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ORIGINAL ARTICLE

Impact of the Covid-19 pandemic on a pediatric medical residency program in the city of Rio de Janeiro

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Abstract

Introduction: In March 2020, the COVID-19 pandemic - a disease caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) was decreed. Since then, there has been a need for adaptations in the pediatric medical residency program (MRP) at a federal hospital in the city of Rio de Janeiro. **Methods:** Retrospective observational study whose objective was to describe the modifications in the pediatric MRP at a federal hospital resulting from the COVID-19 pandemic. **Results:** Our pediatric MRP implemented adaptations such as: postponement of outpatient consultations; reduction in the number of residents allocated to the wards; temporary suspension of external rotations except for maternity rotation; training for proper dressing and undressing procedures; removal of residents with chronic diseases, pregnancy and those with suspected COVID-19; implementation of remote consultation and educational activities in a virtual environment. Data from March, April, May, and June 2020 were analyzed. During this period, 4 residents from pediatrics were removed due to chronic diseases or pregnancy. Of the 37 remaining residents of the PRM, 27 (73%) were removed due to issues related to COVID-19 (suspected COVID-19 or psychological stress). Of these, coronavirus infection was confirmed in 15 residents (40.5%). **Conclusion:** The pandemic caused the removal of many residents on suspicion of COVID-19 and alteration of the services routines. There was a significant reduction in outpatient consultations and suspension of face-to-face theoretical activities. In any case, the adoption of digital platforms for remote consultations and teaching activities allowed the maintenance of patient care and continued medical education.

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INTRODUCTION

In December OF 2019, an infection outbreak of a new coronavirus strain was documented in Wuhan, Hubei province, China, in a group of adults with severe acute respiratory syndrome[1]. This coronavirus was called SARS-CoV-2 (coronavirus 2 of severe acute respiratory syndrome); a beta coronavirus belonging to lineage B or subgenus sarbecovirus, which includes SARS-CoV. The closest similar RNA sequence is that of two bat coronaviruses, and it seems likely that bats are the primary source. Whether the virus is transmitted directly from bats or through some other mechanism (for example, via an intermediate host) is unknown[2]. The structure of the receptor-binding gene region is very similar to that of the SARS coronavirus, and it has been shown that the virus uses the same receptor, the angiotensin-converting enzyme 2 (ACE2), for cell entry[3]. On February 11, 2020, the World Health Organization (WHO) named it the coronavirus disease 2019 (COVID-19)[4].

The main form of transmission is person-to-person, from an infected individual to an uninfected one, and occurs through respiratory droplets or direct contact. Regarding air transmission (through particles smaller than droplets, which remain in the air over time and at a distance), a study was carried out in which SARS-CoV-2 (grown in tissue culture) remained viable in aerosols generated experimentally for at least three hours[5]. The virus present on contaminated surfaces can be another source of infection, if susceptible individuals touch these surfaces and then transfer the virus to the mucous membranes of the mouth, eyes or nose. The frequency and relative importance of this type of transmission remains uncertain.

The disease has spread all over the world and the death toll has continued to grow rapidly. With the increase in the number of new cases and the high lethality, COVID-19 has become a major concern for global health[6]. The WHO recognized this crisis and declared a pandemic on March 11, 2020, due to its sustained transmission and spread across several continents. This pandemic has drastically changed the lives and perspectives of residents in an incredibly short period[7]. Currently, there are more than eight million confirmed cases of COVID-19 worldwide. Updated case counts can be found on the websites of the WHO and the European Center for Disease Prevention and Control. In Brazil, an updated data from the COVID Panel, dated June 23, 2020, there were 1,106,470 million people infected by COVID19 and 51,271 thousand deaths[8].

The Medical Residency Program (MRP) of our hospital started in 1948 in a pioneering way in Brazil, becoming a reference in medical training[9]. Until 1977, the rules of Medical Residency did not exist in a uniform and systematic way, and were at the discretion of each institution[9]. Since then, the National Medical Residency Commission (CNRM) was created through Decree nº 8281/1977 and was consolidated by law nº 6932 on June 7, 1981, which established the exclusive dedication regime, prohibiting the use of the expression Medical Residence to designate any medical training program that was not accredited by the CNRM[10]. The CNRM visited and approved our MRP in 1982, and then we expanded it[9].

