Assessment of Depressive Symptoms During Post-Transplant Follow-Up Care Performed via Telehealth

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Abstract

*Telehealth provides a successful medium for the treatment of depression and other mental health illnesses. Often, inadequate treatment for this condition is found in patients with chronic co-morbid conditions such as those presented by the transplant recipient, a population at risk for depression. One concern of healthcare providers is the inability to adequately screen for symptoms of depression. This secondary analysis describes depression screening of 138 transplant recipients receiving follow-up care via telehealth (TH) and standard care (SC) as part of a larger National Institute of Nursing Research–funded randomized clinical trial. Of subjects who consented, 70 (51%) were randomized to the TH portion of the study. Depressive symptoms were measured by the Center for Epidemiologic Studies–Depression (CES-D™) survey at study entry and at 6 and 12 months postconsent into the study. Univariate and subgroup analyses using SAS found no differences between the TH (*n = 70*) and SC (*n = 68*) group for demographic and social characteristics. No differences in CES-D scores were found between TH and SC groups. The concern in adding distance in the care of this medically fragile population was not substantiated in this study.*

Key words: *telemedicine, telehealth*

Introduction

Telehealth offers the opportunity for transplant recipients to receive quality care at a distance without sacrificing physical assessment. The goal of this secondary analysis was to explore an existing telehealth (TH) program of long-term transplant follow-up care and determine whether including distance in the formula of complex care impacts the depressive symptoms reported by patients. Depressive symptoms are defined as a cluster of symptoms that may be indicative of the diagnosis of clinical depression, which is a recognized mental health disorder affecting mood, self-esteem, and loss of interest or pleasure in normal activities. In the late 1970s, the Center for Epidemiology Studies developed an instrument to screen for a cluster of symptoms that may be indicative of depression.[1] Although the instrument is not used for diagnosis of depression, it helped to identify patients who may need further evaluation by a mental health specialist. The symptoms that the short screening instrument measured included presence of low mood, guilt or feelings of worthlessness, helplessness, decreased ability to participate in normal activities, loss of appetite, and sleep disturbances. In patients with chronic disease, these symptoms may be present individually and easily overlooked. As a result, introducing distance into the follow-up care of transplant recipients may alter the ability of the healthcare provider to screen for depression.

Many dialysis clinics report depression rates among renal disease patients as high as 30%;[2] however, little research has been done to directly address this issue in post-transplant kidney, liver, or pancreas recipients specifically.[3] A retrospective cohort study of first kidney transplant recipients with at least 6 months of Medicare coverage (*n* = 41,588) found that 3% of pretransplant candidates were diagnosed with pretransplant depression and 18% were diagnosed with both

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pre- and post-transplant depression. The adjusted incidence rate of depression at 1, 2, and 3 years post-transplant was 5.05%, 7.29%, and 9.10%, respectively.[3]

Depression has been found in patients with chronic conditions[4–6] and is characterized as one of the leading causes of disability around the world.[7,8] It has been noted that depression may exacerbate existing medical conditions, may elevate the cost of caring for those conditions, and may also be associated with a threefold higher rate of patient nonadherence to recommended care or medications.[9] In diseases where frequent medical oversight and ongoing self-management skills are needed to control disease progression and exacerbation of symptoms, depression can complicate disease management. Examples of conditions where depression can cloud treatment outcomes are diabetes,[4,6] multiple sclerosis,[10] cystic fibrosis,[11] arthritis,[12] chronic obstructive pulmonary disease,[13] scleroderma,[14] and both chronic[2] and end-stage renal disease.[15] Recently, the World Mental Health Survey initiative assessed the results of 18 surveys of the general population in 17 countries and found consistent results that indicated many chronic conditions had related depression and anxiety.[16]

In transplantation, the concern regarding patient anxiety induced by their failing health is understandable. As organ failure progresses, it often leads to an inability to work, straining personal relationships. Additional stressors include apprehension surrounding the wait for an available organ and the considerable medical risks if the organ transplant has less than optimal results. Following transplantation, even with excellent organ transplant function, there continue to be risks and negative outcomes to address in addition to rejection. Crone and Gabriel (2008) stress that the identification and treatment of depression in transplant patients (both pre- and post-transplant) is crucial because morbidity, mortality, and poor adherence to medication may be increased in the presence of depression.

