

R E V I E W

Timely adaptation of a Pediatric Unit to COVID-19 emergency in Northern Italy: the experience of Fondazione IRCCS Policlinico San Matteo in Pavia

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Abstract. Italy is one of the most exposed countries worldwide to COVID-19, and Lombardy is the most affected region in Italy. In this context, Fondazione IRCCS Policlinico San Matteo in Pavia, one of the largest University hospitals in the region, has been involved in the management of the outbreak since its inception. Immediately after the communication of the first Italian COVID-19+ patient, the Pediatric Unit has been completely reorganized to face the approaching outbreak. The optimization of the Pediatric Unit resources for COVID-19 emergency is reported as an example to safely preserve health activity during the pandemic. (www.actabiomedica.it)

Key words: severe acute respiratory syndrome coronavirus 2, coronavirus disease 2019, children, management, hospital

In late December 2019, the first pneumonia cases of unknown origin were identified in Wuhan, the capital city of Hubei province in central China (1). The causative pathogen has been identified as a novel enveloped RNA betacoronavirus (2). Given the phylogenetic similarity to the previously isolated severe acute respiratory syndrome coronavirus (SARS-CoV), the new virus has been named SARS-CoV-2 (3). SARS-CoV-2 rapidly spread outside China, and COVID-19 is currently a pandemic health emergency (4). Italy is one of the most exposed countries worldwide, and Lombardy is the most affected region in Italy (5). The first indigenous case of COVID-19 in Italy was confirmed on February 21, 2020 in Pavia, transferred from

the Codogno Hospital in the Lodi province, i.e. at a 46 km distance.

In this context, Fondazione IRCCS Policlinico San Matteo in Pavia, one of the largest University hospitals (1300 beds) in the region, has been involved in the management of the outbreak since its inception.

Before the outbreak, the Pediatric Unit was arranged on 3 floors located in a freestanding building. At the ground-level, the Pediatric Emergency Service was divided into a triage point, two operating rooms, and four observation rooms; moreover, through a corridor, it was possible to access the rooms dedicated to two Pediatric Outpatient Services: Neurology (four rooms) and Infectious Diseases (one room). One floor

housed the rest of the Pediatric Outpatient Services including Pediatric Allergy/Immunology (four rooms), Endocrinology (four rooms), Cardiology (four rooms), Gastroenterology (two rooms) and Rheumatology (1 room); all these Services refer to the same day-hospital area in this floor for complex procedures. The third floor was for inpatients (9 twin-bedded rooms and 7 single-bedded rooms); at normal capacity, the ward could host 25 patients. The building also housed the Pediatric Hematology/Oncology Unit with a day-hospital service and the ward with 21 beds including 5 beds dedicated to bone marrow transplantation, and the Pediatric Surgery with inpatient and outpatient services.

Immediately after the communication of the first COVID-19+ patient from Codogno, the Pediatric Unit has been completely reorganized to face the approaching outbreak. In accordance with the WHO Guidelines, the Ministry of Health in Italy provided rules for the prevention of SARS-CoV-2 infection in the population and in the healthcare workers (6). These have been taken up to formulate specific protocols, updated in real time with the evolution of the epidemic, in order to provide operators with indications to safely carry out their jobs. Our Institution - which already on January 31, 2020 had completed the first draft of the "Corporate document for the management of suspected, probable or certain cases of Coronavirus 2019" - immediately activated an ad hoc Coordination Unit, specifically designed to coordinate all the actions necessary to manage the health emergency, and in particular: i) guarantee a standardized approach to the diagnosis and treatment of patients with COVID-19 disease, in compliance with the most up-to-date scientific knowledge available; ii) minimize the risk of transmission of the SARS-CoV-2 virus; iii) ensure the supply of all necessary personal protective equipment to all operators.

