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The Impact of Dialysis Facility Performance on Dialysis Facility Providers' Preparedness to Educate Dialysis Patients about Kidney Transplantation Options

By

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Master of Public Health

Epidemiology

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Abstract

The Impact of Dialysis Facility Performance on Dialysis Facility Providers' Preparedness to Educate Dialysis Patients about Kidney Transplantation Options

By Cheryl Isenhour

Objective: Dialysis facility providers play a crucial role in facilitating access to kidney transplantation through patient referral to a kidney transplant center. Few studies have sought to assess the opinions of dialysis facility providers regarding preparedness to educate patients about transplantation. We sought to determine whether dialysis facility providers from Georgia facilities with historically higher kidney transplant percent referral performance were more or less likely to demonstrate a positive change in opinion regarding their own preparedness to educate dialysis patients after attending Explore Transplant (ET) Dialysis Facility Provider Training, as compared to staff from Georgia dialysis facilities with historically lower referral performance.
Methods: We evaluated survey data collected before and after four ET training sessions held in Georgia during 2014. These data were linked to 2008-2011 Dialysis Facility Report (DFR) data, and facility referral data (2013 data). We used multivariable logistic regression to evaluate the relationship between positive change in opinion following exposure to ET provider training (outcome) and historical dialysis facility kidney transplant referral performance (exposure).
Results: The four ET training sessions attracted 101 dialysis facility staff attendees representing 85 unique dialysis facilities. In a crude logistic regression model, staff members representing facilities with higher historical percent transplant referral were more likely to demonstrate a positive change in opinion regarding their own confidence as a transplant educator following ET training, as compared to staff representing facilities with lower historical percent transplant referral [OR = 2.61 (95% CI: 1.10-6.45)]. This relationship was also evident in a multivariable logistic regression model adjusted for number of patients treated within the facility and for-profit status, with high vs. low performing facilities nearly three times more likely to feel confident in their transplant education abilities after attending the training [OR=2.99 (95% CI: 1.11-8.04)] [Table 3].
Conclusions: Staff members representing facilities with higher historical transplant referral performance were more likely to feel confident about their transplant education abilities after ET training. Additional research should focus on why staff from facilities with historically lower referral performance are not as confident in their abilities to educate, despite receiving kidney transplant educator training.

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Chapter I: Background

The Significance and Burden of Chronic and End Stage Kidney Disease

Kidney disease is broadly defined as an "abnormality of kidney structure or function with implications for the health of an individual" (1, p. 15). Chronic kidney disease (CKD) is characterized by renal dysfunction lasting longer than 90 days (1). End stage renal disease (ESRD), synonymous with kidney failure, is a serious potential outcome of CKD. Symptoms of ESRD may become so severe that the patient requires dialysis therapy or kidney transplantation to survive (1).

CKD is a condition with significant public health impact both globally and domestically. As of 2013 the average worldwide population prevalence of adults with CKD was estimated at approximately 10%, with prevalence reaching over 50% among high-risk populations (2, 3). Regarding ESRD specifically, in 2008 the World Health Organization reported than an estimated 1.4 million people were receiving renal replacement therapy, with incidence increasing by approximately 8% each year (4). CKD and ESRDD may also pose a significant financial burden at both the individual and population level. This often has the greatest impact among individuals residing in developing nations when universal health care is not available and individual health insurance is not affordable (3).

In the United States, research is currently underway to develop a sensitive and comprehensive national surveillance system for CKD (5). Prevalence of CKD among Medicare patients over 65 years old was reported to be 10%; in 2011 (6). The resulting Medicare expenditures for CKD patients totaled approximately 45.5 billion dollars. For the same year, the United States Renal Data System (USRDS) also reported

approximately 600,000 patients living with ESRD (6). The United States is second only to Taiwan in reported annual incidence of ESRD (3). Including both US. Medicare and private insurance claims, the total estimated cost of treating ESRD in 2011 was 49.3 billion dollars (6).

Demographic Profile of ESRD Network 6

There are 18 ESRD Networks in the United States. The Networks are tasked by the United States Centers for Medicare and Medicaid Services (CMS) to ensure ESRD patients receive quality care from ESRD facilities, including dialysis facilities and transplant centers, as well as medical providers (7). ESRD Network 6, which includes the states of North Carolina, South Carolina, and Georgia, is the largest ESRD Network in the nation. At the end of 2013 there were 632 Medicare certified facilities in Network 6, including both dialysis facilities and 10 transplant centers (8). Georgia had 309 dialysis facilities, the most among the Network 6 states, and 3 transplant centers. Large dialysis facilities comprised 84% of Network 6 facilities (8). Approximately 88% of patients on dialysis in Network 6 received in-center treatments with the remaining 12% on home dialysis (8).

At the end of 2013, approximately 10% of the nation's ESRD patients were residing in Network 6 states. There were an estimated 42,245 patients receiving dialysis in Network 6, and 12,638 (30%) living with a functional transplant. Approximately 55% of the ESRD patients were male. ESRD patients were also predominately older, with 67% of Network 6 patients over 55 years of age (8). These demographics reflect a gender and age distribution similar to the other ESRD Network areas (6). The same does not apply for the distribution of ESRD patient race in Network 6.

Network 6 has the highest percentage of African American patients on dialysis of all 18 ESRD networks, with 62% of patients identified as African American and 37% identified as white at the end of 2013 (8). This is in contrast to the three states' reported population demographics, with African Americans and Whites comprising 26% and 66% respectively, of the total population (8). The difference in race demographics between the general and ESRD population in Network 6 correlates with the previously well documented higher prevalence of CKD, and ESRD, in African Americans, when compared to white patients. For example, in 2011, the rate of prevalent ESRD among African American and white patients was 5,584 and 1,396 per million respectively (6).

