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The Use of Technology for Seniors in Health Care Management

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THE USE OF TECHNOLOGY FOR SENIORS IN HEALTH CARE MANAGEMENT

by

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B.S., Southern Illinois University, 2014

A Research Paper
Submitted in Partial Fulfillment of the Requirements for the
Master of Science

Department of Rehabilitation Administration and Services
in the Graduate School
Southern Illinois University Carbondale
December 2019

RESEARCH PAPER APPROVAL

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November 1, 2019

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CHAPTER 1

IMPORTANCE OF THE PROBLEM

In today's world technology plays a major role in streamlining multiple day-to-day activities. According to the PEW research center (2019) the vast majority of Americans (96%) now own a cellphone of some kind. The share of Americans that own smartphones is now 81%, up from just 35% in Pew Research Center's first survey of smartphone ownership conducted in 2011. Smartphone ownership varies based on age, household income and educational attainment (Pew, 2019). More than nine-in-ten of those who turn ages 23 to 38 this year own smartphones according to Pew Research Center. In contrast, nearly three quarters (74%) of 50-64 year-olds own a smartphone, while a little less than half (42%) of individuals who are 65 or older own a smartphone, according to Pew Research Center's Mobile Fact Sheet, which is updated regularly throughout 2017.

Growth in the use of social apps has also been highest among older users. (Vogels, 2019). The use of technology by older users is expected to increase, driven not only by the smartphone's global penetration but also by the world's growing reliance on the technology, regardless of age (Levdikova, 2017). Health apps are increasingly becoming an integral part of health care for older populations in Europe. Rashe and colleagues (2018) conducted a study among older Germans in which participants answered various questions regarding app and health app use, including frequency of use and number of installed apps, demographic factors, and health status. Of the 576 participants, 16.5% used health apps, whereas 37.5% (216/576) indicated only using general apps, and 46.0% (265/576) reported using no apps at all. The most frequently cited type of health apps were exercise-related ones. Individuals using health apps were younger (mean = 66.6) and have a higher level of technical readiness compared to other participants.

For older adults, the potential of mobile phone apps to increase quality in health care and thus the quality of life is currently the topic of much interest among researchers (Boyle, Grainger, Hall, & Krebs, 2017; Lee, 2017; Rasche, et al., 2017). Notable research on the uses of smartphone apps for older adults include their effectiveness in control of diabetes (Scheibe, Reichelt, Bellmann, & Kirch, 2015), chronic disease management (Kim, 2017) as well as fall risk (Rasche, et al, 2017) Yet, despite statistics, predictions and the broad recognition that technology is increasingly becoming a needed tool for daily living, applications designed for the benefit of older persons in the United States seem to be developing very slowly.

As noted above, technological advances have proven to be beneficial to this population when utilized correctly. New technology also has the potential to provide suitable interventions to assist seniors in maintaining their health and independence for longer (Vaportzis et al., 2017,). It is important to first understand the perception of older adults and the use of technology to aid in health care management in order to maximize it to its full potential. According to Lepkowsky and Arndt (2019), the rate of which seniors age 65 or older utilize health care resources is significantly higher than that of younger age cohorts: 136% for emergency department admissions, 263 % for inpatient discharges, and 241% for outpatient office visits. With the growth in the elderly population in recent years these numbers stand to increase greatly in the future.

Although members of the elderly community are not large users of the Internet as they once were in earlier years, they are still using it to the best of their capacity. The same people have not stopped using the Internet as they aged but rather that adaption of new IT including the Internet is lower among seniors (Lepkowsky & Arndt, 2019). It is important that this generation is not forgotten and that certain technologies are built around their needs. Therefore

implementing these technologies is important for their continuum of care as older adult are often transitioning between different healthcare settings and are at risk of receiving fragmented care (Hasan & Linger, 2016). It is vital that the use of technology in managing health care is recognized as an area of interest for this population in order to maintain their independence and improve overall wellbeing.

CHAPTER 2

SENIOR CITIZEN POPULATION IN THE US

Throughout this paper I will use the following definition of seniors as individuals who are over sixty to sixty-five years old who have retired from the workforce (Cambridge dictionary, n.d.). Some refer to seniors as Baby boomers generation (Phelan & Larson, 2002). This generation consists of those born between 1946 and 1964. Jual and Barron (2017) senior citizens can be broken up into three separate categories, which include "young-old", "old", and "old-old". The "young-old" are individuals that range from people n their 60's to early 70's that are active and healthy. "Old" are people in their 70"s and 80's who are chronically ill with bothersome symptoms. The "old-old" are often sick, disabled and nearing death. These categories are important to understand because the aging process encompasses more than one generation and there are many different healthcare needs within those categories.

