieved

Definition: **The number of cumulus oocytes retrieved at OPU**

18. In-vitro maturation (IVM)

a. **Yes**

b. **No**

Definition:

A cycle is considered an IVM cycle if the patient was prepared specifically or if an alternate treatment cycle was converted prior to OPU into an IVM treatment cycle

19. Number of oocytes cryopreserved

Definition:

The number of oocytes frozen before fertilization

20. Reasons for oocyte cryopreservation

a. **Medical reason**

- **OHSS risk**
- **Infection**
- **Intercurrent disease**
- **Sperm issues**
- **Fertility preservation (Polyp/endometrial issue)**
- **other**

b. **Non-medical reason**

- **Religion**
- **Legal issues**
- **Planned autologous egg banking (fertility preservation)**
- **Other**

c. **Donation**

Definition:

***Cryopreservation*: The process of slow freezing or vitrification to preserve biological material (e.g. gametes, zygotes, cleavage-stage embryos, blastocysts or gonadal tissue) at extreme low temperature. (IG)**

***Intercurrent disease:* A disease that intervenes during the course of another disease. For instance a patient with AIDS may develop an intercurrent bout of pneumonia.**

21. Number of oocytes donated

***Definition:* The number of oocytes given by the patient for reproductive purposes of others or for research (adapted from IG)**

Module 4 – Laboratory data

22. **Source of sperm:**

    a. **Origin**

        1. **Partner sperm (own sperm)**
        2. **Donor sperm**

    b. **Collection**

        1. **Ejaculation**
        2. **Retrograde ejaculation**
        3. **Surgical retrieval**
        4. **Combination of ejaculation and surgical retreival**

    c. **Type of sperm**

        1. **Fresh**
        2. **Frozen**
        3. **Combination of fresh and frozen**

Definition:
Ejaculated sperm: **sperm cells released from the male reproductive system**
Antegrade ejaculation: **Normal, forward ejaculation**
Retrograde ejaculation: **The complete or partial inability to ejaculate in an antegrade direction**

23. **Source of oocytes**

    a. **Origin**

        1. **Own oocytes**
        2. **Donor oocytes (age of donor at time of oocytes collection)**

    b. **Type of oocytes**

        1. **Fresh**
        2. **Frozen**
        3. **Combination of fresh and frozen**

Definition: /

24. Date of insemination

Definition: **Date when sperm and oocyte are brought together**

25. Insemination technique used:

a. **IVF**

b. **ICSI**

c. **Mixed IVF and ICSI**

d. **IUI**

26. Number of oocytes inseminated (IVF)

Definition: **Number of oocytes in which a sperm cell has entered**

27. Number of oocytes injected (ICSI)

Definition: **Number of oocytes in which a sperm cell was injected**

28. Number of 2 pronuclei (2pn) – IVF

Definition:
Pronucleus: **A round structure in the oocyte surrounded by a membrane containing chromatin. Normally, two pronuclei are seen after fertilization, each containing a haploid set of chromosomes, one set from the oocyte and one from the sperm, before zygote formation (IG)**

29. Number of pronuclei (2pn) – ICSI

Definition:
Pronucleus: **A round structure in the oocyte surrounded by a membrane containing chromatin. Normally, two pronuclei are seen after fertilization, each containing a haploid set of chromosomes, one set from the oocyte and one from the sperm, before zygote formation (IG)**

30. Number of all embryos developed (IVF and ICSI)

31. Number of embryos cryopreserved

32. Optional: Number of cleavage stage embryos cryopreserved

Definition:

Cleavage stage embryo: **Embryos beginning with the 2-cell stage and up to, but not including, the morula stage**

33. Optional: Number of blastocysts cryopreserved

Definition:

Blastocyst: **The stage of preimplantation embryo development that occurs around day 5–6 after insemination or ICSI. The blastocyst contains a fluid-filled central cavity (blastocoele), an outer layer of cells (trophectoderm) and an inner group of cells (inner cell mass).**

