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Original Contributions

Telemedicine Use by Older Adults in a COVID-19 Epicenter

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☐ **Abstract—Background: In early 2020, New York City was the epicenter of the Coronavirus disease 2019 (COVID-19) pandemic in the United States. Older adults were at especially high risk. Telemedicine (TM) was used to shift care from overburdened emergency departments (EDs) to provide health care to a community in lockdown. TM options presented unique challenges to our diverse older adult population, including visual, hearing, cognitive, and language limitations. Objective: Our objective was to evaluate the use of TM during the peak of the pandemic in New York City. Methods: We conducted a retrospective chart review of patients 65 years and older evaluated remotely via TM during our pandemic surge. Chart extraction was performed by six emergency physicians. Outcomes included demographics, technical limitations, rates of ED referral, and 30-day mortality. Results: During the study period, a total of 140 encounters were reviewed. The mean age was 73 years. Overall, 20% of patients in the cohort were emergently referred to the ED. Use of TM by this age cohort increased 20-fold as compared with a similar time frame pre-pandemic. ED referral was highest in those over 75 (45.9% > 75 years). Forty-three percent used family to assist. Thirty-day mortality was 7%. Conclusion: TM use by older adults grew substantially at our institution during our initial COVID-19 surge. The same-day emergent referral rate and mortality rate reflect the high acuity represented in this cohort and points to the need for telehealth providers that are trained in triage and emergency medicine with a knowledge of local resource availability. © 2022 Elsevier Inc. All rights reserved.**

☐ **Keywords—telehealth; COVID-19; older adults**

Introduction

Background

The Coronavirus disease 2019 (COVID-19) pandemic in 2020 impacted more than 230 million people worldwide and caused over 500,000 deaths in the United States. It was estimated that in the first 3 months of the U.S. pandemic, more than 80% of the deaths were in those over 65 years of age [1]. In the spring of 2020, New York City was the U.S. epicenter. Resources at city hospitals were limited [2]. There was a dramatic shift for all primary and non-emergency care to either be delayed or conducted via phone or telehealth. These forms of remote health care monitoring offered patients and clinicians an opportunity to interface without the use of scarce personal protective equipment [3].

There is a long history of using technology in low-resourced areas and in disasters worldwide. In both natural and manmade disasters, telehealth has been used to assist clinicians on the ground with the use of video-link

expert consultation and has been used by both military and peacetime health care providers (4). More recently, with high-speed internet connections and the use of smart phones, a more comprehensive service can be provided.

Despite the potential innovations that telehealth presents, certain patient populations may face logistical and other unique challenges in adopting such care platforms. Reaching older adults presents unique challenges due to technology requirements and visual, hearing, and cognitive limitations (5–7). Additionally, in diverse multilingual communities, translation services need to be readily available.

Importance

With a greater knowledge of telehealth platform limitations specific to older adults, we can improve services in the future. The peak of the pandemic in New York City required implementation of multiple disaster response plans. This study helps to identify and describe the utility and limitations of telemedicine in serving the older adult population during a pandemic, and can be used to model improved response in future disasters. The U.S. non-English-speaking population is increasing; the 2016 American Community Survey found that over 21% of the population spoke a language other than English at home, an increase from 18% in 2010 (8). The Columbia University Irving Medical Center/New York Presbyterian Hospital (CUIMC/NYP) Emergency Department (ED) serves a multilingual urban population, thus, we specifically described our patients' cultural and language needs.

Goals of This Investigation

This is a descriptive study of TM patients > 65 years old in which we describe the TM visits and problems that arise. Our primary objective was to describe the TM utilization among older adults during the peak of the pandemic in our ED and to compare usage with a similar time during the 2019 flu season. We also specifically compared the older adult age cohorts of 65–75, and > 75 years to determine if there were differences in medical acuity and needs.

