Telehealth in Southern New Jersey: An Analysis of Primary Care Telehealth Visits in Southern New Jersey

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Abstract

Telehealth is a care model that has been slowly evolving over the last few decades. The purpose of this study was to analyze trends in the implementation of telehealth at a large community-based health system during the COVID-19 pandemic in an attempt to identify successes and challenges for sustaining the future use of telehealth.

This study analyzed the specifics of both patient, provider, and telehealth visit demographics to identify trends as well as successes and challenges related to telehealth usage during an 18-month timeframe. Significant relationships in the use of telehealth were identified between providers of primary care and specialty care ($X^2 = 100211.149$, $p < .001$). Patient factors such as age ($X^2 = 61373.120$, $p < .001$) and female gender ($X^2 = 61355.812$, $p < .001$) demonstrated significant relationships with telehealth participation. This preference for modality type was especially noted between age groups with patients greater than 60 preferring the use of the phone while those younger utilized internet-based platforms most frequently ($X^2 = 107,560.398$, $p < .001$). The choice of telehealth modality was also identified as significant between provider types, and locations with the use of an internet-based platform being most utilized.

The results of this study also indicate that the use of telehealth while higher than pre-pandemic levels has declined. Telehealth has not been adopted as a standard platform of care delivery. In the late and post-pandemic periods, health systems need to revisit telehealth implementation programs and strategies to incorporate patient preferences and technology access, literacy, as well as provider satisfaction, access, and technology literacy. With careful thought, planning, and implementation, telehealth can be incorporated into plans of care for patients yielding high levels of satisfaction and improved overall health outcomes.

Dedications

“Find something you’re passionate about and keep tremendously interested in it”. - Julia Child.

I have been a “learner” all my life but never expected to follow the road that led me to this degree. Not many people follow a path like this 30 years into a career. I have relished every moment and have learnt much including many lessons about myself. To my family, who may have thought I was crazy for embarking on this journey at this point in my life, I could not have done this without you. To my husband Mark, our four children, two children-in-law, and the three grandchildren who arrived during this journey, you have given me encouragement when I needed it, daily normalcy, and distractions at just the right time. Finally, to my parents who somehow always knew that I would succeed in the academic world, I am beyond lucky that you are here to share this.

To my work colleagues at Virtua Health, this would not have happened without an opportunity that allowed me to transition into a new role. The belief that a physical therapist could transition into the world of healthcare information technology allowed me to learn a new skill set that has been simultaneously difficult, fulfilling, and inspiring, much like the completion of this degree. The support of my team and work colleagues has been unending throughout this process. I have loved my transition into the world of all things healthcare IT. I remain passionate and tremendously interested in it and look forward to learning more each day.

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Introduction

Healthcare is a dynamic industry that must adapt to new advances, consumer needs, and demands, as well as ever-changing technology. Over the last few decades, the use of technology has become an option for healthcare delivery for both patients and providers (Mesko and Gyorffy, 2019). Technologies including smartphones with voice and text capability, computers with internet access, remote patient monitoring, and store and forward functionality have become a component of patient care.

The interaction of a patient and provider using a remote connection technology known as telehealth is a technology historically reserved for the delivery of care to patients in geographic locations with limited access to providers (Chuttur, 2009; Waller & Stotler, 2018). Regulations regarding the use of telehealth defined its use from a reimbursement and patient privacy perspective. These regulations required the interaction to occur in an area identified as a Health Professional Shortage Area (HPSA) or in a county outside of a Metropolitan Statistical Area (MSA). Care had to be delivered at a designated healthcare location and could not be in a patient's home (Telehealth, 2018). Patient privacy concerns as outlined in the Health Insurance Portability and Accountability Act (HIPAA) contained regulations limiting telehealth usage to interactions utilizing only secure video-based platforms and excluded the use of audio-only telephone-based interaction (Turner Lee et al., 2020; Waller & Stotler, 2018).

The COVID-19 pandemic of 2020 significantly changed the use of telehealth (Smith & Raskin, 2020; Turner Lee et al., 2020). The need to limit the spread of the coronavirus disease 2019 (COVID-19) and deliver care while respecting social distancing dramatically increased the need for remote patient care models (Fishpaw & Zawada, 2020; Smith & Raskin, 2020). The Corona Virus Preparedness and Response Supplemental Appropriations Act of 2020

implemented on March 17, 2020 removed many telehealth regulatory barriers by allowing telehealth visits to occur in patients' homes outside of HPSA or MSA areas. HIPAA requirements were temporarily relaxed to allow additional types of remote platforms, including non-video-based modalities such as the telephone (COVID-19 Telehealth Changes, 2020; Smith & Raskin, 2020). Additionally, all remote communications platforms were considered reimbursable, including the use of telephones. The ability to provide care to patients remotely became an integral way of delivering care safely and responsibly due to concerns of COVID-19 transmission.

Many benefits for the use of telehealth visits exist for both primary and specialty care. Decreased office wait times, patient satisfaction, continuity of care, and positive health outcomes for both acute and chronic disease management have been seen over the last 20 years (Ahmadvand et al., 2018; Dobrusin et al., 2020; Fishpaw & Zawada, 2020; Kruse et al., 2017; Moore et al, 2017). Barriers, however, do exist for the use of telehealth patient-provider visits. Most barriers are attributed to the existence of the digital divide. The digital divide is very simply defined by the Oxford Dictionary (Lexico, n.d.) as "the gulf between those who have ready access to computers and the internet and those who do not." Socioeconomic status, racial and ethnic differences, the lack of devices or internet connection, knowledge deficits, and advancing age are all components of the digital divide identified as barriers to the successful use of telehealth as a patient care modality (Campos-Castillo & Anthony, 2021; Mesko & Gyorffy, 2019; Weber et al., 2020).

While hardware and software are often identified as essential components for technology, the human component cannot be forgotten. Social determinants of health contributing to health disparities have resulted in a potential expansion of the digital divide and may have created

health inequities due to the use of telehealth (Weber et al., 2020). The acceptance and ability of individuals to utilize healthcare technology are necessary for its success (Kissi et al., 2020; Purwanto & Budiman, 2020). This interaction between people and technology can only be successful if human factors such as demographics and preferences, as well as technical knowledge and the experience of users, are identified and integrated into technology platforms. The ability to incorporate these human factors will define the success of telehealth as the United States moves into the post-COVID-19 world.

Statement of the Problem

Healthcare organizations in recent years have been focused on delivering high-value care to all patients. Concerns with patient access to care, increasing shortages of healthcare providers, and rising costs all present significant barriers to providing high-quality care for many patients. The Triple Aim developed by the Institute for Health Care Improvement (IHI) defines that healthcare must address three main dimensions to be successful. These dimensions include improving patient care experiences, improving the health of populations of patients, all while limiting costs (Bagot et al., 2019; Kissi et al., 2020; Purwanto & Budiman, 2020). The use of telehealth is an effective, cost-effective type of care that addresses issues of both patient access and provider shortages while still delivering high-value care resulting in positive satisfaction and health outcomes for patients (Polinski et al., 2016; Zhang et al., 2020). However, telehealth has demonstrated very limited adoption until the COVID-19 pandemic in March 2020. The need to provide remote care during the pandemic facilitated a rapid shift to the use of telehealth (Fishpaw & Zawada, 2020; Smith & Raskin, 2020; Triana et al., 2020). For many health systems, the need to transition rapidly forced a one-size-fits-all implementation of telehealth. Platforms chosen and modalities implemented often did not match the technical knowledge and

skill levels of the providers delivering care utilizing telehealth or the patients participating (Campos-Castillo & Anthony, 2020; Eberly et al., 2020; Fischer et al., 2020; Nouri et al., 2020; Weber et al., 2020).

Purpose of the Research

As the United States continues to shift towards a post-pandemic period, a retrospective review of the successes and failures of telehealth will inform decisions regarding the use of this care type known as telehealth as a viable option to care in the future. The purpose of this research was to conduct a retrospective review of data from a large health system in New Jersey, Virtua Health, detailing the use of telehealth visits during the pandemic and into the post-pandemic period. This analysis will describe the characteristics of both patients and providers to determine the presence of any trends.

Significance

As healthcare continues to evolve in the post-COVID-19 era, technology will become a larger component of patient care models. Connecting patients with providers of all specialties from a distance is only one of the benefits of using technology. Telehealth visits allowing real-time interaction encourage patients to become more active participants in their care. Management of acute but particularly chronic diseases can improve health outcomes by increasing the use of more patient-centric care models including telehealth (Moore et al., 2017). The use of telehealth is, however, not without barriers. Issues of patient and provider access as well as knowledge and familiarity with technology usage must be considered as telehealth becomes more incorporated as a viable patient care setting. Identifying trends, successes, and failures regarding the actual usage of telehealth during the COVID-19 pandemic and beyond will inform how to more effectively integrate telehealth into patient-provider care models.

While much literature exists regarding the transition to telehealth during the COVID-19 pandemic, limited recommendations exist for the successful implementation of telehealth models particularly concerning adoption by patients and providers. Data describing the later phases of the pandemic are demonstrating that usage of telehealth, while still higher than pre-pandemic rates, are falling (Fox & Sizemore, 2020). As described in 2020 by Fouquet & Miranda, the key for the successful, continued use of effective telehealth will be to determine how the human factors of both patients and providers influence adoption and usage. The telehealth usage trends identified in this study may lead to predictors and recommendations for successful telehealth usage.

Research Questions and Hypotheses

Research Question 1: Is there a difference in the use of telehealth as defined by the number of visits conducted between primary care providers and specialist providers from March 2020 through August 2021?

Alternate Hypothesis H1a: There will be a significant difference in the number of telehealth visits between primary care providers as compared to specialist providers from March 2020 through August 2021.

Research Question 2: Is there a difference in telehealth modality type use between primary care providers and specialist providers from March 2020 to August 2021?

Alternate Hypothesis H2a: There is a significant difference in the use of telehealth visit modality type between primary care providers as compared to specialist providers from March 2020 through August 2021.

Research Question 3: Is provider practice location as identified by the RUCA zip code area significantly associated with the choice of telehealth modalities by providers at Virtua Health?

Alternate Hypothesis H3a: Provider practice location is significantly associated with the choice of telehealth modalities types by providers.

Research Question 4: Is the patient demographic of the town of residence as identified by the RUCA zip code area significantly associated with participation in a telehealth visit?

Alternate Hypothesis H4a: Patient town of residence as identified by RUCA zip code area is significantly associated with participation in a telehealth visit.

Alternate Hypothesis 4b: Patient town of residence as identified by the RUCA zip code area is significantly associated with the choice of telehealth visit modality type in which a patient participates.

Research Question 5: Is the patient demographic of age significantly associated with participation in a telehealth visit?

Alternate Hypothesis H5a: Patient age is significantly associated with participation in a telehealth visit.

Alternate Hypothesis H5b: Patient age is significantly associated with the choice of telehealth visit modality type in which a patient participates.

Research Question 6: Is the patient demographic of gender significantly associated with participation in a telehealth visit?

Alternate Hypothesis H6a: Patient gender is significantly associated with participation in a telehealth visit.

Alternate Hypothesis H6b: Patient gender is significantly associated with the choice of telehealth visit modality type in which a patient participates.

Scope of the Study

This study was limited to all ambulatory telehealth visits completed by the Virtua Medical Group (VMG) using all telehealth modalities at Virtua Health during the period March 1, 2020, through August 31, 2021.

Research Design

This retrospective secondary analysis of data was conducted using a dataset developed by the Virtua Health System Information Technology (IT) Business Analytics Team at the request of the VMG senior leadership team. This data was drawn from the Epic (http://www.epic.com) electronic medical record (EMR) as well as Excel spreadsheets created by Virtua Health operations and compiled into a single integrated dashboard using the Qlikview (https://www.qlik.com) software. Operationally, this data is used to inform decisions regarding the use of telehealth for patient and provider interactions. Access to this data is limited and by permission of senior leadership only. The principal investigator is an employee of the Virtua Health IT Department and was granted access to this dataset by VMG senior leaders.

The principal investigator extracted all data from the dashboard concerning telehealth visits during the defined study period into a Microsoft Excel spreadsheet. This Excel spreadsheet was saved to a password-protected location accessible only by the principal investigator. Columns including Encounter CSN Id, Patient MRN, Insurance, and payor, which were not included in this analysis, were removed. Unique identifiers such as names were coded by the principal investigator before analysis. All data analysis was conducted by the principal

investigator using IBM's Statistical Package for the Social Sciences (SPSS) software platform version 28.

Summary

The use of telehealth as a care setting for patients with both acute and chronic conditions has many benefits including improved access, more frequent patient-provider touchpoints, cost-effectiveness, positive healthcare outcomes, and the ability to provide services in health professional shortage areas. Before the COVID-19 pandemic, limited use of telehealth existed due to issues of broadband access, hardware availability, technology literacy, as well as medical licensure, regulatory, and reimbursement limitations. Waiving the licensure, regulatory, and reimbursement during the COVID-19 public health emergency significantly impacted the use of telehealth. Remote visits between patients and providers dramatically increased the use of telehealth modalities of all types beginning in March 2020. This increased usage was essential to providing ongoing, effective healthcare during the pandemic. Use of all modality types including telephones, internet-based platforms, and patient portals embedded in an EMR became common. The barriers that were not addressed, however, included patient and provider access to broadband and hardware. Additionally, the technology literacy needs of both patients and providers were not considered as most organizations utilized a one-size-fits-all approach to telehealth implementation.

Virtua Health in southern New Jersey is an organization that pivoted rapidly to the use of telehealth following the stay-at-home order implemented on March 20, 2020, by the governor. The choice of multiple telehealth modalities included phone calls, use of phone and computer-based applications to allow face-to-face interactions, and the Epic EMR patient portal My Chart. The use of face-to-face modalities provides a connection closer to an in-office visit. Senior

leaders at Virtua collected data regarding all telehealth visits beginning in March 2020. This data collection is ongoing. Analysis of this data, including differences in the types of modalities utilized by patients and providers, is important as this will describe the successes and failures of telehealth usage. Provider and patient demographics including age, gender, and geographic location may also contribute to the body of knowledge that will inform operational decisions in the future. Generalizing the information and conclusions from Virtua Health's use of telehealth beginning at the height of the pandemic and moving forward will benefit other healthcare organizations by predicting key components to facilitate successful outcomes when utilizing telehealth visits in diverse provider and patient populations. Telehealth is a patient care setting with large-scale potential use beyond the COVID-19 pandemic. Key to its expanded use is the need to optimize telehealth platforms and implementation to meet the needs of patients and providers alike.

Literature Review

This chapter describes the current literature related to the use of digital health with a particular focus on patient-provider telehealth visits. The review of the literature details a definition of telehealth and telemedicine to provide a framework in which to view these types of digital health modalities. The historical use of these modalities prior to the 2020 COVID-19 pandemic will be reviewed as well as the significant changes that occurred as an immediate result and a longer-term consequence of that pandemic. Benefits and barriers to the migration towards telehealth will be identified as will the information regarding the currently known demographics of who is using this healthcare type inclusive of both patients and providers.

Introduction

Technology is rapidly changing the face of healthcare (Baker & Stanley, 2018). Growth projections indicate that the use of technology-based patient visits comprised 13% of all patient-provider interactions before the 2020 COVID-19 pandemic. These visits increased to greater than 50% at the height of the pandemic and are expected to stabilize in the post-pandemic time frame as a patient care modality (Thomas et al., 2020; Waller & Stotler, 2018; Weber et al., 2020). Digital health is an inclusive term that has been used to define the components of the technology leveraged in healthcare (Jones et al., 2020). In 2017, Mesko and Győrffy (2019) defined digital health as “the cultural transformation of how disruptive technologies that provide digital and objective data accessible to both health care providers and patients leads to an equal-level doctor-patient relationship with shared decision-making and the democratization of care” (p. 2).

