

Hospital Pediatrics®

AN OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic

Zaid Haddadin, Anna Blozinski, Kailee Fernandez, Kelly Vittetoe, Amber L. Greeno, Natasha B. Halasa, Harold N. Lovvorn

DOI: 10.1542/hpeds.2020-005074

Journal: *Hospital Pediatrics*

Article Type: Brief Report

Citation: Haddadin Z, et al. Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic. *Hosp Pediatr*. 2021; doi: 10.1542/hpeds.2020-005074

This is a prepublication version of an article that has undergone peer review and been accepted for publication but is not the final version of record. This paper may be cited using the DOI and date of access. This paper may contain information that has errors in facts, figures, and statements, and will be corrected in the final published version. The journal is providing an early version of this article to expedite access to this information. The American Academy of Pediatrics, the editors, and authors are not responsible for inaccurate information and data described in this version.

Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic

Authors: Zaid Haddadin, MD¹, Anna Blozinski, MPH¹, Kailee Fernandez, BS¹, Kelly Vittetoe, BS², Amber L. Greeno, NP³, Natasha B. Halasa, MD, MPH, FAAP¹, Harold N. Lovvorn, III, MD, FAAP³

Affiliations: ¹Department of Pediatrics, Vanderbilt University Medical Center, Nashville, TN, USA; ²School of Medicine, Vanderbilt University, Nashville, TN, USA; ³Department of Pediatric Surgery, Vanderbilt University Medical Center, Nashville, TN, USA

Corresponding author

Zaid Haddadin, MD

Vanderbilt University Medical Center; Division of Pediatric Infectious Diseases;
1161 21st Ave South, Medical Center North D7232;
Nashville, TN 37232

Phone number: (516) 838-5232

Fax number: (615) 343-9723

Email: zaid.haddadin@vumc.org

Running title: Pediatric Emergency Visits During the COVID-19 Pandemic

Conflict of Interest Disclosures: The authors have no conflicts of interest to disclose.

Funding/Support: No funding was secured for this study.

Abbreviations: ARI: acute respiratory illnesses; ED; emergency department; ACS: American College of Surgeons; NAT: non-accidental trauma

Contributors' Statement Page

Zaid Haddadin conceptualized and designed the study, designed the data collection instruments, collected data, conducted the initial data analyses, drafted the initial manuscript, and reviewed and revised the manuscript.

Anna Blozinski conducted data analyses and reviewed and revised the manuscript.

Kailee Fernandez, Kelly Vittetoe, Amber Greeno collected data, and reviewed and revised the manuscript.

Natasha Halasa conceptualized and designed the study and reviewed and revised the manuscript.

Harold Lovvorn conceptualized and designed the study, coordinated and supervised data collection and analysis, and critically reviewed the manuscript for important intellectual content.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic

Abstract

Objective

Community mitigation measures were implemented to decrease the spread of SARS-CoV-2. This study aimed to evaluate changes in pediatric emergency department (ED) visits secondary to acute respiratory illnesses (ARI) and trauma before and during the pandemic. We hypothesized that the numbers of ED visits and ARI decreased while the proportion of trauma increased.

Patients and Methods

A retrospective study from 2018-2020 was performed on children 18 years and younger presenting to the ED either for ARI or trauma at a high-volume comprehensive pediatric hospital between March-May each year. International Classification of Diseases, Tenth Revision, Clinical Modification admission diagnosis codes were used to identify ARI, trauma, and injury mechanisms. Pearson's chi-squared test was used to compare proportions between categorical variables.

Results

Overall, 6,393 total ED visits occurred in 2020, compared to 11,758 and 12,138 in 2018 and 2019, respectively. In 2020, the total ARI number declined by 58%, and ARI frequency decreased significantly, while the total trauma number declined by 34%, and the proportion of trauma significantly increased. Further, the number and proportion of recreational vehicle accidents increased, while both decreased for all intentional and animal-related trauma.

Conclusions

The total number of pediatric ED visits dropped precipitously in 2020, but the proportions of trauma increased significantly in 2020, accounting for almost one-third of all ED visits. Injury mechanism varied significantly compared to previous years. Future studies are needed to confirm these findings and evaluate the benefits of community mitigation to decrease ARI and strategies directed to reduce mechanism-specific trauma.

