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Evaluating VA Nurse Acceptance of Virtual Healthcare Technology

During the Coronavirus Outbreak

By

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Doctor of Nursing Practice Final Scholarly Project

In Partial Fulfillment of the Requirements for the Degree

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Executive Summary

At a regional Veterans Administration hospital, nurses performing case management were directed to stop providing face-to-face visits with patients due to the coronavirus. Care coordination services were then conducted through telephonic case management to preserve personal protective equipment and reduce transmission rates through social distancing. Due to the removal of personal contact with patients, nurses voiced concern that the nurse-patient relationship was negatively impacted and could decrease the quality of patient care. The clinical change project was conducted with VA registered nurses to change perceptions about virtual health care technology and the impact on the nurse patient relationship. The clinical practice change project included three components: a pre-education intervention questionnaire which was adapted from the Myers (2014) technology perception questionnaire, review of an education intervention video, and a post-education intervention questionnaire. The clinical practice change project, based on Peplau's interpersonal relations theory, demonstrated statistically significant changes at $p < 0.05$ in six of the fourteen domains after the education intervention was implemented. Three themes emerged through the participant responses: nurses who received frequent updates, education, and support during the transition to virtual health technology; (1) perceived virtual health technology to be user friendly; (2) believed that virtual health technology promoted effective communication and built relationships between nurses and patients; (3) found virtual health technology to be challenging, but manageable. The implications of the project indicate that nurses perceive virtual health care technology as beneficial to patient care and promote the nurse-patient relationship if educated about the technology, receive support through transition, and receive frequent updates.

Evaluating VA Nurse Acceptance of Virtual Healthcare Technology During the Coronavirus Outbreak

Introduction

Since the time of Florence Nightingale, nurses have provided bedside care for patients using holistic physical, psychological, and spiritual assessments. Face-to-face (FtF) contact between nurses and patients was the traditional method to provide healthcare services (Hrabe, 2005). The personal protective equipment (PPE) requirements during the coronavirus pandemic, altered the way many nurses were able to provide care to patients. Nurses in care coordination were no longer permitted at the bedside. Hospital leadership rationed the supply of PPE in order to ensure that bedside nurses on clinical wards had sufficient quantities of protective equipment. Due to PPE conservation efforts, all non-bedside nurses had to utilize alternative methods to provide patients with health care services. One of the options available to nurses was to use virtual health care technology.

Many VA nurses did not trust that virtual healthcare technology would create a safe environment to perform holistic assessments and maintain positive nurse-patient relationships. A clinical practice change project was conducted with VA registered nurses to evaluate perceptions about virtual healthcare technology (VHT) and the correlation of those perceptions to the nurse-patient relationship.

Problem Statement

In VA nurses, how does a virtual health care technology education intervention, compared to current knowledge about virtual health care technology, impact nurse perception of the nurse-patient relationship?

Background

A search of the literature was completed using MEDLINE, CINAHL, Cochrane Library, and Google Scholar. Key search terms were used based on the project PICOT question. The terms searched in the databases were: telemedicine, telehealth, Peplau's interpersonal relations theory, and nurse-patient relationship(s). Three articles were found using these search terms but were not relevant to the project. No articles were found from the Google Scholar search. Additional search terms were added which included: nurse-client relationship, internet-based communication, information and communication technology, and virtual nursing care. A total of 23 articles were found using these search terms.

Three main concepts were repeated throughout the literature review. The concepts were central to the discussion regarding the impact of virtual nursing care to the nurse-patient relationship; interpersonal relationships between nurses and patients can occur in a technological environment; application of nurse theory in the virtual setting; and challenges with communication between the nurse and the patient. An important finding in the literature search was that nurses with more years of clinical experience, better communication skills, and higher levels of critical thinking skills provided better patient care in the virtual setting than nurses new to computer based platforms (Fagerstrom et al., 2017).

Peplau's interpersonal relations theory discussed the importance of FtF contact to create human relationships and connections. A concern of the virtual or internet-based platforms was related to the ability for humans to find a connection or create meaningful relationships without the FtF contact. A thorough theoretical analysis by Hrabe (2005) determined that Peplau's interpersonal relations theory was applicable and appropriate in the computer mediated platform.

Hrabe (2005) also found that communication between the nurse and the patient could *flourish* in the technologic environment.

Four expert opinions specifically discussed the needs, the growth, and application of nurse theory in the virtual setting. In 2018, the American Nurses Association (ANA) updated the *Core Principles of Telehealth* (Clarke, 2019). The primary purpose of the document was to provide 13 professional nursing principles about the use and security of patient data (American Nurses Association, 2018).

Three of the ANA core principles directly relate to the clinical practice change project. Principle number one states that the use of virtual healthcare technology cannot alter quality standards of professional practice when delivering healthcare. Principle number six states that healthcare normally provided in person must have the same standards of care and patient centered outcomes when providing virtual nursing care. Principle number seven states that the therapeutic value, integrity, and professional relationship must be “*established, maintained, and promoted*” (American Nurses Association, 2018, np) when providing virtual care to patients (American Nurses Association, 2018). Virtual nursing care was described as care provided by virtual reality, telephonic, audio, or video communication (Clarke, 2019).

Boston-Fleischhauer (2017) determined that the use of telehealth technologies by nurses has grown from outpatient settings including the intensive care unit (ICU). The use of telehealth by nurses continues to evolve as technology advances and nurses become experts with computer generated platforms. In 2000, the Institute of Medicine created new directives to use information technology (IT) effectively and safely in the health care setting. Based on that foundation, hospitals across the United States now use well-structured core computer-based processes as a daily activity and as an integrated part of the nursing culture (Boston-Fleischhauer, 2017).

Similar to the Hrabe (2017) theoretical analysis of Peplau's interpersonal relations theory in a computer-based nursing platform, Fronczek (2019) investigated the role of nursing theory in the virtual health care setting. Although technology provides greater access to care, Fronczek (2019) was concerned that the digital world would "dilute the art, science, and practice of nursing care" (Fronczek, 2019, p. 37). The project education intervention taught nurses that theory, art, and science of nursing care is possible and expected when providing virtual healthcare.

Multiple nursing theories can be successfully integrated into the realm of virtual nursing care (Fronczek, 2019). Orem's Self Care Theory, Peplau's interpersonal relations theory, and Roy's Adaptation Model are three theories that provide the foundation for the art and science of nursing to continue in the modern virtual world. Fronczek (2019) predicts that virtual nursing care will become universally expected from patients and an integral part of the future patient experience. The recommendation is to ensure that future nurses have a clear professional scope of practice that continues to be based on research, theory, and evidence-based results (Fronczek, 2019).

