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## Millennial Attitudes Toward Telehealth: An Integrative Literature Review

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MILLENNIAL ATTITUDES TOWARD TELEHEALTH: AN INTEGRATIVE  
LITERATURE REVIEW

by

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A thesis submitted in partial fulfillment of the requirements  
For the Honors in the Major Program in Nursing in the College of Nursing  
and in the Burnett Honors College  
at the University of Central Florida Orlando, Florida

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## ABSTRACT

### Millennial Attitudes Toward Telehealth: An Integrative Literature Review

**Purpose:** The primary purpose of this research was to explore individuals born in the millennial generation's likelihood of using telehealth and virtual office visits as a replacement for face to face provider interactions. The secondary purpose was to examine the feasibility and access of treatable conditions and ailments in a virtual environment.

**Methods:** A literature review exploring millennials and telehealth was performed using various databases with search terms combined to include: 'millennials\*', 'telehealth\*', 'telemed\*', 'finance\*', 'primary care\*', 'healthcare\*', 'health knowledge\*', 'literacy\*', 'education\*', 'misinformation\*'. The data was conformed into tables that synthesized the relationship between the millennial generation and their access to telehealth and virtual office visits.

**Results:** An initial search of literature returned 72 articles that met search criteria. In total, 10 articles were chosen for synthesis and relevance to the topic. After further review, a total of 10 articles were chosen for synthesis and relevance to the topic. The results suggest the use of telehealth as a virtual office visit in place of face to face interaction have limited applications at this time. The severity of conditions used by millennial's for telehealth ranged from mild symptomatic conditions, such as the common cold, to moderate symptomatic conditions, such as sore throat and gastrointestinal discomfort. Millennial populations are more likely to use telehealth and virtual office visits based on their increased proficiency and use of technology; however this does not translate into actual use of technology for health-related conditions. Millennials likelihood of embracing telehealth and virtual office visits is related to

convenience and timeliness of care, as well as trust in the provider established through web-based reviews and ratings offered by other telehealth users. Cost is not as beneficial as originally anticipated. Factors regarding safety and privacy through mobile applications and online portals are untested.

## DEDICATION

For my parents, who have continuously pushed me to pursue my goals. Thank you  
for your unwavering love and encouragement.

To my sister, Althea, thank you for being my best friend and my number one  
supporter.

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To Dr. Kubiet, you have been a great mentor to me. Thank you for your guidance  
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## INTRODUCTION

Technology in health care is rapidly changing in response to the modern-day demands of consumers seeking alternatives to traditional health related encounters (Sevetson, E., & Boucek, B., 2013). Telemedicine and telehealth have the platform to connect providers and individuals seeking regardless of time-of-day, geological boundaries, and physical presence of the provider (Wise, M., 2016). Millennials are digital natives at utilizing technology efficiently and use technologic devices or applications in most activities of daily living, including banking, education, and for social experiences. Health care applications in the form of wearable technology have recently become available for general purposes and are useful for monitoring physiologic status, such as heart rate, breathing, and blood pressure. However, it is unknown if monitoring physiologic status for daily health status will translate to using technology in the form of telehealth or remote provider access as a replacement for a face to face visit with a provider.

Although millennial populations are more likely to use emerging technology related to their health care needs, the accuracy of the shared information and provider interface can be cumbersome or virtually skewed. Likewise, access to equipment and internet access often varies from region to region, which can affect virtual office visits and telehealth connections. Further research is required to investigate if the availability and acceptance of telehealth and virtual office visits would impact millennial health engagement.



## BACKGROUND

### *Telehealth*

Telehealth or telemedicine is the utilization of electronic information and telecommunication tools to support and advance long-distance clinical health care, patient and professional health-related education, public health, and health administration.

Telecommunication tools include the use of the internet to stream wireless communications such as videoconferences, store-and-forward imaging.

Store-and-forward imaging collects clinical information such as medical history and documents, laboratory reports, images, videos, and sound files to be transmitted to a private network.

<https://www.telehealth.org.nz/what-is-telehealth/store-and-forward/>. Through a private network, a specialist or physician can review the information sent from a remote location without the need to travel. Store-and-forward imaging enables efficiency and convenience as it does not require the patient and provider or specialist to be available at the same time or be synchronous with one another.

In 2007, Maryland eCare was formed to allow round- the- clock monitoring of the critical care patient systems remotely, this allowed for critical care nurses and physicians to communicate with the ICU team at the hospital, and with the patient through two-way video and audio (Franklin, M. A., 2018). Telemedicine can improve the way health care is conveyed, especially for individuals with limited access to medical services (Kim, T., & Zuckerman, J. E., 2019). Limitation to healthcare access may be due to geographical barriers such as rural areas, or financial barriers such as low- and middle-income developing countries.