Starting from day 1 of the outbreak (February 21, 2020), the outpatient services closed until further notice. All non-urgent visits were postponed in order to limit the infection risk for patients and staff. The accurate selection of patients whose visit can be delayed and rescheduled was a fundamental part of the outpatient service reorganization. Urgent and unpostponable procedures (e.g., administration of drugs and

blood products licensed to be administered only in the hospital, necessary diagnostic tests) were carried out to limit the risk of viral transmission. Unpostponable appointments were scheduled in order to avoid that every patient met each other (at least 30 minutes between appointments, depending on the specific procedure). All staff members were requested to wear a surgical mask. The outpatient service became accessible only from one entrance. To every patient and its accompanying person entering the outpatient service for unpostponable procedures, questions were asked regarding their clinical symptoms (flu-like symptoms), and the temperature was measured. All patients needed to wash their hands with hand sanitizer and wear a surgical mask before entering the Clinic. For those patients whose visits could be delayed, telemedicine management was arranged, especially for patients with chronic conditions requiring adequate monitoring (e.g., pediatric patients with asthma or diabetes).

The Pediatric Emergency Service was immediately reorganized (Figure 1). On the ground floor, a pre-triage area was set up to allow suspected cases (according to virus contact history and/or symptoms) to access the Pediatric COVID Emergency Unit (PCEU) directly. This Unit was obtained in the area that previously housed the Neurology and Infectious Diseases Pediatric Outpatient Services. Facial surgical masks were worn by health-care professionals at all times. Dedicated personnel were assigned to PCEU, including one pediatrician, one pediatric resident, and one pediatric nurse. When accessing PCEU, the use of adequate personal protective equipment (PPE) was mandatory. Nasopharynx and throat swabs to detect SARS-CoV-2 were performed in children presenting with respiratory symptoms, and at least one out of the following three features: fever, cough, and contact with confirmed or suspected cases. All pediatric patients undergoing swabs and one parent for each patient were isolated in this dedicated area. In case of a negative result, they were discharged or, if indicated due to clinical conditions, admitted to the Pediatric ward. In case of a positive result, patients were transferred to the Pediatric COVID Inpatient Unit (PCIU).

The PCIU was obtained isolating four rooms of the Pediatric ward. Every single room hosted one pediatric patient and one parent. Dedicated personnel were

