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## Telehealth: History, Successes, and Future Implications

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Telehealth: History, Successes, and Future Implications

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NURS 533

Spring 2014

## PERMISSION

Title Telehealth: How it Works, Potential Uses, & Technological Aspects

Department Nursing

Degree Master of Science

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## ABSTRACT

The purpose of this paper was to explore the historical relevance, success stories, and future implications of telehealth. This is an important topic due to the advancing age of our population. Along with that advancing age, comes increased chronic illness. In addition, many patients are unable to attend visits to healthcare practitioners due to limited mobility, rural setting, or lack of transportation.

A literature review was conducted utilizing CINAHL, and a total of 42 articles were reviewed for this paper. The initial search terms used were "telehealth". This elicited 2,952 articles. Utilizing the filters of publish date of 2002 and later, in the United States, and adults, dropped this number to 199.

The key findings of this literature review centered on a few key concepts. First, telehealth has been utilized throughout the ages. It was first used in Europe during the bubonic plague with the lighting of bonfires. It continued through the use of Morse Code, telephone, television, and internet. Second, there are many studies that have shown its effectiveness in preventing hospital stays in patients with chronic diseases and increasing access to care. However, numerous barriers still exist. These barriers need to be studied and addressed in order to be overcome. They include financial funding, standardized education, and legal issues such as licensing and HIPPA compliance.

## Background

The purpose of this paper is to complete a literature review related to providing healthcare via telehealth (remote monitoring). This paper will explore the history of telehealth, success stories, and possible future implications. In addition this review will incorporate a patient case, and critique the literature related to telehealth.

According to the U.S. Department of Health and Human Services, telehealth is the use of technology to deliver healthcare, patient education, and administrative duties over a distance ([www.hrsa.gov](http://www.hrsa.gov)). The prefix "tele" comes from the Greek word meaning remote. People have been using the technology available at their time for centuries. A few examples would be the lighting of bonfires in Europe during the plague and utilizing Morse code.

With the advancing age of our population, telehealth may play an important role in future providers' practice. Statistically, we are living longer and with more numerous chronic conditions than ever before. Many patients would rather live at home, with the use of telehealth services, than in an assisted living facility. Not only do telehealth services enable patients to live independently longer, it also increases access to health care for those who live in rural areas, or who are homebound due to lack of transportation, or disability.

Greater than 1.7 million Americans die every year due to chronic disease. One out of every ten people has a disabling condition that affects their activities of daily living (Kobb, Hoffman, Lodge, & Kline, 2003). Often times, hospital admissions could be diminished with an effective remote monitoring system. For example, more than five million Americans have heart failure. Heart failure accounts for more than 43% of Medicare spending, with most of that cost

associated with hospitalization (Dang, Dimmick, & Kelkar, 2009). Kobb et al. (2003) highlighted an example of a successful telehealth patient. A 78 year old male with heart failure, who had five admissions, 15 days of hospitalization, three emergency room visits, and 18 clinic visits within a six month period. After enrollment in a remote monitoring telehealth system, he did not use any healthcare services for the next six months. The patient also stated that this improved his feelings of independence.

Preventing unnecessary hospitalizations and improving access to health-care are both goals of telehealth. By delaying or preventing exacerbations of chronic illnesses, one can decrease the number of hospital stays. In addition, improving access to healthcare will decrease the rate of emergency department (ED) visits and increase compliance.

#### Case Report

**Patient Initials:** MS

**Age:** 58

**Sex:** Female

**Date of Examination:** 03-26-2014

**Location:** Remote Monitoring via Telehealth

MS is a 58 year old white female with limited previous health history. She was recently diagnosed with hypertension in an urgent care clinic, and is scheduled to appear via a telehealth remote monitoring system for follow-up. MS lives in a rural area of North Dakota, and has limited transportation. Due to these reasons, she was seen in a satellite clinic. There was a nurse present in the clinic to assist the nurse practitioner, who appeared via webcam.

#### **Chief Complaint:**

Patient stated, "I'm just here for a follow-up for my blood pressure".

**History of Present Illness:** Patient woke up approximately three weeks ago with a headache, which was unrelieved with OTC medication. Patient's husband insisted she go to the urgent care clinic for evaluation. Patient stated her blood pressure at the clinic was 190's/110's. She was started on Metoprolol 50mg Po Daily and told to follow-up with primary care.

Patient states she has been monitoring her blood pressure at home and it has been "fine". She states the readings range from 120-130's/60-80's. Patient stated the only issue she has had since starting the medication is fatigue.

Patient lives in a very rural area and does not drive. She is limited by lack of transportation to make regularly scheduled office visits. Therefore, this visit was completed at a satellite clinic via Telehealth.