Incorporating technology into healthcare spans a wide range of uses, which include improving wellness as well as treating disease and disability (Food and Drug Administration,

2020; Jones et al., 2020). According to the World Health Organization (WHO, 2016), digital health provides "a unique and pivotal role in achieving universal health coverage in many countries because it extends the scope, transparency and, accessibility of health services and health information, widening the population base capable of accessing the available health services and offering innovation and efficiency gains in the provision of health care" (p. 1). The many components of digital health include mobile health platforms, health information technology, wearable monitoring devices, and personalized medicine, as well as telehealth and telemedicine (Turner Lee et al., 2020).

Telehealth or telemedicine is identified by the United States Department of Health and Human Services (HHS) as the ability to use electronic information and technology for delivery of healthcare when the patient and provider are not in the same geographical location ("Description of telehealth", n.d.). The Office of the National Coordinator for Health Information Technology identifies that telehealth includes a broader scope of patient care adding remote patient monitoring as well as non-clinical uses such as education (World Health Organization, 2010). This type of care delivery involves patients and providers interacting through the use of a phone, mobile device, or the internet, and may include direct interactions in real-time or store and forward communication between a patient and provider. The use of health system technology networks and software platforms meeting the regulations outlined in HIPAA of 1996 is also necessary for the success of telehealth visits.

The benefits of telehealth are numerous and include increased efficiency, expanded access to care, and improved quality of more personalized care—all while decreasing cost (Ahmadvand et al., 2018; Dobrusin et al., 2020; Fishpaw & Zawada, 2020; Kruse et al., 2017; Moore et al., 2017). The use of electronic platforms has allowed patients to become more active

partners in their care and to leverage technology to improve healthcare, and most importantly, influence health outcomes (Ahmadvand et al., 2018; FDA, 2020). These technologies can be used to empower patients to make informed choices about prevention and treatment options regarding their health (FDA, 2020).

Statement of the Problem

The COVID-19 pandemic saw rapid changes to healthcare delivery beginning in March 2020. The need to provide quality care for patients in a rapidly changing environment as a result of the highly contagious COVID-19 virus significantly increased the need for social distancing and the use of personal protective equipment (PPE; Koonin, 2020; Weber, 2020; Wosik et al., 2020). The addition of a "stay-at-home" order in March 2020 added to the burden of care delivery not only for patients diagnosed with COVID-19 but also for patients requiring routine and emergent care for all diagnoses(Koonin, 2020; Weber, 2020; Wosik et al., 2020). According to the Centers for Disease Control and Prevention, the number of telehealth visits increased by 50% in the first quarter of 2020 with the greatest increase in the last week of March as compared to the same timeframe in 2019 (Koonin, 2020). Healthcare systems were forced to initiate the use of telehealth quickly and without the ability to assess specific technology needs of the patient or provider populations being served.

Although the users of telehealth are often described in the literature, studies regarding the initial adoption demonstrate that health systems often did not conduct assessments to ascertain whether specific technologic solutions were meeting the needs of the patient or provider as part of the initial increase in telehealth usage during the early days of the pandemic (Fischer et al., 2020; Nouri et al., 2020; Thomas et al., 2020). Gaps have been identified in the literature since March 2020 regarding the successful use of telehealth by both patient and provider populations

(Thomas et al., 2020). Descriptions of the successful patient and provider participants and interaction types may identify solutions for closing these gaps, ultimately improving the success of telehealth use. These solutions are necessary to ensure the long-term success of telehealth as a healthcare modality (Fouquet & Miranda, 2020; Mesko & Gyorffy, 2019; Thomas et al., 2020). Thomas et al. (2020) has identified important components essential for the success of telehealth. Two of these components include a technologically skilled workforce as well as empowered and knowledgeable consumers (Thomas et al., 2020). Fouquet and Miranda (2020) identified the need for human factors to be considered in the successful design and integration of telehealth for both patients and providers. These human factor concerns are not new. Powell et al. in 2017 identified the need for patient-level technology support to maximize the use of telehealth visits. The ability to create a "new normal" as identified by Thomas et al. (2020) with telehealth integrated into overall care delivery will require that appropriate telehealth modalities and technology support are available to meet the needs of providers and patients.

The importance of the social determinants of health continues to demonstrate that socio-demographic heterogeneity exists (Weber et al., 2020). Health disparities in many populations including those of minority ethnicity, low income, and geographic isolation from healthcare services continue to impact health, access to care, and the potential use of telehealth as a care platform (Turner Lee et al., 2020). A one-size-fits-all model of telehealth will not work. These differences continue to provide barriers and areas of opportunity to the successful implementation of telehealth for all patient and provider populations (Campos-Castillo & Anthony, 2020; Eberly et al., 2020; Fischer et al., 2020; Nouri et al., 2020; Weber et al., 2020).

There is a need to analyze data from the use of telehealth before, during, and after the COVID-19 pandemic with a particular emphasis on the rapid adoption of this technology. The

need to incorporate human factors including demographic information, preference, and knowledge level of both patient and provider users is essential and has not been fully described in the literature. This study analyzed data to determine if the patient and provider needs were met during the rapid adoption of telehealth to inform successful integration of continued telehealth use as a care modality.

Telehealth versus Telemedicine

Telehealth and telemedicine are options for delivering patient care that have been available for decades (Moore et al., 2017). The terms telehealth and telemedicine are often used interchangeably. The American Telehealth Association identifies telehealth as the use of electronic information and telecommunications technologies to support long-distance clinical healthcare, patient and professional health-related education, public health initiatives, and health administration (Turner Lee et al., 2020). Telehealth has many components including telephone and text communication, video conferencing, store and forward images and testing, remote patient monitoring, streaming media, wireless communication, and the use of the internet. The WHO describes telemedicine as the ability to deliver healthcare services when distance may be a critical factor. It involves all healthcare professionals using information and communication technologies for the exchange of valid information for the diagnosis, treatment, and prevention of disease and injuries, research, and evaluation. The use of technology including the continuing education of healthcare providers necessary for advancing the health of individuals and their communities is also included in the telehealth umbrella (World Health Organization, 2010. The incorporation of telehealth or telemedicine as a care model has four basic elements described in 2020 by Turner Lee et al. These elements include that telehealth must be used for clinical

support and utilize a variety of modalities including phone and computer, it must overcome geographic barriers, and must improve outcomes for patients (Turner Lee et al., 2020).

The term telehealth is used throughout the following discussion to encompass telemedicine in describing the care model occurring as a result of an interaction between a patient and a provider.

Telehealth Modalities

Synchronous Visits

Patient care known as "telehealth" can take many forms. Synchronous care describes interactions between patients and healthcare providers that occur in real time. This type of care allows for real-time patient-provider interaction via several platforms including phone calls, texts, or video visits (Hoffman, 2020). Most commonly synchronous visits include the use of telephone calls, mobile applications such as FaceTime, Skype, or Doximity, internet platforms including Zoom or Microsoft Teams, and finally computer-based video visits often incorporated into a patient's EMR.

Synchronous telehealth visits provide a particular challenge due to privacy and cybersecurity concerns. HIPAA of 1996 provides a specific framework for the sharing and protection of patient information (Hoffman, 2020). Before the COVID-19 pandemic, video-based platforms and those integrated within an EMR needed to contain "reasonable safeguards" to protect patient information and prevent disclosures (Hoffman, 2020). The additional need for business associate agreements between health systems and the vendors of technology services, video platforms, and EMRs also contributed to the difficulty with conducting synchronous visits before the COVID-19 pandemic (Hoffman, 2020).

Telephone versus Computer Use for Telehealth. With almost 13% of Americans not having high-speed internet a need for multiple synchronous telehealth modality types exists (Jaklevic, 2021). Video visits using computer-based platforms became more common during the COVID-19 pandemic as 2020 progressed, but for many practices telephone visits continued to make up as much as half of all telehealth visits (Jaklevic, 2021; Li et al., 2017; Uscher-Pines et al., 2021). The requirement to use a video-based platform for telehealth was amended to allow for the inclusion of telephone visits during the pandemic (Fishpaw & Zawada, 2020; Hoffman, 2020). These telephone-based visits do not require video components to meet regulatory and reimbursement standards (Fishpaw & Zawada, 2020; Hoffman, 2020).

Data from the Pew Research Center identified that over 30% of households with incomes of $30,000 or less do not have a smartphone and over 40% do not have a computer or broadband (Anderson & Kumar, 2019; Jaklevic, 2021;). In addition to the lack of hardware or network, the lack of technical knowledge contributes to a high level of telephone usage for telehealth visits (Jaklevic, 2021). According to the Centers for Medicare & Medicaid Services (CMS), almost one-third of beneficiaries during 2020 utilized telephone only for these visits (Jaklevic, 2021; Verma, 2020). A study by Roberts and Mehrotra (2020) identified that disparities in technology hardware exist with over 40% of Medicare beneficiaries lacking a computer with internet access and 41% not having a smartphone with a data plan. Of that group, over 26% did not have either. The highest proportion of individuals without computer and/or internet access are those with lower socioeconomic status (Roberts & Mehrotra, 2020). Other populations utilizing mainly telephone visits include African Americans, tribal communities, Medicaid recipients, and those requiring an interpreter (Jaklevic, 2021). Similar data was found in a study of 231,596 primary and specialty care telehealth visits completed at Massachusetts General (Rodriguez et al., 2021).

Of these telehealth visits, 31.7% were via the use of the telephone (Rodriguez et al., 2021). In this population, telephone visits were utilized more by older, minority, and non-English speaking patients (Rodriguez et al., 2021). From the current state of literature, it appears that telehealth synchronous visits must include options for the telephone as well as computer-based visits to ensure equal access to this care modality (Nouri et al., 2020; Rodriguez et al., 2021).

Asynchronous Visits

As opposed to synchronous care, asynchronous interactions are models of remote care between healthcare providers and patients that are occurring at different times and/or different locations allowing information to be stored and sent to another individual for review and interpretation (Hoffman, 2020; Weinstein et al., 2014). Examples of asynchronous care include the review and release of test results via a mobile portal by providers or the sending of pictures from patient to provider. Mobile health tools and platforms, known as "mHealth," represent another form of telehealth. These mHealth tools allow for the provision of information via mobile devices and applications (FDA, 2020). A final type of telehealth model is an asynchronous tool called Remote Patient Monitoring (RPM). RPM allows for transmission of medical data via a mobile medical device such as occurs with remote inpatient provider consults and patient monitoring, allowing patient care and condition to be tracked over time (Hoffman, 2020; Weinstein et al., 2014; Wosik et al., 2020).

Historical Use of Telehealth Visits

The need to provide care over a distance has existed for many decades mostly due to geographic distance between patient and provider or lack of provider availability in specific areas (Waller & Stotler, 2018). Due to concerns of rising cost, quality, and the continued challenges with provider and health system accessibility, the use of telehealth in recent years has

been proposed as a potential care model for the delivery of healthcare services (Tanriverdi & Iacono, 1999). Adoption of technology in healthcare, particularly the use of telehealth, however, has demonstrated mixed results (Chuttur, 2009). Historically, overall adoption of these visit types has been difficult (Rahimi et al., 2018). As of 1992, only five states had language in regulations and statutes that addressed the standards and use of telehealth (Waller & Stotler, 2018). Over 3 years to 1995, an increase to 28 state-level telemedicine/telehealth programs occurred (Waller & Stotler, 2018). Currently, all 50 states have laws addressing telehealth and telemedicine (Waller & Stotler, 2018). Significant variability, however, does exist between state telehealth laws. Some states allow for telehealth visits to be conducted in a patient's home or at work while others require the use of telehealth to be in a healthcare facility only (Turner Lee et al., 2020). Telehealth coverage also varies at the state level. Differences are seen in private pay parity laws with some states requiring partial coverage for telehealth while others provide full coverage (Turner Lee, 2020). Given that much of the practice of medicine and a significant portion of reimbursement for care is determined at the state level, the influence of variability in the regulations regarding telehealth use has a significant impact (Turner Lee et al., 2020; Waller & Stotler, 2018).

One of the major limiting factors to the use of telehealth before the COVID-19 pandemic were regulations regarding the use of telehealth by the CMS. Original uses of telehealth visits required patients to travel to an originating site defined as a location at which medical services would be delivered in a telecommunications format (Fishpaw & Zawada, 2020; Turner Lee et al., 2020). These originating sites were located either in a rural HPSA or a county outside of a MSA (Telehealth Services, 2018). No care could be provided in a patient's home. Telehealth services had to be delivered within an interactive audio and video system by a limited number of

providers including physicians, nurse practitioners, physician assistants, nurse-midwives, clinical nurse specialists, certified registered nurse anesthetists, clinical psychologists, social workers, and registered dieticians (Telehealth Services, 2018).

Requirements for secure platforms coupled with the need to protect patient information as outlined in HIPAA and the concern for the privacy of the patient and provider locations during visits also presented challenges for telehealth usage before the COVID-19 pandemic (HIPAA Guidelines on Telemedicine; Smith & Raskin, 2020; Turner Lee et al., 2020). These privacy guidelines include the limitation of only authorized users having access to electronic patient health information (ePHI), the integrity of that ePHI needed to be protected by secure communication platforms, and an ongoing system of monitoring for any information breaches must be in place (HIPAA Guidelines on Telemedicine). Many third-party platforms store data on servers deemed to be non-compliant (HIPAA Guidelines on Telemedicine).

Smith and Raskin in 2020 reported that there was a gradual increase in telehealth use from 2006–2016, however only about 10% of consumers used telehealth services with 75% of consumers reported being unaware of this type of healthcare service. The description of telehealth users before the COVID-19 pandemic identified specific groups that were not successfully utilizing telehealth. These included older adults, racial and ethnic minorities, as well as individuals with lower socioeconomic status (Weber et al., 2020). Interestingly, the group for whom telehealth was originally approved, those in rural areas, also had difficulty with telehealth visits pre-pandemic due to limited broadband access (Weber et al., 2020).

Even with the challenges discussed, the use of telehealth was slowly growing in the time frame from 2016–2019 (American Medical Association [AMA] Digital Research). According to a survey conducted by the AMA of 1,359 providers of all specialties, the number of telehealth

visits significantly increased to one-quarter of physicians in a sample group using telehealth visits during the 3 years 2016–2019 (AMA Digital Health Research). This represented a doubling of the number of providers previously using telehealth in the same population (AMA Digital Health Research). Telehealth visits were also listed as one of the top three digital health tools that have gained traction (AMA Digital Health Research). Unfortunately, telehealth patient-provider interactions before the COVID-19 pandemic, while increasing, had remained relatively low (Moore et al., 2017; Rahimi et al., 2018). Jaffe et al. (2020) reported that 76% of all hospital systems in the United States had some level of telehealth implementation but the use of the modalities was limited. It wasn't until the COVID-19 pandemic that the adoption rates for telehealth patient-provider care began increasing significantly (Koonin et al., 2020; Reed et al., 2020; Weber et al., 2020; 2020 State of Telemedicine Report).

Telehealth and the COVID-19 Pandemic

COVID-19 forced a shift in care delivery models secondary to the need for social distancing, masking, availability of PPE, and prioritization of services (Smith & Raskin, 2020). Telehealth became a necessary care model with increased usage ranging from 100% to more than 4,300% during the pandemic to date (Fishpaw & Zawada, 2020). Some estimates state that the number of telehealth visits in the United States increased from approximately 15 visits per day before the COVID-19 pandemic to more than 2,000 visits per day in the early weeks of the pandemic (Triana et al., 2020). A safe means of delivering care was needed for patients being seen regularly for management of chronic disease, patients needing to be seen for more acute non-COVID-related diagnoses, and those with potential COVID-19 symptoms. Statistics demonstrate that as many as 56% of all telehealth visits were for care secondary to the COVID-19 virus (Weber et al., 2020). Continuity of medical care with a decrease in potential community

exposure to and spread of the virus was achieved via the use of telehealth visits (Wosik et al., 2020). The Coronavirus Preparedness and Response Supplemental Appropriations Act expanded access to telehealth services in response to the pandemic. This act enacted by the HHS included provisions that allowed reimbursement for professional services delivered in a patient's home and that reimbursement would be at the same rate as a face-to-face visit for Medicare, Medicaid, and private payers. Audio-only visits such as telephone visits became reimbursable (COVID-19 Telehealth Changes, 2020; Smith & Raskin, 2020). The act also expanded the eligible providers to any provider eligible to bill Medicare while allowing these providers to practice across state lines (COVID-19 and Telehealth Changes, 2020). Licensure, however, is regulated at the state level and while the Coronavirus Preparedness and Response Supplemental Appropriations Act encouraged state governments to remove interstate licensing barriers, policies at the state level ultimately determine the ability of a provider to see a patient residing in another state (Turner Lee et al., 2020).

