

The Effect of Education on Student Perceptions about Telehealth

Ranelle M. Nissen, MS, OTR/L¹ & Barbara L. Brockevelt, PhD, OTR/L, FAOTA²

Abstract

The purpose of this research study was to determine if perception about telehealth changes based upon exposure to different telehealth technology educational formats. Participants were involved in a hands-on or educational lecture format group. Both groups completed a pre- and post-questionnaire to assess perceptions of telehealth. The hands-on group also completed the Telehealth Usability Questionnaire (TUQ) to assess experiences with the technology. Overall results were significant ($p=.018$), indicating the participants' familiarity and perceptions of telehealth changed positively after education. Results were not significant ($p=.902$) between groups, indicating the type of education does not make a difference in change of perception. These results correlate with other research findings indicating that education may improve health professional's perceptions of telehealth. There is need for additional research to provide further support of these findings.

Keywords: Telehealth, Education, Technology Acceptance Model

1. Introduction

Telehealth is a service delivery model that provides health care services through information and communication technologies. This enables the integration of technology and health care provision, which allows for healthcare service delivery of evaluations, consultations, treatment, education, prevention, care management, and therapeutic services to clients whom are unable to visit their healthcare providers in person (Cason, Hartmann, Jacobs, & Richmond, 2013; Center for Connected Health Policy, 2014). Telehealth services are an evolving area of health care that is becoming more prominent as technology capabilities advance.

Advancements in technology have led to the development of several services underneath the telehealth delivery umbrella, including telerehabilitation, teleconsultation, and telemonitoring. Telerehabilitation is the utilization of telecommunication and information technologies to deliver rehabilitation services by health care professionals such as occupational therapists, physical therapists, speech-language pathologists, and audiologists. Teleconsultation is a cybernetic consultation that consists of an expert provider and a client; an expert provider and a local provider with the client present; or an expert provider and a local provider without the client present. The primary purpose is to gain health and medical information or aid in advice. Telemonitoring allows healthcare providers to track a client's adherence to specific intervention programs, aid a client with achieving a desired outcome, and respond to client concerns within the comfort of their own environment (Cason et al., 2013).

¹ Assistant Professor and Academic Fieldwork Coordinator, University of South Dakota, Department of Occupational Therapy, 414 E. Clark St., Vermillion, SD, 57069. USA. Ranelle.Nissen@usd.edu, Telephone – 605-658-6378, Fax – 605-677-6745

² Chair and Professor, University of South Dakota, Department of Occupational Therapy, 414 E. Clark St., Vermillion, SD 57069. USA.

Delivery of telehealth services occurs in two main modes: synchronous and asynchronous. Synchronous technologies offer live interaction between the client and healthcare provider who are distant from one another. Examples of synchronous technologies include videoconferencing, real-time monitoring devices, and interactive virtual reality. Asynchronous technologies, or 'store-and-forward' technologies, include recorded information. With asynchronous telehealth technologies, there is no live interaction with the client and provider. These 'store-and-forward' technologies can record data from a client's home environment, request expert review of medical information, or document a trend in a client's vital signs. Examples of asynchronous technologies include videos, photographs, and electronic communication (Cason, 2012).

The use of telehealth to deliver health care services to clients is a clinical decision based upon the benefits and limitations. Each client has unique therapy needs and expectations. The healthcare practitioner and the client must determine the best match (Cason et al., 2013; Loh et al., 2004; Windle, 2010). One benefit is that telehealth may reduce time and cost of healthcare service delivery by reducing the distance traveled by the client or practitioner (Buckley, 2006; Cason et al., 2013). A second benefit is the ability to deliver services to clients who may not otherwise be able to access services due to distance or inability to travel (Bendixen, Horn, & Levy, 2007; Buckley, 2006; Cason et al., 2013; Forducey et al., 2012; Windle, 2010). A third benefit is the ability to monitor clients in their home who may need increased level of supervision due to safety concerns or need for assistance with chronic disease management (Bendixen et al., 2007; Buckley, 2006; Cason et al., 2013).

The benefits do not always outweigh the limitations inherent with the use of telehealth. One limitation is technical issues. If a client does not understand how to use the technology or the system malfunctions, needed services may not occur. A lack of technical support may delay or increase the cost of the service (Forducey et al., 2012; Smith et al., 2007). A second limitation is the need for further research to fully demonstrate and validate the benefits of using telehealth over a traditional in-person office visit (Bendixen et al., 2007; Loh et al., 2004; Windle, 2010). A third limitation is the perception of the client. For example, older adult generations may have less proficient use of technology and it may compromise the effectiveness of the telehealth services. Some caregivers view technology as added burden with increased responsibilities and a dependency on the caregiver to provide services in the absence of a therapist (Loh et al., 2004; Windle, 2010).

