COVID-RED

innovative medicines initiative

101005177 — COVID-RED

COVID-RED

WP7 – Project management, coordination, and sustainability

D7.4 First biannual report

Period covered by the report: from 1 July 2020 to 30 April 2021

Lead contributor	1 UMCU
Other contributors	2 – Ava AG 3 – Julius Clinical 4 – University College London 5 – VIVE 6 – Stichting Sanquin Bloedvoorziening 7 – Takeda Pharmaceuticals International AG 8 – Roche Diagnostics Nederland 9 – Labormedizinosches Zentrum Dr. Risch Ostschweiz AG

Document History

Version	Date	Description
V1.0	17 May 2021	First version
V1.1	07 July 2021	Final version

Contents

1. Explanation of the work carried out by the beneficiaries and Overview of the progress

1.1 Objectives

In this project, we will evaluate the use and performance of a CE-marked device (wearable), which uses sensors to measure breathing rate, pulse rate, skin temperature, and heart rate variability for the purpose of early detection and monitoring of COVID-19 in general and high-risk populations. At the same time, a mobile application will be used to track participant-reported symptoms. A prospective, observational study will follow 13,000 individuals from the general population and 7,000 high-risk individuals wearing the device and responding to participant self- report parameters via a purpose-designed app. Based on this data, an algorithm will indicate which individuals likely require general practitioner (GP) care (for COVID-19 diagnostic testing, further vital signs assessment, and/or treatment) and/or hospital care.

To evaluate algorithm performance, the cohort will be tested for COVID-19 antibodies at the end of follow-up, with stored baseline samples of participants who have tested positive also being tested to determine whether the participant was already positive at baseline or was exposed to SARS-CoV-2 during follow-up. COVID-19 seropositivity in the intervention cohort will be compared to seropositivity in a control population of 10,000 individuals drawn from the same populations using an application only.

Thus, this project will deliver a large body of information on COVID19 PCR testing and antibodies that can be used to develop additional diagnostics and therapeutics in addition to validating remote vital signs and self-reported symptoms monitoring systems.

The COVID-RED consortium has summarized in the below table the main outputs produced in the first period to achieve the project's objectives. Those outputs are further detailed in section 1.2 of this report.

Progress towards COVID-RED project objectives
1. To assess the diagnostic and prognostic value of monitoring vital signs (such as breathing rate, pulse rate, skin temperature, and heart rate variability) by bracelet in users at home (for early COVID-19 case identification)
Realisations: • Feasibility study (D3.2) has been completed based upon collaboration with COVI-GAPP. A formal report has been drafted and is under review. • Within the main COVDI-RED study, the wearable bracelet has now been deployed to 17,824 study participants. • The vital signs monitored by this bracelet are, in combination with a self-completed symptom diary, being used to generate predictive algorithms for COVID-19 case identification as the study transitions from participant recruitment to long-term monitoring.
2. To monitor individuals after the diagnosis to detect deterioration and that are under medical supervision (for early identification of COVID-19 patients requiring mechanical ventilation and/or intensive care) (WP 1)
Realisations: • D1.1 Functional and validated real-live monitoring device tailored to COVID- RED • D1.2 Functional and tested novel app to collect biophysical data and patient reported outcomes for the detection of early signs of CO. • D1.3 Functional and tested novel App improved. • D1.4 Algorithm to generate signals (1st) • D1.7 Updated data capture and transmission strategies.

3. To study the added value of these remotely measured vital signs to the patient reported outcomes (WP3)
Realisations: • 17,824 participants randomized at enrolment closure. • D3.1 study protocol • D3.3 Study subject approvals package
4. To assess on the economic and clinical effects of monitoring vital signs for the early detection of COVID19 and in the detection of deterioration after the diagnosis (WP4)
Realisations: • N/A yet
5. To generate a large database on vital signs and symptoms over time, and health care usage, that can be linked to COVID-19 antibody presence (as a marker of past COVID-19 infection) at the end of the data collection period (WP2)
Realisations: • D2.1 Testing protocols + appendixes.
6. To deliver large open-source databases that are GDPR compliant (WP5)
Realisations: • InApp Daily Symptom Diary List of question developed. • App Onboarding questions list developed. • D5.1 Full data management plan (1st iteration) • D5.2 Full data management plan (2nd iteration v1) • D5.3 Data management plan (3rd iteration v1) • D5.5 Deploy technology infrastructure components I, II and III • D5.6 Deploy tech infrastructure component IV • D5.7 Initial CRF development completed.
7. To partner with stakeholders and other related projects to create a network and maximize project impact (WP6)
Realisations: • D6.2 Project website, templates, and social media tools
8. To ensure the efficient & effective management of the consortium and sustainability of results, incompliance with the Grant Agreement and Consortium Agreement. (WP7)
Realisations: • D7.1 Project Handbook • D7.2 Contact Database • D7.3 Detailed project plans plus tracking tools, to be maintained throughout the life of the project. • D7.10 Report describing internal and external communication outputs. • D7.11 Tendering procedure description

1.2 Explanation of the work carried per work package.

1.2.1 Work package 1 Technology & algorithm development and maintenance

Objectives

The aim of WP1 is to tailor an existing remote monitoring infrastructure (the Ava bracelet, app, data analysis, computer algorithms, and APIs) from its original (pre-project) application to the application of COVID-19 remote monitoring. To address this aim, we have devised the below sub-objectives.

Sub-objectives:

- Modify the Ava monitoring device output and data analysis process for detection of changes in physiological parameters that could be indicative of a COVID-19 infection.
- Develop a novel app (Ava COVID-RED) based off Ava's existing architecture that gathers baseline data, clinical symptoms, biophysical parameters and potential exposure status that

then transfers this raw data to a backend server for pre-processing and sends algo-derived testing recommendations back to the user in real-time.
- Build a machine learning algorithm based on data from the wearable device, clinical symptoms and risk class to adjudicate participants to testing for SARS-CoV-2.
- Build and maintain a GDPR-compliant infrastructure for extracting, cleaning, storing, analysing and transferring data from deployed measurement technologies in conjunction with WP5.

Work carried out in this period towards the achievement of these objectives (referring to tasks, milestones and deliverables as mentioned in the DoA)

Task-by-task updates:

1.1 Extending the functionality of technology and software of an existing remote monitoring wearable device to the specific situation of COVID-19

The Ava device was repurposed for capturing general infection and potentially COVID 19-specific changes in temperature, breathing rate, pulse rate, heart rate variability (HRV), perfusion, and/or sleep quality and quantity. These physiological parameters were used to create a machine learning algorithm (v1) designed to aid in the detection of early signs of COVID-19 infection (see Task 1.3).

