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A Randomized Controlled Trial of a Pretransplant Educational Intervention in Kidney Patients

Holly Mansell, PharmD,[1] Nicola Rosaasen, BSP,[2] Jenny Wichart, BScPharm,[3] Rahul Mainra, MD,[4] Ahmed Shoker, MD,[4] Michele Hoffert, BSW,[5] David F. Blackburn, PharmD,[1] Juxin Liu, PhD,[6] Brianna Groot, BA,[7] Paraag Trivedi, BSP,[8] Errin Willenborg, BSA,[9] Maithiri Amararajan, BSc,[3] Huokai Wu, BSc,[6] and Annshirley Afful, PhD[6]

Background. Poor patient knowledge about transplantation is a significant problem following kidney transplant. A video-based educational intervention was developed to supplement standard education provided by transplant teams. **Methods.** A multicenter randomized controlled trial tested the intervention delivered to patients undergoing assessment or waitlisted for kidney transplant. Adult participants were randomized to the control (standard education) or the intervention group, consisting of electronic access to the videos (or digital video disks if no internet) plus standard education. Differences between groups in changes in transplant knowledge (measured by the Kidney Transplant Understanding Tool), education satisfaction, self-efficacy, and quality of life (secondary outcomes) were evaluated by a preintervention and postintervention survey. Video viewing habits were tracked and described for patients in the intervention group. **Results.** One hundred sixty-two patients were enrolled, with 132 completing both questionnaires (n = 64 intervention and n = 68 control), with similar enrollment from 3 Canadian sites. Video viewing statistics in the complete cases indicated that 78% (50/64) watched the videos, with 70% (45/64) viewing them electronically, while 8% (5/64) received digital video disks and self-reported participation. Baseline knowledge scores in the intent-to-treat population were 55.4 ± 6.5 and 55.7 ± 7.1 in the intervention and control, respectively. The mean knowledge change in the intervention (2.1 ± 3.6) was significantly higher than in the control group (0.8 ± 3.4, $P < 0.02$). In the per-protocol analysis (patients with objective evidence of watching at least 80% of the videos), the knowledge improvements were 3.4 ± 3.8. Video group participants reported higher satisfaction with education ($P < 0.02$) and expressed positive comments in open-ended feedback. **Conclusions.** Electronic video education in the pretransplant setting improved knowledge and satisfaction.

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[1] College of Pharmacy and Nutrition, University of Saskatchewan, Saskatoon, SK, Canada.

[2] Saskatchewan Transplant Program, Saskatchewan Health Authority, Saskatoon, SK, Canada.

[3] Department of Pharmacy, Alberta Health Services, Calgary, AB, Canada.

[4] Division of Nephrology, Department of Medicine, College of Medicine, University of Saskatchewan, Saskatoon, SK, Canada.

[5] Saskatchewan Transplant Program, Saskatchewan Health Authority, Regina, SK, Canada.

[6] Department of Mathematics and Statistics, College of Arts and Science, University of Saskatchewan, Saskatoon, SK, Canada.

[7] Canadian Hub for Applied and Social Research, University of Saskatchewan, Saskatoon, SK, Canada.

[8] Transplant Recipient/Patient Advisor, Regina, SK, Canada.

[9] Transplant Recipient/Patient Advisor, Saskatoon, SK, Canada.

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Correspondence: Holly Mansell, PharmD, College of Pharmacy and Nutrition, University of Saskatchewan, E3132 Health Sciences, 104 Clinic Pl Saskatoon, SK, Canada. (holly.mansell@usask.ca).

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The benefits of kidney transplantation are substantial; patients generally experience improved quality of life (QOL) and live longer than patients remaining on dialysis.[1–3] However, the preparation required to be considered for transplantation can be extremely challenging for patients.[4,5] To be deemed suitable, patients undergo a rigorous assessment consisting of a multitude of tests and appointments with a multidisciplinary team and specialists. For patients who have successfully negotiated the assessment process and have received a transplant, a new set of challenges emerge. Immunosuppressant medications must be taken regularly to prevent transplant rejection, and patients must attend regular appointments for medical assessments and laboratory test procedures. Navigating the healthcare system can be difficult, and many patients experience additional challenges, such as poor health literacy, cognitive disabilities, or additional comorbidities.[6,7] Poor health literacy has been associated with decreased access to kidney transplant and may contribute to patients' poor understanding of the kidney transplant process.[8,9] Education about kidney transplant occurs during the assessment process, well before the transplant occurs. Nevertheless, poor knowledge about transplant medications is a major problem following the transplant surgery and patients in our center and others have indicated a need for more information before the transplant.[9–12]

Effective transplant education may help patients prepare for the complexities of the transplant process. Strategies such as repetition in nonhospital settings, provision of culturally competent education at appropriate literacy levels, and use of technology effectively have been recommended.[13] Video education, in particular, seems to be an effective platform for disseminating health information visually,[14] and pictures can greatly increase attention and recall, which is ideal for patients with low health literacy.[15] Because transplant programs are located in the larger urban centers, many potential recipients have to travel long distances for transplant education. A video series could provide supplemental pretransplant education, which could be viewed as often as needed from home.