Chronic and End Stage Renal Disease Risk Factors

Researchers have sought to understand the risk factors associated with the development and progression of chronic and end stage kidney disease. Across the globe diabetes mellitus, hypertension, and obesity are widely recognized as important risk factors for CKD (3). In the United States the most common causes of CKD, include diabetes (45%), hypertension (28%), chronic glomerulonephritis (5%), inherited disorders (4%), and several other less common and/or unknown conditions (18%) (3). The obesity epidemic is of particular concern in developed nations like the United States, because obesity can further predispose individuals to developing hypertension and diabetes, as well as contributing directly to renal damage under certain conditions (9). In addition to obesity, maternal diabetes, low birth weight, and rapid weight gain in early life have also been associated with the development of CKD later in life (10). Aside from predisposing conditions, there is also an increased risk of developing ESRD among those individuals with a family history of ESRD. Individuals with a family history of

ESRD are as much as 2.6 times more likely to develop ESRD than individuals without a family history of ESRD (11). This is of particular concern among African Americans, who may not be appropriately screened for CKD if they do not perceive it to be a critical health problem (12).

Socioeconomic status (SES) is believed to play a role in the development and progression of chronic renal disease, with research suggesting that racial and ethnic minorities of the lowest SES generally bear the greatest burden of disease and potentially poorer outcomes (3, 13). When studying the link between CKD and SES, income, education level attainment, and occupation have previously been considered (14). Part of the explanation for this phenomenon may lie in the increased prevalence of all or some of the aforementioned predisposing conditions among those who live in poverty. In addition, dietary acid load has been linked to progression of chronic kidney disease, with one study identifying higher levels of acid excretion in association with lower SES among minorities (13).

The geographic variation in the prevalence of CKD and ESRD has also been documented in the United States (13). There is evidence to suggest that African Americans who reside in the Southeastern United States for their whole lives are at greater risk for developing ESRD (15). However, it is important to note that this region of the country also has a higher prevalence of diabetes and hypertension than other portions of the United States (13).

There is also some evidence for genetic variation that may explain a portion of the biologic difference in the development and progression of chronic renal disease in African Americans compared to other races or ethnicities (11, 13). Interestingly, while

African Americans and individuals of lower SES may be at higher risk for developing CKD and ESRD, previous studies have reported that white dialysis patients have a higher mortality (16-18). However, it has been established that this difference in mortality exists among individuals over the age of 50, with younger African American ESRD patients at higher risk for mortality, while on dialysis, than white patients (19). Unfortunately, nephrologists may be less likely to refer African American patients for renal transplant if they believe that they do comparatively well on dialysis. For example, one study found that one third of United States physicians surveyed did not believe that kidney transplant would result in survival benefit over dialysis for African American patients (20).

Disparities in Renal Transplantation

Kidney transplantation is considered to be the preferred treatment for ESRD (21). Patients who have received a transplant generally live longer and have a better quality of life than patients who remain on dialysis (22). USRDS reported that, nationally, 17,671 kidney transplants were performed in 2011, including 11,835 deceased donor transplants and 5,772 living donor transplants (6). A closer look at the 2011 data demonstrates the clear racial and ethnic disparity among renal transplant recipients. Approximately 64% of all kidney transplants recipients were identified as white, 25% African American, and 11% Asian or other race (6). Even though African Americans make up 62% of dialysis patients in Network 6, the transplantation rate for African Americans is 40% lower than for white patients (8).

The disparity in access to renal transplantation among racial and ethnic minorities, women, and poor ESRD patients has been well documented (13, 23-28). Reasons for

disparities in access to kidney transplant are hypothesized to be varied and multifactorial. These factors include low SES (13, 25, 29, 30), physician bias (20, 31), fear of racism (32), lack of social networks for support (33, 34), inadequate health insurance coverage (23), technological barriers (35), poor health literacy (36-38), poor communication between doctor and patient (39), and differing preferences or motivation (20, 40). Living donations for kidney transplant are particularly low among African Americans, comprising only 11.8% of all living donations in 2008 (32). Previously identified barriers to living donation include mistrust of the medical community, financial concerns, reluctance to ask family members to donate, lack of awareness regarding transplant options, and failure of potential donors to complete the evaluation process (32, 41-43).

The Impact of Dialysis Facility Level Factors on Transplantation Rates

Dialysis facilities are equipped and staffed to provide dialysis treatments to ESRD patients. Hemodialysis sessions typically last about 3 hours, with most patients receiving dialysis a few times each week. ESRD patients have the opportunity to receive education about ESRD treatment options, such as kidney transplantation, during their regular appointments for dialysis. Patients may also be referred for kidney transplant evaluation by dialysis facility medical providers. Following referral, patients must undergo a medical and psychological evaluation at a transplant center, be approved by the transplant center as an appropriate candidate for the waiting list, and maintain their active listing status prior to receiving a kidney transplant.

As the dialysis facility plays such an integral role in the education and referral of potential kidney transplant recipients, researchers have sought to evaluate the role of dialysis facilities in the overall rate of transplantation, and disparities in access to

transplantation. Previous analysis of national transplant data from 2007 through 2010 has demonstrated that Georgia has the lowest standardized transplant ratio (STR) in the United States, with 86% of Georgia facilities having a lower STR than expected (STR <1.00) (44). Examining facility level data has helped researchers to better understand some common factors among poor performing facilities. For example, wait-listing for transplantation is comparatively lower for facilities which predominately serve racial minorities (13). A higher percentage of African-Americans in the patient population has also been identified as one predictor of lower facility STR in Network 6 (45). For-profit status has been associated with lower transplantation rates and inconsistent provision of kidney transplant education (44, 46, 47). Financial pressures and inadequate staffing of dialysis facilities have also been associated with lower kidney transplantation rates (44).

The Importance of Education about Kidney Transplant Options

Providing complete and culturally-sensitive transplant education for dialysis patients may provide a means to boost kidney transplantation rates among historically poor performing facilities, and help to reduce disparities in access to transplantation (32, 42, 45, 48-51). Previous research has demonstrated that patients who were not informed about kidney transplant options had a 53% lower rate of access to transplantation (52).

