Interventions to Reduce Clinical Inertia in Cardiac Risk Factor Management in Renal Transplant Recipients

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Cardiovascular disease (CVD) is the leading cause of death in renal transplant recipients (RTRs). Clinical inertia (CI) is defined as "recognition of the problem, but failure to act." The effect of educational interventions in minimizing CI in CVD risk factor management was assessed. Educational sessions were conducted among 201 RTRs to inform them about their goals for blood pressure (BP), low-density lipoprotein cholesterol (LDL-C) and glycated hemoglobin (HbA_{1c}). Physicians were reminded about treatment goals using checklists. Pre-intervention and post-intervention CI was measured as "no action" or "appropriate action" by the physicians. Post-intervention percentage of RTRs with "no clinical action" for BP, LDL-C, and HbA_{1c} control decreased from 10.8% to 3.8% (P=.02), 28.2% to 11.1% (P=.008), and 10.3% to 4.5% (P=.05), respectively, while those with "appropriate action" increased from 66.2% to 83.3% (P<.001), 68.7% to 79.4% (P=.008), and 85.1% to 93.2% (P=.03), respectively. Educational interventions and patient participation were shown to reduce CI. *J Clin Hypertens (Greenwich).* 2014;16:127–132. ©2014 Wiley Periodicals, Inc.

Cardiovascular disease (CVD) is the leading cause of death among renal transplant recipients (RTRs).[1–3] Death is the most common cause of loss of graft function.[4] Chronic kidney disease (CKD) and CVD have several common risk factors. Similarly, new-onset diabetes mellitus after transplantation (NODAT) and side effects of immunosuppressive regimens may be related to CVD among RTRs.[5,6] Fortunately, CVD risk factors such as hypertension (HTN), diabetes mellitus (DM), and dyslipidemia are modifiable and control significantly reduces the risk for CVD.[4]

Kidney Disease Improving Global Outcome (KDIGO) guidelines are comprehensive evidence-based guidelines for the care of RTRs and have specific recommendations for CVD risk factor control.[7] However, attaining these treatment goals, and hence reduction in CVD mortality, in RTRs seems challenging as evident from results of studies performed at renal transplant clinics comparing performance with guideline recommendations. Control of modifiable CVD risk factors was observed to be suboptimal in a study of 231 RTRs.[8] A recent study at the center where the current study was conducted also revealed that a substantial number of RTRs did not achieve treatment goals or missed recommended screening for risk factors.[9] Glycated hemoglobin (HbA1c) was assessed in only 50% to 60%. Similarly low-density lipoprotein cholesterol (LDL-C) was checked in 66% to 80% of RTRs. Only 38% of RTRs were taking ≥3 antihypertensive medications despite the high prevalence of uncontrolled blood pressure (BP). This study speculated that the phenomenon of clinical inertia (CI), widely studied in the primary care setting, may play a part in poor control.

Phillips and colleagues[10] defined CI as "recognition of the problem but failure to act." Another definition is lack of treatment intensification in a patient who is not at evidence-based goals for care.[11] CI may be caused by both physician and patient factors.[11] Physician-related factors include lack of awareness of recent clinical guidelines leading to decisions based on goals with which the clinician is most familiar or comfortable, fear of adverse effects of medications, insufficient time for clinical encounters, and reactive rather than proactive care. Patient factors include denial, lack of perception of severity of the disease, low health literacy, lack of self-efficacy, medication side effects, poor communication between physician and patient, or lack of trust on behalf of the patients in their physician.[11–14]

We investigated the physician and patient factors that may be involved in CI in the management of hypertension, diabetes mellitus, and dyslipidemia at a renal transplant clinic. The effect of educational interventions to minimize these patient and physician factors contributing to CI was also assessed.

METHODS

This study was conducted at the Erie County Medical Kidney and Pancreas Transplant center. The institutional review board at the University at Buffalo and the Erie County Medical Center Review Committee approved the study protocol.

