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Hold the Phone! Cell Phone-Related Injuries in Children, Teens, and Young Adults Are On the Rise

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Abstract

We describe trends in cell phone-related injuries in patients 21 years of age and under presenting to United States Emergency Departments. We calculated age-adjusted rates of cell phone-related injury per 100 000 individuals using data from the National Electronic Injury Surveillance System (NEISS) database and United States Census Bureau. From 2002 to 2015, an estimated 38 063 patients 21 years old and younger sustained a cell phone-related injury. The overall rate of injuries for all ages increased from 17.1 injuries per 100 000 in 2002 to 138 injuries per 100 000 in 2015, an increase of over 700%. The incidence of cell phone-related injuries increased across all age groups, with children 2 years of age and under experiencing the highest single incidence rate of 159 injuries per 100 000 in 2014. These findings highlight an important and relatively under-reported pediatric safety issue. Anticipatory guidance and injury prevention plans should be updated accordingly.

Keywords

cell phone, pediatric injury, injury prevention, anticipatory guidance, safety

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What do we already know about this topic?
Increasing injuries related to cell phone use have been reported previously in the literature; many reports are focused on distraction-related injuries in drivers and pedestrians.

How does your research contribute to the field?
To our knowledge, this research is the first to detail cellphone related injuries in specific pediatric age groups. After adjusting for age, we found that young children, aged 2 years and less, sustain the highest rate of cell phone injuries.

What are your research's implications toward theory, practice, or policy?
Our research argues for discussion about safe cellphone usage for the parents of children of all ages and for patient-specific discussions starting around the early teenage years at the latest.

Background

Cell phone use has increased dramatically in the United States (US), growing from approximately 90 000 subscriptions in 1984 to 382 million in 2015.[1] In 2015, more than 92% of US adults reported owning a cell phone, including smartphones.[2] While cell phone subscription data specific to children and teens is not available, survey data demonstrates that cell phone and smart phone access have also increased dramatically, with 75% of teens reporting access to a smartphone in 2015, increasing to 95% as of October 2018.[3,4] Furthermore, a 2019 survey reports that 19% of 8-year-old children have access to a smartphone.[5]

An unintended consequence of increased cellphone adoption is an increase in cell phone-related injuries. Mechanisms of injuries such as motor vehicle accidents associated with distracted driving,[6] texting while driving,[7] or texting while walking are well characterized.[8,9]

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There is, however, a critical gap in the literarature in regards to the cell phone injuries in the specific pediatric age groups. Thus, the primary objective of this study was to examine trends in cell phone-related injuries among persons 21 years of age and younger presenting to US emergency departments (EDs).

Materials and Methods

We gathered cell phone injury data from the National Electronic Injury Surveillance System (NEISS),[10] a division of the United States Consumer Products Safety Commission (CPSC). This database provides national estimates of injuries associated with consumer products. Estimates are gathered from 100 participating EDs, selected as a probability sample of 5388 hospitals.[11] The data recorded for each injury includes the product(s) related to the injury, age, race, and a short narrative description of the mechanism of injury. The database is searchable and allows for customized queries.

We queried the NEISS database for cell phone-related injuries sustained by patients age 21 years and under for the years 2002 to 2015. Product code 550 was used to screen for all injuries associated with telephones and telephone-related products, including cell phones. Then, we distinguished injuries related specifically to cell phones (as opposed to landline or other telephone-related injuries) by designing an algorithm which searched the narrative description of the injury for the keywords "cell," "cellular," "mobile," "charger," and "text[ing]." Cases with descriptions that contained these keywords were labeled as cell phone-related injuries. For the remaining cases, a research team member reviewed the narrative descriptions for indications of cell phone involvement. If the injury was clearly cell phone-related based on context, the case was also labeled as cell phone-related. For example, a case where a patient was injured while driving and talking on the phone was labeled cell phone-related even if the exact phrase "cell phone" was not included in the narrative description, because it is assumed a person could not be using a landline telephone in a moving vehicle.

