The case of Erasmus MC within the Dutch health system during the COVID-19 pandemic

Issues faced at the start of the hospital response to the crisis

In January 2020, the Dutch Health Minister classified COVID-19 as a disease requiring positive cases of infection to be communicated to regional public health organizations (GGD). The National Outbreak Management Team (N-OMT) advised the Health Minister to stress the need for good hygiene and distancing when dealing with infected persons. The National Institute for Public Health and the Environment (RIVM) coordinated the crisis response and has represented N-OMT. Erasmus MC, together with the RIVM, set up SARS-CoV-2 test capacity.

The first COVID-19 patient admitted to a Dutch hospital was confirmed on February 27, 2020. In early March more hospital admissions were seen, especially in the southern provinces of Noord-Brabant and Limburg. On March 5 it was announced that the network of GGDs would coordinate the distribution of Personal Protective Equipment (PPE) to medical and care professionals. The first shelter for COVID-19 positive patients who needed to be quarantined but not admitted to hospital was organized and fitted-out.

On March 9, a press conference was held by the Dutch Prime Minister and the RIVM director responsible for pandemic control, and people were instructed not to shake hands; large public meetings in the southern provinces were cancelled; people were asked to work from home whenever possible.

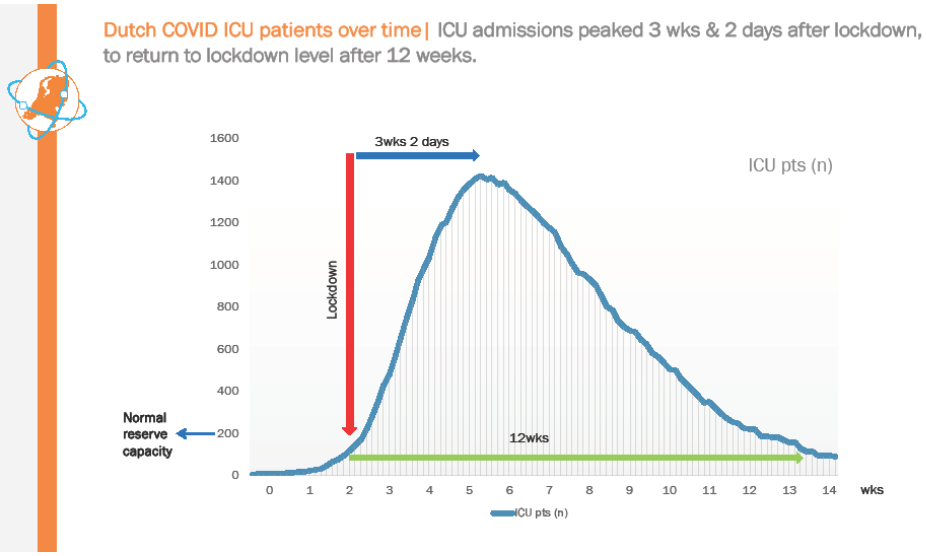
The regional GGD approached Erasmus MC to set up a shelter in a vacant clinical building. The initial preparations by the Erasmus MC COVID Readiness Team were transferred to Erasmus MC's Crisis Management Team-meetings (CBT); the minutes of their meetings (available to the researcher) start on March 9. The first patient from a general hospital in Noord-Brabant was transferred to Erasmus MC during the following weekend. Everybody was keen to find out whether all the preparations for pandemic control, including protocols on infection prevention and control, would work. Amphia hospital in Noord-Brabant decided to test all their staff during this weekend and diagnostics were being performed at Erasmus MC's Virology lab. The supply of PPE was already on the agenda of the CBT, including regional distribution of existing supplies and investigating the options for re-use of medical grade masks after sterilisation.

