Patterns in emergency department unscheduled return visits during the COVID-19 pandemic☆

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ABSTRACT

Introduction: Fear surrounding nosocomial infections, expanded telehealth, and decreases in ED (emergency department) utilization altered the way patients sought emergency care during the COVID pandemic. This study aims to evaluate COVID-19s impact on the frequency and characteristics of unscheduled return visits (URVs) to the adult and pediatric ED.

Methods: In this retrospective cohort study, the electronic medical record was used to identify ≤9-day URVs at a tertiary adult and pediatric ED from 4/16/19–2/29/20 (control) and 4/16/20–2/28/21 (COVID). The primary outcome, proportion of total ED visits made up by URVs, and secondary outcomes, patient characteristics (age), illness acuity (emergency severity index (ESI)), disposition, and mortality were compared between the cohorts. Pediatric and adult data were analyzed separately. A sub-analysis was performed to exclude patients with suspected respiratory infections.

Results: For adults, $n = 4265$, there was no significant difference between the proportion of ED census made up by URVs (4.56% (control) vs 4.76% (COVID), $p = 0.17$), mean patient age (46.33 (control) vs 46.18 (COVID), $p = 0.80$), ESI acuity (2.95 (control) vs 2.95 (COVID), $p = 0.83$), disposition (admission 0.32% (control) vs 0.39% (COVID), $p = 0.69$), and mortality (0.23% (control) and 0.49% (COVID), $p = 0.15$). When excluding possible respiratory infections comparisons remained insignificant.

For pediatrics, $n = 1214$, there was a significant difference in the proportion of ED census made up by URVs (4.83% (control) to 3.55% (COVID), $p < 0.01$), age (5.52 (control) vs 6.43 (COVID), $p = 0.01$), and ESI acuity (3.31 (control) vs 3.17 (COVID), $p < 0.01$). There was no difference in disposition (admission 0.12% (control) vs 0% (COVID), $p = 1$). When excluding possible respiratory infections acuity ($p = 0.03$) remained significant.

Conclusion: In the adult population, COVID did not significantly alter any of our outcomes. For pediatric patients, a decrease in the proportion of URVs and increase in acuity during COVID suggests that patients may have had other means of accessing care, avoided the ED, received more adequate care at initial presentation, or represented when more acutely ill.

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1. Introduction

Emergency department (ED) unscheduled return visits (URVs), have been utilized by researchers and hospital administrators since the late 1980's as a performance and quality metric assessing physician and health system performance [1-4]. ED URVs have been linked to poorer patient care [5-8]. Although returns make up a minority of total ED census at any given time, their length of stay, ED billing, and admission rates are significantly higher than ED averages and therefore have a disproportionate impact [4,9,10].

1.1. Effect of COVID

The changes brought on by the COVID pandemic have the ability to substantially alter the landscape of emergency department URVs. Health systems were placed under significant strain and forced to rapidly adapt. During the height of COVIDs first surge in April 2020 hospital systems across the US reported record admissions pushing beyond their normal capacity [11-13]. Contrary to this trend, hospitals saw ED volume drop dramatically as sick patients avoided emergency departments

due to concern for nosocomial COVID infections [11]. A CDC survey conducted in June of 2020 reported 12% of US adults avoided urgent/emergency care with higher rates among caregivers, those with ≥2 comorbidities, and minorities [14]. In tandem with these swings in patient volume, health systems and insurers across the United States expanded access to care by rolling out wide scale telehealth [12,13,15]. The dramatic increase in utilization of telehealth allowed providers to safely care for non-acute patients outside of the ED or clinic setting.

This study aims to evaluate the effect of COVID-19 on the frequency of URVs to the emergency department and compare patient as well as illness characteristics of emergency department URVs during the COVID-19 pandemic to a cohort of URVs one year prior. It is our hypothesis that COVIDs impact on individual patients and the greater health system will alter the frequency of unscheduled return visits to the emergency department and change the nature of these URVs in terms of patient characteristics and illness acuity. It is important to analyze the impact of COVID on emergency department bounce back visits to assess the pandemics impact on care quality and the patients who interface with emergency care as a means to inform future strategies to reduce and mitigate URVs during non-pandemic times and future pandemics.

