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## Status Report on the information technology **of the e-health system**

**Authors: AReSS Puglia**  
**Agenzia Regionale per la Salute ed il Sociale**

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**Authors:** AReSS Puglia  
Agenzia Regionale per la Salute ed il Sociale

**Year of Release: 2022**

Report produced within the framework of the Project **CoofHea - Cooperation for Health**, funded by the Interreg Programme Italy – Greece (2020-2021)



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THE  
**PROJECT**



The Covid-19 pandemic is undoubtedly an obvious threat to public health that requires a huge commitment by the Italian, Greek and international scientific community aimed at a deeper knowledge of both the molecular mechanisms that cause the pathological condition and the evolutionary characteristics of the virus genome pathogen SARS-CoV-2.

The COVID-19 outbreak has affected Member States in a sudden and dramatic manner and will have implications, specifically on the Greece Italy Programme territory. In Puglia, at the end of July 2020, there were over than 4,500 cases of COVID-19 (1,14‰ of the total population). According to the official data, 551 people have died for COVID-19 causes in Puglia. The profile of the sick people has an average age of 56 years out of which 51,2% are of male gender. In Greece, in the same period, there are 4,401 cases 20 died people for COVID-19 causes.

With these data, it is clear the involvement of all the eligible area. Until today we are living a great impact of the COVID-19 and it is necessary to have a common approach in order to try to solve or to mitigate the problem.

The COOFHEA project, indeed, will operate with three approaches:

A. supporting Puglia Region and the Hospitals in the Greek eligible area to purchase the personal protective equipment and/or medical equipment (ventilators, beds, monitors, etc.).

B supporting scientific research that will use a set of methods based on different types of approaches, to identify possible molecular mechanisms that can be exploited for the development of innovative and more efficient therapies.

C. sharing with the Greek hospitals the Puglia platform of telemedicine/clinical remote assistance. This is an innovative system with lets the monitoring of patients forced to quarantine for Covid-19 in their home, to avoid the hospitals costs, thanks to the "H-Casa" clinical remote assistance platform and to give a possibility of "normal life" to the population affected but not in a very serious way.

With this differentiated approach it will be possible to give organic answers to a complex problem like COVID-19.

# INTRODUCTION

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The central theme of this report is to present and relate the e-health solution introduced by the Apulia Region in the early stages of the management of the Covid-19 pandemic; a solution which, originating from other e-health projects already carried out or in progress at the time of its adoption, was then structured over time as a general solution for the regional telemedicine services.

Chapter 1 aims to offer a brief review of the measures and policies, especially organisational and triage measures, introduced by the two nations, Italian and Greek, at the outbreak of the pandemic. This is to highlight the relative contexts, especially the Italian one, in which the technological solution was conceived and prepared.

Chapter 2 will instead be dedicated to the presentation of the HCasa Covid-19 Management System solution, dissecting it in the components that are considered of greatest interest for the purposes of the transferability of the rational concepts inherent in it. This examination will be structured along the lines of what will later be the subject of the training to be conducted on the subject and will specifically concern the operational and organisational aspects of the solution.

Chapter 3 will be a general presentation of the solution from a technological point of view.

1.

CORONAVIRUS DISEASE (COVID-19)  
**MEASURES AND POLICIES**  
**ITALY VS GREECE**

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The pandemic began in Europe in early 2020, originating from a strain of coronavirus, named SARS-CoV-2 (formerly 2019-nCoV), which had never been identified in humans before it was first reported in Wuhan, China, in December 2019. The disease caused by the new Coronavirus has been given the name "COVID-19" (where "CO" stands for corona, "VI" for virus, "D" for disease and "19" indicates the year in which it occurred), as announced on 11 February 2020 at a press briefing during a break in the Extraordinary Forum dedicated to the virus by the WHO Director-General, Mr. Tedros Adhanom Ghebreyesus.

Two years after the start of the pandemic, the scientific community has now precisely identified the characteristics of the original virus, as well as the different variants that have developed over time. The development of vaccines that are effective in preventing the recrudescence of the viral disease has made a substantial step forward, but the emergence of new variants and the uneven spread of vaccination campaigns throughout the world's population mean that it is not yet possible to lower our guard and completely abandon, in extreme or particular cases, the containment measures adopted at the start of the pandemic as the only possible measure: isolation and treatment of infected individuals, preventing and limiting contact and contagion<sup>1</sup>.

## 1.1 Italy focus

In 2020, the COVID-19 epidemic caused the death of about 75,000 people in Italy (10 % of all deaths). A further 54,000 people died from COVID-19 in the first eight months of 2021. Most deaths were among the elderly: the average age of people who died from COVID-19 in 2020 was 81, and 86 % of deaths were among people aged over 70.

### 1.1.1 Governance

The governance systems for managing Italy's response to the COVID-19 outbreak were coordinated at the national level. Italy's emergency response to the COVID-19 outbreak was led by the Presidency of the Council of Ministers, supported by the National Department of Civil Protection and the Extraordinary Commissioner appointed in March 2020 to coordinate measures to combat the pandemic. Binding decisions were adopted through decrees of the Prime Minister, although these decisions were increasingly the result of consultation and mediation with regional leaders, particularly regarding lockdown measures and other restrictions under the state of emergency declared in March 2020. A Scientific Technical Committee was established in February 2020 to provide technical assistance and scientific evidence to support the central government's decision-making process on prevention and protection measures. The Istituto

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<sup>1</sup> At the beginning of the pandemic, for Italy, these standards were set by the DPCM 9 March 2020 (Decree "io resto a casa")

Superiore di Sanità has also been instrumental in coordinating the national disease surveillance system and in facilitating the use of the reference laboratory network to collect and analyse data daily.

The Ministry of Health was the main authority responsible for the health system's response to the crisis, through coordination with regional administrations. Regions set up crisis management units coordinated by regional health authorities, directors of local health agencies and prefectures representing the central state. In the early stages of Italy's response to the crisis, the government also mobilised the Civil Protection Department to support the regions in the procurement of medicines, medical devices, human resources, and infrastructure.

In response to the COVID-19 outbreak, additional funding was provided to the Italian health system. In 2020, the national government approved EUR 7.5 billion in funding for the National Health Service and the Civil Protection Department to support measures to respond to the ongoing pandemic, such as hiring new health workers and paying overtime, strengthening the National Emergency Fund, increasing the number of beds in intensive care units, subsidising companies that produce surgical masks and related products, and allocating resources for prevention and hygiene in schools and public infrastructure.

### 1.1.2 Initiative

Despite having a well-developed healthcare system, in the regions most affected by the pandemic, Italy was unable to flatten the infection curve early enough. This resulted in rapid saturation of hospital capacity and a dramatic acceleration of deaths, with a peak of 800 deaths per day at the end of March 2020.

As the spread of COVID-19 cases began to increase rapidly during the first wave, the government declared a state of emergency in February 2020. Radical measures were therefore taken to combat the pandemic, such as the decision to quarantine the main outbreak areas by imposing blanket lockdowns across the peninsula (9 March 2020) and suspending all activities not essential to life in the country (11 March 2020). The containment measures also included the need to wear masks in all public places, social distancing, a national curfew, and the obligation to stay at home in case of fever. With the start of the second wave of the pandemic on 7 October 2020, the government extended the mask-wearing requirement to the whole country, including outdoors. Even before this measure was imposed, at least four out of five Italians said they always wore a mask outside the home.

The development and propagation of the virus has severely tested the healthcare system of every Italian region to the extent that it has prompted the Government and the Regions themselves to commit themselves by approving important measures in the field of healthcare, contact containment, economics, etc.

The organisational and management difficulties within the health structures that emerged as the pandemic developed, however, highlighted the need to intervene with innovative technological solutions that could guarantee a minimum of support to the traditional hospital and general practitioner healthcare system which, in the meantime, especially in the most critical areas, was suffering considerable inconvenience.

This situation of general difficulty then had a devastating effect on all those defined as 'fragile' (suffering from pathologies defined as "rare", chronic patients, etc.), for whom the containment of general mobility has determined the impediment to the usual organisational/managerial practices of public health, in contrast with the management of the COVID-19 emergency, highlighting on the other hand, the potential advantages and value of home care in containing the spread of the contagion. On the other hand, it highlighted the potential advantages and value of home care in containing the spread of the infection. This brought out the opportunity to intervene with innovative logical infrastructures to support the connection of the patient and his family (or caregivers) with the hospital, the socio-health district (DSS)/ASL, the paediatrician and the family doctor, and the reciprocal interconnection between these care actors.

### 1.1.3 Structural equipment

Before the COVID-19 crisis, the number of beds in intensive care units in Italy was 8.6 per 100,000 inhabitants, a rate 50 % lower than in most other EU countries for which data are available.

In April 2020, the Ministry of Health set a safety target of 14 beds per 100,000 inhabitants in intensive care units. However, by mid-October 2020, just before the start of the second wave, only four out of 20 regions had managed to increase the capacity of intensive care units to this level. By then, an average of 11.8 beds per 100,000 inhabitants were available in intensive care units.

During the second wave, several regions reported intensive care units bed occupancy rates of COVID-19 patients above the 30 % alert threshold set by the Ministry of Health. In the second half of November 2020, about two thirds of the available beds in intensive care units in the Lombardy region were occupied by COVID-19 patients. In contrast, during the second wave, Sicily never reported an occupancy rate above the alarm threshold. Thereafter, the situation improved significantly and, by March 2021, only four regions had not reached the target of 14 intensive care units' beds per 100,000 inhabitants.

### 1.1.4 Staffing levels

To increase the number of emergency health workers during the first wave of COVID-19, in March 2020, the Italian government allowed the national health service to temporarily recruit retired doctors, nurses and final year medical students for a period of six months.

In addition, to alleviate pressure on GP practices and emergency rooms, the government started to set up special units of continuity of care (USCA), with the aim of enabling proactive management of suspected COVID-19 cases through home consultations and diagnostic tests, home monitoring of less severe COVID-19 cases, and supervision of cases in residential and semi-residential care facilities. Staffed by volunteer doctors, specialists, nurses, and administrative personnel paid on an hourly basis, these special units were active 12 hours a day, seven days a week. To strengthen their effectiveness in managing COVID-19 cases, the government later allowed the USCAs to be supplemented by psychologists and social workers.

In May 2020, Italy introduced the profile of the "family and community nurse", a new type of nurse with advanced skills, which would contribute to enhancing the role of home care and support the work of USCAs. The government has allocated EUR 480 million to recruit about 9,600 nurses during 2021.

### 1.1.5 Health Information systems

The 'Immuni' contact tracing application for COVID-19 was introduced on 1 June 2020. By February 2021, less than one in five Italians had downloaded the app. In addition, the number of users uploading data in case of a positive test result for COVID-19 and the number of notifications sent were rather low. In early 2021, a call centre was set up to help those who tested positive to upload their data. In Italy, the Civil Protection Department and the Istituto Superiore di Sanità are the main sources of information on the COVID-19 epidemic. In particular, the Protezione Civile is responsible for collecting daily aggregated information on the total number of positive tests, deaths, hospitalisations and admissions to intensive care units in all Italian provinces. It also created and maintains a publicly accessible database containing data on COVID-19. The data are collected daily by the regional institutions which send them, via the Ministry of Health, to the Civil Protection Department, which in turn analyses them and updates its own databases. The Istituto Superiore di Sanità, on the other hand, asks regions to provide individual-level data on laboratory-confirmed cases of COVID-19 infection, including demographic data, clinical conditions, and comorbidities. The Infectious Diseases Department of the Istituto Superiore di Sanità processes and analyses the data and makes the information accessible to ensure pandemic monitoring across the country.

In February 2020, the Ministry of Health promptly activated a parallel surveillance system of the occupancy rate of beds in intensive care units by COVID-19 patients.

The regions are responsible for collecting data on a daily basis, which is then sent to the Ministry of Health. A data portal containing this information has also been set up by the National Agency for Regional Health Services (Agenas, 2021).

The COVID-19 integrated surveillance system has proved to be a necessary and useful tool for informing the population about the impact and evolution of the pandemic and for assisting the authorities in public health decisions.

## 1.2 Greece Focus

The COVID-19 pandemic had a major impact on population health and mortality in Greece, with more than 13,600 deaths from COVID-19 recorded between January 2020 and the end of August 2021, with a very high prevalence among the population aged over 60.

### 1.2.1 Governance

The first case of COVID-19 was diagnosed in Greece on 26 February. On 1 March, the first measure taken by the Greek government, the cancellation of the carnival, was initially perceived as excessive, as only three cases of COVID-19 had been confirmed at the time. On 10 March, with 89 officially confirmed cases, all schools and universities were closed. Since that day, new regulatory measures have been gradually introduced to mitigate the risk of exponential transmission of the virus. On 23 March, some four weeks into the pandemic, with 695 confirmed cases and 17 deaths, strict closure measures were enforced nationwide. Although the number of positive cases detected was low, within a month the government introduced a complete shutdown, including the closure of educational establishments, retail outlets, restaurants and cafes, and cultural and recreational venues, as well as the suspension of religious services and severe restrictions on internal movement. The easing of measures in Greece was gradual and targeted, based on epidemiological assessments. Between the beginning of May and the end of June 2020, all businesses and public bodies resumed activities, with rules in place on compulsory wearing of masks and physical distancing. In October 2020, the government launched a new risk assessment plan, whereby each week regions were assigned a risk rating based on the number of new daily cases per 100,000 inhabitants. In November 2020, with the resurgence and increase in new cases, it was inevitable to impose a second national lockdown, followed by another set of strict containment measures during a third lockdown in February 2021. Since May 2021, many restrictions have been lifted, but normal precautions such as wearing masks in enclosed public spaces and crowded outdoor areas have been maintained throughout the country, while areas with a higher prevalence of COVID-19 have been subject to stricter local rules and restrictions from time to time.

### 1.2.2 Structural equipment

During the COVID-19 crisis, the role of public health centres was strengthened and expanded. Some centres were mandated solely to detect and manage COVID-19 cases; others were converted into facilities to provide care for patients with chronic diseases, manage acute cases and communicate with patients in quarantine or home isolation. Thirteen hospitals have been

designated as referral centres to treat COVID-19 cases. Some of these were designated to treat infected patients, while others were converted to COVID-19 intensive care beds. Scheduled surgeries and outpatient specialist visits have been cancelled ensuring only emergencies. The state's focus in addressing the pandemic has been mainly at the hospital level in ensuring adequate intensive care beds,

Specific health centres in six major urban areas (Athens, Thessaloniki, Patras, Larissa, and Heraklion) were designated exclusively for the screening of patients with respiratory infection. These COVID-19 health centres are responsible for the early detection, monitoring, and management of possible and confirmed cases, cases with mild symptoms not requiring hospitalisation, home management, and the operation of teleconsultation services for these patients diagnosed with COVID-19.

### 1.2.3 Staffing levels

During the pandemic, recruitment mechanisms were used to expand and strengthen the workforce in public hospitals, and strategies were implemented to improve the capacity of health workers. Scheduled or planned leaves and even retirements were suspended; retired or non-professional health workers were mobilised to return to work; and health professionals working in the private sector were offered fixed-term contracts and additional incentives to work in public hospitals.

