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A Dialysis Center Educational Video Intervention Increases Patient Self-Efficacy and Kidney Transplant Evaluations

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Abstract

Introduction: The optimal treatment for end-stage kidney disease is renal transplant. However, only 1 in 5 (21.5%) patients nationwide receiving dialysis are on a transplant waitlist. Factors associated with patients not initiating a transplant evaluation are complex and include patient specific factors such as transplant knowledge and self-efficacy. **Research Question:** Can a dialysis center-based educational video intervention increase dialysis patients' transplant knowledge, self-efficacy, and transplant evaluations initiated? **Design:** Dialysis patients who had not yet completed a transplant evaluation were provided a transplant educational video while receiving hemodialysis. Patients' transplant knowledge, self-efficacy to initiate an evaluation, and dialysis center rates of transplant referral and evaluation were assessed before and after this intervention. **Results:** Of 340 patients approached at 14 centers, 252 (74%) completed the intervention. The intervention increased transplant knowledge (Likert scale 1 to 5: 2.53 [0.10] vs 4.62 [0.05], $P < .001$) and transplant self-efficacy (2.55 [0.10] to 4.33 [0.07], $P < .001$. The incidence rate per 100 patient years of transplant evaluations increased 85% (IRR 1.85 [95% CI: 1.02, 3.35], $P = .0422$) following the intervention. The incidence rates of referrals also increased 56% (IRR 1.56 [95% CI: 1.03, 2.37], $P = .0352$), while there was a non-significant 47% increase in incidence rates of waitlist entries (IRR 1.47 [95% CI: 0.45, 4.74], $P = .5210$). **Conclusion:** This dialysis center-based video intervention provides promising preliminary evidence to conduct a large-scale randomized controlled trial to test its effectiveness in increasing self-efficacy of dialysis patients to initiate a transplant evaluation.

Keywords

kidney transplant, education, video intervention, dialysis patients, renal disease

Introduction

In the United States, over 700,000 individuals are being treated for end-stage kidney disease (ESKD), and 511,000 of those are on renal dialysis (2016).[1] The optimal treatment for ESKD is renal transplantation. The Centers for Medicare and Medicaid Services (CMS) requires all dialysis centers to provide education to new ESKD patients regarding renal transplantation.[2] Despite this, only 1 in 5 (21.5%) patients nationwide receiving dialysis are on a kidney transplant waitlist.[3] A statewide analysis of patients' progress through the kidney transplant waitlist process (referral, evaluation, and approval for waitlisting) reveals significant patient dropout at every step. In this analysis, only 44.3% of dialysis patients were referred, 15.1% evaluated, and 7.3% ultimately were waitlisted for kidney transplant. Patients who successfully progressed through this process were more commonly younger, non-African American, privately insured, and lived in neighborhoods with higher income.[4] In the Southeast United States, most patients who initiated a transplant evaluation did so at a time that was noticeably distant from initiating dialysis. Within 1 year of starting dialysis, only 33.7% of patients have been referred for evaluation[5] in the United States Renal Disease Systems Network 6 (USRDS-North Carolina, South Carolina, and Georgia). Furthermore, pre-emptive referrals were uncommon in the Southeast. Thus, there is need to reengage prevalent

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ESKD patients with dialysis vintage regarding the option of renal transplant across the United States, but particularly within Network 6.

Factors associated with patients not initiating a transplant evaluation are complex, ranging from nephrologists' and dialysis center staff's understanding of current requirements for referral to patient specific factors, including transplant knowledge and perceived barriers to transplant (ie, suitability for transplant, financial and social needs, donor identification, religious, etc).[6] Previous studies clearly demonstrate that patients' knowledge of the transplant process and self-efficacy regarding initiating a transplant evaluation are suboptimal.[7] Additionally, non-Hispanic Black race was associated with a lower probability of initiating a transplant evaluation.[4] Surveys of dialysis centers demonstrate that increased transplant education was associated with increased waitlisting rates.[8] Studies also suggested that effective interventions to increase the number of patients initiating a transplant evaluation must increase both transplant knowledge and patient self-efficacy to initiate a transplant evaluation.[9]