Given the need to improve education before transplant and the potential benefits of electronic video education, we developed a 6-part video series entitled "Solid Organ Transplantation: An Educational Mini-Series for Patients." This intervention was designed with extensive patient involvement and guided by the available evidence regarding best practice for patients pursuing renal transplant.[13,16] The videos feature an animated character embarking on a transplant journey. Difficult concepts are animated to accommodate patients with poor health literacy. Patient testimonials are embedded throughout the videos to provide context and relevance to the information presented. Preliminary feedback was collected during the video review process; however, a formal evaluation of the effectiveness of the intervention was not previously undertaken.

We conducted a multicenter randomized controlled trial to test the effectiveness of the home-based video intervention on improving kidney transplant candidate's knowledge compared with usual care. We also aimed to answer the following study questions:

- What percentage of patients will watch the video series on their own time?
- How frequently will patients view the video series at home?
- To what extent will patients be satisfied with receiving education at home versus usual care?
- Does video education before transplant improve other outcomes (self-efficacy, QOL, beliefs about medicine)?

MATERIALS AND METHODS

The parallel arm randomized controlled trial was undertaken in 3 Canadian cities spanning 2 provinces (Saskatoon and Regina, Saskatchewan; Calgary, Alberta). The study protocol was registered on Clinicaltrials.gov (NCT03633136) and was approved by the local regional ethics boards under protocol numbers Beh18-63 (Saskatchewan sites) and Pro00082570 (Alberta).

Inclusion and Exclusion Criteria

Patients were eligible to participate in the study if they were 18 years or older, functionally able to speak and read English (or had a support person able to assist them to complete the study tasks), and were undergoing assessment or currently on the kidney (or kidney-pancreas) transplant waitlist. Patients were excluded from participation if they were told by the transplant center that they were not a suitable candidate for transplant, did not speak or read English (and no suitable provisions could be made to support them), or they were unable or unwilling to consent to participating. Because we wanted the study to mirror our population of interest, we worked to include all potential participants. For instance, in the case of a language barrier, patients were allowed to participate if they had a suitable support person to assist with study-related tasks. In the case of a hearing impairment, closed captioning could be accessed for patients in the intervention group.

Enrolment, Randomization, and Blinding

Each center generated a list of all adult patients who were booked for a pretransplant appointment during the recruitment period. Eligible patients were mailed an invitation letter explaining the nature of the study. During a pretransplant healthcare appointment at the hospital, a research assistant explained the study to potential participants and assisted with enrolment. Patients who consented to participate were temporarily provided with a study tablet (iPad) for enrolment and a unique participation link. These links were pregenerated by an independent research support unit (the Canadian Hub for Applied and Social Research, formerly known as the Social Sciences Research Laboratory [SSRL]) at the University of Saskatchewan. They randomized the participant (1:1) to either the intervention (ie, home-based video education plus usual care) or the control group (usual care alone). Randomization was stratified by site in permuted blocks of 6 or 8 according to a custom Python (V.2.7.11) script. Only the SSRL was aware of the allocation sequence; sequential participant codes masked the treatment so that the study team and research assistants were blind to the process. Due to the nature of the intervention, participant blinding was not possible. Nevertheless, specific protocols were put into place to minimize bias. All patients in the study were told that they would be taking part in an educational study and that one group may receive additional educational materials; but they were not told what the education in each group would consist of. Patients in the study were reminded not to discuss

the nature of the intervention with program staff or other patients. All patients received the questionnaires at the same time points, and a personalized email message was sent to control for attention in lieu of the video email message sent to the intervention group.

Enrolment took place between June 2018 and May 2020. Upon completing the postsurvey, participants became eligible to receive a $25.00 CAN gift card of their choosing. Following commencement of each project stage, participants received up to 3 email and/or telephone reminders prompting them to complete their project phase and providing additional supports as required.

Intervention Arm

Participants in the intervention arm received the electronic video education in addition to standard education provided by their transplant center. As previously described,[16] "Solid Organ Transplantation: An Educational Mini-Series for Patients" is a patient-oriented educational series with content specific for kidney transplantation, with 6 videos ranging in length between 3 and 24 minutes. The videos are chunked into smaller segments to assist with information retention and provide greater flexibility and content control to the user.[13,16] The miniseries was hosted on the Panopto video platform and access to the videos was provided to the participants after the baseline assessments were completed. Personalized, password-protected video links were emailed to the participants so that they could view the following videos at home: Video 1: Introduction; Video 2: The Kidney; Video 3: Assessment and Waitlist; Video 4: Operation and Recovery; Video 5: Medications; and Video 6: Your New Life. Patients were instructed to watch the videos sequentially at least 1 time. Continuous access to the videos was permitted so that participants were able to replay a specific video as often as desired. The total viewing time for the entire series was 75 minutes. The outcome assessment/postintervention survey was emailed to the participants approximately 1 month after study enrolment.