Live interactive video and digitized assessment equipment have broadened the healthcare delivery system for meeting the needs of this medically fragile population. TH can serve as adjunctive care to keep transplant recipients connected to the transplant center without compromising the quality of care. Transplant providers face a challenge to identify subtle changes in the transplanted organ function often in the light of the disease process that led to organ failure as well as multiple co-morbidities. It is not uncommon for a clinician to provide care for high blood pressure, lipid abnormalities, diabetes, and cardiovascular disease along with renal or liver compromise. This leads to treatment with multiple medications, further complicating care with polypharmacy. Overseeing the care for continued chronic disease or an acquired de novo health concern can be complicated if the symptoms of depression are overlooked. Because of the complexity of disease management and the distance between the provider and patient, the voiced concern from the clinician was that depressive symptomatology may not be detectable during a telehealth visit.

Because overlooked depressive symptoms can result in undertreatment and deleterious effects on medication adherence, we felt it was important to assess depressive symptoms in subjects at the point of entry into the study with continued reassessment over time. This would enable us to evaluate the effect of telehealth on the depressive state of the transplant recipient. The purpose of this secondary analysis was to explore differences in self-reported depressive symptoms in solid organ transplant recipients who received care by either live interactive TH delivery or standard care (SC) in the transplant clinic.

Materials and Methods

DESIGN

This secondary analysis is part of a larger National Institute of Nursing Research–funded, Institutional Review Board–approved prospective randomized clinical trial that compared health outcomes of solid organ transplant recipients in TH versus SC. Solid organ transplant recipients entered into the study were followed by the nurse practitioner (NP) assigned to their care and completed the study instruments at three separate time points.

SAMPLING

Subjects were recruited from the existing patient population of the transplant center. In the past 30 years, over 3,000 liver, kidney, kidney–pancreas, and pancreas-alone transplants have been performed at this center. The outpatient transplant clinic is located within the medical center and is staffed with transplant surgeons, 2 transplant nephrologists, and NPs. Recipients of solid organs are followed twice weekly for about 1 month and then weekly for 1–2 months after the initial discharge from transplant confinement. The visits are titrated over the first 6 months until patients are stable, and appointments can be reduced to once per month. During the first 2 years, patients are seen on average 14 times per year. After that time, as long as they are followed by a local physician familiar with transplantation, transplant clinic visits are reduced to once or twice yearly. The clinic handles approximately 3,500 post-transplant visits per year.

To be included in the study, subjects had to live within an approximate 200-mile radius, as transplant recipients living farther than 200 miles from the transplant clinic usually have a different pattern of follow-up care. Subjects also needed to be assigned to a NP for the majority of their follow-up care, be at least 18 years of age, have a functioning transplanted organ, possess a working knowledge of the English language, and be willing and able to complete all surveys.

Subjects randomized to the TH group must also be willing to travel to one of the three distant TH sites used for the study. Prior to study initiation, a table of random numbers was generated to assign individuals to groups. After the informed consent process was completed, the subject was assigned to either the TH group (where they received follow-up care via live interactive video monitoring) or SC (where follow-up care remained unchanged).

Subjects in this study were generally more than 1 year post-transplant, and greater than one third were employed. Other than peripheral neuropathy secondary to diabetes, no subject had documented primary neurological disease. Although approximately one quarter of patients were disabled, disability in this population is generally related to chronic physical illness.

