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The impact of COVID-19 lockdown on children with medical complexity in pediatric emergency department

Giacomo Brisca, MD, PhD^{a,*}, Giulia Vagelli, MD^b, Giulia Tagliarini, MD^b, Andrea Rotulo, MD^a, Daniela Pirlo, MD^a, Marta Romanengo, MD^a, Emanuela Piccotti, MD^a

^a Pediatric Emergency Unit, IRCCS Istituto Giannina Gaslini, Genoa, Italy

^b Department of Neuroscience, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DINOGMI), University of Genoa, Italy

1. Introduction

Italy has been the first western country to be overwhelmed by the COVID-19 pandemic, forcing the Government to institute a strict national lockdown to limit virus spread, from 9 March to 3 May 2020.

SARS-CoV-2 diffusion and the resulting containment measures, have deeply modified national health services with a profound impact on emergency department (ED) activities [1].

During lockdown, pediatric emergency accesses substantially decreased [2] likely due to the instructions to stay-at-home and prevent overcrowding in ED and parents' concern to risk exposure to infection in a health-care setting.

Likewise, a marked reduction of consultations also occurred in family pediatric clinics although accurate data are not available.

COVID-19 per se does not seem to represent a significant threat to the pediatric population [3], although there is concern for children with medical complexity (CMC), who are supposed to be more likely to have complications from COVID-19 [4].

Extensive data about the impact of infection on this vulnerable group are still lacking, but even less is known about the unintended consequences that the pandemic might cause on the management and overall health of CMC.

Children with special health care needs typically have multiple chronic conditions, functional limitations, medical technology dependence, and a complex network of service providers and caregivers critical to maintain day-to-day health. [5]

Care network disruptions could generate outsized adverse consequences for CMC who are potentially at higher risk of severe illness from not accessing health care than their healthy peers [1–11].

2. Abbreviations

ED, emergency department; CMC, children with medical complexity; ICU, intensive care unit

The aim of our study was to investigate on possible collateral effects of pandemic on CMC, measuring how their ED accesses changed during national lockdown.

* Corresponding author at: Pediatric Emergency Unit, IRCCS Istituto Giannina Gaslini, via Gerolamo Gaslini 5, 16147 Genoa, Italy.

E-mail address: giacomobrisca@gaslini.org (G. Brisca).

3. Materials and methods

We conducted a retrospective study of all CMC assessed at tertiary pediatric ED of IRCCS Gaslini Children's Hospital between 9 March to 3 May 2020 and compared to the corresponding time frame of 2019.

Patients were considered with medical complexity and included if they had ≥ 1 complex chronic condition (CCCs), identified using the International Classification of Diseases (ICD) diagnosis classification scheme used by Feudtner et al. [6].

CCCs represent defined diagnosis groupings expected to last > 12 months, and involve either a single organ system severely enough to require specialty pediatric care and hospitalization, or multiple organ systems.

The IRCCS Gaslini Children's Hospital, Genoa, is a tertiary pediatric care center providing assistance within a Region with 1.5 million population in the North-West of Italy, with a wider catching area at national level for pediatric subspecialties and surgical care of complex medical and surgical referrals.

The hospital has 328 pediatric beds and it is equipped with a third level ED, which receives, under normal conditions, around 3000 children per month.

Patients admitted to ED are normally aged 0–18 years. However, the hospital usually takes care of CMC, who account for 3% of total ED visits, also when they are older.

We retrieved demographics data, nursing triage category, patients' main complaint and pre-existing conditions, outcome and length of stay from medical records.

Triage followed the four-level national triage category system, which ranges from not urgent to emergency and resuscitation (Table 1).

4. Results

The number of accesses of CMC dropped from 173 of 2019 to 63 (–64%), accounting respectively 2.7% and 3.2% of total ED visits.

This decline reflects the reduction of total ED visits (6340 vs 1923, –70%), similarly to what observed in many ED across the Italy [5].

Children with pre-existing neurological/neuromuscular and hemato-oncologic diseases were the most represented categories in both years, while those with pre-existing respiratory disease decreased from 15.6% in 2019 to 4.8% of presenting patients in 2020.

Table 1
Key features of CMC assessed in emergency department

Period	9 March – 3 May 2019	9 March – 3 May 2020
CMC visits	173	63
Sex	Female 76 (44%) Male 97 (56%)	Female 34 (54%) Male 29 (46%)
Age, median, range	7,0 years (2 months–26 years)	6,0 years (1 month–24 years)
Red: critical patient, top priority	7 (3,9%)	1 (1,6%)
Yellow: subcritical patient, immediate priority	109 (63%)	33 (52,3%)
Green: low priority, deferrable care	56 (32,4%)	28 (44,4%)
White: non urgent patient	1 (0,6%)	1 (1,6%)
Hospitalization	102 (59%)	54 (86%)
Length of stay, median	6 days	8 days
ICU	4 (2,3%)	1 (1,6%)
Deaths	1 (0,6%)	2 (3,2%)

Abbreviations: CMC, children with medical complexity; ICU, intensive care unit.

The spectrum of main complaint at presentation was similar among the two years, being fever the most frequent, followed by neurological symptoms and respiratory distress (Table 2).

The number of CMC assessed for serious and critical conditions (yellow and red codes) was lower during lockdown comparing to 2019 (53.9% vs 67%).

In 2020, only a 6-year-old boy with bone marrow aplasia who had access to ED for the onset of fever, abdominal pain and diarrhea, required intensive care unit (ICU) admission, while were four in 2019.