The approval to use telehealth visits as a viable alternative to in-office visits enabled by the HHS during the early days of the COVID-19 pandemic (Turner Lee et al., 2020) resulted in a sharp increase in the use of telehealth visits from March–May 2020 (Jaklevic, 2020; Koonin, 2020). Increases of 50–175% in the months following the emergence of COVID-19 during the first quarter of 2020 have been documented (Henry, 2020; Koonin et al., 2020).

The increased use and success with telehealth during the height of the pandemic was not universal. Disparities in usage continued. Weber et al. (2020) identified that patients in New York City over the age of 65 and those of Black and Hispanic ethnicity continued to have the lowest use of telehealth services. Choice of telehealth modality type also differed widely during the pandemic. Greater use of telephone visits as compared to video visits was seen in many

populations including older patients as well as Black, Hispanic, and non-English speaking patients (Rodriguez et al., 2021). Finally, access to broadband particularly in underserved populations is a significant limiting factor to the use of telehealth visits during the pandemic (Rodriguez et al., 2021). While the implementation of the Coronavirus Preparedness and Response Supplemental Appropriations Act allowed for some of these barriers to be removed in underserved populations, this act was enacted as a temporary, emergency measure.

Ongoing and Projected Use of Telehealth Beyond COVID-19

Of recent note is the change in usage of telehealth as the COVID-19 pandemic continues to progress. National data from one of the largest electronic medical records software vendors, Epic (epic.com), report that telehealth visits dropped to 21% of overall patient encounters during the summer of 2020 by health systems utilizing the Epic platform (Fox & Sizemore, 2020). This is down from a peak of 69% in the early months of the pandemic (Fox & Sizemore, 2020; Ross, 2020). Telehealth usage levels do, however, remain significantly higher than the pre-pandemic usage of 0.01% (Fox & Sizemore, 2020). The challenge for health systems in the future is to determine how telehealth fits into the model of delivering care late in the pandemic and post-pandemic (Ross, 2020). Many of the changes that positively impacted the use of telehealth implemented as part of the Coronavirus Preparedness and Response Supplemental Appropriations Act are temporary (Hoffman, 2020; Smith & Raskin, 2020; Ross, 2020; Thomas et al., 2020). Careful analysis and expansion of these changes will be necessary for the success of telehealth visits as a care modality in the post-pandemic environment (Hoffman, 2020; Ross, 2020; Smith & Raskin, 2020).

In parallel to the COVID-19 pandemic, changes in public health initiatives such as Healthy People 2030 (Office of Disease Prevention and Health Promotion [ODPHP], n.d.), have

similarly identified the need to use telehealth visits as a care model for patients, especially in the area of primary care and chronic disease management.

Balance will be needed to determine the need for face-to-face patient-provider visits with the option of providing care through the use of telehealth. Determining the right fit of in-person visits combined with telehealth visits will depend on cost, diagnoses, reimbursement rates, and potentially patient or provider preference (Ross, 2020).

Benefits of Telehealth

Overall Benefits of Telehealth

Outcomes research has demonstrated that telehealth is a positive care delivery model for access to preventative and specialty care in all populations, including those identified as underserved (Moore et al., 2017; Smith & Raskin, 2020). Polinsiki et al. (2015) reviewed existing literature and determined that telehealth visits and patient outcomes are similar to traditional in-person visits. A systematic review by Kruse et al. in 2017 also determined that improved patient outcomes as a result of telehealth visits were found in over 20% of the literature even before the COVID-19 pandemic from the years 2000–2017.

Reduction of wait times in offices is a significant benefit of using telehealth. It is reported that more than half of all patients have left an office visit at least once due to long wait times (Fishpaw & Zawada, 2020). A survey conducted by the American Hospital Association found that about 75% of patients would use telehealth if it resulted in timely access to care and if the level of comfort for them is the same as a face-to-face appointment (Smith & Raskin, 2020).

A study of patient satisfaction following a telehealth visit as part of the CVS Minute Clinic program identified that one-third of patients identified a preference for using a telehealth visit as compared to an in-office visit and over half reported that the telehealth visit was

equivalent to the in-office visit in quality and that wait times were significantly improved. (Polinski et al., 2016). Polinski et al. (2016) determined that over 94% of all patients reported being “very satisfied” with care received via a telehealth visit. An interesting finding is that patients with no medical insurance had a 20% greater preference for using telehealth visits (Polinski et al., 2016). Donelan et al. (2019) identified by a patient survey that telehealth visits were as good as or better than in-person office visits in terms of convenience, cost, quality, and personal connection. Of particular interest is that in this study population face-to-face video visits were preferred over telephone visits due to the more personal connection (Donelan et al., 2019).

The literature identifies that the use of telehealth enables access to care, decreases transportation issues, improves continuity and coordination of care, decreases wait time, reduces healthcare costs, and can improve outcomes while empowering patients to be active participants in their healthcare (Mesko & Győrffy, 2019; Moore et al., 2017; Rising et al., 2017). The use of telehealth is moving healthcare to be more patient-centered (Fishpaw & Zawada, 2020). Patient satisfaction is an important component of today’s healthcare. Satisfaction of patients with care reduces the redundancy of and potential costs of care (Kruse et al., 2017). High levels of patient satisfaction with telehealth have been demonstrated in numerous studies (Fishpaw & Zawada, 2020; Kruse et al., 2017). These types of telehealth visits have allowed healthcare providers to view patients in their home environments often with increased participation of family members, resulting in valuable insight into a patient’s circumstances (Triana et al., 2020).

Benefits of Telehealth in Chronic Disease

Managing chronic conditions over a lifespan has also created the need for the development of a partnership between providers and patients, which often requires more frequent

interactions (Mesko & Győrffy, 2019). The use of telehealth improves the frequency of communication with providers, increases access to care, and improves self-awareness of health and disease management for patients with physical and behavioral diagnoses (Kruse et al., 2017; Liu, 2020). Innovative opportunities exist to manage care outside of traditional office visits by utilizing telehealth modalities (Liu, 2020; Tuckson et al., 2017). Managing patients with chronic diseases or acute episodes of disease is facilitated by the use of telehealth as it will allow the provider to base interventions on real-time health indicators (Liu et al., 2020). Telehealth visits provide touchpoints for providers to confirm adherence to medication regimens, discuss lifestyle modifications, and provide information and support for patients managing chronic disease (Liu, 2020). Liu and colleagues (2020) defined the concept of "copresence" in the management of a disease. Copresence is the perception of support and communication, which can be felt by using frequent touch points and technologically mediated interactions (Liu, 2020). Use of the copresence model may give patients more support and confidence to engage in behaviors promoting better management of disease states to promote lifestyle change and adherence to medical regimens (Liu et al., 2020). Both patients and providers demonstrated that the use of telehealth is an effective modality for managing chronic disease (Powell et al., 2017; Reed et al., 2020). In one report, while 57% of patients overall used and were satisfied with telehealth, 77% of patients with chronic disease used telehealth and felt that was equivalent to or more comfortable than an in-office visit (2020 State of Telemedicine Report). A survey completed by Penn Medicine found that over half of providers guiding patients in the management of chronic disease felt that the use of telehealth was the same or better than an in-office visit (Penn Medicine News, 2020)

A survey of providers indicated that 81% of providers feel overextended or at full capacity (Polinski et al., 2016). Managing patients for longer lifespans and more chronic conditions has resulted in many providers facing the challenge of time (Mesko & Győrffy, 2019). The use of new technology such as telehealth has the potential to increase provider workload. A study published in April of 2021 by Joo and Liu determined that case managers using telehealth to assist with the management of patients with diagnosed chronic decisions resulted in increased workloads. The use of other technology such as electronic health records (EHRs) has been shown to increase provider workload. Lopez et al. (2021) documented that transition to electronic platforms, particularly EHRs, increased workloads for providers. However, the use of telehealth is not viewed similarly. Smrke et al. (2020) in a survey of provider satisfaction noted that telehealth visits were similar to face-to-face appointments in terms of workload. Therefore, the use of telehealth by providers as a tool in the management of patients with acute or chronic disease is an effective means for providing ongoing care.

Barriers to Telehealth

Identified barriers to the use of telehealth visits have a significant impact on both patient and provider participation (Smith & Raskin, 2020). According to Smith and Raskin (2020), utilization of telehealth may have disrupted care to patients and communities that lack access to high-speed internet and for patients who experience what is popularly known as the digital divide. The digital divide describes a gap existing between accesses to information technology seen in different groups (Steele, 2019). Groups identified as most affected by the digital divide include older adults, those living in rural areas, vulnerable populations, racial and ethnic minorities, and those with lower socioeconomic status (Weber et al., 2020). The use of telehealth during the COVID-19 pandemic has transformed healthcare; however, an unintended

consequence may be an expansion of that digital divide (Wosik et al., 2020). In a description of the rapid use of telehealth in New York City during the pandemic, it was noted by Weber et al. (2020) that patients older than 65 and minority groups including African American and Hispanic populations had lower use of telehealth visits. The rapid transition seen during the pandemic to telehealth platforms and telehealth patient care visits in populations with less internet availability, use, and experience may also expand the digital divide and negatively impact existing social disparities and healthcare inequities (Magsamen-Conrad & Dillon, 2020; van Deursen & van Dijk, 2014). The digital divide is determined by access to the internet, access to hardware, internet knowledge, and skill of utilization (van Deursen & van Dijk, 2019). There is an intersection between populations identified as having health disparities and the digital divide (Smith & Raskin, 2020; van Deursen & van Dijk, 2019). Smith and Raskin (2020) noted that lower-income individuals are more likely to use mobile devices as opposed to computer-based devices and are more likely to experience service disruption. Other barriers identified by patients include the following:

- Lack of patient interest in utilizing a telehealth visit (Hawley et al., 2020)
- Lack of knowledge regarding telehealth use and capability resulting in a belief that telehealth is subpar to traditional healthcare delivery platforms such as in-person visits (Smith & Raskin, 2020)
- The need for a previously established relationship with a provider (Moore et al., 2017; Reed et al., 2020).
- Privacy concerns based upon the location of a patient during a visit (Rising et al., 2017)

- Access to technology including hardware and broadband (Hawley et al., 2020). Broadband access is being identified as an explicit social determinant of health that has surfaced as a result of the COVID-19 pandemic (Smith & Raskin, 2020).
- Confidence with using technology (Smith & Raskin, 2020)
- Level of technology literacy and experience (Hawley et al., 2020)

Providers are feeling similarly about the use of telehealth. Only 15% of primary care providers nationally used telehealth patient care visits as a care model before the COVID-19 pandemic (Moore et al., 2017). A national survey of primary care providers by Moore et al. (2017) demonstrated that 84% of providers using telehealth and 90% of those using only traditional office visits had at least one barrier to utilizing telehealth visits. Some common barriers cited by providers included ease or unease with technology. Privacy concerns are also of primary concern as confidential private locations are needed to conduct telehealth visits. Providers also specifically report concerns with state-to-state licensure, credentialing, and reimbursement barriers (Fishpaw & Zawada, 2018; Nicol et al., 2020; Rising et al., 2017; Waller & Stotler, 2018).

As barriers to the use of telehealth exist for both providers and patients, a need for the availability of technical support exists (Baker & Stanley, 2018; Smith & Raskin, 2020). Lack of support with both technology and clinical skills available to both patients and providers is a barrier to telehealth often resulting in significantly decreased use of technology-based services (Baker & Stanley, 2018). Presence of this support results in a better patient and provider experience (Baker & Stanley, 2018; Smith & Raskin, 2020).

The use of telehealth as a means to improve access to care has been included as an objective of Healthy People 2030 (ODPHP, n.d.). This newly added research objective includes

increasing the population of adults with broadband Internet access (ODPHP, n.d.). In 2017, slightly over half of U.S. adults reported having broadband internet access (Smith & Raskin, 2020). Eighty-nine percent of the households in the state of New Jersey report having at least one computer or smartphone. However, greater than 350,000 households do report having no device to access the internet (O'Dea, 2018). Those households with no device or access have incomes of less than $20,000 (O'Dea, 2018).

The presence of an important perceived barrier for both patients and providers affecting the use of telehealth was also proposed by Smith and Raskin in 2020. This barrier is the potential belief that delivery care via telehealth at a distance may be subpar when compared to face-to-face visits (Smith & Raskin, 2020). While the information in the literature exists documenting that telehealth visits provide equivalent and often superior care, this perceived barrier may be difficult to overcome (Pooja & Ryan, 2021; Shaverdian et al., 2021; Stokel-Walker, 2020; Zuleta & Ajilore, 2020).

Who is Using Telehealth?

Digital health and the use of telehealth platforms have significantly changed the practice of medicine (Mesko & Győrffy, 2019). According to a systematic review by Smith and Raskin in 2020, patients often demonstrate more acceptance of telehealth visits and modalities than providers. Patients are demonstrating the demand for more telehealth options due to the benefits provided (Waller & Stotler, 2018). Interestingly, a "pull" effect for the use of digital health from patients is described in the literature (Ahmadvand et al., 2018). This effect demonstrates that patients are becoming more digitally engaged and providers are being "pushed" to embrace digital health patient care platforms (Ahmadvand et al., 2018). In a study by Dobrusin et al. (2020), greater than 80% of patients being seen for telehealth visits with gastroenterological (GI)

providers felt that telehealth is an acceptable care platform and would be willing to use telehealth in the future. Interestingly, while 90% of provider respondents in the same study reported being satisfied with telehealth visits over half report they expect less than one-third of future patient encounters to be conducted via telehealth (Dobrusin et al., 2020). The concept of individual patient influence on healthcare paradigms is termed the biopsychosocial-digital model (Ahmadvand et al., 2018; Mesko & Győrffy, 2019). Understanding provider and patient's biological, psychological, and social factors, as well as ability to embrace and use technology may help predict the success of utilizing digital health platforms.

Jaffe et al. (2020) determined that predictors for a patient's use of telehealth included age. Individuals less than 44 years of age were more likely to have a telehealth visit (Reed et al., 2020). However, the age group demonstrating the greatest interest in using telehealth was older adults (Jaffe et al., 2017). Hawley et al. (2020) cited that older populations have less knowledge of and experience with technology and telehealth. With individualized training and support, these knowledge barriers could be successfully addressed (Hawley et al., 2020). Jaffe et al. (2017) also noted that other predictors of telehealth use included marital status, geography, anxiety, and depression. Gender, ethnicity, socioeconomic status, and baseline health behaviors were not predictive in this study (Jaffe et al., 2017). Other studies, however, have identified additional factors influencing the use of telehealth including gender, race, age, socioeconomic status, geographic location, and technology literacy (Eberly et al 2020., Fischer et al., 2020; Koonin et al., 2020; Moore et al., 2017; Triana et al., 2020; Weber et al., 2020).