While the hardware of the device itself was not modified as a result of WP1, Task 1.1 extended and altered the functionality of the current Ava app specifically for the purposes of the COVID-RED project. Currently, a pre-study trial in Liechtenstein (n=2,000) is underway to validate the Ava bracelet's ability to register biophysical changes indicative of COVID-19 infection. The pre-study required users to log their symptoms and sync the wearable device through Ava's existing fertility tracking app, which can be freely downloaded from mobile App/Play stores. Prior to first use, the app requires user registration, background demographic details, and login information. In M1-M6 of WP1, Ava's team of software engineers, UX designers, and data scientists adapted the existing user interface (UI) and application programming interface (API) to display changes in the key physiological parameters of interest that may signal a COVID-19 infection. Whereas the current Ava app allows users to log menstrual symptoms like abdominal cramping, the COVID-19 iteration allows COVID-RED participants to report the presence and severity of illness symptoms on a daily basis. Potential logging options in the updated app now include dry cough, fatigue, chills, aches, nasal congestion, sore throat, diarrhoea, and/or loss of taste and smell. Additionally, COVID-RED participants can record potential confounds that may interfere with biophysical data measured by the Ava bracelet (e.g., taking anti-febrile medication or drinking alcohol) in the updated app. Development of the iOS and Android versions of the COVID-RED app will occurred in parallel. The novel app (Ava COVID-RED) was submitted to the Google play and Apple mobile stores for approval in December 2020 (M6); final approval was granted and the app became available for download February 4, 2021 (M8).

1.2 Maximize novel app's clinical research potential and alignment with other WP objectives.

Task 1.2 ensured that the design and features specified in novel Ava COVID-RED app align with the objectives of the other work packages. WP5, for example, aims to develop a questionnaire to capture individual subject signs and log symptoms longitudinally; accordingly, WP1 worked closely with WP5 to ensure efficient allocations of resources and minimize potential redundancies in trial design and survey responses. Similarly, coordination between members involved in WP1 and WP2 helped determine whether a self-report log of antibody or PCR tests in-app made sense; ultimately, the collaboration led WP1 to include self-report PCR logs in-app while removing the logging of antibody test results (which will be objectively verified by WP2's seroprevalence analysis).

1.3 Developing machine-learning algorithm

Simultaneous to the Ava COVID-RED app's development, Ava's data science and machine learning Subject Matter Experts (SME) developed a novel algorithm to detect early signs of COVID-19

infection. Version 1 (v1) takes a user's nightly and past physiological parameters recorded by the Ava bracelet along with their self-reported data to return a signal determining whether the user has early signs of COVID-19 and should be contacted for medical follow-up (see Figure 3.4. At a later stage, signals generated in the study could also form the basis for prophylactic treatment.

The algorithm development will continue across the course of the COVID-RED study, refined and retrained on data collected during the Learning Phase, Phase 1 and Phase 2. The initial iteration of the algorithm (v1) was trained on data from the Liechtenstein pre-study (n=1,186) currently underway; only data collected through January 2021 was included in the training and validation datasets. Through data exploration, feature selection and model specification, Ava's data science team trained a novel COVID-19 detection algorithm ingesting temperature and breathing rate together with self-reported symptoms to generate potential alarms about the existence of an infection. The algorithm included a state-of-the-art recurrent neural network based on Long Short-Term Memory units that leverages time series data to detect deviations in physiological parameters compared each participant's healthy baseline. The model performance of COVID-19 infection detection measured on the holdout test dataset gave a precision of 0.54, recall of 0.68, and F-score of 0.61. The algorithm was deployed to Ava's backend infrastructure and integrated to the COVID-RED app's API prior to the study's start. The second iteration of the algorithm (v2) will be based on data collected during the COVID-RED trial and is planned for release in September 2021, at the start of Phase 2.

1.4 Creating the necessary data infrastructure for data extraction and analysis

In order to make sure that the data generated by the Ava bracelet and the Ava COVID-RED app can be included in the data platform in WP4, we reviewed, analysed and adjusted Ava's data generating mechanisms. Ava's internal database from its current fertility app user base was duplicated and customized for the COVID-RED clinical trial in M1-M6, thereby fulfilling the set-up requirements of Task 1.4. Data collection and storage began in M8, upon enrolment of the first participant in the COVID-RED clinical trial. Following the first transfer of serology and PCR data from the pre-study in Liechtenstein, data analysis started in M6 and contributed towards v1 of the COVID-RED algorithm. Reporting has been ongoing since M1, with communication between WP1, other WPs and the COVID-RED management board necessary to ensure the app and bracelet's compatibility with COVID-RED's primary and secondary research objectives.

Deliverable-by-deliverable updates:
D1.1: Functional and validated real-live monitoring device tailored to COVID-RED for tracking changes in physiological parameters associated with early signs of infection – Completed.
D1.2: Functional and tested novel app to collect biophysical data and patient reported outcomes for the detection of early signs of COVID-19 infection (1st iteration) – Completed.
D1.3: Functional and tested novel app to collect biophysical data and patient reported outcomes for the detection of early signs of COVID-19 infection (improved version) – Completed.
D1.4: Algorithm to generate signals on patients to be tested for SARS-CoV-2 – Completed.
D1.5: Algorithm to generate signals on patients to be tested for SARS-CoV-2 (improved version) – Planned, will be completed in September 2021
D1.6: Algorithm to generate signals on patients to be tested for SARS-CoV-2 (final version) – Planned to begin after the end of data collection (December 2021)
D1.7: Updated data capture and transmission strategies – Completed.

<u>Significant exploitable results delivered during this period (if any)</u>
No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T1.1, T1.2, T1.3, D1.1, D1.2, D1.3, D1.4, D1.7
Ava	T1.1, T1.2, T1.3, T1.4, D1.1, D1.2, D1.3, D1.4, D1.7

Julius Clinical	T1.1, T1.2, T1.3, T1.4, D1.1, D1.2, D1.3, D1.4, D1.7
Takeda	T1.1, T1.3, T1.4, D1.1, D.2, D1.3, D1.4, D1.7
Roche	-
LMZ Dr. Risch	D1.2, D1.3, D1.4, D1.7

1.2.2 Work package 2 Testing procedure and implementation

Objectives

The following objectives have been identified as part of the WP2:

- Develop protocols and procedures for study participant testing in the cohort study.
- Test study participants who have a positive signal using the algorithm developed in WP1 for SARS-CoV-2 virus.
- Test all study participants for SARS-CoV-2-specific antibodies at the end of their follow-up period, and if positive, also test their stored baseline samples.
- Collect information on positive cases and their clinical follow-up.

Work carried out in this period towards the achievement of these objectives (referring to tasks, milestones and deliverables as mentioned in the DoA)

Task-by-task updates:

2.1 Develop protocols and procedures for testing and for follow-up of positive cases –
Procedures for serological sampling and evaluation for SARS-CoV-2 antibodies have been established and participant samples are being collected and evaluated. Procedures for sampling and evaluation for SARS-CoV-2 infections using PCR and antigen testing has also been stablished and is currently on the way.