34. Reasons for embryo cryopreservation

a. Supernumerary embryos
b. PGT
c. Medical reason
   - OHSS risk
   - Infection
   - Intercurrent disease
   - Fertility preservation
   - Uterine or tubal pathology undiagnosed before cycle start
   - other
d. Non-medical reason
   - Religion
   - Legal issues
   - other
e. Planned freeze all) for autologous use /fertility preservation)
f. Donation

35. Pre-implantation Genetic Testing

a. **No**

b. **Yes**

If yes,

- **PGT-A**
- **PGT-M**
- **PGT-SR**

Definition:

***Preimplantation Genetic Testing*: A test performed to analyze the DNA from oocytes (polar bodies) or embryos (cleavage stage or blastocyst) for HLA-typing or for determining genetic abnormalities. These include: PGT for aneuploidies (PGT-A); PGT for monogenic/single gene defects (PGT-M); and PGT for chromosomal structural rearrangements (PGT-SR).**

Module 5 – Embryo transfer

Make choice between (fresh/thawed)

36. Embryo transfer:

a. **Yes**

b. **No**

Definition:

Placement into the uterus of an embryo at any embryonic stage from day 1 to day 7 after IVF or ICSI.

37. Embryo transfer of:

a. **Fresh embryos**

b. **Frozen embryos**

c. **Combination of fresh and frozen embryos**

Use of fresh embryos

38. Date of embryo transfer

Definition:

Date on which the embryos are transferred to the uterus

39. Number of cleavage stage embryos transferred.

40. Number of blastocysts transferred.

41. Embryo Transfer Outcome

a. **HCG detected (Positive Pregnancy test)**

b. **No HCG detected (Negative pregnancy test)**

c. **Lost to follow-up**

Use of frozen embryos

42. Date of thawing

Definition:

Thawing: **The process of raising the temperature from the storage temperature to room/physiological temperature (adapted from IG)**

Date of thawing**: date on which the frozen embryos are taken out of the storage and container**

43. Frozen Embryo Transfer protocol (FET)

a. **natural cycle (NC) - no medication**

b. **modified NC (only HcG trigger)**

c. **hormone replacement cycle (estrogen-progesterone)**

d. **stimulated cycle (stimulated with gonadotrophins, aromase inhibitors, SERMs)**

Definition:

Natural cycle: A **menstrual cycle without the use of any pharmacological compound.**

Modified NC: **A spontaneous menstrual cycle in which pharmacological compounds are administered with the sole purpose of inducing timed ovulation**

44. Luteal support in FET:

a. **None**

b. **hCG**

c. Progesterone
d. Combination

Definition:
Luteal support: **Hormonal supplementation in the luteal phase, usually progesterone.**

45. **Date of embryo transfer (link to OPU if available)**

46. **Number of cleavage stage embryos transferred.**

47. **Number of blastocysts transferred.**

48. **Embryo Transfer Outcome**
    a. **HCG detected (Positive Pregnancy test)**
    b. **No HCG detected (Negative pregnancy test)**
    c. **Lost to follow-up**

General

49. **Cause of no embryo transfer**
    a. **No embryos (failed fertilization/failed cleavage)**
    b. **No embryos (failed thawing)**
    c. **PGT**
    d. **Medical reason**
        - **OHSS risk**
        - **Infection**
        - **Intercurrent disease**
        - **other**
    e. **Non-medical reason**
        - **Religion**
        - **Legal issues**
        - **Other**
    f. **Autologous use (planned freeze all)**
    g. **Fertility preservation**

h. Donation
i. Other

Module 6 – Complications during pregnancy

To be completed if 41a and/or 48a

Definition Pregnancy: **A state of reproduction beginning with implantation of an embryo and ending with the complete expulsion and/or extraction of all products of implantation**

50. Complications

a. Yes
b. No
c. Unknown

Definition:

Complications of pregnancy include physical and mental conditions that affect the health of the pregnant or postpartum person, their baby, or both. Physical and mental conditions that can lead to complications may start before, during, or after pregnancy

51. Causes of complications

a. OHSS Severe (Grade III – IV or hospitalization for lesser grades)
b. Infection (Pelvic Inflammatory Disease - PID)
c. Bleeding requiring hospitalization, blood transfusion and/or surgery
d. Thrombosis