All transplant recipients were eligible to participate, but because of provider hesitancy to use TH, the prospective subject had to be cleared by the provider prior to being approached by the study recruiter. As a result, newly transplanted recipients (less than 6 months) were routinely not cleared for approach. We found that providers who had concern about a particular patient's volatility of organ function or high risk of susceptibility to infection would prohibit clearance for patient eligibility for the study. While this created a situation of potential bias, all efforts were made to increase the confidence of the NPs with the TH process. Recruiters were vigilant in their efforts to revisit practitioners for eventual clearance of patients. The initial inclusion criteria for the study were expanded as well. In addition, analyses of subjects who consented and those who declined the study were evaluated and other than time from transplant, no differences in demographic characteristics were identified. All efforts to prevent subject bias were addressed.

INSTRUMENTS

Depressive symptoms were measured by the Center for Epidemiologic Studies–Depression (CES-D™) survey. Due to its ability to accurately screen for depression while not overemphasizing other symptomatology such as fatigue, this survey is commonly used by medical practitioners in patient populations with chronic medical illnesses.[10] The survey consists of 20 questions assessing the patient's emotional state during the previous week. Using a Likert-type scale, response options include 0 (rarely or none of the time) to 3 (most or all of the time), and total scores range from 0 to 60. A score of 16 or higher suggests a depressive state and requires additional evaluation.[10,17] The CES-D identifies symptoms in six areas: depressed mood, guilt/worthlessness, helplessness/hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance.[1] The study protocol did not alter the healthcare received, just the medium through which it was delivered.

TELEHEALTH EQUIPMENT

The TH receiving room consisted of an examination room within the SC transplant clinic. The room was equipped with a PolyCom VSX 7000 camera system (PolyCom, Pleasanton, CA), a 32-inch video monitor, a telephone line and headset for the AMD-3450R analog stethoscope (AMD, Boston, MA), and a separate phone line for a receiving phone/fax machine. The PolyCom camera system and monitor were controlled by a handheld remote control that was manipulated by the TH Coordinator during the patient visits.

Each of the three distant TH sites was also equipped with Polycom VSX 7000 camera systems and 19-inch dual-screen video monitors. In addition, distant sites were equipped with AMD-2015 ENT digital otoscopes, Sony DCR-TRV840 hand-held digital cameras (Sony, Tokyo, Japan) for close examination of skin conditions, and AMD-3450S analog stethoscopes systems for the distant-site nurses to use during patient examinations.

PROCEDURE

Once a subject was enrolled in the study, the procedure of the clinic visit varied slightly depending on whether a subject was followed via the TH equipment or examined in person within the physical confines of the SC clinic. The study protocol did not dictate the number of visits, or when a visit occurred. The NPs were assigned a case load of transplant recipients for follow-up care and in most instances remained the care provider during the study.

For the TH group, the procedure mimicked the SC visit closely. To keep the visits as similar as possible, the connection between sites was generally established approximately 15 minutes prior to each appointment to allow time for the resolution of any technical difficulties. At that time, the analog stethoscope connection would also be made between sites. The tasks of each visit were kept in the same order as if the subject were being seen face-to-face. The TH coordinator collected the chart and billing documents while the distant site nurse reviewed medications, assessed vital signs, and documented any complaints or concerns. Meanwhile, the NP was informed of the established connection. Billing forms were faxed to the distant site and completed by the patient and faxed back to the TH coordinator. If the clinic visit was a data collection point, all study documents were at least initiated while waiting for the NP to enter the TH room. During the NP visit, the subject was placed in the center of the screen and the TH coordinator used the hand-held remote to zoom-in or out as needed. If additional close-ups were needed, the hand-held digital camera could be used for additional magnification. At the completion of the NP medication/lab review and physical assessment any prescriptions, lab orders, and clinic appointment cards were faxed to the distant site.

For the SC group, the billing procedure, obtaining vital signs, and examination room assignment were unchanged. If the clinic appointment was a data collection point, the TH coordinator collected all study questionnaires after the subject was placed in an examination room and prior to the NP entering to complete the medication/lab review and physical assessment.