We predicted that at least 90% of transplant candidates would have access to the internet.[9] These participants were able to obtain the intervention and outcome assessments in the form of links and surveys on a personal computer, phone, or tablet. The SSRL was responsible for disseminating the videos and outcome assessments at the appropriate time points. However, personalized accommodations were made for those who did not have an email address, internet access, or a personal computer. These included either (a) arranging a time for the research assistant to meet the participant, providing a video viewing opportunity on the study iPad or (b) the provision of digital video disk (DVD) copies. Follow-up assessments for these participants were performed over the phone by the research manager at the SSRL.

Control Arm

Patients randomized to the control arm received the standard of care education provided at the transplant center. In both provinces, participants met with nephrologists, surgeons, and nurses and a social worker as needed, who provided verbal information and printed information in the form of an information booklet. The evaluation process was similar in Regina and Saskatoon, but not in the Calgary site, which included additional group teaching sessions and consistent involvement of a social worker. Participants in both groups received the same surveys at the same time points.

Outcome Measures

Change in Transplant Knowledge (Primary Outcome)

The primary outcome for the trial was the difference-in-difference of knowledge scores measured by the Kidney Transplant Understanding Tool (K-TUT) at baseline and 1 month later. The questionnaire consists of 22 questions (9 true/false and 13 multiple-choice questions) regarding immunosuppressive medications and lifestyle recommendations necessary for optimal transplant outcomes. Scores are based on the number of correct answers to each item and summed to achieve a maximum total of 69.[17] The scale was evaluated in prekidney and postkidney transplant cohorts and shown to have good internal consistency, content, reproducibility, and construct validity.[17]

Video Viewing Habits (Secondary Outcome)

Video viewing statistics were available from the Panopto platform, which recorded the number of occasions and minutes that each participant logged on to a specific video. The SSRL generated a report for all of the patients who received the personalized links enabling an assessment of the percentage of patients viewing at least 1 module, percentage of patients viewing the miniseries in its entirety, and frequency of video views. On the postintervention questionnaire, participants in the intervention group were asked whether they watched each video, and if so, how many times. This self-reported measure was necessary for participants who received DVD copies because there was no way to monitor their video viewing habits.

Education Satisfaction (Secondary Outcome)

On the postintervention questionnaire, participants were asked to rate their satisfaction with their pretransplant education on a Likert scale of 1 to 5. Participants were also asked 5 questions assessing education satisfaction and understanding about medications and transplant expectations. Participants in the intervention group were additionally asked open-ended questions, which were used to identify strengths and limitations of the videos.

Self-efficacy (Secondary Outcome)

The Generalized Self-Efficacy Scale was used to assess a patient's beliefs in coping with difficult demands in life.[18] This psychometric tool consists of 10 items, in which the patient rates each statement on a scale of 1 = not at all true to 4 = exactly true. The items are summed to achieve a score between 10 and 40, with higher scores indicating increasing self-efficacy. The Generalized Self-Efficacy Scale is a generic scale that has been widely used in multiple disease states including transplantation.[19,20]

QOL (Secondary Outcome)

The Short Form-12v2,[21] which is the short version of Short Form-36, was used to measure QOL. This validated tool consists of 12 questions which assess 8 subscales, including physical functioning, emotional, general health, and mental health, bodily pain, general health, vitality, and social functioning. The Quality Metric Health Outcomes Scoring Software program version 4.5 was used to create 2 component summary scores,

the mental component summary and physical component summary, and translate the scores into norm-based values (with 50 equating to the US average plus or minus an SD of 10), adjusted for age and gender.[22] This well-known QOL measure has been used previously in kidney transplant cohorts.[23–25]

Beliefs About Medications (Secondary Outcome)

The beliefs about medicines questionnaire is an 18-item scale that evaluates 4 factors related to commonly held medical beliefs.[26] These domains include the specific-necessity, specific-concerns, general-harm, and general-overuse. The 5-item subscales for specific-necessity and specific-concerns have shown good psychometric properties across 6 chronic illness groups including renal inpatients[27] and have demonstrated predictive criterion-related validity in treatment adherence in kidney transplant patients.[28] Scores in these subscales range from 5 to 25. A BMQ necessity-concerns differential was also calculated, with positive scores indicating that patient perceives the benefits of the treatment to outweigh the risks (score range = −20 to 20). The general-harm and general-overuse subscales generate a score ranging from 4 to 20, with higher scores indicating more negative perceptions about medications in general.

