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## Traumatic Brain Injuries: A Telehealth Alternative for Veterans

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Traumatic Brain Injuries: A Telehealth Alternative for Veterans

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Doctor of Nursing Practice Project Presented to the  
Faculty of Graduate Studies  
University of Missouri – St. Louis

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In Partial Fulfillment of the Requirements  
for the Degree of Doctor of Nursing Practice

by

JESSICA DICKMAN, MSN, RN, SCRNP

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DNP Committee Chair Laura Kuensting

DNP Committee Member Roberta Lavin

DNP Committee Member Amy Alter

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### **Abstract**

*Problem:* Traumatic Brain Injuries (TBI) are known as the signature wound of veterans serving in Operation Enduring Freedom (OEF) and the Operation Iraqi Freedom (OIF). After the initial TBI diagnosis, outpatient TBI follow-up rates are reported to be approximately 9% less in the Veteran Healthcare Administration (VA) system when compared to the private sector. The purpose of this quality initiative was to decrease the rate of missed appointments among OEF/OIF veterans using a telehealth alternative.

*Methods:* The Plan-Do-Study-Act (PDSA) method was used to implement a consistent process for the telehealth visit option. A retrospective medical record review over the same 60-day period in 2017 and 2018 compared rates of in-person with telehealth visits.

*Results:* A total of 397 visits ( $N=397$ ) in 2018 occurred. Most were in-person visits ( $n=382$ ) with few telehealth visits ( $n=15$ ); however, 73% of telehealth users had a history of missed appointments. The total rate of missed appointments declined from 30.5% in 2017 to 24.5% in 2018. The mean of 2017 missed appointments ( $M = 31.25, SD=1.08$ ) was higher than the mean of 2018 missed appointments ( $M = 24.83, SD 4.26$ ). The difference between the two means is statistically significant at the .05 level ( $t = 3.68, df=7, p = .014$ ).

*Implications for Practice:* Physical travel to appointments impacted patients who had a history of difficulty accessing TBI care. The TBI outpatient population could attend an appointment using a telehealth alternative for clinic visits. The VA Connect Application provided a feasible alternative to a traditional in-person

visit. Increasing access to TBI care may enhance recovery and quality of life for veterans.

### Traumatic Brain Injuries: A Telehealth Alternative for Veterans

Traumatic Brain Injuries (TBI) are a significant health problem in the United States (US) and are characterized by injuries caused from external forces to the head (US Department of Veterans Affairs, 2017). TBIs are known as the signature wound of veterans serving in Operation Enduring Freedom (OEF) and the Operation Iraqi Freedom (OIF), as opposed to other conflicts, due to the elevated incidence of blast injuries caused by improvised explosive devices, rocket-propelled grenades, and landmines (Bagalman, 2013).

Within the Veterans Healthcare Administration (VA), TBI treatment is foundational, and a Polytrauma System of Care (PSC) exists to ensure comprehensive, multidisciplinary care for service-connected military personnel and established veterans with TBI (Bagalman, 2013). Nearly 400,000 veterans from all eras have been diagnosed with a condition associated with TBI's, though 53% of the 1.4 million OEF/OIF veterans who completed their active duty between the fiscal years of 2002-2011 have enrolled with the VA for medical treatment, despite the VA's coordinated care system for TBI. (Bagalman, 2013; Defense Medical Surveillance System, Theater Medical Data Store Armed Forces Health, Surveillance Branch, 2017). Within the PSC, 30-60% of patient's follow-up with specialists as recommended, which varied based on the location of the VA facility (Defense Medical Surveillance System, Theater Medical Data Store Armed Forces Health, Surveillance Branch, 2017). Demographic and socioeconomic elements, such as physical, mental and/or cognitive limitations, educational status, location of living, financial stability, lack of access to necessary resources, limited access to shelter, food, water, transportation, or other

communicative means, directly affect follow-up care acquisition. (Yue et al., 2016). More specifically, post-deployment, veterans experience additional barriers to follow-up acquisition that comprise of monetary, social and academic demands accompanying reestablishment into society (Yue et al., 2016).