2.2 Testing study participants for SARS-CoV-2 virus
As of June 23, 2021, 556 participants that have received a positive signal from the App and that have been unable to be tested using the government test centres have also received a test kit and Sanquin has received and reported the results for 396 of them.

2.3 Testing study participants for SARS-CoV-2 antibodies
To this date 11,906 LP and 13,348 baseline serological samples have been received of which 6,358 have been tested at Sanquin

Deliverable-by-deliverable updates:
D2.1: Testing protocols – Completed.
D2.2: Interim report on testing results – Delayed, due to delayed start of recruitment.
D2.3: Final report on testing results – Delayed, due to delayed start of recruitment.

Significant exploitable results delivered during this period (if any)

- No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T2.1, D2.1, D2.2
Sanquin	T2.1, T2.2, T2.3 D2.1, D2.2
Roche	T2.1, T2.3, D2.1, D2.2
LMZ Dr. Risch	T2.1, D2.1, D2.2

+ Risch services	
Julius Clinical	T2.1, D2.1, D2.2

1.2.3 Work package 3 Study design, execution and analysis

Objectives
The objective of WP3 is to evaluate the ability of the Ava Bracelet when coupled with a signs and symptoms diary to detect early indicators of COVID-19 infections accurately and reliably enough to be used to make early triage recommendations regarding need for further testing and treatment. The following sub-objectives have been devised.
Sub-objectives:

- Develop study protocol for cohort study.
- Acquire relevant approvals (including feasibility of e-consent/data privacy issues).
- Analyse data from study and interpret results.
- Develop advice for further use of tested approach.
- Pilot testing.
- Full study execution including recruitment & retention of participants & monitoring the study for operational quality.

A protocol for COVID-RED was developed and approved by the ethics committee of the Universitair Medisch Centrum Utrecht (UMCU) on 27 January 2021. The design addressed key logistical constraints (e.g. informed consent regulations within decentralized trials, testing kits for COVID-19, number of devices available, and single-user limitation for the devices). Due to the introduction of COVID-19 vaccines into the Netherlands beginning in 2021, the protocol was amended to allow for vaccination prior to and during the trial. Additionally, the serology testing methods needed to be adjusted to ensure that infection could be detected distinctly from vaccination. Enrolment began on 19 February 2021 and was closed on 3 June 2021. The trial enrolled 17,824 participants of the target 20,000.

Planning for end-of-trial analyses is underway with the first draft of the statistical analysis plan provided on 21 May 2021. Further progress on the remaining objectives of work package 3 await the completion of the trial (estimated as December 2021).

Work carried out in this period towards the achievement of these objectives.

Task-by-task updates:
3.1 Protocol development – Completed.
3.2 Feasibility study – Feasibility study has been completed based upon collaboration with COVI-GAPP. Formal report has been drafted and is under review.
3.3 Execution of the cohort study – Recruitment began on 19 February 2021.with extensive public campaigns and closed on 3 June 2021.
3.4 Monitor the cohort study for operational quality – Monitoring plan was in place prior to recruitment with ongoing data review, help desk interactions, and follow-up for select participant clinical events.
3.5 Clinical Analysis of study results and future recommendations – Statistical analysis plan in development.
3.6 Develop advice for further use of tested approach – Not yet begun.

Deliverable-by-deliverable updates:
D3.1: Study protocol - Completed.
D3.2: Report on small feasibility study & proposed adaptations to the protocol to be made - Protocol has incorporated learnings from COVI-GAPP including practices for participant retention. Creation of formal report is finalized.
D3.3 Study subject approvals package - Completed.
D3.4 Midterm recruitment report – 17,824 of 20,000 participants recruited. A recruitment report is

being developed for this phase. As recruitment has been front-loaded as part of the cross-over trial design, further reporting on recruitment is no longer relevant.
D3.5 Report on final analysis of results - Not yet begun.
D3.6: Report on the status of posting results in the study registry - Not yet begun.
D3.7: Report on lessons learned to inform checklist creation - Not yet begun.

Significant exploitable results delivered during this period (if any)
No significant exploitable results at this stage of the trial, except for the protocol being accepted for publication.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T3.1, T3.2, T3.3, T3.4, T3.5, D3.1, D3.2, D3.3, D3.4
Ava	T3.1, T3.2, T3.3, T3.4, T3.5, D3.1, D3.2, D3.3
Julius Clinical	T3.1, T3.2, T3.3, T3.4, T3.5, D3.1, D3.2, D3.3, D3.4
Roche	T3.1, T3.2, T3.3, T3.5, D3.1, D3.2, D3.3

1.2.4 Work package 4 Health Economics Analysis

Objectives
The objective of WP4 is to explore the health economics of the AVA monitoring device for SARS-CoV-2 detection. This will include collection of data related to use of healthcare resources for both the AVA monitoring device and in the hospital system. Moreover, a cost-consequence analysis will be performed to relate the incremental costs to the clinical advantages of the AVA monitoring system.
Sub-objectives:

- To assess the costs of implementing and operating the AVA monitoring device.
- To assess the economic outcomes of the monitoring device.
- To assess the monitoring device using a cost-consequence analysis.

Work carried out in this period towards the achievement of these objectives (referring to tasks, milestones and deliverables as mentioned in the DoA)

Task-by-task updates:
4.1 Determining the intervention costs – Intervention costs have been identified through communications with members of WP1, WP2 and WP3. The intervention costs are being registered and accumulated by AVA and Julius Clinical so that they are ready for analysis when the intervention is finalised.
4.2 Assessing the economic outcomes – The economic outcomes have been identified through communications with members of WP2, WP3 and WP5. The economic outcomes are collected through the bi-weekly questionnaire and will be ready for analysis when the trial finalises.
4.3 Cost-consequence analysis – There are ongoing collaborations with WP3 on the relevant outcomes and how these are estimated. A statistical analysis plan (SAP) is under development. The costs in the cost consequence analysis consists of the costs estimated in the tasks above.

Deliverable-by-deliverable updates:
D4.1: Report on the intervention costs/price of the Ava monitoring device – The report will be constructed when all the intervention costs have occurred.
D4.2: Report on the outcomes and associated hospital costs – The report on the outcomes and costs will be constructed when the trial is finalised.
D4.3: A first draft of a scientific paper reporting on the results of the cost-consequence analysis for publication in an international peer-review journal – Not yet begun.

Significant exploitable results delivered during this period (if any)

No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T4.1
VIVE	T4.1, T4.2, T4.3

1.2.5 Work package 5 Data Management

Objectives
WP5 will develop a full 'data management plan' (DMP) as well as a data sustainability plan. The overall objective is to provide an infrastructure to host all data, or features extracted from the data, collected and analysed in the study with the same level of annotation, pseudo-anonymization and accessibility for model development as during the research phase. The plan should comprise financial, legal, ethical and structural aspects as well as scalability of the storage/ access capacity. For WP5, we have devised the following sub-objectives:
Sub-objectives:

- Develop electronic questionnaire(s) capturing individual subject signs and symptoms longitudinally directly from the patients.
- Develop case report forms (CRFs) to capture additional data as collected/or available by the site for each patient including baseline demographics, baseline comorbidities, baseline COVID risk factors, PCR results, chest CT results, serology results, health resource utilization, adverse events, and clinical outcomes.
- Create the infrastructure to host signs and symptoms data, CRF data, and Device data (or parameterized results from the Device data).
- Implement a long-term, sustainable model for data storage meeting FAIR requirements.