For both SC and TH groups, the TH coordinator did a visual calculation of the CES-D immediately to ascertain the depressive symptoms. If the score was found to be 16 or greater, the NP was notified. In addition, patients in both groups were given as much time as needed to complete the survey. Verbal assistance was offered to patients who exhibited visual impairment and/or requested assistance. For subjects whose data collection points came between clinic appointments, the subject was contacted by phone and either completed questionnaires over the phone with the TH coordinator or received the questionnaire packet in the mail with an enclosed self-addressed stamped envelope for survey return. The CES-D and other study questionnaires have been used in the transplant clinic for nearly 10 years and the investigators were comfortable with mailing the questionnaire packets for completion.

ANALYSIS

Surveys were analyzed via the SAS statistical analysis program (SAS Institute, Cary, NC). Univariate analyses for within and between groups (SC versus TH) based on CES-D scores were completed. Subgroup analysis by race, gender, transplant type, time post-transplant, employment status, income, and access to transportation were also completed. Probability was set at ≤ 0.05.

Results

SAMPLE

The study included 138 subjects. No differences were found between the TH ($n = 70$) and SC ($n = 68$) groups for the demographic characteristics of gender, race, ethnicity/cultural background, transplant type, time from transplant, or individual and family income (*Table 1*). At this time, the ethnic background in this transplant center remains limited to either African-American or white. The uniqueness of this homogeneous group is that we have sufficient numbers to assess the impact of interventions on two groups: African-Americans and white.

The TH group consisted of 44.3% female ($n = 31$), 47.1% African-American ($n = 33$), and 82.9% kidney transplant recipients ($n = 58$). Thirty-seven percent were employed either full-time or part-time and 82.9% owned a reliable vehicle for transportation to and from the transplant center. The SC group consisted of 44.1% female ($n = 30$), 54.4% African-American ($n = 37$) and 76.5% kidney transplant recipients ($n = 52$). Thirty-eight percent were employed either full-time or part-time and 80.9% owned a reliable vehicle. Time since the transplant procedure was 59.9 ± 59.23 versus 60.76 ± 74.05 months (p = NS) for the TH and SC groups, respectively. Approximately 80% of all subjects reported their individual income below $30,000 per year with nearly 60% of subjects reporting their total family income below that level as well.

Access characteristics included employment status, transportation, and round trip miles from the transplant center (*Table 2*). No differences were found between groups for employment status or subjects classified as disabled (34.3% versus 39.7%; p = NS). Both groups reported reliable transportation. The TH group was significantly further from the transplant center (121.1 ± 106.6 versus 76.91 ± 82.86 miles; $p \leq 0.05$).

The mean number of visits per patient to see the NP for follow-up care during the 12 months of study follow-up was 2.97 ± 2.00 for

Table 1. Demographics of the Study Population

PARTICIPANT DEMOGRAPHIC		TH $N = 70$ (%)	SC $N = 68$ (%)	p VALUE
Gender	Male	39 (55.7)	38 (55.9)	0.9841
	Female	31 (44.3)	30 (44.1)	
Race	White	35 (50.0)	31 (45.6)	0.6040
	Black	33 (47.1)	37 (54.4)	
Transplant type	Kidney	58 (82.9)	52 (76.5)	0.3510
	Liver	4 (5.7)	7 (10.3)	
	Kidney–pancreas/ pancreas	8 (11.4)	9 (13.2)	
Individual income	<$10,000	17 (24.3)	25 (36.8)	0.5072
	$10,000–$20,000	23 (32.9)	17 (25.0)	
	$20,000–$30,000	10 (14.3)	7 (10.3)	
	>$30,000	14 (20.0)	15 (22.1)	
Family income	<$10,000	8 (11.4)	13 (19.1)	0.6743
	$10,000–$20,000	22 (31.4)	16 (23.5)	
	$20,000–$30,000	10 (14.3)	9 (13.2)	
	>$30,000	27 (38.6)	26 (38.2)	
Time from transplant (in months)		59.9 ± 59.23	60.76 ± 74.05	0.6685

No differences were found between the telehealth (TH) and standard care (SC) groups for demographic characteristics.

the TH group versus 2.79 ± 2.04 for the SC group during the first 6 months and 1.24 ± 1.14 for the TH group versus 1.08 ± 1.22 for the SC group during the second 6 months of study follow-up. These results were not statistically significant when analyzed by group or over time (*Table 2*).

