

DESIGN AND ORGANIZATION OF AN INTERPROFESSIONAL NETWORK FOR HOME MANAGEMENT OF PATIENTS IMPLEMENTED DURING COVID-19 PANDEMIC AT ASL NAPOLI 2 NORD, SUITABLE ALSO IN THE DAILY MANAGEMENT OF CHRONIC PATIENTS LIVING IN THE SAME AREA

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KEYWORDS: Interprofessional network, Interdisciplinary network, USCA: Home Health Care, Units, Nodes

ABSTRACT

Introduction:

The Coronavirus SARS-CoV-2 pandemic has altered the perception of the current National Health Service (SSN). On one hand, the importance of a free and always accessible SSN for everyone has been strengthened. On the other hand, the fragility of a system with a too specialized and hospital-centered approach has become evident. In the pandemic context, the need to reverse the model by focusing on the needs of the community has become clear, with the main aim of promoting home-based management as much as possible for both chronic and acute conditions. This can be achieved through the creation of an integrated network involving all stakeholders in the care and assistance process, utilizing new technologies and telemedicine systems.

Materials and Methods:

The aim of this activity was to delve into an integrated network model for home care of Covid patients, within ASL Napoli 2 Nord. This model utilizes interconnected and functionally integrated structures and nodes, with defined pathways and operational procedures based on dedicated telemedicine platforms. These platforms facilitate the comprehensive management and care of Covid-19 patients by all network stakeholders.

Results were monitored using specific and dedicated indicators, collecting and analysing data from the period when the care of positive Covid patients began (November 2020), whose management did not require hospitalization.

Results:

From November 2020 to December 2021, the number of patients living in the ASL Napoli 2 Nord territory under home management included Home Health Care Units (USCA), non-ambulatory residential facilities undergoing non-pharmacological therapy (TNF), non-ambulatory vaccinated individuals receiving home vaccination, and vaccinated individuals in residential facilities, amounted to 38,223. Among these, 37.8% (14,476) tested positive for Covid.

The total number of accesses during this period was approximately 94,000, encompassing various types of care provided (TNF at home, TNF in facilities, home management of Covid+ patients, vaccinations in facilities, vaccinations at home for non-ambulatory patients). The shift has been significant, transitioning from managing the entirety of patients in hospitals to slightly over 4.5% of the total managed from December 2020 to December 2021.

Conclusions:

The sensitivity of healthcare managers during the pandemic period translated into the realization that the focus of the National Health System (SSN) and the Regional Health System (SSR) needed to shift, directing efforts increasingly towards the implementation of local healthcare policies.

The high number of hospitalizations recorded was not solely due to the increased number of infections, but also to the challenges faced in providing home care. Creating, developing, and continually implementing an interdisciplinary and interprofessional network, coupled with the development of technological infrastructures and more, ensured the ability to address the emergency. This guaranteed that all citizens received the necessary care and assistance to navigate this historically critical and unexpected moment.

The reproducibility of this system assures the possibility of further network implementation, not only in emergencies but also for the daily management of chronic patients. Moreover, in a time when, among other things, Mission 6 of the National Recovery and Resilience Plan (PNRR) has allocated resources amounting to 15.63 billion euros to be invested in the healthcare sector, most of which are dedicated to revolutionizing our SSN and ensuring its greater efficiency and effectiveness in the territory.

INTRODUCTION

The pandemic caused by the novel coronavirus Sars-CoV-2 has radically changed everyone's perception and idea of the current Healthcare System. On one hand, the importance of a free and accessible Healthcare System for everyone at any time has been appreciated. On the other hand, the fragility of a system focused on a specialized and hospital-centric perspective has emerged. Indeed, the situation can easily risk collapsing if there is an overwhelming demand for hospitalization, often due to inappropriate reasons or non-health-related difficulties. This can exceed the capacity of the system, especially in crisis contexts like the one that characterized the period from March 2020 until a few months ago.