As a result of this and a major new recruitment campaign, between March 2020 and February 2021, some 7,500 new medical specialists, in particular intensive care doctors, nurses, and paramedical staff, have been added to the health system. In addition, since March 2020, more than 10,000 professional health volunteers have applied through a digital platform to provide clinical, technical, or administrative support in response to the pandemic.

### 1.2.4 Health Information system

The country rapidly implemented various measures and preventive actions for case identification, contact tracing and the imposition of quarantine for confirmed cases, based on the recommendations of the European Centre for Disease Prevention and Control (ECDC). The government also launched a comprehensive information strategy on COVID-19, particularly behavioural, through various initiatives, including an official COVID-19 portal ([covid19.gov.gr](https://covid19.gov.gr)), the publication of daily epidemiological analyses and assessments, TV and radio advertisements, and the social media campaign 'Menoume Spiti' ('Let's stay at home') to gather public support for preventive measures.



In April 2020, a teleconsultation network for COVID-19 patients provided through health centres was introduced and from spring 2021, an electronic registry for monitoring and follow-up of individuals diagnosed with COVID-19 became fully operational.

2.

HCASA - COVID\_19  
**MANAGEMENT  
SYSTEM SOLUTION**

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The general Italian situation described in the previous chapter has led many private actors to offer their knowledge and experience in order to implement technological solutions to support hospitals, ASLs and the Regions themselves, so that an extraordinary flow of users can be managed in an optimal way, both directly at the NHS facilities and remotely at home.

On 12 March 2020, the Apulia Region received an offer of collaboration from DEDALUS Healthcare Systems Group, in which an IT process (Covid-19 APP Management System) was presented that would allow the remote monitoring and health surveillance of the population obliged to return to their homes. This proposal was based on the technology deriving, for the technical part, from the Programme Contract HLCM - Health Life-Cycle Management and, for the organisational part, from the research project PON TALISMAN proposed by a group of 16 Italian and foreign partners, including AReSS Puglia, funded by the Ministry of University and Research.

In this regard, the Presidency of the Apulia Region, the Department of Health and the Regional Agency for Health and Social Affairs (AReSS Puglia), the latter already being involved as a partner in the TALISMAN project, have positively evaluated the proposal offered, entrusting the company DEDALUS Italia S.p.a. with the immediate activation of the solution and identifying: the University Hospital Policlinic of Bari, as the Implementing Party, and AReSS Apulia, in the role of technical and scientific coordination.

## 2.1 COVID-19 patient stratification model - Italy solution and HCASA - COVID\_19 Management System implementation

The Italian Ministry of Health, with the outbreak of the pandemic, provided all citizens with guidelines on what to do in case of infection or suspicion of infection, namely:

- I. Individuals with symptoms of respiratory infection and fever (greater than 37.5° C) are strongly advised to remain at home and to limit social contacts as much as possible by contacting their doctor.
- II. Anyone who, starting from the fourteenth day before the date of publication of the Prime Ministerial Decree of 8 March 2020, has entered Italy after having stayed in epidemiological risk areas, as identified by the World Health Organisation, must communicate this circumstance to the Department of Prevention of the competent local health authority as well as to their general practitioner or freely chosen paediatrician;
  - Persons for whom the Asl Prevention Department establishes the need to initiate health surveillance and fiduciary isolation must remain in isolation for fourteen days from the last exposure, with a ban on social contacts, a ban on travel, and an obligation to remain contactable for surveillance activities.

III. If symptoms appear, the person under surveillance should:

- Immediately inform the general practitioner or paediatrician of free choice and the public health professional.
- Wear the surgical mask provided at the start of health surveillance and move away from other cohabitants.
- Remain in your room with the door closed and ensure adequate natural ventilation while waiting for transfer to hospital, if necessary.

In spite of these guidelines, unfortunately, non-compliance by a not insignificant proportion of the population often occurred. On the other hand, the frightened citizen, having no precise reference point to turn to, in most cases went to the nearest hospital or emergency room, heedless of contact with other healthy people and medical and paramedical staff, thus increasing the collective risk of contagion.

In the light of this, and while waiting for an effective vaccine against the COVID-19 virus to be produced and disseminated, there was an immediate need for an instrument that would allow the remote management and monitoring of the state of health and the effectiveness of the measures (therapeutic and otherwise) adopted with regard to those at risk of COVID-19, to patients who were complex due to the intrinsic fragility of their clinical situation, and to the population as a whole. On the other hand, the technology, by now consolidated in various experiences of Telemedicine both at local and national level, was able to guarantee the stability, effectiveness, modularity, and feasibility of such solutions in a very short time.

Based on these premises, the technology partner offered the Apulia Region the technology of the HCasa system which, with a dedicated platform, made it possible to:

- A. Home care of COVID-19 positive cases and telemonitoring of quarantine management of individuals who did not require access to high-intensity care facilities (with the aim of decongesting hospital facilities and ensuring appropriate care and treatment for the most serious cases).**
- B. telemonitoring management of patients with a high level of care complexity and in home care or undergoing treatment that exposes them to complications and risks from COVID, and monitoring, including diagnostic monitoring, if necessary, of the underlying condition by Specialists, Primary Care Paediatricians (PLS) and General Practitioners (GPs).**
- C. Activation of large-scale pre-triage and tele-assistance processes of the whole population at "risk" of COVID.**

A solution which, in line with the state of emergency and the criticality of the COVID-19 problem, aimed to:

- Limiting infections by encouraging symptomatic and asymptomatic infected people to stay at home and ensuring continuity of care and monitoring.

- Encouraging the early discharge of in-patients and out-of-hospital patients who can be de-hospitalised and cared for at home, thus freeing up beds, so valuable in this particular time of crisis.
- Providing a monitoring tool at provincial and regional level.
- Providing support, including psychological support<sup>2</sup>, to citizens who often do not know how to behave, giving them the correct indications in a context where panic and interpretation of information can make the difference.

## 2.2 Operational Protocol Model

The decisions of the signatories of the Operational Protocol implemented in the Region of Apulia in organising the project were aimed at guaranteeing, in each line of activity, the effectiveness of the implementation of the planned services and the necessary flexibility and adaptability of the service to the needs that emerged during its implementation.

To this end, the organisational solutions adopted have considered certain basic criteria:

- I. **Unified direction and coordination:** a Project Directorate was set up as a "place" for effective integration between the Management of AReSS Puglia, the Management of the General Hospital of Bari and the management of DEDALUS.
- II. **Highly specialised and complementary expertise of the working groups:** The Project Management was supported by professionals who boasted a high level of seniority and experience both in the IT and health sectors and in the managerial field, gained in different experiences and contexts abroad, at national and regional level. The activities were carried out by all the professionals of the Working Group belonging to all the structures of the subscribers of the Operational Protocol with key competences in the processes to be managed, thus entailing, from time to time, the recomposition of the different competences available according to the characteristics and specific objectives of the service and of the addressees to guarantee a high operational flexibility and transversality.
- III. **Logistical and instrumental autonomy of the working groups:** The activities were ensured by the provision by the signatories of the Operational Protocol of adequate working space and equipment.

### 2.2.1 Organisational framework

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<sup>2</sup> This also refers to simple daily contact, which does not make the user feel abandoned

There is no doubt that when dealing with complex scenarios such as the one that saw the implementation of the HCasa Covid-19 Management System, the main problems lie not so much in the technologies to be deployed in the field as in managing to integrate them into already consolidated and structured organisational environments. The definition of the organisational models of integration between the various actors was therefore the main area of intervention in the implementation project for the entire system.

In the specific case of the Apulia Region, since everything started as a trial of the technological solution, the introduction of the system took place in two distinct phases, aimed at analysing and defining the organisational models referring to two distinct classes of patients:

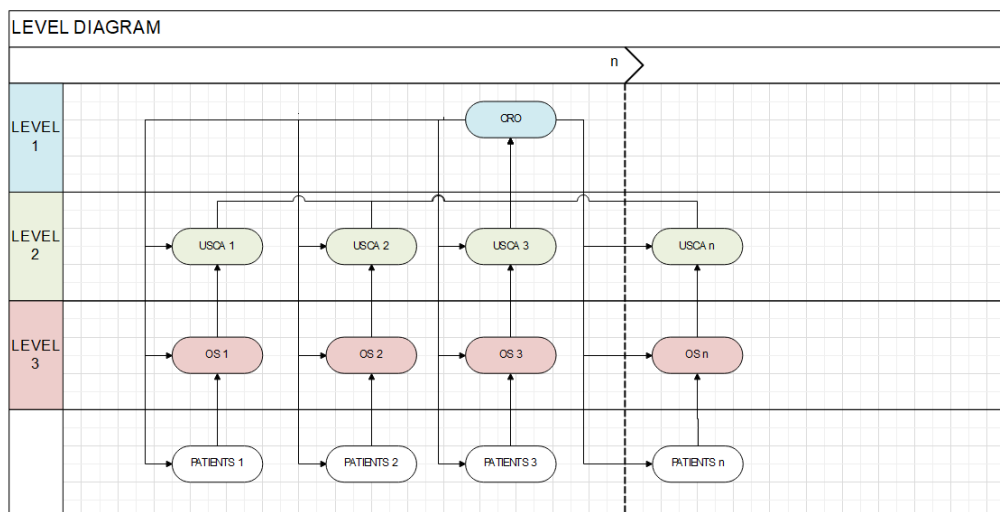
- **Phase 1 A - POSITIVE COVID-19 PATIENTS IN HOME ISOLATION:** this phase involved the rapid recruitment of verified COVID-19 patients in home isolation in order to test and run-in the HCasa system on certain patients. This was done in order to facilitate the admission phase (since the patients were already registered in the regional systems) and to "test" the stress of the system. The taking on of the patient should have been carried out by the General Practitioners (MMG), the Paediatricians of Free Choice (PLS) and the Continuity of Care Doctors (MCA), while waiting for the activation of the Special Continuity of Care Units (USCA), with which they would have then coordinated, together with the other health figures involved, in the management of the patient.
- **Phase 1 B - CHILDREN AND PEOPLE WITH RARE DISEASES IN EMERGENCY COVID-19:** this phase envisaged the rapid recruitment of rare diseases with a high level of care complexity and in level III ADI (integrated home care), also in this case with the aim of testing and running in the HCasa system on certain patients, confined to their homes and more exposed to complications from COVID-19, with the aim of protecting as soon as possible the very fragile population groups that already outside the emergency presented extreme needs. In this case, the patient should have been taken care of by the Rare Diseases Specialists (MSMR), pending the activation of the USCA, with which they would have coordinated, together with the other health figures involved, the management of the patient.

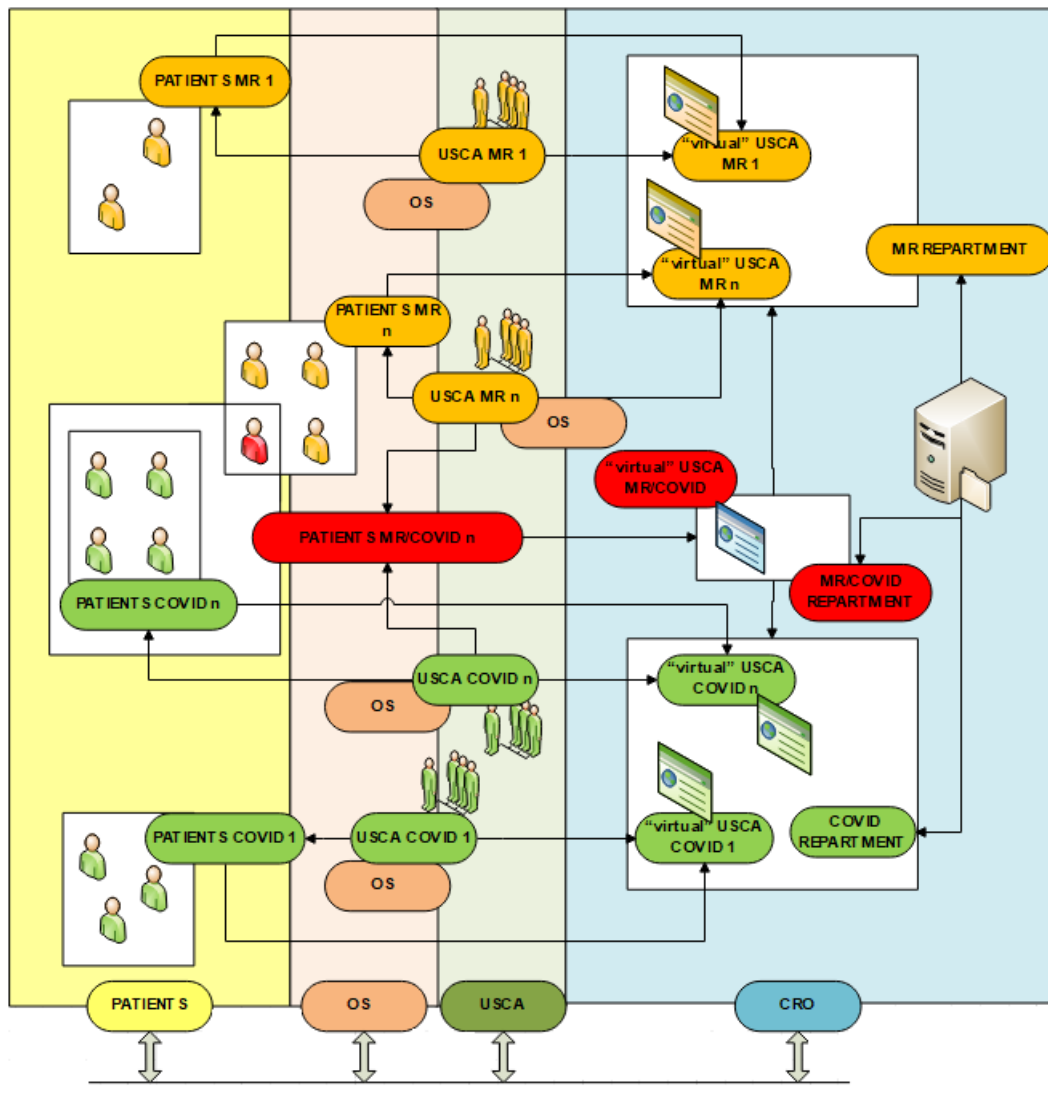
Once Phase 1 had been initiated and tested as quickly as possible, the next phase described below could be initiated:

- **Phase 2 - PRE-TRIAGE FOR THE ENTIRE POPULATION AND TRIAGE ON COVID-19 RISK:** As soon as we were certain of the stability (including organisational stability) of the system, its use in the management of needs related to the COVID-19 emergency would have been started on the entire regional assisted population.

The resulting organisational reference model was therefore structured on four different levels:

1. **LEVEL 1 - Regional Operations Centre (CRO):** a regional governance level, physically entrusted to an operations centre, specifically located and allocated in the existing Telemedicine Centre of the AOU Policlinico di Bari.
2. **LEVEL 2 - Special Continuity of Care Units (USCA):** an intermediate level, physically distributed throughout the territory in relation to the local health authorities and functionally organised according to the various needs of the different categories of users. The structure of this level has been designed to be sufficiently flexible to be able to respond to any type of health need characterised by organic and multifunctional care (e.g., "fragile" patients [HLCM/TALISMAN projects]) expressed by the territory, including future and post-emergency care.
3. **LEVEL 3 - Health Operators (OS):** GPs, MCAs, PLs, MSMRs, Territorial and Hospital Specialist Doctors (MSS), Emergency/Urgency (118), Integrated Home Care (ADI), etc..., who can access the system in taking charge of the patient and managing him/her at home, according to his/her health and clinical needs and requirements.
4. **LEVEL 4 - Patients.**





*Structure of the organisational model*

### 2.2.2 Functions, roles, organisation – general description

The functional units defined in the organisational model were therefore:

1. CRO;
2. USCA;
3. OS.

Which in turn define their respective organisational levels.