The purpose of this quality initiative was to improve the rate of follow-up appointments among outpatient TBI clinic visits at a Midwestern VA network PSC site. While focusing on OEF/OIF veterans, the intent was to use a telehealth alternative called 'VA Connect' with patients aged 18-59 years seen at a VA TBI clinic in a metropolitan, Midwestern region to mitigate transportation barriers to appointments. The disciplines of nursing, psychology, speech pathology, and case management took part in the initiative. The project questions were:

1. What was the rate of usage of the VA Connect virtual visits compared with face-to-face visits during a 60-day period between March 1<sup>st</sup>, 2018 -April 30<sup>th</sup>, 2018?
2. What was the rate of follow-up visits during a 60-day period between February 1<sup>st</sup>, 2017 through May 1<sup>st</sup>, 2017 when compared to the same time frame in 2018?

### **Literature Review**

A review of the Cochrane Library, CINAHL, guidelines.gov, VA Synthesis Program, and the AHRQ was conducted for the period 2011 to 2017. Keywords searched included TBI, follow-up, compliance, telehealth, and VA. Articles were reviewed based on six criteria and summarized in an evidence table. Evaluation criteria included accuracy, authority, objectivity, the currency of information, quality of evidence and relevance to the topic. Inclusion criteria

included systematic reviews, randomized control trials, cohort studies, case-control studies, Framingham variable (age 18 and older), and minimum outcomes: follow-up rates in a clinic setting. Exclusion criteria included studies with no data, no feature of the Framingham variable, or the topic did not examine either the use of telehealth, TBI outcomes, or follow-up compliance in the outpatient setting. Additional data metrics were acquired through the utilization of relevant government databases using the same criteria as previously described. Initially, there were 81 publications found and 35 selected as relevant to this project.

TBI is a chronic disease that is a result of an acute physical injury to the head evidenced by one or more of the following sequelae: irritability, fatigue, insomnia, depression, headaches, anxiety, short-term memory loss, epilepsy, tinnitus, loss of libido, headache, or incontinence (Gano, Kean, Renshaw, Kernandez & Willis, 2016). De Konig et al. (2017) found an early diagnosis and regular outpatient follow-up visits by various medical specialists, irrespective of hospital admittance, was central to TBI care that aligns with current practice guidelines (CPG). The findings of the systematic review of the literature revealed use of CPGs for TBI is essential to decrease levels of disability and mortality among this population (Patel et al., 2016).

The burden of TBI's has increased among veteran's related to the nature of combat and exposure to blast injuries over the past few decades (Malec, Van Houtven, Taniellian, Atizado, & Dorn, 2016). Guidelines created by the VA and recommended by the Brain Trauma Foundation, are adopted at VA facilities nationwide, although follow-up compliance from the patient is hard to achieve. This may be a result of the lack of recommendation for specific multidisciplinary

follow-up patterns (Patel et al., 2016). Assured follow-up among TBI patients remains essential for improved outcomes but is a challenge to accomplish post discharge (Malec et al., 2016). Within the VA and private sector, nearly two-thirds of all TBI patients consult one or more specialists within the first six months after diagnosis (de Konig et al., 2017). Outpatient TBI follow-up rates are reported to be approximately 9% less in the VA system when compared to the private sector. About 30% of patients receiving care within the VA system had an unfavorable outcome compared to the private sector (CDC, 2017; de Konig et al., 2017). Hence, the VA may have limitations in access to care when compared to the private healthcare sector (Hernandez, Scholten & Moore, 2015).

The consequences of a TBI include lifelong physical, cognitive, behavioral, and emotional deficits for the afflicted individual and their social support systems (US Department of Veterans Affairs, 2017). US veterans are a multidimensional population that have an experience of one or more years with exposure to specific values, codes of conduct, patterns of communication, and obedience to command that deviate from basic civilians (Olenick, Flowers & Diaz, 2015). Given the physiology of TBI and military background, veterans with TBI are at increased risk for mental health disorders, post-traumatic stress, and suicide (Dobolt et al., 2015; Olenick et al, 2015). Approximately 49,933 of US veterans are homeless with two out of 10 veterans having post-traumatic stress, and one out of every three have substance abuse disorders (Olenick et al., 2015; US Department of Veterans Affairs, 2015). Veteran's aged 18-44 years with a diagnosis of TBI are 1.55 times more likely to commit suicide at one year post injury compared to those without a TBI history (Godbolt et al., 2015).



Adjustment to life after TBI is a time consuming process , reliant on long-term multidisciplinary care for the individual and associated support systems (Straits-Troster et al., 2013). An open clinical trial noted five difficult tasks common among TBI patients and their families: 1) reducing isolation, 2) building coping skills, 3) restoring relationships through effective communication strategies, 4) improving knowledge regarding the interconnection between TBI and posttraumatic stress disorder, and 5) increasing the treatment engagement of veterans and families (Straits-Troster et al., 2013). All five challenges suggested the need for innovative healthcare alternatives for TBI patients such as a virtual visit via an electronic connection.