The final concept found in the literature review centered on the concerns and barriers that can exist when using virtual communication methods. Solli and Hvalvik (2019) described many ways in which computer mediated communication (CMC) improved caregiver skills and knowledge, however, significant challenges were noted which need to be considered during project implementation. The authors found that some patients were not able to adequately set up to use the computer equipment. Other patients had difficulty asking questions or requesting guidance from the nurse in the virtual setting (Solli & Hvalvik, 2019).

In many of the studies, patient difficulties were noted when using virtual technology (Fagerstrom, 2017; Bauce et al., 2018; Hrabe, 2005; Niznik et al., 2018; Solli & Hvalvik, 2019). Some patients with hearing impairments found it easier to hear the nurse while using CMC, while others found hearing the nurse more difficult. The web camera could be beneficial to enhance the relationship with the nurse, while in other situations, the web camera made the nursing assessment more difficult to complete than FtF examinations. Not all care can be provided using the virtual platform. Certain medical conditions must be assessed and treated in person (Fagerstrom et al., 2017).

Fagerstrom et al. (2017) found that nurses without adequate communication skills and fewer years of nursing experience often provided virtual care that was deemed less than satisfactory. The study revealed a direct correlation between the nurse's trust in the technology and the ability to successfully provide quality virtual nursing care (Fagerstrom et al, 2017). Nursing education for future students will need to contain core virtual nursing care content and competencies to maintain patient safety, quality care, and security of personal health information.

Significance of the Problem

Nursing practice traditionally involves visualization of the patient at the bedside when performing physical, psychological, and spiritual assessments. Holistic nursing assessments are most effective when the nurse and the patient have regular face-to-face interactions (Harrison et al., 2019). Due to the need for the preservation of PPE and promote social distancing during the COVID-19 crisis, the ability for many nurses to see the patients FtF was prohibited.

VA nurses voiced concern about the quality of care provided to veterans due to lack of FtF contact. Key areas of concern were patient safety and appropriate disease management

services in the absence of FtF communication. The nurse-patient relationship and meaningful communication were vital components of the nursing role (Fronczek, 2019). Subsequent discussions between nursing leadership and nurses from various areas of the hospital confirmed concerns with alternatives to FtF bedside communication with patients.

Project Implementation and Measures

Peplau's interpersonal relations theory is a middle range theory that describes six nurse roles and three phases of relationship development required to create therapeutic nurse-patient relationships. Connectedness is a key concept considered to be the path to a successful meaningful therapeutic nurse-patient relationship (Hrabe, 2005). Personal interaction, such as FtF communication, has been the traditional method of relationship building by nurses in the health care setting (Webb, 2018). The coronavirus pandemic interrupted bedside communication, causing nurses to consider how technology can bridge gaps created by social distancing and personal protective equipment mandates.

The six nurse roles in Peplau's theory include: stranger, resource, teacher, leader, surrogate, and counselor (Hrabe, 2005). As each of the nurse roles develop, the patient gains a sense of trust, safety, and confidence. These factors build the foundation for the nurse-patient relationship. To create a therapeutic nurse-patient relationship, the theory purports, the nurse must first be self-aware of biases, strengths, and barriers to personal connection (Hrabe, 2005). The nurse's understanding of *self* is critical to development of therapeutic relationships with patients, because without self-awareness, the nurse will have difficulty connecting with other human beings in positive or compassionate ways (Hrabe, 2005).

Figure 1

Peplau's Interpersonal Relations Theory

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Nurses with emotional intelligence and highly effective communication skills apply the components of this theory to guide the patient through the process of relationship development. Successful nurse-patient relationships are based on the patient's ability to feel safe and promote connection with the nurse. Once the connection has been established, fundamental nursing care can be accepted and welcomed by the patient (Hrabe, 2005). Peplau's interpersonal relations theory addressed the ability to create therapeutic connections between nurses and patients in the absence of a personal human physical presence.

There were three main objectives for this clinical practice change project; describe the group of registered nurses at this VA hospital who may use virtual health care technology (VHT) during the coronavirus pandemic; determine the current nurse perception of the benefits of VHT for communication and relationship building; and determine if an educational intervention will change nurse perception of using VHT to provide patient care.

The project was reviewed and approved by the Otterbein University Institutional Review Board (Appendix A) and the Southern Arizona VA Health Care System (SAVAHCS) Institutional Review Board (IRB) (Appendix B). Once the VA IRB approval was received on February 10, 2021, additional approvals were obtained by the SAVAHCS Nurse Executive and the facility American Federation of Government Employees (AFGE) union president.

On February 15, 2021, a letter was sent via email to 267 VA nurses as an invitation to participate in the project (Appendix E). A research information sheet was attached to the email to ensure that the participants were aware that the project was deemed to be a Category 3 Exempt project and that written consent was not required (Appendix F). Forty-two nurses responded with interest to participate in the project and the instructions on how to complete the three required project elements were sent as an additional email. The project was open for participation for two weeks, between February 15, 2021 and March 1, 2021. At the end of the two week period, a total of sixteen VA nurses completed all three project requirements.

The clinical practice change project used a pre-test/post-test design borrowing data collection and analysis techniques from both the quantitative and qualitative paradigms. The project measurement tool was adapted from Myers (2014), (Appendix D) to collect demographic information, and evaluate nurse perceptions using 5-option Likert type scales. Attitudes and beliefs of nurses about technology changes in nursing practice had been successfully evaluated by Myers (2014), (Appendix C) using mixed methods. Attempts to reach the authors of the original study were unsuccessful.

The clinical practice change project included five demographic items: age, gender, years of nursing experience, level of nursing education, and perceived level of expertise in technology. The questionnaire contained the same Myers (2014) attitude and belief questions, but the

questions were modified to specifically evaluate nurse perception of virtual healthcare technology. Free text items were included after each question to allow the participant to provide additional information.

Total time required to participate in the clinical practice change project was 50 minutes. The pre-education intervention questionnaire required ten minutes to complete. The education intervention video required 30 minutes to view. The post-education intervention questionnaire required ten minutes to complete. All three items were available at any time of day to participants through web-based platforms.

The clinical practice change project questionnaire was administered through Qualtrics, an Otterbein University electronic survey platform. Qualtrics is provided to Otterbein students at no cost. A total of sixteen nurses participated in the project during off duty hours. Participation in the project was completely voluntary. VA nurses participated during off duty time and did not receive any incentives, bonuses, or compensation for their time.