The territory of the ASL Napoli 2 Nord is extensive and complex, encompassing four hospital facilities (Pozzuoli - level II emergency department -, Giugliano - the third largest city in terms of population and extension in the Metropolitan City -, Frattamaggiore, and the Island of Ischia - which also partially serves the Island of Procida) and 13 Districts that cater to around 1,000,000 residents across approximately 33 constituent municipalities.

upon or affected the individual's freedom. However, this time, in the face of a clear global threat without known treatments, the initial initiatives and interventions focused on the principle of isolation, which significantly reduced the virus's potential to spread from host to host.

This anomaly is also reflected in the instrument used by the legislator for setting rules going forward. In Italy, numerous Prime Ministerial Decrees (DPCM) have followed one another with the stated objective of containing and managing the epidemiological emergency derived from CoVid-19, since that now sadly notorious March 9, 2020. Only when treatments began to have encouraging scientific foundations and with the implementation of the vaccination campaign, the restrictions dictated by different DPCMs began to adopt a more clinical, epidemiological approach, and were less oriented toward curtailing personal freedom, although necessary previously.

Science, medicine, and the legislative aspect were all affected by the completely unexpected, aggressive, and ruthless nature of the virus's spread in the absence of adequate tools to combat this new enemy. A rapid reorganization of hospital and community care had to be undertaken. Throu-



Fig.1: Hospital Facilities and Districts Map of ASL Napoli 2 Nord

The regulatory aspect concerning Covid has been a new, complex, and intricate phenomenon that has impacted the global population as a whole, not only on a continental, national, or local level. The legislator found themselves facing something unprecedented in the modern era and in democratic states, where daily life is regulated by rules, albeit restrictive, that have never truly infringed

throughout the national territory for an extended period, services focused on supplying essential goods (food and medicines), and the National and Regional Health Systems had to allocate funds and generate ideas to redesign service provision and obtain specific devices, which up to that point, had been scarcely used (such as disinfecting gels or forced ventilation helmets).

In particular, hospitals had to swiftly modify and reorganize their departments, increasing bed capacity in intensive care and resuscitation units, which initially were the only places where patients were assisted, sometimes causing significant issues due to overcrowding in these units and even leading to the heartbreaking choice for healthcare providers of which needy patient to accept and which to reject.

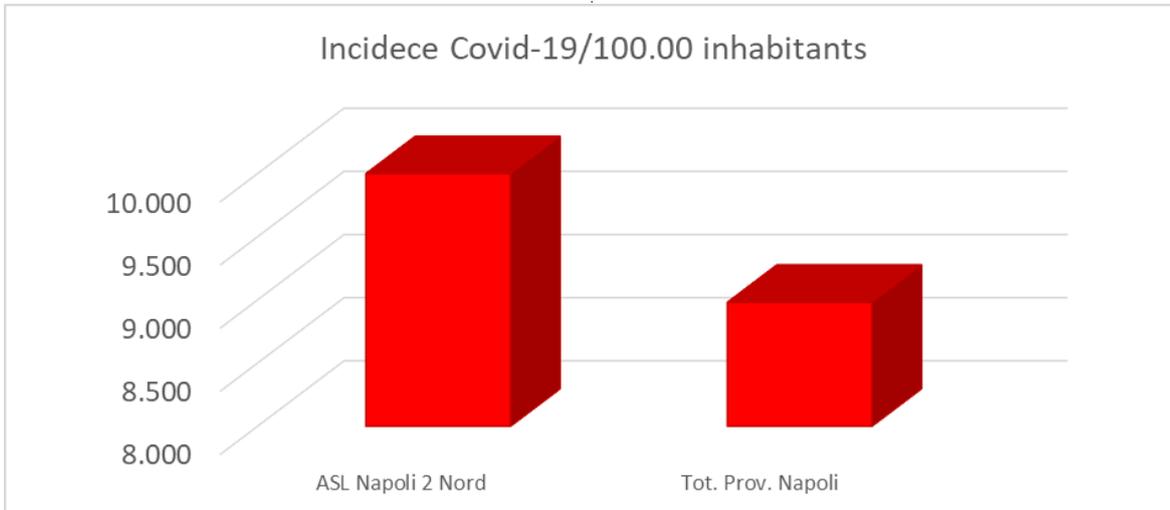
In light of this distressing and alarming situation, numerous departments were converted to provide Covid assistance, with the obvious consequence that only acute emergencies were managed, and planned procedures were postponed, including preventive diagnostic phases. In the initial phase of the pandemic, the hospitals in the ASL Napoli 2 Nord recorded 3,733 admissions (371 in ICU) related to Sars-CoV-2 infections.