Phelan and Larson (2002) noted that seniors face the prospect of surviving to very old age, and those that are already at that age of 65 have a life expectancy of an additional 16 to 20 years. The oldest individuals in the "boomer generation" reached age 65 in 2011 and will reach 85 in 2013, while the younger members will reach age 65 in 2029 and 85 in 2049 (Johnson & Appold, 2017). With this projected increased life span, the number of seniors is expected to rise even more over 98 million by 2060 (Phelan & Larson, 2002). As the older population continues to age, the number of seniors are projected to outnumber children for the first time in U.S. history. By 2035 there will be 78 million people 65 and older compared to 76.7 million under the age of 18 (U.S. Census Bureau, 2016).

Due to this statistic many older adults are seeking information on how to age successfully and how to maximize their potential for doing so. Rowe and Kahn (1997) defined successful

aging as including three main components: low probability of disease and disease-related disabilities, high cognitive and physical functional capacity, and active engagement with life. This biomedical model is the most widely used approach, but there is a failure in addressing the implication of the fact that a disease-free older age is unrealistic for most people (Bowling & Dieppe, 2005). Psychosocial approaches to successful aging emphasize life satisfaction, social participation and functioning, and psychological resources, including personal growth (Bowling & Dieppe, 2005).

No matter how one defines successful aging, whether as biomedical or psychosocial, one thing is apparent: when seniors age, they want to age successful. With advances in technology there are many innovative solutions with the integration of technology. For example, seniors with limited mobility may prefer a video conference call with their health care provider rather than an in-person visit (Meinert, 2018). As we move closer to a population with advanced age we must develop effective strategies to support their health care needs.

CHAPTER 3

HEALTH CARE NEEDS

In regards to the elderly population there is a large majority of those individuals with illnesses that range from minor to chronic. Recently the National Council on Aging observed that 75 percent of seniors have one chronic health condition, and most have two or more (Senior living, n.d.). It has been shown that seniors with chronic health conditions are also at a greater risk for acute illness and injuries. As we age it is common for our bodies and minds to lose some of their essence as compared to previous years. Some of the most common aliments include vision impairment, hearing impairment, urinary problems, depression, anemia, arthritis, hypertension, dental issues, and diabetes (Thakur, Banerjee, & Nikumb, 2013). It is important to identify these aliments in order to accurately address their health care needs and prepare for future generations. Arthritis is the most common condition among seniors: a reported 47% of persons 65 years and over have this condition (German & Fried, 1989). While some people consider these aliments to be a normal part of the aging process they are still a major concern for this population.

These aliments and many more must be controlled each day to allow seniors to live productive and fulfilling lifestyles. As Americans begin to live longer, the financial burden of associated with that will also rise and have a major impact on future health care costs. Rising out of pocket costs will quickly become a burden as income levels are not increased at an equivalent rate. An aging population will mean an increase of those that are not self-supporting out of their asset's income or labor. This ratio of older adults to working adults, also known as the old-age dependency ratio, is projected to rise, predicting that there will be about three-and-a-half working age adults for every retirement-age person (U.S. Census Bureau, 2016).

This rapid aging population and continued extension of life could lead to dramatic impacts on programs such as Medicare and Social Security as they will become severely strained or possibly even collapse due to the rise of the baby boomer generation (Peterson, 1999). If the health care system fails to keep up with the increasing number of retirees that demand more advanced medical technology to extend life even further, and if the job market fails to adapt to the shift in the country's age structure may lead to catastrophic economic and health conditions in the United states. A longer life brings with it many opportunities, yet it all depends on one thing: the individual's health. Aging results from the impact of a wide variety of molecular and cellular damage over the individual's lifetime. Due to this, as senior's age, their physical and mental capacity is diminished over time.