CMS has recently expanded their ESKD Quality Incentive Program (as part of the Advancing American Kidney Health Initiative) establishing a new benchmark termed the Percentage of Prevalent Patients Waitlisted (PPPW).[10] The PPPW is simply the proportion of dialysis patients aged <75 years who are on a kidney transplant waitlist. In the near future, dialysis center reimbursement rates will be tied to the PPPW. The PPPW goal for each dialysis clinic is 34.29% by 2022.[10] In the study-targeted state, the PPPW was only 7.3% in 2018,[11] compared to a PPPW of 21.5% in the United States.[12] Achieving the 34.29% PPPW will be especially challenging in the study-targeted state given the poor historic track record of kidney transplant referral, evaluation, and waitlisting.

We presented an iPad-based video educational intervention involving 14 dialysis centers, led by a single transplant center, with the goal of increasing rates of initiating a transplant evaluation in prevalent ESKD dialysis patients with dialysis vintage. Somewhat unique to this intervention, the dialysis centers allowed access to patients during center-based hemodialysis. The intervention was deliberately designed to increase patient self-efficacy with regards to initiating a transplant evaluation. Self-efficacy is an important concept in health behavior research, defined as one's belief in their ability to complete a prospective task.[13] Measures of self-efficacy have been demonstrated to be strongly associated with initiating a transplant evaluation.[9,14] Therefore, the purpose of this study was to assess whether an iPad video educational intervention, delivered to dialysis patients during hemodialysis at their dialysis facility, would increase patient self-efficacy resulting in increased rates of dialysis patients initiating a transplant evaluation.

Table 1. Comparison of Participating Dialysis Clinics from Which Accessible Population was Recruited, and all State Dialysis Clinics.

Variable	Participating clinics (N = 14)	All state clinics (N = 150)
	Mean (SE)	Mean (SE)
Facility size (patients)	60.14 (28.14)	64.98 (31.23)
Age	59.66 (2.56)	61.22 (2.88)
	Median [IQR]	Median [IQR]
BMI, male	27.38 [26.68, 27.95]	28.38 [26.92, 29.83]
BMI, female	31.57 [30.42, 34.99]	29.68 [27.50, 32.66]
	N (%)	N (%)
Female	47.04 (6.68)	45.17 (7.03)
Black	72.16 (16.57)	65.14 (18.22)
Diabetes	41.84 (8.03)	42.15 (9.39)
Congestive heart failure	56.65 (7.93)	53.46 (9.45)
COPD	31.89 (7.43)	31.79 (7.85)
Cardiovascular disease	22.72 (4.53)	23.72 (7.63)

BMI, body mass index (kg/m^2); COPD, chronic obstructive pulmonary disease.

Design/Methods

Design

This was a prospective intervention using a before-and-after design to determine the impact of a video-based intervention on the measurable outcomes of dialysis patient transplant knowledge, self-efficacy, and transplant evaluation rates. Waiver from IRB oversight and waiver of written informed consent was granted by the local institutional Office of Research Integrity because the design did not use protected health information of the participants.

Setting

Fourteen dialysis centers in the state, operated by a single nonprofit corporation, agreed to participate. The nonprofit entity approved all programmatic materials. Permission was obtained from each dialysis center medical director.

Population

The description of the accessible patient population of these 14 clinics can be found in Table 1. The majority of the patient population at these clinics were Black (72.2%), male (53%), suffered from congestive heart failure (56%) and averaged 59.7 years old; demographics similar to that seen in all dialysis clinics in the state (65%, 54.8%, 53.5% and 61.2 years old, respectively.

Sampling

At the targeted transplant center, all ESKD patients undergoing dialysis (our target population) are eligible for kidney transplant evaluation, even if they are likely to have absolute or relative contraindications for transplant. Inclusion criteria for the target population were: English-speaking adult ESKD patients aged 18 to 75 on hemodialysis. Exclusion criteria included: patients who had previously completed a transplant evaluation and/or were currently on a kidney transplant waitlist. Dialysis patients were approached during hemodialysis (the accessible

population) by a transplant center advanced practice provider (APP). The 3 APPs that conducted this intervention included 1 Nurse Practitioner and 2 Physician Assistants. The APPs verbally asked patients if they had completed a transplant evaluation. Patients who responded that they had not (transplant evaluation self-report was validated through review of the electronic health record) were asked if they would be willing to watch an educational video about kidney transplantation. Participation was voluntary and verbal consent was acquired prior to initiation of the education intervention. Patients were informed that there was no identifying information collected and that the APPs were blinded to the patient's responses.

