Residência RP Pediátrica
Publicação Oficial da Sociedade Brasileira de Pediatria
ISSN-Online: 2236-6814

Submitted on: 05/30/2020
Approved on: 06/05/2020

POINT OF VIEW

Operational setup of a pediatric emergency unit for COVID-19 patients

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Keywords:
Coronavirus, Coronavirus Infections, Emergency Medicine, Hospital.

Abstract

COVID-19 is caused by the SARS-CoV-2 virus and was declared by the World Health Organization as a Public Health Emergency of international importance, being considered a pandemic on March 11, 2020. To provide the best care to patients in the context of a pandemic, hospitals need strategies to organize and optimize their space, staff and materials. In this context, it is imperative to use containment measures to reduce the risk of viral transmission to other patients or health professionals that make up the multidisciplinary team. In the urgency and emergency sector, planning is a challenge due to the involvement of different professionals in the various stages of care. Thus, in the present study, the pandemic response measures implemented in the pediatric urgency and emergency department of a tertiary university hospital in Campinas/SP are described.

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INTRODUCTION

The World Health Organization declared the COVID-19, caused by the SARS-CoV-2 virus, a public health emergency of international relevance, which became a pandemic on March 11, 2020[1]. The first cases of pneumonia of unknown cause were reported in December 2019 in China, the first case of SARS-CoV-2 was confirmed outside China in January 2020[2,3]. In Brazil, the first records of COVID-19 occurred in late January and February[4], with the first death documented in March 2020[5].

The SARS-CoV-2 virus has intrinsic characteristics that yield a high potential for multiplication and dissemination, with the possibility of transmission by asymptomatic individuals or those with mild symptoms[6]. The clinical manifestations are varied, including fever, cough, runny nose, sore throat, myalgia, arthralgia, headache, diarrhea and vomiting, with mild to moderate cases being reported in about 80% of patients. Severe cases of COVID-19 that progress to respiratory failure, shock and multiple organ dysfunction correspond to about 5% of the cases[7].

COVID-19 lethality varies widely according to the country[3]. However, the elderly and individuals with chronic comorbidities are at greater risk for respiratory complications and death[7]. In the pediatric age group, information on COVID-19 clinical presentations is scarce. However, symptoms in infected children can vary, especially from mild to moderate[8]. However, despite this apparent lower severity, the risk of death should not be ruled out. The literature reports that children under one year of age have higher rates of complications in relation to children older than one year[9]. To date, there are no vaccines or drugs with proven efficacy for the treatment of patients with COVID-19. Clinical management involves symptom control and ventilatory support, in more severe cases.

As described, the SARS-CoV-2 virus has a high transmission capacity, being able to reach a large portion of the population, and it can progress with greater severity. In this context, we need to take action to prevent healthcare system breakdown. To provide the best care to patients in the context of a pandemic, hospitals need strategies to organize and optimize their space, staff and materials. Thus, it is imperative to use containment measures to reduce the risk of viral transmission to other patients or healthcare professionals that make up the multidisciplinary care team[10,11]. Planning must include actions from the different healthcare professionals involved in patient care, with measures in the scope of engineering and administration, modification of workflows, optimization of personal protective equipment use, formulation of clinical guidelines for the management of care, and training of teams in realistic simulation.

This study describes the pandemic response measures instituted in the pediatric urgency and emergency department of a tertiary-level university hospital in Campinas, SP. The hospital serves the Brazilian Public Healthcare System (SUS), with 20 beds in the Pediatric Intensive Care Unit (PICU), and is a reference center for a healthcare district that covers 42 municipalities. The measures adopted were based on the recommendations from the World Health Organization (WHO), aimed at guiding the care of patients with COVID-19, without compromising public health and the safety of healthcare professionals[12,13].

INSTITUTIONAL PROTOCOL

Structural organization

Goal: Reduce contamination between patients and healthcare professionals. Changes to the service space, since the Pediatric Emergency Unit (PEU) has service boxes separated by curtains, next to a nebulization room. We have only one isolation bed for diseases that require contact precaution.

Action: We established separate areas for the care of patients with respiratory complaints, using tents provided by the army of the city of Campinas, SP, in a place attached to the PEU. We set up a tent to start the consultation record and to screen patients. We have a second tent for the initial care, with a stretcher, clinical examination equipment and medications for fever, pain and bronchospasm. The tents have side openings, with ventilation. Inside them, we set up clean areas and contaminated areas. We installed a computer with access to the hospital's computerized system, for exclusive use on site.

The emergency room was organized with individual protection equipment in kits, containing a cap, N95 mask, waterproof apron, surgical gloves, glasses and face shield for each professional, a HEPA filter (High Efficiency Particulate Air) and other materials needed for airway access.

Service flows

Goal: To decrease transmissibility and contamination between patients and healthcare professionals.

Action: We created a specific care flowchart for patients with respiratory complaints. Initially, the patient and companion are approached by a nursing technician and asked about the presence of flu-like signs. In the absence of symptoms, the patient and companion are instructed to go to the PEU reception to fill in the care form and be seen in our routine care.

Patients and companions with respiratory complaints receive a surgical mask and are instructed to wear it throughout the entire time they spend in our facilities. The patient undergoes a risk assessment, using the Manchester system to assess severity.