The objective of the MRP in Pediatrics is to provide the resident with training under supervision, in order to develop autonomy with the acquisition of technical, cognitive and relational skills for professional practice with ethical, humanistic and citizen values. Because of the pandemic, there was a need to reorganize care at the hospital, seeking to maintain the safety of patients and professionals, including residents who are involved in care, learning and research activities. Thus, several adaptations were made to the MRP in Pediatrics, in order to enable the program to continue with minimal losses. The purpose of this paper was to describe the changes in the MRP in Pediatrics because of COVID-19.

METHODS

Retrospective observational study carried out in the months of March, April, May and June 2020 at the Pediatrics Department. We analyzed the following data: changes to the routines of the Pediatrics Service; number of residents on leave and reasons for it; percentage of residents on leave due to suspected COVID-19; percentage of residents with confirmation of SARS-COV2 infection; new strategies for patient care and maintenance of learning activities remotely.

The MRP in Pediatrics lasts for three years and currently consists of 14 residents in the 1st year (R1), 13 residents in the 2nd year (R2) and 14 residents in the 3rd year (R3). There are external rotations in the various years of residence: 1st year (Neonatology at Maria Amélia Municipal Maternity); 2nd year (Pediatric Emergency at the Pasteur Hospital; Center for Adolescent Health Studies at Pedro Ernesto University Hospital - NESA/HUPE); 3rd year (Mental Health at the Psychiatry Institute of the Federal University of Rio de Janeiro - IPUB/UFRJ and 1 month optional). The residents from our MRP in Pediatrics did the entire data analyses (41 in total).

In view of the first reported cases of COVID-19 in Brazil in February 2020 and the pandemic decree by the WHO on March 11, 2020, social isolation measures were taken in the municipality of RJ as of March 16, 2020. Since then, the MRP in Pediatrics implemented changes such as: postponement of outpatient consultations for controlled patients; reduction in the number of residents allocated to the wards; temporary suspension of external rotations except for maternity rotations; training of residents for proper putting on and taking off PPE; removal of residents with chronic diseases, pregnancy and those with suspected COVID; implementation of teleconsultation and learning activities in a virtual environment.

RESULTS

Postponement of outpatient consultations and relocation of residents

As a result of the social isolation measures taken by the government of the State of RJ and by the municipality of RJ, the appointments made in the various sectors of the Pediatrics

Department had to be rescheduled. Thus, the residents needed to be relocated from outpatient activities to activities in the wards, Pediatric Intensive Care Unit, maternity and Neonatal Intensive Care Unit. In addition, they assisted in the screening of pediatric patients with suspected COVID-19 who arrived at the hospital. External rotations (NESA/HUPE, Pasteur, IPUB and optional) were temporarily suspended, with the exception of Maria Amélia maternity. Mental health discussions were held remotely.

There was a reorganization in the number of residents allocated in the different scenarios, aiming to reduce the crowding of people and optimizing the use of the personal protective equipment (PPE) provided. Patients with suspected COVID were examined by only one properly equipped resident, assisted by a staff member.

Training for putting PPE on and taking it off

One of the main measures to deal with the pandemic in hospitals is the correct use of PPE by doctors and other healthcare professionals in direct contact with patients with suspected COVID-19. Thus, all the healthcare professionals, including the residents, received training to put their PPE on and take it out. This short training programs (about one hour) was carried out in small groups and on different days and times, in order to include as many professionals as possible.

Putting Residents on Leave

Some residents with chronic diseases (diabetes mellitus, high blood pressure, autoimmune disease using immunosuppressants), in addition to the pregnant women, were removed from face-to-face activities in the hospital and relocated to other activities such as: call center; development of a care protocol for children with suspected COVID-19 (Appendix 1); presentation of classes to other residents of the Service through digital platforms; and preparation of summaries of the various themes of Pediatrics and making them available to other residents of our Department. In total, four pediatric residents were put on leave for these reasons.