## 1. CRO - Regional Operations Centre

Thanks to the solution adopted, with the presence of a Regional Operations Centre capable of operating on the entire regional population, it has been possible, pending the adoption and formal implementation of the USCA<sup>3</sup>, to make “virtual” USCAs immediately operational with their own telematic services, immediately connecting the Regional Operations Centre with the local health workers (GPs/PLSs/MCAs), hospital and non-hospital specialists, and all the services relating to the Regional Health System and the patients enrolled. Thanks to this, it was possible to immediately activate all the services envisaged by the digital health system for COVID-19.

When the territorial USCAs were formally activated, the HCasa system would then have been able to simply assign them to the management of the patients they were responsible for, enabling them to operate on the virtual USCAs already defined. On the other hand, the Regional Operations Centre always retains the function of supervision and remote control of all activities and the back-up function. With this solution, the HCasa system and the Regional Operations Centre are able to redefine and reassign the breakdowns from time to time, implement the same telematic services for other types of patients (in general, frail patients requiring home care), startup telemonitoring, telemonitoring and specialist teleconsultation activities even with actors not envisaged by the COVID-19 emergency and on groupings, even formal ones, other than USCAs. All this has made the entire system extremely flexible and modifiable, guaranteeing its scalability and portability to other classes of patients, once the COVID-19 emergency is over.

The scalability of the concept of the Operations Centre also allows for the setting up of dedicated sub-operations centres, organised in a network, with dedicated and adequately trained doctors to take charge of the requests for advice and provide feedback according to the criteria and protocols provided for each time.

### **Functions**

The CRO has the following **functions**:

- Design and organisation of virtual USCAs.
- Recruitment of OS and setting up of virtual USCAs.
- OS/USCA training and education.
- OS/USCA coordination.

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<sup>3</sup> Or even in case of non-formal adoption

- OS/USCA technical and technological support.

### **Roles**

The CRO has:

- A management and a scientific technical committee.
- A Teleconsultation team that supports the clinical activities of the other functional units.
- A Data Scientist (data lake and data warehouse) for data processing and management.
- A technical/scientific training centre for OS/USCA/caregivers.
- A Control Room with a control dashboard and application platform.
- An operational support in the management of active patient surveillance, in coordination with OS/USCA.
- A Technical Support Centre.
- An Information Technology Service for the management of technological components and user support.

The full functionality of the HCasa system Application Platform can be used from any device connected to the Internet (PC, tablet, smartphone, etc.) and it is possible to set up, on the indication of the reference OS or based on defined diagnostic and therapeutic plans:

- The monitoring plan (types, frequency of measurements to be collected and alarm conditions on the values detected).
- The active surveillance plans.
- The collection of clinical data in automatic mode by means of integration with the Telemonitoring Kit and/or in manual mode, by means of insertion in specific loading masks, by the Patient and/or Caregiver, and/or the COR, and/or the OS and/or the USCA.
- The collection of the values independently collected by the patient.
- The analysis of the clinical data trend and the signalling of alarms when the defined conditions occur.
- Automatic generation of the list of patients to be contacted, also including any warnings concerning the correct performance of the telemonitoring activity.

Communication tracking to and from the patient is also available, as well as archiving of processed data on its own repository.

## 2. USCA - Special Continuity Care Unit

As the Italian of Health Ministry's explanatory circular states:

*"The Special Units of Continuity of Care (USCA), were established pursuant to art 8, d.L. 9 March 2020 no. 14, entitled "Urgent provisions for the strengthening of the National Health Service in relation to the COVID-19 emergency", play an essential role in the home management of patients affected by COVID-19 who do not require hospitalisation, in order to enhance the care and active territorial surveillance for patients in compulsory home isolation affected by COVID-19, discharged, or paucisymptomatic patients who have not been admitted to hospital, and for patients in fiduciary isolation for case contacts or symptomatic patients without evidence of contact, as well as frail, chronic and disabling patients who, as a result of the current emergency, constitute the most vulnerable part of the population.*

*As part of this activity, it has been envisaged, among other things, that the territorially competent public health services, in liaison with the MMGs and the special continuity of care unit, will adopt specific protocols defining all the measures necessary to ensure maximum protection and support for the needs of daily life for those who are in need of care. for the needs of daily life for single people without a caregiver.*

*MMGs, PLSs and MCAs, through active health surveillance carried out by means of initiative telephone triage, communicate the name and address of the patients to the special continuity of care unit [...]. To carry out their specific activities, the doctors of the Special Unit must be equipped with NHS prescription books and suitable personal protective equipment and follow all the procedures already prescribed for that purpose. For the activities of the Special Unit of continuity of care, outpatient specialist doctors may be involved. The MMGs, PLSs and MCAs send reports on the onset of symptoms in their patients to the public health departments. The districts assess the opportunity of establishing a reference/centre that assists MMGs, PLSs, MCAs in identifying the most appropriate pathway for patients between the hospital and the territory".*

From this it can be determined that:

### **Functions**

USCAs therefore perform the functions of:

- Home evaluation of subjects (USCA-COVID).
- Health support for rare diseases (COVID/NO-COVID) (USCA-MR).
- Functional clustering within the HCasa system, OS operating in the territory and referral specialists for rare diseases and COVID-19 patients.

- Within the HCasa System:
  - Taking charge of the patient and management of home interventions according to criteria established by FIMMG (Italian federation of general practitioners) and Region (CRO).
  - Tele-assistance of patients
  - Patient telemonitoring
  - Telemonitoring of patients.
  - Coordination with the CRO.
  - Coordination with other OS.

### ***Roles***

USCAs are functional groupings of OS operating in the home care of the fragile COVID/NO-COVID patient, operating according to national and regional operating procedures, and responding from an organisational point of view to the DSS (Social and Health District);

- The following are part of the USCA:
  - MMGs, PLSs, MCAs enrolled for this purpose (USCA COVID), OS of rare diseases, ADI staff.

### ***Organisation***

From an organisational point of view, the USCAs operate by taking charge of the management of patients reported by the OSs belonging to it in the territory, not as an outpatient service, but as a service to which they delegate the management of cases falling into the COVID-19 categories (Suspected, Confirmed, Discharged) in home isolation, and the management of "rare patients" (COVID/NO-COVID), which are extremely fragile in this emergency phase. To this end, they operate in coordination (through the HCasa system, of which each USCA functionally represents a subset of PATIENTS/OS) with the CRO and with the OSs belonging to their territorial area, in relation to the patients taken care of.

They work physically within the DSS where exclusive dedicated premises are made available to them with the following characteristics:

- Dedicated changing room for wearing the work uniform, equipped with lockers.
- Dedicated room for putting on PPE and bathroom with dedicated shower.
- Environments to be used as offices for documentation activities, computer communication and stationing.

Sanitised daily in accordance with the law.

The rooms must be equipped with an internet connection, a telephone connection (or company mobile phone) with a number known only by the MMGs, PLSs and MCAs and MSMRs of the area covered and by the OSs belonging to the USCA, as well as to the CRO; and the possibility of communicating with the Emergency Room Services, 118, Prevention and Hygiene Services, Infectious Diseases, etc.

The ASLs must provide by the Safety Managers, in addition to the safety routes of the entire activity and chain of each intervention, places, times and methods of undressing after each intervention to avoid contamination and unnecessary downtime for the sanitisation processes.

USCAs do NOT perform outpatient activities.

The DSS shall guarantee the regular supply of personal protective equipment (PPE) through dedicated logistics. The DSS provides the USCA with a dedicated car and diagnostic equipment placed in an emergency backpack (saturimeter, remote thermometer, P.A. meter, emergency drugs, and any other medical equipment necessary for interventions) in sufficient quantity to guarantee continuity of care.

For each shift, the USCA is supported by a nurse for the management of specific activities, and possibly by other operators who may be needed to manage the HCasa system.

After ratifying the USCA staffing plans, intensive training is organised, also with the support of the CRO, on the following topics:

1. COVID-19 infection modes.
2. Means of prevention.
3. Means of protection.
4. Use of individual protection devices to be used in contact with sick persons and their subsequent management until disposal.
5. Correct sanitisation of medical equipment (saturimeter, remote thermometer, BP meter, emergency drugs, and any other medical equipment needed for interventions).
6. Application on the use of the HCasa system.

Courses can also be organised remotely.

The training hours will be paid to the doctors involved as a service activity.

Of course, the training content can be tailored to the specific care activities of the units.

Within the HCasa system, the USCAs operate by means of telephone contacts and/or video contacts, conducted in such a way as to guarantee that the patients are taken care of while maintaining effective clinical management, albeit with extraordinary contingencies, coordinated with the other services.

They take charge of the patients and, if necessary, provide them with tele-assistance, at least on a daily basis, via the HCasa system and, if necessary, telemonitoring.

In the latter case, they receive the telemonitoring kit to be delivered to the patient at home and, after instructing the patient in its use, they take charge of the daily monitoring activity.

In the case of USCA-MR, it operates according to USCA-COVID criteria, carrying out the home services of the 2nd level ADI.

The USCA operates between 8:00 AM and 8:00 PM; from 8:00 PM to 8:00 AM the telemedicine service will be provided directly by the CRO, interfacing with the MCA on duty and the emergency/urgency service.

It is fundamental to reiterate that the USCA, as defined by the decree, are entities that have not yet been formalised and defined, and that, at the time of the adoption of the HCasa system, were still subject to negotiation from both a formal and functional point of view. Also, the "internal" organisational structure and the "internal" operating protocols of the same were still to be defined, as were the equipment and whatever else has been reported here. However, as already pointed out above, the system has been designed and implemented in such a way as to be able to operate regardless of the institution and formalisation of the USCA as "Special Units" for the COVID-19 emergency, and to aggregate in a functional generic USCA the various figures that within the system perform the function of "Special Units" for patient care, regardless of the internal structure that would have been given to it, and which, indeed, given the multiplicity and heterogeneity of extra COVID problems, would necessarily have been composed in relation to and according to the various types of patients and the various types of health problems. It is in this sense, for example, that in the HCasa system, in the case of rare patients, MR USCAs have been indicated; precisely to differentiate them from the COVID ones, which are extemporaneous for the emergency phase, and to highlight their specificity in relation to the management of the rare patient. This guarantees the portability of the entire organisational structure, even beyond the COVID-19 emergency phase, when the "official USCAs" will have lost their *raison d'être*, and may be replaced, in the HCasa system, by functional aggregations suitable for the home management of the "generic" "fragile" patient.

### **3. OS - Health workers**

#### ***Functions***

Proprietary to the role.

Within the HCasa system:

- Patient care.
- Telecare of patients.
- Telemonitoring of patients (included remote surveillance).
- Coordination with the CRO.
- Coordination with other SOs and USCAs.

#### ***Roles***

- MMG.
- PLS.
- MCA.
- MSMR.
- MSS.
- Healthcare staff, ADI staff, Emergency/Urgency.

#### ***Organisation***

The OSs involved in various ways in the management of the patient taken on by the HCasa system will refer and interface functionally with the "virtual" USCA of competence for the territory (as per normal procedure), accessing, with their help, the management possibility through the HCasa system. It will be the Health Operators already normally in charge of taking charge of patients (MMGs, PLSs, MCAs, MSMRs), who will operate on the system and on their own patients through the functions offered by the same. The Health Authorities will provide the CRO with the list of operators to be activated, with information also on telephone and e-mail contact for the receipt of personal credentials.

#### **4. Patients**

The HCasa system is proposed as a teleassistance technological solution for home patients, both for COVID-19 related pathologies and for other pathologies where home patient care is necessary or appropriate. In general, therefore, the HCasa solution is able to provide support to the Health System in its entirety, in the home management of health problems of the entire population at home (not by chance it is a vertical of wider projects and initiatives, [HLCM/TALISMAN], which have as their target the home management of 'fragile' subjects through dedicated ICT infrastructures, regardless of the pathology they suffer from).

Within the HCasa-COVID\_19 Management System, the patients considered fall into the types:

##### ***Rare Diseases***

Rare Diseases are extremely diverse diseases (there are about 8,000 different nosological entities). About a thousand of them require very demanding treatment and are treated in hospitals that are often very far from the patient's home, partly because of the geographical characteristics of the region. Approximately 300 of these are very serious and require third-level home care. Many of these patients are children, and all require complex and continuous care and the support of family members and/or caregivers.

##### ***Patients COVID***

In the specific case of the COVID emergency, it was necessary, partly in order to standardise the nomenclature with the national and regional definitions provided at the time, and to integrate the solution into the healthcare pathways already implemented and in place for classification and triage, to define the type of patient precisely and to define how and where the HCasa system fits into the pathway according to the various types<sup>4</sup>.

With the Ministry of Health Circular prot. 0007922 of 09.03.2020, the definitions of "COVID-19 CASE" were defined distinguishing:

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<sup>4</sup> Of course, this nomenclature and the resulting models were functional at the time of the pandemic outbreak and may therefore not be current. However, the intention is to show how, in the light of defined healthcare organisational processes (in this case in COVID function), it is possible to attribute different functions and actions of these processes to the HCasa system



- **SUSPECTED CASE OF COVID-19 REQUIRING DIAGNOSTIC TESTING:**

1. Person with acute respiratory infection (sudden onset of at least one of the following signs and symptoms: fever, cough, and difficulty in breathing) and without another aetiology fully explaining the clinical presentation and history of travel or residence in a country/area where local transmission is reported during the 14 days preceding the onset of symptoms.
2. Person with any acute respiratory infection who has been in close contact with a probable or confirmed case of COVID-19 in the 14 days preceding the onset of symptoms.
3. Person with severe acute respiratory infection (fever and at least one sign/symptom of respiratory illness - e.g., cough, difficulty breathing) and requiring hospitalisation and without another aetiology fully explaining the clinical presentation.

- **PROBABLE CASE:**

1. **Suspected case** whose test result for SARS-CoV-2 is inconclusive or doubtful using specific Real Time PCR protocols for SARSCoV-2 at identified Regional Reference Laboratories or is positive using a pan-coronavirus test.

- **CASE CONFIRMED:**

1. Case with laboratory confirmation of SARS-CoV-2 infection, carried out at the National Reference Laboratory of the Istituto Superiore di Sanità (ISS) or by Regional Reference Laboratories meeting the indicated criteria, regardless of clinical signs and symptoms.

- **CLOSE CONTACT OF A PROBABLE OR CONFIRMED CASE:**

1. Person living in the same house as a case of COVID-19.
2. Person who has had direct physical contact with a COVID-19 case (e.g., handshake).
3. Person who has had direct unprotected contact with secretions from a COVID-19 case (e.g., touching used paper handkerchiefs with bare hands).
4. Person who has had direct (face-to-face) contact with a COVID-19 case, at less than 2 meters and lasting longer than 15 minutes.
5. Person who has been in an enclosed environment (e.g., classroom, meeting room, hospital waiting room) with a COVID-19 case for at least 15 minutes, at less than 2 meters.