Within 6 weeks after delivery

e. Maternal Death, assumed to be linked to ART/IUI cycle

Within 6 weeks after delivery

f. Maternal Death, link with treatment cycle not established

Within 6 weeks after delivery??

g. Other

Definition:

OHSS: **To be reported: Grade 3, Abdominal distension and discomfort (grade 1) plus nausea, vomiting, and/or diarrhea, ovaries 5-12cm plus ultrasonic evidence of ascites (grade 3); Grade 4, Grade 3 + clinical evidence of ascites and/or hydrothorax or dyspnoea; Grade 5, All above plus haemoconcentration, coagulation abnormalities, diminished renal perfusion (EIM)**
Pelvic Inflammatory disease: **an infection of the female reproductive organs. It most often occurs when sexually transmitted bacteria spread from your vagina to your uterus, fallopian tubes or ovaries.**
Thrombosis: **A blood clot in the deep vein (also known as a deep vein thrombosis or DVT) is a medical condition that typically occurs in the lower leg, thigh, pelvis or arm. When a DVT is left untreated, a part of the clot can break off and travel to the lungs, causing a blockage called a pulmonary embolism (PE).**

Module 7 – Pregnancy and outcome

To be completed if 41a and/or 48a

52. Number of intra-uterine gestational sacs on ultrasound scan

Definition:
***Clinical pregnancy*: A pregnancy diagnosed by ultrasonographic visualization of one or more gestational sacs or definitive clinical signs of pregnancy. In addition to intra-uterine pregnancy, it includes a clinically documented ectopic pregnancy**
Gestational sac: **A fluid-filled structure associated with early pregnancy, which may be located inside or, in the case of an ectopic pregnancy, outside the uterus.**

53. Details of twin pregnancy

a. **Monoamniotic**
b. **Diamniotic**

a. **Monochorionic**

b. **Dichorionic**

Definition:

***Monoamniotic*: occur when a single fertilized ovum (egg) results in identical twins that share a common placenta and amniotic sac.**

***Diamniotic*: twin pregnancy with two distinct amniotic cavities.**

***Monochronic*: a form of multiple gestation in which each twin shares a placenta but has its own amniotic sac**

***Dichronic*: a form of multiple gestation in which each twin has a separate placenta and amniotic sac**

54. Fetal reductions

a. **Yes**

b. **No**

Definition:

a first-trimester or early second-trimester procedure for reducing the total number of fetuses in a multifetal pregnancy.

55. Clinical pregnancy outcome

a. **Delivery after 22 weeks**

b. **Ectopic pregnancy**

c. **First-trimester miscarriage**

d. **Second-trimester miscarriage**

e. **Induced abortion**

Reason?

f. **Molar pregnancy**

g. **Loss of follow-up**

Definition:

***Ectopic pregnancy*: A pregnancy outside the uterine cavity, diagnosed by ultrasound, surgical visualization or histopathology. (IG)**

***Miscarriage:* the spontaneous or unplanned expulsion of a fetus from the womb before it can survive independently.**

Induced abortion: **Intentional loss of an intrauterine pregnancy, through intervention by medical, surgical or unspecified means. (**
Molar pregnancy: uncommon abnormal type of pregnancy **in which a non-viable fertilized egg implants in the uterus**
Loss of follow-up: **refers to pregnant patients who at one point in time were actively followed, but have become lost at the point of follow-up of the pregnancy.**

56. Date of delivery

Definition:
Delivery**: The complete expulsion or extraction from a woman of one or more fetuses, after at least 22 completed weeks of gestational age, irrespective of whether they are live births or stillbirths. A delivery of either a single or multiple newborn is considered as one delivery. If more than one newborn is delivered, it is often recognized as a delivery with multiple births**
Date of delivery**: date on which the child(ren) is/are born**

57. N of children born

58. Number of stillbirths

Definition:
Stillbirth: **The death of a fetus prior to the complete expulsion or extraction from its mother after 22 completed weeks of gestational age. The death is determined by the fact that, after such separation, the fetus does not breathe or show any other evidence of life, such as heartbeat, umbilical cord pulsation, or definite movement of voluntary muscles. Note: It includes deaths occurring during labor**

