

# Changes in Patient Characteristics in Telehealth Usage During Times of Crisis

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**Abstract.** There is limited knowledge on whether increased telehealth usage may enhance health access to communities during natural disasters, particularly for emergency medical services. This study aimed to elucidate telehealth usage during three hurricanes in NC between 2018 and 2020 and assessed demographics of users including gender and age, insurance status, and daily rate of visits in relation to respective hurricanes. From 10,056 telehealth visits, we found that age and insurance coverage were significantly different between crisis and non-crisis times. Patients found comparative satisfaction during both times. This study suggests the use of phone and video visits to enable better access to parents with children under the age of 18 years and uninsured patients.

**Keywords.** Patient, Telehealth, Crisis

## 1. Introduction

Hurricanes are natural disasters that take a large toll on individuals and infrastructure, causing damage to property, loss of power and resources, and potentially death. These disasters have short- and long-term impacts on the access to and quality of healthcare and individual health, including morbidity and mortality, disease burden, disruption in healthcare delivery, and mental health. In addition to limiting and delaying patients' access to healthcare, hurricanes impact healthcare communication, transportation, and other facility disruptions [1]. Between 2005 and 2020, a total of 33 hurricanes hit the United States with a total mortality rate of 2003 individuals, resulting in a mortality rate between 0 and 1,518 per year related to hurricanes [2]. With several hurricane crises impacting U.S. healthcare systems every year, patients need telehealth solutions during times of crisis. In 2018, Hurricane Florence left over 890,000 customers lost power across 76 counties in NC [3]. Florence resulted in a total of 40 deaths in North Carolina [4]. In 2019, over 288,000 customers lost power across eastern North Carolina following Hurricane Dorian [5]. In 2020, about 362,000 power outages were reported in North Carolina, with approximately 45,000 of customers still without power because of Hurricane Isaias [6]. Telehealth provides benefits to patients that include potentially shortened wait times, elimination of travel time, and limited physical contact and

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exposure, which may be beneficial for individuals with health needs during a natural disaster [7].

Telehealth usage has been shown to vary by patient population and demographic [8], and continues to be increasingly utilized and studied. There is also identified potential for telemedicine programs particularly in high-risk areas for disasters [9]. However, research on the impact and usage of telehealth in the US during periods of natural disasters or crises is limited and warrants further studies. To that extent, there is limited knowledge on whether increased telehealth usage may enhance health access to communities during natural disasters, particularly for emergency medical services [10]. This study aimed to elucidate telehealth usage during three hurricanes in NC between 2018 and 2020 and assess demographics of users including gender and age, insurance status, and daily rate of visits in relation to respective hurricanes.

## **2. Methods**

In this cross-sectional study, we examined the usage of telehealth services at a virtual care center (VCC) during three hurricanes: Florence, Dorian, and Isaias. Between August 2018 and August 2020, the three hurricanes struck North Carolina (NC): Hurricane Florence (August 31-September 18, 2018), Hurricane Dorian (August 24-September 10, 2019), and Hurricane Isaias (July 28-August 5, 2020). Hurricanes ranged in number of days, category, amount of rainfall, wind speeds, and pressure.

VCC provides on-demand virtual services for primary and urgent care needs to individuals residing in North Carolina, USA since 2018. Patients have to create an account through a web portal in order to schedule an appointment with a provider. VCC providers were licensed to treat or consult on a wide range of medical conditions and common ailments including ear infections, fevers, rashes, and respiratory infections. Although health insurance is accepted, patients have an option to pay an out-of-pocket flat fee. Patients could schedule the appointment for a later date if they preferred to. This study was approved by the institutional review board.

We extracted visit data from 2018 to 2020, which included patient demographics and date and time of the visit. We categorized each visit to one of four categories: Florence, Dorian, Isaias, and non-Crisis. non-Crisis were the telehealth visits that occurred during time were there were no crisis i.e., hurricanes. We ran descriptive analysis on the data, and we tested if there were any differences in characteristics among patients in times of crisis versus regular times.