The success of many healthcare modalities, including telehealth, is dependent on patient satisfaction. Some of the most important factors for patient satisfaction when utilizing telehealth visits are convenience, efficiency, privacy, and comfort (Dobrusin et al., 2020; Fleischhacker,

2020; Kruse et al., 2017). Additionally, programs addressing patient education have proven to be helpful with improving technology adoption and patient advocacy (Fouquet & Miranda, 2020; Triana et al., 2020). Tuckson et al. (2017) in the New England Journal of Medicine stated, "Telehealth interventions must be informed by more research on their usability by both providers and patients" (p. 1599). In addition to knowledge regarding general patient and provider identified barriers to the implementation of telehealth, individual health systems must also determine real and perceived barriers specific to their patient and provider populations. A review of the literature does demonstrate some specific demographic facts describing the populations accessing telehealth platforms. These include:

- Individuals with access to the internet (Reed et al., 2020)
- Individuals located a significant distance from a provider and those identifying challenges with parking at the provider location (Reed et al., 2020)
- Racial differences in the use of telehealth do exist. In several studies, Black patients were more likely to use telehealth visits than White patients (Campos-Castillo & Anthony, 2021)
- Patients in lower socio-economic areas demonstrate less likelihood to utilize a telehealth visit, particularly a video visit, as opposed to a telephone visit (Reed et al., 2020)
- Individuals without insurance or higher copays opt for telehealth visits more often. High out-of-pocket costs and lack of insurance are often a deterrent to an in-person office visit but are associated with increased usage of telehealth visits (Reed et al., 2020)

- Polinski et al. (2016) and Koonin et al. (2020) found that women were more likely than men to participate in a telehealth visit

Use of Telehealth in Primary Care

Shortage of Primary Care Providers

One of the largest platforms for providing ongoing patient care is primary care services. Primary care is defined as an integrated approach to patient care that addresses the majority of patient healthcare needs (Primary Care, n.d). A primary care provider can be a specialist in family medicine, internal medicine, or general pediatrics who oversees care for preventative services and services related to the management of chronic disease (Primary Care, n.d.). As late as 2015, it was estimated that more than 25% of the American population did not have a primary care provider due to geographic access issues (Polinski et al., 2016). In 2017, data reported by Gudbranson et al. identified that more than 507 million primary care visits are conducted each year representing almost 55% of all provider visits in the United States. Zhang et al. (2020) reported that one of the most recognized barriers to providing healthcare services in the United States is the limited number of primary care providers. It is projected that the supply of providers particularly in primary care will not meet future demands of patient care (Basu et al., 2019; Zhang et al., 2020). The shortage of physicians by 2030 is currently estimated as being greater than 120,000 with 20,000 of those being in primary care (Streeter et al., 2020; Zhang et al. 2020). Adding to the potential imbalance between the supply and demand for primary care providers is the fact that since the implementation of the Affordable Care Act (ACA), 22 million residents have received additional health coverage, adding to the demand for care (Gudbranson et al., 2017).

The United States Health Resources and Services Administration (HRSA) identifies areas of healthcare provider shortages in many specialties including primary care. These areas of primary care shortage are known as Primary Care Health Professional Shortage Areas (pcHPSAs) (Streeter et al., 2020). More than 75 million Americans have been identified as living in these areas known as pcHPSAs (Jaffe et al., 2020; Streeter et al., 2020). In-depth analysis of these areas noted that 18% of those living in these areas are over 65 years of age, 24% are of a minority race/ethnicity, 16% live below the poverty line, and 14% report low levels of education (Streeter et al., 2020). Of particular note is that almost 20% of the population living in these areas report fair or poor health, while another 16% have some type of disability (Streeter et al., 2020). It is startling to note that 89% of all counties in the United States have areas designated as pcHPSAs (Streeter et al., 2020).

Availability and use of primary care services is a positive predictor of improved health outcomes (Streeter et al., 2020). Basu et al. in 2019 determined that improved mortality was seen in areas with a higher concentration and utilization of primary care providers. Access to care, including primary care, has been identified as an important social determinant of health in underserved populations (Stanley, 2018). Given the large number of patients seen by primary care providers, this care setting provides a large area of opportunity in which to expand access via the use of telehealth services for all populations, including the underserved (Moore et al., 2017).

Telehealth and Primary Care

There is a growing base of knowledge identifying that telehealth visits, particularly telehealth visits for primary care provider-patient interactions, improve access to primary and specialty care in not only rural areas but also urban areas (Hoffman, 2021; Powell et al., 2017).

A survey by Moore et al. in 2017 identified that rural primary care providers were more likely to use telehealth than providers located in urban care settings before the COVID-19 pandemic. The use of telehealth and video visits particularly as a result of the COVID-19 pandemic has allowed the focus of care to become more patient-centric in all geographic locations inclusive of urban and rural settings (Fishpaw & Zawada, 2020).

A review by Moore et al. (2017) determined that primary care providers were effective in making clinical decisions for 10 chronic conditions when combining a telehealth visit with patient completion of a questionnaire. This same review identified that costs were not higher for the delivery of telehealth services than for in-person visits (Moore et al., 2017).

Telehealth can be used strategically as an effective treatment platform for triage and routine care in many patient populations but particularly in those with chronic diseases (Fix & Serper, 2020). Looking toward the end of the COVID-19 pandemic is a critical time to create a new normal that includes telehealth as an integral and effective part of healthcare delivery (Nouri et al., 2020; Serper et al., 2020; Stokel-Walker, 2020).

Virtua Health

Virtua Health is a health system in southern New Jersey serving patients in Burlington, Camden, and Gloucester counties. The mission of Virtua Health states that “Virtua helps you be well, get well and stay well” (Virtua Health, 2021). Virtua is a member of the South Jersey Health Collaborative. With five hospitals, urgent care centers, ambulatory surgery centers, health and wellness centers, and more than 100 provider offices, Virtua Health is the largest healthcare employer and the third-largest overall employer in southern New Jersey. Of the provider offices, 24% or almost 25% are primary care (Virtua Health, 2021).

Like many other health systems in the United States, Virtua responded to the need for telehealth solutions and social distancing by increasing the use of telehealth for all specialties, including primary care, during the COVID-19 pandemic. From March to April of 2020, the number of telehealth visits increased by 22,534 visits. Also like many other health systems, the telehealth solutions implemented by Virtua were one-size-fits-all with limited options available for patient or provider personalization strategies.

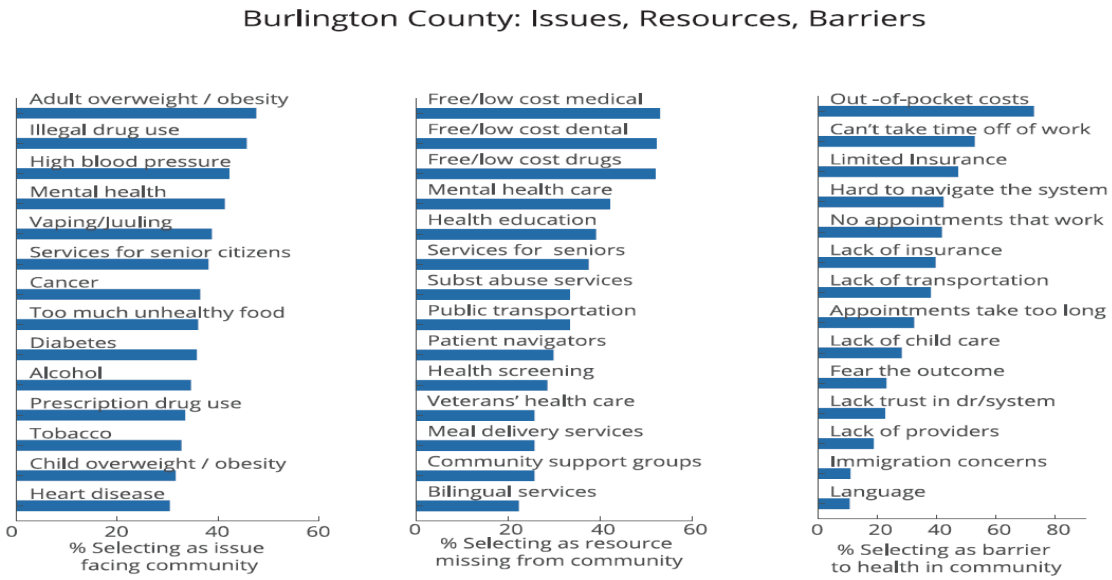
Population Served by Virtua Health

According to the 2019 Community Health Assessment completed by the South Jersey Health Collaborative, the main issues identified by the communities in Burlington and Camden counties as barriers to health are related to access to care (Allred, 2019). These concerns of access include transportation, location, navigating the health system, and getting care (Allred, 2019). Almost one-third of residents reported not accessing healthcare due to cost and 75% reported overall healthcare costs as barriers to health (Allred, 2019*).* Fifty percent of residents reported being unable to take time off from work or to find appointments that work in their schedules. One-third reported waiting too long at appointments (Allred, 2019). Navigation was also identified as an issue by more than half of the community with a particular emphasis on using the internet (Allred, 2019). Transportation was one of the top three community issues identified for Burlington and Camden counties. Many patients are unable to physically get to appointments due to transportation issues (Allred, 2019). It is also important to note that between 20–30% of all residents of both counties travel outside of the county for care due to lack of provider availability (Allred, 2019). Figures 1 and 2 summarize these findings of resources and barriers in Burlington and Camden counties as outlined in the 2019 Community Health Assessment. This information

can provide valuable information as decision-making regarding the effective expansion of the use of telehealth for the patients served by Virtua Health.

Figure 1

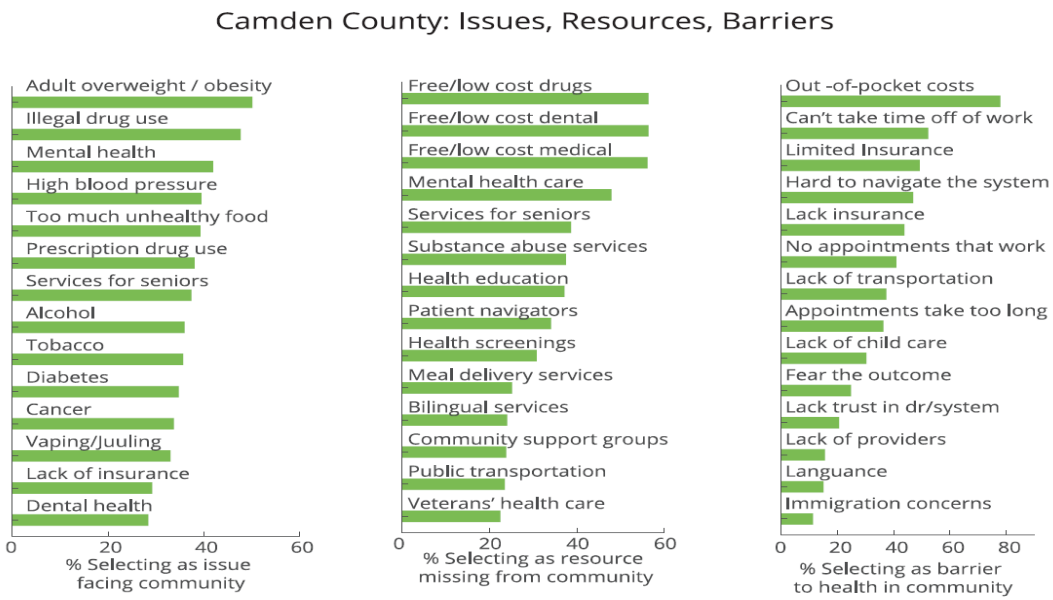
Burlington County Issues Resources and Barriers



(Source: Allred, 2019)

Figure 2

Camden County: Issues Resources and Barriers



(Source: Allred, 2019)

The general recommendations from this 2019 South Jersey Health Collaborative Community Health Needs Assessment presented in Figures 1 and 2 can be summarized as:

- "Reduce wait times for appointments
- Provide appointment options outside of the Monday-Friday, 9 am – 5 pm window
- Culturally competent patient navigators to assist with health care and insurance systems
- Patient ambassadors or community members to help provide social support and encouragement; act as 'health coach'
- Translation services for those whose primary language is not English
- Resources for low-cost medical care

- Resources for low-cost prescription drugs
- Resources for low-cost dental care
- Increase access to reliable transportation options" (Allred, 2019)

The digital divide exists in the counties served by the Virtua Health System. Almost 20% of residents are over the age of 65 with approximately 50% being female (U.S. Census Bureau, n.d.). Slightly more than 30% of the residents of Virtua's service area represent minority populations (U.S. Census Bureau, n.d.). It is important to note that the city of Camden with a population of 94% being identified as minority ethnicity is located in the area served by the Virtua Health System. Like many other cities in New Jersey, the presence of smartphones, computers, or internet access is lower in Camden than in other areas of the state (O'Dea, 2018). Within the city of Camden, the poverty rate is 36.8% with a median household income of $27,070. The ratio of primary care physicians providing care to patients is 1 to almost 1,000 (O'Dea, 2018).

For the counties served by Virtua Health, multiple federally designated primary care Health Resource Shortage Areas (HPSA's) exist (Health Resources & Services Administration, n.d.). The state of New Jersey demonstrates that 83% of the counties have at least one area identified as a primary care HPSA (Streeter et al., 2020). Addressing the recommendations from the 2019 Community Health Needs Assessment in all areas, but particularly in those areas designated as primary care HPSA's, is an important component of Virtua Health's mission.

Telehealth at Virtua and the COVID-19 Pandemic

Virtua Health increased its emphasis on the use of telehealth patient visits at the outset of the COVID-19 pandemic in 2020 and understood the need to collect data regarding those

telehealth visits. For operational purposes, data regarding the use of telehealth has been collected from March 2020 through June 2021 to describe the operational components of patient-provider care interactions. These data include:

- Number of telehealth visits by provider specialty
- Number of telehealth visits by individual provider
- Type of telehealth modality used including telephone, Face Time, and electronic platforms
- Patient demographics including age, gender, and geographic location within the Virtua service area

Theoretical Frameworks Commonly Used When Evaluating Telehealth

The adoption and use of telehealth tools have been viewed through the lens of many theoretical frameworks. One such theoretical model is the diffusion of innovations model (Cain & Mittman, 2002). Healthcare is a dynamic industry; therefore, new ideas and models of information and care provision occur regularly in healthcare (Cain & Mittman, 2002). According to Cain and Mittman, in 1985 Everett Rogers described the diffusion of innovations model as, “Diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system” (p. 4). Cain and Mittman (2002) summarized the 10 critical elements for innovation diffusion defined by Rogers:

- Relative advantage – the understanding and recognition of the significant impact of the innovation
- Trialability – the ability to try out an innovation before adoption
- Observability – Making the innovation easily seen and highly visible

- Communications channels – communication to the right channels to persuade adoption
- Homophilous groups – the sameness of the group will facilitate diffusion of the innovation
- Norms, Roles, and Social Networks – the leveraging of existing groups
- Opinion Leaders – individuals to promote adoption of the innovation
- Compatibility – easier to use innovations will be adopted more readily
- Infrastructure – the ability of the existing infrastructure to support the adoption of the innovation.

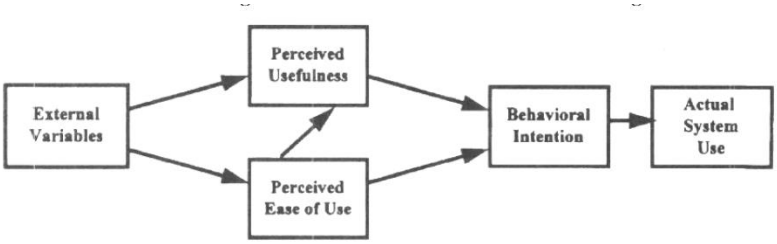
In 1985, the development of the technology acceptance model (TAM) was introduced in a doctoral thesis by Fred Davis (Davis, 1985). This model was based upon the theory of reasoned action developed by Fishbein and Ajzen in 1975 (Chuttur, 2009; Davis, 1985). Davis described the TAM as identifying a user's motivation to adopt technology was critical to acceptance and was based upon three factors:

- Perceived Ease of Use – the level at which the individual believes uses of the technology will not be physically or mentally difficult (Purwanto & Budiman, 2020)
- Perceived Usefulness – use of a particular technology will be of positive benefit (Purwanto & Budiman, 2020)
- Attitude Toward Using the System

Figure 3 demonstrates the relationship of any external variables and the perceived usefulness and ease of use. This interrelationship ultimately identifies the value of use for a particular technology, resulting in actual use.