## *Millennials*

The Pew Research Center defines the millennial generation as being born between the years of 1981 to 1999 and “Boomers” as individuals born from 1946 to 1964. Millennials are expected to surpass the Boomer population in 2019 as millennials increase to 73 million, and Boomers decline to 72 million (Fry, R., 2018). The Millennial Generation are pioneers of a technologically booming environment, where health-related information is readily available through the internet, TV, and other electronic sources of media (Lloyd, T., et al, 2013).

Millennials are characterized as being the most racially and ethnically diverse generation in history; the Millennial generation is also known to value community, technology, and prosperity (Lohrmann, D. K. (2011). In various studies focusing upon the learning habits and ethics of millennials, millennials were portrayed as being positive, team-oriented individuals that incorporate and willfully accept autonomic generated and controlled technology; as well as finding themselves comfortable when it comes to utilizing challenging and multidimensional technological environments (Lloyd, T., et al, 2013). Millennials are more engaged and familiar with the technology than the previous generation and tend to use the internet as the primary source of information (Galeshi, R., Sharman, J., & Cai, J. 2018).

The dissimilarity the Millennial generation and past generations, such as Baby Boomers and the Silent Generation, have regarding the use of technology is that widespread technologic applications were introduced to the previous generations after their social and cultural identities had been developed; whilst the Millennial generation has established their social and cultural identities surrounded in an environment with technology that increased their quality of life and connections to the world around them. Although the Baby Boomer and Silent generations can

adapt and learn how to navigate new technology, barriers in the utilization of technology in health care still exist. These barriers are related to unfamiliarity and uncertainty in using technology regarding the quality and security of health information (Paige, S. R., Miller, M. D., Krieger, J. L., Stellefson, M., & Cheong, J., 2018).

### *Telemedicine as a healthcare alternative access for millennials*

The influence of word- of- mouth communication has been impactful through online reviews offered about most businesses and trades. Health care providers and facilities have also been included in web-based reviews and evaluations available to consumers. Consumer decisions are heavily influenced by feedback posted by different individuals about the desired product (Stoddard, J. E., Dotson, M. J., & Das, N., 2016). Millennials are autonomous as individuals seek medical information from different sources, not just through primary care providers. The millennial generation turns to the online “neighborhood” and seek insight from their “neighbors”. In comparison to the baby boomer generation, millennials seek treatment options and scrutinize the quality of physicians and hospital facilities through ratings such as Yelp, Google Reviews. In a study conducted by Stoddard, J. E., Dotson, M. J., and Das, N, to explore the relationship between the online behavior of millennials’ as well as the opinion of millennials about online reviews; the study concluded that millennials found online reviews to be beneficial. Kim Jenkins, CEO of OrthoSouth stated, “Convenience, availability, and accessibility are paramount for capturing millennial patients.” Telemedicine is valued amongst the millennial generation as delivery and availability of appointments are prioritized over developing a relationship with a primary care provider.

(<https://www.forbes.com/sites/joeharpaz/2019/08/26/6-expectations-millennials-healthcare/#4ca39afc30ec>)

### *Millennials and financial freedom*

Millennials are the most educated generation in American history; nonetheless, millennials are also the most burdened with debt. Pursuing financial freedom demands efficient and practical skills in managing money. Millennials, being digital natives, socialize amongst each other through media and share values, beliefs, and the current norms; through media, financial literacy is spread; thus, financial practice is distributed as well (Salumintao, M. T. G., & Cinches, M. F. C., 2019). Millennials seek cost transparency and inquire about costs and whether or not procedures are covered by their insurance

(<https://www.forbes.com/sites/forbestechcouncil/2019/04/09/five-ways-millennials-do-health-care-their-own-way/#1c928c1020c5>). In a research study that examined the financial decisions of young adults, the top concern was identified as student loans; followed by debt and housing (Barbara, O. N., Yilan, X., Carrie, L. J., & Elizabeth, K., 2018). In addition to the financial concerns, young adults have goals as well, such as: being debt-free, having a savings account, and purchasing a house (Barbara, O. N., Yilan, X., Carrie, L. J., & Elizabeth, K., 2018).

Telemedicine and virtual office visits can aid in providing health care to millennials without the financial burden, although the full extent of cost savings through the use of telehealth has not been financially estimated.

### *Misinformation*

Millennials have an optimistic attitude in terms of sharing their personal and general health-related information on social media, which reflects a positive relationship with the Millennial generation's intent to engage in the utilization of health information retrieved from social media (Dalsang, C., & Sun Gi, C., 2017). As millennials are heavily dependent upon the internet for health-related information, doubt can be established within the individual's relationship with their health care provider. Identifying a concise and trustworthy source of health-related information can be difficult. When an individual conducts health-related research for themselves, it can be biased and swayed according to the individual's culture and beliefs about what makes the information accurate (Galeshi, R., Sharman, J., & Cai, J., 2018). This raises concerns for misinformation. In a study done by Cole, J., Watkins, C., and Kleine, D. (2016), in which focuses on the assessment of discussion forum websites; their findings concluded that discussion forum websites could possibly be "a useful platform through which people can ask health-related questions and receive answers of acceptable quality."