Other residents were put on leave for presenting symptoms suggestive of COVID-19 (fever, cough, anosmia, dyspnea, among others), or psychological stress related to the pandemic. Table 1 shows the number of remote residents and those with confirmation of SARS-COV2 infection. Of the remaining 37 residents of the RMP in Pediatrics, 27 (73%) were dismissed due to issues related to COVID-19 (suspected COVID-19 or psychological stress). There was confirmation of coronavirus infection in 15 residents (40.5%).

Call Center Implementation

The hospital's Pediatrics Department and Telemedicine Center implemented the virtual consultation to meet the new demands for social isolation and maintaining the care of the Service's chronic patients, in addition to offering post-discharge monitoring of patients hospitalized for COVID-19 or other diseases. Teleconsultation was recently approved in the country on an exceptional basis by the Ministry of Health (MS), which recognized its use during the period to combat the COVID-19 spread, through Ordinance No. 467, which read: "In an exceptional and temporary basis, regarding Telemedicine actions, with the objective of regulating and operationalizing measures to cope with this public healthcare emergency of international importance provided for in art. 3 of Law No. 13,979, of February 6, 2020, due to the epidemic of COVID-19 "[11]. The Regional Board of Medicine of the State of Rio de Janeiro (CREMERJ) regulated the use of Telemedicine through Resolution No. 305/2020 of March 26[12].

Pediatric residents were responsible for the care, always supervised by the Service's staff doctors. The consultations were carried out by video, using the communication and collaboration service of the National Education and Research Network (RNP) through the Mconf platform. The communication among the service members was carried out securely, through digital ICPEdu certificates in web conference rooms. In cases of suspected COVID-19; we used the follow-up questionnaire developed by the residents themselves (Appendix 1).

Learning activities

Learning activities occupy approximately 20% of the program's workload, usually consisting of rounds, clinical sessions, journal club and presentation of clinical cases. With the service's reorganization, the learning activities in the classroom were suspended in order to avoid crowding. Thus, it became necessary to develop new strategies to maintain continuing medical education. The classes were organized, mostly presented by residents, on the themes of General Pediatrics, starting with themes related to COVID-19. These classes were held through the Zoom platform, about three times a week, since the beginning of the pandemic. The same platform was used to carry out rounds in the Service.

In addition, we organized a course on "Antimicrobials for Pediatrics", with classes given by staff from the Pediatric Infectious Diseases Sector and Hospital Infection Control Commission (CCIH), using the Telemedicine platform. The course will last for 2 months with weekly classes. All the classes in the course and those held by Zoom are being recorded and made available to the residents.

Virtual learning increased the participation of residents and Service staff in teaching activities, promoting great interaction between different pediatric specialties. In addition, it brought on informal meetings among the residents, reducing the group's emotional stress.

DISCUSSION

The COVID-19 pandemic significantly affected the entire population, and the MRPs needed to quickly reinvent themselves and adapt to this new reality, drastically changing the routine, including that in pediatric services. Some changes

Table 1. List of residents put on leave and tests ran to investigate COVID-19.

Resident	On leave	COVID investigation	Type of test	Result
R1				
1	Yes	Yes	RT-PCR	Positive
2	Yes	Yes	Serology	1st Negative 2nd Positive
RT-PCR	1st Negative	Sim	RT-PCR	Negative
2nd Positive	Sim	Sim	RT-PCR	Positive
3	Yes	Yes	RT-PCR	Negative
4	Yes	Yes	RT-PCR	Positive
5	No	No	N/A	N/A
6	Yes	Yes	RT-PCR	Positive
7	Yes	Yes	RT-PCR	Positive
8	Yes	Yes	RT-PCR	Positive
9	Yes	Yes	RT-PCR	Negative
10	No	No	N/A	N/A
11	No	No	N/A	N/A
12	Yes	No	N/A	N/A
13	Yes	Yes	RT-PCR	Negative
14	Yes	Yes	Serology	Positive
R2				
1	Yes	Yes	RT-PCR	Negative
2	Yes (2x)	Yes (1x)	RT-PCR	Positive
3	Yes	Yes	RT-PCR	Positive
4	Yes	No	N/A	N/A
5*	Yes	No	N/A	N/A
6	Yes	Yes	RT-PCR	Negative
7	Yes (2x)	Yes (2x)	RT-PCR	1st Negative
2nd Positive	Não	Não	N/A	N/A
8*	Yes	No	N/A	N/A
9	No	No	N/A	N/A
10	No	No	N/A	N/A
11	No	No	N/A	N/A
12	Yes	Yes	RT-PCR	Positive
13	No	No	N/A	N/A
R3				
1	Yes	Yes	RT-PCR	Negative
2	No	No	N/A	N/A
3	Yes	Yes	RT-PCR	Negative
4	Yes	Yes	RT-PCR	Positive
5	No	No	N/A	N/A
6	Yes (2x)	Yes (2x)	RT-PCR	1st Negative
2nd Positive	Sim	Não	N/A	N/A
7	Yes	Yes	RT-PCR & serology	Negative
8*	Yes	No	N/A	N/A
9	Yes	Yes	RT-PCR	Negative
10*	Yes	No	N/A	N/A
11	No	No	N/A	N/A
12	Yes	Yes	RT-PCR	Negative
13	Yes	Yes	RT-PCR	Positive
14	Yes	Yes	RT-PCR	Positive