At least 1.4 million OEF/OIF veterans are eligible for healthcare services within the VA but have not registered to claim them, thus representing a gap in care within the system (Bagalman, 2013). Currently, there are approximately 22 million US veterans with only 8.9 million enrolled in the VA healthcare system with an estimated 61% of OEF/OIF veterans who have elected to use private healthcare indicating veterans are opting for civilian medical care facilities as opposed to VA healthcare options (Olenick et al., 2015). Despite the advances in TBI treatment pioneered in the VA, veterans do not register for VA healthcare benefits, present for initial evaluations, or seek follow-up care as recommended by their providers (US Department of Defense, 2017). Some studies have examined potential motives for veterans not seeking healthcare within the VA system (Corrigan et al., 2003; De konig et al., 2017; Godbolt et. al., 2015; Lew et al., 2008; Ponsford et al., 2014). Service-connected individuals may not disclose or recognize mental health symptoms to avoid any complications with benefits,

pay, or assignments (Tanielian & Jaycox, 2008). Cognitive impairments due to TBI and lack of resources such as money, transportation, and technology may compromise a veterans' ability to seek care or navigate the system (Lew et al., 2008). Finally, veterans may not be fully aware of physical, social, or cognitive changes in their functions due to the complex and sometimes ambiguous sequelae of TBI (Vanderploeg, Belanger, Duchnick, & Curtiss, 2008).

Since 2005, the VA's PSC offers triage by degree of brain injury and the geographic location of the patient (Bagalman, 2013; Centers for Disease Control and Prevention [CDC], 2017). The VA has segmented its health care coverage into regions called Veteran Service Integrated Networks (VISN) with five PSC TBI hubs offered in all 18 geographic VISN's. These hubs can provide direct patient care and consultative services that meet practice guidelines (Bagalman, 2013). To date, there are 23 network centers in the US able to provide specialized post-acute care for veterans (Bagalman, 2013). Eighty-seven VA centers do not offer polytrauma specialized rehabilitation services for TBI patients, and 38 VA centers do not have adequate resources suitable for TBI patients (Bagalman, 2013). The CDC (2017) reported the existence of the VA's PSC has proven impactful to TBI morbidity and mortality outcomes in the US citing a 2.5% decrease in hospitalizations and a 5% decrease in mortality rates from 2007-2013 (CDC, 2017). Still, lack of consistent follow-up among TBI patients and veterans post deployment has caused TBI-related Emergency Department (ED) visits up 47% in the past 10 years (CDC, 2017).

Lack of follow-up is a problem inherent to the TBI population due to the physical, social, and cognitive barriers that accompany the sequelae of the disease

(Corrigan et al., 2003; de Konig et al., 2017). Variables most frequently associated with lack of follow-up include low-income, limited transportation, substance abuse, and those with other violent injury etiologies (Corrigan et al., 2003). In 2015, only 30% of OEF/OIF/OND veterans being treated for TBI, sustained TBI from a violent injury (CDC, 2017). Many veterans are living with post-traumatic stress disorder (PTSD), with an estimated 70% of the population being undiagnosed (United States Department of Veterans Affairs, 2015). PTSD plays a significant factor in the acquisition of TBI as well. Greater than 75% of TBI's that occur after the tour of duty completion are related to substance abuse, reckless behavior or unintentional injury (Corrigan et al., 2003; de Konig et al., 2017). Currently, the VA is not as modern as civilian sector alternatives lacking proficiency at technology integration to foster improved health outcomes (Corrigan et al., 2003; Hernandez et al., 2015).