As access to the internet and health-related information is readily available, health care providers face challenges when it comes to caring for their patients. Individuals use search engines, such as Google, to research health-related information or ask peers, and resist recommendations and advice given by their provider (Davis, J. K., 2018). This positions the health care provider in a dilemma between respecting patient autonomy, as well as wanting to care for their patients who have potentially received medical information from an unreliable source.

### *Health Literacy*

Health literacy is the potential to acquire, process, and comprehend health-related information as well as apply that knowledge to synthesize appropriate health decisions; higher education and healthier behaviors follow in correspondence to greater health literacy (Park, C. L., Cho, D., & Moore, P. J., 2018). Individuals with a college education, in contrast to individuals without a college education, portrayed greater health literacy through exuding the quality of being able to comprehend recommendations made to prevent and lower cancer risks as well as being able to research reliable sources of health-related information. According to Crystal L. Park, Dalnim Cho, and Philip J. Moore (2018), “Prevention locus of control is the belief that one can, through his/her own actions, prevent illness and/or disease.” Prevention locus of control has been interconnected with healthier behaviors such as a healthier diet and more physical activity.

Prior to the use of technology and media as the basis of health information, the primary sources of health education relied heavily upon middle school and high school curricula (Lloyd, T., et al, 2013). In order to appease the learning habits of the Millennial Generation, health educators are encouraged to align teaching methods to the way Millennials live, learn and engage in the most: by being interactive through the incorporation of digital technology (Lohrmann, D. K. (2011). Health educators have taken part in an essential role in health promotion by empowering individuals in schools, communities, and the general public to find up to date, valid, and accurate health information (Iammarino, N. K., & O'Rourke, T. W., 2018). With the proper tools and aptitude to find reliable health information, individuals have the potential to make their own informed health decisions and be actively engaged in their health care.

## PROBLEM

Human diseases are complex, which is why it is pertinent that communication between an individual and their healthcare provider should be coherent and easily accessible (Lloyd, T., et al, 2013). With recent advances in global internet access and virtual technology, the millennial population is in a unique position to access health related information. The search possibilities related to health care needs are endless; major search engines such as Google, Bing, Yahoo allow for hundreds of search results to surface. However, there is a scarcity of research investigating the attitude of millennials towards telehealth and virtual care for access to accurate healthcare information and for diagnosis of common health problems. It is expected this review of literature will lead to a better understanding of how the attitudes of millennials in relation to the usage of telehealth.

## PURPOSE

The primary purpose of this review of literature is to cross-examine current research related to millennials and the likelihood of their use of telehealth and virtual office visits as a replacement for face to face provider interactions. The expectation is that understanding the values and attitudes towards virtual health by the Millennial generation can potentially improve early, cost-effective, and efficient access to health care clinicians and provide a more tailored plan of care for an individual (Johanson, L. S., 2017). The secondary purpose of this review will be to explore expectations of treatable conditions and ailments that are feasible to access in a virtual environment.



## METHODS

A literature review was used to explore the millennial populations perceptions and openness to telehealth and virtual health care using research articles available from 2000 to 2019. Databases that were used to search for articles included Cumulative Index to Nursing and Allied Health Literature (CINAHL), Educational Resources Information Center (ERIC), Elton B. Stephens Co. Host (Ebsco Host), Medical Literature On-line (Medline), and Psychological Information Database (PsychINFO). Keywords included: \*millennials, \*telehealth, \*telemed, \*finance, \*primary care, \*healthcare, \*health \*knowledge, \*literacy, \*research, \*education \*misinformation. Inclusion criteria through the use of advanced searches will include peer-reviewed articles written in English or translated to the English language. The articles will be focused on millennials and their sources of health-related information and how telehealth can aid millennials in staying proactive in the care they receive.

This data was conformed into tables that synthesize the relationship between the millennial generation and their access to telehealth and virtual office visits.

## RESULTS

### *Telehealth Perspectives*

An empirical study was conducted by Dalsang, C., & Sun Gi, C., (2017) to analyze the likelihood of the millennial generation accepting social media as a method to engage in healthcare discussion. Independent variables were studied to evaluate how they influence the attitude of sharing general and personal health information on social media. With a total of 239 participants; the breakdown of age groups is as follows: 95% were millennials with 1% under the age of 20 but at least 18 years of age, 83% between the ages of 21-30 and 13% between 31-35 (Dalsang, C., & Sun Gi, C., 2017). The findings suggested a significance ( $p < 0.001$ ) in the relationship between an individual's attitude toward sharing general health information and intention to utilize the information found on social media. (Dalsang, C., & Sun Gi, C., 2017).