In early March 34 medium-care beds in the vacant clinical (Ad-)building were being recommissioned. The fitting-out of a Medium Care (MC)-ward in the new building as a surge ICU (on top of the maximum of 56 adult beds in the two ICUs) was considered. The policy was established to first use the pressurized isolation rooms on the wards, especially those in the ward for infectious and pulmonary diseases. Erasmus MC's new adult hospital has 100% single room accommodation in both MC- and ICU-wards. To free up space in the clinic to form dedicated COVID-wards, the move of non-COVID patients towards the Ad-building (mix of single, double and 4-bed patient accommodation) was prepared, which required time to make changes for the transfer for pharmacy services, logistics, nurse call system, connections to the EPR/HIS, et cetera.

The location of the surge ICU on the 8th floor of the new adult hospital facility (open since May 2018) was chosen because of the availability of telemetry infrastructure and proximity to the 'acute-elevator bank' (connecting to the Emergency Department). New ventilators were purchased, 'spare' ventilators were

refurbished and installed. Two weeks later, 24 new ICU-patients were admitted in one day. To create space to care for COVID-patients, elective care had to be scaled down. Being both the largest tertiary care centre in the Netherlands, as well as a major trauma centre in this Acute Care Region, acute tertiary services had to be continued. As the 8-bed Post Anaesthesia Care Unit (single patient accommodation) was commissioned as additional COVID-ICU, one of the holding/recovery areas was prepared for PACU-care (up to 48 hours post-surgery), but mostly staff members were relocated to COVID-care. Medical students and OR/anaesthesia nurses were a crucial element in scaling up ICU capacity.

After two weeks a national coordination mechanism, coordinated by the LPCS centre, started to relocate COVID-patients between hospitals, as not all regions were affected in the same way at the same time. The army was helping with logistics; patients were transferred by ambulances and helicopters and additional ICU capacity was found in neighbouring regions in Germany. During the first wave the LPCS centre is located at Erasmus MC; Erasmus MC's CEO is not only the chair of the Regional Network Acute Care (ROAZ) of the South-West of the Netherlands, but also of the joint regional networks in the Netherlands.



Source: Landelijk Coördinatiecentrum PatiëntenSpreiding (LCPS)

Coordination of the hospital response; responsibility for planning and decisions; organization of governance

As mentioned above, there was a COVID Readiness Team (CRT) prior to the coordination being taken over by the existing (and deployable) Crisis Management Team (CMT). Both teams were advised by the local Outbreak Management Team (L-OMT). In early May the CMT stood down and continued as the COVID Coordination Team (CCT). An Executive Board member chairs the CMT and CCT meetings; decisions made in CMT and CCT meetings are formally affirmed by the Executive Board. Several working groups, with representatives from the Medical Board and the Theme-directors[1], were established to plan clinical capacity, human resources, equipment and facilities, logistics and other matters. Each working group reported to the

[1] the managing directors of clusters of medical departments, Erasmus MC's Themes

CMT. Daily reports were prepared, giving information on numbers of patients admitted, number of (positive) tests performed on staff members (there was a policy for very low threshold testing for all Erasmus MC employees, including students), supplies of PPE, et cetera.

The Erasmus MC CMT had trained, the year before, with the simulation of a severe flu episode, where capacity was reduced due to illness amongst staff, and patient cases rose. The CMT consists of medical specialists from the Intensive Care & Infection Prevention Unit, Facility Management/Business Services, Estates Management, Communications, representatives from the Medical Board and the Theme Directors, and is chaired by an Executive Board member and supported by a Crisis manager and the Business Continuity/Security Officer. During the COVID-crisis two researchers from the Erasmus School of Health Services Management were present at all meetings, to study decision-making in pandemic times[2].

Regular updates were posted on the hospital's intranet relating to the protocols regarding COVID-19 suspected patients and staff members, wearing PPE, and other measures. The Infection Prevention Unit led on establishing and/or changing protocols; updates were directly available for staff in the Quality Management System, that can be accessed with the nurses' devices. From March 17 onwards a panel of experts from the L-OMT/CMT was available for regular updates on the situation, as well as answering questions sent in by employees in (weekly and later 2-weekly) livestream sessions.