Figure 3

TAM

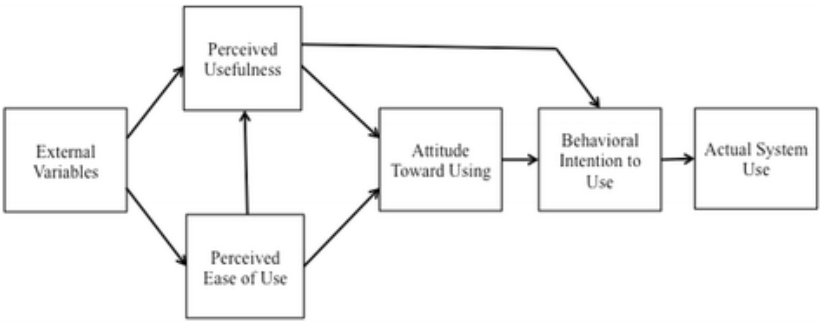


(Source: Venkatesh & Davis, 1996*)*

The TAM has been widely used and modified since its inception with the most important modification being the addition of Behavioral Intent (Chuttur, 2009). Figure 4 demonstrates the need for perceived usefulness by the user for behavioral change to occur. This intent to change behavior could occur even without a change in attitude, resulting in the actual use of the technology (Chuttur, 2009).

Figure 4

Modified TAM



(Source: Chuttur, 2009)

As the TAM has been used to study behavior in regards to telehealth, research has demonstrated that individuals will adopt the use of technology if they are comfortable with the use of the technology with little energy or effort being required to do so (Bagot et al., 2019; Kissi et al., 2020; Purwanto & Budiman, 2020). Individuals adopting technology in the performance of telehealth visits include both providers and patients. A study by Kissi et al. (2020) demonstrated that the acceptance of physicians to use technology for patient visits was based on the perceived usefulness and the perceived ease of use in regards to clinical consultation tasks, diagnosis, treatment plan development, and management.

While the TAM is widely accepted as a theoretical framework to describe the acceptance and use of technology, there are additional factors that have been identified as important in the use of healthcare technology (Bagot et al., 2019; Chuttur, 2009; Kissi et al., 2020; Purwanto & Budiman, 2020). Trust has been demonstrated to have a significant impact on the decision to utilize healthcare information technology (HIT) (Chuttur, 2009; Purwanto & Budiman, 2020). Individuals must trust in the technology for successful adoption. Another important factor is privacy. The concern over the sharing of confidential information with anyone other than providers and in particular third-party vendors such as technology vendors often presents an obstacle for patients accepting the use of HIT (Purwanto & Budiman, 2020). Finally, social influence or context will exert an effect. The influence of family and friends often plays a role in the acceptance of technology usage (Bagot et al., 2019; Dash et al., 2019; Purwanto & Budiman, 2020).

The need to modify the TAM to represent all areas influencing the adoption of technology, including HIT, resulted in the formation of the theoretical model known as the unified theory of acceptance and use of technology (UTAUT). This theory is based upon four

main constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003; Williams et al., 2015). Each construct will directly determine the behavioral intention and actual behavior (Venkatesh et al., 2003; Williams et al., 2015). The use of UTAUT allows for use of the framework in different environments by different systems as each of the four main constructs is influenced by the mediating conditions of gender, age, experience, and voluntariness of use (Venkatesh et al., 2003; Williams et al., 2015).

While the diffusion of ideas, the TAM, and the UTAUT have been applied to healthcare (Dixon-Woods et al., 2011; Kaminski, 2011), Tanriverdi and Iacono in 1999 identified that these theories did not completely explain the adoption of telehealth. They identified that in addition to all the components defined in the diffusion of innovations and TAM, knowledge barriers have an important role in technology adoption (Tanriverdi & Iacono, 1999). To bridge this gap, Tanriverdi and Iacono (1999) proposed the theory of knowledge barriers introduced by Atewell in 1992. Initially applied to the adoption of technology by business entities, the use of the theory in identifying non-innovation specific factors has important implications for healthcare and in particular the adoption of telehealth (Tanriverdi & Iacono, 1999). These knowledge barriers have been classified into four categories. These categories include Technical Knowledge Barriers, Economic Knowledge Barriers, Organizational Knowledge Barriers, and Behavioral Knowledge Barriers (Tanninen, 2017; Tanriverdi & Iacono, 1999). Identified as the most significant barrier, the Technical Knowledge Barrier is the knowledge and skills of the individual to use technology (Tanriverdi & Iacono, 1999). Economic barriers to the use of telehealth include the use of appropriate business models, regulatory frameworks, and potential reimbursement (Tanriverdi & Iacono, 1999). Integration of the use of telehealth and its technology into the organizational structure is the third category known as Organizational Barriers (Tanriverdi & Iacono, 1999).

Finally, willingness to change behavior coupled with actual behavioral change itself are the components of Behavioral Knowledge Barriers (Tanriverdi & Iacono, 1999). The four categories contained within the theory of knowledge barriers can be applied to both patients and providers participating in the telehealth care model.

External factors influencing the use of HIT are those factors that influence how people behave. The use of telehealth at Virtua Health and many organizations nationwide has been significantly influenced by the external factor of the COVID-19 pandemic beginning in early 2020. The need to provide a technological solution for patient visits created by the COVID pandemic had a significant impact on both the behavior of providers and patients. The literature supports that COVID-19 resulted in a significant increase in the use of telehealth visits of all modality types beginning in March 2020 (Dosaj et al., 2021; Jaklevic, 2021; Koonin et al., 2020; Lau et al., 2020; Rodriguez et al., 2021; Thomas et al., 2020; Uscher-Pines et al., 2021; Weber et al., 2020; Wosik et al., 2020). The modified TAM model will be used to view the information and trends seen in the "VMG Telehealth Analytics: VMG Telehealth and Telephone Encounter Metrics" (VMGTA) dataset as the results gathered during this study may lead to additional external factors. These additional factors could identify why specific patient and provider groups have more readily adopted telehealth visits. Patterns of telehealth visit usage may also help to identify existing knowledge barriers for both patients and providers. Donelan et al., in 2019, concluded that telehealth visits, particularly video visits, are not just a replacement for in-person visits but represent a new care model allowing more frequent, shorter patient encounters and the possibility of earlier intervention with patients. Once identified, organizational initiatives and future research can be developed by Virtua Health to identify and address those barriers for both

providers and patients to facilitate true behavior change and increase adoption of telehealth modalities beyond the COVID-19 pandemic.

Gaps in the Literature

Today's healthcare model has become more patient-centric with patients being viewed as active participants in their health and the model of care delivery. It is also apparent that the use of technology is changing the face of many industries, including healthcare. The ability to share information and connect patients and providers from a distance is one of the many benefits of utilizing technology. While many studies are outlining the benefits and barriers of healthcare information technology, there are far fewer describing the demographics of who is successfully using healthcare information technology. Further investigation into the influence of the digital divide is needed to understand the use or lack of use for telehealth to attempt to counteract the widening of this technology divide. Additionally, information regarding the frequency of modality type requires further investigation. Knowledge about actual usage is essential to determining how to more effectively integrate healthcare information technology platforms into future patient-provider care models.

The use of telehealth as a patient care model was significantly affected by the COVID-19 pandemic. While telehealth usage was identified as an important care model during the pandemic, very limited literature was found with recommendations for continued successful integration of telehealth visits for all specialties, including primary care. Data have shown that while the number of telehealth visits increased steeply in the early days of the pandemic, the number of telehealth visits has been decreasing since June of 2020 (Demeke et al., 2021). According to Demeke et al. (2021), the increased use of telehealth has continued in those geographic areas with higher incidences of COVID-19. Areas in which surges have diminished

have demonstrated the greatest decline in telehealth use. Interestingly, however, a recent poll conducted by the Medical Group Management Association (MGMA) found that one-third of healthcare leaders believe that the use of telehealth in 2021 will increase, one-third feel it will decrease, and one-third feel there will be no change (MGMstat). These data indicate that at least 60% of healthcare leaders in the United States believe that telehealth use will change as the pandemic subsides and ultimately ends (MGMstat). Current data demonstrate that while telehealth usage has decreased since the early days of the COVID-19 pandemic, it does continue to remain higher than pre-pandemic levels (Fox & Sizemore, 2020; Ross, 2020).

Telehealth has many benefits for providing cost-effective, patient-centered care. The use of telehealth has the potential to satisfy the Triple Aim of improving the care experience for patients, reducing costs, and ultimately improving both patient and population health outcomes (Dobrusin et al., 2020). An essential component to this success of telehealth beyond the COVID-19 pandemic is the need to describe the specific patient populations being served by a health system with particular emphasis on the demographics successfully utilizing telehealth modalities. A second important component is a determination of the most commonly utilized telehealth modality platforms. This information is the first step towards incorporating successful telehealth programs into long-term care paradigms. Finally, the concept of human factors and the interaction of people with technology must be considered. Telehealth platforms and modalities must first and foremost meet the needs of the user both patient and provider (Fouquet & Miranda, 2020). "Fitting the tech to the person and not the person to the tech" as described by Fouquet and Miranda (2020) has been identified as an important key principle for the success of telehealth.

The need to identify and describe those patients and providers using telehealth visits within the Virtua Health System in southern New Jersey is the focus of this project. Given the challenges with access to care for the population served by the Virtua Health System in Southern NJ, including those identified as underserved or at risk, it is hypothesized that telehealth visits would be a viable option to close those care gaps, particularly for primary care. Literature has shown though that many of the social determinants of health identified in the area served by Virtua indicate that barriers to the use of telehealth visits will be encountered by participants (Smith & Raskin, 2020; van Deursen & van Dijk, 2019). This information may allow for the formation of a viable plan to maintain telehealth as a viable care option at Virtua Health and beyond as we move out of the COVID-19 pandemic.

Methodology

This study was a retrospective analysis of the use of telehealth visits conducted by primary and specialty care providers at the Virtua Health System in southern New Jersey. To comply with emergency stay-at-home orders issued in the state of New Jersey as a result of the COVID-19 pandemic, Virtua Health increased its emphasis on the use of telehealth patient visits at the outset of the COVID-19 pandemic in 2020. The focus for this study was on data collected by the Information Technology department at the request of Virtua Medical Group (VMG) operational senior leaders beginning in March 2020. These data were compiled into a dataset using information extracted from the Epic Electronic Medical Record (EMR) by Qlikview software. This data set is available in report, table, and dashboard format. In addition to gathering and storing raw data, the integrated software application known as Qlikview summarizes all information in a user-friendly, interactive, graphic form. The data is displayed in a dashboard format by default and is entitled "VMG Telehealth Analytics: VMG Telehealth and Telephone Encounter Metrics" (VMGTA). The dataset includes all data collected during telehealth visit encounters conducted by the provider practice entity of Virtua Health called VMG and represents all clinical areas including primary and specialty care. At Virtua Health the specialty of primary care is labeled as "Family Medicine," while specialty care is represented by all medical and surgical specialties outside of Family Medicine. Currently, the VMGTA dataset is used to inform operational decisions regarding telehealth modalities at Virtua Health. Access to the data is limited to a designated group of Virtua leaders.

Target Population

The study population was patients and providers from Virtua Health participating in a telehealth visit between March 1, 2020, and August 31, 2021, captured in the VMGTA dataset.

This timeframe was chosen as the shift to telehealth at Virtua occurred rapidly during March of 2020 when the governor of the state of New Jersey issued an emergency stay-at-home order secondary to the COVID-19 pandemic. The need to socially distance to try to limit the spread of the COVID-19 virus forced Virtua Health to significantly increase the usage of telehealth visits. Virtua's telehealth visits include both primary and specialty care visit types, each with access to all modalities of telehealth. Modalities include telephone and computer-based telehealth video interactions between patients and their providers. Visits conducted by telephone at Virtua were categorized into a group entitled "Telephone Visits" and did not include a face-to-face patient and provider component. Other telehealth visits, while potentially using a smartphone, tablet, or computer, were completed by the use of Apple's FaceTime application, and the applications of Doximity and Microsoft Skype (version 2019). Real-time patient video visits were conducted with the internet-based platform Zoom from March 2020 to March 2021. A switch to Microsoft Teams as the Internet-based platform for telehealth use was implemented in March of 2021 based upon organizational decisions to move away from Zoom to Microsoft Teams. Face-to-face visits utilizing Skype, Doximity, Zoom, or Microsoft Teams are captured within the VMGTA data set as Non-MyChart Video Visits. The final telehealth video visit type is integrated into the Epic EMR platform and required the patient to download and utilize the Epic application known as MyChart. In the VMGTA dataset, these integrated visits were identified as MyChart Video Visits. There were 191,682 records in this dataset in total.

Inclusion and Exclusion Criteria

All records dated from March 1, 2020, through August 31, 2021, residing in Virtua Health's VMGTA dataset, which met the inclusion criteria below, were used for analysis.

Inclusion. The analysis included any ambulatory patient care interaction ("patient visit") utilizing any form of telehealth modality including phone, FaceTime, Doximity, Zoom, Microsoft Teams, or Epic MyChart. Included patient interactions must have taken place between March 1, 2020, and August 31, 2021, the timeframe encompassing the start of the pandemic and beyond.

Exclusion. Any in-person patient care interaction such as an in-office appointment were excluded. Additionally, any telehealth visits occurring before March 1, 2020, or after September 1, 2021, were not included in this analysis.

Telehealth visits conducted by disciplines other than primary or specialty provider care were also excluded. These excluded disciplines include nutrition, diabetes services, physical therapy, occupational therapy, as well as speech and language pathology.

Sample Size

As of August 31, 2021, the VMGTA dataset size for March 1, 2020, through April 30, 2021, consisted of 191,682 observations. This constitutes an average of 10,649 interactions per month. To achieve a power of 0.8, a sample size of 102 was required as determined by the use of G*Power. Since all records in the dataset constituted the sample, and since the number of records was far more than needed for 80% power, the sample was large enough for statistical significance.

Institutional Review Board

The principal investigator is an employee of Virtua Health and worked with the Virtua Health Internal Review Board to gain access to all primary and specialty care office data regarding patient and provider demographics and telehealth visits.

Virtua Health was the IRB of record. As required, prior to IRB approval, the principal investigator submitted a research proposal along with all required documentation to the Virtua Health Research Review Committee for approval. Approval from the Virtua Health Research Review Committee was obtained and the principal investigator submitted the research proposal to the Virtua Health IRB. This approval was granted on September 1, 2021.

As required by Radford University a letter of support from the senior officer of VMG granting authorization to use the data for this project along with a copy of the proposal and the approval letter from Virtua Health's IRB was submitted to the Radford University IRB.

Instruments and Measures

The Qlikview Reporting Software

The VMGTA data was gathered and extracted via the use of a software application called Qlikview. This data analytics tool, used routinely by Virtua Health, delivers data in an interactive format. Qlikview dashboards can be harvested from multiple data sources and integrated for ease of use within an organization's network. These data sources at Virtua include operational metrics gathered from Excel spreadsheets as well as data harvested directly from the Epic EMR database. Qlikview integrates these heterogeneous data sources into a centralized, easily accessed single location. At Virtua, access to this unified view ("dashboard") of the data sources, as well as the underlying data sources themselves, is available to authorized users only. These merged data sources constitute the VMGTA dataset. The VMGTA application allows users to select desired variables and extract these for further analyses and processing in other applications. Such applications include those that perform statistical analysis; statistical analysis is the process to be used for this research study.

The VMGTA dataset extraction occurred on August 31, 2021. The data in this dataset included:

- Number of telehealth visits by encounter provider and provider specialty
- Number of telehealth visits by individual encounter provider
- Provider practice location identified as Department
- Type of telehealth summary modality and visit type used, including telephone, FaceTime, Doximity, internet platforms such as Zoom or Microsoft Teams, and video visits integrated into the Epic EMR Remote Client Visit
- Date of telehealth visit encounter
- Patient demographics including date of birth, age group, gender, and geographic location identified by patient zip code within the Virtua service area.

Data Collection

Overview of the Data Collection Process

Data from the VMGTA Qlikview Dashboard was accessed by the principal investigator via the Virtua Intranet and tools available in Qlikview. The data was exported by the principal investigator to Microsoft Excel for analysis. The principal investigator attached a password to the file and stored the file in a secured shared file location. The password was not shared and was placed in a locked file cabinet drawer in the principal investigator's office.

Following all guidelines identified by Virtua Health, the principal investigator de-identified all data. Unique identifiers such as names for both identifying patients and providers were removed with each patient and provider name being assigned a number by the principal investigator. Once each number was assigned, the name of patients and providers were removed. In addition, the principal investigator removed column information for the Encounter CSN Id,

which identified a visit and potentially a patient in the Epic EMR. Other column information removed included Patient MRN (medical record number) as well as any insurance and payer information. Data defined as excluded was removed by the principal investigator before saving the final Excel spreadsheet. Rows in which no data was available were deleted. This Excel spreadsheet with no identifying information was saved in the password-protected shared drive file.