Crosswell, L.H. (2019), used a double round delphi survey to interview nine industry experts to identify the impact of new social media tools on health initiatives, subsequent health behaviors, as well as addressing the impact and efficacy of mobile health. The panel was comprised of experts averaging 17.7 year of professional practice and specializing in various fields such as granular communication, digital media, and health and human development, clinical practice (Crosswell, L.H., 2019). This study revealed that 88.9% of the surveyed panel indicated that a digital shift in healthcare will positively benefit individual and public health, 77.8% indicate that the health industry has been slow to acknowledge mobile technology, (Crosswell, L.H., 2019). The study suggests that patient accountability depends on having equal access to digital health care as well as an understanding of it; an expert panelist indicated that for

populations with “low levels of technological literacy (old folks) or intermittent access (poor, underserved) that our reliance on technology may leave people behind” (Crosswell, L.H., 2019).

In a secondary data analysis, Carroll et. al. (2017), studied the sociodemographic attributes related with health app use. A total of 3677 individuals completed the 2014 National Cancer Institute’s Health Information National Trends Survey (HINTS). Participants with a smartphone or tablet computer (n=2,392) was further divided between participants with health apps on their device (n= 816) and participants without health apps on their device (n=1,577). Out of the 816 respondents that had a health app on their device, only 472 reported that it has helped them achieve a health- related goal such as quitting smoking, losing weight, or increasing physical activity (Carroll et. al., 2017). Results concluded that the primary users of health apps were younger, had more education, reported excellent health and had a higher income (Carroll et. al., 2017). In this study, a limitation to be considered is that although HINTS is a cross-sectional survey that nationally represents a group of individuals, the study was not able to evaluate trends in an individual’s use of health applications over time (Carroll et. al., 2017).

Researchers analyzed in depth qualitative interviews with adult patients following video visits with their primary care clinicians at a single academic medical center and further analyzed these interviews with a content analysis approach (Powell et al., 2017). Participants indicated that video visits reduced barriers such as: dealing with traffic, being late to appointments, finding offices, scheduling a convenient appointment childcare and physical limitations (Powell et al., 2017). Results suggested that patients could possibly accept as well as even prefer video visit; their experiences with primary care telehealth were molded by factors such as convenience, efficacy, privacy and comfort. Powell et. al (2017), included that limitations included, not

knowing how clinicians selected the potential participants, thus possibly introducing bias in the study's population. Additionally, interview data was only gathered from 19 participants out of the thirty-two that were approached for the study (Powell et al., 2017).

### *Effectiveness of Telehealth*

Researchers conducted a randomized control trial, The Stepped Care to Optimize Pain Care Effectiveness (SCOPE) study, where patients with chronic musculoskeletal pain were randomized into either an intervention group where individuals received telecare management (n= 124) or continued to receive usual care from their primary care providers (n= 126) (Kroenke et al., 2014). Kroenke et. al. (2014), measured pain score was through the use of Brief Pain Inventory (BPI), which ranges from 0 (“no pain”) to 10 (“pain as bad as you can imagine”). Individuals that were randomized into the intervention group had intervention calls that were scheduled at 1 and 3 months, as well as automated symptom monitoring (ASM). ASM reports were scheduled weekly during the first month, every other week for months 2 and 3, and lastly monthly for months 4 to 12. Results concluded that patients in the intervention group were twice as likely to report a 30% improvement in pain scores by 12 months. Additionally, patients in the intervention group had an average BPI of 5.31, which is 1.02 lower in comparison to the group that received usual care (Kroenke et al., 2014).

In an international randomized control trial, conducted in Australia by Marshall, Leslie, Bauman, Marcus and Owen (2003), participants were either allocated into a web intervention group (n=327) or a print intervention group (n= 328) to evaluate the effects of a physical activity program delivered through an interactive website and e-mail. Both intervention groups displayed a positive change in overall physical activity but significance was only found in the print

intervention group (  $t [1,173] = -2.21, p=0.04$ ). Additionally, in the web intervention group, there was a decrease in the average time spent sitting during a weekday (  $t [1,326] = 2.2, p= 0.03$ ) (Marshall et al., 2003).

In a randomized control trial, researchers examined the effects of mobile telehealth on glycosylated hemoglobin (HbA1c), 81 participants with a baseline HbA1c of  $8.98\% \pm 1.82$  were randomized into standard care (n=36) and the intervention group (n=45) (Baron, J., Hirani, S. P., & Newman, S. P., 2017). In the intervention group, individuals were provided with the mobile telehealth equipment (blood glucose monitor, blood pressure monitor, mobile phone, and a Bluetooth cradle) where the mobile phone software allowed for diabetes- related data to be stored and transmitted to a mobile telehealth nurse; the nurse is able to access the data and provide feedback on out- of- range clinical readings, education about lifestyle changes, and support insulin titration (Baron, J., Hirani, S. P., & Newman, S. P., 2017). Baron, J., Hirani, S. P., and Newman, S. P. (2017), concluded that supplementing standard care with mobile telehealth did no significantly result in HbA1c improvements (  $p= 0.228$ ).

### *Privacy Concerns*

Of the reviewed literature, two studies mentioned privacy concerns and how lack of privacy may decrease the willingness millennials may have towards the use of telehealth.