6. Healthcare worker or other person providing direct care to a COVID-19 case or laboratory personnel handling specimens of a COVID-19 case without the use of recommended PPE or using unsuitable PPE.
7. Person who has travelled in an aircraft seated in the two adjacent seats, in any direction, of a COVID-19 case, fellow passengers or caregivers and crew members assigned to the section of the aircraft where the index case was seated (if the index case has severe symptoms or has moved around the aircraft, resulting in increased exposure of passengers, consider all passengers seated in the same section of the aircraft or throughout the aircraft as close contacts).

In health surveillance contact tracing activities, based on case-by-case assessments carried out by the public health worker in his specific activity, it appears necessary to identify all individuals who have been or may have been in contact with a confirmed or probable COVID-19 case, focusing the search for them with particular attention on the 48 hours preceding the onset of symptoms until the time of diagnosis and isolation of the case.

It is also appropriate to define, here, the type of HEALTHCARE PATIENT, also in this case, again from the Ministry of Health Circular prot.0006607 of 29.02.2020, it is possible to distinguish two cases:

1. Patient who after being symptomatic can be considered cured of Covid-19:
  - a. A patient is clinically cured of Covid-19 if, after presenting with clinical manifestations (fever, rhinitis, cough, sore throat, possibly dyspnoea and, in severe cases, pneumonia with respiratory failure) associated with virologically documented SARS-CoV-2 infection, he/she becomes asymptomatic due to resolution of the clinical symptoms presented. The clinically recovered individual may still test positive for SARS-CoV-2.
  - b. A Covid-19 cured patient is defined as one whose symptoms of Covid-19 infection have resolved and who tests negative in two consecutive 24-hour tests for SARS-CoV-2.
2. Patient with SARS-CoV-2 clearance<sup>5</sup>.

Virus clearance is defined as the disappearance of detectable SARS-CoV-2 RNA in body fluids, both in persons who have had signs and symptoms of disease and in persons in an asymptomatic phase with no signs of disease. This elimination is usually accompanied by the appearance of specific IgG antibodies to the SARS-CoV-2 virus produced by the body.

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<sup>5</sup> Virus clearance is defined as the disappearance of detectable SARS-CoV-2 RNA in body fluids, both in persons who have had signs and symptoms of disease and in persons in an asymptomatic phase with no signs of disease. This elimination is usually accompanied by the appearance of specific IgG antibodies to the SARS-CoV-2 virus produced by the body

According to these definitions, within the HCasa system, the two phases will cover:

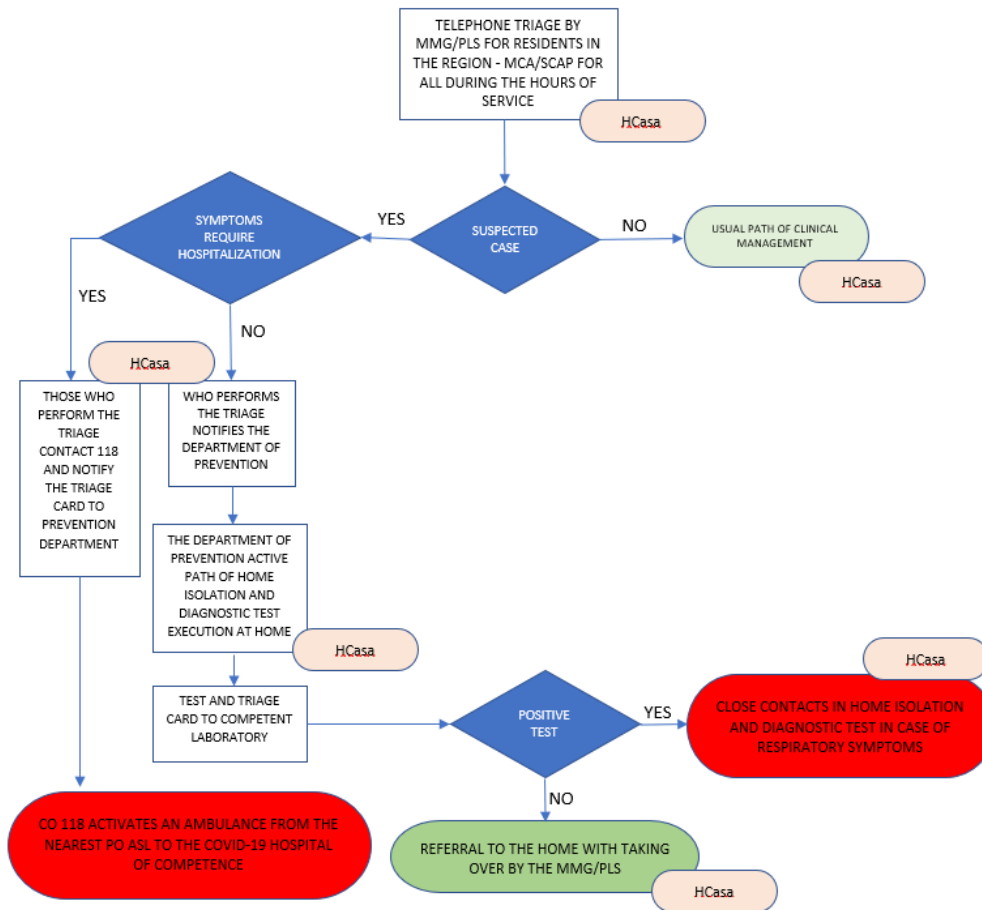
- Phase 1 A - COVID-19 POSITIVE:
  1. PROBABLE CASES.
  2. CONFIRMED CASES.
  3. CLOSE CONTACTS.
- Phase 2 - ENTIRE POPULATION ON RISK COVID-19:
  1. ENTIRE POPULATION FOR TRIAGE AND SEARCH FOR SUSPECTED CASES.

From the point of view of the interconnection of the HCasa system with the normal triage protocols active in the Region, the flow-charts of these are reported, highlighting the points of intersection/support/replacement offered by the system.

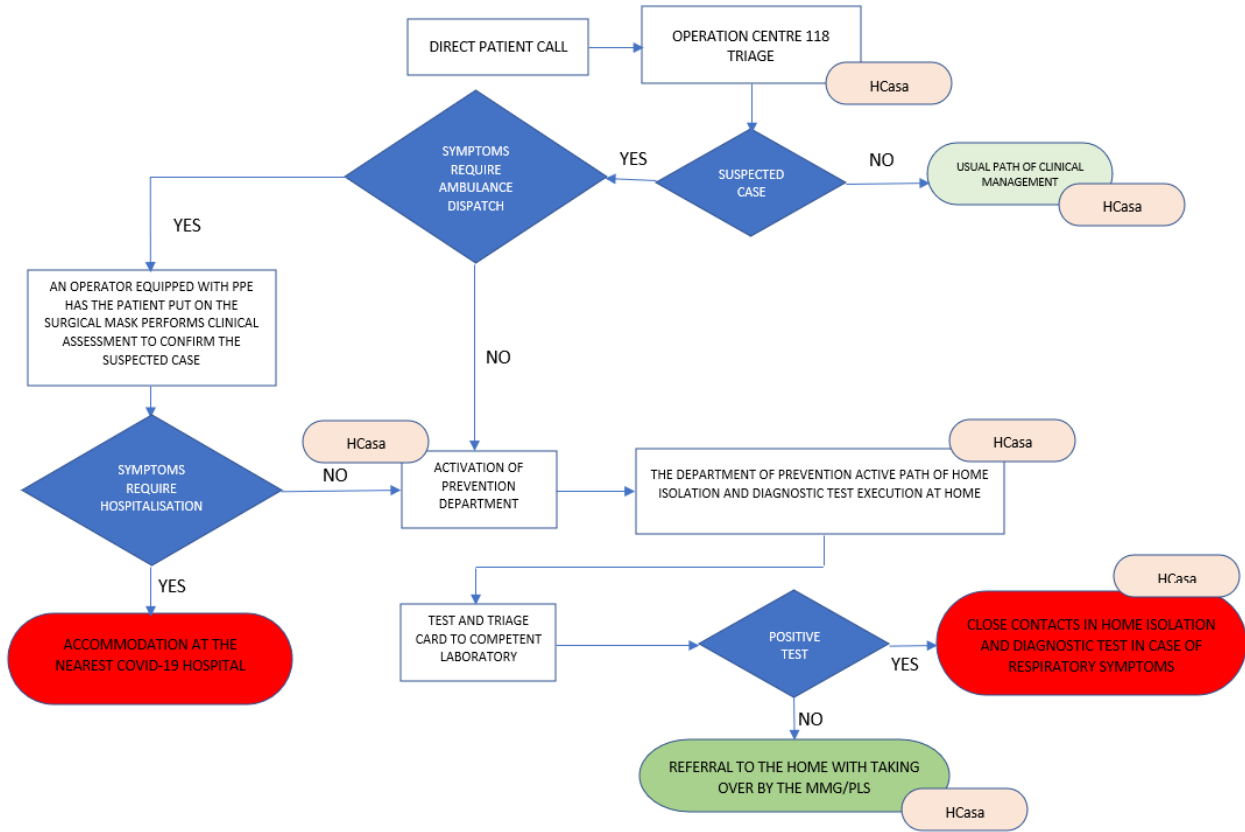
### 2.2.3 Operational flow chart

Regional flow charts (guidelines) - transposition highlighting where and what can be managed with the HCasa system.