On March 26, while the number of admitted COVID patients was still rising, despite the 'intelligent lock-down' that has been enforced for the whole country on March 23, the CBT decided on the minimum capacity to be reserved for adult non-COVID care: 10 OR's , 275 MC-beds and 30 ICU-beds were to stay operational. (Compare these to the numbers with the usually available capacity in the adult hospital: 24 OR's, 522 MC-beds and 58 ICU-beds.[3]) On April 7, just after the peak in COVID ICU-patients (with 65 patients) had been reached, availability of non-COVID-care capacities was increased to 12 OR's and then to 14 OR's a few days later (to keep up with the expected decline of COVID-ICU patients).

The immediate priorities at the start of the crisis

Medical departments quickly started to work in separate teams: one team working from home and one team at the hospital, to minimize the risk of contamination amongst themselves, also to prepare back-up services.

Rapid changes were made in relation to e-health solutions for out-patient services. Patients were contacted 2-3 days prior to their appointments and asked whether they have COVID-like symptoms; patients with symptoms were triaged to decide whether they needed to attend in person, or whether the appointment could be postponed. When they needed to attend in person they were asked to come to the hospital for a timely test. Alternatively, when postponement was not an option, they were considered as infectious patients, issued with a medical-grade mouth/nose mask at the entrance, and directed to an isolation room immediately. Cleaning protocols were put in place when these isolation rooms were vacated.

[2] https://www.eur.nl/en/eshpm/research/research-groups/health-care-governance/projects/covid-19/learning-dance-decision-making-pandemic-times.

[3] The emphasis on the physical capacity is due to the fact that availability of staff is often a limiting factor to the capacity that can actually be used.

New medical equipment was bought, but also repurposed, to support the increased capacity for ventilated patients, and for monitoring patients in COVID-wards. Optiflow treatment was introduced early April, as an intermediate stage between the regular MC-ward and the ICU.

After a few days into the first wave, each hospital, care home and home care organisation was struggling to purchase their own PP supplies. In answer to this a national coordination centre was established, in charge of procurement and distribution of all PPE over the regions and to all health care organizations. Guidance on the wearing of medical grade masks was partly influenced by the availability. An air-bridge was established to bring in supplies from China.

For Erasmus MC the triage of the remaining elective tertiary care was key: which patients needed to come in and what care could be postponed. All hospitals saw a sharp decline in new patients being referred to hospital by their GP's; the number of acute myocardial infarctions and traffic accidents also declined (or in the former, were missed as a diagnosis). It is estimated that up to 40% of regular care was not delivered during the first wave[4].

Changes to physical infrastructure

A disused decontamination unit, at the former Emergency Department, became the in-house testing location for all Erasmus MC-staff and students. Opening hours were adjusted to meet demand, and each employee received notification of their status after testing within 24 hours. The Travel Clinic (for inoculations for travellers) housed the test location for patients. Triage prior to admission to outpatient services, diagnostics and clinical care was considered to be the key 'weapon' of Erasmus MC to continue delivering 'safe care' in a 'safe environment', both from the perspective of patients and staff.

A tent/pavilion was erected in front of the Emergency Department for the triage of walk-in patients.

This is the current triage unit, photographed December 2020


Inside the triage unit, photo Erasmus MC

[4] COVID goes Cuckoo – How the March-April 2020 COVID-19 surge overwhelmed Dutch hospitals and undermined regular care; an independent study by Gupta Strategists from May 2020

One of the first changes in the public areas was to change the hand dryers in the restrooms for paper towels. Later, routes were marked with ground-stickers, advising on routing and the maximum amount of occupants of an elevator. Staff members were advised to use the third floor as their circulation level, giving more room to patients and visitors on the first floor (public circulation level).

Floor stickers are used a lot, here indicating the waiting point upon using the elevator and standing positions within the elevators in the Ba-building, photographed December 2020.

Waiting areas in the outpatient departments were changed to reduce the number of seats available, to allow social distancing (determined at 1.5 meters in the Netherlands); one-way routes were indicated for high turn-over services such as blood taking; volunteers and 'stewards' were distributed at entrances to the elevator banks to advise patients who turned up early for appointments to stay in the public spaces until 10 minutes beforehand, to avoid crowding in the waiting areas. Some reception desks were shielded with plastic dividers, but the general opinion was that keeping 1.5 meters apart would suffice in continuing to provide 'safe' care in a controlled area, due to the triage of those coming into the hospital.