Privacy poses as a barrier when it comes to integrating technology with healthcare. According to the Advanced Technology Institute, the presence of outsiders or non- clinical persons in teleconsultations, such as non- clinical technicians, camera people and schedulers located on either side of a telemedicine consultation or at the site of a service provider, either physically or via the technology they support (Kumekawa, J. K., 2001). In the articles

synthesized for the literature review, only two illustrated the concerns regarding privacy in telehealth.

In an empirical study by Dalsang, C., & Sun Gi, C., (2017) individual variables such as privacy was studied to further analyze the likelihood of millennials accepting social media as a platform in healthcare discussion. Results indicated that privacy concerns significantly affected individuals' attitudes in relation to sharing general health information ( $p < 0.3388$ ) and personal health information ( $p < 0.0775$ ) (Dalsang, C., & Sun Gi, C., 2017).

Powell et. al (2017), analyzed patient experiences with video visits performed with their primary care providers. The study concluded that patient location may affect privacy; for example, the participants who connected to video visits in the workplace found privacy to be the most important consideration. Although they benefited by not missing work, individuals that did not have private offices found it challenging to find a space to have a proper exam (Powell et. al., 2017).

### *Cost Effectiveness*

Researchers, Franzini, L., Sail, K. R., Thomas, E. J., & Wueste, L. (2011) conducted an observational study to estimate the costs and cost- effectiveness of a telemedicine intensive care unit (tele-ICU) program. In the cost- effectiveness analysis, the tele-ICU program was found to be cost- effective in the group that comprised of the sickest patients as it has the possibility of decreasing mortality without significantly increasing cost. As for patients in a less critical condition, costs increased by \$6,415 between the pre tele-ICU period and the post tele-ICU period. Health economists suggest adopting a societal perspective when conducting a cost-

effectiveness study. However, a limitation of this cost- effectiveness analysis was the use of the health care system perspective due to the challenges in utilizing a societal perspective when evaluating ICU patients (Franzini, L., Sail, K. R., Thomas, E. J., & Wueste, L., 2011).

Health is a function of length of life as well as quality of life, the quality- adjusted life-year (QALY) was developed as a way to combine these factors (Prieto, L., & Sacristán, J. A., 2003). In a study conducted by Mason et. al. (2006), in Salford, United Kingdom, 591 patients with type 2 diabetes mellitus were randomly selected and randomized to Pro- Active Call Centre Treatment Support (PACCTS) or usual care in a 2:1 ratio. PACCTS' call-center was positively received by both patients and healthcare professionals. However, utilizing telehealth alone to improve glycemic control in patients with type two diabetes was concluded to be borderline cost-effective. During trial conditions, PACCTS had an average cost- effectiveness estimate of £43, 500/QALY. In a routine- use scenario where the call center was limited to patients with raised HbA1c the average cost- effectiveness estimated at £33, 900/QALY. Therefore, PACCTS was determined to be 10% likely to be cost- effective under trial conditions and 29% under routine- use circumstances. (Mason et al., 2006).

In 2006, researchers Hersey et. al. (2011), conducted a randomized controlled trial to investigate the efficacy and cost- effectiveness of a cognitive- behavioral weight management program. 1,755 overweight, non-active-duty TRICARE beneficiaries were randomized into one of the three interventions in which increased in intensity. The three interventions are as follows: written materials and basic Web access (RCT1), plus an interactive Web site (RCT2), plus brief telephone/e-mail coaching support (RCT3) (Hersey et. al., 2011). Cost effectiveness was analyzed by three outcome standards: percentage weight loss, life years gained, and QALYs.

Results indicate that after 15 to 18 months, participant experienced marked weight lost, respectively, in each RCT group: -3.5%, -3.8%, and -5.1%. The cost- effectiveness analysis reported that for the RCT1 and RCT2 interventions, it required \$30 to \$40 to produce 1% of weight loss and \$900 to \$1,000/QALY. Additionally, in the RCT3 intervention, \$70 was required to produce 1% of weight loss and \$1900/QALY (Hersey et. al., 2011).



## DISCUSSION

The studies reviewed explored the attitudes of millennials and the expectations of treatable conditions and ailments that are feasible to access in a virtual environment. The literature shows mixed results; it suggests that although millennial attitudes and openness towards telehealth are positive, millennials customarily do not have chronic illnesses therefore findings are loosely correlated with these results. The cost- effectiveness of telehealth is not as beneficial as originally thought, as studies concluded that the cost of telehealth is borderline to the cost of face to face care. However, patients with higher acuity conditions in the intensive care unit setting may benefit from telehealth (Franzini, L., Sail, K. R., Thomas, E. J., & Wueste, L. (2011). Safety and privacy factors regarding online portals as well as mobile applications have yet to be tested.