Work carried out in this period towards the achievement of these objectives.
Longitudinal data capture of signs and symptoms was incorporated into the Ava COVID-RED app. Electronic case-report forms (CRFs) were developed with broad consortium feedback which addressed each of the data domains listed in the sub-objectives. Infrastructure for the individual data sources was in place prior to start of the trial. Infrastructure for hosting each of the pseudo-anonymized data sources, linking, and analysing those data is well progressed with target release for production work in July 2021. A long-term, sustainable FAIR data storage platform is still under discussion with two potential platforms being compared for cost-effectiveness and utility for external researchers.

Task-by-task update:
5.1 – Data Management Plan – The DMP has reached the 3rd iteration with final version on target for end-of-trial.
5.2 - Deploy and maintain the technology infrastructure to underpin the cohort study - A customized AWS environment has been under development by Julius Clinical which meets the requirements of COVID-RED. Release for production programming is targeted by July 2021.
5.3 - CRF Development – Completed.
5.4 - Implement a long-term, sustainable model for data storage meeting FAIR requirements – In discussion. This has been narrowed down to two potential platforms.

Deliverable-by-deliverable update:
D5.1: Full data management plan (1st iteration) - Completed.
D5.2: Data management plan (2nd iteration) - Completed.
D5.3: Data management plan (3rd iteration) - Under review.
D5.4: Data management plan (final version) - Not yet begun.

D5.5: Deploy technology infrastructure components I, II and III - Completed.
D5.6: Deploy technology infrastructure component IV - Underway with production targeted by July 2021.
D5.7: Initial CRF development completed - Completed.
D5.8: Report on sustainability model for data storage - Not yet begun.

Significant exploitable results delivered during this period (if any)
No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T5.1, T5.3, T5.4, D5.1, D5.2, D5.3, D5.6, D5.7
Ava	T5.1, T5.2, T5.3, T5.4, D5.1, D5.2, D5.3, D5.5, D5.6, D5.7
Julius Clinical	T5.1, T5.2, T5.3, T5.4, D5.1, D5.2, D5.3, D5.5, D5.6, D5.7
UCL	T5.1, T5.2, T5.3, T5.4, D5.1, D5.2, D5.3, D5.5, D5.6, D5.7
Takeda	T5.1, T5.2, T5.3, D5.1, D5.5, D5.6, D5.7
Roche	T5.1, T5.2, T5.3, D5.1, D5.2, D5.3, D5.5, D5.6, D5.7

1.2.6 Work package 6 Communication, dissemination and stakeholder outreach

Objectives
WP6 will work to serve the needs of the project acting as a facilitator of the work, connecting information sources from key stakeholder groups to improve the value, quality and harmonization of information disseminated on evidence related to COVID-19 remote monitoring and its utility in early detection of illness incidence and triage decisions. The aim of WP6 is to help maximize the impact of project outcomes on stakeholders.
Sub-objectives:

- Identify and incorporate stakeholders' perspectives on the barriers and enablers of remote monitoring devices and apps for monitoring physiological parameters in detecting early signs of a COVID-19 infection into project roadmap.
- Development and execution of an appropriate regulatory strategy.

Work carried out in this period towards the achievement of these objectives.
Task-by-task update:
6.1 - Develop dissemination and exploitation plan - communication activities have started and were reported upon in D7.10 and D6.2. For example, in D7.10 we described our communication strategy. In addition, we have created a communication plan for the clinical trial specifically, and a social media plan for our Twitter and Instagram accounts, which were not shared with IMI yet. External communication was mainly focused on participant recruitment and retention during this first reporting period, and it is expected to shift towards project dissemination as the project proceeds. Other progress that has been made towards this task includes the development of the logo, website, manual, and templates, and of course the elaborate press attention for our clinical trial within the Dutch press.
6.2 - Understand stakeholder needs and perceptions and align with project outcomes - We realised that we do not have the expertise required for this analysis and are in the process of contracting an external partner to provide input in D6.3-D6.8. We expect to host the first-round table between the external board of stakeholders and the project's partners by mid-October 2021.
6.3 - Develop and execute regulatory plan - this activity was not started yet. It is related to the T6.2 and delayed along with it.

Deliverable-by-deliverable update:
D6.1 Report describing an initial dissemination, communication and exploitation plan – in progress.

D6.2 Project website, templates, and social media tools – completed.
D6.3 Report with stakeholder landscape analysis – in progress.
D6.4 Report on the barriers and enablers of remote monitoring devices and apps for detecting early signs of COVID-19 infection – not started yet.
D6.5 Roadmap of planned project outputs, including qualification advice submissions, mapped to stakeholder needs and planned stakeholder interactions – not started yet.
D6.6 Checklist of best practices for setting-up remote monitoring technologies as new strategies for current and future epidemics – not started yet.
D6.7: Report on relevant regulatory requirements – not started yet.
D6.8: Regulatory management plan - not started yet.
D6.9: Report describing a final dissemination, communication and exploitation plan – first version being drafted (D6.1), final version due by the end of the project.

Significant exploitable results delivered during this period (if any)
No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	Led and completed T6.1, D6.2
Ava	Provided inputs to Report describing an initial dissemination, communication and exploitation plan and Project website, templates, and social media tools.
Roche	Provided inputs to Report describing an initial dissemination, communication and exploitation plan and Project website, templates, and social media tools.

1.2.7 Work package 7 Project management, coordination, and sustainability

Objectives
The objective of WP7 is to run effective project management for the COVID-RED consortium and to guarantee the project's capacity to respond to the urgent need for remote detection of COVID-19, and to facilitate an improved understanding of the spread of and capacity to remotely detect COVID-19.
Sub-objectives:

- Project management: Providing detailed follow-up and tracking, via regular work package reports, early reports of any unexpected organisational or structural issues or delays with respect to the project deployment and intermediate objectives.
- Set-up an effective communication infrastructure and foster the integrative process within the consortium.
- Ensure the consortium's contractual duties are carried out. Advise and guide the participants to comply with the IMI regulations and their contractual and legal requirements. Abide by the "good practice" of resources management as presented in the Financial Guidelines.
- Prepare and execute a sustainability plan, to ensure the most efficient exploitation of project results and to achieve the highest possible benefit for scientists, industry and the European society.

Work carried out in this period towards the achievement of these objectives.