2. Methods

2.1. Study design

In this single center retrospective cohort study, electronic medical records were used to identify unscheduled return visits at a 628 bed suburban academic medical center's adult (58 beds) and pediatric emergency department (12 beds) located in Hershey, PA. Patient and illness characteristics associated with each URV were collected over a 21 month period and were compared between a cohort of patients presenting during the COVID pandemic (April 16th 2020 - February 28th 2021) to a control cohort who presented the year prior to the pandemic (April 16th 2019 - February 29th 2020). The study period was designed to capture the beginning of community COVID transmission, with rolling averages of 16 cases per day in the study site's county, and to extend for the maximum period while allowing for a chronologically identical control cohort period from the year prior which did not encompass any local confirmed positive COVID cases or lockdown orders [16]. This study was reviewed and approved with exempt status by the Pennsylvania State University College of Medicine Institutional Review Board.

2.2. Definition of URV

URV was defined as re-presentation to the ED within 9 days of an index visit. Although 72-h was the originally defined return period and subsequently the most frequently utilized in the literature to date, no data driven justification has been made for this seemingly arbitrary time period [1-3,6,9]. Recent literature based on empirical analysis have suggested 9-day returns as a more appropriate metric to adequately capture ED revisits [5,10].

2.3. Patient population

Patients who presented to the emergency department within 9 days of an index visit were included. Patients were excluded if they left against medical advice, left without being seen, or returned to the ED for routine follow up care (such as suture removal).

2.4. Data collection

Identified URVs were abstracted for demographic information (age in years), reason for ED visit, Emergency Severity Index (ESI) acuity score as inputted by nursing staff, time to ED revisit (hours), disposition (admission, discharge), and mortality. ESI is a validated five level triage algorithm which rates patients on a scale of 1 (sickest) to 5 (least

resource intensive) [17,18]. Data was collected regarding frequency of unscheduled return visits as measured by proportion of total ED census they encompassed within their respective cohort period.

2.5. Outcomes

The primary outcome was the proportion of total ED visits made up by unscheduled return visits. Secondary outcomes included patient characteristics (age in years), illness acuity (ESI acuity score (1–5)), disposition, and mortality.

2.6. Data analysis

Categorical variables are displayed as proportions while continuous variables are reported as means. For categorical variables, the COVID and control cohorts were compared using the Chi-Squared Test or Fisher's Exact Test if sample size was small. For continuous variables, the COVID and control cohorts were compared using the student's *t*-test (Two-Sample Assuming Equal Variances or Two-Sample Assuming Unequal Variances). All *p* values are two sided and considered significant if ≤0.05. Data analysis was completed in Microsoft Excel version 2112 (Redmond, Washington).

Pediatric (<18) and adult data were analyzed separately. A subanalysis was completed on URVs excluding respiratory infections identified using the "reason for visit" as inputted by nursing staff. Respiratory (cough, SOB, respiratory distress, pneumonia, respiratory, covid etc), constitutional (fever, flu symptoms), and ear nose and throat (sore throat) related visits were excluded in this sub-analysis. The aim of the sub-analysis was to remove the direct impact of COVID-19 infections therefore capturing only the broader impact the pandemic had on the greater health system and patient behavior.

3. Results

6258 URVs were identified (Fig. 1). Of the identified records, 779 were excluded as the URV was routine follow-up ($n = 253$), the patient left against medical advice (AMA) ($n = 352$), or the encounter had no visit reason ($n = 174$). Adult ($n = 4265$) and pediatric ($n = 1214$) were analyzed separately. The total adult ED census dropped 10.7% from 48,456 during the control cohort to 43,247 during the COVID cohort and the total pediatric ED census dropped 39.6% from 17,410 during the control cohort to 10,520 during the COVID Cohort.

For adults there was no statistically significant difference between the proportion of ED census made up by URVs (Table 1).

There was no difference in mean age and hours to representation after index between the adult control and COVD cohorts (Table 2).