The determination to use telehealth often starts with the health care provider. The way a healthcare provider perceives telehealth depends on their exposure to education, training, and research. Education is essential for the successful use of telehealth. Previous study results indicate that the more education and training providers have about telehealth, the more likely they are to implement it. Inversely, research shows if providers do not have proper education and training about the use of telehealth, they are more likely to have negative perceptions and may not use it (Dunkley, Pattie, Wilson, & McAllister, 2010; Levy & Strachan, 2013; Perle et al., 2013; Shahpori, Hebert, Kushniruk, & Zuege, 2011).

The Technology Acceptance Model (TAM) assists in identifying the connection between a user's perception of technology and actual behavioral intention to use the technology (Davis, 1986). TAM posits that an individual's perception toward the ease of use, usefulness, and attitude toward the technology will affect the behavioral intention to use the system. Thus, providers are more likely to use telehealth if there are reliable results of the benefits for their clients and their practice (Cason et al., 2013; Dunkley et al., 2010; Levy & Strachan, 2013; Moeckli, Cram, Cunningham, & Schacht Reisinger, 2013; Perle et al., 2013). The inconsistent data regarding benefits and effectiveness of telehealth requires further research for providers to feel confident in using telehealth in practice (Moeckli et al., 2013).

Education of future healthcare professionals may assist in the advancement of telehealth knowledge to expand use in practice. The purpose of this research study was to determine if perception of telehealth changes, either positively or negatively, based upon exposure to telehealth technology through formal education or hands-on experience. This research builds upon the current evidence of professionals' perceptions about telehealth.

2. Methods

2.1 Design

This study used a two-group pretest-posttest design (Portney & Watkins, 2009). This design allowed for assessing participant's perceptions about the use of telehealth before and after education about its use.

2.2 Theoretical Foundation

This study is based upon the Technology Acceptance Model (TAM). Fred D. Davis (1986) developed the TAM based upon a psychological theory of behavior. The Theory of Reasoned Action (TRA) posits that a person's intent (or behavior) relates directly to a person's performance, attitude, and social influence. Davis utilized the constructs of TRA to develop the four main constructs of TAM, which include the perceived ease of use (PEU), perceived usefulness (PU), attitude toward using the system (A), and actual system use (behavioral intention, BI). The relationships between these constructs are well established by multiple researchers (e.g. Chau & Hu, 2002; King & He, 2006; Lee, Kozar, & Larsen, 2003; Legris, Ingham, & Colletette, 2003; Lin, 2013; Schepers & Wetzels, 2007). This study utilizes these concepts to reason how the end-user of technology for telehealth purposes may demonstrate an increase in overall perception and intended use through education. Changing the user's perception about the ease of use and usefulness will affect their attitude and thus affect their intent to use the technology. A meta-analysis conducted by King & He (2006) found supporting evidence to utilize students as a proxy for practitioners in measurement of TAM constructs. The meta-analysis results indicate significant overlap between student and practitioner perception about technology.

2.3 Participants

The study sample included nine college students pursuing a degree in a healthcare related field at a Midwest university. The mean age of the participants was 20.56 ± 1.8 years. All nine participants were female. There were seven undergraduate and two graduate level students. Four of the participants were in the hands-on group and five of the participants were in the education group. The university's Institutional Review Board approved this study.

2.4 Instruments

Participants took part in either the hands-on or the educational group. The hands-on participants stayed in a fully functional apartment equipped with telehealth technology for three days while actively using the technology. The educational group attended a one-hour informational session about telehealth. The hands-on and educational groups completed the Perception of Telehealth survey, created and tested for reliability by the principal and student investigators. The hands-on group also completed the Telehealth Usability Questionnaire (TUQ) at post-test to assess their experiences with the technology. The TUQ is a 21-statement questionnaire with a Likert-type scale from 1 (disagree) to 7 (agree) (Parmanto, Pulantara, Schutte, Saptono, & McCue, 2013). During the stay in the apartment, each hands-on group participant took her vital signs two times per day using a remote patient monitoring system. The vitals included blood pressure, heart rate, respirations, and a series of questions about the participant's current health status. A motion activated remote monitoring system tracked the regular patterns of movement of the participant. The participant engaged in one televideo session with the researchers. This session used a smart TV equipped with video conferencing capabilities. The principal researcher conducted a short upper extremity exercise program with the participant and provided education on use of teleconference for delivery of health care services.

2.5 Procedure

Participants voluntarily chose to participate in the hands-on group or the education group. If a participant chose to participate in the hands-on group, they were required to maintain residence in the telehealth apartment. The telehealth apartment is fully functional with a bedroom/sitting area, laundry, full kitchen, and a full bathroom.