The mortality rate is particularly high with seniors and can be associated with self-neglect and the inability to effectively care for themselves. According to German and Fried (1989) falls that result in fractures constitute a major cause of morbidity and health care costs in seniors. Other factors that contribute to increased mortality include cardiovascular disease and stroke, which combined cause over 50% of deaths in people 65 and older (German & Fried, 1989,). Many seniors often have a combination of different illnesses and disease processes, along with their increased age it can lead to detrimental affects. Secondary factors due to primary illness can also lead to mortality in this population. Muscle weakness and rapid rate of strength decline predict mortality in seniors (Jaul & Barron, 2017).

Self-neglect plays a large role with the increasing health care needs of seniors. Due to the growth of this population and declining health these individuals they are often left to fend for themselves causing issues with appropriate care. Loneliness is a strong risk factor for undernutrition among seniors (Thakur, Banerjee, & Nikumb, 2013). When seniors live alone they

lack the necessary support system to adequately care for themselves, and often forget to take their medications and eat healthy meals on a daily basis. This also poses other major concerns for health related issues. The more isolation seniors experience mediates the observed associations between hearing loss and depression, cognitive decline, and reduced quality of life (Jaul & Barron, 2017). According to Thakur, Banerjee, and Nikumb (2013) rapid urbanization has resulted in more elderly individuals being left behind and made to fend for themselves while younger generations leave to better opportunities in larger areas. This means that seniors living in rural areas are experiencing more health concerns than those in urban areas due to lack of resources and support.

In addition to physical deficits, mental deficits are also reaching a high with seniors. Findings from a 2012 Institute of Medicine report point out the growing crisis of dementia, substance abuse and mental illness, such as depression among America's senior population (Meinert, 2018). The elderly tend to get overlooked when healthcare needs are involved because these needs are often looked as a normal part of the aging process. It is not acceptable to dismiss such concerns and not provide the necessary services to these individuals. According to Jaul and Barron (2017) depression rates in those 85 and older are twice as high as those between the ages of 70 to 74. Depression is not a normal part of aging and can often be confused with normal processes, such as grief related to life events as we age.

CHAPTER 4

BARRIERS TO HEALTH CARE

The high needs for adequate health care for seniors comes along with many barriers. With declining cognitive ability and limited resources senior citizens find themselves in a difficult position when trying to access health care. According to Fitzpatrick, et al., (2004) cost associated with income, insurance coverage and hospital bills are a major barrier associates with access to care for the elderly. Difficulties in finding transportation as well as being able to find a regular doctor are also barriers the elderly face. Seniors also feel that an unwillingness of doctors to respond to their concerns is a barrier to treatment. Older generations of people also find it hard to trust doctors of different racial minorities. Many different factors play a role in these barriers and effect people differently.

With the growing use of technology in healthcare, seniors find it hard to keep up when they are not properly shown or trained on how to use these new technologies. For seniors over 70, discrepancies in frequency of IT use (vs. people up to age 40) increase for each domain: home (23%), social (32%), e-commerce (88%), health care (93%), and technical (84%) (Lepkowsky & Arndt, 2019). Of those figures health care was the highest, and it is possibly the most beneficial domain to the elderly in maintaining their independence and communication with their doctors. Seniors (70 – 79 and those over), whose health care utilization is highest almost never use the Internet to communicate with insurers or health care providers (Lepkowsky & Arndt, 2019). When this population is easily able to communicate with their doctors it allows for an improved continuum of care. These are factors that are often overlooked by younger generations as well as health care providers, which create barriers to access of care. The cost of technology for the elder is also a cause for concern. A majority of seniors live on a fixed income

and cannot afford the costs associate with utilizing new technology for health care management. Software exists for all technologies in order to run smoothly and it is always going to require updates. (Vaportzis et al., 2017).

The cost of healthcare in comparison to the coverage by insurance providers for the elderly creates a barrier to health care. Roughly 11% of the Gross National Product is spent on health, and of this amount, about a third is spent on 12% of the population that is 65 and older (German & Fried, 1989). Seniors are arguably the population that uses the healthcare system the most, yet they receive the least reimbursement from insurance companies. Other barriers that insurance companies pose for the elderly are related to access to coverage and language that is easy to understand. Websites by Medicare, private insurance providers, and providers of health care for communicating with their patient populations are inept with seniors and might create a barrier to care and communication (Lepkowsky & Arndt, 2019,). These barriers can lead to stark health outcomes from lack of use of services offered by insurers. Insurance providers do not offer enough services to adequately care for those covered by them. Medicare does not include preventative care as a benefit and therefore it represents a very serious obstacle to such care (German & Fried, 1989). This means that necessary care is not being provided in combination with the lack of knowledge on how to utilize the services that are available, which leads to a decrease in the ability of the elderly to care for themselves.