The most common visit reason as a proportion of all visits within the adult cohort was musculoskeletal related complaints followed by abdominal pain (Table 2). There were reductions in the proportion of musculoskeletal (-4.94%, $p \leq 0.01$) and neurologic (-1.65%, $p = 0.04$) related complaints and increases in the proportion of abdominal pain (2.81%, $p = 0.01$) and respiratory complaints (3.39%, p ≤0.01).

In the adult cohorts there was no significant difference in acuity as measured by the ESI scale, percent of URVs leading to hospital admission, and percent of URVs culminating in an in hospital death (Table 2).

When possible respiratory infections were excluded there remained no statistically significant difference in acuity as measured by the ESI scale, percent of URVs leading to hospital admission, and percent of URVs culminating in an in hospital death among the adult cohorts (Table 3).

In pediatric patients there was a 1.28% difference between the proportion of ED census made up by URVs (4.83% (control) vs 3.55% (COVID), *p* value <0.01) (Table 1).

There was a 0.91-year difference in mean age (5.52 (control) vs 6.43 (COVID), $p = 0.01$). There was no difference in hours to representation
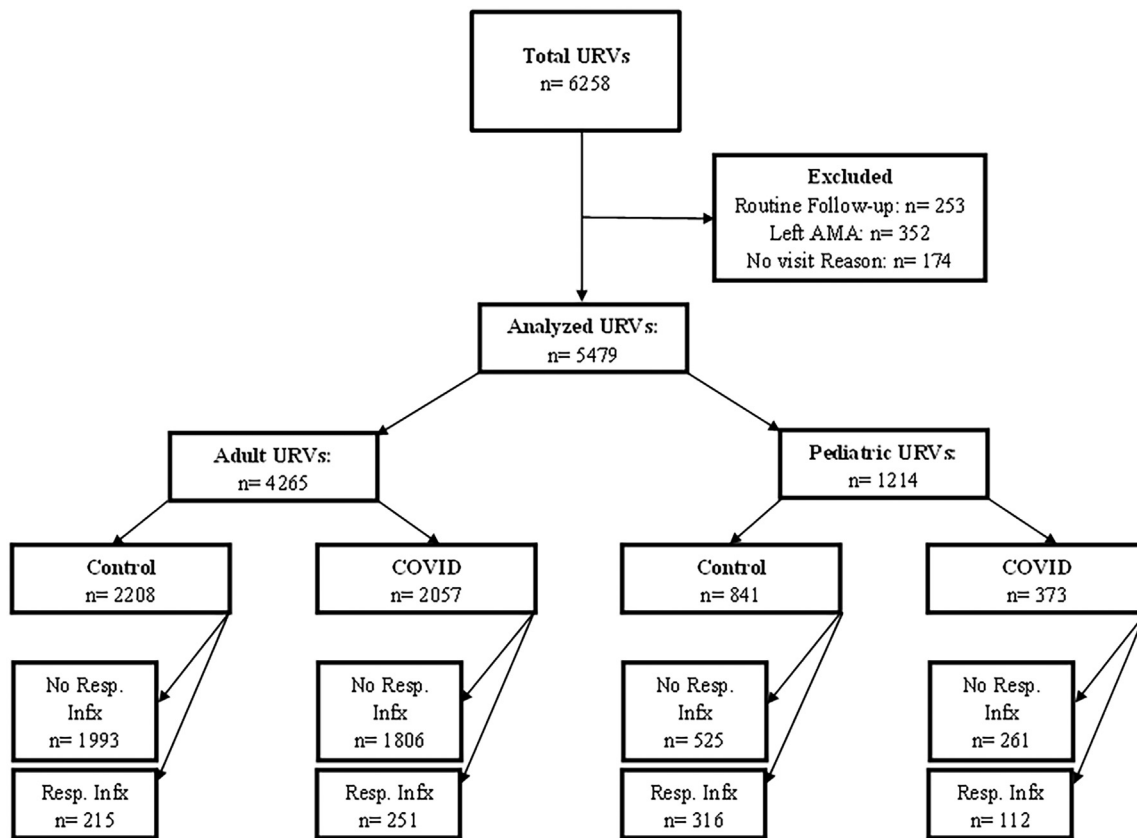
Fig. 1. Participant flow.
Flow chart showing inclusion/exclusion and stratification of cases.
URVs, unscheduled return visits. Resp. Infx, respiratory infection. AMA, against medical advice.

after index visit between the pediatric control and COVD cohorts (Table 2).