In facing this extraordinary and unexpected condition, the path of the interprofessional network, based on the constant principles of collaboration and connection, emerged as a solution to efficient-

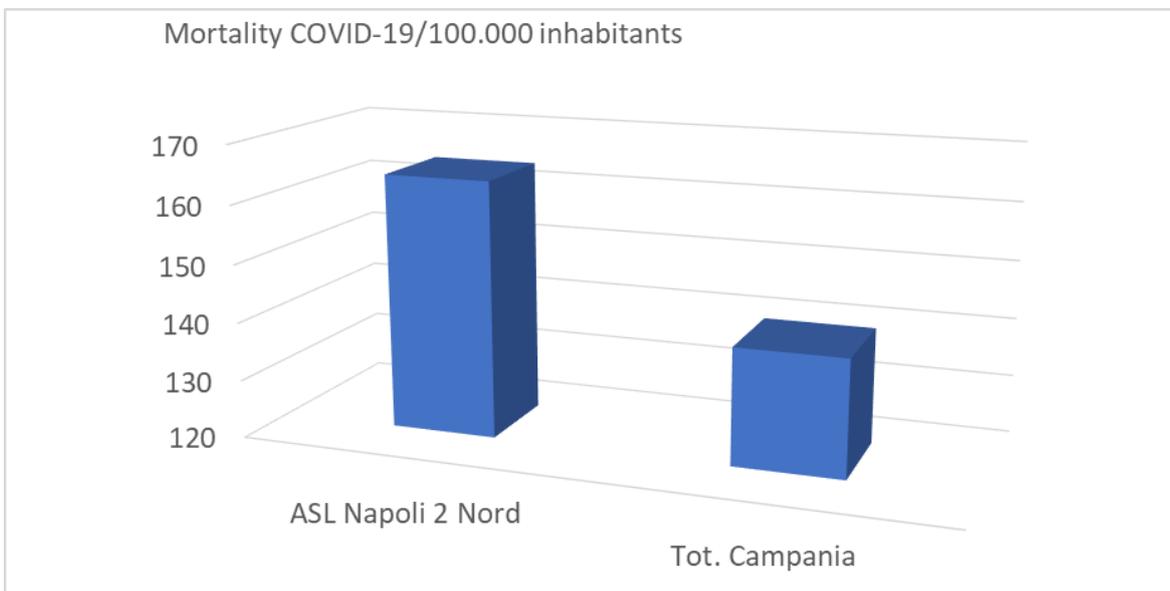
ly, effectively, and decisively manage patients afflicted with Sars Covid-19, aiming to relieve the congestion of the departments so they could progressively return to fulfilling their original missions.

Within the context of the latest pandemic, the need to shift from the current hospital-centric model to a territory-centered model became evident. The necessity was grounded in promoting as much home-based management as possible for both chronic and acute conditions requiring medium-low intensity care. This has been achieved through the creation of an integrated network, involving all actors in the care and assistance process, through the use of new technologies and telemedicine systems.

The typical characteristics of high transmissibility, extreme variability in clinical presentation, and subsequent clinical management of COVID-19 made it an ideal inspiration for creating an integrated network for home care. Therefore, the present work intends to delve into a model of an inte-



Graph 1: Covid-19 Incidence per 100,000 Inhabitants in the Territory of Napoli 2 Nord vs Total Inhabitants in the Metropolitan City of Naples



Graph 2: COVID-19 Mortality per 100,000 Inhabitants: Territory Napoli 2 Nord vs. Total Population of Campania Region

grated network for the home care of Covid patients in the territory of ASL Napoli 2 Nord.

