COVID-19
Transatlantic Declines in Pediatric Emergency Admissions

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Introduction: This cross-sectional study looked at the impact of the SARS-CoV-2/COVID-19 pandemic on pediatric emergency department (PED) attendances and admissions (as a proxy for severity of illness) in the United States and United Kingdom.

Methods: Data were extracted for children and adolescents, younger than 16 years, attending Royal Manchester Children's Hospital (RMCH, United Kingdom), and Yale New Haven Children's Hospital (YNHCH, United States). Attendances for weeks 1 to 20 of 2020 and 2019 were compared, and likelihood of admission was assessed via calculation of odds ratios, using week 13 (lockdown) as a cutoff.

Results: Attendance numbers for each PED decreased in 2020 compared with 2019 (RMCH, 29.2%; YNHCH, 24.8%). Odds of admission were significantly higher after lockdown than in 2019—RMCH (odds ratio, 1.26; 95% confidence interval, 1.08–1.46) and YNHCH (odds ratio, 1.60; 95% confidence interval, 1.31–1.98).

Conclusions: Although the absolute numbers of children and adolescents attending the PED and being admitted decreased after lockdown, the acuity of illness of those attending appears to be higher.

Key Words: COVID, pandemic, international

(*Pediatr Emer Care* 2020;00: 00–00)

At the end of January 2020, the World Health Organization declared the outbreak of a novel coronavirus a Public Health Emergency of International Concern. By the middle of March, the virus (SARS-CoV-2) and its associated disease (COVID-19) had reached pandemic status.[1] A growing body of evidence shows that children and adolescents (CAAs) represent a relatively small number of serious COVID-19 infections and deaths.[2] However, CAAs are vulnerable to indirect effects of the pandemic.[3]

In April 2020, we published data showing pronounced decreases in pediatric emergency department (PED) attendances in two hospitals, early in the pandemic.[4] Similar patterns have been reported in countries, such as Italy, where delayed access appears to be related to fears around COVID-19.[5]

As countries affected in the first part of the pandemic begin to emerge from the initial peak, it is important to understand the impact on PED attendances and the acuity of those attending. It is vital that governments deploy clear messaging in future lockdowns to ensure those with serious medical conditions are cared for in a timely fashion.

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Disclosure: The authors declare no conflict of interest.

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ISSN: 0749-5161

The objectives of this cross-sectional study are to (1) compare 2020 attendances (during the pandemic) at each PED to the same period in 2019 and (2) assess the acuity of attendees using likelihood of admission as a proxy.

METHODS

This cross-sectional study used routine count data from two children's hospitals, both housing level 1 trauma centers.

Setting

Royal Manchester Children's Hospital (RMCH) is the largest and busiest children's hospital in the UK and the PED sees approximately 50,000 patients per year. Yale New Haven Children's Hospital (YNHCH) is an acute care hospital in New Haven, CT, and the PED sees over 38,000 patients per year. Both hospitals are in geographical areas that went into "lockdown" on March 23, 2020 (England and Connecticut, respectively) which was in week 13 of 2020. In the United Kingdom, medical care is free at the point of need and in the US health care is mainly insurance-based/fee-for-service.

Data Collection and Analysis

Data for weeks 1 to 20 were extracted from hospital systems as counts only (ie, without any patient information). All CAAs younger than 16 years were included (usual age of transition to adult services in the United Kingdom). Percentage differences between weekly attendances in 2020 (January 1, 2020, to May 20, 2020) compared with 2019 (January 1, 2019, to May 20, 2019) were calculated and plotted in *R*. The likelihood of admission was compared using a fractional regression with the proportion of CAAs admitted as the dependent variable and the lockdown cutoff as the independent variable. All analyses were performed by using *Stata 16*. The pandemic was declared in the middle of week 11, and lockdown commenced at the start of week 13.

RESULTS

Weekly Attendances Compared With the Same Week in 2019

In weeks 1 to 20 of 2020, there were 13,671 attendances to the PED at RMCH and 10,005 at YNHCH, reductions of 29.2% and 24.8%, respectively, compared with the same period in 2019. Attendances began to decrease around the time of the first reported death for each country, and this accelerated the week before lockdown (Figs. 1A and B).