Data Collection

Protected health information was not collected. Patients completed a REDCap-based electronic self-administered survey before and after the interventional video. The survey included 5 demographic questions (pre-video only) and 5 questions that mirrored the 5 components of the video (pre- and post-video). These questions measured the patient's perception of their transplant knowledge. A sixth question (pre- and post-video) was posed gauging the patient's transplant self-efficacy ("I feel prepared to start a medical workup for kidney transplant", Table 2). The self-efficacy question measures an individual's confidence in their ability to complete the transplant evaluation process.[13] The response options were a standard 5-point Likert Scale. Following the video, they answered the same 6 questions. Responses were compared before and after the educational video intervention. Transplant referrals, evaluations, and waitlist additions were measured for 13 of 14 participating dialysis centers. The data for these pre-defined endpoints were obtained from the transplant center's database (Phoenix module in EPIC).

Interventional Video

The educational video was narrated by a local television college sports commentator who was also a recipient of a living donor kidney. The video was presented on an iPad and participants were provided disposable earbuds. iPads have successfully been used to deliver medical educational interventions including those targeting organ donation registrants, ESKD patients, and Hepatitis B patients.[15–17] Content was delivered via a blended approach, involving factual information intermixed with testimonials, an effective method to induce behavioral change.[18]

The video was 12 min in length and explained the kidney transplant process from referral to entry onto the waitlist. Both deceased donor and living donor transplant were covered. The specific following topics were included: (1) survival advantage of kidney transplantation compared to dialysis, (2) steps involved in kidney transplant workup, (3) medical contraindications to transplant (eg BMI, functional status), (4) social requirements for transplant (eg caregiver, reliable transportation), and (5) living donor kidney transplant. These 5 topics and survey questions were abstracted from several validated transplant knowledge and self-efficacy surveys.[19–22] During the development of the video, panels consisting of nephrologists, transplant surgeons, transplant coordinators, advance practice providers, and transplant administrators were asked for their input. The initial prototype video was further refined by transplant recipients and dialysis center social workers, prior to developing a final 12-min video reviewed and approved by the corporate office of the dialysis center ownership. A significant difference in this video compared to those in the literature was the geographically specific, short, focused content presented by a Black narrator reflective of the majority of the target population.

Table 2. Transplant Knowledge and Self-Efficacy Survey Questions.

Question #	I feel that I have an understanding of:
1	The survival benefit of a kidney transplant over dialysis
2	The steps that I need to take to complete my medical workup for my kidney transplant
3	What would prevent me from being considered as a candidate to receive a new kidney
4	The benefits of identifying a living donor for my new kidney
5	The financial and caregiver requirements that go along with getting a new kidney
	Self-efficacy question:
6	I feel prepared to start a medical workup for kidney transplant

Data Analyses

Baseline demographic information is displayed using standard descriptive statistics (N, proportions, means and standard errors). For each self-assessed transplant knowledge survey question, we compared the mean Likert score (1 = Totally Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Totally Agree) before and after the educational intervention using a paired *T*-test. A preliminary analysis was performed to identify univariate associations between the self-efficacy question and baseline demographic information. From this, multivariable linear regression was performed for key factors associated with this response using PROC MIXED.

Event rates per 100 patient years were calculated for the outcomes of referrals, evaluations initiated, and waitlist entries and compared before and after the intervention. Generalized Linear Modeling was used, as implemented in the PROC GENMOD procedure, to perform regression analysis for these event counts (referrals, evaluations, and waitlist entries). Because of large standard deviations relative to the mean rates, overdispersion was expected. Thus, negative binomial regressions were used instead of Poisson. Repeated measures with independent correlation structure were implemented for pre and post-test. The estimated incidence rate ratios (IRR) were reported from the models. Event rates were estimated per 100 patient

years by incorporating dialysis center patient volumes and follow-up time. Baseline rates were established from the 12 months immediately preceding the intervention for each dialysis center. Rates were determined from the time of the intervention administration to the end of the study for each dialysis center, which ranged from 4 to 13 months. Statistical significance was set as a two-sided *P*-value <.05. SAS 9.4 (SAS Institute) was used for the statistical analysis.