This principle is based on alarming data that has been collected regarding the incidence, mortality, and morbidity of COVID-19 in the early stages of the pandemic. Particularly, an incidence of 10,000 cases/100,000 inhabitants was recorded in the territory of ASL Napoli 2 Nord, compared to 8,981 cases/100,000 inhabitants in the Metropolitan City of Naples.

Comparing in the same period, COVID-19-related deaths were recorded at a rate of 164 per 100,000 inhabitants in the territory of Napoli 2 Nord, compared to 140 per 100,000 inhabitants for the entire Campania Region.

During the same period, a considerable number of transfers to hospitals outside the ASL were carried out due to overload of the local hospital network.

MATERIAL AND METODS

The basic principle for structuring an in-depth process of an interprofessional network was to create and/or implement specific actions and monitor them with the analysis of specific indicators. The actions that were primarily focused on include:

- Creating a patient care platform for COVID-19;
- Establishing a network for sharing best practices;
- Developing a social support network;

- Providing healthcare services;
- Implementing overall indicators.

Once the patient care platform was established, the need to monitor it by analyzing indicators to control its progress arose. This has been carried out, considering the numbers of activated "Patient" and "Healthcare Provider" profiles and interactions on the platform, both in terms of the total and for each individual patient. Simultaneously, the need to create a dense and efficient network for the exchange of good clinical practices emerged. This network utilized a corporate care protocol, continuously examining the number of meetings for comparison, training, and protocol updates.

Considering the growing prominence of the social aspect of the pandemic, there was a necessity to establish a social support network based on the number of initial psychological assessments conducted, sessions of psychological support provided, socio-sanitary evaluations performed, and socio-sanitary care interventions.

From a practical standpoint, evaluating the network's effectiveness required focusing on the provision of healthcare services and their assessment. This involved verifying the number of home-based USCA visits conducted, home-based laboratory tests performed, home-based X-rays and ultrasounds administered, specialist consultations, hospitalizations, emergency network interventions, and monitoring hospitalization and mortality rates.

The organization of the interprofessional network



Fig. 2: Network and Nodes

aims at primary and secondary objectives that differ in nature, characterizing their focus. In the former case, the focus was directed more specifically towards the individual, the patient; in the latter, towards the quality of care.

Thus, it became essential to ensure comprehensive care for individuals affected by the condition in order to reduce inconveniences for patients and their families, while also reducing avoidable hospitalizations without losing sight of resource rationalization. At the same time, it was necessary to ensure a qualified and consistent healthcare response by implementing common informational tools and informational connections between facilities. At this point, the acquisition of specific professional skills among healthcare providers

became an increasingly crucial need, as well as evaluating treatment outcomes, treatment appropriateness, levels of quality provided, and the economic impact in terms of cost-benefit analysis.

RESULTS

The expected outcome of this investigation corresponds to an evident improvement of the home care of patients affected by COVID-19, with the additional goal of creating an integrated network among care providers and healthcare professionals in general, thereby contributing to the implementation and exchange of best practices.

The indicators used to assess the progress and results achieved by this project will be categorized as follows:

| Actions: | Indicators |
|---|--|
| Creation of a patient care platform. | Number of initial psychological assessments conducted Number of psychological care sessions attended Number of socio-sanitary evaluations conducted Number of socio-sanitary care interventions performed |
| Establishment of a network for the exchange of best clinical practices. | Creation of a company care protocol Number of meetings for protocol discussion and updates Number of training sessions |
| Establishment of a social support network. | Number of initial psychological assessments conducted Number of psychological care sessions Number of socio-health assessments Number of socio-health care interventions |
| Execution of healthcare services. | Number of home visits by USCA (Home Care and Social Assistance Unit) Number of in-home laboratory tests conducted Number of in-home X-rays and ultrasounds performed Number of specialist consultations |
| Implementation of general indicators. | Number of hospitalizations Hospitalization rate Number of interventions by the emergency network Death rate |

Table 1: Action and Indicators

It is possible to gather and analyze data from November 2020, the period when the management of COVID-positive patients began, whose condition did not require hospitalization. From November 2020 to December 2021, the number of patients residing in the ASL Napoli 2 Nord territory, under home management by USCA, non-pharmacological therapy (tnf) in residential facilities, non-ambulant home vaccinations, and vaccinations in residential facilities, amounted to 38,223.