Task-by-task update:
7.1 - Scientific coordination and progress management – UMCU is coordinating the general progress management. The progress of WPs is being monitored in monthly Managing Board meetings where each WP provides an update. Risk assessment regarding the clinical trial is bi-weekly discussed and assessed by a working group composed of UMCU and Julius Clinical, this group reporting directly to the Managing Board. Deliverable progress is tracked in an excel document and a SharePoint environment has been set up to ensure smooth transfer of results between WPs. The Advisory Board

members have been identified and by the end of April, all but one had signed their contracts. By June, all contracts were signed and countersigned and a kick-off meeting is being scheduled for early July.
7.2 - Communication management – UMCU is managing the overall project communication. Communication about the study (focused on recruitment and retention) is mainly managed by Julius Clinical.
7.3 – Financial and periodic reporting – UMCU manages overall budget and budget transfer. Financial reporting is not applicable until the end of the project.
7.4 – Legal and contractual management – UMCU manages legal topics and contracts. The CA was finalised by December 2021. GA amendment is in the planning for June-August 2021. Contracts with Advisory Board members were almost all signed by April 2021 and fully signed by June 2021.
7.5 – Sustainability and business development – not started yet.
7.6 – Support collaboration activities and potential synergies with grants awarded under the CallIMI2-2020-21-01 – UMCU is actively participating in monthly collaborative meetings led by DRAGON. The objectives of those meetings are clear: 1) signing of the collaboration agreement (close to completion); 2) identify and agree on modes of engagement, communication & dissemination (completed): 3) continue discussions on synergies (ongoing); 4) finding solutions to implement synergies (ongoing); 5) partake in IMI recommended meetings and activities (ongoing, two monthly meeting + 1 side technical meeting attended so far)

Deliverable-by-deliverable update:
D7.1: Project management plans – completed.
D7.2: Contact database of stakeholders and key project contacts – completed.
D7.3: Detailed project plans plus tracking tools, to be maintained throughout the life of the project – completed.
D7.4 + D7.5 + D7.6 Bi-annual reports on project progress - first report is in the making (this report). It was delayed due to a full focus on getting the clinical study up and running. The ethics report is not added to D7.4 since the ethicist in the Advisory Board faced a delay in getting the contract signed by her employer. She did not manage it before the end of the first reporting period, but it was in place by early June 2021. The ethics report will be included in D7.7, which is due by the end of July, and in the next bi-annual report (D7.5).
D7.7 + D7.8 + D7.9 Reports by Advisory Board – The contracting phase for the Advisory Board took longer than expected but was finalised by June 2021. The kick-off meeting is being scheduled for early July and if all goes well the first report from the AB will be submitted by the end of July.
D7.10: Report describing internal and external communication outputs – completed.
D7.11: Tendering procedure description – completed.
D7.12: Consortium agreement, including IP guidelines – completed.
D7.13: Report describing sustainability plan – not started yet, although we keep the topic of sustainability in mind, concrete plans are not described in a report yet. We will submit a final version at the end of the project.
D7.14: Business plans – not started yet, due at end of project.
D7.15: Definition of the areas of collaboration [6] - started.

Significant exploitable results delivered during this period (if any)
No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	T7.1, T7.2, T7.3, T7.4, T7.6, D7.1, D7.2, D7.3, D7.10, D7.11
Ava	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.
Julius Clinical	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering

	procedures description.
UCL	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.
VIVE	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.
Sanquin	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.
Roche	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.
LMZ Dr. Risch	Provided contents to project Handbook; detailed project plans; report describing internal and external communication procedures and tendering procedures description.

1.2.8 Work package 8 Ethics requirements

Objectives
This work package sets out the 'ethics requirements' that the project must comply with.

Work carried out in this period towards the achievement of these objectives.
Deliverable-by-deliverable update:
D8.1: HCT - Requirement No. 2 [3] obtained all the relevant documents for using, producing or collecting human cells or tissues – completed.
D8.2: NEC - Requirement No. 4 [6] adequate import/export authorisations – completed.
D8.3: GEN - Requirement No. 5 [3] appointing an independent ethics advisor – ethics advisor identified as per October 2020 and confirmed as per January 2021. Contracting with employer was a lengthy process and was not finalised before end of April 2021 (this reporting period). Contract is in place since May 2021, deliverable is in progress.

Significant exploitable results delivered during this period (if any)
No significant exploitable results at this stage yet.

Contribution from beneficiaries	
Beneficiary	**Work carried out for this WP (e.g. task, deliverable)**
UMCU Utrecht	Led and completed D8.1, D8.2

1.3 Impact assessment

The table below contains an overview of the expected impacts of the COVID-RED project and how the work carried out in this period contributes to these impacts.

How the work carried out contributes to the expected impacts
1. Leveraging an existing medical-grade technology may allow clinicians and researchers to more rapidly evaluate patients' well-being, thereby enabling faster case detection and management.
Realisations:

• There have been 29 confirmed cases (as of 02.07.2021) for which the app reported red signal 1-3 days prior to any reported symptoms by the participant.
2. Healthcare professionals and researchers may benefit from using this device to monitor confirmed cases of COVID-19
Realisations: • No significant impact confirmed yet.
3. By reducing the in-person contact between patients and their care team, the AVA Bracelet could lower potential transmission rates among nurses, doctors, and/or researchers studying COVID- 19's development.
Realisations: • No significant impact confirmed yet.
4. The repurposed AVA Bracelet could contribute to fast-track development and availability of therapeutics and/or diagnostics to be used in the clinical management of patients infected by COVID-19 and/or future outbreaks of coronaviruses, and patients with similar infectious diseases, and to ensure that a variety of drugs are available for patients, including tackling resistance, and combination therapy.
Realisations: • No significant impact confirmed yet.
5. Contribution to public health preparedness and response in the context of the ongoing epidemic of COVID-19 and/or future outbreaks of pan-coronaviruses
Realisations: • The study itself resulted in a number of public campaigns including social media campaigns which reached a large number of residents. This activity raised awareness of COVID-19 and the degree to which it can be an asymptomatic infection which may still bring infection risks to others.
6. Significant impact on global health, both at the individual and the public health level by leading to results that have a direct impact on people at risk of exposure to coronavirus or on patients suffering from coronavirus disease.
Realisations: • No significant impact confirmed yet.
7. Impact on competitiveness and growth of companies including SMEs
Realisations: • No significant impact confirmed yet.

1.3.1 Non confidential section

All public deliverables are published onto the project website. The project has focused on setting up the clinical trial in the first period and additional outputs will be made publicly available throughout the lifetime of the project.