**Past Medical History:** Patient denied any past medical history prior to this recent hypertension diagnosis.

**Childhood Illnesses:** Patient stated she had the "usual" childhood illnesses

**Adult Illnesses:**

1. Hypertension, newly diagnosed.
2. Tobacco Abuse, Previous. Quit 10 years ago.

**Surgical History:**

1. None

**Current Medication (NKDA)**

1. Metoprolol 50mg PO Daily

2. Multi-Vitamin 1 PO Daily

**Allergies:** NKDA

**Health Maintenance:** Patient states her Pap smear and mammogram are up to date. She did have a flu vaccination this year.

**Family History:**

Patient states her parents are both still alive. Her father has a history of hypertension, and her mother has cardiovascular disease. She stated her grandmother had diabetes.

**Psychosocial History:** Patient currently resides in a single family home, with her husband.

Patient does not drive and lives in a very rural area of North Dakota. Patient denied use of alcohol or illicit drugs. Patient used to smoke 1ppd, but quit 10 years ago.

**Review of Systems:**

**General:** No anorexia, weight loss, fever, chills, night sweats, or insomnia. (+) Fatigue

**Skin, Hair and Nails:** No rash, itching, nodules, ulcerations, or other significant lesions.

No nail clubbing or pitting noted.

**Lymphatic System:** Patient denies any lumps or nodules. No history of Hodgkin's disease or radiation.

**Head and Neck:** Head symmetrical, no tenderness noted above sinuses. No JVD noted.

Trachea midline.

**Eyes:** No double vision or sensitivity to light.

**Ears, Nose, and Throat:** Patient denies any sore throat, surgeries, and no hearing loss.



**Chest and lungs:** No dyspnea, or cough, or hemoptysis.

**Breasts:** Mammogram up to date.

**Cardiac:** No chest pain, or palpitations. (+) HTN.

**GI:** No abdominal pain, N/V, diarrhea, constipation, or GI bleeding.

**Urinary:** No dysuria, hematuria, frequency, urgency, or incontinence.

**Musculoskeletal:** No arthralgias, myalgias, stiffness, backache, joint swelling, or stiffness..

**Neurologic:** No dizziness, numbness, syncope, seizures, or paralysis noted. (+) for HA, which led to HTN diagnosis.

**Physical Examination:**

**General:** SM is a well nourished adult female who is alert and oriented X3.

**Vitals:**

T= 98.6, HR= 80, BP= 160/98, RR=20, Height= 5'6", Weight=130 lbs., BMI=20.98

**Skin:** Intact, no rashes or lesions noted.

**HEENT:** Head normocephalic, PERRLA. TMs intact bilaterally with no erythema noted. Nares patent bilaterally. No tonsillar exudates or erythema noted.

**Neck:** Supple, no lymphadenopathy or JVD. Full ROM. Trachea midline.

**Respiratory:** CTA bilaterally. No adventitious sounds noted.

**Cardiovascular:** RRR, no murmur or rubs noted. No peripheral edema noted.

**Breast:** Deferred, up to date.

**Abdomen:** Soft, non-tender. Bowel sounds present x4. No guarding or rebound tenderness noted.

**Genitalia:** Deferred, up to date

**Neurological:** A&O x3, cooperative.

**LABS/Urine:**

CBC, CMP, A1C, Thyroid Panel w/ TSH all WNL.

Total Cholesterol      220

LDL                              140

HDL                              45

Triglycerides              100

**Assessment:**

1. HTN (401.9)
2. Hypercholesterolemia

**Plan:**

1. Had a lengthy discussion regarding her blood pressure. Patient states her blood pressure has been running WNL at home. This could possibly represent "white coat syndrome". The plan at this time for her hypertension is to continue the Metoprolol. Patient is to keep a blood pressure log, utilizing a variety of times for the next 30 days. Patient will bring her home blood pressure monitor in to the clinic within the next week, so we may

evaluate whether it is calibrated correctly or not. (Transportation is an issue for this patient, but she stated she could try to arrange someone to bring her in to the satellite clinic long enough for us to look at her home monitor). Explained the fatigue may well be related to the beta-blocker. We will continue to watch this to see if it improves or not. If the fatigue continues, we may have to change classes of medications. Also advised patient that many times one medication is not effective in controlling blood pressure issues. We may have to add additional medications in the future. We will follow-up with her in 1 month to look at the blood pressure log and evaluate the effectiveness of her current medications.

2. For her elevated cholesterol, we will try therapeutic lifestyle changes at this point. Her cholesterol is only mildly elevated at this time. Patient was resistant to starting additional medications. A heart-healthy diet plan was discussed in detail. Patient was also encouraged to start exercising (walking program). Patient stated it was too cold at this point to do much walking outdoors. Patient was given alternatives, such as walking at the mall, or an indoor treadmill. We will try these methods for approximately three months, and then re-evaluate her Lipid panel.
3. Patient advised when to seek emergency help (un-relieved headache, slurring of speech, numbness or tingling on one side of her body, facial droop, etc.).
4. F/U in satellite clinic via Telehealth in one month.
5. Patient verbalized an understanding of all instructions and denied any questions or further concerns at this point.