We calculated rates of cell phone-related injury per 100 000 individuals by using population estimates obtained by the US Census Bureau.[12,13] The July 1st population estimates were used to represent the center date of each year.

We reported mechanism of injury data for several categories and by the following patient age groups: (1) infants and toddlers (age 0-2 years); (2) young children (age 3-10 years); (3) pre-teens and young teens (age 11-15 years); 4) older teens (age 16-18 years); and (5) young adults (age 19-21). We also report total incidence stratified by injury type. Additionally, we report disposition and mortality data for the entire cohort.

We used SAS University Edition (SAS 9.4 SAS Institute Inc., Cary NC) for the statistical analysis. SAS Survey Procedures (PROC SURVEYFREQ and PROCSURVEY LOGISTIC) were used to account for the complex sampling design and weighted structure of the data.

Table 1. Estimated Number of Cell Phone-Related Injuries Presenting to US Hospital EDs From 2002 to 2015 (Ages 0-21).

Year	Injuries	Incidence per 100 000
2002	727	17.1
2003	839	20.0
2004	850	20.5
2005	1186	28.6
2006	884	21.5
2007	1983	48.7
2008	2037	49.8
2009	2757	66.7
2010	2788	66.6
2011	4069	98.4
2012	4133	102.2
2013	3821	93.8
2014	6305	153.2
2015	5685	138.0

Ethical Approval and Informed Consent

Ethical approval and informed consent were not needed for this project since the data were gathered from public sources and no patient health information was accessed.

Results

Injury Rates and Socio-Demographic Characteristics

From 2002 to 2015, an estimated 38 063 patients aged 21 years and under visited a US emergency department to report an injury involving a cell phone. The overall rate of cell phone-related injury for all ages in the cohort increased from 17.1 injuries per 100 000 in 2002 to 138 injuries per 100 000 in 2015, an increase of more than 700% (Table 1).

Young adults (age 19-21 years) accounted for almost 30% of injuries, and preteens and adolescents (ages 11-18) comprised approximately 50%. Cell phone-related injuries were slightly more common among females than males in overall analysis (Table 2),

Table 2. Demographics of Patients Aged 21 years or Less Presenting to US EDs for Cell Phone-Related Injuries 2002 to 2015.

Age (years)	n (%)
0-2	3600 (9.5)
3-10	4539 (11.9)
11-15	8880 (23.3)
16-18	9952 (26.2)
19-21	11 092 (29.1)
Sex	
Female	20 774 (54.6)
Male	17 290 (45.4)
Race	
Black/African American	5952 (15.7)
White	17 885 (47.0)
Other	3154 (8.3)
Not stated	11 073 (29.1)

although younger males between the ages of 0 to 10 were more likely to sustain injuries than younger females (Appendix 1).

Of those evaluated, 96.2% were discharged, 2.4% were admitted or observed, and 0.5% were transferred to another facility. Less than 1% left without being seen or left against medical advice. There were no deaths reported in this dataset for this time period.

Age-adjusted incidence rates demonstrate increases in cell phone-related injuries across all age groups on average from 2002 to 2015, with children 2 years of age and under experiencing the single highest incidence (159 injuries per 100 000) in 2014 (Figure 1). Over the same time period, children 3 to 10 years of age demonstrated the greatest change compared to 2002, with an approximate 8-fold increase (Table 3).

Mechanism of Injury by Age

In addition to reporting the population-level estimates of injury incidence (per 100 000 individual) calculated using the complex weighted NEISS data and census data provided above, we also report the a breakdown of individual injuries by mechanism and age, which were based on a review of each injury summary. For a graphical representation please refer to Figure 2.

Infants and Toddlers (0-2 Years)

For children aged 2 years or less, 47.9% of the presenting cell phone-related injuries resulted from being struck with a cell phone. Infants under 6 months who were struck were typically hit with a cell phone by a sibling, or the injury occurred when an adult dropped a cell phone while holding the infant. All of these infants were evaluated in the ED for head or facial injury as a result of being struck by a cell phone. Oral ingestion of cell phone parts or accessories and electrical injury accounted for an additional third (32.9%) of injuries in children 2 years of age or under. All electrical injuries involved a cell phone charger.

