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Implementation of the ASCENT Trial to Improve Transplant Waitlisting Access

Megan Urbanski[1,2], Yi-Ting Hana Lee[1], Cam Escoffery[3], Jade Buford[4], Laura Plantinga[5], Stephen O. Pastan[1], Reem Hamoda[1], Emma Blythe[2] and Rachel E. Patzer[1,4,6]

[1]Division of Transplantation, Emory University School of Medicine, Atlanta, Georgia, USA; [2]Health Services Research Center, Emory University, Atlanta, Georgia, USA; [3]Department of Behavioral Sciences and Health Education, Rollins School of Public Health, Atlanta, Georgia, USA; [4]Regenstrief Institute, Indianapolis, Indiana, USA; [5]University of California San Francisco, Department of Medicine, Divisions of Rheumatology and Nephology, San Francisco, California, USA; and [6]Indiana University School of Medicine, Department of Surgery, Indianapolis, Indiana, USA

Introduction: The Allocation System for changes in Equity in Kidney Transplantation (ASCENT) study was a hybrid type 1 trial of a multicomponent intervention among 655 US dialysis facilities with low kidney transplant waitlisting to educate staff and patients about kidney allocation system (KAS) changes and increase access to and reduce racial disparities in waitlisting. Intervention components included a staff webinar, patient and staff educational videos, and facility-specific feedback reports.

Methods: Implementation outcomes were assessed using the Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework. Postimplementation surveys were administered among intervention group facilities (n = 334); interviews were conducted with facility staff (n = 6). High implementation was defined as using 3 to 4 intervention components, low implementation as using 1 to 2 components, and nonimplementation as using no components.

Results: A total of 331 (99%) facilities completed the survey; 57% were high implementers, 31% were low implementers, and 12% were nonimplementers. Waitlisting events were higher or similar among high versus low implementer facilities for incident and prevalent populations; for Black incident patients, the mean proportion waitlisted in low implementer facilities was 0.80% (95% confidence interval [CI]: 0.73–0.87) at baseline and 0.55% at 1-year (95% CI: 0.48–0.62) versus 0.83% (95% CI: 0.78–0.88) at baseline and 1.40% at 1-year (95% CI: 1.35–1.45) in high implementer facilities. Interviews revealed that the intervention helped facilities prioritize transplant education, but that intervention components were not uniformly shared.

Conclusion: The findings provide important context to interpret ASCENT effectiveness results and identified key barriers and facilitators to consider for future modification and scale-up of multilevel, multicomponent interventions in dialysis settings.

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Inequities in transplant access persist across geographic regions, socioeconomic status, and race or ethnicity.[1,2] Specifically, Black versus White disparities have been documented in steps of the transplant process, including education about transplant,[3] evaluation completion,[3,4] placement on the waitlist,[4,5] and transplant.[3,6] Reasons for these disparities are multilevel and multifactorial and include adverse social determinants of health,[7–11] health system factors,[12,13] and provider bias.[14]

Correspondence: Rachel E. Patzer, Regenstrief Institute, Indiana University School of Medicine, 1101 West 10th Street, Indianapolis, Indiana 46202, USA. E-mail: rapatzer@iu.edu

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In 2014, the KAS was revised and changed the start of waiting time for deceased donor transplant from date of waitlisting to the date of kidney failure.[15] Disparities in waitlisting and transplant have been reduced, but not eliminated, since the policy implementation.[16,17] In 2016, 57.9% of dialysis facility staff in US facilities with low waitlisting rates were aware of the KAS change and only 19% were aware of racial disparities in waitlisting.[18,19] Dialysis facility staff are mandated by the Centers for Medicare and Medicaid Services to educate patients about transplant[20]; therefore, it is imperative that they are informed of the implications of policy changes on transplant access.

In 2016 to 2017, we conducted a cluster-randomized, pragmatic, hybrid type 1 effectiveness-implementation

trial,[21,22] the ASCENT study, in partnership with all US end-stage renal disease (ESRD) Networks, that assessed the effect of a multicomponent educational intervention on waitlisting and racial disparities in waitlisting among US dialysis facilities in the lowest national tertile of transplant waitlisting.[23] Effectiveness results found that the intervention had a small effect on extending the reach of the new KAS policy by attenuating racial disparities in waitlisting among a population of US dialysis facilities with low waitlisting and increasing provider knowledge of transplant policy.[24,25] However, no study has examined the contextual factors related to the implementation of ASCENT, which can aid in the interpretation of effectiveness results and scaling of the intervention more broadly.[26] Therefore, the secondary aim of the ASCENT study was to assess implementation of the ASCENT intervention through a process evaluation.

METHODS

Study Design

The ASCENT intervention included 4 core components as follows: (i) a live and recorded staff webinar, (ii) facility transplant performance feedback report, (iii) staff educational video, and (iv) patient educational video, and 2 supplemental components (Supplementary Table S1); all available at https://www.ascenttotransplant.org/.[23] The process evaluation protocol, guided by the Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework,[27] was developed *a priori* and the primary analysis aimed to assess implementation outcomes between low and high implementer facilities (defined *a priori* as use of 1–2 and ≥3 core intervention components, respectively) at staff-level and dialysis facility-level using 3 sources of data: a web-based postimplementation survey and structured interviews targeting dialysis staff, and surveillance data from the publicly-available Dialysis Facility Report and the United States Renal Data System.[28]

Survey and Interview Data

Approximately 3 months after implementation of the ASCENT intervention (January–April 2017), intervention facilities were invited to participate in a web-based survey targeted at staff members primarily responsible for transplant education (e.g., nurse manager, social worker). The postimplementation survey assessed changes in knowledge and awareness of KAS changes, transplant education practices, and facility transplant referral and waitlisting practices from baseline (these results have been previously described),[24,25] and implementation questions. The postimplementation survey and interview guides were developed by the research team and the study's Dissemination Advisory Board, which included dialysis facility medical directors; nephrologists; social workers; patients with ESRD; ESRD Network 6 staff; and regional members of the Southeastern Kidney Transplant Coalition, an academic-community partnership in Georgia, North Carolina, and South Carolina, committed to eliminating health disparities in kidney transplant.[29] The survey and interview guides were informed by the Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework[27] and evaluated facilities' implementation and views on intervention usability and acceptability (Supplementary Table S2).