Methods

Study Design and Setting

We conducted a retrospective chart review at an urban single-center academic medical center of patients > 65 years of age that utilized the Virtual Urgent Care program entitled "On Demand" platform from March 1–April 30, 2020. Our Virtual Urgent Care program, which launched

in 2018, is a TM platform where patients outside the hospital setting (e.g., home, at work) are able to virtually connect and access a board-certified emergency physician for a consultation and virtual examination/treatment plan, using a secure link on the hospital webpage. Users of this program were a mix of existing patients within our health care system who received targeted hospital messages regarding the TM services, alongside members of the public who came across the program through web searches. There were no new advertising initiatives during March/April 2020. Our daily total patient visit volume on the platform increased approximately 20-fold during March and April of 2020 as compared with January/February 2020. The TM physicians were affiliated with CUIMC/NYP, a quaternary academic medical center with two campuses in the borough of Manhattan. The TM service was available to anyone calling from the state of New York. The Virtual Urgent Care platform was staffed overwhelmingly by emergency medicine-boarded physicians who are employed full time in the ED. The telehealth shift was a dedicated shift, but the same physicians had most of their clinical shifts providing in-person ED care at the affiliated department. We developed and employed a chart extraction tool for data acquisition. We additionally performed a deidentified electronic medical record (EMR) inquiry of TM visits by the same age cohort from December 1, 2019 to January 23, 2020 to determine TM frequency of use during a similar time span in the preceding influenza season. The study was approved by the local Institutional Review Board.

Selection of Participants

Eligible participants were identified through the electronic health records and included if they were 65 years of age or older with a Virtual Urgent Care "On Demand" visit note from March 1–April 30, 2020 from a physician affiliated with the CUIMC/NYP west campus.

Measurements

Patient data were deidentified and entered into a secure abstraction tool by six emergency physicians. A legend for the abstraction tool was created by the six physicians so that data collection had consistency. The chart reviews were divided evenly among the physicians. Each physician was responsible for providing chart extraction of between 21 and 24 separate visits. Missing data were reported as such. An inter-rater reliability analysis was performed to ensure homogeneity and consensus among the data abstractors. All information was gathered solely through chart extraction of available notes in the EMR. Thirty-day mortality was reported only if the death was found in the EMR; of note, the EMR in use is a large

Demographics
Age
Sex
Encounter Date
Encounter Time
Encounter
Primary Language
Does patient live alone?
Marital Status
Did family assist in encounter?
Days of Illness before visit
Patient's Chief Complaint
Is there a concern for COVID like illness?
Is this visit for a medication refill?
Is the Chief Complaint related to a Neurology complaint?
Is the Chief Complaint related to a head, ears, eyes, nose, throat complaint?
Is the Chief Complaint related to a Cardiology complaint?
Is the Chief Complaint related to a hypertension and blood pressure complaint?
Is the Chief Complaint related to a Respiratory complaint?
Is the Chief Complaint related to a Skin complaint?
Is the Chief Complaint related to a Gastrointestinal complaint?
Is the Chief Complaint related to a Musculoskeletal complaint?
Is the Chief Complaint related to a Genitourinary complaint?
Is the Chief Complaint related to a Psychiatric complaint?
Medical History
Does the patient have hypertension?
Does the patient have diabetes?
Does the patient have cardiovascular disease?
Does the patient have chronic kidney disease?
Is the patient immunocompromised?
Does the patient have lung disease?
Visit Wrap Up
What is the Diagnosis for the patient visit?
Was the patient given a pulse Ox?
Was medications prescribed?
Did the visit resolve the complaint? [1]
Was non-emergent follow up recommended?
If follow up was recommended, what service was the patient referred to?
Was the patient referred to the Emergency Department?
Was Emergency Medical Services activated?
Did the patient refused to go to the Emergency Department?
Did the patient refused Emergency Medical Services?
Technology
Was the visit disrupted by technical difficulties?
Was the visit incomplete?
Was there a repeat Virtual OnDemand visit?
Comments
Comments that may be helpful and needs further review
[1] **If patient was referred for follow up care, then problem was not resolved.**

Figure 1. Data abstraction tool data headings.

national platform and thus, did include some deaths that occurred at other institutions that shared the same EMR system.