There is a well-documented need for standardized transplant education for patients and their families. Approximately one third of ESRD patients do not receive information about kidney transplant options within the first 45 days after ESRD diagnosis (52). This is problematic because patients who have started, and become accustomed to dialysis, may be reluctant to change treatment plans and consider kidney transplant (32). Historically, adults over 65 years of age, as well as women, have been less likely, than

young patients and males, to have discussions with their medical providers about kidney transplant options (53). African American patients also receive less frequent and less adequate communication about transplantation, as compared to white patients (20). In Network 6, dialysis patients have reported not receiving enough information about kidney transplant options, not receiving helpful information, and not receiving information that was presented in a meaningful way (54).

Timely referral and education of dialysis patients, as well as support for patients as they navigate the process may help to ensure completion of pre-transplant evaluation procedures (40, 55). Dialysis facility staff typically see dialysis patients on a regular basis, so they have multiple opportunities to educate patients about kidney transplant options. In fact, 91% of transplant recipients reportedly received dialysis prior to transplantation (56). The decision to pursue transplant may not be easy. The education and support of patients throughout the decision-making process should continue over the course of regular visits for treatment (57).

After referral, the transplant evaluation process can take time. USRDS reported that the median wait time for transplanted patients was 2.6 years in 2011 (6). Pre-transplant evaluation often includes a review of medical, social, and financial aspects of each patient for transplant eligibility. Patients may not complete the evaluation process for a variety of reasons, including complications due to comorbidities, issues with travel to and from the transplant center for evaluation, or lack of intrinsic motivation (40). Patients who are not properly educated about the steps in the process are more likely to stall or fail to complete one of the key steps in the process (58).

The RaDIANT Community Study and Explore Transplant

Currently there are several ongoing research projects at Emory University, in conjunction with community partners, designed to implement and evaluate interventions to address the historically low transplant rates and significant racial and ethnic disparities identified in ESRD Network 6. The Reducing Disparities in Access to kidNey Transplant (RaDIANT) Community Study aims to increase kidney transplant referrals among African American ESRD patients, and to reduce disparities in transplant referral (59). As part of this study, Emory University is regularly tracking referral data from 134 Georgia Dialysis Facilities through their participation as part of the Southeastern Kidney Transplant Coalition (SEKTC) (59). Specifically, RaDIANT evaluates referrals to the three adult transplant centers in Georgia; Emory Transplant Center (Atlanta, GA), Georgia Regents Kidney and Pancreas Transplant Program (Augusta, GA), and Piedmont Transplant Institute (Atlanta, GA) (59).

As part of the RaDIANT interventions to improve kidney transplant education efforts at the facility level, Emory University has partnered with the Explore Transplant (ET) organization to conduct Dialysis Facility Provider Training sessions in various locations throughout Georgia (59). Explore Transplant is a nonprofit organization whose mission "is to increase informed transplant decision-making" (57, 60). The organization developed the Explore Transplant Patient Educational Program to be used by dialysis facility staff to provide information, in a step-wise fashion, to ESRD patients who might be candidates for renal transplant (57, 60).

The ET process begins with Dialysis Facility Provider Training sessions. This training is important because approximately one third of surveyed ESRD Network 6

dialysis facility staff have previously reported that they did not have sufficient training in transplant education and did not have sufficient education resources to share with their patients (61). Each training sessions lasts for one full day, during which dialysis facility staff members receive general information about renal transplantation, the content of the ET education materials, and how to guide patients through the various steps of the ET program to make an informed decision about renal transplantation (57, 60). Surveys are administered to attending staff members immediately before and after each training session. The surveys are designed to capture demographics, facility details, information about current patient education efforts, individual provider transplant knowledge, perceived barriers to patient education, and provider opinions about transplant education for dialysis patients.

The Importance of Evaluating Dialysis Facility Providers' Preparedness to Educate

Of particular interest to our research group, were the staff members' opinions about their preparedness to educate dialysis patients in their facilities. While the Centers for Medicaid and Medicare (CMS) Conditions for Coverage for End Stage Renal Disease Facilities requires that facilities inform dialysis patients about kidney transplant options (7), few studies have sought to assess the opinions of providers regarding transplant education and their preparedness to educate. However, at least one study did find a potential disconnect between the opinions of patients and their physicians on certain transplant-related topics. Specifically, regarding living donation, physicians felt that the "preferences and availability of living donors [was] the most important reason why black patients are less likely that white patients to be evaluated for renal transplantation" (20). This was in stark contrast to a survey of their respective patients, which found that

African American patients received less frequent and less adequate communication about transplantation, with little difference in preferences, as compared to white patients (20). Additionally, a recent survey of ESRD Network 6 patients revealed that patients believed having a dialysis team member who is empathetic and informative is essential to guiding patients through process of kidney transplantation (54).

Since dialysis facility providers function as the gate keepers to kidney transplantation through referral for evaluation, it is important to evaluate and understand their opinions and intentions to educate dialysis patients about kidney transplant. We sought to evaluate the providers' change in opinions about their own preparedness to educate patients after completing the ET Provider Training. In particular, we were interested in determining if there was a significant difference in a positive change in opinion (i.e. from "disagree" or "strongly disagree" to "agree" or "strongly agree") between facilities with historically high vs. low 1 year percent referral (our primary facility-level exposure of interest). We hypothesized that staff from facilities with previously lower referral rates would be more likely to demonstrate a significant positive change in opinion about their preparedness to educate. A lack of positive change in opinion may serve to inform future targets for intervention at the facility level.

Linking the ET survey data to dialysis facility demographics captured in the 2008-2011 Dialysis Facility Report (DFR) will also provide some additional information about the profile of facilities represented at the training sessions. It will be particularly helpful to know if facilities that have historically performed poorly with regard to transplant referral, have been reached by these training efforts. This may be a way for Emory, and its community partners, to get a preview of the impact the Explore Transplant

intervention may have in helping to address the relatively low kidney transplantation rates and disparities in ESRD Network 6.