Young Children (3-10 Years)

The percentage of children 3 to 10 years of age who were struck by a cell phone was 46.3%. In this age group, however, lacerations (14.2%) and nasal or otic foreign bodies (13.6%) were the other most common reported mechanisms. In fact, 58% of all patients presenting with cell phone-related foreign bodies in the ear or nose were between 3 and 4 years of age.

Pre-Teens and Young Teens (11-15 Years)

Distracted mobility (ie, walking, biking, skateboarding or driving while using a cell phone) accounted for nearly 25% of injuries among those 11 to 15 years of age. All motor vehicle-related injuries occurred were suffered by passengers or drivers in a vehicle with a distracted driver. For injuries categorized as "other" in this age group, 20% were described as overuse injuries involving hand and wrist pain attributed to texting and other cell phone-related practices.

Older Teens (16-18 Years)

Among those 16 to 18 years of age, distracted driving and walking each accounted for 18.1% of injuries, with an additional 4.6% from bike or skateboard accidents. Thus, distracted mobility accounted for over 40% of injuries in this age group. The most common single reported mechanism of injury was still being struck by a cell phone (21.8% in this age group).

Young Adults (19-21 Years)

Distracted mobility accounted for 47% of injuries among patients ages 19 to 21 years. This age group had the highest incidence of motor vehicle accidents compared with all other age groups (25%), and motor vehicle accident was the most common single reported mechanism of injury.

Type of Injury—All Ages

The most commonly reported injury types across all age groups were: contusions/abrasions (34.6%), lacerations