The most common visit reasons as a proportion of all pediatric visits were constitutional, respiratory, and gastrointestinal complaints for the control cohort and constitutional, musculoskeletal, and gastrointestinal complaints for the COVID cohort (Table 2). There was a 5.73% reduction in the proportion of respiratory related complaints ($p < 0.01$) (Table 2). A 2.66% increase in the proportion of psychiatric ($p = 0.03$) and 3.58% increase in other (not-otherwise categorized) complaints ($p = 0.02$) was noted (Table 2).

In the pediatric cohorts there was a 0.14-point difference in acuity as measured by the ESI scale (3.31 (control) vs 3.17 (COVID), p value ≤0.01) (Table 2). There was no change in percentage of URVs leading to hospital admission. No pediatric patients expired.

When possible respiratory infections were excluded the difference in acuity remained statistically significant (3.27 (control) vs 3.16 (COVID), p value = 0.03) (Table 3).

Table 1
Comparison of proportion of total census made up by URVs during the control and COVID cohorts

	Cohort	URVs	Total ED Census	Proportion of Census Made up by URVs	p value
Adult	Control	2208	48,456	4.56	0.17
	COVID	2057	43,247	4.76	
Pediatrics	Control	841	17,410	4.83	<0.01
	COVID	373	10,520	3.55	

URVs, unscheduled return visits; ED, Emergency Department;

Table 2
Comparison of the mean age, hours to representation after an index ED visit, presenting visit reasons as a proportion of all visits, illness acuity, and disposition between control and COVID cohorts

	Pediatric			Adult		
	Control	COVID	p value	Control	COVID	p value
Presentation						
Age (Mean)	5.52	6.43	0.01	46.33	46.18	0.80
Hours to URV	65.82	66.44	0.86	74.00	73.12	0.62
Chief Complaint						
	% of Total URV	% of Total URV		% of Total URV	% of Total URV	
Abdominal Pain	10.11%	8.85%	0.49	14.36%	17.17%	0.01
Neurologic	7.37%	5.73%	0.29	8.11%	6.46%	0.04
Rash	4.99%	3.65%	0.29	1.09%	0.85%	0.42
Genitourinary	6.18%	7.81%	0.29	9.96%	9.01%	0.28
Respiratory	16.41%	10.68%	<0.01	6.70%	10.09%	<0.01
Other	6.06%	9.64%	0.02	13.41%	13.40%	0.99
Chest Pain	0.95%	1.82%	0.2	5.71%	6.18%	0.51
Gastrointestinal	12.25%	11.46%	0.69	6.16%	7.08%	0.22
Musculoskeletal	8.80%	11.46%	0.14	23.05%	18.11%	<0.01
Psychiatric	3.33%	5.99%	0.03	3.76%	3.49%	0.64
Ear Nose and Throat	4.64%	3.91%	0.56	3.71%	3.07%	0.24
Cardiac	0.24%	0.52%	0.42	1.22%	1.60%	0.29
Constitutional	18.55%	18.49%	0.98	1.99%	2.31%	0.47
Multiple	0.12%	0.00%	0.5	0.77%	1.18%	0.17
Illness Severity						
Acuity (Mean)	3.3056	3.1685	<0.01	2.9496	2.9537	0.83
Admission (%)	0.32%	0.39%	0.69	0.12%	0%	1
Expire (%)	0.23%	0.49%	0.15	0%	0%	NA

URVs, unscheduled return visits; ED, Emergency Department;

Table 3
Comparison of illness severity between control and covid cohorts with potential respiratory infections excluded