Introduction

To attenuate the spread of SARS-CoV-2, community mitigation strategies, such as social distancing, stay-at-home orders, closures of schools and places of worship, and telemedicine, were implemented nationwide.¹ The “Safer-at-Home” order for our state was issued on March 30th, 2020,² which recommended that state residents stay home unless necessary, that non-essential businesses close, and that learning in schools be remote, all to limit the exposure and spread of the SARS-CoV-2. Moreover, most schools were closed by March 16th, 2020.³ Pre-COVID-19 data show that non-SARS-CoV-2 acute respiratory illnesses (ARI) and trauma were the two most common reasons for pediatric emergency department (ED) visits with consistent opposing seasonal peaks.⁴ After mandating the state-wide “Safer-at-Home” order and school closures, pediatric surgeons at our institution noticed an unusual increase in trauma related to recreational and outdoor activities for this time of the year. Conversely, pediatricians noted a decrease in ARI visits, during what is normally considered still the school year and respiratory season.⁴ Therefore, this study aimed to assess changes in pediatric ED visits at a comprehensive regional children’s hospital secondary to ARI and trauma from March through May 2020 during the initial pandemic peak, compared to the two previous years. We hypothesized that the total number of ED and ARI visits decreased during the “Safer-at-Home” period, but that the proportion of trauma visits increased, maintaining a typically reciprocal relationship.

Methods

This study was a 3-year single-center retrospective study from 2018 to 2020 including children 18 years and younger who presented to the ED for either ARI or trauma at a high-volume 343-bed free-standing children’s hospital, that includes an American College of Surgeons (ACS)-verified

Level I pediatric trauma center, between March 1st and May 31st of each year. This 3-month time frame of each year was chosen to correspond with the initial pandemic peak and the “Safer-at-Home” mandate, and to include months still in the respiratory season and end of the school year for our state. The specific aim was to evaluate pediatric ED visits changes during community mitigation periods in 2020 compared to the same time periods in previous years. We did not include data from the summer months for the following reasons: 1. Community mitigation measures were loosened during phased reopening that began in June in our state, 2. Schools normally close at the end of May, when the summer trauma season begins and 3. ARI generally peak from October to May of each year, with few cases encountered in the summer months.⁴ During the study period, all children who presented to the ED were identified by a request submitted to the analytics team at our institution. International Classification of Diseases, Tenth Revision, Clinical Modification admission diagnosis codes were used to identify ARI, trauma, and mechanism of injury (Supplement). We aimed to compare ARI, trauma and injury mechanisms total numbers and proportions during community mitigation periods in 2020 (i.e., “Safer-at-Home” mandate in 2020), compared to the same time periods in previous years. All these comparisons were selected *a priori*. Pearson’s chi-squared test was used to compare proportions between categorical variables. The Institutional Review Board approved the study.

Results

During these 3-month periods, 6,393 total pediatric ED visits occurred in 2020, compared to 11,758 and 12,138 in 2018 and 2019, respectively (Table1). In 2020, the total number of ARI visits declined by 58% and the frequency of ARI also decreased significantly (Figure 1A). In contrast, while the total number of trauma ED visits declined by 34% in 2020, the proportion of trauma ED visits significantly increased from 21% and 22% in 2018 and 2019, respectively, to 26% in

2020 ($p < 0.001$; Figure 1A). Further, in 2020, the cumulative proportions of trauma relative to ARI increased significantly after the “Safer-at-Home” order compared to previous seasons ($p < 0.001$; Figure 1B), maintaining seasonal reciprocity between these two causes of pediatric ED visits. A significant increase in the number and proportion of trauma related to recreational vehicle activities (i.e., all-terrain vehicles and motorcycles) was detected ($p < 0.001$; Figure 1C and Table 2). In contrast, the numbers and proportions of both intentional [non-accidental trauma (NAT)/abuse, suicide, assault/homicide] ($p = 0.009$) and animal-related injuries ($p = 0.039$) decreased in 2020 compared to prior years.