The total budget for the project was projected to be approximately, \$6,000, related largely to the salary of the VA nurse participants and the Otterbein faculty Primary Investigator. The actual cost of salary and time for the Otterbein faculty member was approximately \$3,000 which was \$3,000 less than projected. Costs to replicate the education intervention at VA facilities in the future are expected to be low since nursing salaries are already included in the facility budget. However, a positive financial impact is expected for facilities which choose to engage in more virtual health care technology due to increasing reimbursement rates by third party insurers for virtual nurse visits.

Analysis and Outcome Evaluation

Data from Qualtrics was imported to Excel for ease in data manipulation and calculation of descriptive statistics. The responses to the initial questions collecting demographic information were reviewed and collated, and descriptive statistics (mean, median, mode, range) were calculated for each of the five demographic variables.

Table 1

Variables

<i>Variable Name</i>	<i>Definition</i>	<i>Categorical Measure</i>	<i>Value(s)</i>
Years of Practice	Number of years practicing as a registered nurse	Ordinal Level	0-2 years 3-5 years 6-10 years 11-15 years 16-25 years >25 years
Age in Years	Age of participants in whole number years as of their last birthday	Ordinal Level	21-30 years 31-40 years 41-50 years 51-60 years >61 years
Education	Highest level of nursing education	Nominal Level	Diploma Registered Nurse Associate of Nursing Bachelor of Nursing Master's Degree Doctorate
Technology Experience	Number of years using telehealth technology in	Ordinal Level	0 years 1-5 years

<i>Variable Name</i>	<i>Definition</i>	<i>Categorical Measure</i>	<i>Value(s)</i>
	the participant's professional role		6-10 years >10 years
Gender	Participant's gender	Nominal Level	Male Female Other Prefer not to answer
Change	The change to virtual healthcare technology	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Updates	Found the updates informative in keeping me aware of the process and progress of the change to virtual healthcare technology	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Education Intervention	The virtual healthcare technology education was well organized with attainable goals	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Ongoing Support	Ongoing support to meet participant needs	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Input	Participant had opportunities to provide input into the virtual healthcare technology transition process	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
User Friendly	Participant felt that the virtual healthcare	Ordinal	Strongly agree

<i>Variable Name</i>	<i>Definition</i>	<i>Categorical Measure</i>	<i>Value(s)</i>
	technology was user friendly		Agree Neutral Disagree Strongly Disagree
Daily Function	Participant accepts the use of virtual healthcare technology as part of my daily job function	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Prior Use	Participant describes level of use of the virtual healthcare technology	Nominal	Novice Advanced Beginner Competent Proficient Expert
Communication	Participant perception that the use of virtual healthcare technology promotes effective communication between the nurse and the patient/family/caregiver	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Nurse-Patient Relationship	Participant perception that the use of virtual healthcare technology promotes nurse-patient relationship development	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Communication Barriers	Barriers to effective communication between nurses and patients exist when virtual healthcare technology is used	Ordinal	Strongly agree Agree Neutral Disagree Strongly Disagree
Nurse-Patient Relationship Barriers	Barriers to building nurse-patient relationships exist	Ordinal	Strongly agree Agree Neutral

<i>Variable Name</i>	<i>Definition</i>	<i>Categorical Measure</i>	<i>Value(s)</i>
	when virtual healthcare technology is used		Disagree Strongly Disagree
Impact		Ordinal	Significant Impact Some Impact Neutral Minimal Impact No Impact
Future Use		Ordinal	Very Likely Somewhat Likely Neutral Low Likelihood Not Likely at All

Table 2

Project Participant Demographics Post Education Intervention

Age	Gender	Years of Nursing Experience	Level of Nursing Education	Years of Experience with Technology
21-30 years (1)	Female (14)	0-2 years (1)	BSN (5)	0 years (7)
41-50 years (2)	Male (2)	6-10 years (3)	MSN (10)	1-5 years (8)
51-60 years (12)		11-15 years (2)	DNP (1)	6-10 years (1)
➤ 60 years (1)		16-25 years (3) >25 years (7)		
75% of participants were 51-60 years of age	88% of participants were female	44% of participants had over 25 years of nursing experience	63% of participants had achieved a Master's Degree in Nursing	44% of participants had little to no experience with virtual technology 50% of participants had 1-5 years of

Age	Gender	Years of Nursing Experience	Level of Nursing Education	Years of Experience with Technology
				experience with virtual technology

The participant responses to the 14 ordinal questions were collected and analyzed.

Difference scores were calculated for each subject (post minus pre) and then descriptive statistics were calculated (mean, median, mode, range). The relationship between demographic variables and changes in beliefs about virtual healthcare technology in this setting were explored.

Table 3

t-test Results Based on Questionnaire Variables

(Variable 1 = Pre-education Intervention/Variable 2 = Post-education Intervention)

Virtual Technology is Challenging, but Manageable

	Variable 1	Variable 2
Mean	4.391304348	4.933333333
Variance	0.339920949	0.066666667
Observations	23	15
Hypothesized Mean Difference	0	
df	33	
t Stat	-3.909353732	
P(T<=t) one-tail	0.000217432	
t Critical one-tail	1.692360309	
P(T<=t) two-tail	0.000434864	
t Critical two-tail	2.034515297	

Education was Organized with Attainable Goals

	Variable 1	Variable 2
Mean	3.611111111	4.4375
Variance	0.95751634	0.395833333
Observations	18	16
Hypothesized Mean Difference	0	
df	29	
t Stat	-2.960181765	
P(T<=t) one-tail	0.00303605	
t Critical one-tail	1.699127027	
P(T<=t) two-tail	0.0060721	
t Critical two-tail	2.045229642	

Updates were Informative

	Variable 1	Variable 2
Mean	3.944444444	4.6875
Variance	0.996732026	0.629166667
Observations	18	16
Hypothesized Mean Difference	0	
df	32	
t Stat	-2.414645406	
P(T<=t) one-tail	0.010821228	
t Critical one-tail	1.693888748	
P(T<=t) two-tail	0.021642456	
t Critical two-tail	2.036933343	

Received Enough Support

	Variable 1	Variable 2
Mean	3.684210526	4.4375
Variance	1.116959064	0.395833333
Observations	19	16
Hypothesized Mean Difference	0	
df	30	
t Stat	-2.606445873	
P(T<=t) one-tail	0.007055117	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	0.014110234	
t Critical two-tail	2.042272456	

Technology is User Friendly			Technology Promotes Relationships		
	Variable 1	Variable 2		Variable 1	Variable 2
Mean	3.55	4.125	Mean	3.5625	4.25
Variance	0.681578947	0.65	Variance	0.795833333	0.6
Observations	20	16	Observations	16	16
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	33		df	29	
t Stat	-2.103759399		t Stat	-2.327640532	
P(T<=t) one-tail	0.021551466		P(T<=t) one-tail	0.013557392	
t Critical one-tail	1.692360309		t Critical one-tail	1.699127027	
P(T<=t) two-tail	0.043102932		P(T<=t) two-tail	0.027114783	
t Critical two-tail	2.034515297		t Critical two-tail	2.045229642	

The t-test data indicated that the education intervention impacted participant responses in statistically significant ways. The $p < 0.05$ was unexpected and indicates that replication of the education intervention could positively impact the use of VHT in other VA facilities.