CHAPTER 5

TECHNOLOGY BEING USED BY OTHER POPULATIONS

Health care management technology has been around for many years and can vary greatly to fit many different consumer needs. Technology to aid in health care comes in different forms. Telehealth has been defined as the remote distribution of health-related services through telecommunications technology and its use has been growing rapidly in the past two decades (Bagchi et al., 2018, para 1). Using telehealth, some physicians provide virtual appointments that allow patients to see their providers through videoconferencing (Mayo Clinic, n.d).

With the growing use of technology in everyday life, the mobile health industry has flourished. Technology for the elderly population has expanded to address a range of elder abilities and activity levels and apps have been shown as the main way to access technology (Kernison, L 2018). Some apps focus on minimal support and monitored independence, while others are designed for seniors with limited mobility and more thorough home-care routines, for example. There are apps that are designed to share images from radiation oncology, radiology, neuroimaging, and cardiac monitoring with providers to enhance access to these images, and share them with their peers. Other apps are designed to turn your phone in to an electrocardiogram to take cardiac measurements. Another popular app captures blood-glucose information and transmits it in real time to healthcare professionals. Other apps can detect conditions such as retinal detachment or glaucoma. They can also measure blood loss during surgical procedures.

The most common use of these apps is to store vital sign information, allergies, medications, and lab results. (7 best FDA, n.d). Other apps can be used for preventative measure in health care management. They allow patients to directly find information related to their health

conditions and give step-by-step guidance to treat their conditions (Top 10 Healthcare, n.d.). Some apps have been used to allow for improved secure communication with providers. Apps can update providers with messages from several different devices and organize messages by priority. Other features allow for integration with electronic health records systems and hospital scheduling. These services can also be accessed through smart phones or watches (Top 10 Healthcare, n.d.).

Telemedicine platforms have developed and improved in order to meet the needs of patients, and allows them to seek medical help without having to schedule an office visit. This also benefits clinicians too, and it allows nurses and other staff to take on a more active role in the care process. It also allows doctors to have more face-to-face time with patients (Pacella, 2018). The use of wearable tech devices, such as fitness trackers, smart scales and other monitoring devices allows patients to keep a close eye on their health without even thinking about it (Pacella, 2018). In return physicians area able to get accurate readings and measurements for patient activity levels rather than relying on a verbal report from the patient.

Technology in healthcare management is not only beneficial to the individuals using it, but also to medical professionals. It allows for more streamlined services and better monitoring of health conditions. It also cuts down on face-to-face visits and frees up their time to see other more critical patients. Technology is a source of power behind healthcare improvements, and technological advances in treatment (How Technology Has Changed Health Care Management, n.d.). The face of healthcare management has significantly changed since the introduction of in home technologies, however these technologies are more widely used by younger generations. The use of apps is not the only technology that has been helpful. Software systems help to automate business processes, orchestrate data, eliminate waste, and optimize workflow to

improve overall patient outcomes. Software systems also offer solutions for compliance issues, customer service, claims processing, marketing, patient retention, and care management (How Technology Has Changed Health Care Management, n.d.). The Epic System allows patients to view their health data from pervious office visits, confirm appointments, and pay bills (Top 10 Healthcare Mobile Apps Among Hospital, Health Systems, n.d.).

CHAPTER 6

MOST POPULAR QUALITIES AND FEATURES FOR HEALTH APPS FOR SENIORS

For older generations of people, technology can been a foreign concept. It is often times viewed as more of a luxury rather than a necessity; however once they are able to move past fear of the unknown they are able to identify features that are beneficial to them. Making healthcare accessible to people who live in rural or isolated communities has been identified as a benefit to the elderly population. It allows for services to be made readily available and convent for people with limited mobility and lack of transportation (Telehealth: Technology meets, n.d.). The more simplified the process the better. Research has shown that elderly individuals have found that using one device with multiple features is more user friendly than using several devices and systems to track healthcare trends and data (Frennert, Forsberg, & Ostlund, 2013).