Discussion

This study demonstrated a 50% drop in all pediatric ED visits at a comprehensive regional children’s hospital, during the COVID-19 pandemic and “Safer-at-Home” mandate period compared to the same time periods in the two preceding years. Social distancing countermeasures aimed to mitigate the spread of SARS-CoV-2 likely contributed to the decreased circulation of other common respiratory viruses that share similar transmission routes with SARS-CoV-2.^{5,6} Alternatively, the decrease in the total number and proportion of ARI could be associated with changes in healthcare-seeking behaviors and limited access to care during the pandemic.⁷ While our findings are consistent with reports showing decreases in viral ARI, including influenza, in different regions and populations during the COVID-19 pandemic,^{8,9} prospective studies are encouraged to elucidate the actual causes of these decreases in ARI and further confirm the role of non-medical interventions in containing future viral epidemics and pandemics.

The total number of pediatric trauma visits declined in 2020 during the “Safer-at-Home” mandate, possibly due to a reduction in driving, traffic, and organized after-school activities. However, this

study demonstrated that trauma contributed to over one-third of the total pediatric ED visits in April and May of 2020, a significant increase compared to the previous two years. Moreover, mechanisms of injury seemed to vary from previous years too. Specifically, the total number and percentage of recreational vehicle injuries increased during 2020 during normal school months. In addition, as an ACS-verified Level I pediatric trauma center, we usually manage a large number of intentional trauma (NAT/abuse, suicide, assault/homicide),¹⁰ but this season, our data showed intriguingly that the numbers of these injuries declined significantly, likely resulting from the presence of multiple caregivers in the home with increased supervision, which also plausibly explains the decreases in animal-related injuries (e.g., animal bites) in our study. Contrarily, data have shown decreases in healthcare and ED visits among children during the pandemic,^{11,12} and the decreases in NAT/abuse might be a reflection of decreased presentation rather than true declines, given that teachers and other school staff are often instrumental in bringing these concerns to attention in a timely manner, and closure of schools maybe have contributed to reduced detection and delayed presentation of NAT/abuse, which our study would not have captured given the time-window chosen. Nevertheless, we do believe that multiple adults mandated to be home at the same time have contributed to a reduction in the overall intentional and animal-related injuries together through better supervision of young children. Although trauma negatively impacts children and their families directly, the healthcare system is also adversely affected during a pandemic, given the utilization of limited medical resources, such as protective attire and life-sustaining medical equipment. Furthermore, injury-related hospitalizations could potentially increase the risk of SARS-CoV-2 exposure to patients, families, and healthcare workers. Future studies are needed to confirm these findings, as such changes might require resource reallocation in pediatric ED settings, and to evaluate the need for strategies to avert mechanism-specific trauma