Predictors and Covariates

Other variables collected via surveys included demographic information, such as age, sex, marital status, race/ethnicity, education level, province, and place of residence (urban/rural/reservation), distance to transplant center, health literacy, and clinical information such as whether or not a patient is on dialysis. Similar to previous transplant research, baseline learning about transplantation was characterized and subjective health literacy and numeracy was assessed with 2 items scored on Likert-type scales: How often do you have someone (like a family member, friend, hospital/clinic worker, or caregiver) help you read hospital materials? and How confident are you filling out forms by yourself?[29,30]

Data Analysis

Data collected from the electronic surveys were transmitted directly to the SSRL, who deidentified the patient information before providing the final dataset to the research team. The primary end point of the change in knowledge score was compared using a general linear model. We evaluated both the crude difference in change scores and adjusted for baseline knowledge. An a priori sample size was calculated, which estimated a minimum of 141 patients in each group would be needed to detect a crude average increase of 5 points (SD 15) between the intervention and usual care groups in the knowledge survey at a type 1 error rate of 0.05 and type 2 error rate of 0.20. However, because the K-TUT had not yet been tested for responsiveness,[17] a preliminary analysis was planned to refine this calculation once data were available from the first 30 participants. Based on the SDs from this sample (3.5 in the intervention and 4 in the control), and using type 2 error rate of 0.15, and unequal variance assumption, it was determined that 61 participants would be needed for the intervention group and 69 for the control group. Assuming a drop-out rate of 15%, 150 patients would need to be randomized.

The primary end point was first analyzed using intention-to-treat with baseline-observation carried forward. In other words, all patients who met the full inclusion criteria and completed a baseline survey were included in this analysis according to their initial randomization. A complete case analysis was then performed with all patients who completed both questionnaires. The differences in characteristics of patients who did and did not complete the study were evaluated using the χ^2 and 1-way ANOVA for characteristics with 2, or more than 2 categories, respectively. Because the baseline questionnaire did not include the education satisfaction questions, it was impossible to use intent-to-treat to analyze this outcome. As such, all secondary outcomes were evaluated using the complete cases (ie, only the participants who completed both the questionnaires). Patient characteristics and video viewing habits were summarized using descriptive statistics. *T*-tests were used to compare the difference between the intervention and control in changes in transplant knowledge (primary outcome), as well as the differences in education satisfaction, QOL, self-efficacy, and beliefs of medicine scores (secondary outcomes). Subgroup analyses were conducted on participants with evidence of actually viewing the videos (ie, per-protocol analysis), which was defined as objective evidence of watching at least 80% of each video, and clinical variables (age, sex, income, education attained, stage of transplant process, and site of enrolment), to determine whether specific patient subtypes responded more positively to the intervention. Qualitative data from the open-ended questions were collated and stratified according to positive and negative comments.

RESULTS

Out of 222 patients approached to participate, 52 declined, and an additional 8 were excluded for the following reasons: 4 received a transplant, 2 were removed due to an administrative error, and 2 withdrew on their own accord. Of the following patients who met the full inclusion criteria, 162 were randomized, with 82 in the intervention group and 80 in the control group (intent-to-treat population). Thirty of these participants did not complete the postintervention questionnaire, therefore, the number of participants who had full data for analysis was 132, with 64 in the intervention group and 68 in the control (complete case analysis; Figure 1). Ten participants completed the surveys by phone and received DVD copies of the intervention, with approximately 3 requiring the assistance of a caregiver.

Participant Characteristics

Participants who were enrolled in the study (intent-to-treat population, n = 162) were a mean of 50.2 ± 15.2 years old, and nearly 60% were male. Table 1 presents the characteristics for those who did (n = 132) and did not complete the study (n = 30). Significantly more participants that completed the study were white, with less First Nations, Métis, or Inuit ($P \leq 0.03$). In the complete case population (n = 132), the participants were distributed and randomized evenly between the enrolment sites; Regina (n = 22 video assignment and n = 45 total), Saskatoon (n = 20 video assignment and n = 42 total), and Calgary (n = 22 video assignment and n = 45 total). Table 2 presents the characteristics for the complete case population, stratified according to assignment.

Transplant Knowledge

Among the intent-to-treat population (n = 162), the baseline K-TUT scores were 55.4 ± 6.4 and 55.7 ± 7.1 in the