Patient and provider practice zip codes were available within the dataset. The principal investigator created a new column for Rural-Urban Commuting Area Codes (RUCAs) (RUCA, n.d.). A RUCA is a classification based on the United States Census information that includes geographic location, work commuting information, rural or urban status, and zip code. The zip code RUCA was used to classify patient zip codes. The principal investigator assigned each patient's zip code to the appropriate zip code RUCA record and saved that information in a column on the Excel spreadsheet called Zip Code RUCA.

Once extracted and de-identified, data was coded for ease of analysis. All coding of data was completed by the principal investigator as outlined in the Codebook (see Appendix A).

Both independent and dependent variables were used during data analysis. Independent variables (IV) include SPEC, PROVLOC, AGE, PG, TYPE, and RUCA. The dependent variable (DV) was the frequency of telehealth visits.

Data Analysis

Multiple forms of data analysis were conducted. Given that multiple types of data exist in the data set, both descriptive and inferential statistical analysis were performed. Analysis was completed as outlined in the Data Analysis Table (see Appendix B).

The principal investigator transferred all data into the Statistical Package for Social Sciences (SPSS) software platform version 28. A quality check was performed every 20 entries to ensure the accuracy of data entry into SPSS. Descriptive statistics including frequency and percentages were performed to describe trends in the data for each research question.

A second phase of data analysis using inferential statistical analysis was completed. SPSS was to run inferential statistical tests to test each hypothesis. Inferential statistical tests utilized included Chi-Squared and ANOVA.

Summary

This study was a secondary retrospective analysis of data collected by Virtua Health System in southern New Jersey. The data in this dataset described the use of telehealth patient visits for all provider specialties over an 18-month period following the New Jersey stay-at-home order issued by the governor of New Jersey as a result of the COVID-19 pandemic. Virtua Health is representative of many other health systems with its rapid transition to telehealth as a means of providing socially distant care in the early days of the COVID-19 pandemic. Data gathered regarding provider and patient demographics, telehealth visit type, and payer information were gathered by IT at Virtua Health and compiled in an interactive dashboard utilizing Qlikview software. This current analysis identified relationships between patient and provider demographics, use of telehealth, and telehealth modality types. The results of this analysis will inform operational decisions at Virtua Health but will also add to the body of knowledge regarding successes and challenges associated with the use of telehealth.

Results

This study analyzed the use of telehealth visits at a large healthcare organization, Virtua Health, located in southern New Jersey from March 2020 through August 2021. A retrospective analysis of an operational data set, entitled VMG Telehealth and Telephone Encounter Metrics (VMGTA), was conducted to describe the characteristics of both patients and providers to identify any trends from March 2020 through August 2021.

All data within the data set were downloaded and organized into Microsoft Excel. The data were coded as described in the Data Handbook found in Appendix A. The final Microsoft Excel spreadsheet was imported into IBM's SPSS version 28. Descriptive statistics were utilized to initially analyze the data. Frequencies, percentages, and overall counts of visit numbers were determined.

Inferential statistics were utilized to identify any associations. The presence of potential associations was analyzed using the Chi-square statistical test. Chi-square was used to assess relationships in datasets including non-parametric, categorical data. Given the large sample size, a Cramer's V was completed as part of the analysis to address the strength of any associations or relationships. The results of the data analysis were reported in both tabular and graphic format.

Analysis of the VMGTA dataset using the identification of frequency trends and associations as determined by Chi-square identified the following trends in relation to six research questions.

Sample

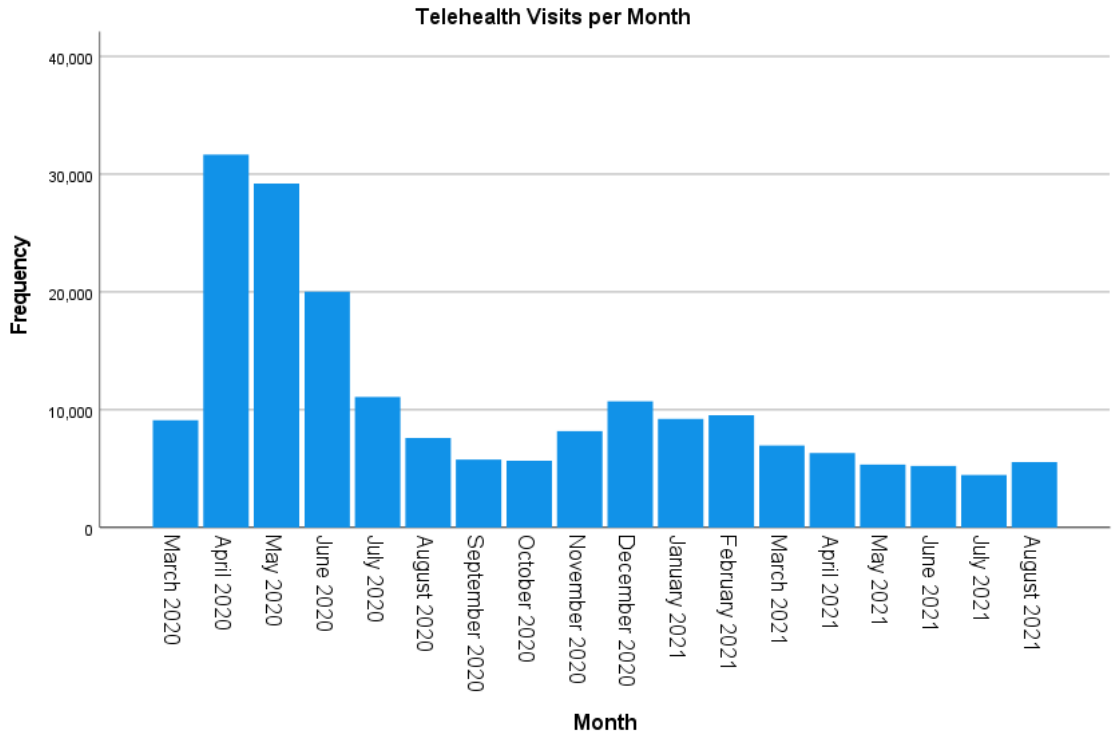
In the 18 months from March 2020 through August 2021, Virtua Health System conducted a total of 191,682 remote patient, telehealth visits. These visits were conducted

utilizing three different modalities including the telephone, internet-based platforms including Zoom and Microsoft Teams, and video visits integrated into the Epic EMR.

The frequency of these visits changed during the time span covered by the dataset, with the greatest number of visits being conducted in April, May, and June of 2020. In fact, 42.1% of all telehealth visits in the dataset occurred during these 3 months with a decrease in the overall number of visits occurring from June 2020 through March 2021. After March 2021, there was a leveling off and stabilization of the frequency of telehealth visits (see Figure 5).

Figure 5

Telehealth Visits by Month



As stated, three telehealth modality types (telephone, internet-based, Epic EMR video) were used during the defined analysis period. The telehealth modality distribution frequency (see Table 1) reveals that about 60% of the visits were equally split between the EMR-based video platform and the telephone, while the internet-based modality was used on more than 40% of the visits.

Table 1

Frequency of Telehealth Modality Usage March 2020 – August 2021

Telehealth Modality

	N	%
Internet Platform	78286	40.8%
EMR-based Video Platform	56794	29.6%
Telephone	56602	29.5%

Analyzing the trend of telehealth modality type usage over time also demonstrated that while the overall frequency of telehealth visits decreased over time, internet-based platforms continued to be more frequently utilized than either the telephone or the EMR-based video visit. There was a significant association between the month in which the telehealth visit occurred and the telehealth modality type, X^2 (34, N = 191,682) = 54151, p =.015.

Results of the Study

Additional descriptive and inferential analysis revealed associations and trends within the dataset. These trends and associations are as follows.

RQ 1: Is there a difference in the use of telehealth as defined by the number of telehealth visits conducted between primary care providers and specialist providers from March 2020 through September 2021?

Alternate Hypothesis H1a: There will be a significant difference in the number of telehealth visits between primary care providers as compared to specialist providers from March 2020 through August 2021.

Virtua Health provides service in three different practice areas. Those areas are Primary Care (known as Family Medicine at Virtua), Specialty Care, and Urgent Care. In the 18 months analyzed, the specialty of primary care utilized telehealth visits most frequently, accounting for 60.7% of overall visits, followed by specialty care at 37.2% and urgent care at 2.1%. This difference was significant, X^2 (1, N = 191,682) = 100211.149, p < .001. It is important to note that telehealth urgent care visits were not conducted with existing physical urgent care locations but within a specific virtual department that only provided remote patient visits. Within the practice type of specialty care, the greatest frequency of telehealth visits was conducted by Cardiology (8.7%), Endocrinology (5.8%), and Pulmonology (4.3%).

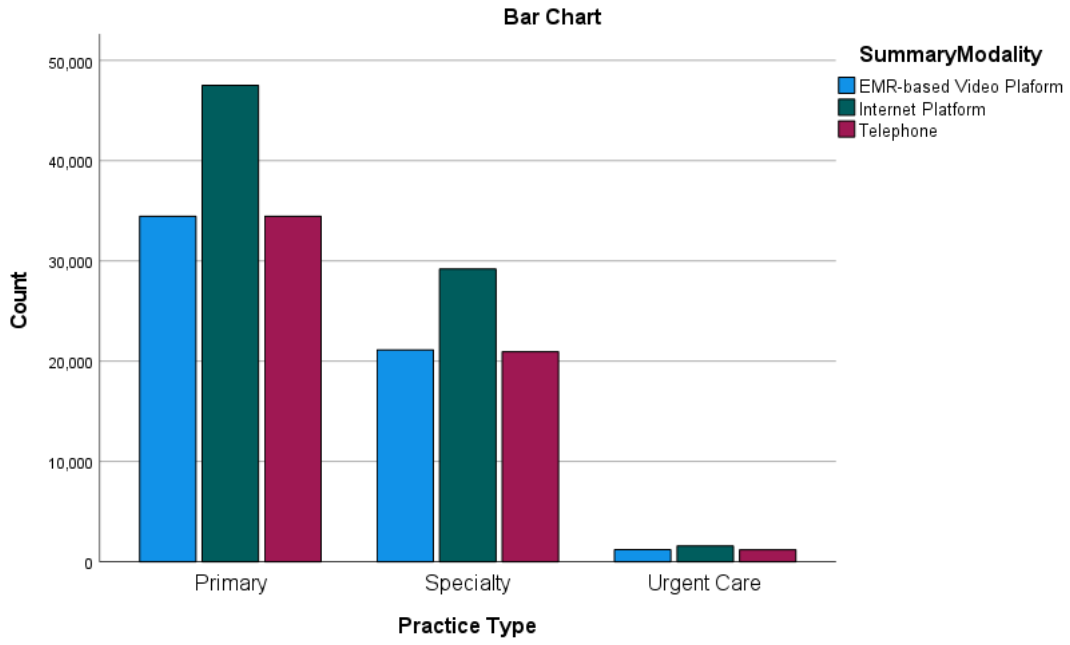
RQ 2: Is there a difference in telehealth modality type used between primary care providers and specialist providers from March 2020 through September 2021?

Alternate Hypothesis H2a: There is a significant difference in the use of telehealth visit modality type between primary care providers as compared to specialist providers from March 2020 through August 2021.

For all practice types, the use of the internet-based platforms including Zoom and Microsoft Teams demonstrated the greatest frequency of use as shown in Figure 6.

Figure 6

Telehealth Modality Usage by Practice Type



Although 40.8% of total visits were conducted by Internet-based platforms, statistical significance was not demonstrated, X^2 (4, N = 191,682) = 3.757, p = .433. Based upon this analysis, it appears that the preference for utilizing an internet-based platform may exist in primary and specialty care but not in urgent care settings.

RQ 3: Does provider practice location as identified by the RUCA zip code area affect the use of telehealth modalities by providers at Virtua Health?

Alternate Hypothesis H3a: Provider practice location is significantly associated with the choice of telehealth modalities types by providers.

The primary service area for Virtua Health in southern New Jersey includes the counties of Burlington, Camden, Atlantic, and Gloucester. While many counties do not include primary as well as specialty care offices, these counties do have primary and specialty care within their borders. Ninety-eight percent of all telehealth encounters were conducted in the state of New

Jersey with over 91.6 % of those being completed in Burlington and Camden counties. An analysis of the total Virtua health dataset revealed that while the majority of visits were conducted with patients located in the state of New Jersey, there were telehealth visits with patients located in 44 out of the 50 U.S. states.

Analyzing the data from the dataset corresponding to the Virtua Health primary service area, the preference of telehealth modality type was statistically significant with internet-based platforms having the highest usage for all counties, X^2 (15, N = 191,682) = 1633.285, p < .001. Further analysis for the strength of association utilizing a Cramer's V measure of association, with a scale of 0 (no association) to 1 (strong association), yielded a value of .055.

Research questions 4, 5, and 6 pertain to specific patient demographics. To accurately assess the number of unique patients participating in telehealth visits, only initial visits were counted. This prevented the duplicate counting of the same patient. In total, 98,736 initial patients were participating in a telehealth visit at Virtua Health from March 2020 to August 2021.

RQ 4: Does the patient demographic of the town of residence as identified by the Rural Urban Commuting Areas (RUCA) zip code area influence participation in a telehealth visit?

> **Alternate Hypothesis 4b:** Patient town of residence as identified by the RUCA zip code area is significantly associated with the choice of telehealth visit modality type in which a patient participates.

Over 90% of all telehealth visits occurred with patients living in the 33 zip code areas in Burlington County and 39 zip code areas in Camden County. Examining the distribution of telehealth visit participation by patient home zip code does identify trends. Specific zip codes

demonstrated greater use of telehealth than others. In Burlington County, five zip codes accounted for almost half, 47.7%, of all telehealth visits. Although not statistically significant, of those five high-frequency areas, a trend for the use of internet-based platforms was seen. The use of the telephone and the EMR-embedded video visit appeared equal. While the use of an internet-based platform had the highest frequency of use, there was a significant relationship between zip code area and modality type, X^2 (15, N = 98,736) = 25.540 p < .001). Camden County demonstrated slightly more variability of telehealth modality type usage but similar trends with an internet-based platform being the most utilized were noted. However, in the lowest usage areas, the use of an EMR-embedded platform was the least utilized platform.

Zip code areas were also analyzed based upon the federally assigned RUCA type. These RUCA types are assigned based upon U.S. Census data to describe an area based upon population density, urbanization, and daily commuting patterns. The majority of all telehealth visits, 94%, particularly those in New Jersey, were conducted with patients living in a RUCA designated as Metropolitan. Five percent of the study population participating in a telehealth visit were living in Micropolitan designated areas. Only 60 total visits, comprising .0003% of the total number of telehealth visits, were completed in areas designated as Rural. A significant difference was seen in the type of modality utilized based upon the RUCA category, X^2 (12, N = 98,736) = 188199.734, p < .001, with a Cramer's V test of association yielding a value of .714, identifying a strong association between modality type usage and RUCA.

RQ 5: Does the patient demographic of age affect participation in a telehealth visit?

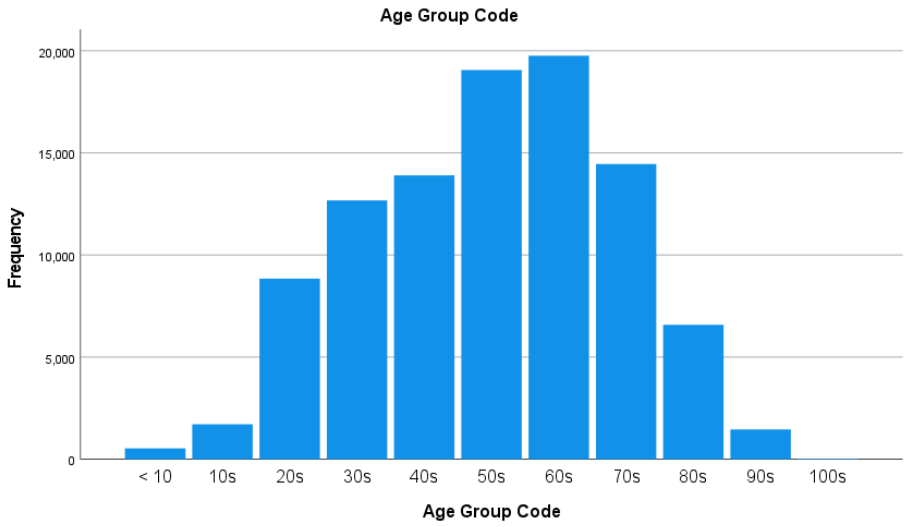
Alternate Hypothesis H5a: Patient age is significantly associated with participation in a telehealth visit.