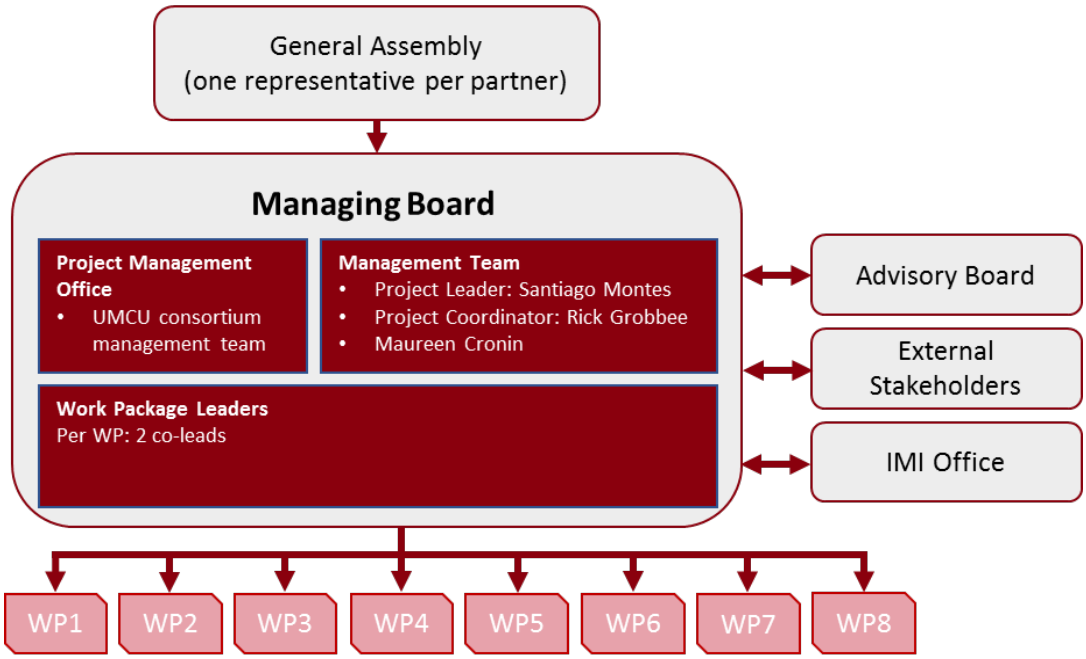
Specific outcomes of note within the project include the completion of participant recruitment, with nearly 18,000 participants being enrolled. Additional major outcomes include the generation of two publications from within the consortium – the publication of the study protocol (accepted at BMC Trials) and a systematic review of the current evidence base regarding wearable devices in the diagnosis of COVID-19 (currently under review).

1.4 Consortium management

A project such as COVID-RED requires a well-designed management structure and expertise in order to ensure project deliverables are of the highest quality and respond to the urgent needs of COVID-19 as quickly as possible. COVID-RED builds upon extensive experience of involved partners and people in IMI and projects of similar complexity. Santiago Montes serves as the Project Leader while professor Diederick Grobbee serves as the Project Coordinator.

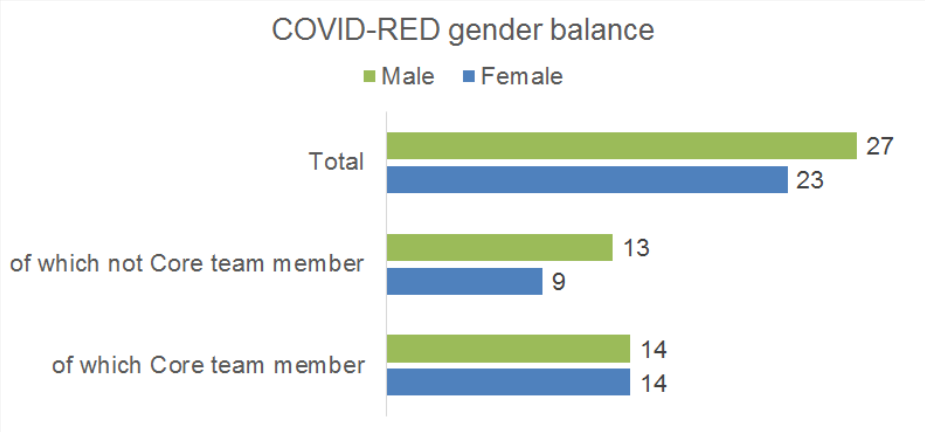
During the first period, the set up and consolidation of a multi-layered governance structure was prioritized to ensure that COVID-RED operates in a transparent and efficient manner and will effectively meet the goals and objectives described in the Grant Agreement. The governance structure of COVID-RED has been strategically designed to ensure the concerns and expertise of all participant organizations, as well as external and tangential stakeholders, are considered in project decisions. The structure is organized in such a way to ensure the consortium can remain flexible, given the evolving nature of the COVID-19 pandemic to which this project is responding. Clearly defined roles, responsibilities, decision-making authorities, processes and procedures have been implemented for the efficient and effective functioning of this consortium.

As outlined in the figure below, the governance structure covers 4 essential management components:
1. Action: represented by WP teams.
2. Coordination: Managing board, including the WP Leads, Managing Team and PMO.
3. Advice and review: the Advisory Board (AB).
4. Approval: The General Assembly.



No significant challenges arose within the team during the first period of the project. The public private partnership is working in a well and transparent manner, resolving conflicts, if any, using the escalation model detailed in the DoA,. The partnership is also working pragmatically towards resolving clinical questions, making use of additional working groups, attendance to ad-hoc meetings is high, topics are discussed and agreed in a collaborative manner.
The consortium did not experience major changes in the its composition during the period. Several Advisory Board meetings will take please during the second period of the project, and results of those interactions will be shared in the next reporting period.

The consortium has achieved an imperfect, yet encouraging gender balance, with a perfect gender equality ratio being found at leadership level (at least 50% of Core team members are women).



1.5 Collaborations/synergies with other initiatives

IMI supported via the European Commission's Horizon 2020 Framework Programme for Research & Innovation, launched a special fast-track call (Call 21) on "*Development of therapeutics and diagnostics combatting coronavirus infections*". Selected projects are expected to advance knowledge of SARS-CoV-2 and of the wider coronavirus family, with the aim of contributing to an efficient patient management and/or public health preparedness and response to current and future outbreaks of coronavirus infection. Total funding in respect to Call 21 is €117 million which is distributes across the 8 selected projects. There are 5 diagnostics projects (COVID-RED, DECISION, KRONO, RAPID-COVID, DRAGON) and 3 treatment projects (CARE, Imprentri, MAD-CoV 2).
It is expected that all 8 projects interact with each other, with the aim of finding synergies to help maximize the impacts of each project. The ultimate aim would be to create an IMI2 COVID-19 Projects Community which not only fosters collaboration among the projects but also the field at large, both during project duration and after.

During the first period, the set up and collaborative definition of a practical way of working together was prioritized to help facilitate discussions and follow-up decisions with executable collaborations. A series of actions have illustrated the work done by the multi-project approach led by DRAGON. These are:

- Signing of the collaboration agreement – almost achieved
- Identify and agree on modes of engagement, communication & dissemination – completed.
- Continue discussions on synergies – ongoing.
- Partake in IMI recommended meetings and activities – ongoing.