Figure 2

t-test Categories with $p < 0.05$

VHT is challenging but manageable	Values	Updates were informative	Values	VHT is user friendly	Values
p (T<t) one-tail	0.000217432	p (T<t) one-tail	0.010821228	p (T<t) one-tail	0.021551466
t Critical one-tail	1.6923600309	t Critical one-tail	1.693888748	t Critical one-tail	1.692360309
p (T<t) two-tail	0.000434864	p (T<t) two-tail	0.021643456	p (T<t) two-tail	0.043102932
t Critical two-tail	2.034515297	t Critical two-tail	2.036933343	t Critical two-tail	2.034515297

Results were triangulated by comparing the questionnaire results with the free-text response items to provide project investigators a systematic approach to facilitate discovery of underlying phenomena, meaning, and inferences contained within the nurse participant responses (Renz et al., 2018). The emerging themes were compared to the outcome of quantitative data analysis for that item for similarities and differences. These themes were compared to the outcomes from each items' quantitative result for similarities and differences.

Table 4

Emerging Themes

Result	Finding
(Pre 4.89) participants agree that using virtual technology is challenging, but manageable (Post 4.93)	More participants agreed that VHT was manageable after the education intervention.
(Pre 3.94) participants agree that they received updates about the transition to virtual technology (Post 4.69)	More participants agreed that received updates about the transition to VHT after the education intervention.
(Pre 3.61) participants agree that the education received about virtual technology was organized with attainable goals (Post 4.44)	More participants agreed that the education they received about VHT was organized with attainable goals after the education intervention.
(Pre 3.68) participants agree that they received support during the transition to virtual technology (Post 4.44)	More participants agreed that they received support during the transition after the education intervention.
(Pre 4.35) participants agree that using virtual technology is part of their daily job function (Post 4.67)	More participants agreed that VHT is part of their daily job function after the education intervention.
(Pre 4.19) participants agree that virtual technology promotes effective communication between the nurse and patient/family/caregiver (Post 4.47)	More participants agreed that VHT promotes effective communication after the education intervention.
(Pre 3.56) participants agree that virtual technology promotes nurse-patient relationships (Post 4.25)	More participants agreed that VHT promotes the nurse patient relationship after the education intervention.
(Pre 3.50) participant agree that barriers to building meaningful nurse-patient relationships when using virtual technology (Post 3.44)	More participants perceived that barriers exists to building meaningful nurse-patient relationships when using VHT. This is a negative finding.
(Pre 2.48) participants did not perceive that they had an input into the transition process (Post 2.67)	Most of the participants perceived that they had no input into the transition process to VHT. This is a negative finding.
(Pre 3.45) participants perceived that barriers to effective communication exist when using virtual technology (Post 3.20)	More participants perceived that barriers exists to having effective communication when using VHT. This is a negative finding.

Conclusion and Recommendation

Based on the outcomes that were measured and analyzed, the findings from this project are consistent with prior studies. Nurses who were included in the planning and implementation

of virtual health care technology had a greater understanding of the benefit and challenges of using VHT to provide nursing services to patients. Nurses who received continuous education and support through the transition to VHT believed that VHT was user friendly, promoted communication between the nurse and patients, and promoted the nurse-patient relationship.

The education intervention provided nurses with the theory behind interpersonal relationships, the instructions on how to use VHT, and provided guidance on how to perform effective patient visits with additional communication skills. The education intervention positively impacted the nurse perceptions about the benefits of using VHT to provide nursing care to patients. The data analysis concludes that VA facilities should ensure that nurses are involved in the planning and education of VHT prior to implementing the new method of patient care.

An interesting finding during the data analysis is that the education intervention did not change the perception that barriers could exist when using VHT. Nurses perceived that the patients could have difficulty using the technology due to knowledge deficits, hearing or vision loss, or difficulties connecting to the internet, especially in rural areas where bandwidth may be less available. A future project to assess the patient's perceptions about barriers and challenges with VHT would be beneficial to determine if the nurse perceptions about barriers are related to actual experiences or assumptions about the abilities of patients to use VHT.

Based on the review and analysis of all the data, the main recommendations from the project are that all VA hospitals:

- a) provide hospital nurses formal education about how to use VHT
- b) create VHT champions to each work area for trouble shooting any difficulties or challenges nurses may experience when using VHT

- c) provide ongoing support to reduce real or perceived barriers in communication or the ability to create a meaningful nurse-patient relationship when using VHT to provide patient care

Financial Implications

Besides the nursing education which helps nurses to see the benefits of VHT, VA facilities need to perform the cost/benefit analysis of a transition to virtual patient visits. The financial impact of using VHT for patient care directly relates to the cost of a virtual nursing visit by case managers versus the cost to care for patients through FtF visits. The average cost for FtF primary care visits is \$103 in the United States (Health Care Cost Institute, 2020).

The Centers for Medicare and Medicaid (CMS) released the new list of reimbursable telehealth service when COVID-19 became a pandemic (Centers for Medicare and Medicaid, 2020). United Health Care released a telehealth and telemedicine policy allowing nurses to perform office visits virtually and bill those office visits using codes 99211-99213 along with a CPT modifier to meet billing standards. Medical providers, ie: MDs, NPs, or PAs could use these codes and bill for office visits at the same rate of \$103, but the cost for nursing telehealth visits is less than the medical provider fee (United Health Care, 2020).

When patients receive virtual nursing care visits, the cost of the visit is less than if the patient came to the physician's office. Since telehealth services are now available in the inpatient and outpatient setting, case managers are able to provide the same level of service, at a lower cost to the patient. An additional positive financial impact is related to the long term reduction of costs due to decreased need for nursing resources such as overhead, staffing, and space when caring for veterans with virtual technologies.