Social distancing, hand washing and availability of cleaning materials for shared desks, were the main measures required of employees during the 1st wave. Hand-alcohol was scarce at this point, so not publicly provided at entrances (this became more available during the 2nd wave); medical grade masks were only used conform the infection prevention protocols, as the general idea is that all people inside the building have been triaged upon entrance. The success of this policy can be seen in the fact that no employees were infected by patients; the few cases where employees were infected by other employees stem most likely from not adhering to the social distancing policy during breaks. Occupational physicians and Infection Prevention specialists kept track of infected employees.

Training and education

To expand capacity, particularly in the COVID-ICU, nurses were invited to work extra shifts, and nurses with ICU qualifications, working elsewhere, were approached to help. Fully trained ICU nurses were termed 'profile 1' nurses. Additional help was provided by 'profile 2' nurses, who were OR nurses (especially anaesthesia nurses, because of their experience with patients on ventilators) and nurse specialists. They were appointed to work together with profile 1 nurses, so that the staffing ratios of the ICU nurses could be expanded – not only for the COVID ICU, but also for the regular ICU care. To boost their confidence, excursions to the ICU environment were organized and e-learning was provided, to prepare for new roles.

An innovative learning and performance support, Ask Erasmus MC, was developed by Erasmus MC and Xprtise, as a rapid response to an ever-increasing number of patients in COVID-19 units, Emergency Rooms and ICUs. With a new approach and the application of the 'Five moments of need' methodology, the team had a frontline solution live within 10 days which enabled nine different key roles to support and treat COVID patients effectively on the ground. This has been extended to all health professionals in the Netherlands, with significant impact[5].

Training accommodation for COVID care, photos Erasmus MC

It is important to note that nursing policy did not change during the first wave, although the types of masks, goggles and overgarments changed due to availability from different suppliers. These items PPE were donned on entering a room with an infectious patient and removed on leaving that room. Special measures applied when performing aerosol producing procedures. Erasmus MC did not adopt the strategy of cohort-nursing, where donning and doffing of PPE was done upon entering a ward. Breathing through FFP-2 masks is harder, and tiring for staff; this is one of the reasons to protect them from having to wear a FFP-mask throughout their shifts. The single room accommodation, but also the available experience with infectious patients, were key to this decision. Protocols (supervised by the Infection Prevention Unit) were easily available in various digital media used by nurses and other staff members working in the wards; new types of PPE were demonstrated during the livestream sessions. Notices at the entrance of each room displayed in detail the measures to take, not only on behalf of the staff, but also for visitors. Visitors continued to be welcome throughout the 1st wave, although in restricted numbers, after triage and for reduced time periods.

[5] This tool won the bronze award in the category 'Best international digital transformation of a training programme in response to COVID-19' at the 2020 UK learning technologies award ceremony, November 2020.

Single patient rooms in ICU and MC-wards allow staff to don PPE in the corridor, photo Erasmus MC