Chapter II: Manuscript

The Impact of Dialysis Facility Performance on Dialysis Facility Providers' Preparedness to Educate Dialysis Patients about Kidney Transplantation Options

By Cheryl Isenhour

Abstract

Objective: Dialysis facility providers play a crucial role in facilitating access to kidney transplantation through patient referral to a kidney transplant center. Few studies have sought to assess the opinions of dialysis facility providers regarding preparedness to educate patients about transplantation. We sought to determine if dialysis facility providers from Georgia facilities with historically higher kidney transplant percent referral performance, were more or less likely to demonstrate a positive change in opinion regarding their own preparedness to educate dialysis patients, after attending Explore Transplant (ET) Dialysis Facility Provider Training, when compared to staff from Georgia dialysis facilities with historically lower referral performance.

Methods: We evaluated survey data collected before and after four ET training sessions held in Georgia during 2014. These data were linked to 2008-2011 Dialysis Facility Report (DFR) data, and facility referral data (2013 data). We used multivariable logistic regression to evaluate the relationship between positive change in opinion following exposure to ET provider training (outcome) and historical dialysis facility kidney transplant referral performance (exposure).

Results: The four ET training sessions attracted 101 dialysis facility staff attendees representing 85 unique dialysis facilities. In a crude logistic regression model, staff members representing facilities with higher historical percent transplant referral were

more likely to demonstrate a positive change in opinion regarding their own confidence as a transplant educator following ET training, as compared to staff representing facilities with lower historical percent transplant referral [OR = 2.61 (95% CI: 1.10-6.45)]. This relationship was also evident in a multivariable logistic regression model adjusted for number of patients treated within the facility and for-profit status, with high vs. low performing facilities nearly three times more likely to feel confident in their transplant education abilities after attending the training [OR=2.99 (95% CI: 1.11-8.04)] [Table 3].

Conclusions: Staff members representing facilities with higher historical transplant referral performance were more likely to feel confident about their transplant education abilities after ET training. Additional research should focus on why staff from facilities with historically lower referral performance are not as confident in their abilities to educate, despite receiving kidney transplant educator training.

Introduction

End stage renal disease (ESRD), synonymous with kidney failure, is a serious potential outcome of Chronic Kidney Disease (CKD), with over 100,000 CKD patients per year progressing to ESRD (1). ESRD is a significant public health and financial burden in the United States, where in 2011 there were more than 500,000 prevalent ESRD patients utilizing 6% of the annual Medicare budget (6). There are 18 ESSD Network regions in the United States, that are tasked by the United States Centers for Medicare and Medicaid Services (CMS), with ensuring ESRD patients receive quality care from ESRD facilities and providers (7). Georgia is part of ESRD Network 6, which has historically had the highest percentage of African American patients on dialysis of all 18 ESRD networks(8). Georgia also has the lowest standardized transplant ratio (STR)

in the United States, with 86% of Georgia dialysis facilities having a lower STR than expected (STR <1.00) (44). A nationwide disparity in access to renal transplantation exists among racial and ethnic minorities, women, and poor ESRD patients (13, 23-28). Even though African Americans comprise 62% of dialysis patients in Network 6, the transplantation rate for African Americans is 40% lower than for white patients (8).

The Reducing Disparities in Access to kidNey Transplant (RaDIANT) Community Study aims to increase kidney transplant referrals among African American ESRD patients, and to reduce disparities in transplant referral among patients in Georgia (59). ESRD Network 6 is regularly tracking referral data from 134 Georgia Dialysis Facilities (59). As part of the RaDIANT interventions to improve kidney transplant education efforts at the facility level, Emory University has partnered with the Explore Transplant (ET) organization to conduct Dialysis Facility Provider Training sessions in various locations throughout Georgia (59). Explore Transplant is a nonprofit organization whose mission "is to increase informed transplant decision-making" (57, 60).

Providing complete and culturally-sensitive transplant education for dialysis patients may provide a means to boost kidney transplantation rates among historically poor performing facilities, and help to reduce disparities in access to transplantation (32, 42, 45, 48-52). While the Centers for Medicaid and Medicare (CMS) Conditions for Coverage for End Stage Renal Disease Facilities requires that facilities inform dialysis patients about kidney transplant options (7), few studies have sought to assess the opinions of dialysis facility providers regarding transplant education and their preparedness to educate.

Since dialysis facility providers function as the gate-keepers to kidney transplantation through referral of a patient to a kidney transplant center for the required medical and psychological evaluation, it is important to understand their opinions and intentions to educate dialysis patients about kidney transplant. In this study, we sought to evaluate providers' change in opinions about their own preparedness to educate patients about transplant after completing the ET Provider Training. We were interested in determining whether there was a difference in a positive change in opinion (i.e. from "disagree" or "strongly disagree" to "agree" or "strongly agree") between facilities with historically high vs. low cumulative one year percent referral (our primary facility-level measure of interest). We hypothesized that staff from facilities with previously lower referral rates would be more likely to demonstrate a significant positive change in opinion about their preparedness to educate.

Methods

Explore Transplant Dialysis Facility Provider Training

Explore Transplant Facility Provider Training sessions were administered at four different locations in Georgia in 2014: Savannah, Atlanta, Macon, and Riverdale. Two sessions were held in March and two were held in April. All dialysis facilities in Georgia were notified about the training through mailed brochures. Facility staff members interested in attending one of the sessions were encouraged to pre-register, but on-site registration was also available prior to the start of each session. The provider training sessions consisted of multiple modules presented over the course of one 8-hour day. The content of all training sessions was identical, with topics including theory and

research to support the ET program, how patients should navigate the four step ET process, and how facilities can implement best practices for transplant education (60).