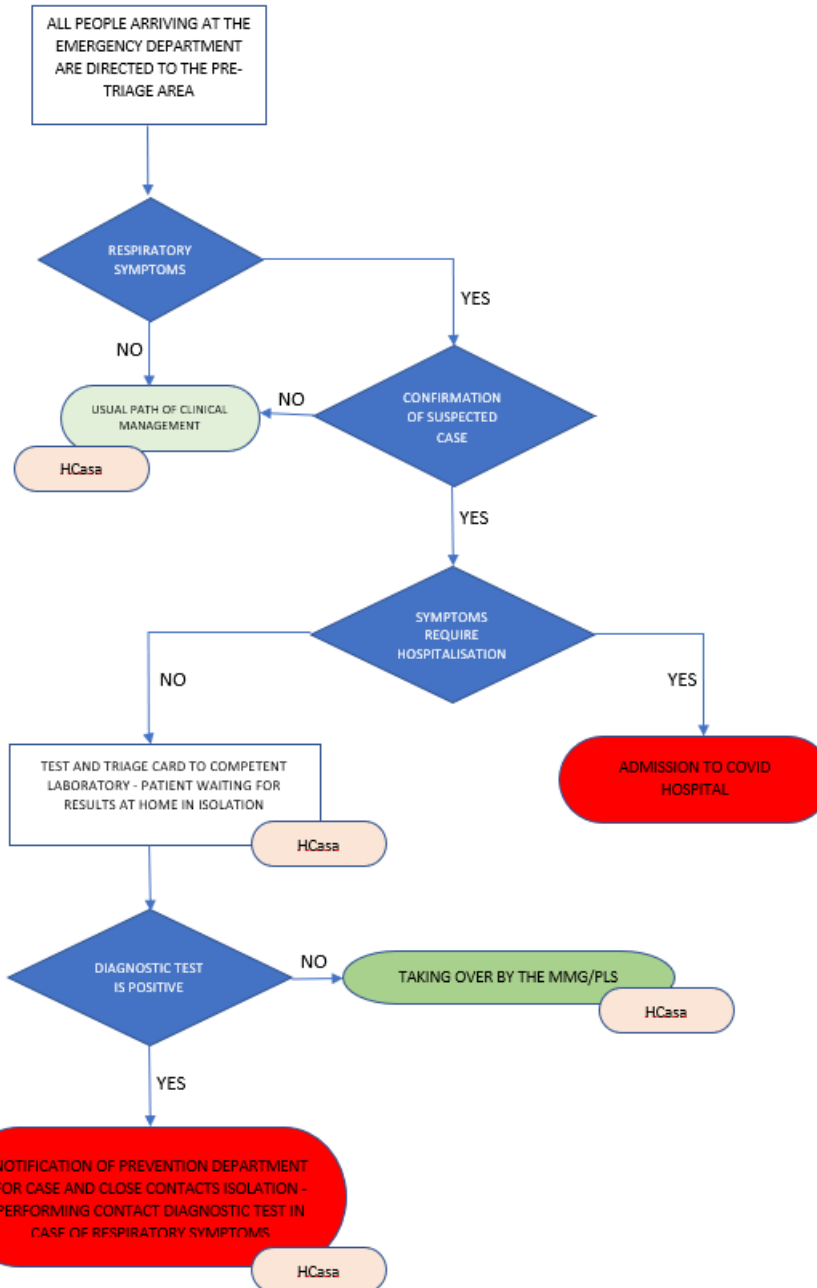
**Suspected case at home**



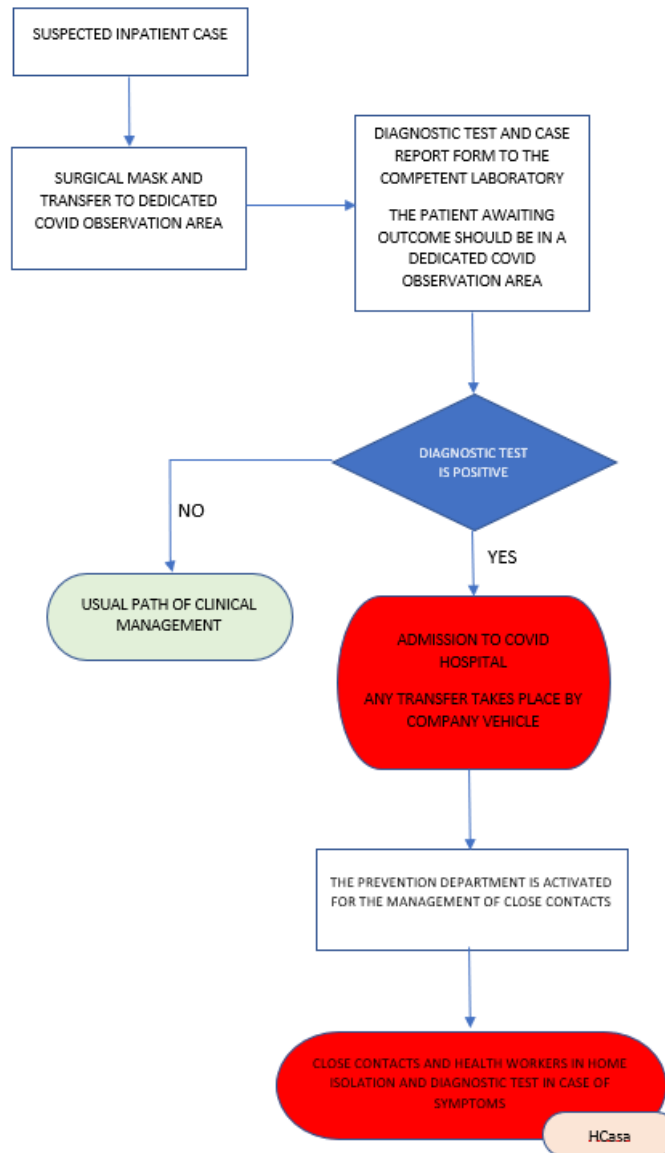
**Suspected case contacting CO 118**



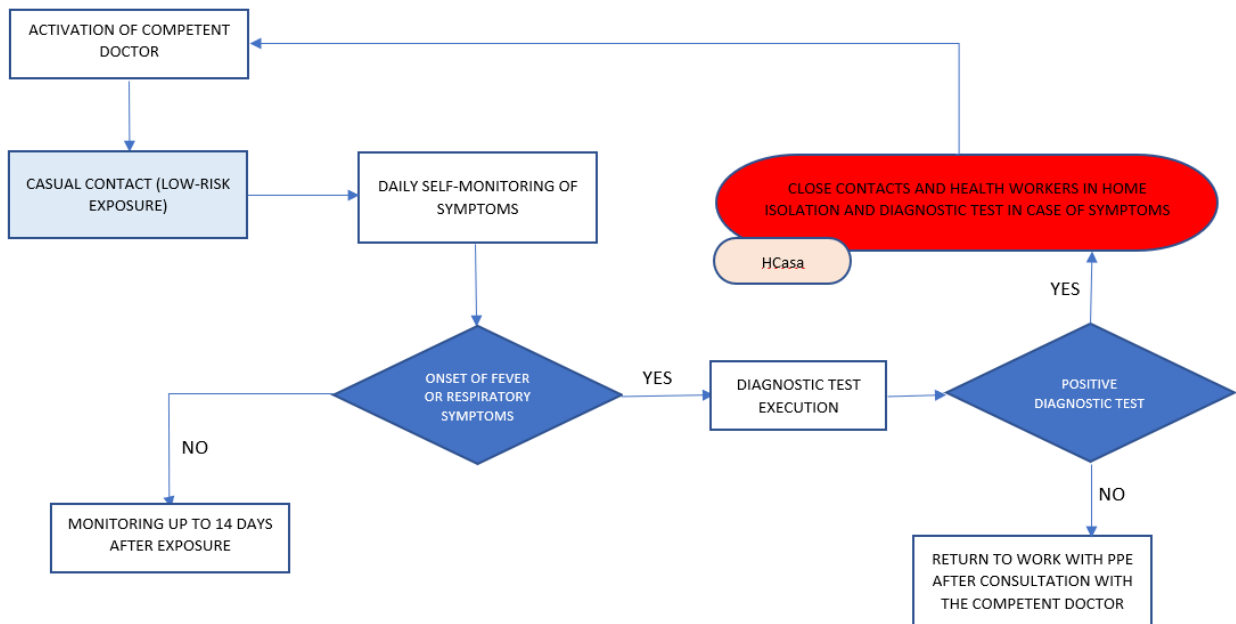
**Emergency Department - Suspected case arriving independently**



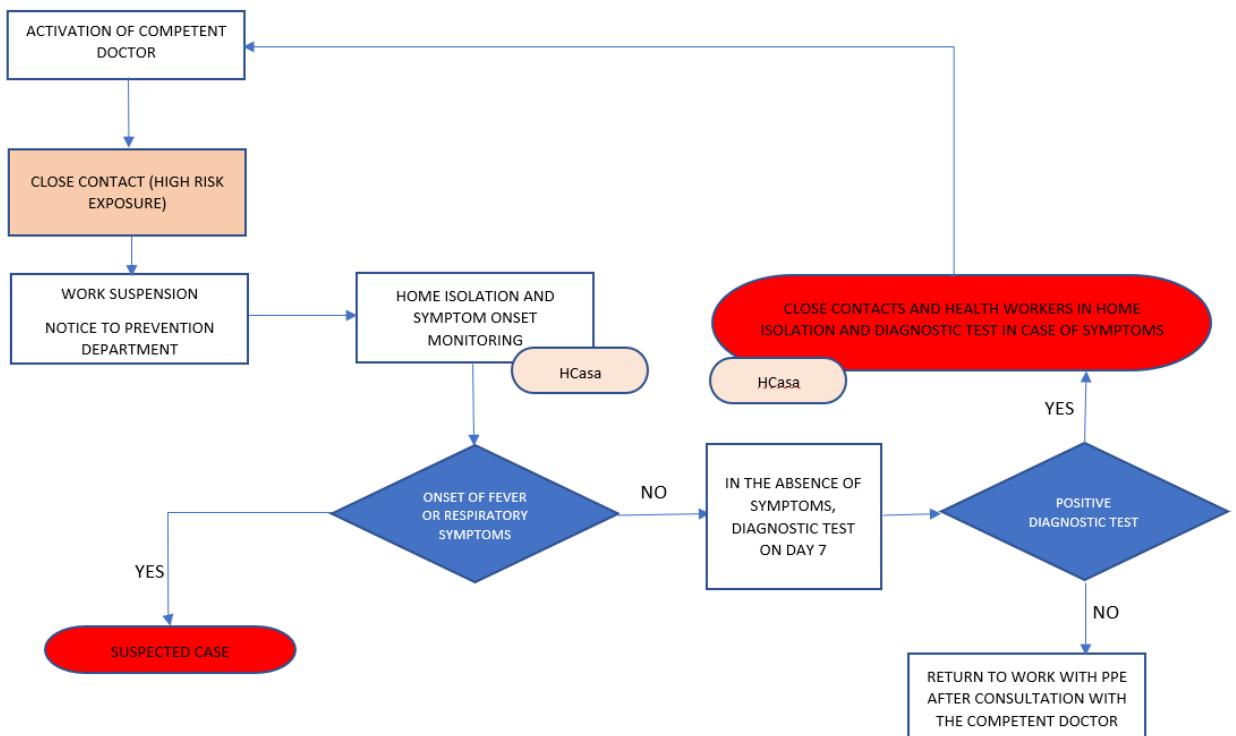
**Suspected in-patient case**



**Exposed healthcare worker without PPE - case 1**



**Exposed healthcare worker without PPE - case 2**





## 2.2.4 Operganisational models

### *PHASE 1 A - Organisational model covid-19 positive patients in home isolation*

At this stage, patients already diagnosed with COVID-19, asymptomatic, paucisymptomatic, on hospital discharge but not yet negative will be considered for care through the HCasa system.

#### **Actors involved in services**

- OS (MMG, PLS, MCA);
- Discharge hospital specialists and supporting speciality doctors (SS).
- USCA-COVID;
- CRO;
- PATIENTS.

#### **Typology of target users**

- **COVID-19 POSITIVE PATIENTS**, which can be classified as:
  - A. COVID-19 positive patient for whom the conditions of home isolation and quarantine exist.
  - B. Patient discharged from hospital, clinically recovered, still COVID-19 positive.

#### **Services provided**

- Informal consultation, pre-triage questionnaire, information
- Telemonitoring
- Telecare
- Other services related to USCA.

The target users benefit from the different types of services according to their type:

USER TYPOLOGY		HCASA SERVICES
POSITIVE COVID-19 PATIENTS	POSITIVE COVID-19 PATIENT	INFORMAL CONSULTATION
		TELEMONITORING
		TELECARE
	PATIENT DISCHARGED	INFORMAL CONSULTATION
		TELEMONITORING (EVENTUALLY)
		TELECARE

## OPERATIONAL REFERENCE MODEL

### Engagement

The engagement phase involves COVID-19 POSITIVE individuals in home isolation/quarantine, or who are in home discharge but still positive<sup>6</sup>.

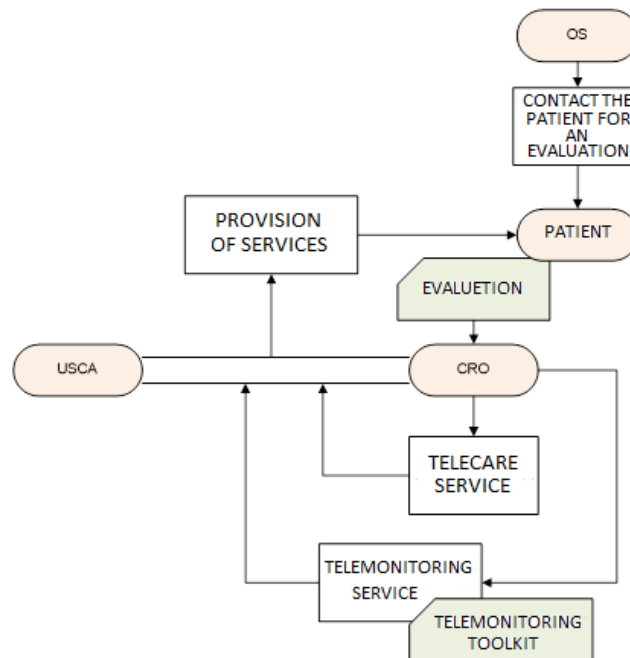
Patients will be entered in the teleassistance/telemonitoring platform, distinguishing cases:

CASES	DESCRIPTION
POSITIVE COVID-19 PATIENTS	IN WHICH CASE HE/SHE IS CONTACTED BY A CRO OPERATOR AND ASSIGNED TO THE RELEVANT HOSPITAL, GUARANTEEING THE TELE-ASSISTANCE SERVICE AND TELEMONITORING OF PARAMETERS CONSIDERED VITAL
POSITIVE COVID-19 PATIENTs IN CONTINUITY OF CARE DISCHARGED TO HOME OR ISOLATED ENVIRONMENT	THE TELE-ASSISTANCE AND TELEMONITORING SERVICE IS GUARANTEED ON DISCHARGE FROM THE HOSPITAL OF VITAL PARAMETERS

<sup>6</sup> The list of these persons will be provided by the Health Information System Edotto of the Apulia Region, which censuses the results of diagnostic tests. As well as from the COVID-19 reportings for patients being discharged.

**A - POSITIVE COVID-19 PATIENT**

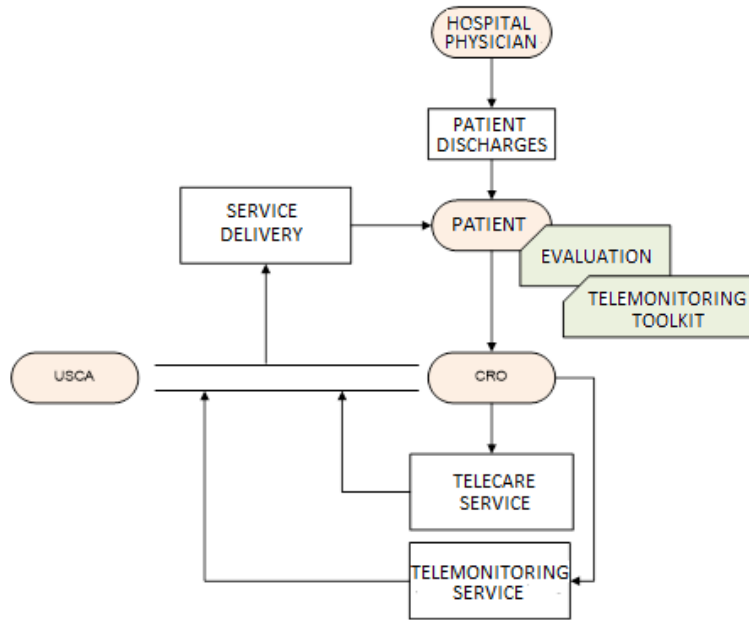
1. The subject is contacted by an OS for a specific assessment.
2. The CRO determines activation of the telecare service.
3. The CRO determines the activation of the telemonitoring service and a telemonitoring toolkit in its most appropriate composition.
4. The MMG/MCA/USCA contacts the subject, assigns the telemonitoring toolkit and trains him/her in its use.
5. The operating center, in agreement with the MMG/MCA/USCA, begins to provide the services.



**B - POSITIVE COVID-19 PATIENT IN CONTINUITY OF CARE DISCHARGED TO HOME OR ISOLATED ENVIRONMENT**

1. At the time of patient discharge, the Hospital physician determines whether the Telemonitoring toolkit is needed in its most suitable composition and requests activation of the telecare and telemonitoring services.
2. The CRO determines the activation of the telecare service.
3. The CRO determines the activation of the telemonitoring service.
4. The MMG/PLS/MCA/USCA contacts the subject, assigns the telemonitoring toolkit, and trains him/her to use it.

5. The operations center, in agreement with the MMG/PLS/MCA/USCA, initiates the provision of services.



## *PHASE 1 B - Organisational model for children and people with rare diseases in emergency covid-19*

Taking into account, in this emergency situation, the specific needs of people with serious rare and complex pathologies, there is no doubt that particular attention must be paid to patients who are unable to understand the instructions given to them or are uncooperative because of their disability or illness, and who see their condition worsened by the difficulty of moving around. This prevents them from receiving the life-saving treatment that many of them have to continue to receive and that some of them are suspending for fear of contagion, putting their health and lives at risk. Furthermore, it is of fundamental importance to take preventive action on the monitoring and surveillance of those healthcare workers who, to carry out their duties with regard to these patients, risk becoming vehicles for transmission themselves. It is therefore necessary to introduce appropriate instruments to ensure that 'fragile' people, especially those suffering from rare and complex diseases, are better protected, both by implementing measures to prevent the risk of contagion and, where contagion has already occurred, by preventing their health condition from deteriorating to the point of requiring hospitalisation. Clearly, now, any access to hospital, even for life-saving treatment, is a further source of risk and distress for them and their families, as well as adding to the workload of healthcare staff already prostrated by the COVID-19 emergency. It is therefore essential for this patient to have access to treatment at home, avoiding avoidable admissions to hospitals; where this is not possible, safe routes away from possible sources of contagion must be guaranteed. Therefore, as in the case of health emergencies, it would be appropriate to establish a social and socio-sanitary emergency service at the level of the socio-sanitary district, setting up services able to collect the requests of these citizens who need specialist medical services in an urgent and safe manner and therefore a reference point that can provide a response within a certain time.

In this COVID-19 emergency phase, CoReMaR (Regional Coordination of Rare Diseases) surveyed the needs of rare patients and highlighted:

1. The possibility for the patient/family member/caregiver to get in touch with the specialist doctor of the Rare Disease Centre to which the patient is referred.
2. The possibility of home monitoring for COVID-19 for the patient, his or her caregiver and the health care personnel involved in home care.
3. Possible in-depth COVID-19 diagnostics to be performed at home.
4. The prompt and safe home administration of anti-COVID-19 drugs to reduce disease progression in individuals who, due to the nature of their rare disease, have difficulty accessing COVID hospitals.
5. The prompt administration of the enzyme replacement drugs envisaged by the AIFA (Italian Drug Agency) determinations issued in COVID emergencies.

The HCasa system can meet all or part of these needs:

1. Teleconsultations are possible between specialist(s) (or other health and non-health professionals) and patient/family/caregiver.
2. Telecare, possible Diagnostics, and COVID-19 Telemonitoring on both patient and caregiver and ADI health personnel is possible.
3. The organisation of the various actors of the health care system is facilitated so that the needs expressed by the patient/family/caregiver can be taken care of, coordinating the various actors.
4. It is possible to organise, manage and monitor COVID-19 diagnostic examinations at the patient's home.
5. It is possible to organise, manage and monitor the home visits of health personnel for the administration of drugs or for any intervention necessary at the patient's home.