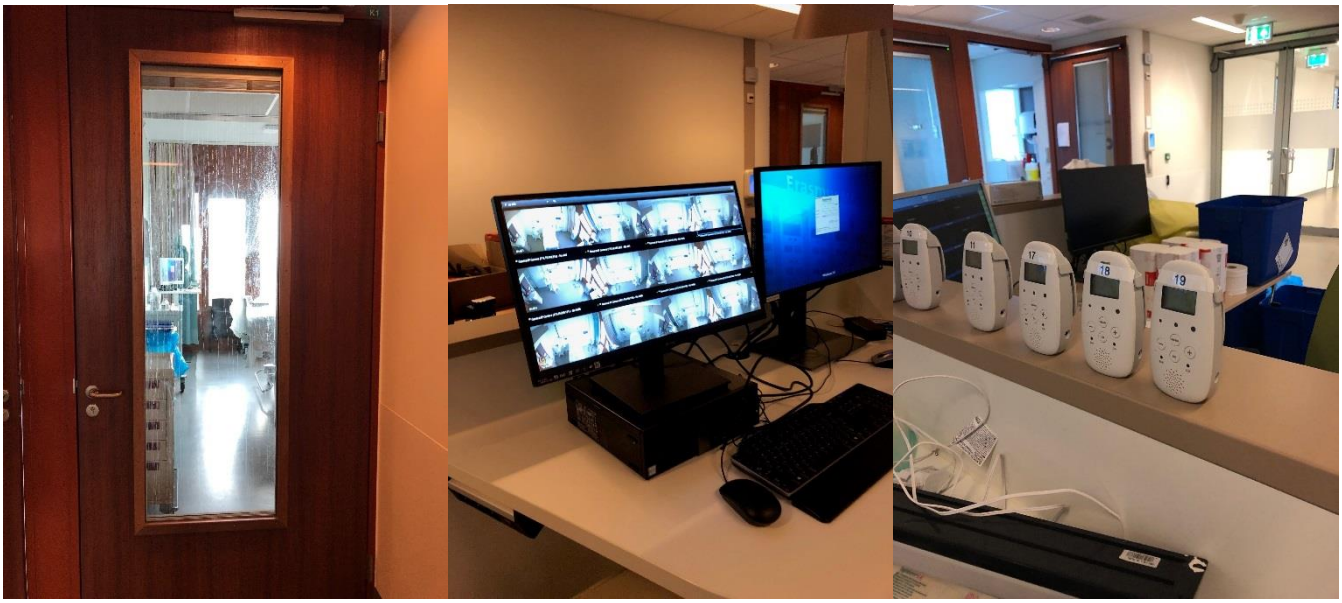
Concerns of staff about working on the COVID-wards (ICU and Medium Care) were taken seriously; coaching was provided and in the livestream this issue was mentioned. 'How are you today?' is a digital survey tool that was quickly introduced to gather input from nurses. It was stressed that all people working in the front-line are crucial, from cleaners and lab technicians to doctors and nurses. Each livestream started with the Executive Board stressing this inclusive attitude: everyone's valuable contribution to the joint effort of caring for all patients. Students, whose internships had been put on hold, helped by collecting and ferrying medication and lab-samples, making sure supplies were at hand when needed, and many other tasks. Later this role was taken up by Red Cross volunteers.

Evaluation of the effectiveness of the measures

The CBT has carried an internal evaluation of the effectiveness of the measures taken; results are not available at the time of writing. However, during the 1st wave it was reported that, based on genotyping of infections with the Sars-COV-2 virus found in patients and employees, no transmission had taken place between patients and employees. This indicates that the infection prevention protocols and the policies regarding the use of PPE had been effective to keep the workforce safe. Being able to work in a safe environment was a major concern for employees.

What will be different from now and into the future?

There will be a more permanent fit-out of the MC ward as a surge ICU environment. The Dutch government has asked Dutch hospitals to expand the ICU-capacity in a more permanent fashion, and to prepare these beds as spare or surge ICU environments. Some adaptations have been made prior to this surge ICU coming into use again during the 2nd wave.