To assess adoption and implementation at the setting-level, we used a facility-level cohort restricted to 1 response per facility. Reach was examined by linking the facility cohort to the 2015 American Community Survey and the 2018 Dialysis Facility Report to describe facility-level characteristics. A staff-level cohort assessed intervention reach and effectiveness; other overall effectiveness measures are reported by implementer status (e.g., change in new waitlisting events, staff training in KAS, proportion of patients who received transplant education, and intent-to-refer patients for transplant). Staff-level characteristics were self-reported in reach (e.g., age, gender, ethnicity, and race as a social construct). To assess implementation, a dose index was constructed for facility-level and staff-level cohorts. Intervention facilities were categorized as high-implementer facilities (reported use of ≥3 core intervention components), low-implementer facilities (1–2 core intervention components), and non-implementer facilities (0 core intervention components).

Interview participants were purposively sampled from among low and high implementer facility survey respondents. Telephone interviews were conducted by trained study staff from September to November 2017 and no one else was present during the interviews. Interviewers did not have preexisting relationships with interviewees and no interviewer characteristics, assumptions, or biases were reported. Participants were informed of the study's goal and purpose during the consent process. Participants were interviewed once and queried on reasons for or for not implementing the intervention, intervention delivery method, views on the intervention's usability, and suggestions for how to promote intervention adoption. Participants provided informed consent; survey and interview participants received $10 and $30 gift cards, respectively; and the protocol was approved by the Emory Institutional Review Board.

Surveillance Data

Implementation outcomes were examined among incident and prevalent dialysis patients (study population details are described elsewhere),[24] Dialysis Facility

Report data were used to obtain facility-level and United States Renal Data System data were used to obtain patient-level baseline (January–December 2016) and postimplementation (April 2017–March 2018) characteristics and outcomes within ASCENT facilities. Coprimary outcomes of effectiveness were 1-year postintervention changes in the following: (i) mean percentage of patients waitlisted per facility, and (ii) mean percentage of patients waitlisted per facility, stratified by race. Race was considered a social construct and defined as reported on the Centers for Medicare and Medicaid Services-2728 form in United States Renal Data System as either (i) White, (ii) Black or African American, or (iii) Other (American Indian/Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, or Other). Within the United States Renal Data System, it is not known whether race is self-reported or reported by dialysis facility staff. Because KAS was anticipated to have different effects on incident (new) versus prevalent (those on dialysis for longer than 1 year) patient populations, we examined implementation outcomes in both types of patients. The years preintervention (January–December 2016) and postintervention (April 2017–March 2018) represented the baseline and follow-up study periods, respectively. Incident baseline and follow-up patients initiated dialysis during 2016 and April 2017 to March 2018, respectively. Prevalent baseline patients survived beyond 2016, having been on dialysis during that time, and prevalent follow-up patients survived beyond the conclusion of the intervention period, January to March 2017, representing all patients who survived until follow-up.

Analysis

Survey and Structured Interviews Analysis

Survey data were fully described. Fisher's exact test was used to quantify differences in perceived effectiveness and implementation fidelity (defined as use of all 4 core intervention components) between low and high implementers. Bivariable linear regression analyses were used to assess associations at the facility-level between dose index and change in each effectiveness outcome from baseline to 3-month follow-up. Generalized mixed-effects models were used to examine change in waitlisting from baseline to 1-year among low and high implementers. All quantitative data analyses were conducted in SAS version 9.4 (Cary, NC). Interviews were audio-recorded and transcribed verbatim. Thematic analysis was used, and codes were identified deductively from questions in the interview guide and inductively through iterative identification of topics emerging from the data to produce a codebook.[30] MAXQDA 20[31] was used to facilitate analysis of the interview transcripts. Coded segments were aggregated and categorized according to dimensions of the Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework.[27]

Surveillance Data Analysis

Facility and patient baseline characteristics were fully described. A linear growth trajectory model was used to evaluate adjusted mean proportions of waitlisting at baseline and postintervention by low versus high implementer status, and each race, adjusting for facility-level variation; nonimplementer facilities were examined as a reference. Generalized mixed-effects models were used to compare the relative differences in waitlisting across high versus low implementer facilities.

RESULTS

Study Population and Reach

A total of 384 staff from 331 intervention facilities completed the postimplementation survey (99% facility participation rate). Most participating intervention facilities were for-profit (89%) and located in the South (69%). The percentage of overall new waitlisting events in 2016 (baseline) was lowest among nonimplementer facilities for both incident and prevalent patients (Table 1). Most staff respondents were female (66%) and identified as non-Hispanic White (50%). The most common staff roles were facility administrator (28%), nurse manager (23%), and social worker (19%). Overall, 56% of staff respondents were from high implementer facilities, 31% from low implementer facilities, and 13% from nonimplementer facilities (Table 2).

Interview participants included 1 facility administrator and 2 nurse managers from high implementer facilities, all of whom reported complete fidelity to the intervention (i.e., use of all 4 required intervention components); and 1 nurse manager and 2 social workers from low implementer facilities; interviews lasted for approximately 20 minutes. Participants from high implementer facilities reported sharing intervention materials with other staff, but not necessarily all staff members due to difficulty with workflow limitations and perceptions about which staff role is primarily responsible for providing transplant education (Figure 1; Supplementary Table S3). Participants from high implementer facilities reported that they did not distribute the ASCENT intervention materials to all patients equally, but targeted patients perceived as likely transplant candidates.