Among these, 37.8% (14,476) were COVID-positive.

It is also important to note the total number of accesses during the period, which was recorded at approximately 94,000, and their nature, referring

to tnf at home, tnf in facilities, management of COVID+ patients at home, vaccinations in facilities, and vaccinations at home for non-ambulant patients.

The last goal of the interventions remained the decongestion of hospitals due to hospitalizations of COVID-19 positive patients. Considering the periods under examination, the number of hospitalizations, and the average of positive results from molecular and antigenic tests in Campania, there has been a transition from managing almost all patients in hospitals to a little over 4.5% of the total managed during the period from December 2020 to December 2021 (870 out of approximately 16,000 positive patients managed in the territory of ASL Napoli 2 Nord).

| Reference Period | * N°of Patients Under Care | N° of COVID Patients | ** N°of Accesses |
|---------------------|----------------------------|----------------------|------------------|
| Nov-Dic 2020 | 7.569 | 2.536 | 18.165 |
| First Quarter 2021 | 8.190 | 3.457 | 20.107 |
| Second Quarter 2021 | 6.792 | 2.856 | 18.576 |
| Third Quarter 2021 | 4.123 | 1.645 | 11.227 |
| Fourth Quarter 2021 | 11.549 | 3.982 | 25.687 |
| Totals | 38.223 | 14.476 | 93.762 |

Tab.2: Hospitalization Numbers Mar 2020 Nov 2020 – Dec 2020 Dec 2021 and Number of Accesses

| Reference Period | N° of COVID Hospitalizations | Monthly Average | N° of COVID Positives in Campania | Monthly Average |
|------------------|------------------------------|-----------------|-----------------------------------|-----------------|
| Mar 2020 | 258 | 28,6 | 155.319 | 17.257,66 |
| Nov 2020 | | | | |
| Dic 2020 | 870 | 66,92 | around 350.000 | 26.923 |
| Dic 2021 | | | | |

Table 3: Numbers of Hospitalizations Mar 2020 Nov 2020 – Dec 2020 Dec 2021 with Monthly Average

This document outlines a proposal for organizing the clinical and healthcare management of individuals affected by COVID-19 in terms of rescue, diagnosis, treatment, and rehabilitation in a consistent manner across the entire territory of ASL Napoli 2 Nord.

The in-depth work identifies the involved facilities, defines their roles, the technological and organizational levels they must ensure, and provides general guidelines to be adopted in the organization of the network.

The network for the healthcare management of patients with COVID-19 is established with the aim of ensuring the most suitable organizational structure across the entire territory of ASL Napoli 2 Nord to address a condition that exhibits extre-

mely variable clinical presentations and resource requirements, as well as widespread dissemination and engagement of the Healthcare System. The organizational structure must allow maximum clinical-care opportunities for citizens in terms of:

- Improved possible care;
- Access to the best treatments, as established by accredited international and national guidelines and endorsed by scientific societies;
- Decongestion of the hospital network, also by centralizing cases in facilities that are technologically and structurally most appropriate, based on the severity of the clinical picture.

The establishment of such a network is therefore of particular importance as an organizational method capable of connecting various professionals,

in various capacities, both at the territorial and hospital levels, to create the most appropriate and suitable care pathways for the various stages of the condition in question and to provide appropriate health responses to affected individuals.