## LIMITATIONS

Several limitations are considered for this integrative literature review focusing on the attitude of millennials towards telehealth. Firstly, this review was limited to studies written in the English language published from 2003 to 2020. Secondly, three out of ten articles were examined to determine the cost- effectiveness of telehealth; one out of the three articles were conducted in the United Kingdom (UK). Consequently, the UK has a different healthcare system. Additionally, the articles synthesized for the literature review also had limitation within their study. Many of the article utilized small sample sizes where the intervention was for short periods of time; these factors limited whether the intervention is applicable for long- term application as well if their results are significant for a larger population.

## CONCLUSION

The primary purpose of this review of literature is to cross-examine current research related to millennials and the likelihood of their use of telehealth and virtual office visits as a replacement for face to face provider interactions. The secondary purpose of this review will be to explore expectations of treatable conditions and ailments that are feasible to access in a virtual environment. This study suggests that millennials have a positive attitude related to the use of telehealth and are more likely to embrace the idea of telehealth and virtual office visits due to convenience and timeliness. Privacy and cost of virtual services are at the forefront of accessibility concerns and would impact if a millennial would use telehealth and virtual office visits as a replacement for face to face clinician interactions. However, cost- effectiveness is not as beneficial as originally anticipated. Factors regarding safety and privacy through mobile applications and online portals are untested.

Overall, these findings warrant further research be conducted on larger sample sizes and attempt to quantify the experiences of those involved.

## **APPENDIX A**

### **Table of Evidence**

Article	Crosswell, L. H. (2019). The doctor in my pocket: examining mobile approaches to personal wellbeing. <i>Perspectives in Public Health</i> , 1757913918823808. <a href="https://doi.org/10.1177/1757913918823808">https://doi.org/10.1177/1757913918823808</a>
Study Design	Using a double round Delphi survey, nine industry experts were asked about the impact of new media tools on health initiatives and subsequent healthcare behaviors. The panel also addressed the impact and efficacy of the mobile health movement.
Purpose	“...to understand ways in which new media influence public health practices, the researcher turned to health communication and digital technology specialists for collective input.” (p. 2)
Participants	“...16 leading experts with a minimum of 7 years recent experience in the health field/digital media industry to participate in this study. Of the 16 experts contacted, 11 participated in the first survey round (response rate=68.8%) and 9 (of those 11) completed the second survey round (response rate=81.8%).” (p. 3)
Results and/or Key Findings	Expert testimony identified ways in which millennial media can encourage (and sometimes prevent) improved patient, community, and population health outcomes. Industry leaders further addressed strategic moves healthcare professionals are making to ensure personal healthcare communication remains relevant, accessible, and attainable for the general public. Clear themes emerged throughout the iterative Delphi process, resulting in the overarching categories of information access, information literacy, patient privacy, patient accountability, physician engagement, and healthcare quality.
Article	Dalsang, C., & Sun Gi, C. (2017). SOCIAL MEDIA USE IN HEALTH CARE: WILL IT BE EMBRACED BY MILLENNIALS? <i>Issues in Information Systems</i> , 18(2), 206. Retrieved from <a href="https://login.ezproxy.net.ucf.edu/login?auth=shibb&amp;url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=edo&amp;AN=125256465&amp;site=eds-live&amp;scope=site">https://login.ezproxy.net.ucf.edu/login?auth=shibb&amp;url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=edo&amp;AN=125256465&amp;site=eds-live&amp;scope=site</a>
Study Design	Empirical Study
Purpose	“To analyze the likelihood that the millennial generation will embrace social media as a platform as a means of engaging in healthcare discussions” (p. 206).
Participants	“239 respondents completed the survey. The population characteristics are as follows: Gender: The overwhelming majority of the respondents are women at 62%. Age: 95% of the respondents are millennials with 1% under the age of 20 but at least 18 years old, 83% between the ages of 21-30 and 13% between 31-35. Level of Education: A total of 90% of all the respondents have graduated from college and specifically, 51% have graduate degrees or higher and 39% have graduated from undergraduate college.