In 2017, the VA healthcare system created an initiative to employ virtual visits via telehealth to adequately tailor care to meet the needs of US veterans diagnosed with TBI as a potential healthcare solution (US Department of Veterans Affairs, 2015). Effective communication between the patient, family, caregiver, and PSC's Case Management Team are critical in the transition of the veteran into the VA healthcare system (Bagalman, 2013). Augmented communication and access via telehealth may address the complexity and challenge of the rehabilitation needs of TBI patients, their families, and caregivers (Hernandez et al., 2015). The PSC has struggled to provide a seamless transition of care for service members that were transferred from the Department of Defense to VA facilities due to systemic communication barriers such as antiquated

record-keeping strategies and electronic systems that do not communicate with each other (Bagalman, 2013; Hernandez et al., 2015). Hernandez et al. (2015) demonstrated the use of clinical video telehealth (CVT) as a method promoting access to healthcare, expanding treatment options to veterans, and enhancing education and care coordination among all stakeholders (Hernandez et al., 2015). A transformational leadership model includes the concepts of intellectual stimulation, individualized consideration, inspirational motivation, and idealized influence. This model was used to adopt CVT into practice (Dunn, Dastoor, & Sims, 2012). Utilizing this model, the first feature focused on intellectual stimulation through the education of all stakeholders about the process. For the remaining features, a multidisciplinary team had influenced others to be engaged in the project, uniquely structured the design to the needs of the clinic and patients, and created positive change within a sustainable structure (Rueveni & Vashdi, 2015).

## **Method**

### **Design**

A retrospective, descriptive design was utilized to improve TBI outcomes among the veteran population as a quality improvement initiative. Using a Plan-Do-Study-Act (PDSA) method, a team of key stakeholders was formed to include the primary investigator (PI) and the TBI multidisciplinary team at the VA Network Site, including representatives from: a) Nursing, b) Executive Leadership, c) Neuropsychology, d) Case Management, e) Scheduling, f) Speech Therapy, and g) Technology and Innovation (Reed & Card, 2016).

### **Setting**

The outpatient polytrauma clinic associated with the VA Heartland Network VISN 15 had one clinic located in a Midwestern metropolitan area servicing nearly 1,000 veterans diagnosed with TBI in five surrounding states was selected. There were approximately 100 TBI cases actively managed at VISN 15 at the end of the 2017 fiscal year. The existing VA Connect software application was utilized as the telehealth clinic source.

### **Sample**

A convenience sample of OEF/OIF/OND active military veterans was used. Inclusion criteria were OEF/OIF/OND active military veterans with a diagnosis of TBI, aged 18- to 59-years seen by speech-language pathology, case management, or neuropsychology. Exclusion criteria comprised of less than 18- or greater than 59-years of age, were not from OEF/OIF/OND, were experiencing a first visit for TBI at the setting, or were seen by any discipline other than speech-language pathology, case management, or neuropsychology.

### **Approval Processes**

This quality improvement project acquired Institutional Review Board (IRB) approvals from the VA and the University of Missouri-St. Louis (UMSL). There was minimal risk associated with this project as this was a retrospective medical record review.

### **Data Collection/Analysis**

Data collection included two retrospective medical record reviews for baseline data and intervention data (when CVT was available). The first review occurred between March 2, 2017 and April 30, 2017 examining the number of in-person follow-up visits for the TBI patients. The second review occurred between

March 2, 2018 and April 30, 2018 examining the number of in-person and CVT follow-up visits for TBI patients. The VA Connect application assured a secure patient-to-provider connection initiated via the sending of an email link by the provider that was encrypted. Healthcare information remained secure within the VA system and all outcome data remained de-identified within the VA's Support Service Center (VSSC) database. Data collection included the demographics of age, gender, and race. A paired samples t-Test was used to compare the two data sets.

### **Procedures**

A quality improvement team was organized to include stakeholders from each stage of the process such as scheduling staff, psychiatry, speech-language pathology, case management, nursing education, and executive leadership representation. The quality improvement team met regularly to plan the implementation of CVT. An aid to the project was an education module for CVT implementation that had been previously developed by the VA and existed in the VA learning management system (LMS). Barriers to implementation were identified such as understanding the CVT software application, indications for the scope of utilization, and resource needs from the organization. Stakeholders utilized the CVT learning module to overcome the barriers of understanding the software and its uses such as scheduling patient visits on-demand and routine visits. Additionally, to overcome a resource need, electronic resources such as five web recorders were installed into the organization's primary computer to establish a secure base connection before sending the encrypted web link for the patient to access. The organizational leadership members participated in and

approved necessary items for project implementation. The timeline for the project was developed in the form of a GANNT chart. The team agreed CVT utilization data would be collected every 10 days for a total of 6 cycles between from March 2, 2018- April 30, 2018, with the no show rates being collected retrospectively.

### **Results**

A total of 397 appointments were completed by the disciplines ( $N=397$ ). The most frequently observed categories were male gender ( $n = 15, 100\%$ ), African American race ( $n = 8, 53\%$ ), and moderate TBI as diagnosis category ( $n = 15, 100\%$ ). The most frequently observed category was previous history of missed visits answering yes ( $n = 11, 73\%$ ). (Appendix A).