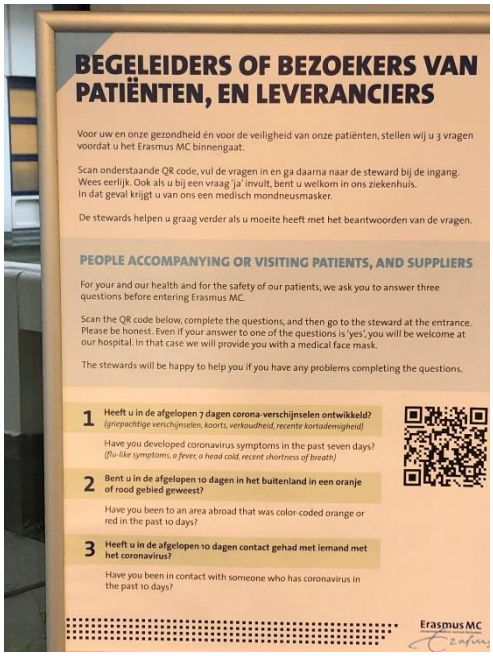


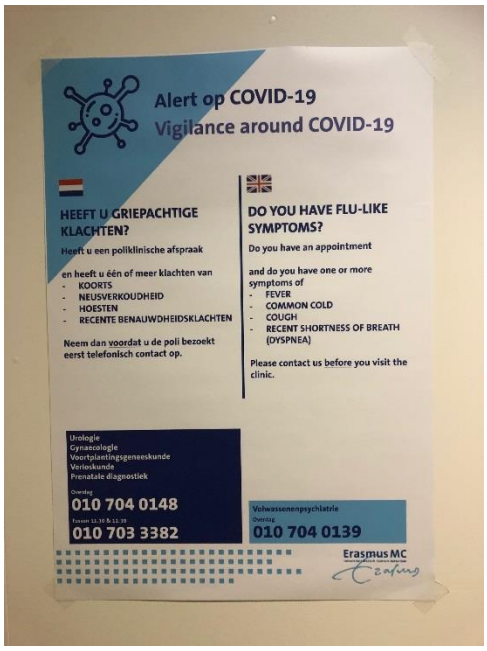
The surge ICU has been fitted with windows in the doors (with blinds), permanent cameras have been installed with images routed to monitoring stations, and communication devices are standing at the ready, photographed in September 2020, when this ward was not in use.

Public spaces are quite generous and have been further freed up by reducing the number of people accompanying or visiting a patient, but also by asking employees to use the 3rd floor as their circulation level and not use the public areas for informal meetings.

P**rotocols for emergency departments, inpatient admissions, outpatient appointments, diagnostic/testing pathways**

Protocols have been updated throughout the COVID pandemic to include the latest scientific knowledge and guidelines from National institutions, such as RIVM and the Dutch Federation of Medical Specialists. There has been a focus on the triage of patients and visitors upon entering the building (see photos below) and – in concurrence with national policies – the wearing of (non-medical) masks in indoor public areas is mandatory.





Information banners (with QR-code to triage questions), posters and hand-alcohol dispenser at the entrance of the Ba-building; stewards are also positioned at many entrances to help with triage and advise patients and visitors on the COVID-19 vigilance rules, photographed December 2020.

Logistics and supply of materials

Minimum supply levels for critical materials have been evaluated and updated. During the 2nd wave no problems arose in the availability of PPE, medicines and equipment. Hand alcohol can now be found at all entrances.

Co-working with primary or community care organisations

During the 2nd wave new initiatives were established for home monitoring by GPs in order to enable earlier discharge from hospital, in order to free up available COVID-bed spaces.

Working conditions for staff members

The emphasis for staff members has been on social distancing at all times. Restrictions have been placed on the number of users of meeting rooms and elevators. A policy has been established regarding working from home, for those not required to be present at the hospital campus. Regarding education, which had switched to online early on, priority has been given to first-year students to attending lectures and group sessions in person; all others have been asked to use online education. Internships for medical students have resumed, and Red Cross volunteers have taken their places in helping out on the wards.

Priorities for capital asset investment and future staff training

When asked, early October 2020, what he would like to change in the new hospital facility due to the current pandemic, Erasmus MC's CEO said: "Nothing at all". That said, some alterations were made, prior to the start of the 2nd wave, e.g. to upgrade the 8th floor MC-ward as a future contingency ICU ward. These included installing cameras and intercom communication systems, creating more workspaces for monitoring patients and adding windows in the wooden doors towards the patient rooms. This last alteration was made to enhance communication between the nurse inside the room, and their support/helpers outside, ready to hand over supplies etcetera (see photo above).


ÌCU-room ready for and during COVID-care, photos Erasmus MC

Surge-ICU-room on the 8th floor ready for ICU-care, photographed in September 2020, when ward was not in use

December 2020,

Liesbeth van Heel, Erasmus MC

Photo credits: Liesbeth van Heel and Erasmus MC image-bank