The average overhead cost for a private practice primary care office is \$25,000 per month (InvestingDoc.com, 2020). The primary expenses are due to business overhead, such as staff wages and benefits, rent, and business equipment or software (InvestingDoc.com, 2020). Nurses are able to evaluate more patients a day using virtual technologies than when patient visits were FtF.

The space needed to perform those visits decreased from multiple patient exam rooms to one centralized location to perform telehealth examinations (Mills et al., 2020). Patient assessments require less staff than prior to the COVID-19 pandemic. Delays in care are reduced because of patient travel, traffic, or difficulties with ambulation do not exist when the virtual visit is performed in the patient's home (Mills et al., 2020). Using virtual nursing technology to perform patient assessments, reduced the overall cost of providing those same assessments in a FtF environment.

Expenses for nurse salaries are direct and fixed costs, however, productivity should increase due to the ability to see more veterans in a day using virtual technology than were able to be seen FtF. Concerns about adequate clinical space are reduced in the virtual nursing care environment. Nurses need only an office, a computer, a microphone or telephone, and a web camera to perform patient assessments (Mills et al., 2020). Multiple patient exam rooms are not necessary in the virtual patient care environment. This means that the facility can maximize the current clinical exam rooms for patients that must be evaluated in person.

Revenue from third party insurers will increase based on approved telehealth billing codes and modifiers (Mills et al., 2020). Nurses are able to provide quality care and improve patient outcomes using virtual health care technology. The clinical change project helps nurses to

understand the virtual health care technology available at the VA and feel more comfortable using the technology to provide patient care.

Limitations

Limitations in the project were due to the number of nurse participants available to complete all three required elements and the length of time available for participation. The low number of participants was expected due to extemporaneous staffing issues as a result of the current coronavirus crisis and the availability of nursing staff to take time away from their normal scheduled work day to participate in the project. The VA promotes nursing research activities and efforts, but during a pandemic, normal processes were paused and all extra project were relegated to off duty hours. The other limitation was the length of time nurses were able to participate in the project. After review of the data, the two-week time frame was not sufficient to allow nurses to participate. Future projects should consider a 30-day window to allow more nurses on various shifts to participate.

Summary

Nurses in traditional roles need guidance to embrace the change to a new healthcare environment and educators must prepare future nurses for endless possibilities to expand the profession. Nurses who embrace virtual health care technology to care for patients will positively impact the financial status of the VA and help create stability in these uncertain times in healthcare. Peplau's theoretical framework provides the structure for nurses to understand their roles when using a virtual platform and provides skills to create the human *connectedness*.

The ANA's *Core Principles of Telehealth* provides 13 professional nursing principles about the use and security of patient data which can further educate VA nurses on ways to provide safe and quality patient care when using VHT (Clarke, 2019). Academia may want to

consider adding elective advanced nursing courses to the curriculum which educate students on how to use virtual platforms to provide nursing care to patients. VA facilities with medical simulation centers may want to consider providing continuing education courses to teach medical staff, including nurses, on ways to effectively communicate and build relationships using VHT. Based on the current literature and project findings, the financial, medical, relationship, and communication benefits of virtual nursing care outweigh any challenges, concerns, or barriers.

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Appendix A

Figure 3

Otterbein IRB Approval


OTTERBEIN
 UNIVERSITY

INSTITUTIONAL REVIEW BOARD

☒ Original Review
☐ Continuing Review
☐ Amendment

Dear Dr. Chovan,

With regard to the employment of human subjects in the proposed research:


HS # 20/21-03
Chovan, Bryan-Couch & Gdovin: Improving VA nurse acceptance of virtual healthcare ...

THE INSTITUTIONAL REVIEW BOARD HAS TAKEN THE FOLLOWING ACTION:

<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Disapproved
<input type="checkbox"/> Approved with Stipulations*	<input type="checkbox"/> Waiver of Written Consent Granted
<input checked="" type="checkbox"/> Limited/Exempt/Expedited Review	<input type="checkbox"/> Deferred

* Once Stipulations stated by the IRB have been met by the investigator, then protocol is APPROVED.

- As Principal Investigator, you are responsible for ensuring that all individuals assisting in the conduct of the study are informed of their obligations for following the IRB-approved protocol.
- It is the responsibility of the Principal Investigator to retain a copy of each signed consent form for at least four (4) years beyond the termination of the subject's participation in the proposed activity. Should the Principal Investigator leave the university, signed consent forms are to be transferred to the IRB for the required retention period.
- If this was a limited, exempt, or expedited review, there is no need for continuing review unless the investigator makes changes to the proposed research.
- If this application was approved via full IRB committee review, the approval period is one year, after which time continuing review will be required.
- You are reminded that you must promptly report any problems to the IRB, and that *no procedural changes may be made without prior review and approval*. You are also reminded that the identity of the research participants must be kept confidential.

Date: 04 Sept 2020 Signed: 
 Chairperson

(Revised January 2019)

Appendix B

Figure 4

*VA IRB Approval***Department of
Veterans Affairs****Memorandum**

Date: 02/09/2021

From: Chair, Research and Development Committee (R&DC) (11-151)

To: Gloria Gdovin, DNP

Project: SAVAHCS Project No. 1588929 / Evaluating VA nurse acceptance of virtual healthcare technology during the coronavirus outbreak.

1. You are hereby notified that the above project has been approved using the R&DC Designated Review Procedure, and all relevant committees and subcommittees.

R&DC Approval Date: 02/09/2021.

R&DC Expiration Date: 02/08/2022.

2. Your ePromise project number is 0001.
3. Any changes to this study, i.e. protocol revisions or amendments, must be submitted to the appropriate subcommittee(s) and/or R&DC for review and approval **prior** to implementation.
4. The Research Office makes every effort to notify Principal Investigators when Continuing Review Reports are due; however, it is the responsibility of the Principal Investigator to provide Continuing Review Reports to the appropriate subcommittee(s) 45 days prior to the expiration date(s).
5. You are now authorized to initiate your research project. If you have questions, you may contact Elleen Martin, R&DC Administrator, via phone: 520-792-1450, ext. 1-6327; or email: Elleen.Martin@va.gov.