Data Sources

In this study, conducted as part of Emory University IRB00072756, we evaluated survey data collected at each ET training session, 2008-2011 Dialysis Facility Report (DFR) data, and RaDIANT historical percent referral data (2013 data) aggregated at the dialysis facility level. Pre-training surveys, administered to attending dialysis facility staff members immediately before the start of each training session, gathered basic demographic and facility level information, in addition to assessing general transplant knowledge, and opinions about kidney transplant education for dialysis patients. At the conclusion of each training session, post-training surveys were administered. Items included the repetition of select questions from the pre-training survey to allow for appropriate comparison of responses.

Three Likert-type questions were included in both pre-training and post-training surveys to evaluate the attendees' opinions about their own preparedness to educate dialysis patients regarding kidney transplant options. Each question allowed respondents to select one of four options regarding their opinion: "strongly disagree", "disagree," "agree," or "strongly agree." The precise wording of the three questions of interest was as follows:

Question A: “I am sufficiently knowledgeable about transplant that I could answer most patients’ questions.”

Question B: “I am confident in my ability as a transplant educator.”

Question C: "I have excellent transplant education materials available at my dialysis center for patients."

Data Cleaning

Data cleaning and analyses were conducted using SAS version 9.4 (Cary, NC). Using unique study id numbers, the pre-training and post-training survey responses were matched for each facility to allow for appropriate comparison of responses. Positive change in opinion (from disagree to agree) from pre-training to post-training was the outcome of interest for questions A, B, and C. Responses for each of the three questions were dichotomized to "disagree," if a response of "disagree" or "strongly disagree" was recorded, and "agree," if a response of "agree" or "strongly agree" was recorded. This allowed for the creation of three new variables that captured any positive change in opinion.

Study Population

A total of 104 dialysis facility staff members attended one of the four ET provider training sessions. Three individuals (2.9%) failed to complete the pre-training survey, leaving 101 attendees with complete baseline and demographic information. Select self-reported characteristics of the 101 attendees have been presented in Table 1 to describe the population of attendees irrespective of the facilities they represented.

On the pre-training survey, attendees listed the dialysis facility where they were employed. By reviewing the CNNs, we determined that 98 different Georgia dialysis facilities were represented among the four ET training sessions. This represents approximately one third of the 309 dialysis facilities in Georgia at the end of 2013 (8). For those facilities represented by more than one staff member, the responses from social

workers, nurses, medical directors, or nurse managers were averaged to create a composite score for each of the opinion questions A, B, and C. A total of 13 facilities were excluded due to missing data, including incomplete staff responses to the opinion questions (N=4), incomplete referral data (N=8), or incomplete DFR data (N=1). This resulted in a final study population of 85 unique Georgia dialysis facilities represented by at least one staff member, with some facilities represented by multiple staff members through the creation of composite scores.

Study Variables

The outcome variable in this analysis was positive change in dialysis facility staff member opinion, from "agree" to "disagree," generated for each of the three Likert-type questions regarding preparedness to educate (A, B, and C) patients about transplantation. Our exposure variable was historical percent of patients referred for transplant within the facility in which the staff member worked at the time of the ET training, as captured in the 2013 RaDIANT data. This is a measure of the proportion of dialysis patients referred for kidney transplantation, within their first year of ESRD diagnosis, among the entire dialysis patient population in each represented facility, from January 2005 through September 2012. Low historical percent referral was defined as less than the sample median of 26.0%, while high historical percent referral was defined as greater than or equal to the median. This facility referral performance measure was selected to serve as a proxy covariate for the staff members' experience within the facility they represented.

Select dialysis facility characteristics reported in the 2008-2011 DFR data were utilized to further describe the population of represented dialysis facilities. Both characteristics specific to the dialysis facilities and their respective patient populations

were compared across the two levels of historical referral performance (high vs. low). Facility-specific characteristics included for-profit status, age of the facility (years), number of staff working in each facility, number of dialysis patients treated at each facility, and the patient-to-staff ratio within each facility. Patient population characteristics for each facility included average patient age, proportion of patients identified as white, proportion of patients identified as African American, percent unemployment, average number of patient comorbidities, percent diabetic, percent hypertensive, percent smokers, percent uninsured, percent with Medicaid, percent not informed about transplant options prior to ESRD diagnosis, and percent without access to pre-ESRD nephrology care.

Analysis

The only categorical covariate, for-profit status, was compared using the Chi-square test, while continuous variables were compared across the two levels of historical facility referral performance (high vs. low) using t-tests or equivalent nonparametric tests. We used crude and multivariable logistic regression to examine the association between historical percent referral and a positive change in opinion from baseline to post-training. To assess interaction and confounding, facility level covariates were first each evaluated individually in a model with the main exposure and outcome variable. Covariates were selected for further evaluation as confounders in multivariable logistic models if their inclusion in the crude model resulted in a greater than 10% change the unadjusted odds ratio (OR) (62). No significant interaction was detected during the analysis.

An all-subsets approach was used to generate and compare all possible combinations of suitable covariates to find the most appropriate adjusted model; taking both change in

OR and precision into consideration (62). The final adjusted model included for-profit status and number of dialysis patients treated at each facility as confounders for the relationship between historical facility referral performance (exposure) and positive change in staff member opinion (outcome). For each of the described tests and logistic models, results were considered significant at $\alpha<0.05$.

Results

Dialysis Facility Staff Characteristics

Select self-reported characteristics captured on the pre-training ET surveys are summarized for 101 attendees irrespective of the dialysis facilities they represented [Table 1]. This provided a snapshot of the dialysis facility staff attendee demographics prior to the averaging of opinion question responses necessary for dialysis facilities that were represented by more than one staff member. The majority of the attendees were white (53%) or African American (43%) females (95%), with an average age of 42 years. Social workers were the most represented occupation (62%), with nurses (13%), dialysis technicians (11%), dieticians (9%), and managers (6%) also in attendance. Regarding total time spent working with dialysis patients, the most common response was 1 to 5 years (29%), with 86% of attendees reporting they had worked with dialysis patients for one or more years. Most attendees also indicated that they currently were, or would be, conducting transplant education with patients directly, within the dialysis facility (75%).