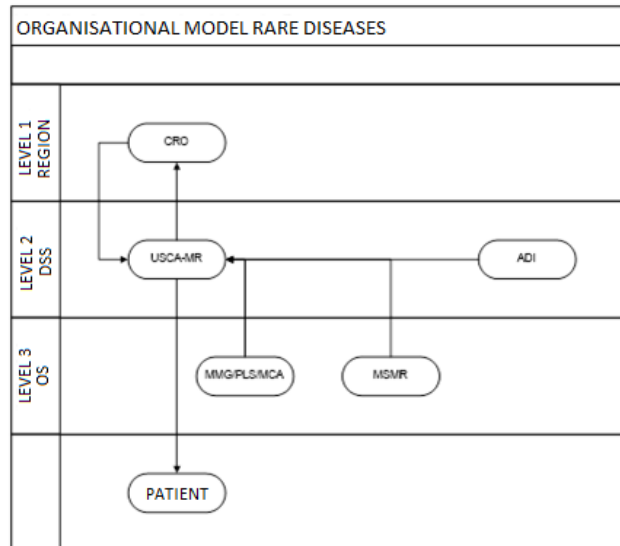
Thus making SERVICES available:

- A. PATIENT TELECARE AND TELEMONTORING
- B. COVID TELECARE AND TELEMONTORIND (PATIENT/OPERATORS)
- C. COLLECTION OF COVID/NO-COVID PATIENT NEEDS/ALERTS

The organisational model which, by exploiting the potential of the system, succeeds in guaranteeing the satisfaction of needs, sees, according to the general multi-level scheme:

- LEVEL 1 - CRO - Regional Operational Centre: Hub centre with the function of coordinating telecare activities (including teleconsultation) and telemonitoring of patients, and of taking charge of patient requests and needs.
- LEVEL 2 - USCA-MR - Special Units for Continuity of Care for the Rarely Ill: in the case of the Rarely Ill, these are made up, given the special conditions and needs of the patients, of 3rd level ADI personnel from the Socio-Health Districts, who act as the centre of responsibility for the activities of the USCA-MR, and possibly integrated with ad-hoc personnel for COVID-19 needs. The USCA-MR staff will have limited turnover for two reasons: the specific expertise the staff has acquired in the care of the specific patient and his disease, and the need to fight the epidemic. The USCA-MR has the task of carrying out all activities that require physical presence at the patient's home.
- LEVEL 3 - The Rare Disease Specialist Doctor (MSMR) of reference of the patient, Health Operators (MMG, PLS, MCA, MR Centres, 118) involved, supported by the USCA-MR, thanks to

the functionalities of the system, in their remote activities, with the task of fulfilling, on the court of patients assigned to them, the telecare and telemonitoring functions.



*Macro organisational-functional scheme*

#### Actors involved in services

- OS;
- USCA-MR;
- CRO;
- PATIENTS MR.

#### Typology of target users

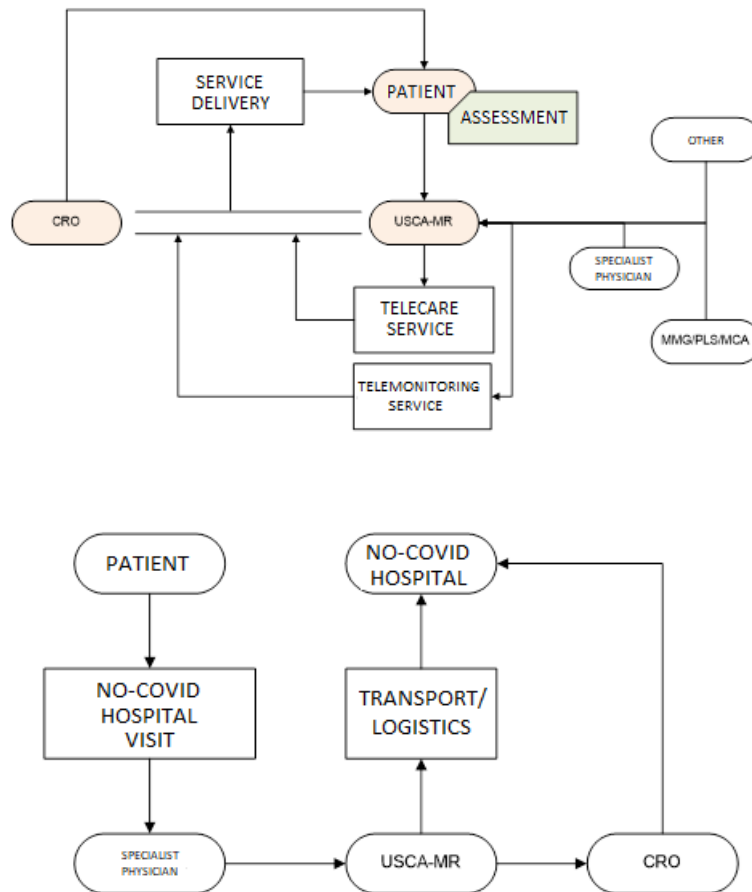
- **Complex Rare Illness Patients in Level III Integrated Home Care.**

#### OPERATIONAL REFERENCE MODEL

##### A - PATIENT TELECARE AND TELEMONTORING

1. The MSMR of the accredited hospital of the Rare Disease Network (ReMaR), through virtual room shared through the USCA-MR, performs clinical monitoring of the underlying disease, and monitors the effectiveness of therapy for MR and COVID-19.
2. If necessary, other OSs can visit the patient remotely.

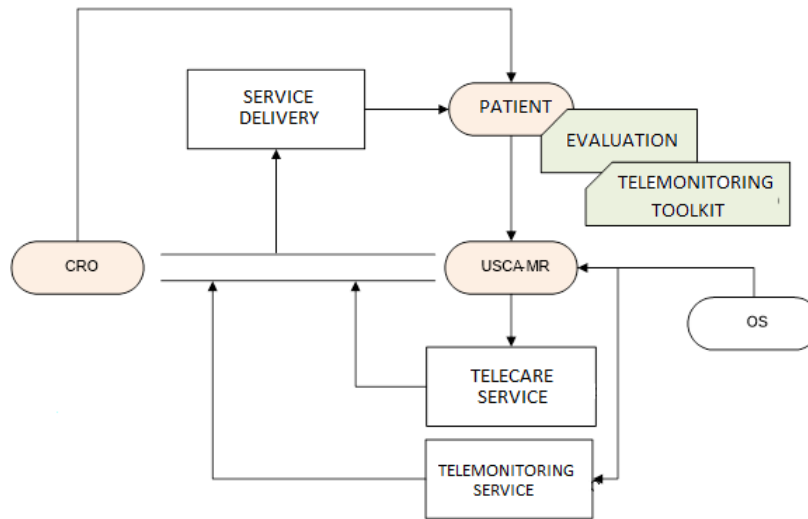
- If the patient requires a visit or admission to hospital, for therapies and services that cannot be provided at home, the specialist at the MR centre will organise access through USCA-MR, which will coordinate the Steps and logistics.



**B - COVID TELECARE AND TELEMONITORING (PATIENT/OPERATORS)**

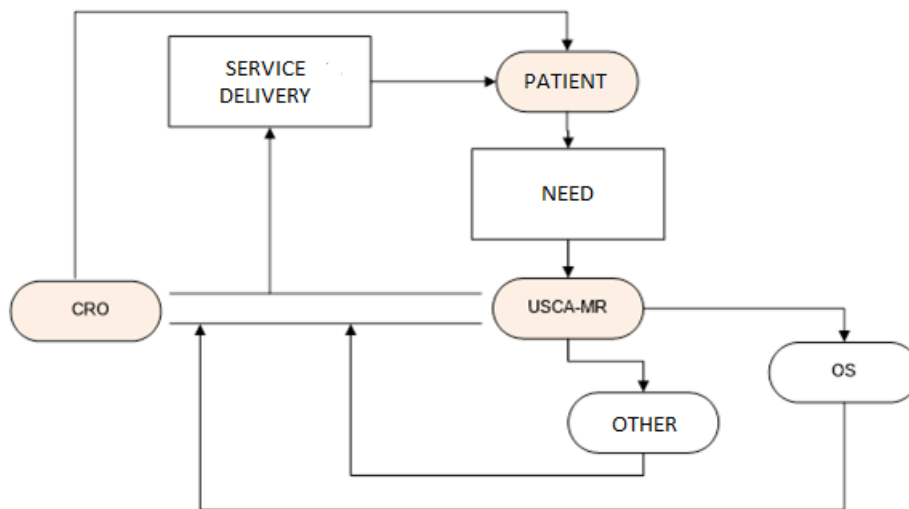
- The subject (patient/caregiver) is contacted by a health professional for a specific assessment.
- Following the assessment, MMG and/or USCA-COVID determines the activation of the telemonitoring service.
- Following the assessment, the MMG/MSMR/CRO/USCA-COVID determines whether a telemonitoring toolkit in its most suitable composition is also necessary.
- In the case of telemonitoring, the USCA-MR contacts the subject, assigns the telemonitoring toolkit, and trains him/her in its use.
- The control room, in agreement with the USCA-MR, starts providing the services.





**C - COLLECTION OF COVID/NO-COVID PATIENT NEEDS/ALERTS**

1. The patient expresses a need for care via WebApp/Other.
2. The CRO/USCA-MR/MSMR/MMG collects and evaluates the need.
3. The CRO activates any other parties that can meet the need.
4. The CRO/USCA-MR manages the needs and provides the service.



*PHASE 2 - Organisational model pre-triage whole population and covid-19 risk triage*

**Actors involved in services**

- OS;
- USCA-COVID;
- CRO;
- PATIENT.

**Typology of target users**

- **General population.**
- **COVID-19 suspected patients, positive for symptoms, coming from risk areas or contact with established COVID-19 patients, in self-isolation.**

**Services provided**

- Informal consultation, pre-triage questionnaire, information
- Telemonitoring
- Telecare

The target users benefit from the different types of services according to their type:

USER TYPOLOGY	HCASA SERVICES
GENERAL POPULATION	INFORMAL CONSULTATION
	PRE-TRIAGE QUESTIONNAIRE
	INFORMATION
COVID-19 SUSPECTED PATIENTS	INFORMAL CONSULTATION
	TELEMONITORING (EVENTUALLY)
	TELECARE

**OPERATIONAL REFERENCE MODEL**

**Pre-triage through webapp**

To make this Covid-19 infection prevention and management project effective, it will be necessary to extend the initiative to the population, raising awareness as much as possible. The solution foresees, in the first instance, the use of a Web APP provided to citizens, which will allow the user to carry out a self-assessment by filling in a questionnaire, acting as a pre-triage.

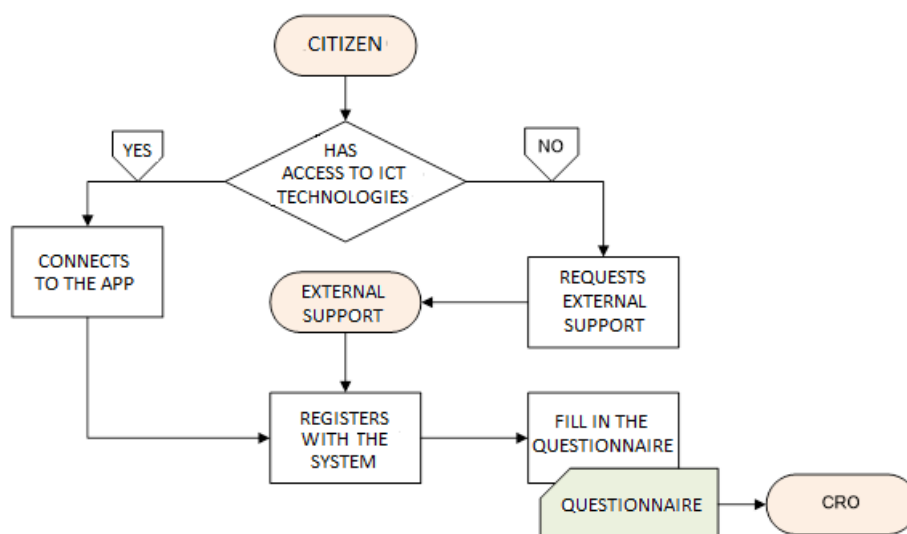
Access to the WebApp will be free and the entire population will be invited to use it to register and fill in the self-assessment questionnaire. The invitation to use the App will be disseminated through any institutional or non-institutional channel (newsletters, newspapers, institutional websites, municipalities, SMS, MMG/PLSs, etc.). The entire population will be invited to register on the WebAPP and to fill in the self-assessment questionnaire; naturally it will be necessary to take into account all those subjects who are not autonomous from the point of view of access to ICT technologies, to whom support will be provided in filling it in, inviting them, in this case, to contact their MMG, or the service centres indicated.

- **Users with access to ICT technologies**

1. The citizen connects to the WebApp, identifies him/herself and fills in the questionnaire.
2. The questionnaire will be sent directly to the CRO, which will set up the CASE MANAGEMENT system, evaluating the subject's situation.
3. The citizen remains at home and waits for possible communications.
4. However, the citizen may continue to use the WebApp to carry out a periodic general self-assessment by filling in the questionnaire again (in particular in the event of the appearance of new symptoms) and to access information regarding the behaviour to be followed.

- **Users without access to ICT technologies**

1. Citizens may directly contact the operations centre, their doctor, the authorised Continuity of Care stations, which will record and fill in the regional questionnaire for the citizen, subject to authorisation to process the data.
2. The result of the questionnaire will be sent directly to an operations centre, which will set up the CASE MANAGEMENT system.
3. The citizen remains at home and waits for possible communications.



Based on the results of the questionnaire, given by predefined scores, the following cases can be distinguished:

CASES	DESCRIPTION
PERSON WHO DOES NOT SHOW ANY SYMPTOMS AND IS NEGATIVE TO THE QUESTIONNAIRE	IN THIS CASE TELEMONITORING WILL NOT BE CONSIDERED NECESSARY, BUT THE CITIZEN WILL STILL BE REGISTERED IN THE CASE MANAGEMENT SYSTEM AND WILL SIMPLY COMPLY, LIKE ALL THE OTHERS, WITH THE LEGAL PRESCRIPTIONS
SUBJECT AT RISK	THIS CASES ACCESS A SPECIFIC ASSESSMENT THROUGH THE PRE-ENROLMENT PHASE.