CES-D SCORES

No group differences in CES-D scores were found between TH and SC at baseline, 6-month, or 12-month data points (*Table 3*). Within the TH group, significant changes were detected between both baseline to 6 month ($p = 0.0429$) and 6–12-month ($p = 0.0487$) time points; however, the 12-month scores returned to near the level of the baseline scores. Within the SC group, no differences were found over time. Comparison of group means (TH versus SC) by study time points are: baseline 12.4 ± 10.6 versus 9.7 ± 7.6 ($p = 0.0646$), 6 months 9.4 ± 8.0 versus 11.5 ± 7.3 ($p = 0.8012$), and 12 months 11.4 ± 8.4 versus 9.7 ± 9.1 $p = 0.1914$). Comparisons of group CES-D scores by time show that symptoms of depression are present and relatively stable.

During the course of the study, 45 participants (32.6%) scored 16 or higher, the indicator for further assessment. The number of subjects with elevated scores was evenly distributed between groups with 27 (38.5%) in the TH group and 25 (36.7%) in the SC group. Healthcare providers were notified of subjects who scored above the cut-off point as per study protocol. In a medical record review of these 45 cases, written documentation of a plan of care for depressive symptoms was found in 3 subjects, all from the TH group. Documentation indicated that the psychological distress was already known by the practitioners. Based on the CES-D scores, 32.6% of this sample was found to have depressive symptoms, with 2.1% undergoing care.

Table 2. Access Characteristics

CHARACTERISTICS		TH *N* = 70 (%)	SC *N* = 68 (%)	*p* VALUE
Employment status	Full/part time	26 (37.1)	26 (38.2)	0.7188
	Unemployed	19 (27.1)	14 (20.6)	
	Disabled	24 (34.3)	27 (39.7)	
Transportation access	Excellent	58 (82.9)	55 (80.9)	0.6708
	Moderate	7 (10.0)	7 (10.3)	
	Slight/difficult	5 (7.1)	5 (7.4)	
Round trip miles to clinic appointment		121.1 ± 106.6	76.91 ± 82.86	0.0170
Number of visits per patient	6-Month time point	2.97 ± 2.00	2.79 ± 2.04	0.6744
Number of visits per patient	12-Month time point	1.24 ± 1.14	1.08 ± 1.22	0.2985

Table 3. Center for Epidemiologic Studies–Depression Scores

GROUP	BASELINE	6 MONTHS	12 MONTHS
TH	12.4 ± 10.6	9.4 ± 8.0[a]	11.4 ± 8.4[b]
SC	9.7 ± 7.6	11.5 ± 7.3	9.7 ± 9.1

No differences detected between groups.
For the telehealth (TH) group: [a]0–6 ($p = 0.0429$), [b]6–12 ($p = 0.0487$).
SC, standard care.

Discussion

Because of the multiple health concerns and ongoing follow-up that is necessary to optimize healthcare, transplant recipients have long been regarded as a medically fragile population. Transplant care is complex due to the intricacies of detecting transplant rejection and compounded by management of co-morbid chronic conditions that either pre-existed or developed as a result of the multiple medications necessary to prevent organ rejection. This type of complex care necessitates constant vigilance and multiple provider visits. Often associated with chronic disease, depression remains a concern in the transplant population.

Although there is emerging evidence that depression is seen in transplant recipients, there is little evidence on how transplant centers recognize and screen for depression in this medically fragile population. Depressive symptoms were found in 32.6% of this sample; 2.1% with healthcare providers addressing symptoms. Compared with the cumulative incidence rate of 5.05%, 7.29% and 9.10%, at 1, 2, and 3 years post-transplant as reported by Dobbels (2008), it is apparent that our sample with a mean post-transplant time of 5 years is not representative of the problem.[3] Introducing distance in transplant follow-up care provided a safe alternative interaction with the practitioner. However, it has been argued by healthcare providers in our transplant clinic that while saving time and money, adding distance to the routine follow-up regimen might decrease reporting of symptoms for conditions such as depression.