Effectiveness

Waitlisting by Facility Implementer Status

Effectiveness results of the intervention versus control groups are reported elsewhere.[24,25] Absolute new waitlisting events were generally higher or similar

Table 1. Baseline (2016) dialysis facility-level characteristics[a] by ASCENT intervention implementer status

Facility-level characteristics	All participating intervention facilities $N = 331$	Nonimplementer facilities $N = 39$ (12%)	Low implementer facilities $N = 103$ (31%)	High implementer facilities $N = 189$ (57%)
Number of social workers within facility (mean, SD)	1.1 (0.4)	1.1 (0.4)	1.1 (0.4)	1.1 (0.5)
Missing, *n* (%)	4 (1)	4 (10)	0 (0)	0 (0)
Social workers: 100 patients ratio (mean, SD)	1.9 (1.1)	2.2 (1.3)	1.9 (1.0)	1.9 (1.2)
Missing, *n* (%)	4 (1)	4 (10)	0 (0)	0 (0)
Staff: 100 patients ratio (mean, SD)	23.0 (8.4)	25.4 (16.1)	22.4 (6.7)	22.9 (7.1)
Missing, *n* (%)	4 (1)	4 (10)	0 (0)	0 (0)
Census region, *n*, (%)				
Northeast	14 (4)	4 (10)	2 (2)	8 (4)
South	228 (69)	27 (69)	64 (62)	137 (72)
Midwest	54 (16)	7 (18)	24 (23)	23 (12)
West	35 (11)	1 (3)	13 (13)	21 (11)
Missing	0 (0)	0 (0)	0 (0)	0 (0)
Location classification, *n*, (%)				
Urban	233 (70)	27 (69)	76 (74)	130 (69)
Rural	89 (27)	9 (23)	26 (25)	54 (28)
Missing	9 (3)	3 (8)	1 (1)	5 (3)
Profit status, *n*, (%)				
Non-profit	35 (11)	5 (13)	5 (5)	25 (13)
For-profit	296 (89)	34 (87)	98 (95)	164 (87)
Missing	0 (0)	0 (0)	0 (0)	0 (0)
% Households in poverty in facility zip code, *n*, (%)				
P1: [0%–5%]	30 (9)	5 (13)	9 (9)	16 (8)
P2: (5%–10%]	68 (21)	9 (23)	18 (18)	41 (22)
P3: (10%–15%]	89 (27)	11 (28)	32 (31)	46 (24)
P4: (15%–20%]	65 (20)	5 (13)	20 (19)	40 (21)
P5: (20%–50%]	71 (21)	7 (18)	23 (22)	41 (22)
Missing	8 (2)	2 (5)	1 (1)	5 (3)
Percent patients with conditions, (mean, SD)				
Diabetes	55.3 (9.3)	53.9 (9.5)	55.1 (8.9)	55.7 (9.5)
Missing, *n* (%)	12 (4)	3 (8)	1 (1)	8 (4)
Hypertension	88.0 (6.7)	87.3 (5.3)	87.2 (7.2)	88.5 (6.6)
Missing, *n* (%)	12 (4)	3 (8)	1 (1)	8 (4)
Congestive heart failure	30.2 (11.5)	30.7 (10.9)	30.0 (11.4)	30.2 (11.7)
Missing, *n* (%)	13 (4)	3 (8)	2 (2)	8 (4)
Cancer	6.9 (4.4)	6.6 (4.0)	6.5 (4.3)	7.2 (4.6)
Missing, *n* (%)	34 (10)	6 (15)	6 (6)	22 (12)
Percent patients with insurance type, (mean, SD)				
Medicare	38.7 (13.2)	36.8 (10.8)	39.2 (14.0)	38.8 (13.2)
Missing, *n* (%)	12 (4)	3 (8)	1 (1)	8 (4)
Medicaid	27.8 (13.1)	27.8 (10.7)	29.7 (14.6)	26.6 (12.6)
Missing, *n* (%)	12 (4)	3 (8)	1 (1)	8 (4)
Employer-provided insurance	19.2 (9.6)	19.1 (8.1)	17.7 (9.2)	20.0 (10.0)
Missing, *n* (%)	15 (5)	3 (8)	2 (2)	10 (5)
No insurance	9.6 (7.9)	11.2 (6.2)	8.1 (6.0)	10.1 (8.9)
Missing, *n* (%)	37 (11)	5 (13)	11 (11)	21 (11)
Percent patients with pre-kidney failure nephrology care 2013–2015, (*n*, %)				
P1: [0%–25%]	32 (10)	0 (0.0)	11 (11)	21 (11)
P2: [25%–50%]	69 (21)	7 (18)	26 (25)	36 (19)
P3: [50%–75%]	132 (40)	8 (21)	40 (39)	84 (44)
P4: [75%–100%]	77 (23)	3 (8)	26 (25)	48 (25)
Missing	21 (6)	21 (54)	0 (0)	0 (0)
Percent patients informed about transplant as treatment option 2013–2015, (*n*, %)				
P1: [0%–25%]	17 (5)	1 (3)	6 (6)	10 (5)
P2: [25%–50%]	19 (6)	1 (3)	5 (5)	13 (7)
P3: [50%–75%]	36 (11)	3 (8)	11 (11)	22 (12)
P4: [75%–100%]	238 (72)	13 (33)	81 (77)	144 (76)
Missing	21 (6)	21 (54)	0 (0)	0 (0)

(Continued on following page)

Table 1. (Continued) Baseline (2016) dialysis facility-level characteristics[a] by ASCENT intervention implementer status

Facility-level characteristics	All participating intervention facilities $N = 331$	Nonimplementer facilities $N = 39$ (12%)	Low implementer facilities $N = 103$ (31%)	High implementer facilities $N = 189$ (57%)
Percent of prevalent patients on waiting list from 2013–2015, (mean, SD)	14.76 (6.8)	14.45 (4.56)	14.54 (6.56)	14.91 (7.15)
Missing, *n* (%)	21 (6)	21 (54)	0 (0)	0 (0)
Percentage of incident patients with new waitlisting events at baseline, (2016)	1.49	1.27	1.74	1.37
% Black waitlisted	0.92	1.16	0.88	0.92
% White waitlisted	1.76	1.32	2.14	1.59
Missing, *n* (%)	0 (0)	0 (0)	0 (0)	0 (0)
Percentage of prevalent patients with new waitlisting events (2016)	2.61	1.95	2.84	2.53
% Black waitlisted	2.44	1.93	2.33	2.53
% White waitlisted	2.73	1.96	3.18	2.53
Missing, *n* (%)	0 (0)	0 (0)	0 (0)	0 (0)