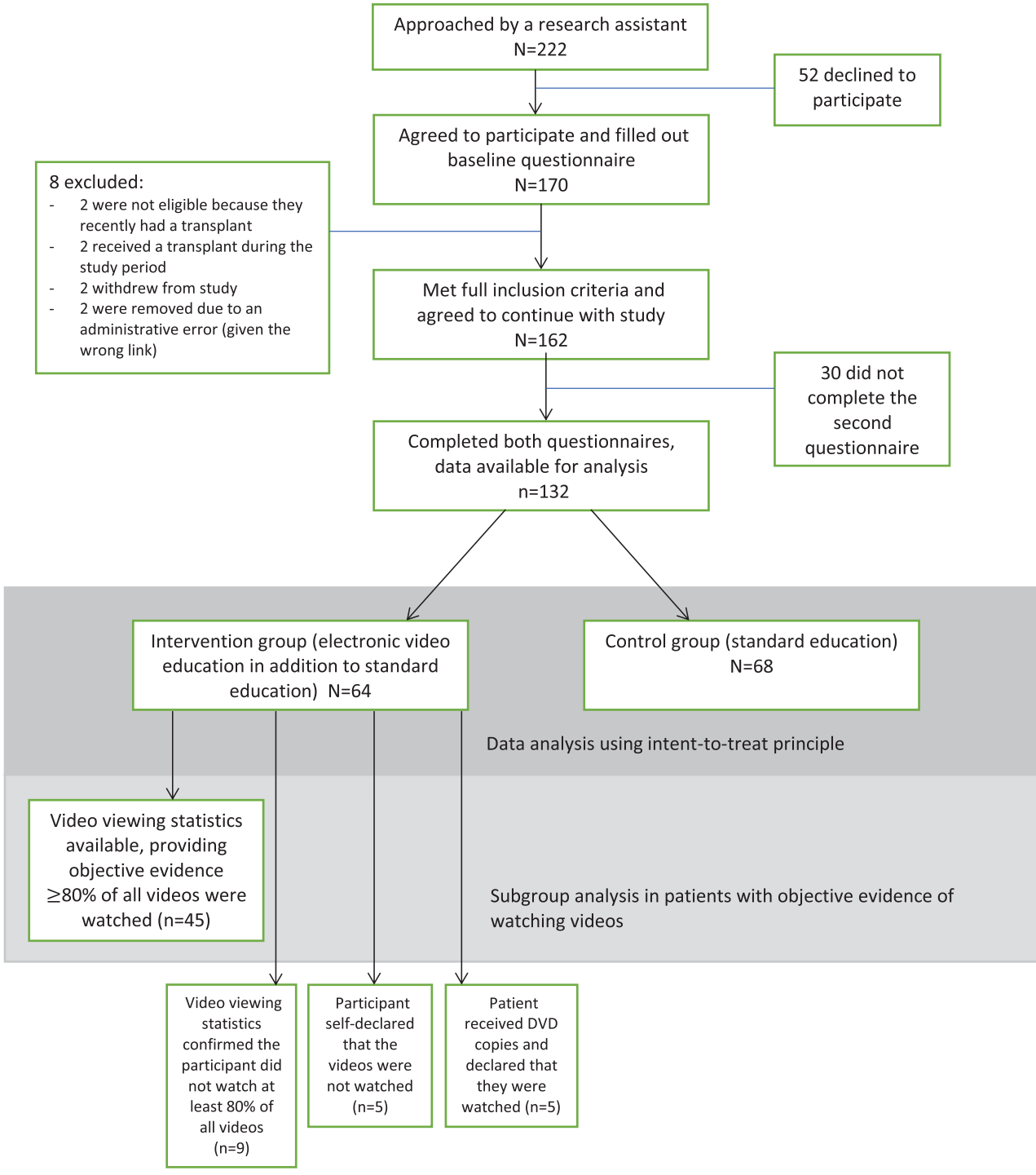

FIGURE 1. Study enrollment flow chart. DVD, digital video disk.

intervention and control, respectively. Change in knowledge using baseline-observation carried forward revealed a significantly higher increase in the intervention group (2.1 ± 3.6) compared with the control (0.8 ± 3.4; $P < 0.02$). Using the complete case analysis (n = 132), the mean knowledge change in the intervention was 2.7 ± 3.9, whereas in the per-protocol analysis (n = 45), it was 3.4 ± 3.8. No demographic variables were associated with change in knowledge overall. However, in the per-protocol analysis (n = 45), employment status was associated, whereby participants who achieved the largest gains were either unemployed or temporarily not working (mean K-TUT change 6.0 ± 2.1, $P < 0.001$).

Education Satisfaction

The mean scores on the satisfaction questions are presented in Table 3. Participants in the intervention group were significantly more satisfied with their transplant education, compared with participants in the control ($P < 0.02$). They also achieved significantly higher mean scores on understanding why transplant medications were necessary and why so many

TABLE 1.