Prepublication Release

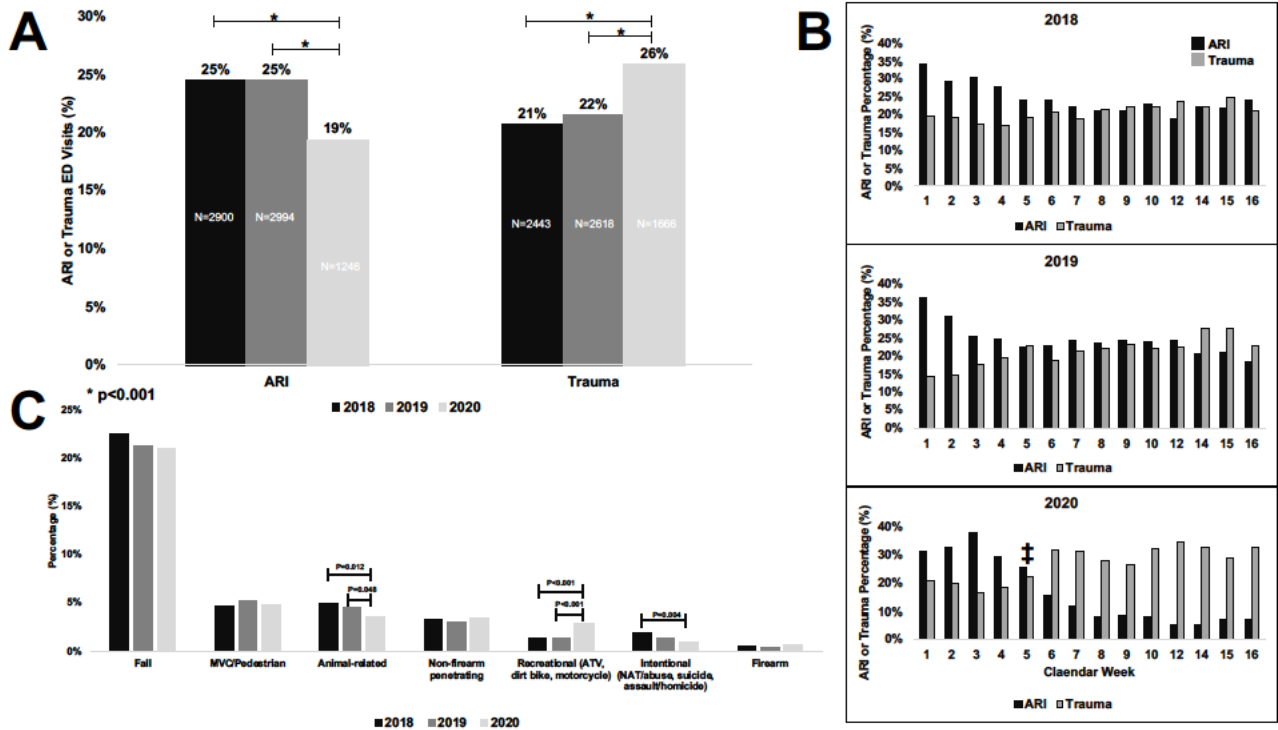
during community mitigation periods and times of limited medical recourses during a pandemic. Because the COVID-19 pandemic is ongoing with intermittent school-closures, increased parental supervision and adherence to practicing safe activities would be strongly encouraged.

References

1. Center for Disease Control and Prevention, Coronavirus (COVID-19). <https://www.cdc.gov/coronavirus/2019-ncov/index.html>. Published 2020. Accessed 4/12/2020.
2. State TSo. AN ORDER DIRECTING TENNESSEANS TO STAY HOME UNLESS ENGAGING IN ESSENTIAL ACTIVITIES TO LIMIT THEIR EXPOSURE TO AND SPREAD OF COVID-19. <https://publications.tnsosfiles.com/pub/execorders/exec-orders-lee22.pdf>. Published 2020. Accessed 10/5/2020.
3. Schools MNP. METRO SCHOOLS CLOSED. <https://www.mnps.org/district-calendar/2020/3/16/metro-schools-closed>. Published 2020. Accessed 12/14/2020.
4. McDermott K SC, Freeman W. Overview of Pediatric Emergency Department Visits, 2015 #242. <https://hcup-us.ahrq.gov/reports/statbriefs/sb242-Pediatric-ED-Visits-2015.jsp>. Published 2020. Accessed September 30, 2020.
5. Sherman AC, Babiker A, Sieben AJ, et al. The Effect of SARS-CoV-2 Mitigation Strategies on Seasonal Respiratory Viruses: A Tale of Two Large Metropolitan Centers in the United States. *Clin Infect Dis*. 2020.
6. Young G, Peng X, Rebeza A, et al. Rapid decline of seasonal influenza during the outbreak of COVID-19. *ERJ Open Res*. 2020;6(3).
7. Santoli JM. Effects of the COVID-19 pandemic on routine pediatric vaccine ordering and administration—United States, 2020. *MMWR Morbidity and Mortality Weekly Report*. 2020;69.
8. Olsen SJ, Azziz-Baumgartner E, Budd AP, et al. Decreased Influenza Activity During the COVID-19 Pandemic—United States, Australia, Chile, and South Africa, 2020. *Morbidity and Mortality Weekly Report*. 2020;69(37):1305.
9. Angoulvant F, Ouldali N, Yang DD, et al. COVID-19 pandemic: Impact caused by school closure and national lockdown on pediatric visits and admissions for viral and non-viral infections, a time series analysis. *Clinical Infectious Diseases*. 2020.
10. Schlegel C, Greeno A, Chen H, et al. Evolution of a level I pediatric trauma center: Changes in injury mechanisms and improved outcomes. *Surgery*. 2018;163(5):1173-1177.
11. Hartnett KP, Kite-Powell A, DeVies J, et al. Impact of the COVID-19 Pandemic on Emergency Department Visits - United States, January 1, 2019-May 30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(23):699-704.
12. Santoli JM, Lindley MC, DeSilva MB, et al. Effects of the COVID-19 Pandemic on Routine Pediatric Vaccine Ordering and Administration - United States, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(19):591-593.