[a]Facility-level data were obtained from the publicly available Dialysis Facility Report.

among high versus low implementer intervention facilities for incident and prevalent populations; for example, among Black patients in the incident population, the mean proportion waitlisted in low implementer facilities was 0.80% (95% CI: 0.73–0.87) at baseline and decreased ($P = 0.04$) to 0.55% at 1-year (95% CI: 0.48–0.62), whereas high implementer facilities increased ($P = 0.04$) from 0.83% (95% CI: 0.78–0.88) at baseline to 1.40% at 1-year (95% CI: 1.35–1.45). Among nonimplementer facilities, the mean proportion waitlisted was 2.02% (95% CI: 1.61–2.43) at baseline and decreased ($P = 0.45$) to 1.89% (95% CI: 1.48–2.30) among Black prevalent patients; and among White prevalent patients was 1.87% (95% CI: 1.46–2.28) at baseline and increased ($P < 0.001$) to 3.50% (95% CI: 3.07–3.92) at 1-year (Figure 2). Racial disparities between Black and White patients in waitlisting in the incident population were observed in both low (adjusted odds ratio [aOR]: 0.42; 95% CI: 0.19–0.95) and high (aOR: 0.59; 95% CI: 0.31–1.15) implementer facilities at baseline that persisted at 1-year postimplementation in low implementer (aOR: 0.39; 95% CI: 0.11–1.36) but not at high implementer facilities (aOR: 1.05; 95% CI: 0.55–1.98). Racial disparities between Black and White patients in the prevalent population were attenuated in low implementer facilities at baseline (aOR: 0.76; 95% CI: 0.59–0.98) to 1-year postintervention (aOR: 0.93; 95% CI: 0.71–1.22) but no disparities were observed at baseline (aOR: 1.09; 95% CI: 0.86–1.37) or follow-up (aOR: 1.09; 95% CI: 0.90–1.33) in high implementer facilities (Supplementary Table S4).

Perceived Effectiveness by Staff

Among staff from high and low implementer facilities, 55% perceived the intervention as effective or very effective. High implementer facility staff consistently rated perceived effectiveness of each intervention component higher than low implementer facility staff. High (vs. low) implementer facility staff were more likely to agree or strongly agree that the intervention components were easy to use (81% vs. 44%), that their dialysis facility liked the project (66% vs. 33%), and intervention components were suitable to their clinics (77% vs. 41%) (Table 3). Higher percentages of staff from high (vs. low) implementer facilities reported larger increases in staff training on transplant and KAS (88% vs. 53%), patient education about transplant (49% vs. 42%), and intent-to-refer patients for transplant (31% vs. 20%) (Supplementary Table S5). Strengths and weaknesses of the intervention components were captured in open-ended survey responses (Supplementary Table S6). In bivariable analyses, each higher point in dose index (i.e., use of additional intervention components) was associated with a 0.36 point (95% CI: 0.22–0.50) increase in dialysis provider knowledge of KAS, 0.88% (95% CI: 0.73–1.03) increase in the percentage of staff trained on transplant and KAS, and 0.19% (95% CI: 0.09–0.29) increase in the percentage of patients educated about transplant. Higher dose index was not significantly associated with percentage of patients waitlisted from baseline to 1-year ($\beta = 0.39$; 95% CI: -0.12 to 0.91 for incident patients; $\beta = 0.17$; 95% CI: −0.11 to 0.45 for prevalent patients).

Interview participants from high and low implementer facilities expressed that the intervention enabled them to prioritize transplant education among staff and patients. High implementer facility participants indicated that the intervention increased staff comfort and confidence in discussing transplant with patients. Conversely, 1 participant from a low implementer facility indicated that they did not find the intervention useful because their facility had several transplant education materials and they already felt well-informed. Participants in both groups emphasized that though transplant education is an important responsibility for dialysis providers, there are many conflicting patient care tasks (Figure 1; Supplementary Table S3).

Table 2. Dialysis facility staff survey respondent characteristics at post-implementation follow up (2016–2017) by ASCENT intervention implementer status

Staff characteristics	All dialysis facility staff respondents $N = 384$[a]	Staff at non-implementer facilities $N = 49$[b] (13%)	Staff at low implementer facilities $N = 120$[c] (31%)	Staff at high implementer facilities $N = 215$[d] (56%)
Gender, *n* (%)				
Female	254 (66)	20 (41)	79 (66)	155 (72)
Male	54 (14)	5 (10)	17 (14)	32 (15)
Race/Ethnicity, *n* (%)				
Hispanic	25 (7)	2 (4)	12 (10)	11 (5)
Non-Hispanic Black	32 (8)	4 (8)	9 (8)	19 (9)
Non-Hispanic White	193 (50)	14 (29)	52 (43)	127 (59)
Other[e]	34 (9)	2 (4)	11 (9)	21 (10)
Prefer not to respond	24 (6)	3 (6)	12 (10)	9 (4)
Role at facility, *n* (%)				
Facility administrator	109 (28)	4 (8)	34 (28)	71 (33)
Medical director	18 (5)	2 (4)	5 (4)	11 (5)
Nurse manager	89 (23)	8 (16)	24 (20)	57 (27)
Social worker	74 (19)	9 (18)	29 (24)	36 (17)
*Other	18 (5)	2 (4)	4 (3)	12 (6)
Length of time in role (years), *n* (%)				
<1	47 (12)	6 (12)	23 (19)	18 (8)
1–5	139 (36)	14 (29)	38 (32)	87 (40)
5–10	66 (17)	1 (2)	20 (17)	45 (21)
>10	56 (15)	4 (8)	15 (13)	37 (17)
Age, *n* (%)				
21–29	12 (3)	1 (2)	5 (4)	6 (3)
30–39	81 (21)	8 (16)	26 (22)	47 (22)
40–49	101 (26)	7 (14)	32 (27)	62 (29)
50–59	77 (20)	3 (6)	22 (18)	52 (24)
≥60	24 (6)	4 (8)	6 (5)	14 (7)
Prefer not to respond	13 (3)	2 (4)	5 (4)	6 (3)

Percentages do not add up to 100% due to missingness:
[a]Missing, *n* (%) = 76 (20).
[b]Missing = 24 (49).
[c]Missing = 24 (20).
[d]Missing = 28 (13).
[e]Other race categories included: American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, and multiple races.

