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COVID-19 Management at Vall d'Hebron University Hospital (Abridged)

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At the beginning of June 2020, Dr. Albert Salazar, manager of Vall d'Hebron University Hospital (HUVH in Catalan and Spanish), expressed his satisfaction with how the hospital had been able to manage the COVID-19 crisis—which already seemed be under control—and his concern about post-COVID management, which would bring with it a series of both challenges and opportunities.

Dr. Salazar had taken on the position of HUVH manager at the end of June 2019, and the beginning of the COVID pandemic had coincided with the preparation of the hospital's new strategic plan (2021-25). After making it through the most critical moments of the pandemic, he was sure that the hospital's strategy for the future would be different. He stated:

> The consequence of COVID must be a transformative evolution of the healthcare organizational model supported by two concepts: (1) regional territory; the need to work on any project in collaboration with all the region's actors; and (2) internally promoting multidisciplinary teams, since COVID has shown us that working together across specialties and different levels, doctors and nurses working together... breaking down the traditional silos, and sharing knowledge, can make it possible to achieve far superior results in terms of patient care. None of these elements is new, but COVID has made them much more visible, and now we must take advantage of them in how we transform the hospital.

This case was prepared by Professors Jaume Ribera, Mihalis Markakis and Weiming Zhu, with Miguel Cebrián, research assistant, and Mariona Esquerdo and Laia Arnal, respectively, Business Development Project Manager and Director at the Vall d'Hebron Institut de Recerca (VHIR). February 2021.
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Vall d'Hebron University Hospital

The Vall d'Hebron General Hospital was inaugurated in 1955 and was the first hospital built in the Spanish state by the Compulsory Health Insurance (*Seguro Obligatorio de Enfermedad*), which had been created in 1942. Later, in 1966, the School of Nursing was inaugurated,

> and in 1967 two more hospitals were opened: the Traumatology and Rehabilitation Hospital and the Maternity and Children's Hospital. In the decades that followed, these centers expanded in both space and services offered; at the same time, their teaching potential also grew. It was then that the need for carrying out research in the field of health began to emerge.
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> Research at Vall d'Hebron was consolidated in 1994, with the birth of the Vall d'Hebron Research Institute, and received the ultimate boost ten years later when a specific building dedicated to research laboratories was inaugurated on the Vall d'Hebron Campus. In 2005, research on the campus expanded once again, with the establishment of the Vall d'Hebron Institute of Oncology, specialized in cancer research.
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> Later, in 2012, the new facilities of the Centre d'Esclerosi Múltiple de Catalunya (Cemcat), were inaugurated, consolidating it as a unique center dedicated to multiple sclerosis. This move expanded the services and studies dedicated to the disease, which until then had been carried out in the hospital's Clinical Neuroimmunology Service. With all this potential, it was clear that it was necessary for the different parts of the hospital to work together to improve coordination.[1]

At the beginning of 2020, HUVH had 1,154 hospital beds, an ICU capacity of 56 adult beds, and an area of direct influence over 430,000 inhabitants and an indirect influence over more than 2,000,000. Each day, 50,000 people came through the hospital; the space was made up of 22 buildings with 9,000 professionals, 531 medical residents, and 2,000 researchers in 85 research groups; it conducted some 1,300 clinical trials and provided training in 47 specialties as well as in biomedical research. In 2019, it provided medical care to 1.2 million patients (children and adults), treated 204,537 emergency cases, performed more than 35,467 surgeries and 319 transplants, and conducted 67,646 discharges and 923,403 visits to outpatient clinics. It was the largest hospital in Catalonia and the second largest in Spain.

The COVID-19 Pandemic

Throughout history, nothing has been more deadly to humanity than infectious diseases. On December 31, 2019, the WHO was informed of cases of pneumonia of an unknown cause in the city of Wuhan, China. Chinese authorities identified a new coronavirus as its cause on January 7, 2020 and temporarily named it 2019-nCoV and later SARS-CoV-2; the disease the virus caused was called COVID-19. On March 11, 2020, the rapid increase in the number of cases outside China led WHO Director-General Dr. Tedros Adhanom Ghebreyesus to classify the outbreak as a pandemic. By then, more than 118,000 cases had been reported in 114 countries, with 4,291 deaths recorded worldwide. The first case in Spain was detected on January 31 in La Gomera (Canary Islands) and the first in Catalonia, on February 25. On March 14, the Spanish government decreed a state of alarm and lockdown for the country's population.

[1] Val d'Hebron. "Historia." Vall D'Hebron Barcelona Hospital Campus. Last modified June 17, 2019. https://www.vallhebron.com/es/el-campus/historia.

COVID-19 patients had very diverse clinical manifestations; the causes behind this variability were unknown, although evidence pointed to age, blood group, sex, etc. as possible factors. Patients could be classified into the following two categories:

- Asymptomatic patients: these were the most problematic cases because they transmitted the disease without being aware that they had it. It was estimated that they accounted for 40% of patients.
- Symptomatic patients: 80% had a mild illness with influenza syndrome. These patients could be confined to their homes and receive home care monitoring by primary care physicians. The other 20% required admission to a hospital bed and amongst those, 5% suffered respiratory insufficiency and required admission into the ICU.

Preparation

Similarly to hospitals in other autonomous communities of Spain, hospitals in Catalonia participated in contingency plans for emergencies and disasters prepared by the Spanish and Catalan government administrations. For its part, before the winter of 2019-20, HUVH had prepared—as it did each year—a contingency plan for flu patient care, which was continually updated as more reliable data on attack rates and estimated duration of waves became available. That winter, the flu contingency plan did not need to be implemented, since the incidence of flu outbreaks was much lower than what had been predicted.

When the first COVID data became available, a dozen scenarios were proposed at HUVH (see Exhibit 1) with different parameters, using the SEMICYUC models.[2] It was deduced from these scenarios that in the worst case, three times as many ICU beds and twice as many hospital beds as the hospital had at that time would be required; and the number of medical leaves due to COVID-19 among healthcare professionals was also estimated at around 10%. Later, it was discovered that the worst-case scenarios were met or surpassed; for example, the forecasted length of hospitals stays was surpassed, given that the ICU stay had been predicted at 10–12 days and ended up lasting three weeks. It should be noted that the incidence and severity of COVID-19 cases varied greatly not only between countries but also between cities and even between neighborhoods within the same city, since it depended on population density, age, comorbidity, etc. So any estimates made always implied a high level of uncertainty.

Detection and Action

Unlike other centers or autonomous communities, HUVH anticipated the instructions of the health authorities and never minimized the significance of the epidemic. Even when there still weren't any cases in Spain, the information coming from China and Italy as the epidemic unraveled there in the early weeks made it clear that the same would inevitably take place in Spain. With this panorama on the horizon, the decision that HUVH would become a COVID hospital was made and communicated in a meeting with all the heads of services.

[2] Spanish Society of Intensive, Critical and Coronary Unit Medical Care. Among the different models of pandemic evolution, a common one was the FluSurge 2.0 model developed by the Center for Disease Control and Prevention in Atlanta in the United States. The model used population demographic data, estimated attack rate, duration of the pandemic, etc., and generated estimates of hospital admissions (in normal beds and in the ICU), deaths, etc. using Monte Carlo models with normal distributions. See "FluSurge 2.0," Center for Disease Control and Prevention," accessed June 8, 2020, https://www.cdc.gov/flu/pandemic-resources/tools/flusurge.htm.