	Pediatric			Adult		
	Control	*COVID*	*p-value*	*Control*	*COVID*	*p-value*
Illness Severity Excluding Resp Infx						
Acuity (Mean)	3.3056	3.1685	<0.01	2.9649	2.9691	0.83
Admission (%)	0.12%	0%	1	0.35%	0.45%	0.65
Expire (%)	0%	0%	NA	0.15%	0.22%	0.71

4. Discussion

This study aimed to evaluate the effect of COVID-19 on the frequency of ED URVs and patient/illness characteristics associated with the URVs. For the adult population, COVID did not significantly alter any of the primary or secondary outcomes. The unchanged rate of URVs is one indicator that care quality may not have decreased during the pandemic despite the increased health system strain. We did find an increase in presentation for respiratory complaints and a decrease in musculoskeletal complaints. Similar alterations in presenting complaints have been reported by others and are likely attributed to the pandemic; i.e. social distancing leading to lower rates of automobile accidents [19-21].

For pediatric patients, a significant decrease in the proportion of URVs during COVID suggests that patients may have had other means of accessing follow-up care, avoided the ED out of fear, or received more efficacious care secondary to the drastically decreased ED census which limited the need to follow up in the ED. This may also reflect a drop in respiratory/infectious disease ED presentations, born out by our data and others, as historically these have made up a large portion of ED URVs [22,23]. The decrease in respiratory complaints was likely due in part to lockdowns and virtual schooling [24].

The increase in pediatric acuity (decrease in ESI severity) is in line with the decrease in proportion of URVs during COVID. Due to factors mentioned above, patients likely had a higher threshold for re-presenting to the ED and therefore the average patient was more acutely ill. Patients who were less ill may have received follow-up care via telehealth or avoided the ED out of fear. The acuity difference cannot be explained solely by the reduction in presentations due to respiratory complaints as the acuity difference remained significant when respiratory illness were excluded.

The increase in mean age by nearly a year in pediatric patients may be reflective of broader trends brought on by the COVID pandemic. Others have demonstrated that the average pediatric ED patient's age increased during the pandemic [23].

Our data demonstrates there was a difference in behavior between the pediatric and adult populations. During COVID pediatric patients represented to the ED less frequently, were more acutely ill, and older whereas adult patients had no changes in URV frequency, illness severity, and age. The causal agents leading to the disparate effect of the pandemic on adult and pediatric URVs was not explicitly explored in this study, but analyzing factors driving URVs could provide insight and areas for future research to further elucidate causal factors driving the difference. It is important to identify the particular factors driving the reduction in pediatric URVs as previous interventions directed at addressing health system and physician related factors have significantly reduced UVRs [25-27].

4.1. Limitations

Given the studies retrospective cohort study design causation cannot be inferred. This study analyzed data from a single center therefore limiting its wider applicability to disparate populations. Furthermore, its single center nature, likely underestimated the number of URVs as bounce backs to other outside emergency departments were not captured. A complete complement of variables, such as education, race, income, internet access, and telehealth access was not available to measure health disparities to fully assess the association between socioeconomic factors and URV behavior. Additionally, we were unable to exclude URVs due to an unrelated complaint from the index ED visit as the visit reason was too vague to carry this out.

5. Conclusion

UVRs are utilized as a marker of healthcare quality and as a clinician and health system performance metric. Reducing UVRs can help alleviate the overburdened emergency care system as URVs result in a disproportionate amount of resource utilization and can be a marker of failed care. This paper demonstrates how the unique circumstances brought on by the COVID pandemic reduced the rate of URVs and changed the patient characteristics (age, illness acuity) of those returning the ED in the pediatric, but not adult population. These findings suggest conditions brought on by the pandemic may decrease URVs in the pediatric population. The applicability of these changes can inform care during and after the COVID pandemic as well as future pandemics. These findings warrant further research into the specific factors that may be driving this change in pediatric populations to assess their applicability in preventing future URVs.

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Nothing to disclose.

Prior presentations

Research related to this manuscript, although with a modified data analysis, was presented at the SAEM Conference on 5/12/22.

CRediT authorship contribution statement

Garrett S. Thompson: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Robert P. Olympia:** Writing – review & editing, Supervision, Methodology, Conceptualization.

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