Adoption

Among all responding intervention facilities, 88% adopted at least 1 core intervention component. High implementer facility interviewees reported that intervention adoption was influenced by the perceived involvement of the ESRD Network. All participants in this group considered the ASCENT intervention a mandatory quality improvement project, even though it was not mandatory. In contrast, participants from low implementer facilities did not view the ASCENT intervention as mandated by their ESRD Networks. Participants in the high implementer group indicated that the intervention was easily incorporated into workflow (e.g., staff meetings), which influenced intervention adoption (Figure 1; Supplementary Table S3).

Implementation

Regarding fidelity to the intervention, greater than half of facilities were classified as high implementers (57%), and among those, 49% reported complete fidelity to the intervention and used all 4 core components. Slightly less than one-third of facilities were classified as low implementers (31%), and a minority reported using no core intervention components and were classified as nonimplementer facilities (12%) (Tables 1 and 4). Among low and high implementer facilities, staff and patient educational videos were used most (73% and 63%, respectively), followed by the performance feedback report (58%) (Table 4).

Staff-related intervention components were often shared most with social workers (transplant performance feedback report: 80%; webinar: 59%; staff education video shared with nurses and social workers equally: 67%) and least shared with nephrologists and medical directors (webinar: 13% and 26%, respectively; staff education video: 16% and 30%, respectively) (except for the performance feedback report, which was shared approximately equally with facility administrators [68%], medical directors [67%], and nurses [68%]). Among high implementer facilities, a higher percentage of facilities that exhibited complete fidelity to the intervention reported that they shared project components

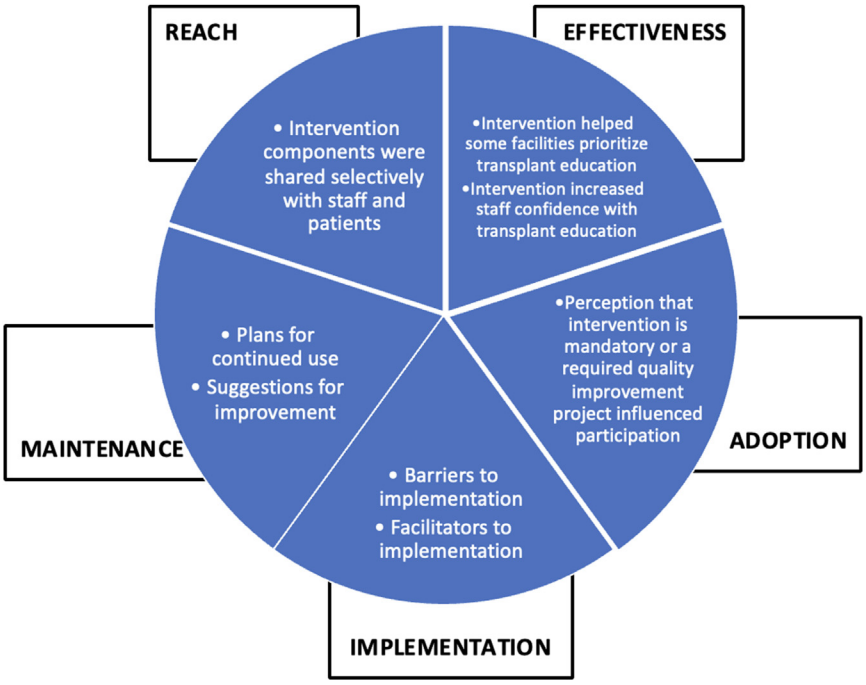

Figure 1. Themes from structured interviews according to RE-AIM dimensions.[27]

with more staff member roles. The performance feedback report was most used in group settings such as quality improvement meetings (47%) and group education training sessions (46%). More facilities used the recorded (vs. live) webinar (55% vs. 12%) (Table 4).

Interview participants from high implementer facilities identified few barriers to intervention implementation and expressed that intervention components were easy to implement. Facilitators to implementation included awareness of their facilities' deficiencies in transplant waitlisting, which motivated them to improve their facilities' transplant performance. Participants commented that enthusiasm and knowledge about the intervention among facility leadership influenced implementation, particularly if leadership engaged all staff roles in the intervention and having a "program champion" dedicated to overseeing the intervention was cited as a facilitator to implementation. One participant commented that patient care technicians at their facility were particularly engaged with the materials because of their frequent patient contact. Another mentioned that the intervention was well-timed with the hiring of new staff and intervention components were used for supplemental training (Figure 1; Supplementary Table S3).