Odds of Admission as a Proxy for Severity

Throughout weeks 1 to 20 in 2019, 28% of attendances resulted in admission at RMCH and for YNHCH this was 12%. In weeks 1 to 12 of 2020, absolute numbers of admissions had begun

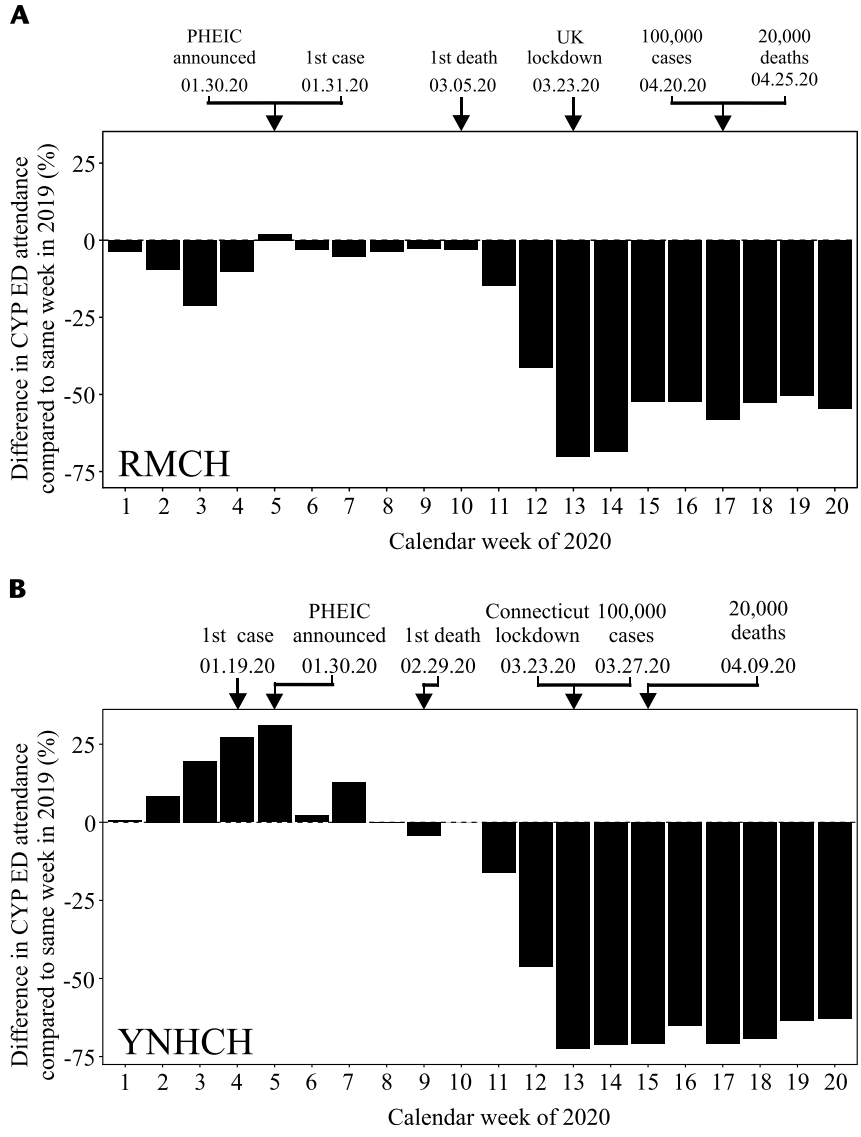

FIGURE 1. Weekly PED attendances (children and adolescents aged less than 16 years) from weeks 1-20 of 2020 compared to the same weeks in 2019. The pandemic was declared in week 11. Dates marked relate to the date on which the event was announced and may not reflect the date that it occurred (e.g. 1st death); PHEIC = Public Health Event of International Concern. **A.** Royal Manchester Children's Hospital (UK), weeks start on a Monday. Note: on April 8th a nearby smaller PED closed and some patients may have diverted to RMCH, resulting in an apparent increase in attendances and therefore decrease in the observed difference compared to 2019. **B.** Yale New Haven Children's Hospital (US), weeks start on a Sunday.

to decrease and rates of admission were down slightly at 25% and 11%, respectively.