Characteristics for those who did and did not complete the study

	Total		Completed		Not completed		
	Count	%	Count	%	Count	%	
Characteristics	**162**	**100**	**132**	**100**	**30**	**100**	***P***
Age, mean (SD), y	50.2 (15.2)		51.2 (14.6)		45.6 (17.2)		0.48
Gender							0.93
Male	94	58.0	77	58.3	17	56.7	
Female	67	41.4	54	40.9	13	43.3	
Other	1	0.6	1	0.6	0	0	
First language							0.18
English	137	84.6	114	86.4	23	76.7	
Others	25	15.4	18	13.6	7	23.3	
Ethnicity[a]							
White	108	66.7	93	70.5	15	50.0	**0.03**
Hispanic/Latin	2	1.2	2	1.5	0	0	0.50
Black/African American	3	1.9	2	1.5	1	3.3	0.51
First Nation/Metis/Inuit	29	17.9	19	14.4	10	33.3	**0.02**
Asian/Pacific Islander	23	14.2	20	15.2	3	10.0	0.47
Other/prefer not to say	2	1.2	1	0.1	1	3.3	0.25
Work status							0.89
Unemployed/temporarily cannot work	19	11.7	15	11.4	4	13.3	
Disability income	47	29.0	36	27.3	11	36.7	
Working (part-time/full-time)	50	30.9	44	33.3	6	20.0	
Retired	33	20.4	28	21.2	5	16.7	
Other/prefer not to say	13	8.0	9	6.8	4	13.3	
Education							0.97
Middle school	4	2.5	4	3.0	0	0	
High school	46	28.4	37	28.0	9	30	
University/graduate studies	53	32.7	42	31.8	11	36.7	
Trade/technical/vocational training	54	33.3	45	34.1	9	30	
Prefer not to say	5	3.1	4	3.0	1	3.3	
Marital status							0.23
Unmarried	28	17.3	22	16.7	6	20	
Married/common law	106	65.4	84	63.6	22	73.3	
Divorced/widowed/separated	23	14.2	22	16.7	1	3.3	
Prefer not to say	5	3.1	4	3.0	1	3.3	
Province							0.79
Saskatchewan	106	65.4	87	65.9	19	63.3	
Alberta	56	34.6	45	34.1	11	36.7	
Whether previously had a transplant							0.89
Yes	31	19.1	25	18.9	6	20	
No	131	80.9	107	81.1	24	80	
How often requires help reading hospital materials							0.69
Never	89	54.9	77	58.3	12	40.0	
Anytime	73	45.1	55	41.7	18	60.0	
Confidence filling out forms without assistance							0.41
Extremely	101	62.3	84	63.6	17	56.7	
Quite a bit/somewhat	58	35.8	46	34.8	12	40.0	
A little bit/not at all	3	1.9	2	1.5	1	3.3	

[a]Since respondents could choose >1 option, *P* values were calculated between each for race/ethnicity separately; results may not add up to 100% because participants could choose >1 response. Significant values are bolded.

tests were needed before the transplant and on satisfaction with information provided about transplant expectations.

Participants in the intervention group expressed several comments about the videos in the open-ended questions, and the feedback was overall very positive. The words clear, concise, and informative were commonly used to describe the videos and several participants commented that it was helpful to hear personal stories from other patients. According to one participant, they were simple and straightforward. It was helpful to have them broken down into sections and in sequence with what happens during the transplant process. Another participant stated, "I think the videos provided good information for me, who has asked a lot of questions and done a lot of research, and for those who know very little

TABLE 2.

Characteristics of the complete case population stratified according to arm

	Total		Control		Video		
	Count	%	Count	%	Count	%	
Characteristics	**132**	**100**	**68**	**100**	**64**	**100**	***P***
Age, mean (SD), y	51.2 (14.6)		52.1 (14.4)		50.3 (14.9)		0.37
Gender							0.47
Male	77	58.3	38	55.9	39	60.9	
Female	54	40.9	29	42.6	25	39.1	
Other	1	0.8	1	1.5	0	0	
First language							0.25
English	114	86.4	61	89.7	53	82.8	
Other	18	13.6	7	10.3	11	17.2	
Ethnicity[a]							
White	93	70.5	49	72.1	44	68.8	0.68
Hispanic/Latino	2	1.5	1	1.5	1	1.6	0.97
Black/African American	2	1.5	2	2.9	0	0	0.17
First Nations/Metis/Inuit	19	14.4	10	14.7	9	14.1	0.91
Asian/Pacific Islander	20	15.2	8	11.8	12	18.8	0.26
Other	1	0.8	0	0	1	1.6	0.30
Work status							0.86
Unemployed/temporarily cannot work	15	11.4	7	10.3	8	12.5	
Disability income	36	27.3	18	26.5	18	28.1	
Working	44	33.3	24	35.3	20	31.3	
Retired	28	21.2	15	22.1	13	20.3	
Other/prefer not to say	9	6.8	4	5.9	5	7.8	
Highest level of education							0.36
Middle school	4	3.0	1	1.5	3	4.7	
High school	37	28.0	18	26.5	19	29.7	
University/graduate studies	42	31.8	21	30.9	21	32.8	
Trade/technical training	45	34.1	27	39.7	18	28.1	
Prefer not to say	4	3.0	1	1.5	3	4.7	
Marital status							0.82
Unmarried	22	16.7	10	14.7	12	18.8	
Married/common law	84	63.6	45	66.2	39	60.9	
Divorced/widowed/separated	22	16.7	11	16.2	11	17.2	
Prefer not to say	4	3.0	2	2.9	2	3.1	
Support person							0.94
Yes	126	95.5	65	95.6	61	95.3	
No	6	4.5	3	4.4	3	4.7	
Living (community)							0.42
Rural or reserve	33	25.0	15	22.1	18	28.1	
Urban	99	75	53	77.9	46	71.9	
Driving distance to transplant center							0.35
Within 1 h	96	72.7	52	76.5	44	68.6	
>1 but <5 h	34	25.8	15	22.1	19	29.7	
>5 h	2	1.5	1	1.5	1	1.6	
Previous transplant							0.61
No	107	81.1	54	79.4	53	82.8	
Yes	25	18.9	14	20.6	11	17.2	
On dialysis							
Yes	104	78.8	51	75.0	53	82.8	0.27
Time on dialysis[b]							0.15
<1 y	28	26.9	11	21.6	17	32.0	
1–5 y	48	46.1	24	47.1	24	45.2	
5–10 y	17	16.3	9	17.6	8	15.1	
>10 y	11	10.6	7	13.7	4	7.5	
Type of dialysis[b]							0.31
Hemodialysis	77	74.0	41	80.4	36	67.9	