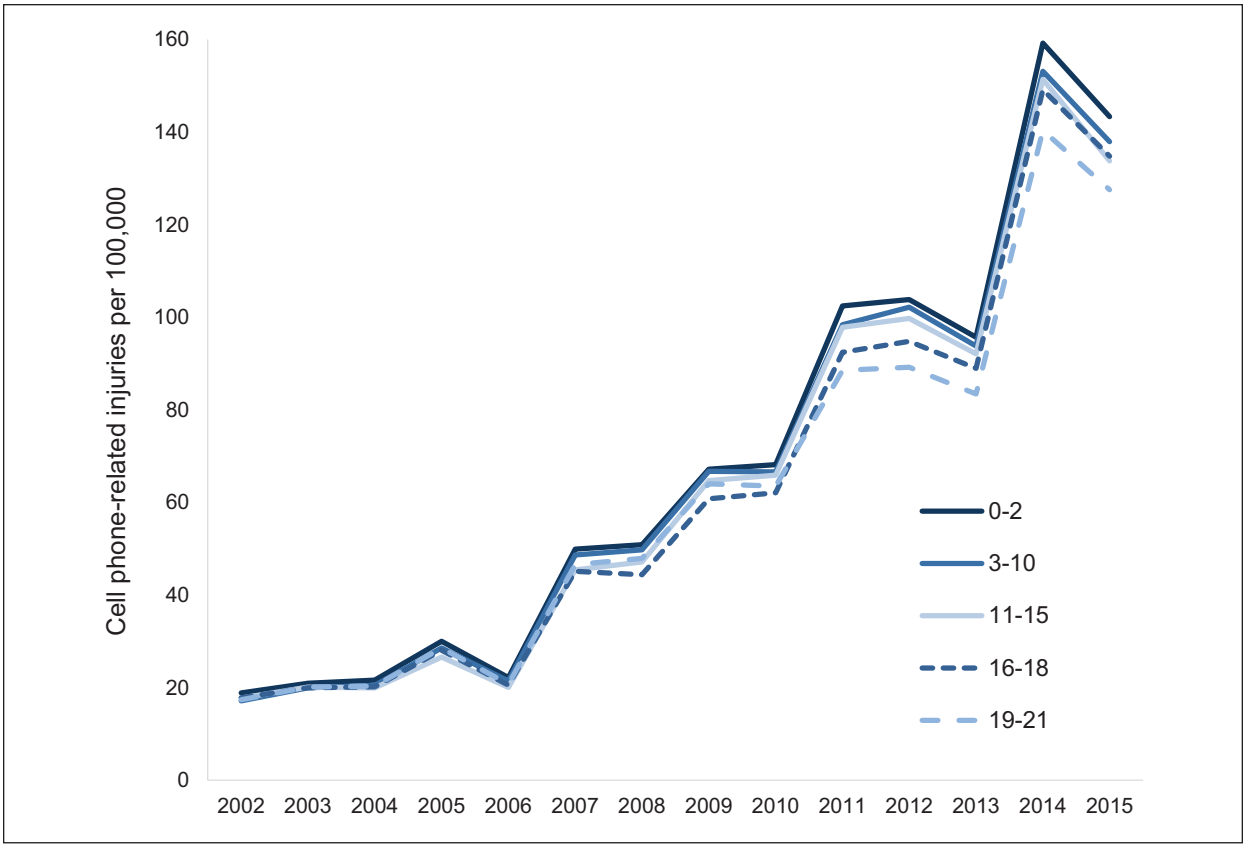

Figure 1. Graphical representation of the estimated rate of cell phone-related injuries presenting to US EDs from 2002 to 2015 by age group.

Table 3. Estimates of Cell Phone Injury Incidence (Injury per 100 000) Presenting to US EDs.

Age (y)	2002	2015	Percent change (%)
0-2	18.85	143.32	660
3-10	17.13	137.94	705
11-15	17.74	133.77	654
16-18	17.8	134.78	657
19-21	17.38	127.56	634

(29.5%), strains/sprains (19.7%), internal organ injuries (10.2%), and fracture (6.0%) (Table 4).

Discussion

The incidence of cell phone-related injuries among patients 21 years of age and under increased over 8-fold between the years 2002 to 2015. Injury rates among infants and children (ages 0-10) were slightly higher than for teenagers and young adults (ages 11-21). This finding highlights an important and relatively under-reported pediatric safety issue.

Given the societal trend of increasing cell phone adoption and proliferation at ever younger ages, understanding the burden of injury, especially in young children, is crucial to developing appropriate injury prevention strategies. Anticipatory guidance during the well-child visit is an anchor in injury prevention,[14] and has been a successful tactic in decreasing a broad range of pediatric injuries.[15,16] Anticipatory guidance is also a major arm of the Center for Disease Control and Prevention's (CDC) National Action Plan for Child Injury Prevention.[17] Currently, the American Academy of Pediatrics' Bright Futures[18] guidelines—an evidence-based compendium of guidelines including anticipatory guidance referenced universally by pediatricians—does mention cell phones in the context of safety and injury prevention. However, the reference is found only in the section for "Adolescence—11 through 21 years" under the subheading "Driving," and focuses almost exclusively on distracted driving. No mention is made regarding cell phone-related injuries in any other age or context.

Our study demonstrates that cell phone-related injuries are more pervasive and include more causes than just distracted mobility. Our study also suggests that these injuries are not significantly weighted towards