Subjects in the TH group indicated they found using TH to be valuable because they were saving both time and money. An additional benefit was the ability of the NP to continue building rapport with the patient through the use of the TH videoconferencing equipment.

At the beginning of the study, concern was expressed by the providers regarding the lack of ability to touch the patient, which might lead to a decrease in rapport. However, once the TH vid-

eoconferencing equipment was used with several sessions, this concern was allayed. The NPs found ways to adapt their ability to assess health concerns through body language and visual appraisal in much the same way they would in a standard clinic visit. At the close of each subject's study obligations, TH was offered to the SC group. However, it was the healthcare providers who opted not to use TH in future follow-up with patients, which was a statement on the NPs' willingness and ability to truly adapt to alternate forms of communication.

Ongoing research has reported that depression can be successfully screened and detected in a TH program;[18] therefore, practitioners electing to use this technology in their practice could include a depression screening process for their patient population. For example, one study of patients in an established TH heart failure program added a quarterly telephonic depression screening. Initially, patients were presented with an abbreviated two-question depression survey. If either question was answered in a manner indicating symptoms of depression, then a second survey of nine questions was administered. It was found that approximately 30% of those screened with the initial screening tool presented enough symptoms of depression to warrant further analysis with the second screening tool. By adding a survey to screen for depression, it was possible to successfully identify and offer treatment to patients who might not have otherwise received treatment for this co-morbid condition.

The integration of a similar screening system into a transplant TH program could potentially identify any patients who may begin to demonstrate such tendencies. As evidenced by Turvey et al.,[18] depression can be successfully screened and detected in a TH program. As the CES-D is an easily administered, reliable screening measure, adding this survey into routine care in TH may bolster confidence in providers.

The link between depression and medication adherence was not conclusively identified in one study that evaluated medication adherence in renal transplant recipients.[19] In this study, researchers were unable to determine whether depression was the source of medication adherence issues or whether lack of adherence to the complicated medication regimen resulted in depression. Regardless of its genesis, there remains an association between medication adherence and depression. This link was also found in a study of late acute rejection and medication nonadherence study where 60% of the subjects who experienced late acute rejection due to nonadherence also reported moderate or severe depression.[20] The study suggested that even long-term transplant recipients remained at high risk for nonadherence in the presence of depression. Identifying symptoms becomes as important as identifying organ rejection. Women were found to report higher levels of depression than men, an outcome associated with a perceived inability to control their health issues.[21] Using gender as a way to guide screening may assist providers in screening as well.

In our study, depressive symptoms that required notification of the healthcare provider were reported in about one third of the sample, with 2.1% receiving additional care. Over the 12 months patients were followed in the study, the CES-D scores remained relatively stable. As we have previously reported, both groups were found to have similar health outcomes with no differences in infections, rejections, or hospital admissions.[22]

The one distinctive difference found between groups was that the TH group lived further from the transplant clinic. To verify that our sample was not biased, we examined consenters and nonconsenters to the study, and did not find evidence of sampling bias.[23]

Based on the findings of this study, TH did not appear to be a factor in psychosocial health. As a result, practitioners using TH in fragile patient populations may feel some sense of confidence that co-morbidities such as depression could be identified and treated. The results of this study support the use of TH as an effective and safe follow-up care treatment alternative for post-transplant kidney, liver, and pancreas recipients who may present with depression. Our difficulty in locating a substantial number of studies related to the use of depression screening in TH also supports the need for greater exploration of screening interventions. In addition, more work is needed to explore the potential benefits of TH technology in post-transplant follow-up care.

Disclosure Statement

No competing financial interests exist.

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