Continued next page

TABLE 2. (Continue)

Characteristics of the complete case population stratified according to arm

	Total		Control		Video		
	Count	%	Count	%	Count	%	
Characteristics	**132**	**100**	**68**	**100**	**64**	**100**	***P***
Peritoneal dialysis	27	26.0	10	19.6	17	32.0	
Stage of transplant process							0.71
In assessment	74	56.0	38	55.9	36	56.2	
Approved for transplant	35	26.5	17	25.0	18	28.1	
Was listed, but status on hold	15	11.4	11	16.2	4	6.3	
Do not know	8	6.1	2	2.9	6	9.4	
Possible or confirmed living donor							0.76
Yes	104	78.8	51	75	53	82.8	
No	28	21.2	17	25	11	17.2	
How often requires help reading hospital materials							0.13
Never	77	58.3	44	64.7	33	51.6	
Anytime	55	41.7	24	35.3	31	48.4	
Confidence filling out forms without assistance							0.80
Extremely	84	63.6	44	64.7	40	62.5	
Quite a bit/somewhat	46	34.8	23	33.8	23	35.9	
A little bit/not at all	2	1.5	1	1.5	1	1.6	
Read brochures about transplant	106	80.3	55	80.9	51	79.7	0.83
Previously watched videos about transplant	57	43.2	29	42.6	28	43.8	0.90
Browsed internet about transplant	86	65.2	42	61.8	44	68.8	0.40

[a]Since respondents could choose >1 option, *P* values were calculated between each for race/ethnicity separately.
[b]The denominator used was the number of patients on dialysis.

TABLE 3.

The mean scores on the satisfaction questions for the intervention and control groups.

Variable	Control group (n = 68), mean (SD)	Video group (n = 64), mean (SD)	*P*
I am satisfied with my transplant education.	3.8 (1.0)	4.2 (0.9)	<0.02
I am happy with the education provided to me about transplant medications.	3.6 (1.1)	4.0 (1.2)	NS
I understand why I must take anti-rejection pills after my transplant.	4.7 (0.5)	4.9 (0.3)	<0.02
I feel confident that I will be able to take my transplant medications as prescribed.	4.8 (0.5)	4.7 (0.6)	NS
I am happy with the education provided to me about other transplant expectations (clinic appointments, bloodwork, life after transplant).	3.8 (1.1)	4.2 (0.9)	<0.05
I understand why so many are tests are needed to make sure that I am suitable to get a kidney transplant.	4.4 (0.7)	4.8 (0.5)	<0.03

NS, not significant.

about transplantation." When asked what the participants did not like about the videos, the majority (n = 27) indicated that they had nothing negative to say. A few participants provided feedback such as they did not like the animations, felt they were a bit simplistic, or that they did not like having to type in a password. More than 1 participant indicated that they would have really liked to see the videos earlier in their transplant process. The full open-ended feedback (verbatim), which outlines what participants did and did not like about the videos, is available in Tables S1 and S2, **SDC**, http://links.lww.com/TXD/A361, respectively.

Video Viewing Habits

Of the participants who completed the study (complete cases, n = 132), 78% (50/64) watched at least 80% of each video. The majority (70%, 45/64) viewed them electronically, while 8% (5/64) received DVDs and self-reported participation. Most participants watched the videos once; however, videos 1 through 4 were watched twice by 8 participants, and videos 5 and 6 were watched more than once by 10 participants. The average time between participant video viewing and completing the postintervention study was 19.9 ± 14.9 days.

QOL, Self-efficacy, and Beliefs of Medicine

Table 4 presents the mean scores for QOL, self-efficacy, and beliefs of medicine scores in the intervention and control group at both time points. No significant differences were apparent in the score changes between the groups in any of these measures.

DISCUSSION

We undertook a randomized controlled trial to determine whether a patient-oriented video series could improve transplant knowledge compared with standard of care education. The video series was developed so that all patients could receive additional transplant education from home, without

TABLE 4.