Alternate Hypothesis H5b: Patient age is significantly associated with the choice of telehealth visit modality type in which a patient participates.

Virtua Health provides care for all age groups across the continuum, including infant and pediatric care to those greater than 100 years of age. All age groups participated in some level of telehealth visits from March 2020 through August 2021 (see Figure 7). A significant relationship existed between age group and participation in telehealth, X^2 (1, N = 98,736) = 61373.120, p < .001). Overall participation in telehealth peaked in the age group from 50 to 69 years of age.

Figure 7

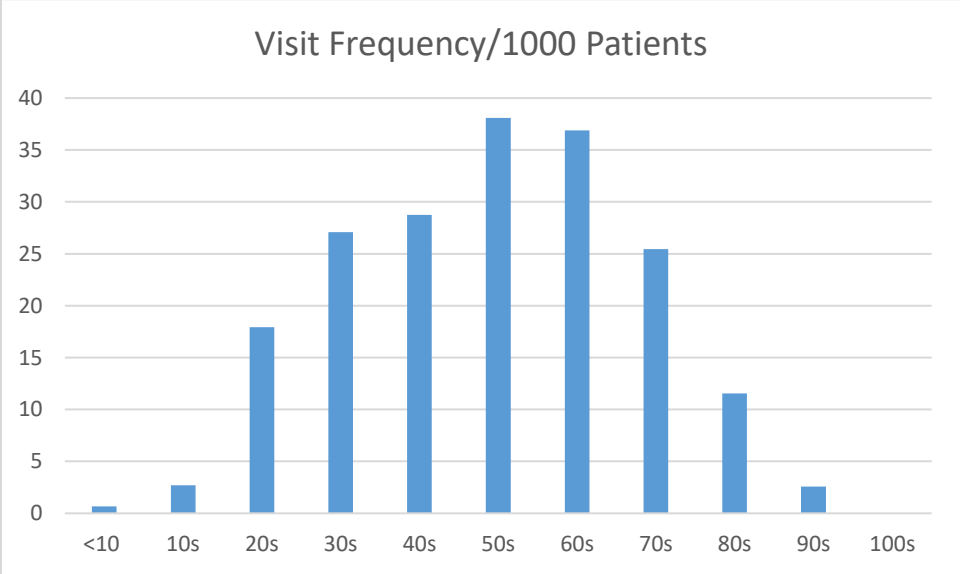
Usage of Telehealth of by Age Group



Given the large sample size, the number of visits per patient age group was determined (see Figure 8). This comparison shows that slightly more visits per age group was seen for patients in the 50-59 group as compared to the 60-69 age group.

Figure 8

Visits per 1000 Patients/Age Group

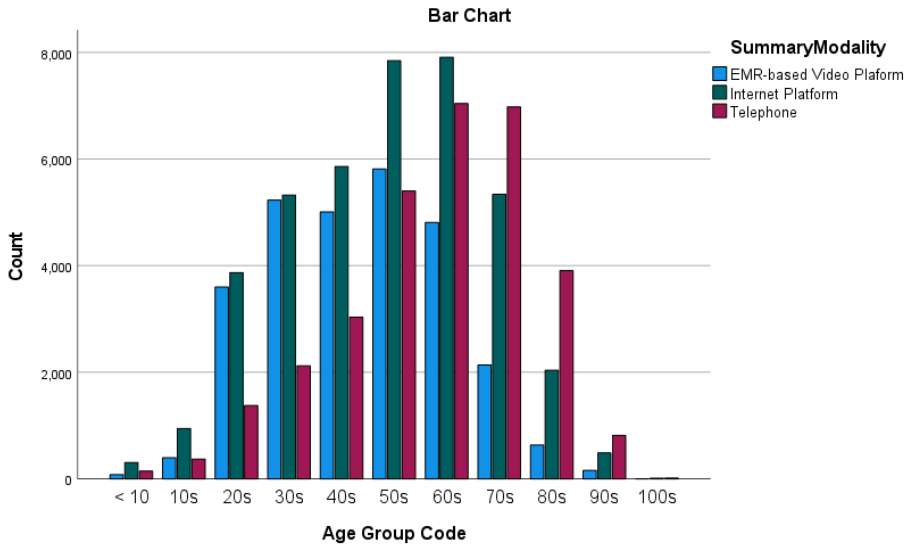


A difference was determined for the preference of telehealth modality type with adults less than 69 years of age preferring an internet-based platform. The patients in their 50s and 60s are the dominant group for participating in telehealth visits using an internet-based platform. While all age groups utilized the telephone to interact with providers, an increased preference for the use of the telephone was seen with advancing age (see Figure 9). Beginning with patients in their 50s and 60s and becoming dominant for patients greater than 70, the telephone became the primary means of participating in a telehealth visit. This relationship of age group with telehealth modality type was significant, X^2 (20, N = 98,736) = 107,560.398, p < .001, with a Cramer's V test of association equal to .218. Performing a one-way ANOVA to compare patient age with telehealth modality type utilized was F (2, 98,736) = 6322.319, p < .001 and demonstrated that at a mean of 48 years of age the use of an internet-based platform was most utilized and at a mean of 60 years of age the preference for telephone-based video visits occurred. The modality utilized least by all age groups consistently was the EMR-based integrated video platform. However,

additional analysis revealed that the use of the EMR-based platform has seen slow but steady progress in all age groups (see Figure 9).

Figure 9

Use of Telehealth Modality by Age Group



RQ6: Does the patient demographic of gender affect the participation in a telehealth visit?

Alternate Hypothesis H6a: Patient gender is significantly associated with participation in a telehealth visit.

Alternate Hypothesis H6b: Patient gender is significantly associated with the choice of telehealth visit modality type of telehealth visit in which a patient participates.

Gender was self-reported by each patient in the registration process for each telehealth visit. Female patients accounted for 64.5% of all telehealth visits and males 35.2%. There were 282 patients comprising 0.3% of the population for whom gender was not identified (see Table 2). In addition, 64.4% of females and 35.6% of the males preferred the use of an internet-based platform with the use of the telephone and an EMR-integrated platform demonstrating equal frequency, X^2 (1, N = 98,376) = 61355.812, p < .001. Although females represented almost two-

thirds of all telehealth visits, no significant relationship was seen in the telehealth modality visit type when compared with patient gender, X^2 (20, N = 98,376) = 2.617, p = .270.

Table 2

Use of Telehealth by Patient Self-Reported Gender

Patient Self-reported Gender	N	%
Male	34897	35.2%
Female	63839	64.5%
Not reported	282	0.3%

Summary of Results

In summary, the results of this analysis of the use of telehealth as a care delivery platform at Virtua Health system from March of 2020 through August of 2021 yielded many trends (Table 3). Overall usage of telehealth as a patient care platform increased significantly and peaked in April and May 2020. Since that time, a decline has been seen with visits beginning to stabilize in March of 2021 and remaining constant to date. Primary care providers had significantly more usage of telehealth visits as a means of delivering patient care when compared to specialist and urgent care providers. A preference for utilizing an internet-based platform such as Zoom or Microsoft Teams was seen in all age groups up to 70 years. Beyond this age group, older patients demonstrated a distinct preference for the use of the telephone. Female patients demonstrated a higher participation rate overall when compared to male patients but there appeared to be no telehealth modality type preference based upon self-identified gender. Utilization of this information will inform operational decisions to maximize the use of effective telehealth visits.

Table 3

Summary of Results

Hypotheses	Statistical Result	
Alternate Hypothesis H1a: There is a significant difference in the number of telehealth visits between primary care providers as compared to specialist providers from March 2020 through August 2021.	X^2 (1, N = 191,628) = 100211.149 *	Reject the null hypothesis
Alternate Hypothesis H2a: There is a significant difference in the use of telehealth visit modality type between primary care providers as compared to specialist providers from March 2020 through August 2021.	X^2 (4, N = 191,628) = 3.757	Fail to reject the null hypothesis
Alternate Hypothesis H3a: Provider practice location is significantly associated with the choice of telehealth modalities types by providers.	X^2 (15, N = 191,767) = 1633.285 *	Reject the null hypothesis
Alternate Hypothesis H4a: Patient town of residence as identified by RUCA zip code area is significantly associated with participation in a telehealth visit.	X^2(1, N = 98,376) = 148864.077*	Reject the null hypothesis
Alternate Hypothesis 4b: Patient town of residence as identified by the RUCA zip code area is significantly associated with the	X^2 (12, N = 98,736) = 188199.734 *	Reject the null hypothesis

Hypotheses	Statistical Result	
choice of telehealth visit modality type in which a patient participates.		
Alternate Hypothesis H5a: Patient age is significantly associated with participation in a telehealth visit.	X^2 (1, N = 98,376) = 61373.120*	Reject the null hypothesis
Alternate Hypothesis H5b: Patient age is significantly associated with the choice of telehealth visit modality type in which a patient participates.	X^2 (20, N = 98,736) = 107,560.398*	Reject the null hypothesis
Alternate Hypothesis H6a: Patient gender is significantly associated with participation in a telehealth visit.	X^2 (1, N = 98,376) = 61355.812*	Reject the null hypothesis
Alternate Hypothesis H6b: Patient gender is significantly associated with the choice of telehealth visit modality type in which a patient participates.	X^2 (20, N = 98,376) = 2.617	Fail to reject the null hypothesis

* $p < .001$

Discussion

Over the last decade, many health systems began the transition of in-person patient and provider interactions to a remote care model using telehealth (Gentry et al., 2021). Technology was being used for office visit check-in utilizing tablets, online scheduling, use of patient portals, and patient-provider communication via telephone call and text. Despite the many benefits seen with telehealth, including patient satisfaction with the platform, widespread adoption lagged (Drerup et al., 2021; Gentry et al., 2021). The COVID-19 pandemic forced people to go virtual and triggered a need for rapid expansion of the telehealth model. Health systems were required to develop telehealth options using multiple telephone and internet-based modalities to meet the need of state and federal stay-at-home orders issued to prevent the transmission of the novel Coronavirus. The ability to utilize internet-based, video platforms became necessary in social settings, occupational environments, and healthcare secondary to the need for social distancing. Many user-friendly platforms such as Zoom, WebEx, or Microsoft Teams were already available. Business statistics show that Zoom alone increased the number of meeting participants during the pandemic by 2900% (Iqbal, 2021). As patients and providers began using these apps more commonly, the transition to utilization for healthcare interactions was a natural progression.

The purpose of this study was to analyze telehealth usage at a large healthcare organization in an attempt to identify trends in the successes and challenges of utilizing telehealth modalities for delivering comprehensive patient care. The success of any new care model including telehealth requires strong institutional support along with operational training and acceptance (Gentry et al., 2021). Trends identified may inform operational initiatives at healthcare organizations to redesign healthcare by considering the role that telehealth can play in

future models of care delivery. This study found that a significant expansion of telehealth occurred as a result of the COVID-19 pandemic, transforming the delivery of healthcare. Important differences were seen in the use of telehealth between primary and specialty providers and the type of telehealth modalities utilized. In addition, significant differences in patient demographics, particularly age and gender, were related to the participation in telehealth.

Discussion of Results

In the United States and worldwide, a rapid increase in the use of telehealth began in April and May of 2020. Secondary to state and federal stay-at-home orders as a result of the COVID-19 pandemic, all health systems in the state of New Jersey, including the health system represented in this study, were required to offer immediate and viable telehealth options as a replacement for onsite visits. An increase in telehealth visits was seen as providers and patients became more comfortable with all health-related technology, including remote patient healthcare visits. The population represented in this analysis was no different. A significant increase in the number of telehealth visits seen in the early days of the pandemic describes the change seen at Virtua Health. In-office appointments were rapidly transitioned to remote visits utilizing multiple telehealth modalities. This pivot to telehealth occurred rapidly as patients and providers identified that telehealth was a safe way to participate in healthcare interactions. As described by the modified TAM, this increased usefulness resulted in attitudinal change regarding the need for technology, and ultimately influenced behavior change.

Before the COVID-19 pandemic, the use of EMR-integrated platforms met all HIPAA compliance and regulatory requirements for telehealth while other platforms such as the telephone or internet-based modalities such as Zoom or Microsoft Teams did not. In fact, prior to the pandemic, one of the often-cited barriers to the utilization of telehealth was the regulatory

requirement for use of HIPAA compliant video-based platforms for telehealth (Turner Lee et al., 2020). Based upon the easing of state and federal regulations for telehealth during the COVID-19 pandemic, Virtua Health offered three telehealth platform options: telephone, Zoom/Microsoft Teams, and video visits embedded within the Epic EMR.

The use of the internet-based and EMR-embedded video visits required training for both patients and providers. A training program was implemented from March through May to encourage the use of video platforms and in particular EMR-based video visits.

The choice of telehealth modality appears to be a representation of what was occurring outside of healthcare during the early days of the pandemic. Patients and providers became more comfortable with virtual platforms such as Zoom/Microsoft Teams, which they were using in occupational and social settings. These platforms continued to allow visual interaction during the visits, replicating the interaction that occurred between patients and providers during traditional office visits. The use of these EMR-embedded platforms lagged, however, as these platforms were new to both patients and providers and required patients to register using a specific, individualized code provided by the provider practice to activate and utilize the patient portal. Patients required higher levels of health and technology literacy to access and utilize these portals as compared to using the telephone or an internet-based application. Much of the check-in process, including the completion of forms and consents, needed to be completed within the portal, making it difficult for patients to access, understand, and interact using the types of visits. This multiple-step process at Virtua Health became a barrier for many patients as the use of the patient portal and the EMR-integrated platform presented a challenge and required a high level of training and support for both providers, office clinical staff, and patients.

As the pandemic numbers regarding transmission and infection began to stabilize, a return to in-office visits was seen over the summer and early fall of 2020 nationwide (Thomas et al., 2020) and in the study population. Both patients and providers began to transition back to traditional care models. Providers, clinical staff, and patients became more adept at utilizing personal protective equipment and social distancing measures. This decreased and eventual stabilization of the frequency of telehealth visits was noted at Virtua Health. While there was increased use of telehealth as compared to pre-pandemic levels, this stabilization may be attributed to concerns with provider and patient knowledge and comfort with technology, concerns of technology security, and the uncertainty surrounding current reimbursement regulations, some of which may end when the pandemic is declared over.

For the permanent addition of telehealth as a care platform, patients, providers, and the health system must perceive the usefulness of the platform as well as be comfortable with the use of the technology as described as part of the TAM. The decline in usage, as the pandemic has moved into later stages, suggests that the change in behavior to use telehealth was based on the environment of the pandemic. Lasting behavioral change will require education and support for all users to address attitudinal change regarding the telehealth care platform. The development of structured educational frameworks, development of technology-based competencies, and ongoing outcome assessments must be part of any successful telehealth implementation (Kemp et al., 2021; Rutledge et al., 2021). As part of telehealth implementation at Virtua Health, the provision of training programs for providers surrounding the use of internet-based visits such as the use of Zoom as well as the use of the Epic MyChart embedded video visit platform occurred. Patient education materials also became available via an easily accessed link on the Virtua Health website. This training and education, however, was implemented without identification of

specific user needs, prior levels of HIT literacy, and without any ongoing outcomes assessments. Development of a plan to provide ongoing education and support is needed.