*Resident on leave because of chronic disease or pregnancy. R1, 1st-year pediatrics resident; R2, 2nd –year pediatrics resident; R3, 3rd-year pediatrics resident; COVID, disease caused by the coronavirus; RT-PCR, *real time – polymerase chain reaction*; N/A, not-applicable.

have made it possible to maintain the care and safety of both patients and the healthcare professionals.

As expected, many residents with suspicion of COVID-19 (73%) were placed on leave, with the confirmation of infection in a significant portion, about 40% of them. It is difficult to say whether the infection occurred inside or outside the hospital. Our hospital is not considered a referral center for the care of patients with suspected COVID-19. Eventually, some patients with suspected COVID-19 came to us and were seen in a screening placed at the entrance to the hospital. Our residents only screened children, always accompanied by a service staff member, all duly dressed and trained. Especially in Pediatrics, considering the evolution of the infection in children, who for the most part are asymptomatic, the number of visits and hospitalizations of children with COVID-19 was low. In any case, it is worth mentioning that many residents work outside the home, including seeing adult patients, and may have become infected outside the hospital. It is also important to mention that all residents evolved well and did not require hospitalization. Those residents with chronic conditions considered risk factors, were dismissed early in the pandemic and were not exposed at any time within the hospital.

In our service, we used digital platforms for the learning activities, having made a great advance in this period, as well as in the Urology medical residency service of the Cleveland Clinic Akron General[13]. Having the responsibility of the virtual meeting about 3-4 times a week and the mental stimulus received positive reviews from residents and participants. Probably, these learning activities by remote means will be incorporated by the service and will continue even after the end of the pandemic.

As in our service, at the Neurology medical residency at New York University (NYU) Grossman School of Medicine's, outpatient consultations were postponed during the current pandemic and visits were made through telemedicine services[14]. In our MRP, telemedicine was able to play a fundamental role in building strategies that contributed to the sustainability of our healthcare services, reducing the risks of exposure and better coordinating the resources present. The video consultation enabled us to see the patient, providing additional information when compared to the telephone consultation. This aspect seems to be of paramount importance for patients with suspected COVID-19, as some progress severely, with significant dyspnea. In a recent paper, Greenhalgh and collaborators discussed some advantages and disadvantages of the video consultation over the telephone in the context of the COVID-19 pandemic[15]. They concluded that most patients with COVID-19 can be monitored remotely, via teleconsultation, and that the video presents additional visual information, in addition to the visual presence of the doctor, who may have a therapeutic role[15]. Also in our call center, we noticed that our contact was able to provide guidance to the patients and their guardians, and reassure them in a meaningful way. In that case, in which the patient had tachypnea or some other sign of severity, he/she was instructed come in person to the hospital.

In our study, we did not measure the psychological impact of the pandemic on residents, but we heard reports about how COVID-19 created physical and emotional tension in residents, including uncertainty in caring for patients with a new medical illness, fear of infection and transmission to a 3rd person. This was also seen in the New York University Neurology Program (NYU) Grossman School of Medicine's[14]. The virtual meetings served to help both the learning and the emotional well-being of residents and other healthcare professionals, keeping us connected with our colleagues and updated on the topics of pediatrics and COVID-19.