The COVID-19 network of ASL Napoli 2 Nord aims to ensure a comprehensive care of individuals affected by the condition to reduce avoidable hospitalizations, minimize discomfort for patients and their families, and rationalize available resources. Additional specific objectives achievable through the reorganization of the healthcare network are listed below:

- Ensuring a qualified and homogeneous healthcare response across the entire territory of ASL Napoli 2 Nord by sending the most appropriate resources based on clinical and healthcare needs.
- Ensuring patient care according to harmonized and shared clinical guidelines and processes involving all network participants.
- Ensuring, when necessary, the swift transport of the individual to the most suitable hospital facility based on the severity of the clinical case, in order to guarantee prompt and effective treatment from a clinical-care perspective (the right patient, in the right place, at the right time).
- Implementing common informational tools to enable collaborative work and informational connection between facilities, as well as the availability of consistent data for performance evaluations of the services

provided and to ensure the flow of information.

- Promoting the acquisition of specific professional skills among the operators involved at various levels, through the implementation of common training initiatives in order to create synergies, promote integration among operators throughout the network, and disseminate good clinical practices.
- Monitoring the professional sustainability of healthcare operators who, in various capacities, operate within the network and participate in the diagnostic-therapeutic pathways of the condition.
- Evaluating, also through benchmarking actions, the outcomes of treatments, the appropriateness of treatments, and the quality levels provided by the constituent facilities of the network.
- Evaluating, also through benchmarking actions, the economic impact in terms of cost-effectiveness in relation to the activities carried out at various levels of the network.

The corporate COVID-19 network utilizes facilities or nodes that are functionally articulated and integrated with each other through defined paths and operational methods based on dedicated telemedicine platforms, guaranteeing comprehensive care for COVID-19 patients across the entire corporate territory through the involvement of all network stakeholders.



Fig. 3: Interprofessional, Interdisciplinary, and Infrastructure Network

For each patient, a care management record is created on a dedicated telemedicine platform, to which all assigned actors are given access and are required to contribute, according to their competence. These actors include those based on the patient's district (General Practitioners/Primary Care Physicians, District USCA Team, District Social Workers, and Psychologists), based on the patient's needs (Specialist Physicians, Hospital Facilities), or as coordination and control bodies (Department of Prevention and Epidemiology and USCA Central Operations).

Moments of interaction between network actors are planned, which can occur both in person and remotely:

Between General Practitioners/Primary Care Physicians, District USCA Team, District Social Workers and/or Psychologists, and any Specialist Physicians involved in the patient's care. These meetings are held upon request of at least one of the network actors and at the end of the patient's journey.

Among all network actors, including those with coordination roles. Periodic collective meetings between network actors are scheduled, with a frequency of at least quarterly. These meetings serve both for exchange and training purposes for the actors. The frequency may be adjusted based on the epidemiological situation, guideline updates, or identified criticalities.

General Practitioners/Primary Care Physicians, as patient case managers, are responsible for opening the care management record and ensuring its correct completion in terms of physiological, past and upcoming pathological history, chronic therapy if applicable, and any ongoing therapy. They are also responsible for remote health monitoring (by completing the relevant section of the record), requesting the first USCA home visit (and/or any other necessary USCA visits due to sudden worsening of clinical conditions identified during remote health monitoring), and notifying coordination bodies of any Specialist Physicians following the patient with chronic conditions who need to be involved in the management (e.g., Diabetologist, Cardiologist, etc.). They coordinate, in collaboration with other network actors, the necessary therapy and issue prescriptions.

USCA units are divided into USCA Central Operations and District USCA Teams (consisting of both medical and nursing personnel). The USCA Central Operations play a coordinating role: they receive and allocate requests for home tests and home visits to various District USCA Teams, organize calendars for visits, interface with the territorial emergency network, hospital facilities, and the Department of Prevention and Epidemiology, involve any necessary Specialist Physicians by organizing exchange moments with other network actors, and facilitate communication.

District USCA Teams perform home tests and home visits, assessing the patient's progress in

person and conducting basic diagnostic tests and medical therapies at home. They attend any video consultations with Specialist Physicians if necessary, to facilitate execution or accompany the specialist if an in-person visit is not possible via telemedicine. After the visit, they update the patient's care management record, request any intervention from the Specialist Physician, confirm or modify the therapy and/or schedule for the next visit, and, if necessary, recommend hospitalization for the patient.