Dialysis Facility Characteristics

A comparison of select dialysis facility and patient population characteristics, by dialysis facility historical transplant referral performance (high vs. low), are summarized in Table 2 for the 85 unique Georgia dialysis facilities represented at the ET training

sessions. The majority of facilities represented at the training sessions were for-profit (89.4%). For-profit facilities were more likely to have a higher percent of patients referred for kidney transplantation from January 2005 through September 2012 (43% vs. 33%, p =0.051). Facilities with lower referral had a higher percentage of patients who were current smokers (0% vs. 6.5%, p=0.024). They also had a patient population with higher numbers of comorbidities (3.2 vs. 2.9, p=0.057), and higher percent of patients within the facility that were unemployed (71.2% vs. 61.0% p=0.059) [Table 2].

Association between Historical Referral and Preparedness to Educate

In a crude logistic regression model, staff members representing facilities with higher historical percent transplant referral were more likely to demonstrate a positive change in opinion, from the baseline survey to the post-trainings survey, regarding question B: "I am confident in my abilities as a transplant educator" [OR = 2.61 (95% CI: 1.10-6.45)]. This difference in positive change in opinion between the high and low referral groups persisted in a multivariable logistic regression model adjusted for number of patients treated within the facility and for-profit status. Higher performing facilities were nearly 3 times more likely to feel confident in their transplant education abilities after attending the training, as compared to the facilities with low referral performance [OR=2.99 (95% CI: 1.11-8.04)] [Table 3].

A similar trend was observed for question A: "I am sufficiently knowledgeable about transplant that I could answer most patient's questions." Staff representing facilities with higher referral performance were 1.5 to 2 times more likely to have a positive change in opinion regarding their preparedness to educate in the crude and adjusted models respectively. However, these associations were not statistically significant [crude OR =

1.52 (95% CI: 0.64-3.60), adjusted OR = 1.94 (95% CI: 0.76-4.94)]. In contrast, for question C: "I have excellent transplant materials at my facility," staff representing facilities with higher referral performance were less likely to demonstrate a positive change in opinion. This finding was also not statistically significant [crude OR = 0.69 (95% CI: 0.29-1.60), adjusted OR = 0.65 (95% CI: 0.26-1.61)] [Table 3].

Discussion

In this study of Georgia dialysis facility staff who attended ET training sessions in 2014, we found that staff representing facilities with historically higher percent of patients referred for kidney transplantation were more than twice as likely to exhibit a positive change in opinion regarding their own knowledge about kidney transplantation and confidence as a kidney transplant educator, as compared to staff from facilities with historically lower referral performance. Understanding why staff from facilities with lower referral performance were less likely to have a positive change in opinion about their own preparedness to educate, may be important for the appropriate design and implementation of future transplant educator training programs at the dialysis facility level.

Previous research has revealed that approximately one third of surveyed ESRD Network 6 dialysis facility staff do not feel they have sufficient training in transplant education and do not have sufficient education resources to share with their patients (61). ET Dialysis Facility Provider training is designed to address these types of concerns. Each training sessions lasts an 8-hour day, during which dialysis facility staff members receive general information about renal transplantation, learn about the content of the ET patient education materials, and learn how to guide patients through the various steps of

the ET program to make an informed decision about kidney transplantation (57, 60). To our knowledge, this is the first study to examine the relationship between historical facility referral performance and providers' changing opinion about preparedness to educate patients regarding kidney transplant options, after attending a dialysis facility provider training program.

We were unable to find other research studies, including those evaluating staff training programs in other fields of medicine, which applied a similar approach of comparing the improvement in attendees' opinions by historical facility performance. Some studies have evaluated the immediate and/or sustained improvement in attitudes, knowledge, or performance of attendees in comparison to a control group of individuals in the same field who did not receive the training. Other researchers chose to use data captured in baseline surveys or performance reviews as the basis for evaluating the attendees' for the programs' desired outcome(s). One systematic review found that a positive change in attitude was demonstrated by continuing medical education (CME) attendees in 85% of attitude studies evaluated (63), indicating that formal training for medical providers may be a suitable approach to improve providers' attitudes about a variety of subjects.

Some researchers have noted a difference in the change of opinion or attitudes for a portion of their study population, as we did in this analysis. For example, in one study of medical providers attending CME about how to educate patients on various aspects of a healthy lifestyle, physicians were more likely than non-physicians to demonstrate improved confidence in talking to patients about smoking and stress management, after attending the CME. Additionally, attendees who initially had a lower opinion of their own confidence in educating patients, demonstrated a greater improvement in confidence

after attending CME, when compared with those attendees who were more confident in their abilities at baseline (64). In another study of physicians and allied health professionals who attended continuing medical education (CME) about diabetes, researchers found that allied health professionals demonstrated desired attitude changes for more of the studied outcomes than physicians. However, they were less likely than the physicians to have sustained a positive change in attitude after 3 months. The authors proposed future studies to seek an explanation for the observed differences in attitude changes between the two groups (65).

We originally hypothesized that staff representing facilities with a lower percent of patients referred for kidney transplantation would be more likely to demonstrate a positive change in opinion about their own preparedness to educate dialysis patients. As previous research has demonstrated that patients who were not informed about kidney transplant options had a 53% lower rate of access to transplantation (52), historically lower referral rates may be, in part, explained by dialysis patients not receiving adequate education about kidney transplant options. While our findings did not completely support our hypothesis, it does appear that providers from facilities with historically lower referral performance were more likely to demonstrate a positive change in opinion about having access to excellent transplantation education materials for their dialysis facility after ET training. However, this result may also indicate that facilities with higher referral performance already believed they had sufficient transplant education materials available for their patients prior to attending ET training.