Descriptive Outcomes

The primary descriptive outcomes from the data abstraction included 30-day mortality, age, gender, date, time of encounter, and zip code of caller. The abstraction tool also included the following information divided into Encounter, Medical History, Visit Wrap Up, and Technology (Figure 1).

We measured statistical correlation between age group cohort and gender, language, family assistance, living alone, technological difficulties, medication prescription, COVID-like symptoms, and same-day referral to the ED.

Age and ED referral analysis

Median with first and third quartile was reported for continuous variables, and frequency with percentage was reported for categorical variables by two age groups. Fisher's exact test was performed to assess the association between age and other categorical variables while Kruskal–Wallis test was performed to assess the association between age and other continuous variables.

Inter-rater reliability analysis

We analyzed inter-rater reliability in multiple ways. First, we assumed independence among different ratings from the same physician and calculated the Cohen's kappa statistics for agreement and tested if the agreement happens by chance (9). We also provided percentage agreement and 95% confidence intervals (CIs). Analysis was conducted in RStudio Version 1.1.453 (10).

Results

Characteristics of Study Subjects

A total of 179 charts were pulled from the electronic health records, of which 140 charts had eligible criteria. Of the 39 charts excluded, 15 had no notes documented, eight were duplicates, and 16 did not meet criteria because the patient was not 65 years of age or older or did not have a Virtual Urgent Care visit. Of the charts that had eligible criteria and were reviewed, demographic information was collected, and is illustrated in Table 1.

Twenty-nine patients were referred to the ED urgently, of which 4 refused to go and 5% (n = 8) of the total cohort were directed to activate (or the provider-activated) Emergency Medical Services (EMS) by calling 911. The comparison of ED referral and age is shown in Table 1. In comparing age and likelihood of urgent ED referral, 45.9% of those 75 years or older were referred, vs. 12.9% of patients younger than 75 years ($p < 0.001$). Patients were assisted by family in 49 cases, 75% of patients > 75 years old used family assistance, whereas only 30.5% of those younger than 75 years ($p < 0.001$) used family to assist. We found charts were missing data related to the use of family assistance in 26 (18.5%) of the visits.

There were 10 deaths recorded with a known 30-day mortality rate of the TM cohort of 7%. The 30-day mortality rate of those referred to ED emergently was 10%, and of those not emergently referred, the 30-day mortality was 6%. The 30-day mortality rate difference was not statistically significant between those older than 75 years and those younger than 75 years ($p = 0.46$) (Table 1), or between those referred to the ED and not referred to ED emergently ($p = 0.45$).

Table 1. Demographics, Characteristics and Outcomes.

		Age Stratification in Years			
		≤ 75 (n = 102)	> 75 (n = 38)	Total (n = 140)	p Value
Sex					0.847
	Female	62 (60.8%)	22 (57.9%)	84 (60.0%)	
	Male	40 (39.2%)	16 (42.1%)	56 (40.0%)	
Primary language					
	No documentation	2	1	3	
	English	75 (75.0%)	20 (54.1%)	95 (69.3%)	0.023
	Spanish	8 (8.0%)	9 (24.3%)	17 (12.4%)	
	Other	17 (17.0%)	8 (21.6%)	25 (18.2%)	
Patient location					0.0821
	Bronx	12 (11.8%)	4(10.5%)	16 (11.4%)	
	Brooklyn	13 (12.7%)	8 (21.1%)	21 (15.0%)	
	Manhattan	23 (22.5%)	9 (23.7%)	32 (22.9%)	
	Queens	26 (25.5%)	9 (23.7%)	35 (25.0%)	
	Staten Island	2 (2.0%)	1 (2.6%)	3 (2.1%)	
	Outside NYC	26 (25.5%)	7 (18.4%)	33 (23.6%)	
Did family assist					< 0.001
	Unknown	20	6	26	
	No	57 (69.5%)	8 (25%.0%)	65 (57.0%)	
	Yes	25 (30.5%)	24 (75.0%)	49 (43.0%)	
Disruption of visit					0.684
	Yes	5 (5.0%)	3 (7.9%)	8 (5.8%)	
First-time telehealth utilization					0.727
	Yes	90 (90.9%)	33 (94.3%)	123 (91.8%)	
Visit for COVID-like illness					0.844
	Yes	66 (65.3%)	24 (63.2%)	90 (64.7%)	
Emergent ED referral					< 0.001
	Yes	13 (12.9%)	17 (45.9%)	30 (21.7%)	
30-day mortality		6 (6.0)	4(10.2)	10(7.1)	0.460
	Female	3 (4.8%)	3 (13.6%)	6 (7.1%)	
	Male	3 (7.5%)	1 (6.3%)	4 (7.1%)	