Results

Accessible Patient Population

The intervention was conducted between January 2019 and September 2019. A total of 340 dialysis patients were approached out of a total of 840 clinic patients at the 14 participating dialysis centers and solicited participation. These patients were representative of the target population of the state: percentages of females, Blacks; patients with diabetes, congestive heart failure, chronic obstructive pulmonary disease, cerebrovascular disease were all similar to that seen in the state as a whole (Table 1).

There were 56 patients excluded because they were already on a transplant waitlist, had already completed an evaluation, or had been formally turned down by a transplant selection committee. This was determined by review of the electronic health record or by questions answered during the survey prior to watching the video. A total of 252 patients met criteria, agreed to participate, and completed all components of the intervention (see Supplemental Figure 1). Anecdotally, a common reason given by patients for not consenting to be in this intervention was a negative perception of transplant. The mean number per clinic for completing intervention was 20.7 (7.9). Accessible patients were highly representative of the demographics of the state's targeted dialysis population including a slight majority of males (54%), a predominance of Blacks (77%), and most with a high school education (66%) (see Table 3). From the participating group, 46 (18%) had initiated (but not completed) a transplant evaluation whereas 206 (82%) had never visited a transplant center (see Supplemental Figure 1).

Table 3. Participant Demographics (N = 252).

Characteristic	*N* (%)
Gender	
Female	117 (46.4)
Race	
White	41 (16.3)
Black	194 (77.0)
Hispanic	12 (4.8)
Other or not reported	5 (2.0)
Age	
<40	34 (13.5)
41 to 55	82 (32.5)
56 to 64	65 (25.8)
>65	71 (28.2)
Previously visited transplant center for evaluation	
Yes	46 (18.3)
No	206 (81.7)
Time on dialysis	
Not on dialysis	0 (0.0)
<1 yr	58 (23.0)
1 to 3 yr	72 (28.6)
4 to 5 yr	49 (19.4)
>5 yr	73 (29.0)
Education level	
< high school	32 (12.7)
High school	165 (65.5)
College 1 to 3 years	38 (15.1)
College 4 years or more (College Graduate)	15 (6.0)
Not reported	2 (0.8)

Survey Outcomes

After delivery of the educational video, participants demonstrated a significant increase in the mean Likert score for all the survey questions (Figure 1). The overall (all questions averaged) Likert score increased from 2.53 (0.10) to 4.62 (0.05), $P < .001$.

Watching the video had the greatest impact on the responses to question 3: "Understanding what would prevent me from being considered as a candidate to receive a new kidney" (2.39 [0.10] to 4.60 [0.05], $P < .001$. See Supplemental Table 1 for detailed data. For question #6 on self-efficacy, "I feel prepared to start a medical workup for kidney transplant", increased from 2.55 [0.10] to 4.33 [0.07] $P < .001$) after watching the video (Supplemental Table 1, Figure 1).

Multivariable analysis of patient sociodemographics was performed to identify associations for a positive response in self-efficacy. Estimates of regression are displayed in Supplemental Table 2. The magnitude of the difference before and after the intervention based on race did not change significantly ($P = .3395$). College education, dialysis center proximity (<50 miles) to the transplant center, and previously initiating a transplant evaluation each were significantly correlated with greater self-efficacy (ie higher response to question #6) prior to watching the video. Following the video, the greater self-efficacy seen as a consequence of education level, dialysis center proximity, and history of initiating a transplant evaluation were no longer significant predictors of response. Watching the video abrogated educational ($P = .0023$), geographic ($P < .0001$), and previous evaluation experience ($P = .0020$) disparities in an individual's perception of their transplant readiness self-efficacy (Figure 2).