To help facilitating exchanges, a working methodology was agreed amongst all collaborative partners. It consists of:

- Identifying key modes and tools to be used within the community are critical to facilitate engagement and communication, and putting in place a shared communication platform via MS Teams (achieved in February 2021).
- Creating a shared contact database – achieved, Excel sheet entitled *'IMI2 COVID-19 Community_Key Info'* uploaded on MS Teams
- Housing pertinent information related each project – ongoing, Excel sheet entitled *'IMI2 COVID-19 Community_Key Info'* uploaded on MS Teams.
- Planning a series of collaborative meeting – achieved, the table below shows the meetings that have taken place within the COVID-19 projects.

Date	Meeting Description	Participants & Attendance
8 Oct	IMI meeting with projects	IMI & reps of 8 COVID-19 projects

2020		
1 Dec 2020	DRAGON initiated meeting with all 8 projects to discuss potential areas of collaboration	Reps of 7 projects. COVID-RED not in attendance
15 Jan 2021	DRAGON-Impentri to discuss proteomics testing	DRAGON & Impentri reps
11 Feb 2021	Signing of Collaboration Agreement	Reps of 5 projects KRONO & DECISION not in attendance
16 April 2021	IMI COVID-19 Projects - Diagnostic - Design sprint call.	reps of DECISION, COVID-RED, KRONO, DRAGON and RAPID-COVID
18 June 2021	IMI COVID-19 Projects call in June	reps of 8 COVID-19 projects

COVID-RED and DRAGON have also exchanged together as both projects use of AI technologies and their use in diagnosis and outcomes of COVID-19 complement our own – first kick-off meeting scheduled in June 2021.

Beyond tangible collaborations in research which are either yet to be defined or require further thought, other ideas the projects could participate in are outlined below, and could be executed in the second period of the COVID-RED project:

- Communication Activities, such as supporting other projects with social media amplification; organize science day or mini conference with open registration with sessions, networking tables and 1-1 networking or content focused around sharing key project results; organize workshops on data standards, AI, apps or invitation to events organized by the project or project partner. Below some examples proposed by DRAGON:
  - COVID-19: State of the art – DRAGON IMI project on 29 April 2021
  - 1st DRAGON Roleplay Roundtable to be scheduled end June-early July 2021
- Ethics & Regulatory Activities, such as formation of Ethics Advisory Board (including regulatory experts) for all 8 projects.
- Stakeholder engagement Activities, such as providing access to broader stakeholders by forming a community.

1.6 Financial contributions

N/A

2. Update of the plan for exploitation[1], dissemination and sustainability of results

In month 3 of the project (October 2020), WP7 coordinated the development of a report describing internal and external communication outputs

[1] In accordance with article 25.3 of the IMI2 model grant agreement, exploitation shall be understood as follows:
(a) 'research use' means the use of results or background needed to use results, for all purposes other than for completing the action or for direct exploitation and which includes but is not limited to the application of results as a tool for research, including clinical research and trials and which directly or indirectly contributes to the objectives set out in the Societal Challenge health, demographic change and well-being referred to in Regulation (EU) No 1291/2013.
(b) 'direct exploitation' means developing results for commercialization, including through clinical trials, or commercializing results themselves."

The purpose of the plan is to:

- Define target audiences, communication channels, and key messages for COVID-RED
- Establish clear goals, objectives, and timelines for communication activities.
- Provide guidance to project participants for the development of communication activities and the preparation and use of materials

The overall aim is to maximize the impact of COVID-RED by ensuring full use of available communication channels both within and outside of the project.

This plan is intended to function as a foundation for the planning and execution of communication activities by members of the project in a professional and coordinated manner. This plan outlined the target audiences, communication channels, and key messages for COVID-RED. The adoption of this plan encourages the full use of available communication channels from the project. Furthermore, it should ensure quality and consistency of communication.
Key messages for different audiences (stakeholders) relating to project deliverables and overall objectives are identified in advance and a matrix is used to map these to project timings, appropriate channels of communication, and the intended impact on stakeholders. Communication activities and, where necessary, key messages will be updated periodically as the project progresses and as feedback from stakeholders is obtained.
High quality internal and external communication is key to the success of COVID-RED, underpinning effective collaboration between project partners and maximizing the impact of the project's findings.

In the first project period, WPs have achieved the following communication and dissemination of results:

- Align all parties on dissemination standards and present a strong external project's image, by generating a strong visual COVID-RED identity and online representation with the creation of logo, dedicated website and communication materials
- Defining key stakeholders and audiences
- Creating a dedicated media campaign to support the recruitment of study participants. Here the project benefitted from the support of a PR/ media specialist from UMCU, who helped shape the key messages and target the right audience and Dutch national media for the recruitment campaign.
- Creating appeal for the recruitment campaign, by conducting a series of news interviews and participating into prominent Dutch media initiatives (*see table below for details*).
- Maintaining a list of external media initiatives and organisations of relevance, with key contacts
- Creating and maintaining effective communication messages for community building. In support of these activities, specific materials have been developed to promote COVID-RED and to ensure that outputs have impact beyond the scope of defined project activities. These materials are described in this deliverable (D6.1).
- Managing the COVID-RED social media community, by ensuring a strong presence on social media (dedicated facebook groups, twitter and instagram feeds) and hiring a social media community manager
- Creating retention storyline and disseminate key adherence messages throughout the project lifetime, to ensure that participants stay engaged while the study environment may slighlty changed (for example, with the increased number of participants that may negatively affect their willingness to adhere to the study) - ongoing
- Attempting to maintain statistics and feedback on the use, quality and impact of communications activities, for example website visits, Twitter 'likes' and feedback from participants themselves. These will be made available to MB so that the success/impact of communication activities can be evaluated.

Below a selection of where the project was presented in the first period:

When	What	Where	Who	Details

TBE July 2021	Article in newspaper VAPVisie – analysis	Article in newspaper VAPVisie – analysis	UMCU / Sanquin	Expected publication summer 2021
01-June-2021	Press release " Even before you've noticed, a smart-ass bracelet can warn you that you've contracted a corona infection"	Dutch regional newspaper	UMCU	Even before you have noticed, a smart-ass ... - Noordhollandsdagblad
14-May-2021	Online article "Research Uses Smart Bracelet For Diagnosis Covid-19"	https://www.icthealth.nl/	UMCU	Research uses smart bracelet for diagnosis COVID-19 - ICT&health (icthealth.nl)
14-May-2021	Online article "UMC Utrecht tests bracelet that detects symptoms COVID-19"	Press release	UMCU	UMC Utrecht tests bracelet that detects symptoms COVID-19 - Utrecht (nieuws.nl)
13-May-2021	Online article "Multimillion-dollar bracelet grant detecting COVID-19"	Online article	All	Multimillion-dollar grant for bracelet detecting COVID-19 - Skipr
24-Apr-2021	Online article	IMI website	UMCU	https://www.imi.europa.eu/news-events/newsroom/covid-red-seeks-volunteers-help-answer-key-question-can-digital-tech-detect
14_Apr-2021	Press release UMCU, UU and DUB about the COVID-RED study	University press release	UMCU	Still subjects needed for bracelet that can detect corona infection days earlier | Dub (uu.nl)
31-Mar-2021	Rick's TV appearance on COVID-RED study with Influencer Nick Schilder	Dutch national television RTL Boulevard	UMCU	Nick Schilder guinea pig for corona bracelet: 'Was triggered' | RTL Boulevard
26-Mar-2021	Press release "Corona news: hospitals to vaccinate vulnerable patients"	Dutch regional newspaper	UMCU	https://www.omroepbrabant.nl/nieuws/3364710/coronanieuws-ziekenhuizen-gaan-kwetsbare-patienten-vaccineren
23-Mar-2021	Online article	https://gizmodo.com/	Ava	https://gizmodo.com/avas-covid-19-early-detection-feature-is-now-out-of-the-1846528302
26-Mar-	Radio brief on	Dutch national	UMCU	RTV Monitor