Kristen M.
Pellingra 298051
Kristen Pellingra, PharmD
For:
Barbara Bode, MD
Acting, Chair, R&D Committee

Digitally signed by Kristen
M. Pellingra 298051
Date: 2021.02.09
15:52:41 -07'00'

Stephen P.
Thomson 389570
Stephen Thomson, MD
Acting Associate Chief of Staff
Research Service

Digitally signed by Stephen
P. Thomson 389570
Date: 2021.02.09 16:04:08
-07'00'

Appendix C

Figure 5

Measurement Tool: Myers (2014) Attitudes and Beliefs of Registered Nurses About the Process of Changing to an Electronic Medical Record in a Community Hospital

Survey Questions

Please select one response for each question

How many years have you been a licensed nurse?

What is your age: 21 – 30 ____, 31-40 ____, 41-50 ____, 51-60 ____, 61 + ____

How much experience with electronic medical records have you had in the past?

None ____, 1-5 years ____, 5-10 years ____, 10+ years ____

Male/Female _____

The following questions relate to your experience with the recent EMR initiative:

- 1) The change to electronic medical records (EMR) is challenging but manageable.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 2) I found the updates informative in keeping me aware of the process and progress of the EMR change.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 3) The education I received was well organized with attainable goals.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 4) I received enough ongoing support to meet my needs.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 5) I had opportunities to provide input into the EMR transition process.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 6) The EPIC system is user friendly.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 7) I accept the use of EMR as part of my daily job function.
 ____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree
- 8) Which best describes your use of the *paper* charting system?
 ____ novice, ____ advanced beginner, ____ competent, ____ proficient, ____ expert
- 9) Which best describes your use of the EPIC/ EMR system?
 ____ novice, ____ advanced beginner, ____ competent, ____ proficient, ____ expert

Please add thoughts and experiences regarding the change from paper charting to EMR

Appendix D

Figure 6

Adapted Myers (2014) Measurement Tool

Adapted Version of the Myers (2014) Instrument

Survey Questions

Please select one response for each question.

1. How many years have you been a licensed nurse?

____ 0-2 years ____ 3-5 years ____ 6-10 years ____ 11-15 years ____ 16-25 years
____ >25 years

2. What is your age?

____ 21 -30 years ____ 31-40 years ____ 41-50 years ____ 51-60 years ____ >60 years

3. What is the highest level of nursing education completed?

____ Diploma ____ Associate's Degree ____ Bachelor's Degree ____ Master's
____ Doctorate ____ other (please explain) _____

4. How much experience with virtual healthcare technology have you had in the past?

____ 0 years ____ 1-5 years ____ 6-10 years ____ >10 years

5. Please identify your gender:

____ Male ____ Female ____ Other ____ Prefer not to answer

The following questions are based on a 5 point Likert Scale and relate to your experience with virtual healthcare technology. Please add comments as appropriate.

Strongly agree (5) Agree (4) Neutral (3) Disagree (2) Strongly disagree (1)

1) The change to virtual healthcare technology is challenging but manageable

____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree

Comments:

2) I found the updates informative in keeping me aware of the process and progress of the change to virtual healthcare technology

____ strongly agree, ____ agree, ____ neutral, ____ disagree, ____ strongly disagree

Comments:

- 3) The virtual healthcare technology education I received was well organized with attainable goals

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

- 4) I received enough ongoing support to meet my needs

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

- 5) I had opportunities to provide input into the virtual healthcare technology transition process

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

- 6) The virtual healthcare technology is user friendly

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

- 7) I accept the use of virtual healthcare technology as part of my daily job function

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

- 8) Which best describes your use of the virtual healthcare technology?

_____ novice, _____ advanced beginner, _____ competent, _____ proficient, _____ expert

Comments:

- 9) The use of virtual healthcare technology promotes effective communication between the nurse and the patient/family/caregiver

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

10) The use of virtual healthcare technology promotes nurse-patient relationship development

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

11) Barriers to effective communication between nurses and patients exist when virtual healthcare technology is used

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

12) Barriers to meaningful building nurse-patient relationships exist when virtual healthcare technology is used

_____ strongly agree, _____ agree, _____ neutral, _____ disagree, _____ strongly disagree

Comments:

13) Please indicate the level of impact COVID-19 has changed how you feel about using the telehealth technology?

_____ significant impact, _____ some impact, _____ neutral, _____ minimal impact,

_____ no impact

Comments:

14) Please indicate the likelihood that you will use virtual healthcare technology to perform your duties after the coronavirus is managed.

_____ very likely, _____ somewhat likely, _____ neutral, _____ low likelihood,
_____ not likely at all

Comments:

Please add any other thoughts or experiences regarding the change from face to face patient care to virtual healthcare technology to perform nursing visits.

Comments:

Appendix E

Figure 7

Clinical Practice Change Recruitment Letter



DEPARTMENT OF VETERANS AFFAIRS
Southern Arizona Medical Center
3601 S. 6th Ave
Tucson, Az 85723

To: VA RN Case Managers
VA Clinical Nurse Managers
AFGE Union Leadership

Re: DNP Clinical Practice Change Project

From: Francesca Bryan-Couch, MSN
Otterbein University DNP Student

Hello,

My name is Francesca Bryan-Couch and I am the Chief of Care Coordination. I am also a Doctor of Nursing Practice (DNP) student at Otterbein University. As part of my academic curriculum, I am required to complete a Clinical Practice Change Project.

Project Title: Evaluation of VA nurse acceptance of virtual healthcare technology during the coronavirus outbreak.

PICOT: (P) In VA nurse Case Managers working in a regional VA system, (I) does an educational intervention, (C) compared to current process (no educational intervention), (O) affect the perceptions of the use of virtual healthcare technology on the nurse-patient relationship?

This letter is a personal invitation to actively participate in the clinical practice change project.

Requirements: Participate in a pre and post online questionnaire about your perceptions of virtual healthcare technology and a 30 minute education session about virtual healthcare technology available at the VA. The recorded education session and questionnaires can be accessed at any time of day or night from any computer. Total participation time is 50 minutes.

Risks: There are no known physical or psychological risks for project participants. All questionnaire responses are anonymous to reduce bias, personal or professional identification, or cyber security concerns.

Compensation: Participation in the clinical practice change project is completely voluntary and no type of compensation will be provided to participants.

If you are willing to participate in the project, please complete and sign the attached consent form.