Some important questions remain unanswered, not only for us, but for other MRPs around the world. How will the MRP in Pediatrics be after the pandemic? What changes in that period will remain? How can we incorporate these new technologies that have been so useful? How can we restore the activities suspended during the pandemic? In this study, we share our experiences from the past four months in a public service within one of the epicenters of COVID-19. This information can be useful, providing guidance on preparing and managing specialized care during a pandemic.

In conclusion, the MRP in Pediatrics was impacted during the COVID-19 pandemic, especially with the removal of a significant number of residents due to suspected SARS-CoV-2 infection. However, the MRP was able to adapt and make changes to ensure the safety of patients and healthcare professionals, without jeopardizing the training and curriculum of the residents. It is important to note that skills have been developed in our residents that go beyond the theoretical and practical knowledge on Pediatrics, such as resilience, professionalism, humanism and empathy. We are certainly training doctors to be more prepared for the adversities to come.

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Appendix 1

COVID-19 QUESTIONNAIRE IN UPPER HOSPIT LAR

ANTITHERTHMICS	**1st OPTION:** PARACETAMOL 200MG/ML OR 500G (CP) 4/4H OR 6/6H (DEPENDING ON THE FR AND HOT OF FEVER DOSE: INFANTS: 10MG/KG/DOSE PRE-SCHOOL: 15MG/KG/DOSE **2nd OPTION:** DIPYRONE 500MG/ML (GTS) or 500MG (CP)		
THESELTAMIVIR	IDEAL START UP TO 48H OF THE BEGINNING OF SYMPTOMS INITIATE IN ALL CASES OF FLU SYNDROME IN RISK SITUATIONS FOR COMPLICATIONS **INDICATIONS:** - CHILDREN < 5 YEARS - < 19 YEARS IN PROLONGED USE OF AAS - PNEUMOPATES - PATIENTS WITH TUBERCULOSIS (ALL FORMS) - HEART DISEASES (EXCLUDED HAS) - NEPHROPATHES - HEPATOPATHS - HEMATOLOGICAL DISEASE - NEUROLOGICAL DISORDERS - METABOLIC DISORDERS (EX :DM) - NEUROMUSCULAR DISEASES - IMMUNODEPRESSIVES - OBESITY **DOSE OF OSELTAMIVIR:** < OR EQUAL TO 15 KG: 30MG 12/12H 5 DAYS 15-23 KG: 45MG 12/12H 5 DAYS 23-40KG: 60MG 12/12H 5 DAYS > 40KG: 75MG 12/12H 5 DAYS CHILDREN < 1 YEAR : 0 TO 8 MONTHS: 3MG/KG 12/12H 5 DAYS 9 TO 11 MONTHS: 3.5MG/KG 12/12H 5 DAYS 9 A 11 MESES: 3,5MG/KG 12/12H 5 DIAS		
HOME ISOLATION (14 DAYS)	PATIENT ISOLATION - Stay in an isolated and well-ventilated room - if it is not possible to isolate the patient in a single room, keep at least 1 meter away from the patient . sleep in separate bed - Limit the patient's movement around the house. Shared house locations should be well ventilated. - Use of surgical mask all the time. Change the mask whenever it is damp or damaged - When going to the bathroom or other mandatory environment, the patient must wear a mask - Perform frequent hand hygiene with soap and water or gel alcohol, especially before eating or cooking and after going to the bathroom - No patient visits - The patient will only be able to leave the house in emergencies	CAREGIVING PRECAUTIONS - The caregiver must use a (disposable) mask when close to the patient. If the mask becomes wet or has secretions, it must be changed immediately. Never touch or tamper with the mask while close to the patient. After removing the mask, the caregiver must wash their hands - Hand hygiene should be performed whenever they appear dirty, before/ after contact with the patient, before/ after going to the bathroom, before/ after cooking and eating, or whenever necessary. Alcohol gel can be used when hands are dry and soap and water when hands feel oily or dirty - Every time you wash your hands with soap and water, give preference to paper towels. If this is not possible, use a cloth towel and change it every time it gets wet - If someone in the household presents symptoms of flu syndrome, start the same precautionary care	GENERAL PRECAUTIONS - Every time you wash your hands with soap and water, use a paper towel instead . If this is not possible, use a cloth towel and change it every time it gets wet - All household residents must cover their mouth and nose when coughing or sneezing, either with their hands or masks. Wash hands after use - Avoid contact with the patient's secretions; when disposing of patient waste, use disposable gloves - Clear freq u entemente (plus 1x the day) surfaces that are frequently touched with solution counting bleach (1 part bleach to 99 parts water); do the same for bathrooms and toilets - Wash the patient's personal clothes, bedding and bathing suit with common soap and water between 60-90º C, let it dry
OTHERS	REST BALANCED FOOD GOOD LIQUIDS OFFER		