The study included all RTRs following up at the transplant clinic for post-transplant care during a 4-month period from October 2011 to January 2012. We excluded three RTRs with failed transplants who were verging on dialysis or were already on dialysis.

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We also excluded RTRs who were not able to participate in questionnaires and educational sessions as a result of acute illness. Inclusion criteria for physicians included all the providers including physicians, physicians' assistants, and transplant fellows who provided care to the patients at the clinic. Since only one physician assistant was involved in care during the study period, providers will be referred to as physicians for simplicity.

Informed consent was obtained from all RTRs. Surveys were administered in the form of paper-based questionnaires in an individual consulting room while the RTRs were waiting for their post-transplant follow-up appointment. The survey was designed specifically for this study and consisted of questions addressing the knowledge, attitudes, and behaviors of RTRs about CVD and its risk factors. Demographic information including age, sex, and education was also collected. The survey was pilot-tested in 20 RTRs for face validity. For RTRs, the educational intervention consisted of a standardized one-on-one session of 15 to 20 minutes following the survey that consisted of educating them about their target numbers for BP (<130/80 mm Hg), LDL-C (<100 mg/dL), and HbA_{1c} (<7.5%). They were also instructed about their risk for CVD and the importance of home recordings of BPs and blood sugar. All information presented to them at the session was pre-printed on a concise one-sheet document that was given to them at the end for their reference. They were provided with small logbooks to encourage home recordings. Two educators who were medical residents conducted these educational interventions. At this session, RTRs were also given a card titled "I need to know" (Figure 1a-supplementary material) that included information which would facilitate their interaction with physicians. Each RTR was encouraged to write down their readings on the card during their discussion with the physicians. RTRs who were in need of home BP monitors were identified and monitors were provided to them.

A separate paper-based questionnaire was administered to the physicians and consisted of questions pertaining to their knowledge, attitude, and practice of the KDIGO guidelines. Physicians were provided with educational material about the current KDIGO recommendations. The physicians were given cards titled "I should check" (Figure 1b-supplementary material) with the clinic progress note of each patient. It was a checklist for management of cardiovascular risk factors, namely hypertension, dyslipidemia, and diabetes.

CI was measured through review of electronic medical records (EMRs). The clinical action taken by the physician was categorized as "no clinical action," "equivocal clinical action," or "appropriate clinical action" for BP, LDL-C, and HbA_{1c} control as shown in Table I. Data were gathered at three time points: (1) at the post-transplant follow-up visit just preceding the intervention visit, ranging from 1 to 6 months prior to intervention (pre-intervention); (2) at the intervention

TABLE I. Categorization of Physician Action to Measure Clinical Inertia

Score	No Action	Equivocal Action	Appropriate Action
BP	No SBP reading SBP >130 mm Hg AND no documentation of HTN in assessment OR no change in medication or lifestyle	SBP >130 mm Hg AND home BP readings ordered OR mention of HTN in assessment OR medications reviewed	SBP <130 mm Hg OR SBP >130 mmHg AND new anti-HTN agent added OR dosage increased OR referral to dietician OR documented home BP readings <130 mm Hg OR re-checked clinic reading <130 mm Hg OR contraindications for intensifying treatment documented
LDL-C	No LDL-C level within 3 months for RTRs within 1 year post-transplant OR no LDL-C level within last 12 months in RTRs past 1 year post-transplant OR LDL-C >100 mg/dL AND no documentation of dyslipidemia in assessment/no change in medication/lifestyle	LDL-C >100 mg/dL AND LDL-C reordered OR mention of dyslipidemia in assessment OR medications reviewed	LDL-C <100 mg/dL OR LDL-C >100 mg/dL and lipid-lowering agent added OR dose of lipid-lowering agent changed OR referral to dietician OR contraindications for intensifying treatment documented
HbA_{1c}	No HbA_{1c} test within last 3 months in known diabetic RTRs OR no HbA_{1c}/FBG within last 3 months in nondiabetic RTRs within 1 year post-transplant OR no HbA_{1c}/FBG within last 12 months in nondiabetic RTRs past 1 year post-transplant OR HbA_{1c} >7.5% or FBG >126 mg/dL AND no documentation of diabetes in assessment/no change in medication/lifestyle	HbA_{1c} >7.5% AND home blood glucose readings ordered OR HbA_{1c} re-ordered OR mention of uncontrolled diabetes in assessment OR medications reviewed	HbA_{1c} < 7.5% or FBG in nondiabetic RTRs <126 mg/dL OR HBA_{1c} >7.5% AND oral hypoglycemic agent added OR dose of oral hypoglycemic agent changed OR insulin added or dose of insulin changed OR referral to dietician OR referral to endocrinologist OR contraindications such as hypoglycemic episodes for intensifying treatment documented