Two children evaluated in ED during lock-down subsequently died (one in 2019): an 11-month-old boy affected by intracranial teratoma with progressive disease, assessed for persisting vomiting and an 8-year-old girl with biliary atresia and severe chronic encephalopathy

Table 2
Pre-existing diseases and main complaint at presentation of CMC in Emergency Department

Period	9 March – 3 May 2019	9 March – 3 May 2020
CMC visits	173	63
Pre-existing disease	n (%)	n (%)
Neurological/neuromuscular	63 (35,2%)	18 (28,5%)
Hemato-oncology	33 (18,4%)	18 (28,5%)
Respiratory	28 (15,6%)	3(4,8%)
Nephrology	23 (12,8%)	9 (14,2%)
Cardiological	11 (6,1%)	3 (4,8%)
Gastrointestinal	11 (6,1%)	8 (12,7%)
Endocrinological	6 (3,3%)	1 (1,6%)
Rheumatological	2 (1,1%)	3 (4,8%)
Orthopaedic	2 (1,1%)	0
Main complaint at presentation	n (%)	n (%)
Fever	37 (21,4%)	23 (36,5%)
Neurological symptoms	34 (19,6%)	13 (20,6%)
Respiratory distress	29 (16,7%)	9 (14,3%)
Abdominal pain	16 (9,2%)	5 (7,9%)
Vomiting/diarrhea	12 (6,9%)	7 (11,1%)
Device problems/surgical wound	10 (5,6%)	4 (6,4%)
Feeding problems	6 (3,5%)	0
Cough	6 (3,4%)	0
Palpitations	5 (2,8%)	0
Articular pain	5 (2,8%)	0
Skin rash	3 (1,7%)	1 (1,6%)
Urinary problems	3 (1,7%)	1 (1,6%)
Injuries	3 (1,7%)	0
Chest pain	2 (1,1%)	0
Edema	1 (0,5%)	0
Jaundice	1 (0,5%)	0

Abbreviations: CMC, children with medical complexity.

evaluated for fever and respiratory distress who developed multi-organ failure. Both of them died after prolonged hospitalization (90 and 31 days respectively).

Hospitalization and median length of stay were increased in 2020 (86% vs 57% and 8 vs 6 days respectively).

Of interest, during lockdown three patients were admitted for SARS-CoV-2 infection (a 7-year-boy with chromosomal deletion, an 18-year-girl with systemic lupus erythematosus and paraplegia and a 1-year-girl with congenital adrenal hyperplasia). All of them had a benign course of disease and no need for respiratory support.

In the period of study, we tested for SARS-CoV-2 infection by nasopharyngeal swab 353 children (18% of all ED visits) according to clinical symptoms and epidemiological link. Among them, 45 children (12%) tested positive.

5. Discussion

Our findings, although limited by the monocentric perspective, provide some insight about the growing issue of collateral effects of COVID-19 pandemic on CMC.

Recent reports have raised great concern for delayed care access for sick children [7] and there is general agreement about the urgent necessity of taking care of families with CMC.

Currently available data on the collateral damage of the pandemic on people with special health care needs are scarce and are mainly focused on suspension of educational and rehabilitation services [8,9].

CMC are often dependent on medical technology (eg, feeding tubes, respiratory equipment) and need continuous care from multiple service providers (eg, home health, primary and specialty providers).

Reduced health services, school closures, social distancing, and ubiquitous public health messages are the main factors that can negatively impact on CMC's health and management.

Reduced health care access may cause difficulty to perform periodic clinical assessment or routine medical examinations needed to monitor the chronic condition.

Moreover, pandemic public health messages may lead to a disproportionate fear of going to ED, potentially inducing a delayed assessment of acute worsening symptoms.

School closure can deprive CMC families of medical (eg, medication administration, feeding and/or nutrition) and other services (eg, physical and/or occupational therapy) often provided at school.

Finally, social detachment and/or COVID-19 disease may shrink habitual care networks leading to the need for more support for CMC caregivers.

However, in our experience, CMC did not suffer for higher incidence of life-threatening conditions and we reported no greater need for ICU admissions or significant increase of death rate.

This, supported by the reduced incidence of children evaluated for critical conditions (red and yellow codes), does not suggest a clear evidence for a delay in seeking care.

Nevertheless, we observed an increased overall admission rate and median length of stay.

This could be explained by the greater difficulty of discharging and managing at home these fragile children, considering the restrictive measures in force during lockdown and the closure of outpatient services.

The telemedicine services set up by most of the subspecialties of the hospital, could have played a significant role, supporting families, intercepting any symptoms of alarm and preventing the onset of severe disease.

In this way, telemedicine services seem to be essential to preserve access to multi-specialty medical care based on tertiary care centers and ancillary school services (eg, physical and/or occupational therapy).

Our study confirms the significant reduction of total and CMC ED visits during lockdown as widely reported in the pediatric and adult population worldwide [10,11].

This is likely due to many factors, including social distancing, school closure and lockdown itself that decreased exposure to infectious agents and reduced the incidence of trauma.

Of interest, we found a significant reduction in patients with pre-existing respiratory disease. These are mainly children affected by asthma and chronic lung infection who may have had a decline of disease exacerbations, as a result of reduced circulation of viral and non-viral infections, secondary to restrictive measures.

Our data refer to a retrospective review at a single tertiary pediatric ED and derive from the comparison between the lockdown data and those of the previous year alone limiting the generalizability of our findings. Moreover, our data relies on information reported by pediatricians on electronic medical records, which might be incomplete.

Nevertheless, analyzing the effects of lockdown on our clinical setting may help us to understand what can be expected when such measures are adopted. This could also help us to plan for future outbreak.

Close monitoring of epidemiological changes and further studies will help to better clarify the impact of pandemic on at-risk subpopulations of children.

Moreover, greater efforts to improve technologies, as telemedicine, which may support long-distance clinical care, education, and health administration for families of children with medical complexity, are needed.

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Declaration of Competing Interest

None.

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