Primary care providers serve as the initial point of treatment and diagnosis for many patients. These providers coordinate care and work as a team with individual patients to manage diseases across a lifespan. Over 60% of the overall U.S. adult population have at least one chronic disease and approximately 42% have multiple chronic diseases requiring ongoing management by primary care providers (Hayes, 2020). This incidence of chronic disease is steadily increasing in the adult population (Hayes, 2020). In June of 2021, the Association of American Medical Colleges released a report that by the year 2034, there will be a shortage of all physician types in the United States (Jaffe et al., 2020; Association of American Medical Colleges, 2021). The greatest projected shortfall is in primary care and is estimated to reach between 17,800 and 48,000. The need to see a large volume of patients coupled with the need to see patients multiple times for management of disease explained the increased number of visits seen by primary care providers at Virtua Health. In this study, over 60% of all telehealth visits were with primary care providers. This allowed patients with chronic illness to maintain care relationships with their primary healthcare partners. Primary care represents the largest specialty at Virtua Health and the increased frequency of telehealth visits may be a function of overall increased volume of patients seen regularly by primary care providers. Additionally, the need to see patients with chronic diagnoses for ongoing monitoring and treatment may also be reflected in the telehealth visit numbers seen in primary care. This increased frequency of visits also included patients exhibiting symptoms of COVID-19 and other acute conditions as a means of diagnosing and managing these conditions without increasing risk of exposure and transmission of the COVID-19 virus. The use of telehealth by providers in primary care at Virtua Health

coupled with the good outcomes seen with the use of telehealth modalities provided a solution for effective care delivery during the pandemic. Specialty providers demonstrated approximately 38% of visits in this population with almost 20% of those visits being completed by specialists treating patients with chronic disease diagnoses such as cardiology, pulmonology, and endocrinology. Much like primary care, the use of telehealth became an effective tool in the management of chronic disease for these patients and providers for visits to monitor patient condition and adherence to medical regimens. Telehealth visits may never fully replace in-person visits but were found to be an additional treatment interaction between patients and their care providers.

Telehealth has long been identified as a means of providing care in underserved or remote geographic regions. Geographic location and associated socioeconomic status influence the use of telehealth (Reed et al., 2020; Smith & Raskin, 2020; Weber et al., 2020). The results of this study indicated that neither location nor socioeconomic status demonstrated statistically significant relationships with the use of telehealth or with the telehealth modality type. According to the U.S. Census Bureau, patients identified within this study live in geographic areas with greater than 80% of residents having internet access. A significant association of telehealth utilization was seen with the geographic location classification of Rural Urban Commuting Areas (RUCA). Those areas designated as Metropolitan had significantly more use of telehealth than those identified as Micropolitan or Rural. Though one might assume that the rural versus metropolitan status of a location is tied to the income of residents in an area, per capita income based upon geographic location in the study population did not demonstrate a relationship with participation in telehealth or the type of telehealth modality observed. Given that access did not appear to be an issue in this study based upon location or socioeconomic

status, provider preference due to the factors of being able to visualize the patient and potential for higher levels of reimbursement may have been the factor driving the use of internet-based visits.

Multiple studies have demonstrated an increased preference for the use of telehealth video modalities based upon age (Dobrusin et al., 2020; Turner Lee et al., 2020; Weber et al., 2020). Similarly, this study found that younger and middle-aged patients preferred the use of computer-based modalities and in particular internet-based platforms. These age groups were using internet-based platforms for occupational, social, and family communications and therefore felt a significant level of comfort with the technology. To fully address the increased use of telehealth by age, utilization of healthcare services must be considered. In terms of healthcare utilization by age group, the highest utilizers of healthcare by age are patients 65 years and over. This age group demonstrates twice the usage of healthcare services as other age groups (American Geriatrics Society, 2011). While all age groups in the United States have demonstrated some increase in the overall use of healthcare services since the early 1990s, this age group has been the fastest-growing rate of utilization when compared to all others. This increased utilization at Virtua Health can be attributed to an increased incidence of chronic disease in patients as they age and/or the fact that as individuals who are under or uninsured become eligible for Medicare, increased utilization of healthcare services are seen. Further analysis of this population and the relationship of payer to telehealth usage may determine the association of healthcare utilization and telehealth.

It is clear in this study that as patients within this study population entered their 60s and beyond, the use of computer-based modalities, both internet-based and EMR-integrated, decreased significantly. The telephone became the modality of choice. The use of the telephone

for telehealth visits bridges the gap often seen for older adults with limited or no internet access and lack of technology and health literacy (Jaklevic, 2020). In fact, the improved outcomes seen with the use of the telephone are similar to those seen with video-based platforms (Rush et al., 2018). It must be noted, however, that while older individuals may initially prefer the use of the telephone as seen in this study, the literature also demonstrates that this patient group report high levels of patient satisfaction when they do participate in a video-based telehealth visit and also report an interest and willingness to utilize technology with the appropriate level of training and support (Dobrusin et al., 2020). According to Serper et al. (2020), "An opportunity to refashion medicine with a blend of approaches – face to face meeting, state of the art telehealth platforms, consumer-friendly video apps and telephone calls, could be on the horizon." Based on the results of this study, for telehealth usage, particularly internet-based platforms, to be embraced by older patients, the implementation of structured programs of education and support targeted to older patient populations would be necessary as described in the literature (Dobrusin et al., 2020).

In addition to age, the use of telehealth in the literature has been strongly associated with gender. When analyzing the use of healthcare service by gender, females utilize medical services overall at a higher rate than other genders for all age groups. In fact, a study by Bertakis et al. in 2000 demonstrated that even when controlled for health status and socioeconomic demographics, women continue to demonstrate an increased utilization rate of health services as compared to men. Reasons for the increased use of health services overall by women include the fact that women often seek health services for themselves and for members of their families (Wheeler et al., 2013). Additionally, women often live longer and have more chronic health conditions than men (Wheeler et al., 2013). Finally, women often demonstrate "help-seeking" behavior sooner than men (Bertakis, 2000). Much like the literature, women for this study were more likely than

men to participate in telehealth visits. What is not known from the study data is whether this increased usage by women was a preference for telehealth, or merely the well-documented increased use of healthcare services. Additionally, when comparing the use of the telephone, an internet-based platform, and a platform embedded within the EMR, there was no significant relationship in the type of telehealth modality when compared with gender in this study population.

Thomas et al. (2020) found that key elements must exist for telehealth to be successful. These include a skilled workforce and empowered patients who have access to the necessary training and support (Thomas et al., 2020). Humans, particularly adults, adopt technology if it is useful to them contextually (Bagot et al., 2019; Kissi et al., 2020; Purwanto & Budiman, 2020). They must see the relevance and benefits of new technology to achieve a motivation level that will result in true behavioral change. To learn to participate in telehealth, both patients and providers must see the usefulness of the telehealth care model within the context of a patient-provider healthcare visit. The COVID-19 pandemic forced the use of telehealth on populations. The potential that its use was not driven by a true behavioral intent to change as described in the Modified-TAM theoretical model, but was directed by federal and state mandate and a public health crisis, is probable.

The decline seen in the use of telehealth since the middle of 2020 at Virtua Health demonstrates that complete adoption of the technology did not occur. This may be attributed to both patients and providers not perceiving the usefulness of the modality and/or not believing that it is easy to use. Additional education, increased availability of resources, and the ability to customize telehealth visits to provider and patient preference may be needed to ultimately incorporate telehealth visits as a permanent care option post-pandemic. It was identified in 2017

by Kruse et al. that “inserting technology into a medical intervention should not be without deliberate design.” This deliberateness should be driven by the successes and challenges seen with the use of telehealth as a result of the COVID-19 pandemic. For example, operational implementation and ongoing use of telehealth at Virtua Health as well as health systems nationwide must include different training, support, and telehealth modality types for different age groups and individuals of varying health literacy. Socio-economic and geographic factors must be considered when training, supporting, and adopting telehealth for the study population. A one-size-fits-all model of telehealth will not result in the successful adoption of technology and incorporation of telehealth as a long-term component of healthcare delivery.

Limitations

While this study identified a number of important trends, some limitations do exist. Although the dataset is quite large, the sample used was a sample of convenience at one healthcare organization only. In addition, additional data such as prepandemic use of telehealth at this organization did not allow for comparisons to be made regarding change in telehealth usage from prepandemic to within pandemic levels.

This study was limited to examination of data within the dataset only and did not include any survey or interview component, which could provide important insight into the overall use of telehealth, preferred telehealth modalities, and may explain the significant decline in use of telehealth as the pandemic has progressed.

Delimitations

This study was conducted from data collected beginning March 21, 2020, through August 31, 2021, at Virtua Health as the principal investigator is an employee of that health system. Virtua Health, however, is the largest healthcare provider in the southern New Jersey area and so

is representative of the use of telehealth during the progression of the COVID-19 pandemic. It is also the third-largest health system in the Philadelphia area. As a large healthcare system and with 25% of care delivery being primary care, Virtua and its delivery of care impacts significant numbers of patients and is representative of care in the region.

Implications for Future Research and Practice

The use of telehealth will continue to evolve in the immediate post-pandemic period and beyond. Continued research describing the demographics of patients and providers in a more stable post-pandemic timeframe will identify those important factors defining the populations successfully utilizing telehealth platforms. The Telehealth Modernization Act introduced to Congress in early 2021 and sponsored by Rep. Earl Carter of Georgia extends the changes allowing telehealth visits to occur in patients' homes with practitioners of all types and specialties to provide reimbursable healthcare via telehealth platforms. What is unlikely to continue is the allowance for use of non-HIPAA compliant platforms. Successes described in the literature can help streamline the process for patients and providers to use platforms embedded within patient electronic medical records to preserve confidentiality and data privacy. Operational decisions regarding telehealth usage should be informed by this continued research.

In addition to examining data regarding visits, descriptive studies including interviews and surveys need to be completed to identify the "why." Feedback and satisfaction of both patients and providers are essential for designing programs that are easy to use and perceived as beneficial. Only then will permanent adoption of telehealth occur.

Finally, research regarding the types of training and support needed by patients and providers alike is also necessary. From the results of this study and others in the literature, operational commitment not only to the hardware and software resources but to the human

factors must be included for successful implementation. Future research into those training models will allow for the allocation of appropriate operational resources by healthcare systems.

Conclusion

The use of telehealth as a means of delivering healthcare was rapidly implemented as a result of the need for social distancing to limit the spread of COVID-19 during the pandemic beginning in March of 2020. Virtua Health, like many organizations nationwide, demonstrated a significant increase in the use of telehealth, particularly in primary care, in the early stages of the pandemic. Although telehealth has the ability to deliver effective care, improve outcomes, resulting in high levels of patient and provider satisfaction with efficiency of resource use, it has demonstrated limited use in later stages of the pandemic at Virtua Health. Human factors, such as age and gender, demonstrated significant relationships with telehealth usage in this study population and so must be considered when implementing strategies of telehealth. Lack of access to broadband and geographic location did not appear to have a relationship with participation in telehealth visits. Knowledge that the majority of the patient population at Virtua Health has internet access will allow focus to be placed on addressing the human factors of gender and age in the post-pandemic period. This will allow Virtua Health to efficiently and deliberately develop multiple options for future telehealth delivery to meet regulatory and reimbursement standards, while providing patient and provider satisfaction. Targeted training and support for technology must be included in any operational implementation strategy. With over half of all Americans and 80% of providers anticipating that telehealth will remain as a permanent option for care delivery post-pandemic, healthcare organizations like Virtua Health must recognize that telehealth is not a replacement for office visits but an alternate visit type.

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Appendix A: Codebook

Variable	Description	Value	Value Description
SPEC	Provider Specialty	1	Primary Care
		2	Specialty Care
PROV	Individual Provider	0 – 587	Individual Provider name as coded and de-identified by principal investigator
DEP	Provider Practice	0 - 189	Name of practice department. See Appendix for a complete listing.
PROVLOC	Provider Practice Location defined as the Geographic location of practice as identified by Rural Urban Commuting Area	1	Urban
		2	Large Rural
		3	Small Rural
		4	Isolated
SUM	Modality Type Summary	1	Telephone
		2	Non-MyChart
		3	My Chart
TYPE	Telehealth Visit Type	0 - 21	Type of telehealth visit based on modality as defined by Virtua Health.
MONTH		1	March 2020
		2	April 2020

	Month of Telehealth Visit	3	May 2020
		4	June 2020
		5	July 2020
		6	August 2020
		7	September 2020
		8	October 2020
		9	November 2020
		10	December 2020
		11	January 2021
		12	February 2021
		13	March 2021
		14	April 2021
		15	May 2021
		16	June 2021
		17	July 2021
		18	August 2021
DATE	Date of Telehealth Visit	0 - 513	Unique dates telehealth visits conducted.
DAY	Day of the Week of Telehealth Visit	1	Sunday
		2	Monday
		3	Tuesday
		4	Wednesday
		5	Thursday
		6	Friday
		7	Saturday
DOB	Patient Date of Birth	0 - 595	Unique date of birth for 595 patients in the dataset. See Appendix for a list of unique birth dates.
AGE	Patient Age Group	1	< 10
		2	10’s
		3	20’s
		4	30’s
		5	40’s
		6	50’s
		7	60’s
		8	70’s
		9	80’s
		10	90’s
		11	>100
		x	blank

PG	Patient Gender	1	Male
		2	Female
		3	Other
RUCA	Geographic location of a patient as identified by zip code approximation area	1	Urban
		2	Large Rural
		3	Small Room
		4	Isolated

Appendix B: Data Analysis Table

RQ 1: Is there a difference in the use of telehealth as defined by the number of telehealth visits conducted between primary care providers and specialist providers from March 2020 through September 2021?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test(s)
H1a	There is a significant difference in the number of telehealth visits by primary care providers as compared to specialist providers from March 2020 through September 2021.	IV 1 = Primary care Providers IV 2 = Specialist Providers	Nominal Data	Number of Telehealth Visits	Frequency	Chi-Square

RQ 2: Is there a difference in telehealth modality type used between primary care providers and specialist providers from March 2020 through September 2021?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test
H2a	There is a significant difference in the use of telehealth visit modality type between primary care providers as compared to specialist providers from March 2020 through September 2021.	IV 1= Provider Type IV 2 = Visit Modality	Nominal Data	DV = Number of Visits	Frequency	Chi-Square

RQ 3: Does provider practice location as identified by the RUCA zip code area affect the use of telehealth modalities by providers at Virtua Health?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test
H3a	Provider practice location is significantly associated with the use of telehealth	ProvLoc	Nominal	DV = Number of Visits	Frequency	Chi-Square
H3b	Provider practice location is significantly associated with the choice of telehealth modalities types by providers	IV 1 = ProvLoc IV 2 = Modality Type	Nominal	DV = Number of Visits	Frequency	Chi-Square

RQ 4: Does the patient demographic of the town of residence as identified by the RUCA zip code area influence participation in a telehealth visit?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test
H4a	Patient town of residence as identified by RUCA zip codes is significantly associated with participation in a telehealth visit.	RUCA	Nominal	Number of Visits	Frequency	Chi-Square
H4b	Patient town of residence as identified by RUCA zip code area is significantly associated with the choice of telehealth visit modality type	IV 1 = RUCA IV 2 = Modality Type	Nominal	Number of visits	Frequency	Chi-Square Logistic Regression

RQ5: Does the patient demographic of age affect participation in a telehealth visit?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test
H5a	Patient age is significantly associated with participation in a telehealth visit.	Age Group	Nominal	Number of Visits	Frequency	X-square
H5b	Patient age is significantly associated with the choice of telehealth visit modality type	IV 1 = Age Group IV 2 = Telehealth Modality	Nominal Nominal	Number of Visits	Frequency	X-square

RQ6: Does the patient demographic of gender affect the participation in a telehealth visit?						
	Hypothesis	IV(s)	IV(s) Data	DV(s)	DV(s) Data	Statistical Test
H6a	Patient gender is significantly associated with participation in a telehealth visit.	PG IV 1 = Male IV 2 = Female IV3 = Other	Nominal	Number of visits	Frequency	Chi-Square
H6b	Patient gender is significantly associated with the choice of telehealth visit modality type	Gender as self - identified as male, female or other	Nominal	Number of visits	Frequency	Chi-Square