Abbreviations: FBG, fasting blood glucose; HbA_{1c}, glycated hemoglobin; LDL-C, low-density lipoprotein cholesterol; SBP, systolic blood pressure.

visit; and (3) at the post-transplant follow-up visit after the intervention, ranging from 1 to 4 months after the intervention (post-intervention).

Statistical Analysis

All analyses were conducted using SPSS version 19 (SPSS, Inc, Chicago, IL). The tests were two-sided, with an α level of 0.05. Frequencies and cross-tabulations were used for distribution of categorical responses of surveys. Correlation was used to study the relation of age, sex, and educational status on survey responses. Chi-square tests were used to compare the differences in the proportions of RTRs within each category of the clinical inertia.

RESULTS

A total of 201 RTRs completed the survey. The response rate for surveys of RTRs was 98.5%. Participation in the one-on-one educational session was 100% since all the RTRs who completed the surveys also completed the one-on-one sessions. Of the 10 total physicians (including physicians, physician's assistants, and transplant fellows) at the renal transplant clinic, 8 completed the physician survey.

The results of the survey of RTRs are depicted in Table II. Among RTRs, 32% were aware that heart disease is the leading cause of death and 7.5% knew that death is the most common cause of transplant failure. There was no correlation between age, education, or sex and responses to knowledge about heart disease and its risk factors. A total of 50% of RTRs believed that they were at high risk for heart diseases while the rest either believed that they were at low risk or were not sure about their risk. BP was never checked at home by 28% of RTRs, and 44.5% responded they always asked their doctors about their readings, whereas 19.5% responded that they never asked their doctors. Similarly, 21% responded that they were either not told or were not sure whether the doctor had told them about their readings.

Results of the physician surveys suggested that all of them believed that KDIGO guidelines were applicable to their practice and needed to improve compliance with the guideline recommendations. Knowledge about LDL-C goals was present in 75% while 37% were aware about the specific recommendations for screening for NODAT. If patients were to ask about their numbers at each clinic visit, 62% responded that this would help in their care, while 37% responded it would not change their management. Among the physicians, 62% occasionally told patients about their target numbers, while 25% told them at each clinic visit. They identified three factors for their difficulty to adhere to guidelines, namely patient noncompliance, time constraints during the clinical encounter, and fear of drug interactions.

During the medical record review to compare CI before and after the intervention, 3 of the total 201 RTRs who completed the survey were excluded because two developed graft failure and one relocated after her initial visit. The final sample for the EMR review consisted of 198 RTRs. Baseline characteristics of these RTRs are depicted in Table III. Results of the educational intervention are shown in Table IV. Panel A, B, and C show the change in CI in terms of clinical actions taken by physicians for BP, LDL-C, and diabetes control, respectively, among RTRs before and after the intervention. Post-intervention percentage of patients with "no clinical action" for BP, LDL-C, and HbA_{1c} control decreased from 10.8% to 3.8% (P=.02), 28.2% to 11.1% (P=.008), and 10.3% to 4.5% (P=.05), respectively, while those with "appropriate action" increased from 66.2% to 83.3% (P<.001), 68.7% to 79.4% (P=.008), and 85.1% to 93.2% (P=.03), respectively.