It was surprising that staff representing facilities with lower transplant referral performance were less likely to improve their opinion regarding their own transplant

knowledge and confidence as a transplant educator. It is possible that perceived barriers to transplant education on an individual, patient, or facility level may have impacted respondents' opinion regarding transplant education for dialysis patients. For example, on an individual level, a staff member who has limited experience educating dialysis patients about transplant options may not feel sufficiently knowledgeable or comfortable with kidney transplant education after attending just one ET training session. Multiple exposures to training may be more successful in changing medical providers' attitudes than a single training session (63). In addition, the use of multiple educational techniques during training, including "case-based learning," is more likely to improve attendee attitudes than a single educational technique alone (63).

Regarding possible patient level barriers, dialysis facility staff may feel that some portion of their patient population is not interested in considering kidney transplantation. Thus, staff may feel that they are not knowledgeable or confident enough to convince some patients that learning about kidney transplant options is worthwhile. Approximately one third of ESRD patients do not receive information about kidney transplant options within the first 45 days after ESRD diagnosis (52). This is problematic because patients who have already started dialysis, and become accustomed to it, may be less motivated to consider kidney transplantation as a treatment option (32, 40). In addition to lack of intrinsic motivation of patients to consider kidney transplantation, dialysis providers' beliefs about patient preferences may also impact their opinions about their preparedness to educate patients. For example, one previous study found a potential disconnect between the opinions of patients and their physicians on certain transplant-related topics. Regarding living donation, physicians felt that the preferences and the

availability of living donors were the most important reasons why African American patients were less likely than white patients to be evaluated for renal transplantation. This was in stark contrast to a survey of their respective patients, which found that African American patients received less frequent and less adequate communication about transplantation, with little difference in preferences, as compared to white patients (20).

On a facility level, staff may feel that aspects of their facility's administration, or their own busy work schedules, do not afford them adequate time to educate dialysis patients effectively. Financial pressures, particularly among for-profit dialysis facilities, as well as inadequate staffing of dialysis facilities have previously been associated with lower kidney transplantation rates among Georgia dialysis facilities (44). Previous research suggests that dialysis providers believe dialysis facility outcome performance is, in part, related to staff working climate. For example, in cognitive interviews dialysis facility staff members indicated that they believed promotion of teamwork, mutual respect, acknowledging staff members good work, and mutual trust among staff members has an impact on facility outcome performance (66). Not having enough time to educate dialysis patients, in conjunction with heavy work load, and insufficient staffing has been identified as a problem and source of stress among surveyed hemodialysis unit nurses (67). Information regarding perceived individual, patient, and facility level barriers to transplant education was captured on the ET post-training survey, and future planed analysis of these data may provide key insight into factors that could have negatively impacted the opinions of staff members' regarding their preparedness to educate dialysis patients.

In addition to our study's main focus of assessing providers' opinions about preparedness to educate, we identified other notable findings during the course of our analyses. For example, in comparing the facilities represented at the ET training sessions by high and low percent of patients referred for kidney transplantation, we observed that facilities with low and high referral performance generally had similar facility level characteristics. The majority of facilities represented at the training sessions were for-profit (89.4%), and for-profit facilities were more likely to have a higher percent of patients referred for kidney transplantation. This was interesting, given that national studies have documented that for-profit facilities have lower transplantation rates and inconsistent provision of kidney transplant education compared to non-profit facilities (44, 46, 47).

Study Limitations

There were clear limitations to this study. First, the study design makes it difficult to demonstrate any true causal associations with regard to historical dialysis facility referral performance and positive change in opinion regarding preparedness to educate. Additionally, only the relationship between historical referral performance and positive change in opinion regarding confidence as a transplant educator was statistically significant. With a final study population of 85 facilities, each represented by 1 or more staff members, it is possible there was not enough statistical power to detect additional significant associations for the other outcomes examined. Future plans to include data from four more ET provider training session held later in 2014 may increase the overall number of staff, and represented facilities, included in the analysis to mitigate the power concerns.

Second, since data from only four ET trainings sessions were evaluated, there is the possibility that certain facilities did not participate in one of the training sessions because of their relative geographic distance to one or all of the sessions being offered. This may have contributed to selection bias if facilities that were not represented at the training differed in some way from the facilities in the study; particularly in terms of their staff members' opinions about preparedness to educate dialysis patients about transplant options. Staff from facilities in particularly remote portions of Georgia may not be regularly reached by transplant education training programs, and may consequently have a lower baseline opinion of their own preparedness to educate. In addition, those facilities who felt they could not justify the expense of sending even one person to one of the sessions would be automatically excluded from this analysis, which could also bias the findings. Again the inclusion of data from the four additional 2014 ET provider training may serve to address this limitation if they were offered in locations not reached by the four training sessions included in this analysis.

Third, items from the staff-reported survey data used in this study may reflect some social desirability bias. Social desirability bias is often associated with data collected through surveys, especially when the data are not collected anonymously. Respondents may have chosen to select "agree" or "strongly agree" for one or more of the opinion questions if they felt that was the correct thing to do. Finally, the Dialysis Facility Report data linked with the responses from the ET surveys are from 2008-2011. Therefore any changes in the dialysis facility demographics that have occurred since that time period were not represented in this analysis. Plans to repeat this analysis with the most recent

Dialysis Facility report data will allow us to update the facility characteristic comparisons as needed.

Conclusions

While the Centers for Medicaid and Medicare (CMS) Conditions for Coverage for End Stage Renal Disease Facilities require that facilities inform dialysis patients about kidney transplant options (7), few studies have sought to assess the opinions of providers regarding transplant education and their preparedness to educate. However a recent survey of ESRD Network 6 patients revealed that patients believed having a dialysis team member who is empathetic and informative is essential to guiding patients through process of kidney transplantation (54).