Liveborn Child 1

59. Sex

a. ***Male***
b. ***Female***
c. **Unknown or undetermined**

60. Birth weight

Definition:
Weight of the newborn at birth

61. Neonatal outcome

a. **Routine postnatal care**

b. **Admission to neonatal special care unit**

Definition:
Neonatal: **The period which commences at birth and ends at 28 completed days after birth.**

62. Neonatal malformations

a. Yes

b. No

c. Unknown

Definition:
Alterations in the structure and function of the organ systems of a newborn that occurs in intrauterine life and is identified before, at, or later after birth.
All birth defects according to ICD 10 Q codes are reported by the IVF units. Later, be sorted centrally for major and minor birth defects.
See : European Concerted Action on Congenital Anomalies and Twins (EUROCAT) (https://eu-rd-platform.jrc.ec.europa.eu/eurocat/data-collection/guidelines-for-data-registration_en) for classification in major and minor.

Questions on children for every liveborn child
Child 2
Child 3

Module 8 - IUI

Parameters 3/4/5/6/7/8/9/10/13/22/24/25/

- **Indications (10) but without POI, surrogacy cases, PGT, tubal pathology**

- **If 25 = IUI**

  ⇨ **New questions**

- **Was IUI cancelled:**

  a. **Yes**

  b. **No**

If yes: reason

If no: outcome

- **HCG detected (Positive Pregnancy test)**
- **No HCG detected (Negative pregnancy test)**
- **Lost to follow-up**

Link to complications and pregnancy

Module 9 – Fertility preservation

63. Method of fertility preservation:

a. **Pre-pubertal ovarian tissue collection and cryopreservation**

b. **Post-pubertal ovarian tissue collection and cryopreservation**

c. **Oocyte cryopreservation**

d. **Pre-pubertal testicular tissue collection and cryopreservation**

e. **Post-pubertal testicular tissue collection and cryopreservation**

f. **Ejaculated sperm collection and cryopreservation**

g. **Epididymal/testicular sperm collection and cryopreservation**

64. Reason for fertility preservation

a. **Medical**

2. **Oncology**

3. **Benign medical conditions (eg endometriosis, benign haematological disorders in children,..)**
4. **Gender reassignment**
5. **Differences in Sex Development (DSD)**
6. **Surgical risk for later infertility**

b. **Non-medical**

1. **Prior to vasectomy**
2. **Personal patient linked reason (planned egg banking, social sperm freezing,...)**

Definition:

***Fertility preservation*: Various interventions, procedures and technologies, including cryopreservation of gametes, embryos or ovarian and testicular tissue to preserve reproductive capacity.**

***Gender reassignment:* the process (typically involving a combination of surgical procedures and hormone treatment) undertaken by a transgender person to alter their physical sexual characteristics to match their gender identity.**

***DSD*: is a group of rare conditions involving genes, hormones and reproductive organs, including genitals. It means a person's sex development is different to most other people's.**

Freeze-all cycles

- ICMART definition for freeze-all: An ART cycle in which, after oocyte aspiration, all oocytes and/or embryos are cryopreserved and no oocytes and/or embryos are transferred to a woman in that cycle.

- For reporting, it may make more sense to report the deliveries per first ET (fresh or frozen) – as this will discriminate between couples with only one embryo going for fresh transfer, and better prognosis patients that will have several frozen cycles.

1

Part 2: Parameters to be derived from the register

Parameter	Definition
# of treated individuals	# of individual persons that had at least one treatment cycle intervention (IUI, IVF/ICSI and/or FET) completed
Age of the individual	Date of start cycle minus date of birth
# of couples that had at least one treatment cycle intervention (IUI, IVF/ICSI and/or FET) completed	# of couples that had at least one treatment cycle intervention (IUI, IVF/ICSI and/or FET) completed
# of treatment cycles without stimulation	# of cycles without ovarian stimulation (includes hormone substituted cycles) that ended up with one of the interventions
# of treatment cycles with stimulation (subdivided IVF/ICSI/ED/IUI/FERTIL PRESERV)	# of cycles with ovarian stimulation (excludes hormone substituted cycles) that ended up with one of the interventions
# of oocyte retrievals (subdivided)	# of retrieval procedures where at least one oocyte was retrieved
# of oocytes retrieved (subdivided)	# of oocytes retrieved in total
# of oocytes cryopreserved (subdivided)	# oocytes cryopreserved in total
# of embryos cryopreserved	# of embryos
# of cleavage stage embryos cryopreserved	# of embryos
# of blastocysts cryopreserved	# of embryos
# of embryo transfers (fresh or cryo)	# of procedures, regardless of the number of embryos transferred
# of single embryo transfers (fresh or cryo)	# of procedures, with only one embryo transferred