### Pre-enrolment

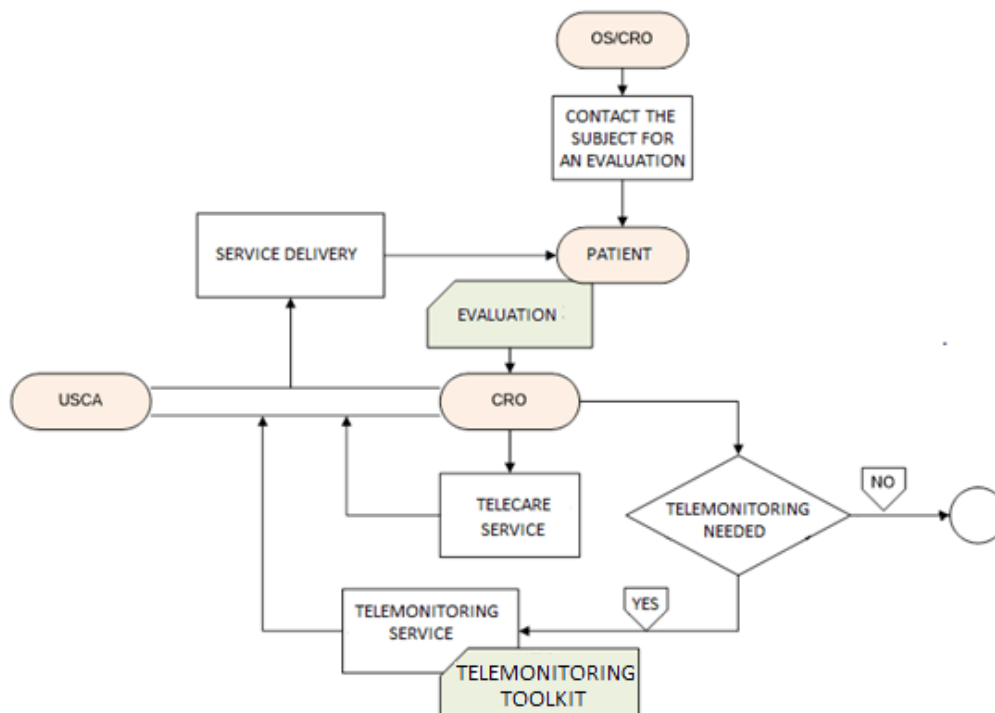
The pre-enrolment phase involves all subjects at risk, i.e., those who have self-declared as such or who have been assessed as such based on the questionnaire. The list of these people will be provided in part by the Health Information System of the Apulia Region, which for some time now has been making available online a questionnaire for those who have returned or are returning to Apulia from the previous red zones, as well as in part will be provided by the General Practitioners who will forward the reports on the basis of the cases that have presented themselves to them, and by the citizens who have gone or will go to the Emergency Department of their city declaring to be at risk or presenting suspicious symptoms.

After the individual cases have been assessed by a special Teleconsultation Team, those at risk will be entered into the telecare/telemonitoring platform, distinguishing between cases:

CASES	DESCRIPTION
NON-SUSPECT SUBJECT	IS NOT MANAGED BY THE HCASA SYSTEM. IS ADVISED TO CONTINUE TO FOLLOW THE NECESSARY CONTAINMENT, BEHAVIOUR AND HYGIENE MEASURES. HE/SHE MAY REPEAT THE PRE-TRIAGE IF THERE ARE ANY CHANGES IN SYMPTOMS.
SUSPECT SUBJECT	IN WHICH CASE HE/SHE IS CONTACTED BY A HEALTH PROFESSIONAL FOR A SPECIFIC ASSESSMENT. ACCESSES THE TELEMONITORING SERVICE AND, DEPENDING ON THE RESULTS OF THE ASSESSMENT, CAN ACCESS THE TELEMONITORING SERVICE

- **Suspect subject**

1. The person is contacted by an OS or CRO for a specific assessment.
2. Following the assessment, the CRO determines the activation of the remote surveillance service.
3. Following the assessment, the CRO determines whether a telemonitoring toolkit in its most suitable composition is also needed.
4. The competent USCA is notified to take charge.
5. In the case of telemonitoring, the USCA contacts the subject, assigns the telemonitoring toolkit and trains him/her in its use.
6. The CRO, in agreement with the USCA, starts providing the services.



## 2.2.5 Telecare and telemonitoring

**The telecare and telemonitoring (including remote surveillance) procedures are the same for each phase and each case.**

### Telecare modalities

Telecare is a telemedicine service that enables a general assessment of the patient's state of health. Interaction with the patient increases the patient's feeling of safety, situational awareness, and adherence to therapy and home isolation prescriptions. Telecare involves visual contact between the health professional and the patient, using the web application.

The telecare is planned in the telemonitoring (remote surveillance) pathway, once a day, by telephone agreement, using the smartphone available to the patient/caregiver based on the patient's clinical condition. During the telecare the OS/USCA:

- Collects additional anamnestic information.
- Assesses the patient's state of health as far as possible.
- Talks with the caregiver (if present).
- Evaluates the patient's clinical evolution with the help of the identified clinical referent and possibly with the identified specialists.

- Evaluates the opportunity to carry out any further investigations, alerting the appropriate operators and health structures.
- If necessary, alert the 118 emergency services to transport the patient safely to hospital.

Additional modalities: the telecare can be carried out by the doctors of the inpatient hospital units of discharged COVID-19 positive patients, clinically cured, after telephone contact with the patient/caregiver, and case management by the USCA.

### **Telemonitoring – toolkit**

As part of the management of people at risk, telemonitoring tools are made available (see chapter 3). In this case, telemonitoring of the patient at home provides for the collection of scheduled measurements on a bi-daily basis, at set times, and their transmission to the operations centre. The patient's condition may evolve positively over the next few days, with symptoms regressing until they disappear completely, or it may worsen and, subject to control by the specialists provided by the platform, in the most serious cases require transfer to the nearest hospital.

### **Telemonitoring – telephone and video calls**

Telemonitoring is a service to support the care of people in fiduciary isolation/quarantine, regardless of the caseload. This measure is very important to interrupt the chain of virus transmission and to avoid overloading the hospital system, allowing patients to be managed at home by the system. Patients in telemonitoring can simply be monitored with video calls and/or follow-up phone calls to check the stability of their health condition. The patient is notified when he/she is taken into care, and the system immediately notifies the other SOs involved. The SO/USCA, through the HCasa system, from their own stations, will have the task of carrying out the control calls for asymptomatic subjects and making sure that no worrying symptoms have appeared during the quarantine days and checking the punctuality of the transmission of the parameters of the group of subjects recruited with the kit, as well as the presence of alerts or special reports that are forwarded to the specialists on call. These specialists, in consultation with the OS/USCA, assess whether the alert is manageable at the patient's home, or whether it requires transfer to the nearest emergency department. In this case, the alert is forwarded directly to the 118 operations centre, which transfers the subject to hospital, where he is assessed and included in the treatment pathway envisaged for the case. Even the person who is transferred to hospital will continue to transmit his or her parameters to the operations centre so as not to lose traceability also for statistical and epidemiological purposes on the local case history of the infected.

During the telemonitoring period, the data collected, and the alarms generated by the application platform are made available by the CRO and made visible to the relevant OS/USCA.

### **Telemonitoring execution modes**

1. Telemonitoring is provided for:

- a. COVID-19 suspected or positive patients for whom, after assessment of the patient's clinical condition and logistical/housing situation (possibly by the competent USCA), home isolation is ordered.
- b. COVID-19 positive patients discharged from inpatient wards as clinically cured, still COVID-19 positive.
- c. Rare COVID/NO-COVID patients requiring constant evaluation of parameters.

Basic criterion for enrolling patients is the ability of the patient and/or caregiver to use electronic devices.

2. Following the activation of the home isolation procedure for the patients referred to in the previous point, the Telemonitoring service will also be activated by means of telephone and/or video calls, notifying the competent OS/USCA.

Delivery of the devices and instructions for use to the patient's home is the responsibility of the competent USCA.

### **Management of the Operations Centre and Telemonitoring Team - alert management**

Clinical parameters collected by telemonitoring devices are transmitted via internet, processed by the CRO and displayed by the referring OS/USCA.

### **De-hospitalisation and post-discharge telemonitoring**

The telemonitoring platform enables medical staff in the increasingly saturated local hospitals to discharge all COVID-19 positive patients who are admitted and deemed to be out of danger at an early stage, following their recovery and monitoring at home. The subject is enrolled and given a telemedicine kit that will be used for the scheduled measurement and transmission of vital parameters and monitored by telemedicine operators. Early discharge provides the opportunity to create new beds for the numerous requests for management of the severely infected. At the same time, enrolling the patient in the telemonitoring platform makes it possible to continue to follow the patient until the end of his or her recovery and thus contribute to the overall case census.



3.

THE TECHNOLOGICAL  
**PLATFORM**

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The HCasa Covid-19 Management System solution was conceived, in the moment of need linked to the outbreak of the COVID-19 pandemic, essentially to provide support to citizens and institutions, in a moment of extreme need and extreme emergency that saw the normal structures and organisational models enter extreme distress within a few days.

In the conditions that arose so quickly, one of the main objectives from the outset appeared to be to simplify and speed up the operational process of managing the Coronavirus pandemic, using systems and technologies capable of providing simple and immediate support to the entire healthcare system.

Having in place, at the time of need, a project such as TALIsMAN for the enrolment of frail and chronic patients - pathways that almost naturally overlapped with the enrolment process of patients potentially affected by COVID -19 and having co-founded and carried out a project for care continuity management such as 'Human Life Cycle Management - HLCM', appeared to be a providential opportunity to be seized at once.

The technological component of the HCasa Covid-19 solution, both in terms of systems and in terms of devices, thus derives directly from the project, HLCM, conceived in accordance with the principle of Population Health Management, which focuses its attention on the transversal planning of citizens' social and healthcare pathways, on the management of the various components of health and on the optimisation of governance in terms of effectiveness and efficiency, and which in HCasa Covid-19, has integrated its components with the organisational and management models of the TALIsMAN project. The technological model proposed by HLCM does not present itself as a verticalised model, but as an ecosystem of horizontal services and technological systems capable of integrating with each other based on the needs of individual cases or types of cases, going on to radically change what are the current patient management systems. It is precisely the modularity of the various components that has enabled HLCM's solutions, aided by the analyses and organisational models derived from TALIsMAN, to adapt to all those contexts - including the management of Covid patients at home - in which it is essential to analyse, measure, plan, and re-plan the care models to be dedicated to citizens. HLCM enables the re-modelling of care processes and care plans for individuals by allowing intervention at all stages of a citizen's life before he or she becomes a patient.

From the point of view of the systems and tools made available by HLCM, the main aspects (given also and above all the needs which emerged following the outbreak of the pandemic) on which the HCASA covid-19 Management System was based, concerned

- diagnosis and health risk assessment: prevention, early diagnosis, population health studies, through population stratification in relation to Covid-19 and based on government-issued triage and pre-triage guidelines.
- clinical decision support systems: optimisation and personalisation of care pathways, through monitoring dashboards and synoptic overviews of trends in key clinical parameters as well as key aetiological and epidemiological indicators.

self-care management: automatic adaptation and optimisation of remote monitoring/rehabilitation devices (Intelligent Environment), using monitoring systems and self-monitoring of citizens' health conditions and the evolution of the main parameters and aetiological factors of pathology.

### 3.1 Approaches, solutions and processes

To be able to define and identify the systems and technological components that could support the health system about the pandemic emergency, we started by identifying, through the organisational modelling of the guidelines issued at government level (see the previous chapter), those needs, activities and processes that could be satisfied and/or supported precisely by the systems and technologies in use or being tested.

Among the many needs that emerged in the emergency, those to which the systems and technologies in use were able to provide concrete answers were essentially:

- answering the population's questions on guidelines, codes and behavioural procedures, rules of access to health services.
- pre-screening the population to immediately identify possible positives through an anamnestic pre-triage and possible triage with the remote support of health workers.
- dealing correctly with suspected cases through the codification of guidelines in terms of processes and thus with the correct indication to both citizens and health workers of the correct procedures and behaviour to adopt.
- monitor the spread of the disease in real time through the continuous feeding of the regional databases and of the course states in suspected or confirmed patients who have not been hospitalised.
- act quickly to slow the spread by immediately taking charge of suspects.

The technologies and systems in use or under experimentation have in fact made it possible to approach these needs through:

- defining the leadership and alignment of the organisation, making it possible, thanks to the organisational models developed, to uniquely identify and coordinate the actors of the system with the system itself and its organisation.
- use of digital systems and tools capable of acquiring information and activating actions in real time.
- simplicity and speed of the proposed solutions.

In fact, the systems and technologies adopted have made it possible to:

- reach as many citizens as possible
  - via SMS sent in cooperation with mobile phone operators through which a link to a web app was provided.
  - through a public advertising campaign in which the entire population was invited to make use of the web app to pre-screen it.
  - public telephone numbers to be contacted for information.
- distribute an web app through which you can register to the system, obtain your credentials and access a web app, which is easier to use immediately, avoiding operations such as downloads, installation, etc.
- offer an automatic responder capable of guiding in the operations to be carried out.
- offer a tool for coordinating and monitoring actions in the territory.
- monitor clinical parameters remotely and offer an audio/video interaction system between citizens at home and health professionals.

while in terms of processes, they allowed:

- publish, via web app, a constantly updated, controlled and reliable pre-screening questionnaire.
- send the completed questionnaires in real time to the Control Centre, allowing the teams to define the next best steps for the citizen, in accordance with the guidelines and directives issued.
- sort questionnaires according to different criteria and plan home visits for specific patients (pre-triage, triage, and stratification).
- make all information available in real time to monitor the evolution of the epidemic.

And so, summing up:

### 1. REACHING OUT TO CITIZENS

- a. **use of SMS with link to Web app to reach as many citizens as possible.**

### 2. INVOLVING CITIZENS

- a. **web app Easily customisable by each institution: citizen verification, dissemination of controlled and correct information, pre-screening and re-evaluation questionnaires.**

### 3. SUPPORTING INSTITUTIONS

**present and filter real-time information from completed questionnaires; send notifications to territorial health units to activate specific pathways.**

## 3.2 Workflow and technology

To be able to achieve the above, the tools already in use for the two projects HLCM and TALISMAN were recalibrated and prepared in the light of the new needs and objectives.

### 3.2.1 Workflow

From the point of view of the workflow on which to base the choice of technological tools to be used, this can be summarised as follows:

1. CITIZEN REGISTRATION [**web app**]: the citizen must be enabled to interface with the systems in a simple yet secure and unambiguous manner. To this end, a web app has been prepared, accessible from all common computer and mobile phone devices, simply through a network connection. This web app allows citizens to register to the systems quickly and flexibly.
2. THE CITIZEN FILLS OUT THE QUESTIONNAIRE AND SENDS IT [**web app**]: the citizen, via the web app, carries out an initial self-assessment through an ad-hoc questionnaire, which is collected by the system.
3. QUESTIONNAIRE ARE RECEIVED IN REAL TIME BY THE COMPETENT HEALTH CARE/INSTITUTIONAL BODY, OPPORTUNATELY CONFIGURED [**portal/web service**].
4. THE PORTAL SHOWS IN REAL TIME THE LIST OF RECEIVED QUESTIONS AND THEIR STATUS, ENABLING THEM TO BE ORDERED ON THE BASIS OF PREDEFINED CRITERDS [**portal/web service**]: this allows an initial pre-triage phase.
5. IT IS POSSIBLE TO ASSIGN TO PRE-CONFIGURED CLINICAL OPERATORS AN IN-DOMICILE ASSESSMENT OF CASES THAT YOU WANT TO FOLLOW UP [**portal/web service**]: based on the lists of registered citizens, it allows you to focus on the cases that, according to the questionnaires filled in by citizens, deserve more attention.
6. THE CLINICAL OPERATOR RECEIVES ON HIS MOBILE DEVICE THE LIST OF CASES TO BE EVALUATED AT HOME [**portal/web service**]: based on the institutional guidelines and the organisational models adopted, the appropriate measures and interventions for the management of the most relevant cases are prepared.
7. HE CAN MANAGE THE CITIZEN'S ASSESSMENT AND TESTING ON THE MOVE [**web app/portal/web service**].
8. ALL DATA ARE SENT TO AND COLLECTED IN THE CONTROL CENTRE WHERE CRUSCOTS ARE ACTIVATED FOR VARIOUS TYPES OF DATA ANALYSIS [**web app/portal/web service/telemonitoring toolkit**]: the control centre allows monitoring the status of citizens, also through telemonitoring and telecare tools.