### **Literature Review**

A literature review was conducted in order to determine the historical and future implications of telehealth. Technology has continued to advance over the ages. The use of telehealth in the healthcare industry has continued to adjust and utilize the available technologies. However, the healthcare industry is still not fully integrated to provide remote care. Many barriers still exist today. This paper will look at the history, successes, and future implications of providing care remotely.

CINAHL, Pub Med, and Google Scholar were utilized for literature searches. The initial search in CINAHL with the term, "telehealth", returned 2,952 articles. Changing the date to those published since 2002 reduced the number of articles to 1,668. Further changing the search to only include only adult in the United States, resulted in 199 articles. A total of 42 articles were reviewed for this paper.

### **Telehealth History and Definition**

The prefix "tele" comes from the Greek word meaning distance (Houston, Stredler-Brown, 2012). Using the latest technology to relay medical information has been around for years. For example, in Europe, they would light fires to alert neighboring towns of deaths due to the plague. In the 1800's, a heliograph was utilized to notify deaths due to war, and Samuel Morse invented the single line telegraph due to a medical problem involving his wife (2012). In the 1940's and 1950's, telephone lines were used to send ECG results. During the 1950's thru 1960's, televisions were used as closed circuits where physicians could interview patients at a distance. While medicine has come great lengths with telehealth, there still remain barriers. These include funding, licensure, and privacy issues (Houston & Stredler-Brown, 2012).

Telehealth, basically defined, is a technological aspect of communication that allows healthcare providers to speak/communicate with patients when separated by distance (Field & Grigsby, 2012). This may involve the use of videography, telephone, email, and digital imaging. While telehealth was slow to be accepted, it is becoming more popular. Radiology is one prime example of telehealth. Often times, radiologists are not present "on site". They are sent a digital copy of the image, they read it, and communicate their findings. For years, this has been commonly performed and reimbursed by insurance companies. Surprisingly, most of the development stems from NASA. Since the 1960's, NASA has been able to monitor physiological aspects of the astronauts (Field & Grigsby, 2012). Telehealth for common, chronic, high-risk diseases such as DM, COPD, and HF is rapidly increasing. Often these patients are provided with home blood pressure, pulse ox, scales, and heart rate monitors. They are instructed to utilize these on a pre-set schedule. These numbers are then transmitted either via telephone, or internet to a healthcare provider. The provider is then able to make adjustments to medications to prevent an exacerbation, thereby reducing readmission rates.

Often times, the terms telehealth and telemedicine are used interchangeably. In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted to increase the adoption of health IT (Daniel, 2008). Numerous agencies participated in defining these two terms. These agencies include, but are not limited to, Department of Health and Human Services, Centers for Disease Control and Prevention, Food and Drug Administration, Department of Veterans Affairs, Office of the National Coordinator for Health Information Technology, and US Department of Transportation (Doorn, Jacobs, Bott, Lamer, & Oliver, 2014). Most of these agencies agree that telehealth includes direct patient care, most of which is "real time". The U.S. Department of Commerce/the National Institute for Standards and Technology

(NIST), included transmission of still images, patient portals, and continuing education sites as being related to telehealth. Telehealth seems to be a broader term and includes issues such as preventative actions and patient education sites. Telemedicine was agreed to be a subset of telehealth that refers specifically to direct patient care.

### **Telehealth Success**

Many studies have been done to look at the effect of telehealth. One study utilized Veterans who had Diabetes (Chumbler, Neugaard, Kobb, Ryan, Qin, & Joo, 2005). The purpose was to examine the long-term effects on preventing hospitalizations over a four year period. The conclusions suggest that telehealth services can improve patient access to care and reduce preventable hospitalizations. This has a great impact on reducing medical expenses, and improving the overall well-being of the patients involved. This study showed a 50% reduction in hospital stays, and an 11% reduction in emergency room visits (2005). There were some limitations with this study. For example, the study focused solely on those patients enrolled in the VA Healthcare System. These patients typically tend to be male, and of an older age. Further, these patients were all diagnosed with Diabetes, which has been shown to have higher morbidity and mortality rates.