# of double embryo transfers (fresh or cryo)	# of procedures, with two embryo transferred
# of deliveries	# of deliveries regardless of the number of children born (including stillborn)
# of live born children	# of infants with any vital signs
Distribution fresh embryo transfers/FET	# of fresh cycles x100/ Total fresh +FET cycles or # of FET cycles x100/ Total fresh +FET cycles
Distribution IVF/ICSI	# of IVF cycles x100/ Total IVF+ICSI cycles or # of ICSI cycles x100/ Total IVF+ICSI cycles
ART infants per national births	# of children born from ART x100/total number of children born in a specific country
Size of the clinics	# of treatment cycles performed in one year
Cycles per million inhabitants	# treatment cycles/million inhabitants in a specific country
Cycles per million females of reproductive age	# treatment cycles/million females of reproductive age (15-45 years) in a specific country
Cycle cancellation rate (before OPU) (%CCR)	Nr of cycles cancelled before OPU × 100 / Nr of started cycles
Rate of cycles with moderate/severe OHSS (% OHSS)	Nr of cycles with moderate to severe OHSS × 100 / Nr of started cycles
Complication rate after OPU other than OHSS (%CoOPU)	Nr of complications (any) that require an (additional) medical intervention or hospital admission (apart from OHSS) × 100 / Nr of OPUs performed
Clinical pregnancy rate (%CPR) (Per transfer + subdivided per treatment)	Nr of pregnancies (diagnosed by ultrasonographic visualization of one or more gestational sacs or definitive clinical signs of pregnancy) × 100 / Nr of embryo transfer cycles

Clinical pregnancy rates per transfer (per age category) (subdivided)	Nr of pregnancies (diagnosed by ultrasonographic visualization of one or more gestational sacs or definitive clinical signs of pregnancy) × 100 / Nr of embryo transfer cycles per age category
Multiple pregnancy rate (%MPR) (proportion twin-triplet? + subdivided)	Nr of pregnancies with more than one embryo or foetus × 100 / Nr of pregnancies
Delivery rate (per transfer) % (and per aspiration? + subdivided)	Nr of deliveries × 100 / Nr of transfers
Delivery rate per age category (subdivided)	Nr of deliveries in specific age group × 100 / Nr of transfers in the same age group
Multiple delivery rate (%MDR) (proportion of all + subdivided by number of fetuses)	Nr of deliveries with more than one foetus × 100 / Nr of deliveries
Cumulative pregnancy rate	The number of oocyte retrievals resulting in at least 1 clinical pregnancy within 1 year of the oocyte retrieval cycle divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.
Cumulative delivery rate	The cumulative delivery rate (CDR) per initiated/aspiration cycle after the transfer of all fresh and frozen–thawed/warmed embryos has been suggested to be the critical endpoint that sets these groups apart
Term of the pregnancy at birth : a. at term b. preterm < 37 weeks c. very preterm < 28 weeks	Number of weeks since the day of OPU/FET/IUI plus 2.