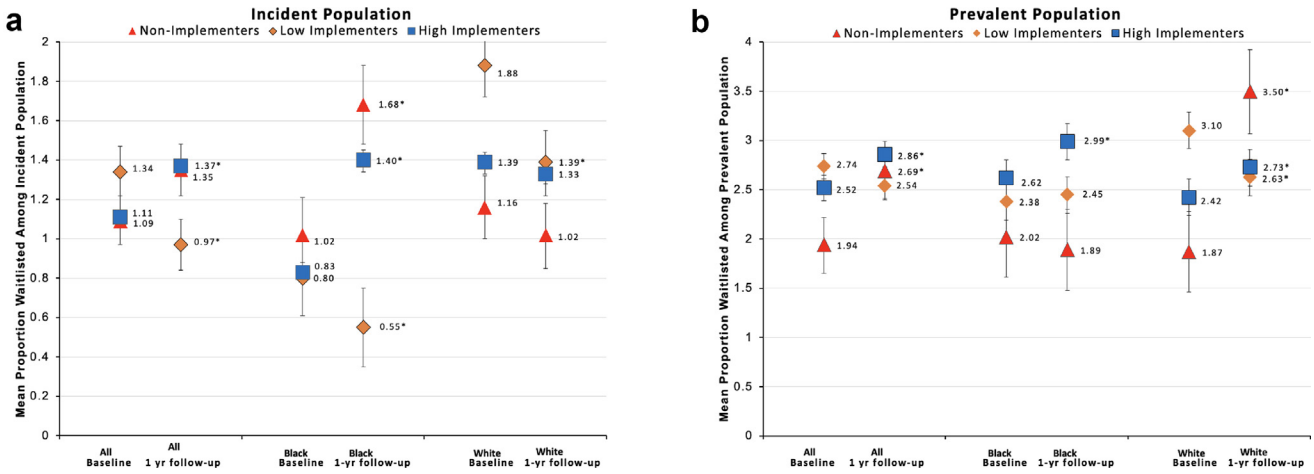

Figure 2. Adjusted mean proportion waitlisted and difference-in-difference estimates (95% CI) (a) Among incident[a] and (b) Prevalent[a] patients within dialysis facilities in the ASCENT intervention non-vs. low vs. high implementers overall and by race at baseline and one year.

Table 3. Perceived effectiveness measures (staff-level) among low and high implementer dialysis facilities

Perceived effectiveness measures	All staff respondents from low and high implementer facilities $N = 335$	Low implementer facilities $N = 120$ (36%)	High implementer facilities $N = 215$ (64%)	Cramer's V[a]	*P*-value[b]
Perceived effectiveness of intervention components in dialysis facility					
Overall effectiveness of ASCENT QIP, *n* (%)				0.3953	<0.001
Very effective/Effective	183 (55)	39 (33)	144 (67)		
Neutral	74 (22)	36 (30)	38 (18)		
Very ineffective/Ineffective	12 (4)	6 (5)	6 (3)		
N/A	23 (7)	19 (16)	4 (2)		
Missing	43 (13)	20 (17)	23 (11)		
Effectiveness of recorded webinar, *n* (%)				0.3205	<0.001
Very effective/Effective	139 (41)	27 (23)	112 (52)		
Neutral	73 (22)	32 (27)	41 (19)		
Very ineffective/Ineffective	12 (4)	7 (6)	5 (2)		
N/A	62 (19)	33 (28)	29 (13)		
Missing	49 (15)	21 (18)	28 (13)		
Effectiveness of live webinar with Q&A, *n* (%)				0.2241	0.002
Very effective/Effective	80 (24)	15 (13)	65 (30)		
Neutral	83 (25)	34 (28)	49 (23)		
Very ineffective/Ineffective	10 (3)	6 (5)	4 (2)		
N/A	108 (32)	42 (35)	66 (31)		
Missing	54 (16)	23 (19)	31 (14)		
Effectiveness of patient DVD, *n* (%)				0.5462	<0.001
Very effective/Effective	167 (50)	22 (18)	145 (67)		
Neutral	63 (19)	35 (29)	28 (13)		
Very ineffective/Ineffective	17 (5)	8 (7)	9 (4)		
N/A	44 (13)	35 (29)	9 (4)		
Missing	44 (13)	20 (17)	24 (11)		
Effectiveness of staff DVD, *n* (%)				0.5362	<0.001
Very effective/Effective	180 (54)	27 (23)	153 (71)		
Neutral	56 (17)	34 (28)	22 (10)		
Very ineffective/Ineffective	11 (3)	5 (4)	6 (3)		
N/A	44 (13)	34 (28)	10 (5)		
Missing	44 (13)	20 (17)	24 (11)		
Effectiveness of transplant performance feedback report, *n* (%)				0.4134	<0.001
Very effective/Effective	170 (51)	36 (30)	134 (62)		
Neutral	76 (23)	33 (28)	43 (20)		
Very ineffective/Ineffective	13 (4)	5 (4)	8 (4)		
N/A	31 (9)	26 (22)	5 (2)		
Missing	45 (13)	20 (17)	25 (12)		
Usability and acceptability of ASCENT intervention components					
ASCENT QIP materials were easy to use, *n* (%)				0.4293	<0.001
Strongly agree/Agree	227 (68)	53 (44)	174 (81)		
Neither	57 (17)	41 (34)	16 (7)		
Strongly disagree/Disagree	8 (2)	6 (5)	2 (1)		
Missing	43 (13)	20 (17)	23 (11)		
My dialysis facility liked this QIP, *n* (%)				0.3331	<0.001
Strongly agree/Agree	182 (54)	40 (33)	142 (66)		
Neither	99 (30)	52 (43)	47 (22)		
Strongly disagree/Disagree	12 (4)	8 (7)	4 (2)		
Missing	42 (13)	20 (17)	22 (10)		
The ASCENT QIP materials were suitable to my clinic, *n* (%)				0.4052	<0.001
Strongly agree/Agree	214 (64)	49 (41)	165 (77)		
Neither	63 (19)	43 (36)	20 (9)		
Strongly disagree/Disagree	14 (4)	8 (7)	6 (3)		
Missing	44 (13)	20 (17)	24 (11)		

[a]Cramer's V calculated by comparing low vs. high implementer facilities. Non-implementer facilities were excluded from the test.
[b]*P*-values calculated from Fisher's exact test.