Specialist Physicians have access to the patient's care management record, supplementing the activities of General Practitioners/Primary Care Physicians and USCA Teams as needed. They mainly work through telemedicine and conduct scheduled home visits with the assistance of USCA Teams where necessary. They collaborate with other network actors for comprehensive patient care.

Social Workers and Psychologists are integral parts of patient care and collaborate with other network actors to avoid "social hospitalizations." They conduct an initial evaluation upon the patient's entry into the care network. Social Workers, in particular, assess the patient's social circumstances, particularly whether maintaining home isolation or hospitalization in COVID-19 residences is possible. They create a social support network, including involvement of the third sector, for daily needs (e.g., groceries, pharmacy) if the patient and their family are unable to provide autonomously (e.g., elderly individuals incapable of ordering groceries, etc.). Psychologists perform an initial evaluation and update it over time if necessary, offering support to the patient and family for psychological difficulties that may arise during the care journey (anxiety, isolation, grief, etc.).

The Department of Prevention and Epidemiology coordinates together with USCA Central Operations and the territorial emergency network, interfaces with hospital facilities, and directly oversees the work of Collective Prevention Operational Units, taking responsibility for epidemiological surveillance, maintaining and ensuring the proper functioning of registers and databases, and the IT infrastructure underlying the network. Additional responsibilities of the Department of Epidemiology and Prevention include creating access profiles for network actors and updating the network on regulatory provisions and guidelines. The Department of Epidemiology and Prevention also has the unique and universal authority for public health issues across the entire territory if the regulations are unclear or open to interpretation.

Collective Prevention Operational Units perform tasks of epidemiological surveillance and data updates within their respective districts. They handle epidemiological surveillance and all necessary public health actions based on regulations and opinions from the Department of Epidemiology.

Hospital facilities will admit COVID-19 patients if home management is not feasible according to territorial care network actors' judgment or, in cases of health emergencies, as determined by 118 emergency physicians.

Hospital facilities communicate twice daily on the availability of dedicated COVID-19 beds to both the Territorial Emergency Central Operations and USCA Central Operations. They differentiate the types of available beds (ward department, semi-intensive care, intensive care).

Daily, hospital facilities communicate any admissions, discharges, and deaths to the Department of Epidemiology.

Essential equipment provision (Number to be calculated based on expected interventions):

Telemedicine and care management platform
Tablets with sanitizable covers for District USCA Teams. Basic equipment kit for District USCA Teams (Blood pressure monitor, thermometer, pulse oximeter, basic hematology and biochemistry analyzer, blood gas analyzer, ultrasound machine, computer-linked electrocardiograph, and portable computer-linked X-ray machine).

CONCLUSIONS:

The sensitivity of healthcare managers during the pandemic translated into the realization that the focus of the National Health Service (SSN) and the Regional Health Service (SSR) needed to shift towards implementing territorial health policies.

The high number of hospitalizations recorded was not solely due to the increased number of infections, but also to the difficulties encountered in

providing home care. These difficulties can essentially be attributed to three main reasons:

Lack of communication with General Practitioners (GPs) and specialists (for complex/chronic patients). Often, due to challenges stemming from a high number of patients and a lack of reliable communication means, it was difficult, if not impossible, to communicate with patients' GPs, making it challenging to manage and often leading to hospitalization of chronic patients who needed at least phone check-ups between visits by USCA teams (usually scheduled every 3-4 days). This need was even stronger and harder to achieve when patients, due to pre-existing conditions (often oncological or neurological), required constant monitoring by their respective specialists.

Lack of social support in vulnerable contexts (elderly, isolated individuals, families with low socio-cultural status and low education). In this context, hospitalization took on the characteristics of a "social hospitalization" for those patients who lacked a strong social network to enable them to remain at home.

Insufficient number of human resources and tools for conducting simple and minimally invasive tests at home.

The creation, development, and increasing implementation of an interdisciplinary and interprofessional network, along with the development of technological infrastructures and more, ensured the ability to address the emergency, providing all citizens with the necessary care and assistance to overcome this historically critical and unexpected moment.

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