The mean (SD) scores in each group for quality of life, self-efficacy, and beliefs of medicine at time 1 and time 2

		Control (n = 68)		Video (n = 64)	
Variables	**Time point**	**Mean**	**SD**	**Mean**	**SD**
Quality of life (physical)	Prescore	44.0	8.4	43.6	8.4
	Postscore	43.6	8.3	42.1	8.4
Quality of life (mental)	Prescore	45.7	10.8	47.5	10.6
	Postscore	46.6	10.1	46.2	10.1
Self-efficacy	Prescore	31.5	3.9	31.7	5.0
	Postscore	32.2	4.1	31.7	5.0
Beliefs of medicine (necessity)	Prescore	19.6	3.9	20.5	3.4
	Postscore	19.6	4.1	20.5	3.3
Beliefs of medicine (concern)	Prescore	12.4	3.7	12.3	3.5
	Postscore	12.5	3.7	12.7	3.5
Beliefs of medicine (overuse)	Prescore	9.7	3.2	9.7	3.1
	Postscore	9.5	3.2	9.7	3.2
Beliefs of medicine (harm)	Prescore	7.5	2.5	7.5	2.2
	Postscore	7.1	2.5	7.3	2.4
Beliefs of medicine (differential)	Prescore	7.2	5.1	8.2	4.9
	Postscore	7.1	5.3	7.8	5.1

geographic limitations or additional visits to the transplant center. Although recent literature has illustrated the benefits of using video-based education to improve knowledge about transplant options and willingness to discuss about living donor transplant,[31–34] very few studies have addressed the impact on transplant-specific knowledge for patients undergoing this procedure. To our knowledge, this is the first study that has used a randomized controlled design and a validated outcome measure.

Our findings showed significant improvements in knowledge and levels of satisfaction among patients receiving video education compared with standard care. However, the intervention did not have any impact on self-efficacy, QOL, or beliefs in medicine. Studies in the posttransplant setting have consistently shown that multimodal approaches (such as a combination of education/cognitive and counseling/behavioral) are superior for influencing positive behaviors, such as improved medication adherence, and tailored (individualized depending on the patient) strategies seem to be most effective.[35,36] Although our intervention was theoretically driven and patient informed and incorporated practical tips aimed at improving self-efficacy, video education by nature uses a one-size fits all approach, and we surmise that this may be a factor that affected our outcomes. Our study adds to existing literature by indicating that multimodal strategies (rather than video alone) may be beneficial in the pretransplant setting as well.

A major challenge with studying educational interventions is the lack of a standardized way to measure them. Although knowledge scales are often used in such prestudy and poststudy designs, it should be noted that this is an extremely difficult construct to measure, and the clinical relevance of such outcomes are difficult to translate. As is the case with any new self-report instrument, time is needed to confirm validity and association with other clinical outcomes. In our initial validation work with the K-TUT, we tested for internal consistency, construct validity, floor and ceiling effects, and reproducibility in pretransplant and posttransplant cohorts.[17] Although further work is ongoing with the K-TUT, most of these results are not yet published. A recent study translated the tool and validated it in a Korean population and showed a moderate but significant association with medication adherence in a posttransplant cohort.[37]

In the present study, although transplant changes in knowledge were significantly higher in the video group ($P < 0.02$), the magnitude of change was indeed small. We are, however, encouraged by the statistically significant improvements in education satisfaction and the positive patient feedback from the open-ended questions. Practically speaking, this video intervention would be part of a multifaceted approach to improving patient outcomes in the posttransplant period. Of note, several other studies testing knowledge in a predesign and postdesign have also shown small (but statistically significant) movements on their respective knowledge scales.[33,38,39]

The limitations of this study warrant consideration. The lack of blinding is a hinderance in all educational studies. We tried to minimize bias by keeping the research team blind to the participant allocation, and we did not explicitly explain the nature of the intervention to participants during the enrolment process, so that patients in the control group were not aware that the intervention was receiving videos and vice versa. Meeting the needs of patients that do not have access to the internet or email or have poor computer literacy was a challenge. Our team worked extensively to develop an alternate process so this was not a barrier for participation, and the process was pretested with patient team members. Nevertheless, participating in the study may have actually been a hinderance to watching the videos because the process may have been perceived to be cumbersome, and password access was required for those who viewed the videos through the Panopto platform. Alternatively, the use of an incentive and reminders may have encouraged participants to view the videos in a manner that would be different than observed in a real-world setting. The incentive, however, was available to all participants after completing the second questionnaire and was not contingent on watching the videos. The study

population consisted of a diverse and heterogeneous cohort and included patients who were being worked up or were listed for kidney transplant. Because little is known about the optimal time to deliver education and which populations may benefit the most, we attempted to explore this in the subgroup analysis, but unfortunately, our sample size may not have been large enough to fully characterize significant trends. Because this is the first time the K-TUT has been tested for responsiveness in a predesign and postdesign, thresholds have not been established for clinical significance. We look forward to the results of additional studies using the K-TUT to help provide insight.

Conclusions

Video education delivered to patients improved patient education and educational satisfaction in the pretransplant period. High uptake of the intervention suggests that this type of intervention is of utility and could enhance transplant care. However, multimodal strategies and tailored interventions are likely necessary for improving other outcomes such as self-efficacy and QOL.

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