Thank you for your support of nursing evidence based practice,

Francesca Bryan-Couch, MSN

Appendix F

Figure 8

Research Information Sheet

Research Information Sheet
<p>This is a Category 3 Exempt research study. By choosing to participate, you are aware that this activity is research.</p>
<p>Researcher(s): SAVAHCS Primary Investigator: Dr. Gloria Gdovin, DNP, and Project Lead: Francesca Bryan-Couch, MSN</p>
<p>Title of Project: Evaluating VA nurse acceptance of virtual healthcare technology during the coronavirus outbreak.</p>
<p>We are asking for your voluntary participation in a clinical practice change project. Please read the following information about the project. If you would like to participate, please email the project coordinator, Francesca Bryan-Couch.</p>
<p>Voluntary Participation: Participation in this study is completely voluntary. If you decide not to participate there will not be negative consequences. Please be aware you may choose not to answer any specific question. Participants can stop participating at any time by not completing the items requested in the project.</p>
<p>Permission to participate can be withdrawn at any time. Permission for use of data can be withdrawn for exempt research activities involving the collection and use of identifiable data.</p>
<p>Purpose of the Project: To change the perception of the nurse-patient relationship while using virtual healthcare technology in a group of RN Case Managers at the VA.</p>
<p>If you participate, you will be asked to: Complete an online pre-education intervention questionnaire (10 minutes), listen to a pre-recorded power point education session (30 minutes), and complete an online post-education intervention questionnaire (10 minutes). Your permission to participate can be withdrawn at any time. Your permission for use of your data can be withdrawn for exempt research activities involving the collection and use of identifiable data.</p>
<p>If you have any questions about this study, feel free to contact SAVAHCS Primary Investigator: Gloria Gdovin at 520-792-1450/1-4418 or gloria.gdovin@va.gov</p>

Raw Data

[illegible]

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	
1 Q8 Pre	Q8 Post	Q8 Pre	Q8 Post	Q9 Pre	Q9 Post	Q10 Pre	Q10 Post	Q11 Pre	Q11 Post	Q12 Pre	Q12 Post	Q13 Pre	Q13 Post
2 Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.	Please indicate your level of agreement with the statement.
3 Advanced beginner	Advanced beginner	Strongly agree	Strongly agree	Comments	Agree	Somewhat agree	Somewhat disagree	Somewhat disagree	Somewhat disagree	Somewhat disagree	Significant impact	Significant impact	
4 Competent	Competent	Somewhat agree	Somewhat agree	Strongly agree	Strongly agree	Neither agree nor disagree	Somewhat agree	Somewhat disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Significant impact	
5 Competent	Competent	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Neither agree nor disagree	Strongly agree	Strongly disagree	Strongly disagree	Neither agree nor disagree	Strongly agree	Significant impact	
6 Competent	Expert	Somewhat agree	Somewhat agree	Strongly agree	Agree	Strongly agree	Strongly disagree	Neither agree nor disagree	Strongly agree	Strongly agree	Strongly agree	Significant impact	
7 Proficient	Competent	Strongly agree	Strongly agree	Strongly agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Strongly agree	Significant impact	
8 Competent	Competent	Somewhat agree	Strongly agree	Strongly agree	Neither agree nor disagree	Somewhat agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Somewhat agree	Significant impact	
9 Competent	Competent	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly disagree	Somewhat agree	Strongly disagree	Strongly disagree	Somewhat agree	Significant impact	
10 Expert	Novice	Strongly agree	Strongly agree	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat agree	Strongly disagree	Strongly disagree	Somewhat agree	Significant impact	
11 Competent	Novice	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree	Significant impact	
12 Competent	Proficient	Strongly agree	Strongly agree	Strongly agree	Agree	Strongly agree	Strongly agree	Strongly disagree	Strongly agree	Strongly agree	Strongly disagree	Significant impact	
13 Competent	Proficient	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Significant impact	
14 Competent	Novice	Neither agree nor disagree	Somewhat agree	Neither agree nor disagree	Somewhat agree	Somewhat disagree	Somewhat disagree	Somewhat agree	Neither agree nor disagree	Somewhat agree	Significant impact	Significant impact	
15 Novice	Novice	Strongly agree	Somewhat disagree	Agree	Somewhat disagree	Neither agree nor disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Somewhat agree	Significant impact	Significant impact	
16 Novice	Novice	Somewhat agree	Strongly agree	Agree	Strongly agree	Somewhat agree	Strongly agree	Comments	Somewhat agree	Somewhat disagree	Significant impact	Significant impact	
17 Novice	Competent	Strongly agree	Strongly agree	Strongly disagree	Strongly agree	Strongly agree	Strongly agree	Strongly disagree	Strongly agree	Strongly disagree	Significant impact	Significant impact	
18 Proficient	Novice	Somewhat agree	Somewhat agree	Neither agree nor disagree	Somewhat agree	Somewhat agree	Somewhat agree	Somewhat agree	Neither agree nor disagree	Somewhat agree	Significant impact	Significant impact	
19 Novice		Neither agree nor disagree		Somewhat agree		Somewhat agree		Somewhat agree		Somewhat agree	Significant impact		
20 Novice		Neither agree nor disagree		Neither agree nor disagree		Somewhat agree		Somewhat agree		Strongly agree	Significant impact		
21 Advanced beginner		Neither agree nor disagree		Neither agree nor disagree		Somewhat agree		Somewhat agree		Strongly agree	Significant impact		
22 Advanced beginner		Somewhat agree		Disagree		Somewhat agree		Somewhat agree		Neither agree nor disagree	Minimal impact		
23 Comments				Strongly agree		Neither agree nor disagree		Somewhat agree		Neither agree nor disagree	Significant impact		
24 Novice				Neither agree nor disagree		Somewhat agree		Somewhat agree		Strongly agree	Significant impact		
25 Advanced beginner				Somewhat agree							Significant impact		

AK	AL
Q14 Pre	Q14 Post
Please indicate the likelihood of the statement being true.	Please indicate the likelihood of the statement being true.
Very likely	Very likely
Somewhat likely	Very likely
Very likely	Very likely
Low likelihood	Very likely
Very likely	Very likely
Very likely	Somewhat likely
Very likely	Very likely
Very likely	Somewhat likely
Somewhat likely	Very likely
Very likely	Low likelihood
Very likely	Not likely at all
Neutral	
Very likely	Comments
Very likely	Very likely
Very likely	Low likelihood
Neutral	
Very likely	
Low likelihood	
Low likelihood	
Low likelihood	
Neutral	
Somewhat likely	