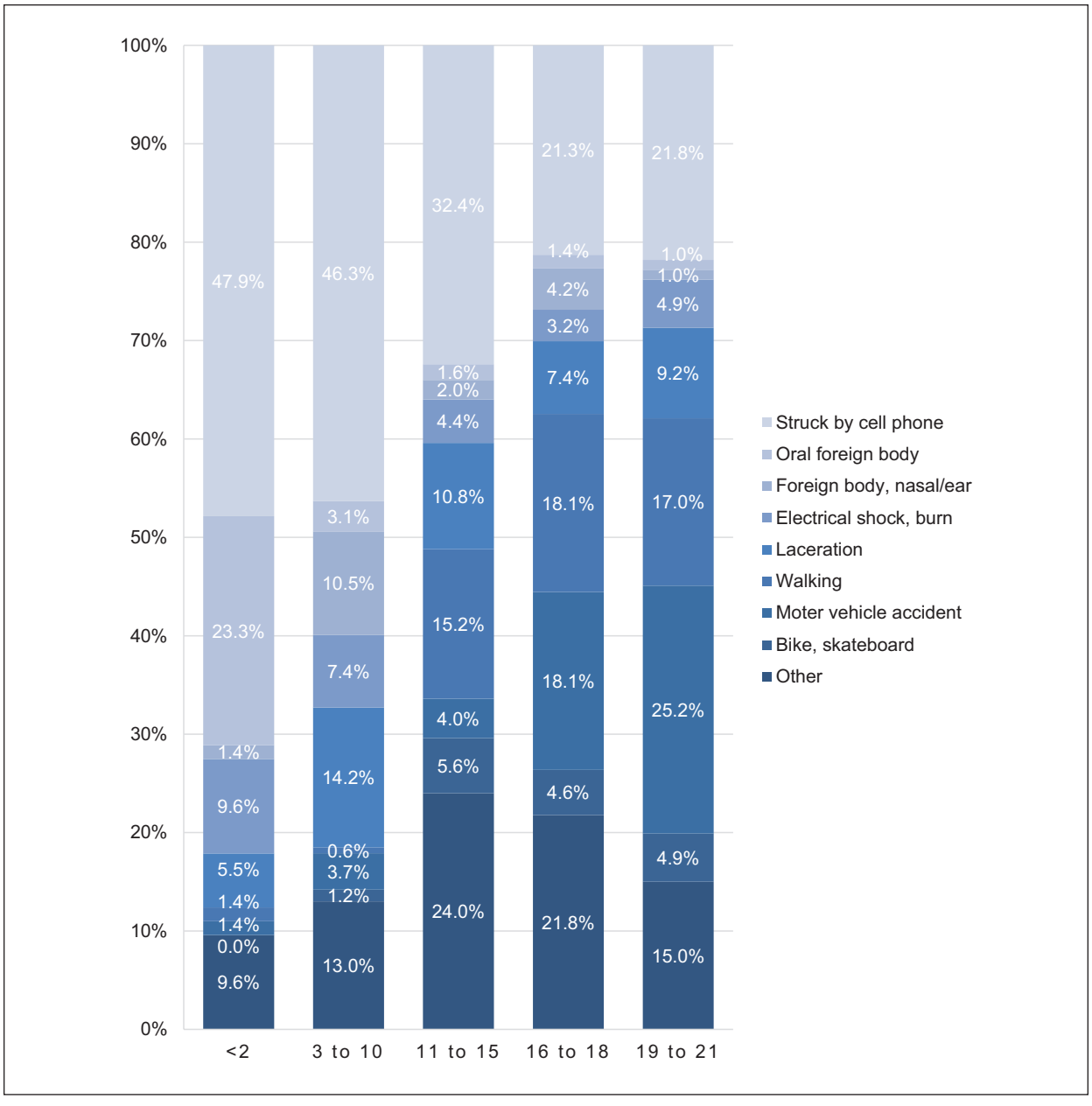

Figure 2. Graphical depiction of the percentage of of total injuries by mechanism within each age group.

adolescent or young adult age groups. Other hazards and younger age groups warrant attention, and support refining the age-appropriate anticipatory guidance regarding injury prevention in Bright Futures and other guidelines.

Being struck by a cell phone was a major cause of cell phone-related injury in all age groups. In light of this, providing anticipatory guidance on avoiding throwing cell phones may be important at all ages. For parents of infants, vigilant supervision should be recommended when handling cell phones while holding young babies. When children reach toddler age, parents should be counseled on the foreign body risks associated with cell phone small parts. Additionally, parents should be advised to unplug cell phone chargers when not in use to prevent electrical injury.

Regarding older teens and young adults, guidance regarding distracted mobility has received well-deserved attention in the sphere of public health.[19-21] Our data support that safety conversations and public health interventions regarding distracted walking, biking or skateboarding should instead likely begin at age 11 and certainly no later than middle school (age 13-14).