The participant lived in the apartment for three days and two overnights while actively using the technology. The educational group attended a one-hour information session about telehealth. The participant in the hands-on group

completed the Perception of Telehealth survey before and after the three days in the telehealth apartment. The researchers provided orientation and access to the telehealth apartment, general safety procedures of the building, education and training on the purpose and use of the telehealth technology. Participants were encouraged to live life normally. The participant also completed the TUQ after the stay in the telehealth apartment to assess the experiences with the technology.

The participants in the educational group completed the same pre-test survey as the hands-on group, the Perception of Telehealth survey. The participants attended a one-hour informational session. The informational session was in a lecture format with no hands-on use of the telehealth technology. The informational session included a brief overview of telehealth with the definition of telehealth, the history of telehealth, types of telehealth, and benefits and limitations based on current evidence. Participants were given time for questions. The participants then completed the Perception of Telehealth survey as the post-test. The participants were free to skip any questions that they preferred not to answer.

3. Results

The Wilcoxon signed-rank was used to test the null hypothesis, education (hands-on or lecture) does not change perceptions ($\alpha \leq .05$) of telehealth. The results were significant ($p = .018$) indicating that the participants' familiarity and perceptions of telehealth did change through education in the positive direction. The Mann Whitney-U test was used to compare the hands-on group to the lecture education group ($\alpha \leq .05$). Significant results were not found ($p = .902$) so we fail to reject the null hypothesis that the type of education does not make a difference in change of perception.

The top four reasons cited on the pre-intervention Perception of Telehealth survey as a barrier or challenge to implement telehealth in the participants' field of study were (1) lack of knowledge about benefits, (2) lack of knowledge about the types and uses of telehealth, (3) technology errors during a client session, and (4) too much upkeep of technology. The participants' ranking changed post-intervention to (1) technology errors during a client session, (2) lack of knowledge of benefits, (3) clients do not want their health care services provided via telehealth, and (4) lack of knowledge about the types and uses of telehealth. Results of the TUQ indicate high satisfaction with the technology used in the telehealth apartment ($6.42 \pm .63$).

4. Discussion

The implementation of telehealth into practice requires an understanding of the perceptions of the health care practitioners who will utilize it. The perceived benefits towards telehealth may positively influence acceptance and implementation of telehealth in their practice (Dunkley et al., 2010; Glinkowski, Pawlowska, & Kozłowska, 2013; Levy & Strachan, 2013; Perle et al., 2013; Shahpori et al., 2011). Exposure to telehealth through education, training, and research, affords the opportunity for providers to be more knowledgeable about the telehealth system and interact with the system hands-on; these types of exposure experiences can positively improve a practitioner's perceptions about telehealth. Education is a key component to successful implementation of telehealth in practice. Research supports a direct correlation between the willingness to implement telehealth and the amount of education and training practitioners have about telehealth. Perceptions that are more negative occur when providers do not receive adequate education and training on the use of telehealth technologies (Dunkley et al.; Levy & Strachan; Perle et al.; Shahpori et al.).

This research study provides preliminary results that hands-on or lecture style educational experiences positively influence students' perceptions on telehealth. This result coincides with our expectations of the study and aligns with other research findings. Therefore, delivery of hands-on experiences with, or education about, telehealth may change healthcare students' perceptions. The improved positive perceptions and familiarity of telehealth has the ability to aid in increasing awareness of the many valuable services that telehealth can provide to clients and practitioners.

The participants also changed their perception about the challenges associated with the use of telehealth. Initial indications provide evidence that the lack of knowledge about telehealth was one of the biggest challenges. Whereas, following education, the most frequently cited challenge was technology errors, consistent with current research (Forducey et al., 2012; Smith et al., 2007). Combined with the results of the perception of telehealth survey, the participants in this study gained knowledge about the utility of telehealth as a delivery method in healthcare practice.

4.1 Limitations

Although, this research found that education about telehealth improved perceptions, the sample size was small (n=9), gender biased, and generationally biased. Additional research is needed to support these findings on a larger scale and to improve generalizability to health care practitioners. Participants also indicated knowledge as a top challenge, which remained even after education, though not as often cited. Further research is needed to explore the amount of education that is most beneficial.