2021	Skyradio	radio station		
26-Mar-2021	Radio brief on NPORadio	Dutch national radio station	UMCU	https://www.nporadio1.nl/fragmenten/nieuws-en-co/30f72a53-954a-4b9d-97a6-560a0840cc40/2021-03-26-armband-als-vervanger-voor-coronatest-hij-kan-tot-wel-twee-dagen-eerder-het-virus-opsporen
23-Mar-2021	Online article	www.prnewswire.com	Ava	https://www.prnewswire.com/news-releases/ava-announces-launch-of-first-clinical-trial-evaluating-effectiveness-of-its-fertility-tracking-sensor-bracelet-in-real-time-pre-symptomatic-detection-of-covid-19-301253681.html?tc=eml_cleartime
26-Feb-2021	Study published on Dutch research website Medians: Overview of medical examinations (medians.com)	Online article	UMCU	N/A
26-Feb-2021	Posters distributed within UMCU	Physical campaign	UMCU / JCL	N/A
26-Feb-2021	Posters and flyers distributed to general practitioners of LRJG (5 practices)	Door-to-Door campaign	JCL	N/A
26-Oct-2020	Online article	IMI website	UMCU	https://www.imi.europa.eu/news-events/newsroom/fertility-tracker-could-be-repurposed-spot-early-covid-19-cases
28-Aug-2020	News brief “A bracelet that detects corona: will this Utrecht invention become the weapon in the fight against the virus?”	Dutch national newspaper https://www.ad.nl/	UMCU	A bracelet that detects corona: will this Utrecht invention become the weapon in the fight against the virus? | Utrecht | AD.nl
28-Aug-2020	Online article “Bracelet that detects corona in you before you have symptoms: is this the egg of Columbus?”	https://www.destentor.nl/	UMCU	Bracelet that detects corona in you before you have symptoms: is this the egg of Columbus? | General | destentor.nl
28-Aug-	Online article	Dutch News	UMCU	Sports watch new weapon against

2020	"Sports watch new weapon against corona: wearable tells who is sick"	RTL Nieuws		corona: wearable tells who is sick | RTL News (rtlnieuws.nl)
28-Aug-2020	Online article "Bracelet UMC Utrecht already measures covid-19 infection before you notice it yourself"	https://innovationorigins.com/	UMCU	Armband UMC Utrecht meet al besmetting met Covid-19 voordat je het zelf merkt - Innovation Origins
26-Aug-2020	Youtube video "Je smartwatch weet eerder dan jij dat je ziek bent: hoe kan dat?"	Youtube video	UMCU	Je smartwatch weet eerder dan jij dat je ziek bent: hoe kan dat? - YouTube
26-Aug-2020	News brief	Dutch News RTL Nieuws 19:30	UMCU	

The Managing Team (MT) and Managing Board (MB) of COVID-RED have also provided oversight of communication activities (including evaluation of their effectiveness), signing off all public project deliverables to IMI and approving communications strategy, such as key messages, interviews, internal publications and/or internal targeted communication (storyline proposals ect)

Next steps are:

- Extending the list of community building initiatives to improve retention within participants
- Increasing the number of project update, both internally and publicly

Sustainability plan (TASK 7.5 – Sustainability and business development – M6- M18
The sustainability report due in February 2021 (D7.13) has been postponed to December 2021.
The report will include, as per DoA, an extensive identification of additional business models beyond those making the use of datasets for commercial developments subjected to fees, whilst facilitating open access for research purposes described in WP4

Additionally, the consortium has agreed to a proven phased approach to implement a successful sustainability strategy:

(1) mapping: identifying valuable use cases for a repository of COVID-19 datasets, as well as further applications of the remote monitoring system beyond COVID-19, by assessing key clinical/societal needs, market/commercial opportunities and operational/technical feasibility, inventorying possible strategic partners, and investigating best practices amongst comparable initiatives;
(2) brainstorming business case development;
(3) validating: together with a selection of key stakeholders and possible funders/payers, the business cases will be validated (including cost-effectiveness modelling);
(4) planning: positive business cases will be further detailed in a sustainability plan;
(5) business development: activities (promotions for industry and not-for-profit organisations) and contacts(key funders/decision makers/payers) will be initiated to realize seed funding/initial revenue/commercial deals.

The sustainability plan will present a roadmap for long-term sustainability of the consortium and network after the official end of COVID-RED to ensure that this valuable collaborative effort will endure.

3. Update of the data management plan

The DMP has undergone two iterations (D5.1 and D5.2) with the third iteration (D5.3) under review by the COVID-RED Management Team. Key updates since the original version have been to:

- Further specify the various data sources and which elements from those data will be directly shared within the infrastructure IV.
- Describe timing of data transfers
- Specify external data which has been re-used.
- Further describe timing of FAIR data use and limitation on certain data (e.g., those with commercial sensitivity)

Although the DMP is a living document, we anticipate that the third iteration will be in force and stable until near the end of the trial at which point a final DMP will be issued (D5.4).

4. Follow-up of recommendations and comments from previous review(s) (if applicable)

Not applicable.

5. Deviations from Annex 1 and Annex 2

5.1 Tasks

The primary deviations from the described Annex are related to the deliverable and task timelines. Owing to unanticipated challenges and delays related to data protection and ethical approval, participant recruitment was not able to begin until the first quarter of 2021, approximately 5 to 6 months later than originally anticipated. Therefore, all tasks and deliverables which are dependent on the initiation of the trial have likewise had their timetables moved 6 months. This means that the project is unable to be completed in the originally described timeline. A no-cost extension is being requested of IMI and an updated project description will be developed with updated timelines.

6. Ethics report

By the end of this reporting period, the ethicist for the COVID-RED Advisory Board had been identified and confirmed, but the contract was not in place yet because of a delay in getting the contract signed by the ethicist's employer. Therefore, this bi-annual report does not include an ethics report. However, the ethicist's contract was signed and countersigned by early June 2021 and the first report for the Advisory Board is due by July 2021. This report (D7.7) will contain an ethics section.