## **3. Results**

Of 10,056 telehealth visits, 540 (5.4%) occurred during times of crisis. During crisis times, 383 (70.9%) telehealth visits were from females, 203 (37.6%) were from individuals between the ages of 18-35 years, 390 (72.2%) were from uninsured patients, 283 (52.4%) were from urban regions within North Carolina. On the contrary, during non-Crisis times, there were 7109 (74.6%) visits from females, 3850 (40.4%) were from individuals 18-35 years, 5926 (62.1%) were uninsured patients, and 5339 (56%) were from urban regions, table 1.

Most telehealth visits in NC during each hurricane were from rural areas, with the exception of Hurricane Isaias. During Hurricane Florence, 118/232 (50.9%) patients

were from rural areas. During Hurricane Dorian, 101/154 (65.6%) patients were from rural areas. During Hurricane Isaias, only 64/154 (41.6%) patients were from rural areas. Of the 232 total visits during Hurricane Florence, 188 (81.0%) were uninsured. Of the 154 total visits during Hurricane Dorian, 88 (57.1%) were uninsured. Of the 154 total visits during Hurricane Isaias, 114 (74.0%) were uninsured.

**Table 1.** Patient Characteristics for all visits, non-crisis visits, crisis visits, and by each hurricane.

	All	Non-Crisis	Crisis	Hurricane Florence	Hurricane Dorian	Hurricane Isaias
<b>Total</b>	10075 (100%)	9535 (94.6%)	540 (5.4%)	232 (2.3%)	154 (1.5%)	154 (1.5%)
<b>Gender</b>						
Female	7492 (74.4%)	7109 (74.6%)	383 (70.9%)	159 (68.5%)	121 (78.6%)	103 (66.9%)
Male	2564 (25.4%)	2407 (25.2%)	157 (29.1%)	73 (31.5%)	33 (21.4%)	51 (33.1%)
<b>Age</b>						
2-17	983 (9.8%)	910 (9.5%)	73 (13.5%)	41 (17.7%)	15 (9.7%)	17 (11.0%)
18-35	4053 (40.2%)	3850 (40.4%)	203 (37.6%)	82 (35.3%)	64 (41.6%)	57 (37.0%)
36-50	3413 (33.9%)	3224 (33.8%)	189 (35.0%)	77 (33.2%)	54 (35.1%)	58 (37.7%)
51-65	1418 (14.1%)	1355 (14.2%)	63 (11.7%)	28 (12.1%)	19 (12.3%)	16 (10.4%)
65+	208 (2.1%)	196 (2.1%)	12 (2.2%)	4 (1.7%)	2 (1.3%)	6 (3.9%)
<b>Insurance Status</b>						
Insured	3759 (37.3%)	3609 (37.9%)	150 (27.8%)	44 (19.0%)	66 (42.9%)	40 (26.0%)
Uninsured	6316 (62.7%)	5926 (62.1%)	390 (72.2%)	188 (81.0%)	88 (57.1%)	114 (74.0%)
<b>Location</b>						
Rural	5622 (56.5%)	5339 (56.0%)	283 (52.4%)	118 (50.9%)	101 (65.6%)	64 (41.6%)
Urban	4334 (43.5%)	4085 (42.8%)	249 (46.1%)	112 (48.3%)	53 (34.4%)	84 (54.5%)

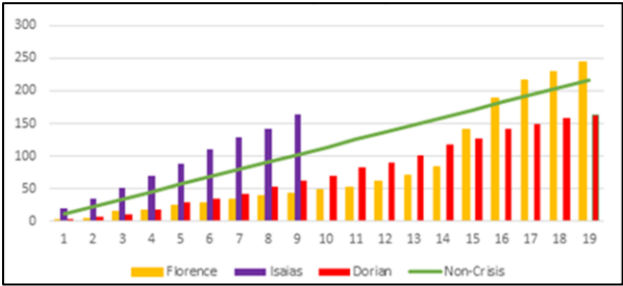
We found significant differences in patient characteristics in telehealth use between times of crisis and non-crisis, table 2. Patients’ age (p-value<0.05) and insurance type (p-value < 0.05) were statistically significant during crisis times such that more uninsured patients utilized telehealth during crisis times compared to regular times. Also, there was a significant increase in patients between 2-17 years during times of crisis. Patients’ gender (p-value=0.07) and rurality (p-value=0.25) were not significantly different between both times.