Table 4. Implementation measures (facility-level) among low and high implementer dialysis facilities

Implementation measures	Total low and high implementer facilities $N = 292$	Low implementer facilities $N = 103$ (35%)	High implementer facilities $N = 189$ (65%)
Fidelity to ASCENT intervention components			
Number of core project components used, *n* (%)			
0	0 (0)	0 (0)	0 (0)
1	57 (20)	57 (55)	0 (0)
2	46 (16)	46 (45)	0 (0)
3	97 (33)	0 (0)	97 (51)
4	92 (32)	0 (0)	92 (49)
Facility reported use of project component, *n* (%)			
Educational webinar	123 (42)	17 (17)	106 (56)
Transplant performance feedback report	169 (58)	36 (35)	133 (70)
Staff educational video	213 (73)	25 (24)	188 (99)
Patient educational video	183 (63)	6 (6)	177 (94)
Approach used to share the dialysis center transplant performance feedback report with staff, *n* (%)			
One-on-one discussion	108 (37)	39 (38)	69 (37)
Group education training session	133 (46)	21 (20)	112 (59)
Quality improvement meeting	138 (47)	28 (27)	110 (58)
Email	9 (3)	1 (1)	8 (4)
Bulletin board	51 (17)	16 (16)	35 (19)
Staff members that the ASCENT transplant performance feedback report was shared with, *n* (%)			
Facility administrator	198 (68)	49 (48)	149 (79)
Medical director	196 (67)	39 (38)	157 (83)
Nephrologist	123 (42)	26 (25)	97 (51)
Nurse	198 (68)	42 (41)	156 (83)
Nurse manager	155 (53)	29 (28)	126 (67)
Social worker	235 (80)	65 (63)	170 (90)
None of the above	18 (6)	15 (15)	3 (2)
Version of webinar viewed by medical directors and staff, *n* (%)			
Live	34 (12)	3 (3)	31 (16)
Recorded	160 (55)	49 (48)	111 (59)
Both	22 (7)	2 (2)	20 (11)
Neither	71 (24)	44 (43)	27 (14)
Missing	5 (2)	5 (5)	0 (0)
Staff members that the webinar was shared with, n (%)			
Facility administrator	126 (43)	32 (31)	94 (50)
Medical director	75 (26)	16 (16)	59 (31)
Nephrologist	39 (13)	8 (8)	31 (16)
Nurse	118 (40)	28 (27)	90 (48)
Nurse manager	113 (39)	25 (24)	88 (47)
Social worker	171 (59)	41 (40)	130 (69)
None of the above	48 (16)	30 (29)	18 (10)
Approach for sharing staff education video with staff in dialysis facility, *n* (%)			
One-on-one discussion	82 (28)	27 (26)	55 (29)
Quality improvement meeting	71 (24)	12 (12)	59 (31)
Physical DVD loaned out to staff	77 (26)	11 (11)	66 (35)
Lunch and learn	92 (32)	16 (16)	76 (40)
Through email to staff with video link	23 (8)	6 (6)	17 (9)
Staff members that the staff educational video was shared with, *n* (%)			
Facility Administrator	137 (47)	26 (25)	111 (59)
Medical Director	87 (30)	14 (14)	73 (39)
Nephrologist	46 (16)	6 (6)	40 (21)
Nurse	197 (67)	32 (31)	165 (87)
Nurse manager	143 (49)	25 (24)	118 (62)
Social worker	196 (67)	43 (42)	153 (81)
None of the above	30 (10)	30 (29)	0 (0)
Approaches used to share educational video with patients in dialysis facility, *n* (%)			
One-on-one discussion	97 (33)	21 (20)	76 (40)

(Continued on following page)

Table 4. (Continued) Implementation measures (facility-level) among low and high implementer dialysis facilities

Implementation measures	Total low and high implementer facilities $N = 292$	Low implementer facilities $N = 103$ (35%)	High implementer facilities $N = 189$ (65%)
Group educational training session	54 (18)	4 (4)	50 (26)
ASCENT business cards distributed	37 (13)	5 (5)	32 (17)
Email with video link	6 (3)	1 (1)	5 (3)
DVD loaned to patients	55 (19)	9 (9)	46 (24)

Interview participants from low implementer facilities described several barriers to intervention implementation, including staff's limited ability to leave the treatment floor to attend trainings. Facility culture about transplant education was also identified as a barrier to implementation, with 1 participant reporting that staff at their facility perceive transplant education as solely the social worker's responsibility. Like participants from high implementer facilities, participants from low implementer facilities indicated that "buy-in" from leadership was critical for implementation fidelity. Participants described infrastructure and technology challenges at their respective facilities, including lack of a DVD player, laptop, or television for viewing videos. Frequent staff turnover was also cited as a barrier to implementation (Figure 1; Supplementary Table S3).

Maintenance

Interview participants from high implementer facilities indicated that they plan to continue using the intervention components during orientation for new patients and staff. Participants expressed a desire for webinars on future transplant policy changes. There were several suggestions for improvements to the intervention components and implementation, including more copies of the patient DVD to share with family and caregivers, tailoring information to regions, and including information for local transplant centers' waitlisting criteria. To incentivize participation, participants suggested that ESRD Networks mandate the program and engage more staff across all roles. Participants also suggested that fewer materials and periodic check-ins from study staff might improve intervention maintenance (Figure 1; Supplementary Table S3). Additional suggestions were collected in open-ended survey responses (Supplementary Table S6).

DISCUSSION

The implementation evaluation of the ASCENT multicomponent intervention provides important contextual information on a complex, pragmatic intervention among a large sample of US dialysis facilities with documented low transplant waitlisting. The results also provide critical context to help interpret the trial's effectiveness outcomes. Specifically, the results revealed moderate usability and acceptability of the intervention among dialysis staff, with at least half of staff participants agreeing or strongly agreeing that the intervention was easy to use, was liked, and was suitable for their clinic. Results also revealed moderate fidelity to the intervention among dialysis facilities with more than half of facilities exhibiting a high degree of fidelity and over a quarter of facilities using all core intervention components.