Fifteen moderate TBI patients utilized CVT via psychology, speech pathology, social work, and nursing education ( $n=15$ ) from March 2, 2018 - April 30, 2018, as compared to zero users in the same time from in 2017. via in-person or remotely which is aside from the fifteen CVT visits. The most frequently observed category of discipline was Nursing Education ( $n = 157, 40\%$ ) for in-person visits and Psychology for telehealth visits ( $n = 7, 46.66\%$ ). The most frequently observed category of Telehealth Conducted was No ( $n = 382, 96\%$ ). (Appendix B).

A paired samples t-Test was used to evaluate the first differences between the missed visits with completed rates from March 2- April 30 in 2017 when telehealth was not available, as opposed to the same dates in 2018 when CVT was available. Despite a sample size of 15, a paired  $t$  test was appropriate due to the shape of the sample distribution as symmetric and unimodal. Prior to the analysis, the assumptions of normality and homogeneity of variance were assessed. A

Shapiro-Wilk test was conducted to determine whether difference could have been produced by a normal distribution. The results of the Shapiro-Wilk test were not significant,  $W = 0.89$ ,  $p = .308$ . Deviation from normality was explainable by random chance; thus, normality could be assumed. In addition, Levene's test for equality of variance was used to assess whether the homogeneity of variance assumption was met. The homogeneity of variance assumption required the variance of the dependent variable be approximately equal in each group. The result of Levene's test was not significant,  $F(1, 10) = 3.96$ ,  $p = .075$ , therefore, the assumption of homogeneity of variance was met. The mean of 2017 missed appointments ( $M = 31.25$ ,  $SD = 1.08$ ) was higher than the mean of 2018 missed appointments ( $M = 24.83$ ,  $SD = 4.26$ ). The difference between the two means is statistically significant at the .05 level ( $t = 3.68$ ,  $df = 7$ ,  $p = .014$ ). (Appendix C).

Finally, summary statistics were calculated for 2017 missed appointments, 2018 missed appointments, 2018 Telehealth Visits, and 2018 Total Visits Excluding Telehealth. The observations for 2017 missed appointments had an average of 31.25 ( $SD = 1.08$ ,  $SE_M = 0.44$ ,  $Min = 30.00$ ,  $Max = 33.00$ ). The observations for 2018 missed appointments had an average of 24.83 ( $SD = 4.26$ ,  $SE_M = 1.74$ ,  $Min = 20.00$ ,  $Max = 31.00$ ). The observations for 2018 Telehealth Visits had an average of 2.50 ( $SD = 1.64$ ,  $SE_M = 0.67$ ,  $Min = 0.00$ ,  $Max = 4.00$ ). The observations for 2018 Total Visits Excluding Telehealth had an average of 63.67 ( $SD = 3.67$ ,  $SE_M = 1.50$ ,  $Min = 57.00$ ,  $Max = 67.00$ ). Skewness and kurtosis were also calculated.

## Discussion



This first cycle of a quality improvement initiative demonstrated an improvement in completed TBI follow-up appointments. The total rate of missed appointments between March 2<sup>nd</sup>, 2017 through April 30<sup>th</sup>, 2017 was 30.5% when compared to 24.5% in March 2<sup>nd</sup>, 2018 through April 30, 2018. Providing the telehealth alternative did improve the number of follow-up visits over a 60-day period. There were 15 patients who used CVT compared with 382 patients who completed an in-person clinic appointment. The disciplines of speech pathology, psychology, social work, and nursing education averaged seven patient visits per day between the in-person and CVT visits. The utilization of CVT did decrease the rate of missed appointments ( $p=.014$ ). Although overall utilization of CVT was low in comparison with in-person visits, the CVT alternative offered an option for veterans to keep their appointment and improved the overall rate of completed visits.

When evaluating 2018 missed appointment rates by the month of use, the missed appointment rate decreased by 7% (March) and 5% (April). Of the 15 patients who utilized the telehealth application, 73% had a history of missed appointments. Overcoming a barrier of physical travel impacted those patients who had a history of missed appointments. While the utilization of the telehealth application was low (3.5% of all visits in 2018), the telehealth application provided an alternative to traditional in-person medical visits, especially for those who may have had transportation barriers.