Transplant Referrals, Evaluations, and Waitlist Additions

One of the 14 dialysis centers closed during the intervention and was excluded from this component of the analysis. Primary analyses only included referral-to-evaluation and evaluation-to-waitlisting events that did not cross the intervention time point (eg, a patient referred prior to the intervention and who initiated an evaluation after the intervention would

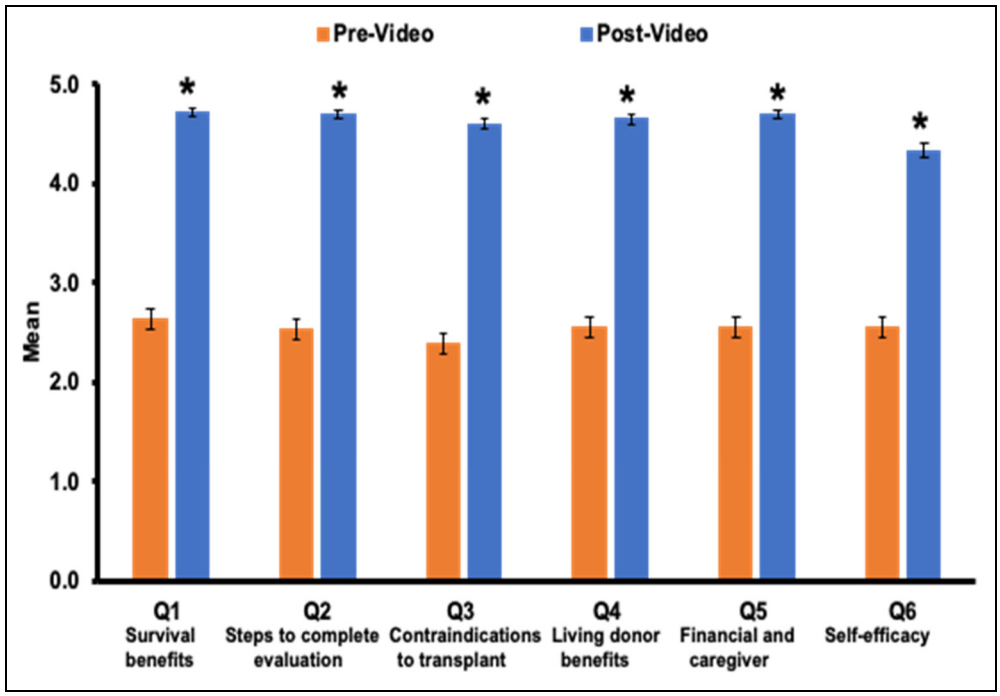

Figure 1. Effects of ipad video educational intervention on patient transplant knowledge and transplant self-efficacy. Likert scores for survey questions pre- and post-video. Mean scores (SE) for each question are shown for answers prior to and after watching the video. *$P < .001$, *t*-test for paired data.

not be counted as an evaluation in the event rate estimation). Increases in initiating a transplant evaluation were observed in 10 of the 13 dialysis centers. Collectively, the incidence rate per 100 patient years of transplant evaluations increased 85% (IRR 1.85 [95% CI 1.02, 3.35], $P = .0422$) following the intervention. While increases in transplant referral rates were observed in 11 of the 13 dialysis centers. The incidence rates of referrals increased 56% (IRR 1.56 [95% CI 1.03, 2.37], $P = .0352$). Transplant waitlist entries were not common during this intervention, with 9 out of 13 centers having no waitlist entries in the 12 months prior to the intervention, and 9 out of 13 centers having no waitlist entries following the intervention. Increases in transplant waitlist entries were observed in 3 of the 13 dialysis centers. There was a nonsignificant 47% increase in incidence rates of waitlist entries (IRR 1.47 [95% CI 0.45, 4.74], $P = .5210$; Figure 3).