The OLLOW POST HIGH:

PATIENTS WITH Comorbidities	DAILY EVALUATION
PATIENTS WITHOUT Comorbidities	EVALUATION EVERY 48H

QUIZ:

Patient's Personal Data:

Name: _____
Date of Birth: _____
Medical Record: _____
Assessment date: _____

Past Pathological History:

	YEA	NO	WHICH
Comorbidities			
ALLERGIES			
PREVIOUS SURGERIES			
PRIOR ADMISSION			
CONTINUOUS MEDICATION			

Issues related to COVID-19:

1)Fever

( ) Yes ( ) No
Maximum temperature of the day: _____
How many days of fever: _____
Evolutionary worsening of fever? ( ) Yes ( ) No
Use of antipyretics? ( ) Yes ( ) No
Which: _____
Dose: _____
Appraiser's Considerations:_____
_____

2) General condition:

( ) Active ( ) Sleepy ( ) Irritated ( ) Prostrate
Appraiser's Considerations: _____
_____

3) Acceptance of liquids/food:

( ) Good acceptance ( ) Little acceptance ( ) Refusal
Appraiser's Considerations:_____
_____

4) Diuresis:

( ) Normal ( ) Decreased ( ) Absent
Appraiser's Considerations: _____
_____

5) Respiratory condition:

( ) Normal breathing ( ) Very slow breathing
( ) Breathing with effort ( ) Breathing quickly
( ) Batimento nose wing / use of accessory muscles
Assessor's Considerations:_____
_____

6) Cough:

( ) Yes ( ) No
How many days of coughing:_____
( ) Contínua ( ) Infrequent ( ) Dry ( ) Production

Use of any medications? ( ) Yes ( ) No
Wed l?_____
Appraiser's Considerations: _____
_____

7) Other symptoms ?

( ) Mialgia ( ) Fadiga ( ) Dor throat ( ) Diarrhea
( ) Nausea/vomiting ( ) Rash skin ( ) Increase ganglia
Others: _____
Appraiser's Considerations: _____
_____

8) Any signs of seriousness? (Table below)

( ) Yes ( ) No
Assessor's Considerations: _____
_____

9) Use of medication?

( ) Antibiotic ( ) Oseltamivir
Number of days: _____
Others: _____

10) Home Isolation:

Days of Isolation: _____
Child's Caregiver:_____
Family member living in the same household with symptoms of COVID19?
( ) Yes ( ) No
Have you maintained Home Isolation?
( ) Yes ( ) No
If not, for what reason? _____

11) Alta do Acompanhamento:

( ) Yes ( ) No
Discharge Date:_____
Symptoms end date: _____

If the patient presents worsening of the clinical condition or signs of seriousness , refer the patient to the Reference Service

SIGNS OF GRAVITY IN CHILDREN
Shortness of breath or difficulty breathing
Snoring, severe sub/intercostal retraction
central cyanosis
nose wing beat
paradoxical movement of the abdomen
Bradpnea and irregular respiratory rhythm
Oxygen saturation < 95% AA
Tachypnea
Deficit in the cardiovascular system
Signs and Symptoms of Hypotension
Decreased peripheral pulse
Lack of appetite for breastfeeding or fluid intake
Worsening in clinical conditions of underlying disease
Change of mental state
Confusion and lethargy
Convulsion