However, comparing week 13 onward (ie, postlockdown) in 2020, to the same period in 2019 showed that although the absolute numbers of admissions were down (RMCH 1007 vs 2053; YNHCH 293 vs 650), there was a statistically significant increase in likelihood of admission for both PEDs (Table 1 and Table 2). The odds ratio (OR) for RMCH was 1.26 (95% confidence interval [CI], 1.08–1.46) and for YNHCH was 1.60 (95% CI, 1.31–1.98). Significant increases in OR were also seen in year 2020 but not 2019 (significant decrease at RMCH; no difference at YNHCH).

DISCUSSION

These data show a striking decrease in the number of attendances to the PEDs during the 2020 pandemic, with an associated increase in the chance of admission after the onset of lockdown. These observations likely reflect both a genuine decrease in need (eg, fewer viral infections) but also an increase in delayed and unmet need. Children and adolescents presenting later on in their illness are more likely to have a negative outcome. Although statistically significant, the observed increased chance of admission is, therefore, also likely to be clinically significant.

Major limitations of this study include that it only examined attendance data for 2 hospitals and used a single measure—likelihood of admission—as a proxy for severity of illness. There are also likely to have been changes in the organization of services during the period of the study that will have had an impact on the data. For example, practice changes, such as triaging of selected CAAs with symptoms of COVID-19 (eg, cough, fever), to other areas of the hospital, such as triage tents or clinics, may have resulted in an overestimation of the number of admissions.

These data show that fewer CAAs have been attending PEDs during the pandemic and suggest attendees were more unwell at the time of presentation. Although reasons for the decreased attendances include "positive" impacts of the pandemic, for example, decreased social mixing leading to fewer minor viral infections, reasons for the increased acuity warrant further scrutiny as do the population-level impacts on outcomes. Although not explored here, contributing factors are likely to include the parent or caregiver's fear of the virus, resulting in higher personal thresholds for needing to attend, and will need to be addressed proactively in case of future lockdowns.

As well as the dangers of attending later (and being more likely to be admitted), decreased attendances may also represent missed opportunities for a myriad of other things that occur during a PED visit.

Despite the 2 very different health care systems and background rates of admission, the decreased numbers attending and the increased likelihood of admission (as a proxy for severity of illness) are similar in the United States and United Kingdom, suggesting that these phenomena are likely being replicated in other settings.

Although the direct effects of COVID-19 currently appear to be less severe in CAAs, only time will reveal the indirect negative impacts on this age group, including deaths because of delayed PED presentation. However, those with responsibility for making and communicating decisions around lockdown need to be aware of the unintended consequences of pandemic control measures. As a minimum, there needs to be clear and consistent messaging around when it is appropriate to take an ill or injured child to hospital—emphasizing that a PED visit can be made safely—delivered at the start of any future periods of lockdown.

TABLE 1. ORs for Admission From the PED

Comparison Weeks and Years	OR for Admission	95% Confidence Interval
RMCH		
Weeks 13–20, 2020 vs 13–20, 2019	1.26*	1.08–1.46
Weeks 13–20, 2020 vs 1–12, 2020	1.36*	1.17–1.58
Weeks 13–20, 2019 vs 1–12, 2019	0.92*	0.84–0.99
YNHCH		
Weeks 13–20, 2020 vs 13–20, 2019	1.60*	1.31–1.98
Weeks 13–20, 2020 vs 1–12, 2020	1.87*	1.51–2.32
Weeks 13-20 2019 vs 1–12, 2019	1.01	0.92–1.11

*Statistically significant.

OR, odds ratio; RMCH, Royal Manchester Children's Hospital; YNHCH, Yale New Haven Children's Hospital.

TABLE 2. Proportion of Patients Admitted

		Attendance (n)	Admission (n)	Proportion Admitted
RMCH	Weeks 1–12, 2019	11,541	3273	0.284
	Weeks 13–20, 2019	7767	2053	0.264
	Weeks 1–12, 2020	10,402	2598	0.250
	Weeks 13–20, 2020	3269	1007	0.308
YNHCH	Weeks 1–12, 2019	8110	993	0.122
	Weeks 13–20, 2019	5193	650	0.125
	Weeks 1–12, 2020	8361	895	0.107
	Weeks 13–20, 2020	1644	293	0.178

RMCH, Royal Manchester Children's Hospital; YNHCH, Yale New Haven Children's Hospital.

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