The findings of our study suggest that providing dialysis facility staff members with access to programs like the Explore Transplant provider training may serve to improve their opinions of their own preparedness to educate dialysis patients about kidney transplantation. Future studies are needed to evaluate factors that may negatively influence providers' opinions about their preparedness to educate dialysis patients within their facility. Additionally, evaluation for sustained positive change in opinions, beyond the attendees' immediate response to ET training, would be useful in helping to evaluate the long-term impact of the intervention. Such research may identify a need to supplement existing staff training programs or even highlight other areas for targeting future interventions at the dialysis facility level. With sufficient transplant knowledge, confidence as a transplant educator, and excellent education materials available to them, dialysis facility providers may be better equipped to inform patients about all of their treatment options, support patients in making an informed decision about kidney

transplantation, and ultimately increase access to kidney transplantation for patients receiving treatment in Georgia dialysis facilities.

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Tables

Table 1: Select characteristics of Georgia dialysis facility staff members who attended one of four Explore Transplant provider training sessions in 2014 (N=101)

Characteristic	Distribution
Age, Mean (sd)*	42 (11)
Female, N (%)	95 (95)
Race, N (%)**	
White	52 (53)
African American	43 (43)
Multiracial	3 (3)
Hispanic or Latino	1 (1)
Other (West Indian)	1 (1)
Job Responsibility, N (%)	
Social Worker (MSW)	62 (62)
Nurse (RN/LPN/MSN/APN)	13 (13)
Dialysis Technician	11 (11)
Dietician	9 (9)
Nurse Manager/Facility Administrator	6 (6)
Medical Director/Physician	0 (0)
Time working with dialysis patients, N (%)**	
< 6 months	4 (4)
6 to 11 months	10 (10)
1 to 5 years	29 (29)
5 to 10 years	22 (22)
10 to 15 years	15 (15)
15+ years	20 (20)
Conducts transplant education, N (%)	
Yes	76 (75)
No	11 (11)
Don't Know	14 (14)

Note: This analysis represents a general description the 101 dialysis facility staff attendees prior to averaging responses for the preparedness to educate opinion questions

*10 attendees did not respond

**1 attendee did not respond

Table 2: Comparison of Georgia dialysis facility characteristics by high and low percent kidney transplant referral*, among facilities represented at one of four Explore Transplant provider training session in 2014

	Total Population (N=85)	High Overall Percent Referral (N=45)	Low Overall Percent Referral (N=40)	p-value
Facility characteristics				
For Profit Status, N (%)	76 (89.4)	43 (50.6)	33 (38.8)	0.0509
Not For Profit Status, N (%)	9 (10.6)	2 (2.4)	7 (8.2)	
Facility age (years), Mean (SD)	4.8 (1.0)	5.0 (1.0)	5.0 (1.9)	0.7247
Number of staff members, Mean (SD)	11.1 (7.8)	10.9 (7.7)	11.3 (7.9)	0.8306
Number of patients, Mean (SD)	51.7 (28.8)	47.6 (26.2)	56.4 (31.1)	0.1620
Average patient to staff ratio, Mean (SD)	4.1 (1.4)	4.0 (1.7)	4.0 (0.9)	0.8397
Facility patient population characteristics				
Age,** Mean (SD), years	41.6 (11.1)	42.1 (11.8)	41.2 (10.7)	0.7247
Percent African American, Mean (SD)	57.9 (25.1)	57.0 (26.1)	59.0 (24.3)	0.7147
Percent white, Mean (SD)	40.0 (25.5)	40.3 (25.9)	39.6 (25.3)	0.8918
Percent unemployed, Mean (SD)	65.8 (24.8)	61.0 (27.2)	71.2 (20.8)	0.0587
Average number of comorbidities, Mean (SD)	3.06 (0.8)	2.9 (0.8)	3.2 (0.8)	0.0569
Percent diabetic, Mean (SD)	62.0 (16.6)	62.5 (16.6)	62.5 (16.7)	0.7779
Percent hypertensive, Mean (SD)	88.6 (10.2)	87.9 (11.7)	89.1 (8.2)	0.5412
Percent smokers, Median (IQR)	4.8 (0-11.5)	0 (0-9.1)	6.5 (0-12.5)	0.0237
Percent uninsured, Mean (SD)	10.5 (9.4)	10.0 (10.1)	11.2 (8.8)	0.5442
Percent on Medicaid, Median (IQR)	7.7 (0-12.5)	6.7 (0-12.5)	8.2 (5.3-13.0)	0.4429
Percent not informed of transplant options, Median (IQR)	1.0 (0-3.0)	1.0 (0-3.0)	1.0 (0-3.5)	0.9774
Percent no access to Pre-ESRD nephrology care, Mean (SD)	25.2 (22.2)	23.7 (21.7)	26.9 (17.5)	0.4601

*This is a measure of the proportion of dialysis patients referred for kidney transplantation, within their first year of ESRD diagnosis, among the entire dialysis patient population in each represented facility, from January 2005 through September 2012. Low historical percent referral was defined as less than the sample median of 26.0%, while high historical percent referral was defined as greater than or equal to the median.

**Data unavailable for 7 facilities (N=78)

Table 3: Association between percent kidney transplant referral* and positive change in opinion regarding preparedness to educate dialysis patients about kidney transplantation options, among dialysis facility staff members attending Explore Transplant training in 2014

	OR (95% CI)
Question A	
Model 1 (crude)	1.52 (0.64-3.60)
Model 2 (adjusted)	1.94 (0.76-4.94)
Question B	
Model 1 (crude)	2.61 (1.10-6.45)
Model 2 (adjusted)	2.99 (1.11-8.04)
Question C	
Model 1 (crude)	0.69 (0.29-1.60)
Model 2 (adjusted)	0.65 (0.26-1.61)

*This is a measure of the proportion of dialysis patients referred for kidney transplantation, within their first year of ESRD diagnosis, among the entire dialysis patient population in each represented facility, from January 2005 through September 2012. Low historical percent referral was defined as less than the sample median of 26.0%, while high historical percent referral was defined as greater than or equal to the median.

**Model 2 adusts for number of dialysis patients treated within the facility and facility for-profit status