**Table 2.** Chi-Square of the differences between Crisis and non-Crisis times.

Patient Characteristics	Chi-square Value	P-value
Gender	5.1697	0.0754
Age	14.8837	0.0049

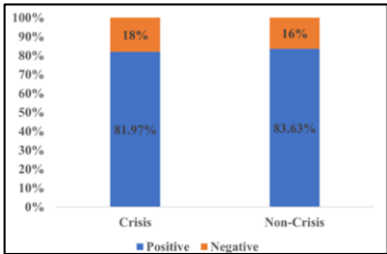
Insurance	21.5645	0.000003
Rurality	2.7662	0.2508

Overall, the average daily rate of telehealth visits at VCC was 11.4 visits. During crisis times, the average was 13.3 compared to 11.4 visits during non-Crisis times, figure 1. The highest average daily rate of telehealth visits occurred during Hurricane Isaias (18.1 visits) while the lowest was during Hurricane Dorian (8.8 visits). When comparing the daily rate before COVID-19 and after, the daily number of telehealth visits pre-COVID were 9.8 compared to 20.8 after COVID.



**Figure 1.** The number of telehealth visits by hurricane (Florence, Dorian, and Isaias) by day from start date (Day 1) to end date (varies) compared to number of telehealth visits during non-crisis times.

There were no significant differences found in patient satisfaction between crisis and non-crisis times. During crisis, 82% of patients who responded to the survey reported an overall positive experience using telehealth compared to 83.6% during non-crisis times. Similarly, the proportion of patients who indicated a negative experience with telehealth were similar between crisis (18%) and non-Crisis (16%), Figure 2.



**Figure 2.** Patient-reported overall telehealth experience stratified by crisis and non-crisis times.

4. Discussion

In this cross-sectional study, we examined the variations in patient characteristics and satisfaction between times of crisis vs. non-crisis. We report that patient age and insurance coverage changed significantly during times of crisis. There was higher utilization of telehealth for patients under 18 years, which may be explained by an increased need for pediatric care when roads and provider offices may be closed during hurricanes. Similarly, the substantial increase in uninsured patients seeking care during crisis was profound. It is plausible that patients with no health insurance may reside in areas with poor infrastructure or no access to care and hence, during crisis when the need

for health care increases, uninsured patients used telehealth to overcome their financial and geographic barriers. The gap in knowledge of telehealth utilization during times of crisis is of importance to policy makers and health organizations as they continue to tailor their telehealth usage. Our findings show that patients in general found merit in using telehealth and particularly, younger patients and uninsured patients. For pediatric and adolescent patients, the ability to seek care without the need to go out during crisis increased their utilization of telehealth. The ability for patients to pay a relatively small out-of-pocket fee for a telehealth consult may have enabled uninsured individuals to seek care during times in crisis. Moreover, we think that providing patients with the option to use phone or video to connect with their provider increased the utilization of specific patient groups such as over 65 years, uninsured, and rural patients. Therefore, we recommend that organizations consider providing both modalities to increase the likelihood of patients who are not able to or are not comfortable enough to use video calls to seek care through telephone. Prior literature has shown that telehealth allows patients and caregivers to overcome physical barriers to convenient medical care [11], and provides a timely solution to provide patient care and services during times of crisis, made particularly evident during the COVID-19 pandemic [12]. However, disparities in telehealth familiarity, knowledge, and willingness to use telehealth still exist, suggesting that further efforts to enhance the use of telehealth effectively and increase access to telehealth are warranted [8]. This study had limitations. We examined a single state-wide telehealth center that belongs to an academic center. Survey response rate was low, which may affect the generalizability of the survey findings. We did not account for the changes in telehealth usage during the COVID-19 pandemic because at the time of this study the pandemic was still ongoing and analyzing its data would not be complete.

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