	<p>7% have some college credits and 3% have graduated high school as their highest educational level. Social Media Sites Usage: 87.9% of respondents use Facebook, 43.9% Instagram, 35.2% LinkedIn, 30.1% Twitter and 4.6% of respondents use no social media at all.</p> <p>Social media Time Usage: The majority of the people who responded spend at the most 3 hours per day on social media almost evenly split at 45% spending less than 1 hour and 46% spending between 1 and 3 hours. 7% spend 4-6 hours and 2% spend more than 7 hours per day.</p> <p>Internet Time Usage: The people who spend less than 1 hour per day on the Internet is in the minority at 1%; those spending 2-3 hours, 4-6 hours and greater than 7 hours per day are 52%, 39% and 8%, respectively” (p. 209- 210).</p>
Results and/or Key Findings	<p>“... results of this study suggest that positive attitudes towards sharing both personal and general health information on social media will lead to intention to use health information obtained from social media. Per our study, both ease of use and localization/personalization have significant positive relationships with attitudes toward sharing both general and personal health information on social media and these in turn have a significant positive relationship with intention to use health information obtained on social media. On the other hand, privacy concerns did not have a significant effect on attitudes toward sharing general or personal health information and for that matter intention to use health information obtained on social media.” (p. 211).</p>
Article	<p>Carroll, J. K., Moorhead, A., Bond, R., LeBlanc, W. G., Petrella, R. J., &amp; Fiscella, K. (2017). Who Uses Mobile Phone Health Apps and Does Use Matter? A Secondary Data Analytics Approach. Retrieved from <a href="https://search.ebscohost.com/login.aspx?direct=true&amp;db=edsbas&amp;AN=edsbas.DA8F16AF&amp;site=eds-live&amp;scope=site">https://search.ebscohost.com/login.aspx?direct=true&amp;db=edsbas&amp;AN=edsbas.DA8F16AF&amp;site=eds-live&amp;scope=site</a></p>
Study Design	<p>Secondary Data Analytics</p>
Purpose	<p>“The objectives of our study were to (1) to describe the sociodemographic characteristics associated with health app use in a recent US nationally representative sample; (2) to assess the attitudinal and behavioral predictors of the use of health apps for health promotion; and (3) to examine the association between the use of health-related apps and meeting the recommended guidelines for fruit and vegetable intake and physical activity.” (p. 1)</p>
Participants	<p>“A total of 3677 individuals completed the 2014 HINTS survey. From this sample, 148 respondents were considered partial completers, in that they completed 50%-79% of the questions in Sections A and B. We included all 3677 respondents in our analysis. We used sampling weights from the HINTS data set that were incorporated into the regression analyses.” (p. 2)</p>

Results and/or Key Findings	<p>“From the 3677 total HINTS respondents, older individuals (45-64years, odds ratio, OR 0.56, 95% CI 0.47-68; 65+years, OR 0.19, 95% CI 0.14-0.24), males (OR 0.80, 95% CI 0.66-0.94), and having degree (OR 2.83, 95% CI 2.18-3.70) or less than high school education (OR 0.43, 95% CI 0.24-0.72) were all significantly associated with a reduced likelihood of having adopted health apps. Similarly, both age and education were significant variables for predicting whether a person had adopted a mobile device, especially if that person was a college graduate (OR 3.30). Individuals with apps were significantly more likely to report intentions to improve fruit (63.8% with apps vs 58.5% without apps, P=.01) and vegetable (74.9% vs 64.3%, P&lt;.01)consumption, physical activity (83.0% vs 65.4%, P&lt;.01), and weight loss (83.4% vs 71.8%, P&lt;.01). Individuals with apps were also more likely to meet recommendations for physical activity compared with those without a device or health apps (56.2% withapps vs 47.8% without apps, P&lt;.01)”. (p. 1)</p>
Article	<p>Franzini, L., Sail, K. R., Thomas, E. J., &amp; Wueste, L. (2011). Costs and cost-effectiveness of a telemedicine intensive care unit program in 6 intensive care units in a large health care system. <i>JOURNAL OF CRITICAL CARE</i>, 26(3).  <a href="https://doi.org/10.1016/j.jcrc.2010.12.004">https://doi.org/10.1016/j.jcrc.2010.12.004</a></p>
Study Design	<p>Journal; Observational study</p>
Purpose	<p>“to estimate the costs and cost-effectiveness of a telemedicine intensive care unit (ICU) (tele-ICU) program” (p. 1)</p>
Participants	<p>“ICU patients cared for during the pre–tele-ICU period and ICU patients cared for during the post–tele-ICU period in 6 ICUs at 5 hospitals that are part of a large nonprofit health care system in the Gulf Coast region. We obtained data on a sample of 4142 ICU patients: 2034 in the pre–tele-ICU period and 2108 in the post–tele-ICU period” (p. 1).</p>
Results and/or Key Findings	<p>“After the implementation of the tele-ICU, the hospital daily cost increased from \$4302 to\$5340 (24%); the hospital cost per case, from \$21 967 to \$31 318 (43%); and the cost per patient, from\$20 231 to \$25 846 (28%). Although the tele-ICU intervention was not cost-effective in patients with Simplified Acute Physiology Score II 50 or less, it was cost-effective in the sickest patients with Simplified Acute Physiology Score II more than 50 (17% of patients) because it decreased hospital mortality without increasing costs significantly” (p. 1)</p>