Table 6

Analyzed Data

	A	B	C	D	E	F	G	H	I	J	K
1	Data Analysis Worksheet - Dummy Data										
2	Francesca Bryant-Couch, Project Lead										
3	As of:		2/9/2021								
4											
5	t-Test: Two Sample Assuming Unequal Variances										
6											
7	CHAL/MANAG			ORG ATTAIN			INPUT				
8	G			I			K				
9		Variable 1	Variable 2			Variable 1	Variable 2			Variable 1	Variable 2
10	Mean	4.391304348	4.933333333		Mean	3.611111111	4.4375		Mean	2.476190476	2.666666667
11	Variance	0.339920949	0.066666667		Variance	0.95751634	0.395833333		Variance	0.861904762	2.095238095
12	Observations	23	15		Observations	18	16		Observations	21	15
13	Hypothesized Mean Difference	0			Hypothesized Mean Difference	0			Hypothesized Mean Difference	Variable 1	
14	df	33			df	29			df	22	
15	t Stat	-3.909353732			t Stat	-2.960181765			t Stat	-0.448054487	
16	P(T<=t) one-tail	0.000217432			P(T<=t) one-tail	0.00303605			P(T<=t) one-tail	0.329247583	
17	t Critical one-tail	1.692360309			t Critical one-tail	1.699127027			t Critical one-tail	1.717144374	
18	P(T<=t) two-tail	0.000434864			P(T<=t) two-tail	0.0060721			P(T<=t) two-tail	0.658495165	
19	t Critical two-tail	2.034515297			t Critical two-tail	2.045229642			t Critical two-tail	2.073873068	
22	UPD INFORM			SUPP			FRIEND				
23	H			J			L				
24		Variable 1	Variable 2			Variable 1	Variable 2			Variable 1	Variable 2
25	Mean	3.944444444	4.6875		Mean	3.684210526	4.4375		Mean	3.55	4.125
26	Variance	0.996732026	0.629166667		Variance	1.116959064	0.395833333		Variance	0.681578947	0.65
27	Observations	18	16		Observations	19	16		Observations	20	16
28	Hypothesized Mean Difference	0			Hypothesized Mean Difference	0			Hypothesized Mean Difference	0	
29	df	32			df	30			df	33	
30	t Stat	-2.414645406			t Stat	-2.606445873			t Stat	-2.103759399	
31	P(T<=t) one-tail	0.010821228			P(T<=t) one-tail	0.007055117			P(T<=t) one-tail	0.021551466	
32	t Critical one-tail	1.693888748			t Critical one-tail	1.697260887			t Critical one-tail	1.692360309	
33	P(T<=t) two-tail	0.021642456			P(T<=t) two-tail	0.014110234			P(T<=t) two-tail	0.043102932	
34	t Critical two-tail	2.036933343			t Critical two-tail	2.042272456			t Critical two-tail	2.034515297	

	H	I	J	K	L	M	N	O	P	Q	R	S
6												
7		INPUT				ACCEPT				EFF COMM		
8		K				M				O		
9			<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>
10		Mean	2.476190476	2.666666667		Mean	4.35	4.666666667		Mean	4.19047619	4.466666667
11		Variance	0.861904762	2.095238095		Variance	0.765789474	0.380952381		Variance	0.761904762	0.695238095
12		Observations	21	15		Observations	20	15		Observations	21	15
13		Hypothesized Mean Difference	<i>Variable 1</i>			Hypothesized Mean Difference	0			Hypothesized Mean Difference	0	
14		df	22			df	33			df	31	
15		t Stat	-0.448054487			t Stat	-1.254813968			t Stat	-0.960812865	
16		P(T<=t) one-tail	0.329247583			P(T<=t) one-tail	0.109180344			P(T<=t) one-tail	0.172040539	
17		t Critical one-tail	1.717144374			t Critical one-tail	1.692360309			t Critical one-tail	1.695518783	
18		P(T<=t) two-tail	0.658495165			P(T<=t) two-tail	0.218360689			P(T<=t) two-tail	0.344081077	
19		t Critical two-tail	2.073873068			t Critical two-tail	2.034515297			t Critical two-tail	2.039513446	
22		FRIEND				USE				PROMO REL		
23		L				N				P		
24			<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>
25		Mean	3.55	4.125		Mean	2.409090909	2.5		Mean	3.5625	4.25
26		Variance	0.681578947	0.65		Variance	1.300865801	1.866666667		Variance	0.795833333	0.6
27		Observations	20	16		Observations	22	16		Observations	16	16
28		Hypothesized Mean Difference	0			Hypothesized Mean Difference	0			Hypothesized Mean Difference	0	
29		df	33			df	29			df	29	
30		t Stat	-2.103759399			t Stat	-0.216821164			t Stat	-2.327640532	
31		P(T<=t) one-tail	0.021551466			P(T<=t) one-tail	0.414932923			P(T<=t) one-tail	0.013557392	
32		t Critical one-tail	1.692360309			t Critical one-tail	1.699127027			t Critical one-tail	1.699127027	
33		P(T<=t) two-tail	0.043102932			P(T<=t) two-tail	0.829865845			P(T<=t) two-tail	0.027114783	
34		t Critical two-tail	2.034515297			t Critical two-tail	2.045229642			t Critical two-tail	2.045229642	

T	U	V	W	X	Y	Z	AA
BAR EFF					COVID		
Q					S		
	<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>	
Mean	3.454545455	3.2			Mean	1.52173913	1.25
Variance	1.021645022	1.457142857			Variance	0.533596838	0.2
Observations	22	15			Observations	23	16
Hypothesized Mean Difference	0				Hypothesized Mean Difference	0	
df	27				df	37	
t Stat	0.671763581				t Stat	1.438198758	
P(T<=t) one-tail	0.253720948				P(T<=t) one-tail	0.079391426	
t Critical one-tail	1.703288446				t Critical one-tail	1.68709362	
P(T<=t) two-tail	0.507441896				P(T<=t) two-tail	0.158782852	
t Critical two-tail	2.051830516				t Critical two-tail	2.026192463	
BAR MEAN					POST-COVID		
R					T		
	<i>Variable 1</i>	<i>Variable 2</i>			<i>Variable 1</i>	<i>Variable 2</i>	
Mean	3.5	3.4375			Mean	2 1.857142857	
Variance	1.119047619	1.595833333			Variance	1.5 1.978021978	
Observations	22	16			Observations	21	14
Hypothesized Mean Difference	0				Hypothesized Mean Difference	0	
df	29				df	25	
t Stat	0.161049644				t Stat	0.309743377	
P(T<=t) one-tail	0.436585507				P(T<=t) one-tail	0.379661631	
t Critical one-tail	1.699127027				t Critical one-tail	1.708140761	
P(T<=t) two-tail	0.873171013				P(T<=t) two-tail	0.759323262	
t Critical two-tail	2.045229642				t Critical two-tail	2.059538553	