Table 4. Type of Cell-Phone Related Injury Sustained by Patients ≤21 Years of Age Presenting to US EDs 2002 to 2015.

Contusions, abrasions	9357 (34.6)
Laceration	7990 (29.5)
Strains, sprains	5331 (19.7)
Internal organ injury	2769 (10.2)
Fracture	1628 (6.0)
Other	10988

Additionally, an increased focus on cell phone-related injury prevention does not need to be limited to the primary care setting. The ED has previously been shown to be an appropriate setting for injury prevention interventions, with several studies demonstrating success.[22-24] Because the ED is the medical setting in which acutely injured patients present for care, it is the ideal "teachable moment."[25] ED providers may provide safety counseling or they may choose to link high-risk patients to school or community programs. For example, 3 community programs have been instituted to reduce unintentional pedestrian injuries in children: the WalkSafe Program, the Child Pedestrian Injury Prevention Project, and Cyrus the Centipede.[26-28] These programs are all geared towards children in primary school, and have all demonstrated increased knowledge and improvement in target behaviors.[28-30]

Strengths and Limitations

This study has several strengths, including a large sample size, a weighted probability sample which is representative of the population of study, and a robust, well-supported database. In terms of limitations, the NEISS database includes only those patients who presented to an ED for their injury. As a result, patients seen in urgent care or primary care settings, or who were injured but did not seek care, are not included. Additionally, NEISS coding for all telephone-related injuries as opposed to codes specific to cell phones lessens the precision of the analysis. These limitations however are likely to result in an underestimation of the total number of cell phone-related injuries.

The lack of precise data on cellphone use in these age groups over the study period renders a comparison between the incidence of injuries and the cellphone use impossible. However, survey data strongly indicates that cellphone and smartphone access was generally increasing in all age groups. Thus, it stands to reason that the increased access and use of smartphones is likely associated with the increased injuries.

Conclusion

Cell phone related injuries are on the rise in the US in all patients under 21 years of age, and surprisingly, the rates of increase are similar among all age groups. Our findings suggest cell phone-injury prevention should begin early and be reiterated as children grow and gain more independence. As the initial main recipients of injury prevention messaging, parents should receive guidance on increased vigilance of handling phones around young infants, unplugging cell phone chargers, and counseling on the potential foreign body hazards of small pieces related to cell phones. Children as young as 11 years old should begin receiving direct, tailored messages on distracted mobility—specifically safety regarding walking, biking, skateboarding and ultimately, driving. These injury prevention tactics are not limited to the primary care setting, and can be messaged in the ED at the time of a "teachable moment."

Appendix 1. National Estimates of Cell Phone-Related Injuries Presenting to U.S. EDs by Age and Sex.

	Males	Females
Age (Years)	n (%)	n (%)
0-2	2061 (57.3)	1539 (42.7)
3-10	2927 (64.5)	1612 (35.5)
11-15	3271 (36.8)	5609 (63.2)
16-18	4230 (42.5)	5722 (57.5)
19-21	4800 (43.2)	6292 (56.8)

Authors' Note

Reprints not available from the authors.

Author Contributions

PWG: Contributed to conception and design; Contributed to acquisition, analysis, and interpretation; Drafted the manuscript; Critically revised the manuscript; Gave final approval; Agrees to be accountable for all aspects of work ensuring integrity and accuracy. JC: Contributed to analysis; Critically revised the manuscript; Gave final approval; Agrees to be accountable for all aspects of work ensuring integrity and accuracy. KF: Contributed to analysis; Critically revised the manuscript; Gave final approval; Agrees to be accountable for all aspects of work ensuring integrity and accuracy. KH: Contributed to analysis; Critically revised the manuscript; Gave final approval; Agrees to be accountable for all aspects of work ensuring integrity and accuracy. MN: Contributed to conception and design; Contributed to acquisition, analysis, and interpretation; Drafted the manuscript; Critically revised the manuscript; Gave final approval; Agrees to be accountable for all aspects of work ensuring integrity and accuracy.

Declaration of Conflicting Interests

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