2

3

Annex 2: Professionals survey questions

Questions for professionals in MAR centres requesting IRCCs through an API

BACKGROUND INFORMATION

1. Country
2. Name of your clinic
3. Position
    a. Embryologist / Lab technician
    b. Nurse / Midwife
    c. Gynaecologist / Obstetrician
    d. Psychologist
    e. Administrative
    f. Other

USER EXPERIENCE

4. How satisfied were you with the information that was provided to you prior to the pilot study? Very satisfied – satisfied – neutral – not satisfied – not at all satisfied – I did not use this resource
    a. Webinar
    b. Written instructions (manual)
    c. Video tutorials
5. Would you have liked to receive any other support or information in preparation for the pilot study?
    a. [Free text box] Yes (Please specify)
    b. No
6. How often did you do tasks related to the EuMAR pilot study?
    a. Daily
    b. Weekly
    c. Less frequently than weekly
7. In how far do you agree with the following statements? Completely agree – Agree – Neutral – Disagree – Completely disagree – Not applicable

a. It was easy to identify the patients that met the inclusion criteria for the pilot study.

b. It was easy to send data to the EuMAR registry (only applicable if your clinic sent data to EuMAR directly).

c. It was easy to request an IRCC code.

8. *Did you experience any difficulties during the pilot study?

   a. Yes

   b. No

      i. [If yes] What were the main issues you experienced? [Select all that apply]

         1. Difficulties with login
         2. Lost, duplicated or accidentally created IRCCs
         3. Uncertainty about which patients required IRCCs
         4. Uncertainty about IRCC requests for transgender patients
         5. Difficulties following recommended timeframe to request IRCCs
         6. (If submitting data manually) Issues with understanding the parameters
         7. (If submitting data manually) Issues with recording the parameters
         8. [Free text box] Other (please, specify)

      ii. [If yes] How helpful was the helpdesk in resolving any difficulties that you have encountered during the pilot study? Very helpful – helpful – not very helpful – not at all helpful

PATIENT COMMUNICATION

9. *Did you talk to patients about the EuMAR pilot study?

   a. Yes

   b. No

i. * [If yes] Did you feel sufficiently prepared to inform patients about the EuMAR pilot study?

1. Yes
2. No

a. [If no] What would have helped you to inform patients about the EuMAR pilot study?

i. [Free text box]

10. Did you encounter any specific difficulties when talking to patients about the EuMAR pilot study?

a. [Free text box] Yes (Please, specify)

b. No

USE OF PATIENT CODES

11. *Did any patients request a ClinicSwitch code from you during the pilot study?

a. Yes

b. No

i. * [If yes] Were you able to request the ClinicSwitch code and provide it to the patient?

1. Yes
2. No

a. [If yes] How far do you agree with the following statements: Completely agree – Agree – Neutral – Disagree – Completely disagree

i. It was easy to request the ClinicSwitch code.

ii. The ClinicSwitch code did not create a significant burden in my daily work.

b. [If yes] Did you encounter any specific difficulties with requesting the ClinicSwitch code?

i. Yes (please, specify) [Free text box]
ii. No

c. [If no] Would you know how to request a ClinicSwitch code if a patient asked you for it?

i. Yes

ii. No

12. Do you routinely ask patients whether they have previously had treatment at a different clinic(s)?

a. Yes

b. No

13. *Did you treat a patient who had previously been treated in another EuMAR pilot clinic during the pilot study period?

a. Yes

b. No

c. I don't know

i. [If yes] Did you ask the patient for a ClinicSwitch code?

1. Yes

2. No

ii. * [If yes] Did the patient provide you with a ClinicSwitch code?

1. Yes

2. No

a. * [If yes] Were you able to scan the ClinicSwitch code and receive an IRCC?

i. Yes

ii. No

b. *[If yes] Did you encounter any difficulties with scanning the ClinicSwitch code and receiving an IRCC?

a. Yes (please, specify) [Free text box]
b. No

iii. [If no] If you had received patients who had previously been treated in another EuMAR pilot clinic during the pilot study, would you have asked them for a ClinicSwitch code?

1. Yes
2. No

iv. [If no] If a patient had come with a ClinicSwitch code, would you have known what to do with it?