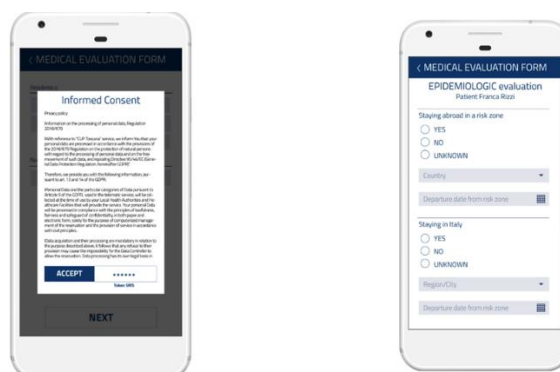
### 3.2.2 Web app

The first technological component is therefore the web app made available to all citizens and all registered operators, which allows citizens, either autonomously or by delegating someone on their behalf (e.g., minors, the elderly, the disabled), to register on the system. It is a tool that can be easily customised according to the needs and requirements of citizens or of groups or categories of them, as well as according to the specific needs of the managing bodies, whether health or not. Through it, it is possible to take advantage of various utilities (including information) and, above all, to register with the system in a univocal and secure manner, allowing the citizen's secure identification and providing the possibility of reporting to the system, at any time, any need related to one's situation.



*Web App - Interface*

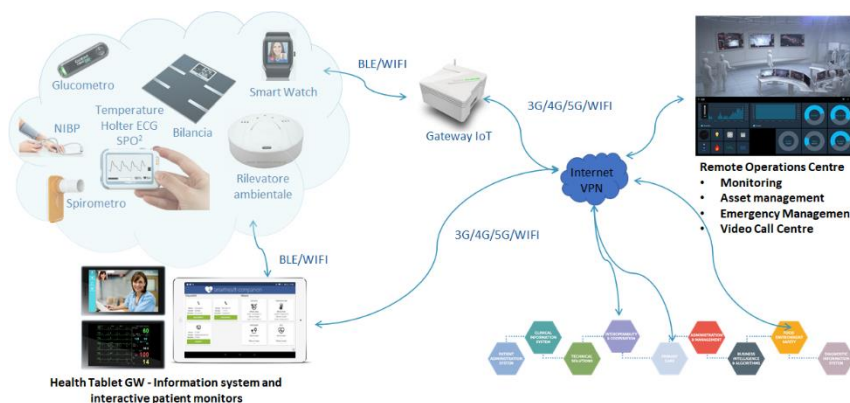
Also, through the web app, citizens give their informed consent to data processing, register their personal and contact details and complete the pre-screening anamnestic questionnaire.



*Web App - Informed consent and pre-screening questionnaire*

### 3.2.3 Portal/web service/telemonitoring toolkit

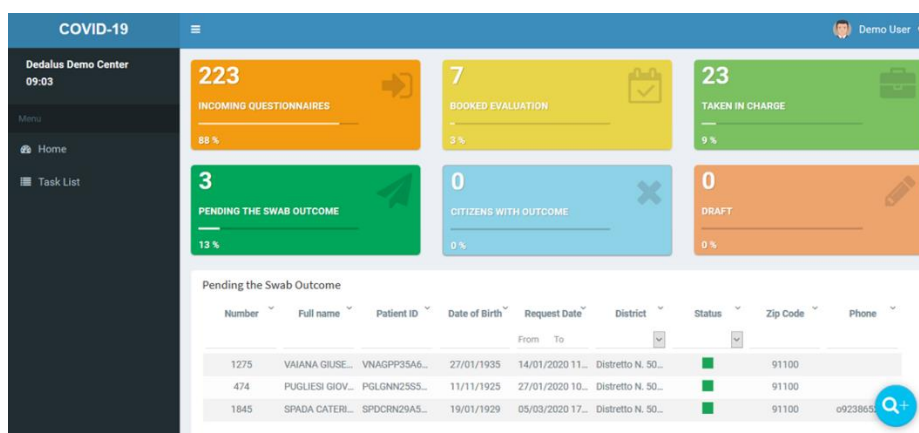
The entire management and control system is composed of several components, virtual and otherwise, spatially distributed but all interconnected. In its main components, it is possible to identify a web portal through which it is possible to access a whole series of web services made available to both citizens and health and institutional operators. The web services are accessible to all registered users limited to the services and functions enabled by means of access credentials to the various functions of the systems with multiple levels of security and operability.



*Technological and IT environment*

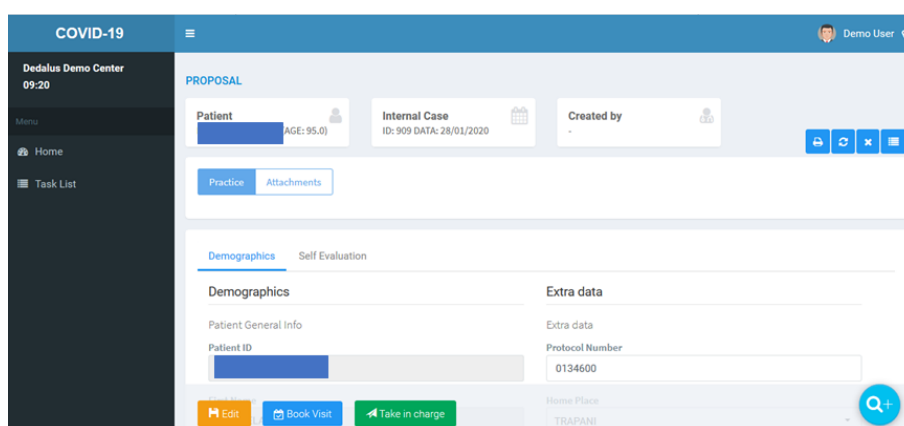
The choice of operating through web-services has made it possible to make the systems usable through any device connected to the Internet, and to connect any device that can be interfaced remotely with the systems.

The main interface services made available include various control and management dashboards. The main dashboard of the control centre allows the registered and authorised operator to have total or partial overviews (according to their access levels) of the registered users and their status (awaiting assessment, in assessment, taken in charge, etc.). The operations centre has visibility over the whole system while individual caregivers have visibility only over their patients and limited to the functionalities, they are responsible for. Just as patients can only view their own data or upload documents and records from devices but cannot make changes.



*Control and management dashboards*

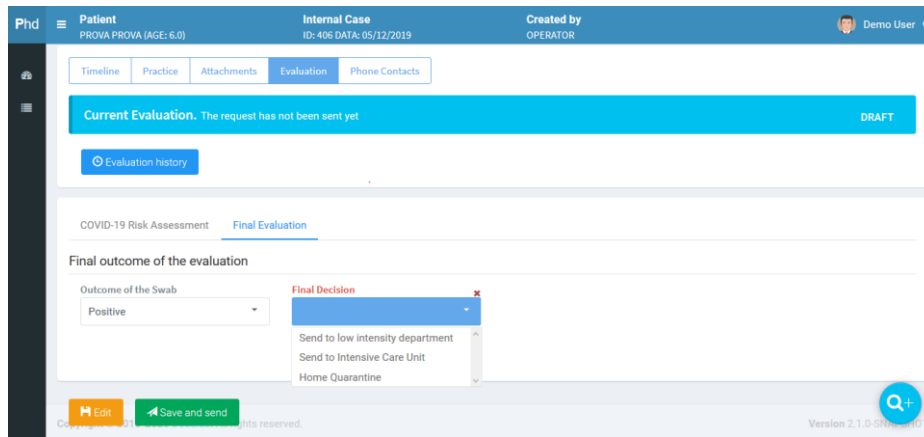
Through the dashboard and by accessing the files of individual registered citizens, it is possible to manage the operational workflows that operators will decide to assign on a case-by-case basis according to the results of the triage and assessments that will be carried out, based on the organisational models and institutional guidelines adopted for individual cases.



*Control and management dashboards*

In cases deemed pertinent, follow-up can be arranged to keep cases under observation and follow up at home, deciding, on a case-by-case basis, on the best means of monitoring (assessment or self-assessment of patients, televisiting and teleconsultation, telemonitoring with an instrumental kit) or their composition.

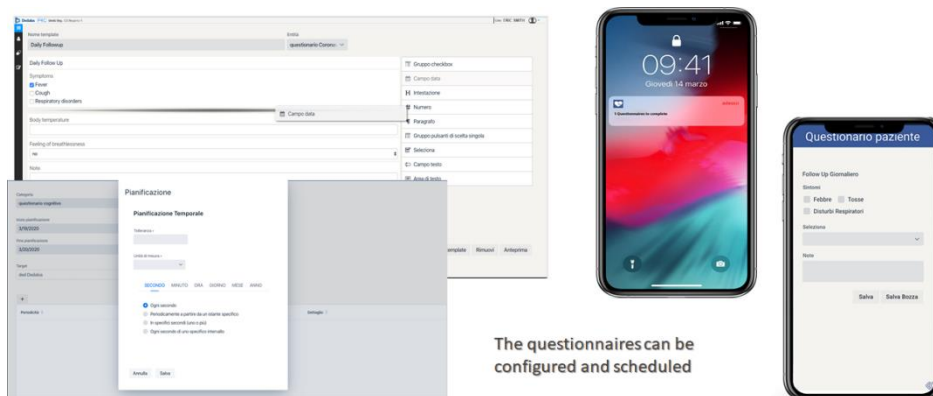




*Control and management dashboards*

### ***Patient self-assessment***

Patients, either autonomously or assisted (even by a remote operator), or directly the healthcare provider (perhaps connected by televisiting), can fill in daily evaluation questionnaires on the basis of which they can assess the condition and evolution of the case.

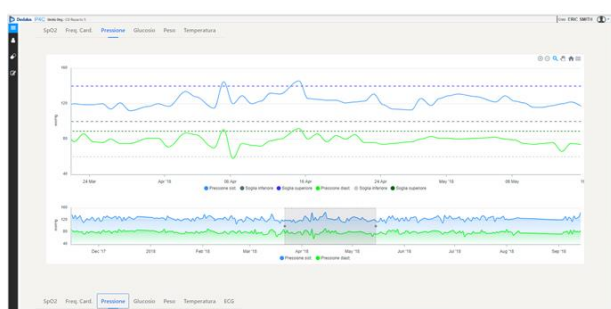


The questionnaires can be configured and scheduled

*Patient self-assessment*

### ***Televisiting and teleconsultation***

The system allows teleconsultations between qualified specialists, sharing patient information and televisiting with patients to assess their status and/or provide assistance, either in a scheduled mode or if it is necessary to take a direct view of their condition.



*Televisiting and teleconsultation*

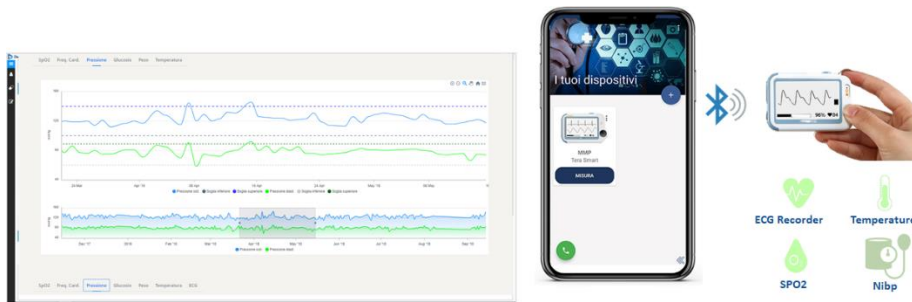
### **Telemonitoring with instrument toolkit**

The possible telemonitoring toolkit to be equipped with for patients under quarantine and home observation consists of the equipment to measure the main parameters associated with the disease and connected via a terminal (tablet or smartphone) to the system, to which it reports the values of the measurements that can thus be monitored remotely by the operations centre or by individual operators, including through alerts and automatic alarms in the event of non-standard conditions.

The composition of the telemonitoring instrument kit thus consists of:

- a mobile terminal (tablet or smartphone) with Internet connectivity via a mobile network.
- a set of devices that can be connected to the mobile terminal via Bluetooth for measuring monitoring parameters, consisting of:
  - thermometer for measuring body temperature.
  - pulse oximeter for measuring arterial oxygen saturation and heart rate.
  - device for measuring respiratory rate.
  - sphygmomanometer for blood pressure measurement.
  - Spirometer for measuring lung volumes.

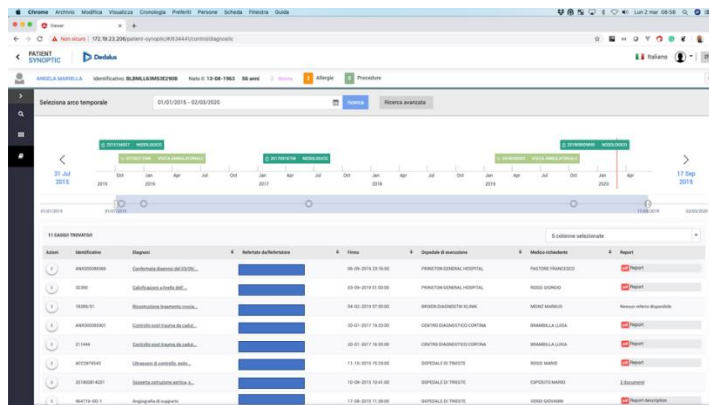
The configuration of the Telemonitoring toolkit, in terms of which devices to connect to the mobile terminal and its activation, can be carried out easily, autonomously and in a simplified manner by non-technical personnel (e.g., Doctors and/or Continuity of Care workers) who deliver the kits to patients' homes.



*Telemonitoring with instrument toolkit*

### **Control dashboards and KPI monitoring**

Through the system and its component services, it is therefore possible to have a continuous overview of the patient's situation and clinical evolution, also by means of synoptic overviews and evolutionary graphs of the main monitored parameters and of any Key Performance Indicators that can be processed based on the data collected.



*Control dashboards and KPI monitoring*

ACRONYMS  
**AND ABBREVIATIONS**

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**ADI** - Integrated Home Care

**AOU** - University Hospital

**ASL** - Local Health Authority

**CoReMaR** - Regional Coordination of Rare Diseases

**CRO** - Regional Operations Centre

**DPI (PPE)** - Personal Protective Equipment

**DSS** - Social and Health District

**ISS** - National Institute of Health

**MCA** - Continuity of Care Doctors

**MMG** - General Practitioners

**MR** - Rare Disease

**MSMR** - Rare Diseases Specialists

**MSS** - Territorial and Hospital Specialist Doctors

**OS** - Health Operators

**PCR** - Polymerase Chain Reaction (Covid-19 test)

**PLS** - Primary Care Paediatricians

**ReMaR** - Rare Disease Network

**SS** – Speciality Doctors

**USCA** - Special Units of Continuity of Care

**Interreg**  
**Greece-Italy**  
CoofHea

European Regional Development Fund



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**REGIONE  
PUGLIA**



**Project co-funded by European Union, European Regional Development Funds (E.R.D.F.)  
and by National Funds of Greece and Italy**