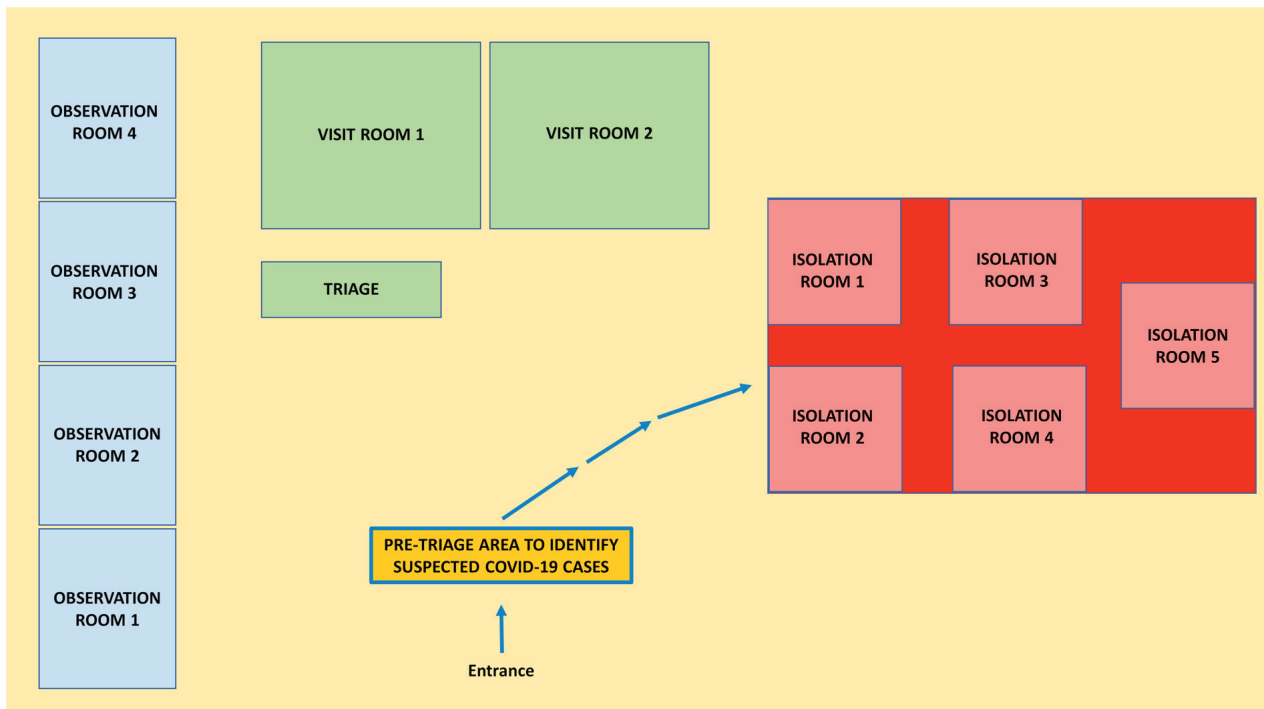


Figure 1. Reorganization of Pediatric Emergency Service after COVID-19 outbreak.

assigned to PCIU, including one pediatrician, one pediatric resident, and one pediatric nurse. The main door of the PCIU opened only for the patient's admittance and once per day for garbage evacuation, performed by fully protected professionals and followed by cleaning with sodium hypochlorite 0.1 to 0.5%. All the therapy was prepared in a dedicated area outside the isolation rooms in order to limit the time spent in them, which is physically demanding due to limited transpiration and rebreathing. In case of rapid deterioration requiring intubation, patients would be transferred to the Intensive Care Unit, located in a close building (DEA, Emergency and Acceptance Department).

Along with the Pediatric Unit reorganization, other key decisions contributed to the effective management of the epidemics, including the establishment of crisis unit meetings with the hospital director and the key staff leading the emergency management (intensive care, infectious disease, emergency room, and laboratory directors), the creation of a COVID dedicated staff in each Unit and the physician shift remodeling according to new COVID-dedicated units, and

the accurate planning of PPE provision. Moreover, the hospital was rearranged in order to differentiate "clean" and "COVID"-dedicated areas for patients and separate "clean" and "COVID" specific patient paths to perform diagnostic tests and procedures. In addition, a preferential swab and sample flow toward the laboratory was developed.

Despite the high number of intra-hospital infections reported in the areas that primarily faced the outbreak, also thanks to all these containment measures, infections were limited to two health care workers that were immediately identified, containing the further spread between health care workers and/or patients. Of note, all the Hospital Units involved in the COVID-19 management developed a specific plan, differentiated according to the specific logistics organizational structures (7-9).

Regarding research activity, despite the difficulties in conducting research projects in this emergency scenario, our research team is currently active in the clinical and immunological characterization of COVID-19 in pediatric patients (10).

Table 1. Number of patients admitted from February 20, to April 30, 2020 and 2019 in the Pediatric ward of the IRCCS Policlinico San Matteo of Pavia

PATIENT ADMISSIONS FROM FEBRUARY 20, TO APRIL 30, 2020 and 2019		
	2019	2020
Inpatients	414	150
Outpatient visits	20836	3076
Patients admitted in ER	2806	987
Inpatients COVID+	-	12

According to our experience and a recent extensive review of the literature (11), although most children with COVID-19 presented with mild symptoms, the majority of them were evaluated in the Pediatric Emergency Unit and required hospitalization. Table 1 summarizes the number of patients admitted to the Pediatric Unit from February 20, to April 30, 2020. According to these data, it was fundamental to be adequately prepared to face the emergency efficiently. All of this was accomplished thanks to the joint efforts of the Pediatric specialists and Pediatric residents, the regular and additional nurses, the administrative and support staff, and the hospital direction that realized this rapid change to the Pediatric Unit.

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