Discussion

This dialysis center-based intervention was designed to measure the effectiveness of a brief transplant educational video delivered to dialysis patients during their hemodialysis treatment in initiating a transplant evaluation. The premise of the intervention was that educating dialysis patients about the transplant evaluation process via an iPad-based educational video would increase their self-efficacy, which would increase the probability of them initiating a transplant evaluation. The educational content was presented in a blended fashion, including factual information intermixed with testimonials by a kidney transplant recipient (narrator of the video). After watching the educational video, patients expressed significantly greater understanding of the transplant process. Measures of self-efficacy significantly increased with watching the educational video. Importantly, watching the video eliminated the educational and distance disparity in an individual's self-efficacy related to transplant readiness. The incidence rates per 100 patient years of transplant evaluations increased 85% in the months after the intervention, as compared to the 12 months prior. This educational intervention was short in duration, easy to deliver, and is capable of being widely disseminated.

Increasing transplant evaluations and additions to waitlist have long been recognized as targets for intervention. A Canadian study of waitlisted patients at a single transplant center reported patient dissatisfaction with the content of pre-transplant education.[23] Early transplant education programs have led to more ESKD patients completing evaluations and entering on to the waitlist, especially among Black patients.[24] The Communicating About Choices in Transplantation (COACH) study demonstrated that a 2 h kidney transplant educational session improved transplant knowledge and transplant communication self-efficacy in transplant candidates compared to those in a control group.[25] Another home-based multimodal longitudinal transplant education intervention targeting Blacks and low-income dialysis patients demonstrated increases in knowledge and self-efficacy in patients that completed the intervention.[9]

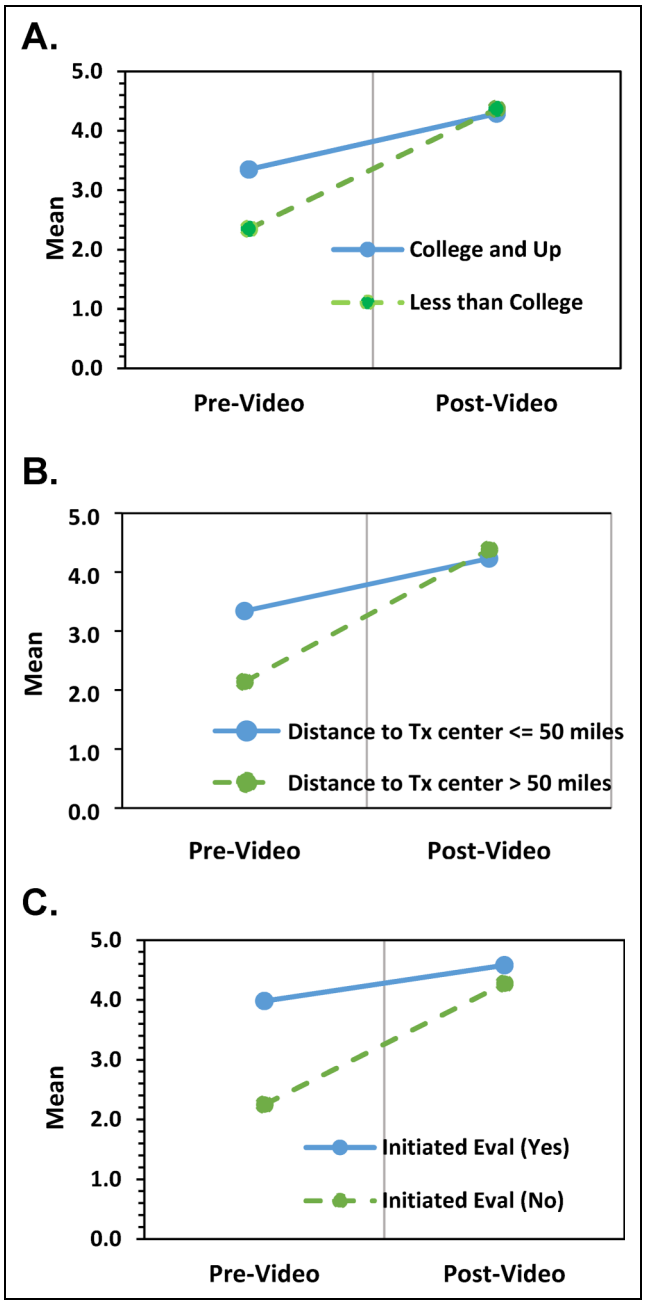

Figure 2. Abrogation of disparities in accessed patient transplant self-efficacy. Secondary analysis of question #6, "I feel prepared to start a medical workup for kidney transplant." Comparison of changes in mean Likert scores. Mean scores (SE) are shown for pre-video and post-video showing effect of educational level (A), distance to transplant center (B), and evaluation visit (C). Post-video response values were greater in all cases, and the pre-video differences were no longer evident after the educational intervention.