The end-of-cycle debriefing revealed barriers existing during the data collection phase such as a change in leadership, loss of a full-time employee (which resulted in increased workload for the team), and technology issues.

There were nine failed telehealth appointments related to an inability for users to access the VA Connect application. Additionally, staff felt utilization rates could have been higher had they had more timely access to the VA information technology (IT) help desk when attempting to connect with patients via telehealth appointments.

Adoption of the telehealth application at the TBI clinic was dependent on effective planning strategies to implement the telehealth modality in practice. A recommendation for the next phase of the PDSA cycle to increase utilization of CVT would be to include a member of IT on the stakeholder team to focus on more rapid access to the IT help desk. Additionally, recommendations to minimize workforce reduction and subsequent increased work load may improve CVT usage rates. Adequate staffing and prompt leadership support were essential to help programs adopt this innovative healthcare solution. Since the VA offered resources to the patient population such as access to smart phones and wireless internet access, these were not considered to be a barrier to CVT access.

### **Conclusion**

Improved follow-up appointment rates among the TBI outpatient population occurred when using a telehealth alternative for clinic visits, especially for those who had a history of missed appointments. The VA Connect Application may have enabled some TBI patients to overcome the barrier of transportation. The VA Connect telehealth application provided a feasible alternative to the traditional in-person visit. Providing a telehealth alternative may improve the overall health for those veterans with TBI who might otherwise miss a scheduled in-person visit.



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## Appendix A

Table 1  
*Demographics*

<b>Variable</b>	<b><i>n</i></b>	<b><i>%</i></b>
Gender		
Male	15	100.00
Missing	0	0.00
Race		
Black	8	53.33
White	7	46.67
Missing	0	0.00
Diagnosis		
Moderate TBI	15	100.00
Missing	0	0.00
Previous History of Missed Appointment		
No	4	26.67
Yes	11	73.33
Missing	0	0.00

*Note.* Due to rounding errors, percentages may not equal 100%.



## Appendix B

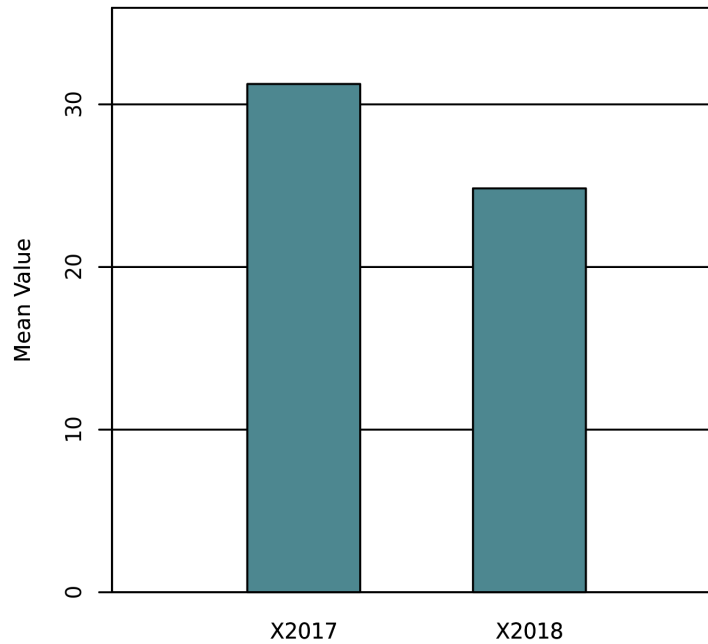
Table 2  
*CVT Utilization*

Variable	<i>n</i>	%
Discipline		
Nursing Education	157	39.55
Psychology	67	16.88
Social Work	136	34.26
Speech Pathology	37	9.32
Missing	0	0.00
Telehealth Conducted		
No	382	96.22
Yes	15	3.78
Missing	0	0.00
Use of Telehealth		
Discipline		
Psychology	7	46.66
Nursing Education	6	40.00
Social Work	1	6.67
Speech Pathology	1	6.67
Missing	0	0.00

## Appendix C

*Figure 1.*

The Means of Missed Appointments in 2017 Compared to 2018.



*Note.* The mean of 2017 missed appointments ( $M = 31.25$ ,  $SD=1.08$ ) was higher than the mean of 2018 missed appointments ( $M = 24.83$ ,  $SD 4.26$ ). The difference between the two means is statistically significant at the .05 level ( $t = 3.68$ ,  $df=7$ ,  $p = .014$ ).