NYC = New York City; COVID = Coronavirus disease; ED = emergency department.

Age Cohort Usage During Preceding Influenza Season

As comparison, the during a similar time in the influenza season (December 1, 2019 to January 23, 2020), only 7 patients > 65 years old utilized the TH platform.

Inter-Rater Reliability

A moderate agreement was observed between two ratings (Kappa = .76; $p < 0.001$). The six reviewers were also compared in pairs; we provided similar statistics for different combinations of raters to see if agreement is sim-

ilar across different combination groups. A vs. F 90% agreement (95% CI 0.71–0.99), C vs. A 94% agreement (95% CI 0.71–0.99), E vs. B 92% agreement (95% CI 0.73–0.99), D vs. B 88% agreement (95% CI 0.69–0.98), F vs. C 92% agreement (95% CI 0.74–0.99), and B vs. E 77% agreement (95% CI 0.55–0.92). Overall agreement was 89% (95% CI 0.825–0.937).

Discussion

Our descriptive study demonstrated a significant increase in telehealth utilization during the COVID-19 pandemic,

suggesting the tremendous potential for use of such platforms by older adults during a disaster or public health emergency. We reached more patients of all ages via telehealth during the COVID-19 surge. We had a 20-fold increase in TM usage among older adults when compared with a similar time in the influenza season.

We found that most TM visits in this study were concerning for COVID-like illness (64.2%). There were a significant number of calls (35.8%) related to other issues. This may represent patients who were unable or unwilling to receive care in an ED, Urgent Care Clinic, or doctor's office. This represents an opportunity to provide care while deferring visits from an overcrowded ED, where it is difficult to isolate undifferentiated patients. From an infection control standpoint, TM provides a way to screen vulnerable patients while avoiding exposure to respiratory illnesses in an overcrowded environment.

Our data also point to room for improvement in the technology interface, with older adults using remote health care. Just under half (43%) of the calls used family members to assist the patient; this was significantly more common in those older than 75 years. Only 6% of the charts reviewed showed evidence of an interrupted visit, but we suspect that technical difficulties were far more frequent, as we do not have the statistics related to the TM visits that were unable to be connected to a clinician. Just over 30% of the calls were made by non-English speakers, which points to the need for not only the clinician visits to be multilingual, but also the instructions to connect. When older patients are seen in the ED, hands-on instruction with their mobile phone or device would be one way to increase appropriate use of telehealth services. Multilingual written instructions and training designated family members would also increase availability of TM services to older adults.

Telehealth program development is often thought to be a way to defer nonemergent care, but we found many patients with high medical acuity. In fact, 21.7% (n = 30) of the cases were referred emergently to the ED. As expected, same-day ED referral was more significant in the > 75 years old age group. There were 10 known deaths of this cohort during the study period, giving us a known 30-day mortality rate of 7% of this cohort of telehealth users.

Limitations

There are several limitations to this study. First, as a study carried out at a single site, generalizability of the results to other clinical contexts may be limited. Additionally, determination of visits with family assistance, technological problems, or language problems were based only on what was documented in medical records, as we did not have access to the software platform statis-

tics of incomplete registration or dropped videocalls that occurred prior to connecting with the clinician. These data points were missing in many of the charts. We are also limited by the clinician's likelihood of noting these concerns, as this was not a required format of the note. Thirty-day mortality includes only mortality recorded in the EMR and thus, may be underrepresented if the death was recorded outside this institution's EMR.