Figure legends

Figure 1. Proportions of Acute Respiratory Illnesses (ARI) and Trauma ED Visits by A. Study Year B. Calendar Week, Stratified by Study Year and C. Proportions of Mechanisms of Trauma Out of All Trauma ED Visits by Study Year.



‡Safer-at-home mandate was implemented during calendar week five.
MVC: Motor vehicle collisions; ATV: All-Terrain vehicle; NAT: Non-accidental trauma

Table 1. Total Numbers of Acute Respiratory Illness-related and Trauma-related pediatric Emergency Department Visits, Stratified by Year.

	2018 (n=11,758)	2019 (n=12,138)	2020 (n=6,393)	p-value
ARI	2,900 (24.7%)	2,994 (24.7%)	1,246 (19.5%)	<0.001[±]
Trauma	2,443 (20.8%)	2,618 (21.6%)	1,666 (26.1%)	<0.001[±]

± Pearson's Chi-squared test

Table 2. Total Numbers of Emergency Department (ED) Visits According to Mechanism of Injury, Stratified by Year.*

	2018 (n=3757)	2019 (n=3924)	2020 (n=2534)	p-value
Fall	848 (22.6%)	842 (21.5%)	535 (21.1%)	0.320 [±]
MVC/Pedestrian	178 (4.7%)	204 (5.2%)	122 (4.8%)	0.615 [±]
Animal-related	183 (4.9%)	179 (4.6%)	90 (3.6%)	0.039[±]
Non-firearm penetrating	121 (3.2%)	115 (2.9%)	87 (3.4%)	0.512 [±]
Recreational (ATV, dirt bike, motorcycle)	53 (1.4%)	50 (1.3%)	73 (2.9%)	<0.001[±]
Intentional [non-accidental trauma (NAT)/abuse, suicide, assault/homicide]	70 (1.9%)	52 (1.3%)	24 (0.95%)	0.009[±]
Firearm	18 (0.5%)	15 (0.4%)	15 (0.6%)	0.482 [±]

*Overall, 6,727 unique ED trauma-related visits were encountered, with 10,215 unique trauma-related admission diagnosis codes.

[±] Pearson's Chi-squared test

Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic

Zaid Haddadin, Anna Blozinski, Kailee Fernandez, Kelly Vittetoe, Amber L. Greeno,
Natasha B. Halasa and Harold N. Lovvorn III

Hospital Pediatrics originally published online January 12, 2021;

Updated Information & Services	including high resolution figures, can be found at: http://hosppeds.aappublications.org/content/early/2021/01/08/hpeds.2020-005074.citation
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.hosppeds.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://www.hosppeds.aappublications.org/site/misc/reprints.xhtml

Hospital Pediatrics®

AN OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Changes in Pediatric Emergency Department Visits During the COVID-19 Pandemic

Zaid Haddadin, Anna Blozinski, Kailee Fernandez, Kelly Vittetoe, Amber L. Greeno,
Natasha B. Halasa and Harold N. Lovvorn III

Hospital Pediatrics originally published online January 12, 2021;

The online version of this article, along with updated information and services, is located on
the World Wide Web at:

<http://hosppeds.aappublications.org/content/early/2021/01/08/hped.2020-005074.citation>

Hospital Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Hospital Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 345 Park Avenue, Itasca, Illinois, 60143. Copyright © 2021 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