Article	Mason JM, Young RJ, New JP, Gibson JM, Long AF, Gambling T, & Friede T. (2006). Economic analysis of a telemedicine intervention to improve glycemic control in patients with diabetes mellitus: illustration of a novel analytic method. <i>Disease Management &amp; Health Outcomes</i> , 14(6), 377–385. Retrieved from <a href="https://search.ebscohost.com/login.aspx?direct=true&amp;db=rzh&amp;AN=105970453&amp;site=eds-live&amp;scope=site">https://search.ebscohost.com/login.aspx?direct=true&amp;db=rzh&amp;AN=105970453&amp;site=eds-live&amp;scope=site</a>
Study Design	Economic Analysis
Purpose	“to improve glycemic control in patients with type 2 diabetes mellitus, illustrating the use of an analytic framework that efficiently combines telemedicine program findings with published estimates of treatment cost effectiveness” (p. 1)
Participants	591 patients with diabetes in Salford, UK
Results and/or Key Findings	Despite being received well by patients and healthcare professionals alike, telemedicine support solely to achieve improved glycemic control in patients with type 2 diabetes was found to be borderline cost effective.
Article	Hersey, J. C., Khavjou, O., Strange, L. B., Atkinson, R. L., Blair, S. N., Campbell, S., ... Britt, M. (2012). The efficacy and cost-effectiveness of a community weight management intervention: A randomized controlled trial of the health weight management demonstration. <i>Preventive Medicine</i> , 54(1), 42–49. <a href="https://doi.org/10.1016/j.ypmed.2011.09.018">https://doi.org/10.1016/j.ypmed.2011.09.018</a>
Study Design	Randomized controlled trial
Purpose	“investigated the efficacy and cost-effectiveness of a cognitive-behavioral weight management program, complemented by an interactive Web site and brief telephone/e-mail coaching”



Participants	“Eligible participants were TRICARE Prime non-active-duty beneficiaries, aged 18 to 64, with a <u>body mass index</u> (BMI) of 25 to 50, living in four Midwestern states.”
Results and/or Key Findings	“Participants experienced significant weight loss (−4.0%,−4.0%, and−5.3%, respectively, in each RCT group after 12 months and−3.5%,−3.8%, and−5.1%, respectively, after 15 to 18 months), increased physical activity, and decreased blood pressure. Cost-effectiveness ratios were \$900 to \$1100/quality-adjusted life year (QALY) for RCT1 and RCT2 and \$1900/QALY for RCT3. The cost recovery period to the government was 3 years for RCTs 1 and 2 and 6 years for RCT3.”
Article	Marshall, A. L., Leslie, E. R., Bauman, A. E., Marcus, B. H., & Owen, N. (2003). <i>Print versus website physical activity programs: A randomized trial.</i>
Study Design	Randomized trial
Purpose	To test the hypothesis that both intervention programs would result in significant increases in PA and progression through the stages of motivational readiness, but that the website would be more effective.
Participants	Participants included staff at an Australian university (n=655; mean age 43, standard deviation, 10 years). Participants were randomized to either an 8-week, stage-targeted print program (Print) or 8-week, stage-targeted website (Web) program
Results and/or Key Findings	There were no differences between the Print and Web program effects on reported physical activity. The Print group demonstrated slightly larger effects and a higher level of recognition of program materials
Article	Kroenke K, Krebs EE, Wu J, Yu Z, Chumbler NR, & Bair MJ. (2014). Telecare collaborative management of chronic pain in primary care: a randomized clinical trial. <i>JAMA</i> , 312(3), 240–248. <a href="https://doi.org/10.1001/jama.2014.7689">https://doi.org/10.1001/jama.2014.7689</a>
Study Design	Randomized Clinical Trial
Purpose	To determine the effectiveness of a telecare intervention for chronic pain.
Participants	250 patients with chronic ( $\geq 3$ months) musculoskeletal pain of at least moderate intensity (Brief Pain Inventory [BPI] score $\geq 5$ )

Results and/or Key Findings	Telecare collaborative management increased the proportion of primary care patients with improved chronic musculoskeletal pain. This was accomplished by optimizing nonopioid analgesic medications using a stepped care algorithm and monitoring
Article	Powell, R. E., Henstenburg, J. M., Cooper, G., Hollander, J. E., & Rising, K. L. (2017). <i>Patient Perceptions of Telehealth Primary Care Video Visits</i> . <a href="https://doi.org/10.1370/afm.2095">https://doi.org/10.1370/afm.2095</a>
Study Design	Content analysis approach
Purpose	To describe patient experiences with video visits performed with their established primary care clinicians
Participants	Of 32 eligible patients, 19 were successfully interviewed.
Results and/or Key Findings	Primary care video visits are acceptable in a variety of situations. Patients identified convenience, efficiency, communication, privacy, and comfort as domains that are potentially important to consider when assessing video visits vs in-person encounters.
Article	Baron, J., Hirani, S. P., & Newman, S. P. (2017). <i>A randomised, controlled trial of the effects of a mobile telehealth intervention on clinical and patient-reported outcomes in people with poorly controlled diabetes</i> .
Study Design	Randomized Control Trial
Purpose	To determine the effects of mobile telehealth (MTH) on glycosylated haemoglobin (HbA1c) and other clinical and patient-reported outcomes in insulin-requiring people with diabetes.
Participants	81 participants with a baseline HbA1c of $8.98\% \pm 1.82$ were randomized into standard care (n=36) and the intervention group (n=45)
Results and/or Key Findings	Mobile telehealth did not significantly influence HbA1c ( $p = 0.228$ ), but p values were borderline significant for blood pressure ( $p = 0.054$ ) and mental-health related quality of life ( $p = 0.057$ )

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