The medical team that sees the patient in the tent wears the proper PPE. In the service space, they can administer medications to resolve low and medium complexity complaints. In this context, the healthcare team administers antipyretics for pain and or fever; oral hydration; and the management of obstructive symptoms using aeration devices (metered

aerosol). If the patient does not show signs of alarm, he/she is discharged from the tent (without entering the PEU). Patients with mild flu-like symptoms do not perform the rapid test to identify the SARS-CoV-2 virus and are released with supportive measures and instructions for home isolation.

In cases with clinical criteria for hospitalization, but stable, the patient is referred from the tent to the pediatric ward, without going through the PEU. The infirmary was restructured to receive the suspected cases of COVID-19. The most severe cases were referred to the emergency room and, after stabilization, directed to hospitalization in the infirmary and/or PICU.

Etiological diagnosis

Goal: Confirm SARS-CoV-2 infection in hospitalized children.

Action: Swab collection of material from the nasopharynx to perform the Real Time Polymerase Chain Reaction (RT-PCR) tests for the influenza virus (in external service) and SARS-CoV-2 for COVID-19 (in the hospital itself, enabled by the Instituto Adolfo Lutz, SP - DG/IAL, 03/03/2020)[14]. The diagnosis occurs by molecular detection of the virus genetic material (RNA). The examination confirms the presence of the virus in the period of greatest activity in the body and transmissible to the community, between the third and tenth days after the onset of symptoms, which enables regulation of the patient's isolation and release measures. The results are presented approximately 48 hours after material collection[15].

Nebulized inhalation therapy interruption

Goal: Decrease virus transmissibility by aerosols.

Action: Replacement of inhalation therapy by nebulization with the use of a metered-dose inhaler (Metered-Dose Inhaler - MDI) with a valve spacer.

Healthcare team protection

Goal: Safety of healthcare professionals.

Action: Training to put PPE on and to take it off, according to the institutional protocol based on WHO recommendations, using educational videos created by the institution (see Supplements).

Training with mechanical pulmonary ventilator in the pediatric emergency room

Goal: To provide skills to PEU healthcare professionals to use the mechanical pulmonary ventilator (MPV) with orotracheal intubation (OTI).

Action: Two complete MPVs were installed (Newport™ e360 Ventilator®; Newport Medical Instruments, Inc. [Newport™ e360®], to use at the PEU, one for children up to 20kg (children's circuit) and the other for children with weight greater than 20kg (adult circuit). The devices are usually used in the PICU department. Considering the importance of training the team to do quick OTI under ventilation[16,17], there are instructions on the handling, the commands and the basic functionalities of the MPV (see Supplements). The initial ventilatory parameters were defined for use in any other pediatric equipment available in the service [spontaneous pressure limit in OTI and SIMV/PSV mode (synchronized intermittent mandatory ventilation with support pressure) during the period on mechanical ventilation], with guidelines for patient transportation and monitoring, in the PICU[18].

Realistic simulation training

Goal: To reduce droplets and aerosols dispersion in the hospital environment and, thus, the risk of contamination by the SARS-CoV-2 virus to other patients or healthcare professionals that make up the multidisciplinary team. There are now unusual recommendations in emergency situations in pediatrics: (i) restricted use of the manual bag-valve-mask; (ii) limitation on the use of non-resealable masks with reservoir and other non-invasive ventilation devices; (iii) use of closed circuit with HME filter (heat and moisture exchanger) in pre-oxygenation; (iv) use of HEPA filter; (v) use of a closed cannula aspiration system; (vi) OTI indication with mask and HME filter coupled to the MPV, in spontaneous mode and pressure limited[19,20].

Action: We used a realistic simulation doll in the emergency room to train the medical team (assistants and residents) and nursing. We created the scenario of a child suspected of having COVID-19 in order to proceed with the OTI following the institutional protocol (see Supplements). In this context, we trained putting on and taking off the PPE, and we practiced closed loop communication of all members present in the simulation.

The purpose of creating the scenario was to ensure that the entire team dedicated to the care of patients with suspected COVID-19 was safe with the new devices implemented in the management of the emergency, and that there was no failure in the protection of the healthcare team.

Disclosure of flows and protocols

Goal: Communicate the measures instituted to the entire medical and nursing staff in a brief and clear manner, with the goal of reinforcing the learning of the steps involved in the management of a pediatric patient suspected of having COVID-19.

Action: We created educational videos addressing the care flow in the tent, the steps for putting on and taking off the PPE, and handling the airway, moving to the OTI (see Supplements).

List of supplements:

S1: Recommendations for the intubation procedure;
S2: Equipment hygiene;
S3: Service flow;
S4: OTI Guide - Part 1;
S5: OTI Guide - Part 2.

CONCLUSION

Preparing for a pandemic involves numerous measures within the urgency and emergency departments of a hospital. Among these measures, there are structural changes, modifications to the flow of care, preparation of clinical protocols and training of the team. Faced with a new disease, in an urgency and emergency department of a university hospital like ours, the development of protocols and training are of fundamental importance to disseminate knowledge and homogenize behavior. We believe that all these measures were necessary to optimize the quality of care provided to patients with COVID-19, and to reduce the risk of virus transmission to other patients or healthcare professionals.

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