Once seniors accept the use of technology in health care management there have been findings to assess the most useful features to them. According to Courtney et al., (2010) monitoring blood pressure and vital signs has been widely used and greatly accepted by this population for managing health conditions. They also enjoy the ability to raise awareness to early signs and symptoms of serious medical events. Another feature that was highly valued by seniors was the convenience and reduced visits to their primary care providers for minor ailments. These features although small to some were very convenient, and of interest to the elderly.

One study found features that patients liked about the telemedicine included the efficiency and convince of the system, including the fact that it would be available to patients who have trouble getting out of the house, patients would not have to sit in a waiting room before being seen, and patients could have the ability to talk to a healthcare provider on short notice (Bagchi et al., 2018). Besides convince, privacy is a draw for these services as well. Tracking

caloric intake and scheduling medication reminders are also two features that were greatly used by seniors through personal health apps (Telehealth: Technology Meets Health Care, n.d.). Studies were subjective; however overall acceptance of these features was agreed to be beneficial.

Looking to the future the use of these technologies is expected to rise. Patients saw e-health as an improvement, an alternative or a counterpart to the existing health care system and some of them expressed beliefs about better access with digital consultations (Nymberg, et al., 2019). Acceptance and the ability to identify beneficial features is the first step in improving health care management though the use of technology for the elderly.

CHAPTER 7

HOW ELDERLY LIKE OR USE THESE HEALTH CARE TECHNOLOGY

Little information is known about how the elderly use technology in their daily life to monitor health conditions. We do know the majority feel open to the idea of utilizing some services however. According to Frennert, Forsberg, and Ostlund (2013), the elderly population have been using technology to track blood pressure, oxygen levels, weight, eating and drinking habits, movements in the home, and medication reminders. It was most commonly discovered that this population did not utilize more advanced technologies in health care management; however they are very comfortable with measuring vital signs independently. When it came to entering personal information into databases or transferring files from on provider to the other they were apprehensive to do so. Given this information, telehealth care systems should be considered as an addition to the existing system not a replacement. This allows seniors to choose the service that they are most comfortable using. (Frennert, Forsberg, & Ostlund, 2013).

Although some features are viewed as valuable when using technology in managing health care needs, the fear of the unknown and learning new skills is a deterrent to some. Other factors come into play when assessing the use of technology in the elderly, such as vision impairments, hearing impairments, multiple health care needs and cognition. As noted by Nymberg and colleagues (2019), Successful implementation of e-health interventions should be tailored to target different attitudes and needs with strong focus on information and support for the elderly.

CHAPTER 8

SUMMARY

With the numbers on senior citizens increasing in the coming years it is important to plan for the future. A normal part of the aging process is declining health, and in return the need for more holistic health approaches. It is imperative to care or those that once cared for us. The aging population can be broken down into three different categories, "young old", "old", and "old old". It is important to understand the difference in order to meet their health care needs and plan a predicted path. The use of technology in meeting these needs opens up a lot of doors in maintaining independence.

Health needs for seniors can range from maintenance level to chronic. The majority of this population experiences hearing impairments, vision impairments, cognitive decline, and issues with mobility. Along with those minor ailments can be secondary mental illness such as depression, anxiety, and social isolation as well as physical concerns. These illnesses are many times dismissed as part of the normal aging process. Because of the increased age of these individuals a minor injury or illness can quickly turn to more serious problems if not immediately taken care of. In addition, the elderly often suffer from several illnesses simultaneously. The psychological stress associated with chronic illness or pain can promote the occurrence of depression. Confounding this problem is the fear of loss of independence that often accompanies health related problems at any age.

While the use of technology may increase autonomy and independence, some important barriers were noted in the literature reviewed. These include fear of the unknown, trust and privacy concerns, and difficulties associated with access and proper use of technology. Other barriers included a lack or inability to afford new technologies, such as smart phones. To

overcome these barriers, health care professionals should be trained themselves in how to implement technologies wisely, and how to identify which technologies are the best match for each patients individual needs. The more health care providers can make use of technology understandable and easy, the more likely it will be accepted by a generation not familiar with texting, apps and the like. Not surprisingly, use of a familiar tool like the telephone or a video monitor have been more readily accepted especially among the more elderly. The benefit of Telehealth services is that they allow for a continuum of care for patients without scheduling regular appointments in the office. Phone applications have been used to manage an array of heath concerns. This population also found it helpful to be able to contact their providers and be seen without having to come to the office and get in and out of the car, wait in the waiting room, just to be seen for minor concerns. These new technologies are not only used for patients, but providers as well. Health care professional use commuter software that allows information to be tracked and accessed by patients at any time. Information is also made readily available for other providers to view, in allowing for a better overall approach to health care management.