1. Yes
2. No

BENEFITS & SATISFACTION

1. Overall, how satisfied are you with your experience in the pilot study? [Likert scale]
2. Would you find it useful to access EuMAR KPI and benchmark data for your clinic?
   a. Yes
   b. No
3. What type of KPI and benchmark data from your clinic would you find interesting to access? [Select all that apply]
   a. Average of baseline characteristics (age of patient; number of fresh/frozen IVF/ICSI…)
   b. Average of clinical KPIs (incidence of OHSS; complication rate after OPU…)
   c. Average of lab KPIs (IVF/ICSI normal fertilisation rate; cleavage rate; implantation rate…)
   d. [Free text box] Other (please specify)

4. Would you like to have national and EU averages of these KPIs?
    a. I would like to have only national averages
    b. I would like to have only EU averages
    c. I would like to have both, national and EU averages
5. Would you find it useful to receive a standardised report from patients who have previously been treated at another clinic?
    a. Yes
    b. No
6. In how far do you agree with the following statements? Completely agree – Agree – Neutral – Disagree – Completely disagree
    a. The EuMAR pilot study did not create a significant burden in my daily work.
    b. The EuMAR data collection could be well integrated into the daily practice in my clinic.
    c. The EuMAR registry could bring improvements to patient care in my clinic.
    d. I would be willing to participate in the EuMAR registry in the long term beyond the pilot study.
7. What specific benefits do you think the EuMAR Registry can bring? [Select all that apply]
    a. Monitoring of trends and treatment outcomes in MAR
    b. Collection and calculation of cumulative outcome parameters
    c. Harmonised data from different EU countries
    d. Inter-institutional and cross-border data collection
    e. Quality assurance and benchmarking in fertility clinics
    f. Data for Open Science
    g. [Free text box] Other (please specify)

8. What would motivate you to continue contributing to the EuMAR Registry? [Select all that apply]
    a. Individual professional recognition
    b. Statistics and KPIs for my clinic
    c. Public recognition for my clinic
    d. Improved patient care
    e. Having an easy and automatised technical solution to submit data
    f. Being part of an international project with other MAR professionals

TELL US MORE

9. Do you have any suggestions for improving the EuMAR data collection system?
    a. [Free text box]
10. Would you like to participate in an online interview to discuss your experience in the EuMAR pilot study and help us improve the EuMAR data collection system? If yes, please leave your name and email address here:
    a. [Free text box]

Questions for professionals in MAR centres requesting IRCCs manually

BACKGROUND INFORMATION

14. Country
15. Name of your clinic
16. Position
    a. Embryologist / Lab technician
    b. Nurse / Midwife
    c. Gynaecologist / Obstetrician
    d. Psychologist
    e. Administrative
    f. Other

USER EXPERIENCE

17. How satisfied were you with the information that was provided to you prior to the pilot study? Very satisfied – satisfied – neutral – not satisfied – not at all satisfied – I did not use this resource
    a. Webinar
    b. Written instructions (manual)
    c. Video tutorials
18. Would you have liked to receive any other support or information in preparation for the pilot study?
    a. [Free text box] Yes (Please specify)
    b. No
19. How frequently did you interact with the EuMAR Registry during the pilot study?
    a. Daily
    b. Weekly
    c. Less frequently than weekly
20. In how far do you agree with the following statements? Completely agree – Agree – Neutral – Disagree – Completely disagree – Not applicable
    a. The database was intuitive to navigate and easy to use
    b. The database was fast when entering information

c. It was easy to identify the patients that met the inclusion criteria for the pilot study.

d. It was easy to send data to the EuMAR registry (only applicable if your clinic sent data to EuMAR directly).

e. It was easy to request an IRCC code.

21. *Did you experience any difficulties during the pilot study?

a. Yes

b. No

i. [If yes] What were the main issues you experienced? [Select all that apply]

1. Difficulties with login
2. Lost, duplicated or accidentally created IRCCs
3. Uncertainty about which patients required IRCCs
4. Uncertainty about IRCC requests for transgender patients
5. Difficulties following recommended timeframe to request IRCCs
6. (If submitting data manually) Issues with understanding the parameters
7. (If submitting data manually) Issues with recording the parameters
8. [Free text box] Other (please, specify)

ii. [If yes] How helpful was the helpdesk in resolving any difficulties that you have encountered during the pilot study? Very helpful – helpful – not very helpful – not at all helpful

PATIENT COMMUNICATION

22. *Did you talk to patients about the EuMAR pilot study?

a. Yes

b. No

i. * [If yes] Did you feel sufficiently prepared to inform patients about the EuMAR pilot study?