One study, conducted by Chaudhry, Mattera, Curtis, Spertus, Herrin, Lin, et al., was unsuccessful in proving that telehealth improved outcomes in heart failure patients. They studied a total of 1653 patients who had recently been discharged from the hospital with a diagnosis of heart failure. Eight hundred and twenty six patients used a telephone-based monitoring system. The patients were to report daily about their current weight, fatigue, shortness of breath, and edema. The patients were instructed to place the phone call themselves, where they would answer a series of questions. The main goal was to prevent hospital readmissions (for any

reason) for 180 days. This study was unsuccessful. They list several reasons for this, including the fact that 14% of the patients never used the system. During the last week, only 55% of the patients utilized the system. If the patient missed more than 2 days in a row, a pre-recorded phone call was made to alert the patient that they had missed their contact call. Also, there were multiple sites involved with these patients. Not all practitioners were documenting their responses in a systematic manner (Chaudhry, Mattera, Curtis, Spertus, Herrin, Lin, et al., 2010).

A three-group randomized controlled trial, based on the Chronic Care Model, was used to evaluate the effectiveness of treating hypertension through remote monitoring. This study concluded that web-based blood pressure monitoring was effective in improving blood pressure control (Green, et al., 2013). It was noted that it seemed to be more effective in patients who had a higher systolic rate at baseline ( $>160$ mm Hg). There were some limitations to this study. For example, all patients had hypertension. Also, all patients were required to have home internet access with computers. Patients were disqualified from participating in this study if they had other co-morbidities, such as diabetes or heart disease. This study was performed by pharmacists, who used medication protocols and electronic medical records to collaborate with the primary care physicians and patients.

Telehealth has also been shown to be effective, especially in remote or rural areas. These areas tend to see higher hospitalization and mortality rates related to access of care (Jones, et al., 2014). Jones et al conducted a literature review in order to look at specific chronic diseases such as asthma, COPD, DM, and HF, between the years of 2005 and 2010. 46.7% of the patients reported improvement in symptoms and quality of life (2014).

### **Future Implications**

There are numerous reasons why remote monitoring may be lacking in implementation. Currently, radiology is the only widely accepted telehealth application. There are several phases one must go through in order to adopt a technological change. The stages are acquaintance, persuasion, decision, initial adoption, and diffusion (Zanaboni & Wootton, 2012). One of the reasons that telehealth has not been widely accepted may be due to the limited information currently available. Several institutions have implemented telehealth services, including the Veterans Administration, US Department of Defense, and the US prison system. However, the information obtained from their data was specific to their particular organization. There is uncertainty about whether these implementations will work with the general public. Other barriers include perception of usefulness, ease of use, time, money, and security issues. While there are multiple studies that show the effectiveness of telehealth, there are limited studies to show the cost-effectiveness.

As our technology has increased, so has our life expectancy. Those who are over the age of 60 account for ten percent of the world's population (World Health Organization, 2011). With the increased age comes an increase in chronic diseases. Remote monitoring will allow practitioners to manage a large number of patients with chronic diseases. This will allow the patients to function at their maximum level for much longer, thereby decreasing hospital stays and institutional costs. A small study done in Taiwan showed that this gave the participants a sense of security and empowerment in dealing with their disease (Lu, Chi, & Chen, 2012). Telehealth appears to be an appropriate way to monitor patients and increase access to care. However, there are multiple barriers to overcome. These include cost (who will pay for these services), and technological aspects (not everyone has internet or a computer).



As we know, there are great aspects to telehealth. One for example, is increasing access of care to those in rural areas. However, there are many barriers to overcome. Reducing adverse events, and educating clinicians on the technological aspects of telehealth are a few. Darkins recommends areas that should be reviewed prior to implementing any telehealth services. These include:

1. The population it is providing care to
2. Specific needs that will be addressed
3. How these services will be provided
4. How the staff will be trained
5. Support services needed (how to transfer an urgent case)

Telehealth is an emerging technology with the potential to greatly enhance access of care to those in rural areas, and help manage those with chronic diseases. It does require further study.

### **Conclusion**

Throughout the literature search and review, a common theme was emerging. Telehealth has been practiced throughout the ages. Whether it be by lighting bonfires for plague alerts, or using closed circuit television to conduct patient interviews. It has continued to evolve, but has not yet fully reached its potential. There have been numerous studies showing its effectiveness in monitoring patients with chronic illness, decreasing the number of days spent in the hospital, increasing patients' sense of security and ability to live alone longer, and improving access to care for those in remote areas. However, there are still numerous barriers. For example, there is no standardized education on telehealth. A few schools have started introducing this into their curriculum, but there is no standardization. Further, there are no standards in place for licensure

and privacy issues. Lastly, not everyone has access to the internet or telephone, which further complicates the ability to provide care at a distance. This is one of the most interesting and potentially substantial developments in the history of healthcare. Further study is needed to delve into removing these barriers.

### **Learning Points**

1. Telehealth has been in use for centuries.
2. Currently, the only widely accepted use of telehealth is in radiology.
3. There are no standardized education curricula for telehealth.
4. Telehealth has shown it can be effective in reducing readmission rates for those with chronic diseases such as COPD, DM, and HF.
5. Multiple barriers such as funding and legal issues still exist and need to be explored.

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