Consumer bias could impact the type of patients that use Virtual Urgent Care, and therefore, affect the outcome of the results. Lastly, the patient population that the platform serves is limited to discrete geographic regions. Internally, the small sample size of 140 patients potentially affects overall power.

Conclusions

In summary, our study points to not only acceptance of telehealth by older adults in a disaster situation, but also some of the pitfalls and technological difficulties. One of the most important findings was that the high medical acuity required emergency medicine-trained physicians that are also actively working clinically within the same health care system. Many of the findings in this study were used to formulate practice standards of our developing TM program. In addition, knowledge of real-time ED capacity and EMS response time are important factors to consider when responding to a community-wide disaster or epidemic.

Ultimately, future work focused on the efficacy and implementation of TM may help us gain greater understanding of TM as an exciting platform with unique opportunities and challenges to better serve and support older adult patients.

References

1. Freed M, Cubanski J, Neuman T, Kates J, Michaud J. What share of people who have died of COVID 19 are 65 and older–and how does it vary by state? Kaiser Family Foundation. 2020. Available at: https://www.kff.org/coronavirus-covid-19/issue-brief/what-share-of-people-who-have-died-of-covid-19-are-65-and-older-and-how-does-it-vary-by-state/. Accessed February 18, 2022.
2. Branas CC, Rundle A, Pei S, et al. Flattening the curve before it flattens us: hospital critical care capacity limits and mortality from novel coronavirus (SARS-CoV2) cases in US counties. 2020. Available at: https://www.medrxiv.org/content/10.1101/2020.04.01.20049759v1. Accessed January 8,2022..

3. Hollander JE, Carr BG. Virtually perfect? Telemedicine for COVID-19. N Engl J Med 2020;382:1679–81.

4. Merrell RC, Cone SW, Rafiq A. Telemedicine in extreme conditions: disasters, war, remote sites. Stud Health Technol Inform 2008;131:99–116.

5. Narasimha S, Madathil KC, Agnisarman S, et al. Designing telemedicine systems for geriatric patients: a review of the usability studies. Telemed J E Health 2017;23:459–72.

6. Greenwald PW, Stern M, Clark S, et al. A novel emergency department-based telemedicine program: how do older patients fare? Telemed J E Health 2019;25:966–72.

7. Zulfiqar AA, Kadri N, Doucet J, Hajjam A, Andrès E. [Geriatrics and e-technology in an institution]. Soins Gerontol 2019;24:27–8 [in French].

8. Shin HB, Bruno R. Language use and English-speaking ability: 2000. Available at: https://www.census.gov/prod/2003pubs/c2kbr-29.pdf. Accessed February 18, 2022.

9. McHugh ML. Interrater reliability: the kappa statistic. Biochem Med (Zagreb) 2012;22:276–82.

10. RStudio Team. Integrated development for R. RStudio, Inc. Boston, MA: RStudio, Inc.; 2016.

ARTICLE SUMMARY

1. Why is this topic important?

The COVID-19 pandemic has, by necessity, required the use of new ways to provide health care, this study provides an initial evaluation of the use of remote health care to provide emergency and urgent care to older adults in a safe environment. It is important that new modalities be evaluated in a systematic way.

2. What does this study attempt to show?

It describes the successes and limitations of health care delivery to older adults via telemedicine.

3. What are the key findings?

There was a 20-fold increase in the use of telemedicine in the older adult cohort during the study period, as compared with the preceding influenza peak. Most adults > 75 years old required family assistance. Older adults using telehealth often required emergent referral to the emergency department.

4. How is patient care impacted?

The findings point to the need for a telehealth program to involve families in the training and use of telemedicine options. Health care providers providing emergency or urgent care via telehealth need to be trained in triage, and Emergency Medical Services capacity and transport time in a pandemic and other disasters.