Studies have found that usefulness, ease of use, and computer/technology self-efficacy were significant predictors of acceptance among the elderly (Or & Karsh, 2009). Although the elderly may not be interested in utilizing all of the technology that is available to them, they have found some features to be beneficial.

With the use of technology early detection of illness and preventative measures can be taken to improve overall wellbeing and independence for seniors. Although many in this population share the same common ailments, they can react to them very differently. Successful technology implementation requires an understanding of how different system factors—individual, human technology interaction, organizational, social, task, and environmental affect

acceptance. This represents a holistic system perspective and should be considered in future studies.

There is a wide variety of technology that is being used in managing health care needs. Telehealth has been proven to be beneficial in other populations for ease of health care needs. Telehealth services provide a continuum of care for patients without scheduling regular appointments in the office. Phone applications have been used to manage an array of health concerns. Apps can monitor vital signs, heart conditions, blood loss during surgery, and much more. These new technologies are not only used for patients, but providers as well. Health care professional use commuter software that allows information to be tracked and accessed by patients at any time. Information is also made readily available for other providers to view, in allowing for a better overall approach to health care management.

With these new technologies comes a many different features made to fit the needs of anyone using them. Although the elderly may not be interested in utilizing all of the technology that is available to them, they have found some features to be beneficial. The ability to monitor and track heath trends was a major advantage to them. Seniors also found it helpful to be able to contact their providers and be seen without having to come to the office and get in and out of the car, wait in the waiting room, just to be seen for minor concerns. The ease of services without having to worry about transportation was another draw to utilize new technology. Many elderly individuals see the value in utilizing technology for managing heath care needs and are open to learning how they can be used in their daily life. They have found the use of apps and other technologies to be inevitable and good resources secondary to traditional medical care. Although the review of literature revealed conflicting data on how much older patients use technology, it is clear that more information on the utilization of new technologies in health care management for

the elderly is greatly needed. Increasingly, and over time, it is anticipated that health apps will be considered favorably by more seniors, especially as older people become more technology-savvy. As indicated by the Pew Research studies noted in the introduction to this paper, interest in technology-supported health services is steadily increasing among this population already.

In regards to future research it is important to first take into consideration those that would benefit the most from the use of health care technologies. Making apps user friendly or offering tech support that is easy to follow would improve the use of such apps. Features that seniors find helpful should be highlighted for ease of use by all populations. Also apps that are to be utilized by seniors alone could be beneficial, such as the use of large print, loud alarms for medication reminders and doctors' appointments, person generated help desk rather than recordings with misleading options. Effective use of technology for seniors is predicted to rise as future generations continue to age. Using different forms of technology can broaden the use of other technologies for everyday use and improve the overall well being of seniors.

It is important to include all populations when discussing new technology. Although the senior population may not be the largest, they are the group that needs the most help maintaining their independence. The use of technology can assist with research efforts to focus on that area. Looking into what seniors have difficulties with in health care management beyond physical or mental aliments is key in developing future research. Seniors could benefit from research in the area of shared applications among family members to assist with the use of these technologies or to check in on their loved ones. It would also be helpful to take a look at how other, more advanced, countries are utilizing technology to aid in health care management for seniors.

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APPENDIX

DEFINITIONS

- Apps- Application designed and usually downloaded for a mobile device

- E-health- healthcare services provided electronically via the Internet.

- Electrocardiogram- display of a person's heartbeat produced by electrocardiography.

- Fitness trackers- wearable device or a computer application that records a person's daily physical activity, together with other data relating to their fitness or health

- Seniors – Individuals age 65 years and older that are no longer in the workforce.

- Smartphone- a mobile device that includes functions such as email or Internet capabilities.

- Smart scale- electronic device that measures, tracks and syncs weight and other useful health data with a smartphone app or a web-based interface

- Telehealth- The remote distribution of health related services through telecommunications technology

- Telemedicine- The practice of two-way voice and visual communication from doctors to patients.

- Videoconferencing- holding a conference among people at remote locations by means of transmitting video and audio signals.

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Research Paper Title:
    The Use of Technology for Seniors in Health Care Management

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