5. References

- Bendixen, R.M., Horn, K., & Levy, C. (2007). Using telerehabilitation to support elders with chronic illness in their homes. *Topics in Geriatric Rehabilitation, 23*(1), 47-51. <http://dx.doi.org/10.1089/tmj.2008.0046>
- Buckley, J. (2006). The importance of telecare for people with dementia. *Nursing & Residential Care, 8* (5), 212-214. Retrieved from <http://www.magonlinelibrary.com/toc/nrec/current>
- Cason, J. (2012). Telehealth opportunities in occupational therapy through the affordable care act. *American Journal of Occupational Therapy, 66*(2), 131-136. <http://dx.doi.org/10.5014/ajot.2012.662001>
- Cason, J., Hartmann, K., Jacobs, K., & Richmond, T. (2013). Telehealth. *American Journal of Occupational Therapy, 67*(6 supp.), S69-90. <http://dx.doi.org/10.5014/ajot.2012.662001>
- Center for Connected Health Policy. (2014). *What is telehealth?* Retrieved from www.cchpca.org/what-is-telehealth
- Chau, P.Y.K & Hu, P.J.H. (2002). Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical test of competing theories. *Information & Management, 39*, 297-311. Retrieved from <http://www.sciencedirect.com/science/journal/03787206>
- Davis, F.D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results (Doctoral dissertation)*. Available from Research Gate.
- Dunkley, C., Pattie, L., Wilson, L., & McAllister, L. (2010). A comparison of rural speech-language pathologists' and residents' access to and attitudes towards the use of technology for speech-language pathology service delivery. *International Journal of Speech-Language Pathology, 12*(4), 333-343. <http://dx.doi.org/10.3109/17549500903456607>
- Forducey, P.G., Glueckauf, R.L, Bergquist, T.F., Maheu, M.M., & Yutsis, M. (2012). Telehealth for persons with severe functional disabilities and their caregivers: Facilitating self-care management in the home setting. *Psychological Services, 9* (2), 144-162. <http://dx.doi.org/10.1037/a0028112>
- Glinkowski, W., Pawlowska, K., & Kozłowska, L. (2013). Telehealth and telenursing perception and knowledge among university students of nursing in Poland. *Telemedicine & e-Health, 19*(7), 523-529. <http://dx.doi.org/10.1089/tmj.2012.0217>
- King, W.R. & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management, 43*, 740-755. <http://www.sciencedirect.com/science/journal/03787206>
- Lee, Y., Kozar, K.A., & Larsen, K.R.T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems, 12*(1), 752-780. Retrieved from <http://aisel.aisnet.org/cais/>
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management, 40*, 191-204. <http://www.sciencedirect.com/science/journal/03787206>
- Levy, S., & Strachan, N. (2013). Child and adolescent mental health service providers' perceptions of using telehealth. *Mental Health Practice, 17*(1), 28-32. <http://dx.doi.org/10.7748/mhp2013.09.17.1.28.e810>
- Lin, C. (2013). Exploring the relationship between technology acceptance model and usability test. *Information Technology Management, 14*, 243-255.
- Loh, P.K., Ramesh, P., Maher, S., Saligari, J., Flicker, L., & Goldswain, P. (2004). Can patients with dementia be assessed at a distance? The use of telehealth and standardised assessments. *Internal Medicine Journal, 34*, 239-242. Retrieved from <http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291445-5994>

- Moeckli, J., Cram, P., Cunningham, C., & Schacht Reisinger, H. (2013). Staff acceptance of a telemedicine intensive care unit program: A qualitative study. *Journal of Critical Care, 28*(6), 890-901. <http://dx.doi.org/10.1016/j.jcrc.2013.05.008>
- Parmanto, B., Pulantara, I.W., Schutte, J.L., Saptono, A., & McCue, M.P. (2013). An integrated telehealth system for remote administration of an adult autism assessment. *Telemedicine and e-Health, 19* (2), 88-94. <http://dx.doi.org/10.1089/tmj.2012.0104>
- Perle, J. G., Langsam, L. C., Randel, A., Lutchman, S., Levine, A. B., Odland, A. P., Marker, C. D. (2013). Attitudes toward psychological telehealth: Current and future clinical psychologists' opinions of internet-based interventions. *Journal of Clinical Psychology, 69*(1), 100-113. <http://dx.doi.org/10.1002/jclp.21912>
- Portney, L.G. & Watkins, M.P. (2009). Experimental designs. In *Foundations of Clinical Research: Applications to Practice* (3rd ed., pp. 193-222). Upper Saddle River, NJ: Pearson Education.
- Schepers, J. & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & Management, 44*, 90-103. <http://www.sciencedirect.com/science/journal/03787206>
- Shahpori, R., Hebert, M., Kushniruk, A., & Zuege, D. (2011). Telemedicine in the intensive care unit environment: A survey of the attitudes and perspectives of critical care clinicians. *Journal of Critical Care, 26*(3), 328.e329-328.e315. <http://dx.doi.org/10.1016/j.jcrc.2010.07.013>
- Smith, G. E., Lunde, A. M., Hathaway, J. C., & Vickers, K. S. (2007). Telehealth home monitoring of solitary persons with mild dementia. *American Journal of Alzheimer's Disease & Other Dementias, 22*(1), 20-26.
- Windle, G. (2010). Does telecare contribute to quality of life and well-being for people with dementia?. *Dementia Care Research Focus, 18* (5), 33-36.