1. Yes
2. No

a. [If no] What would have helped you to inform patients about the EuMAR pilot study?

i. [Free text box]

23. Did you encounter any specific difficulties when talking to patients about the EuMAR pilot study?

a. [Free text box] Yes (Please, specify)

b. No

USE OF PATIENT CODES

24. *Did any patients request a ClinicSwitch code from you during the pilot study?

a. Yes

b. No

i. * [If yes] Were you able to request the ClinicSwitch code and provide it to the patient?

1. Yes
2. No

a. [If yes] How far do you agree with the following statements: Completely agree – Agree – Neutral – Disagree – Completely disagree

i. It was easy to request the ClinicSwitch code.

ii. The ClinicSwitch code did not create a significant burden in my daily work.

b. [If yes] Did you encounter any specific difficulties with requesting the ClinicSwitch code?

i. Yes (please, specify) [Free text box]
ii. No

c. [If no] Would you know how to request a ClinicSwitch code if a patient asked you for it?

i. Yes

ii. No

25. Do you routinely ask patients whether they have previously had treatment at a different clinic(s)?

a. Yes

b. No

26. *Did you treat a patient who had previously been treated in another EuMAR pilot clinic during the pilot study period?

a. Yes

b. No

c. I don't know

i. [If yes] Did you ask the patient for a ClinicSwitch code?

1. Yes

2. No

ii. * [If yes] Did the patient provide you with a ClinicSwitch code?

1. Yes

2. No

a. * [If yes] Were you able to scan the ClinicSwitch code and receive an IRCC?

i. Yes

ii. No

b. *[If yes] Did you encounter any difficulties with scanning the ClinicSwitch code and receiving an IRCC?

a. Yes (please, specify) [Free text box]
b. No

iii. [If no] If you had received patients who had previously been treated in another EuMAR pilot clinic during the pilot study, would you have asked them for a ClinicSwitch code?

1. Yes
2. No

iv. [If no] If a patient had come with a ClinicSwitch code, would you have known what to do with it?

1. Yes
2. No

BENEFITS & SATISFACTION

11. Overall, how satisfied are you with your experience in the pilot study? [Likert scale]
12. Would you find it useful to access EuMAR KPI and benchmark data for your clinic?
    a. Yes
    b. No
13. What type of KPI and benchmark data from your clinic would you find interesting to access? [Select all that apply]
    a. Average of baseline characteristics (age of patient; number of fresh/frozen IVF/ICSI…)
    b. Average of clinical KPIs (incidence of OHSS; complication rate after OPU…)
    c. Average of lab KPIs (IVF/ICSI normal fertilisation rate; cleavage rate; implantation rate…)
    d. [Free text box] Other (please specify)

14. Would you like to have national and EU averages of these KPIs?
    a. I would like to have only national averages
    b. I would like to have only EU averages
    c. I would like to have both, national and EU averages
15. Would you find it useful to receive a standardised report from patients who have previously been treated at another clinic?
    a. Yes
    b. No
16. In how far do you agree with the following statements? Completely agree – Agree – Neutral – Disagree – Completely disagree
    a. The EuMAR pilot study did not create a significant burden in my daily work.
    b. The EuMAR data collection could be well integrated into the daily practice in my clinic.
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    c. Harmonised data from different EU countries
    d. Inter-institutional and cross-border data collection
    e. Quality assurance and benchmarking in fertility clinics
    f. Data for Open Science
    g. [Free text box] Other (please specify)

18. What would motivate you to continue contributing to the EuMAR Registry? [Select all that apply]
    a. Individual professional recognition
    b. Statistics and KPIs for my clinic
    c. Public recognition for my clinic
    d. Improved patient care
    e. Having an easy and automatised technical solution to submit data
    f. Being part of an international project with other MAR professionals

TELL US MORE

19. Do you have any suggestions for improving the EuMAR data collection system?
    a. [Free text box]
20. Would you like to participate in an online interview to discuss your experience in the EuMAR pilot study and help us improve the EuMAR data collection system? If yes, please leave your name and email address here:
    a. [Free text box]