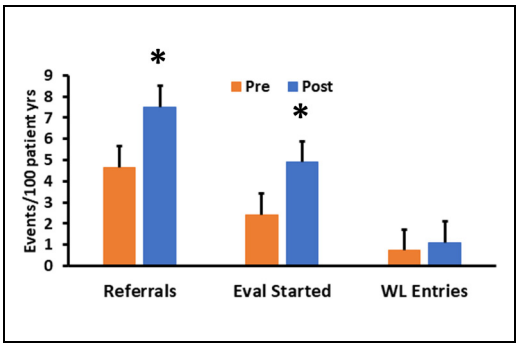

Figure 3. Effect of ipad video educational intervention on transplant referrals, transplant evaluations (Evals), And entry on to waitlist (WL entries). Data shown are mean number (SE) of events per 100 patient years. Comparisons are made before (Pre) the iPad video educational intervention and after (Post). * $P < .05$.

Patient-level interventions at dialysis centers and transplant centers have reported mixed success. Utilization of a previous kidney transplant recipient as a navigator in dialysis centers resulted in completion of more early steps of transplant referral.[26] Other randomized studies using previous kidney transplant recipients as navigators[27] or transplant social workers as navigators,[28] however, did not result in increased evaluations or waitlistings. Implementation of an intensive half-day structured education, held in concert with a formal transplant evaluation, resulted in a 38% higher probability of completing the evaluation process within 1 year compared to historic controls.[29] The RaDIANT (Reducing Disparities In Access to kidNey Transplantation) study involved a multi-component longitudinal intervention targeting dialysis staff members of 134 underperforming dialysis centers in Georgia. In this randomized study, the odds of transplant referral were 75% higher in intervention dialysis centers compared to control centers.[30] Significant increases in the secondary outcomes of evaluations initiated and waitlist additions were also observed.[30] While efficacious, the widespread implementation of intensive, multi-component interventions is challenging due to barriers such as limited personnel, time, and/or resources. In contrast, this intervention was brief, cross-sectional, easy to deliver, performed during routine care for dialysis, and successful at increasing referrals and evaluation initiations.

Despite demonstrating positive outcomes, our intervention had several limitations. This is a small-scale intervention, and thus it would be difficult to determine whether the effect size of this intervention may be mitigated when it is disseminated at a larger scale in a more heterogeneous target patient population. It is important to note that patient identifiers were not collected, so it is not clear that the patients who participated in the intervention were the same patients that initiated a transplant evaluation. In consideration that this was not a randomized controlled trial, we can only report changes that are associated with the initiation of the intervention but cannot make definitive statements about causality. Moreover, demand characteristics and social desirability may have contributed to more favorable questionnaire responses in the program participants. At this point, the increase in the patients initiating a transplant evaluation is probably best described as a bolus effect, and it is not clear if the impact of this educational intervention will have a durable impact. There was limited sociodemographic information collected and no comorbidity data, both of which are

associated with the probability of initiating a transplant evaluation. Unfortunately, patients on home peritoneal dialysis and home hemodialysis were not included. Lastly, this intervention was performed with the collaboration of only one of several dialysis corporations in the study-targeted state. While the demographics of the accessible patient population in this chain of dialysis clinics is similar to the ESKD population in the state as a whole, the results may not match the findings obtained if the intervention was performed at additional centers.

Conclusions

This transplant educational intervention, using a simple-to-deliver, short iPad video, resulted in significant increases in patient self-efficacy and a significant increase in the rate of patients initiating a kidney transplant evaluation. Broad expansion of this educational intervention to heterogeneous patient populations and dialysis centers is necessary to measure the full clinical utility of this video educational intervention to increase patient self-efficacy in attempt to increase transplant evaluations.

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Supplemental Material

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