These findings are comparable to a prior process evaluation of a multicomponent intervention conducted with dialysis facilities in the Southeastern US,[32] and reflect the challenges and opportunities inherent to implementing a complex, multilevel, multicomponent intervention across many diverse and fast-paced outpatient dialysis settings. Differences in fidelity to the intervention were reflected in the study's primary and secondary outcomes. Specifically, high implementer facilities increased waitlisting from baseline to 1-year, particularly among Black patients in the incident population, resulting in overall attenuation of racial disparities. However, in generalized linear modeling results, the implementer status of the facility was not statistically significantly associated with overall waitlisting. These findings, particularly among low implementer facilities, reflect national trends in waitlisting in the years following KAS implementation, including a reduction in Black versus White racial disparity in waitlisting and an overall decline in waitlisting.[17,33] However, increased fidelity to the intervention was associated with increases in the percentage of staff trained on transplant, patients educated about transplant, and provider knowledge of KAS. Low implementer facilities had a worsening in transplant waitlisting from baseline to 1-year compared to high implementer facilities among incident and prevalent patients; this finding is unsurprising because national trends show declines in waitlisting.[33] This may also be due to reported barriers to intervention implementation, including staff turnover, which may have far-reaching implications for transplant education practices and warrants further investigation.

Facility-level implementation barriers were identified, including infrastructure and technology barriers that impacted patient and staff engagement, which are important feasibility and sustainability considerations for future interventions in this setting. Flexibility and adaptations to intervention delivery have been shown to impact reach, adoption, and implementation and flexibility should be considered in future scale-ups.[34] Taken together, results from the process evaluation revealed many "lessons learned" that can inform and improve future large-scale multicomponent, multilevel interventions in dialysis facilities. Suggestions to improve individual intervention components from intervention facility staff were also highly actionable (e.g., additional copies of educational DVDs, other educational formats) and should be considered in any future scale-up of the intervention (Supplementary Table S7).

The transplant performance feedback report was the component used most by low implementer facilities and was used by a majority of high implementer facilities. Audit and feedback interventions can influence providers' performance and care delivery practices across health issues and may be a useful tool for dialysis facility-level quality improvement efforts that is easy to scale.[35] Partnering with the ESRD Network appeared to be an effective strategy to increase implementation fidelity because interview participants indicated that perceived involvement of the ESRD Network influenced intervention fidelity, reflecting ease of integrating the intervention into existing workflow for these facilities. Support and enthusiasm from facility leadership also influenced intervention fidelity and staff engagement. Similarly, Gander *et al.*[36] found that dialysis facilities that fostered a "positive transplant philosophy" had more patients who desired transplant and were ultimately referred for transplant.[36] Therefore, it may be useful to screen facilities for both interest and capacity for the intervention, and assess "readiness for implementation" before rolling out the intervention.[37] Future research should also focus on identifying barriers and facilitators to fostering a positive transplant philosophy among dialysis facilities.

Intervention components were often shared with social work staff compared to other staff roles, and social workers were often identified as the person responsible for provision of transplant-related information.[12] However, interview participants commented that high caseloads and turnover among social work staff were a barrier to implementation. Previous studies have highlighted increasing caseloads and job responsibilities for dialysis social workers, which may negatively impact their ability to prioritize transplant-related education.[38] One potential solution suggested by study participants may be to identify a dedicated staff member to lead the intervention. Consistent with existing literature,[39] intervention implementation was also affected by conflicting work tasks, and although staff viewed transplant education as important, more urgent clinical tasks often took precedence over transplant education.

Staff participants noted that intervention components increased their comfort and confidence in the provision of transplant-related information. Increasing transplant knowledge among dialysis staff is critical because patients have noted in prior studies the importance of education delivered by providers with whom they have existing, trusting relationships.[40] This may be an increasingly salient issue as prioritization of transplant-related responsibilities among dialysis staff evolves in response to novel payment models, such as the ESRD Treatment Choices model, which incentivizes participating facilities to increase use of home dialysis and transplantation.[41]

The results of this process evaluation should be considered within the context of its limitations. Data were self-reported by staff at participating dialysis facilities and missing survey data may impact the validity of the findings. Facility administrators represented the largest percentage of staff survey respondents, yet most intervention materials had been shared with social workers; thus, validity of responses may have been compromised. Intervention materials were also shared with few nephrologists or medical directors, who are often tasked with making referrals for transplant. The study's generalizability is limited because only facilities with documented low waitlisting were targeted. Diverse perspectives, including those of patients and families or caregivers on the intervention's usability and acceptability were not collected and should be explored in future process evaluations. The perspectives of frontline workers, including patient care technicians, should also be prioritized, for insight into intervention implementation and workflow considerations. Intervention materials were also only provided in English. The sample size for the interviews was small and did not include participants from non-implementer facilities to address implementation barriers among this group; future evaluations of ASCENT should interview more sites implementing the program. Interviews were conducted in 2017 and may not be applicable to current practices, particularly following the COVID-19 pandemic. Future work should examine the association between implementation and other facility-level quality metrics to assess if the degree of implementation corresponds with success in these areas. A major strength of this evaluation is the large

sample size of both participating facilities and staff, and collection of both quantitative and qualitative data within a hybrid design to provide critical context for understanding intervention implementation barriers and facilitators.[26]

This process evaluation of the ASCENT intervention provides valuable insight into complex intervention implementation in diverse dialysis settings with a variety of provider roles and adds to the limited implementation science literature in nephrology and kidney transplant.[26] The findings from this implementation study can be used to inform future hybrid effectiveness-implementation studies in dialysis or similar health care settings and serve as a guide of best implementation practices and lessons learned for future dissemination among dialysis facilities wishing to implement ASCENT intervention components or other similar implementation strategies in dialysis facilities.

DISCLOSURE

All the authors declared no competing interests.

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Data Availability Statement

The deidentified data will be made available upon reasonable request.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Table S1. Description of ASCENT intervention components.

Table S2. RE-AIM dimensions, measure in ASCENT, and example questions.

Table S3. Qualitative themes and illustrative quotations according to RE-AIM dimensions.

Table S4. Effectiveness of the ASCENT intervention on waitlisting among incident and prevalent kidney failure patients treated at high versus low implementer facilities, overall and by race, generalized linear mixed effects modeling.

Table S5. Secondary facility-level outcomes of dialysis facility staff self-reported change in staff training on KAS, patient education on kidney transplantation and providers' intent-to-refer patients for kidney transplantation by high versus low implementers facilities.

Table S6. Themes from open-ended survey comments on ASCENT intervention components.

Table S7. Lessons learned and recommendations for future large intervention studies in dialysis facilities.

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