We also conducted this analysis in the subgroup of RTRs in whom treatment goals were unmet. The percentage of CI (no action or equivocal action) for these RTRs significantly declined (P<.05) from pre-intervention to post-intervention for BP (65.3%–48.1%), LDL-C (70.5%–42.8%), and HbA_{1c} (56.0%–35.3%).

TABLE II. Survey Results for Renal Transplant Recipients

Questions	Responses, % (No.)
What is the leading cause of death in kidney transplant patients?	Heart disease: 32 (64/200) Other causes: 39 (78/200) Do not know: 29 (58/200)
What is the most common cause of transplant failure?	Death: 7.5 (15/201) Other causes: 70.1 (141/201) Do not know: 22.4 (45/201)
Does high BP cause heart disease?	Yes: 91.04 (183/201) No: 8.96 (18/201)
Does high cholesterol cause heart disease?	Yes: 90.95 (181/199) No: 9.05 (18/199)
Does diabetes cause heart disease?	Yes: 67.34 (134/199) No: 32.66 (65/199)
What is your risk for heart disease?	High: 50.25 (100/199) Low: 19.09 (38/199) Not sure: 30.65 (61/199)
Do you monitor your BP at home?	Yes regularly: 57 (114/200) Yes sometimes: 15 (30/200) No: 28 (56/200)
How often do you ask your doctor about your BP, LDL-C, and sugar readings?	Always: 44.5 (89/200) Sometimes: 36 (72/200) Rarely/never: 19.5 (39/200)
Does your doctor tell you about BP, LDL-C, and sugar readings?	Yes: 78.5 (157/200) No: 9 (18/200) Not sure: 12.5 (25/200)
How often do you miss your medications?	Never: 81.40 (162/199) Once a month: 6 (12/199) Once a week: 5.5 (11/199) >2–3/week: 7.03 (14/199)

Abbreviations: BP, blood pressure; LDL-C, low-density lipoprotein cholesterol.

DISCUSSION

In the general population, it is estimated that CI in the management of diabetes, hypertension, and lipid disorders may be responsible for up to 80% of strokes and heart disease.[11] Some studies have observed the role of CI in the management of hypertension in renal transplant patients.[15] Failure to intensify therapy in patients with elevated blood glucose, lipid, or BP levels fits the definition of medical errors according to the Institute of Medicine.[11] CI may be related to physician as well as patient factors. Complex pathophysiology and drug regimens among RTRs make management of CVD risk factors challenging. However, this study sheds light on an interesting dimension of care at transplant clinics. The fact that only 32% of the RTRs were aware that CVD is the main cause of death in renal transplant patients and only 7% knew that death is the most common cause of their graft failure indicates a lack of perceived severity and seriousness of illness. According to the Health Belief Model of human health behavior, perceived severity and seriousness of the disease are determinants of whether patients will adopt healthy behaviors such as compliance with screening or treatment.[16,17] Also worth noting were findings that a substantial percentage of patients were not actively involved in their care plan and relied heavily on their physician to inform them about their treatment goals and progress.

According to previous studies such as the Supporting Hypertension Awareness and Research Europe-Wide (SHARE), physicians often underestimate the number of patients with unmet treatment goals at their practice.[18] In addition, in our study, not all physicians at the practice were aware of the percentage of patients with unmet goals or unmet screening requirements. The three factors limiting adherence to guidelines identified by the physicians, namely time constraints, patient noncompliance, and fear of drug side effects, were consistent with previous studies performed in primary care settings.[10,12,13]

We based our interventions on previous clinical trials performed in this area as well as our findings from the

TABLE III. Baseline Characteristics of RTRs (N=198)

Characteristic	No.
Age, mean±SD, y	53.01±12.39
Sex, No. (%)	
Female	80/198 (40.4)
Male	118/198 (59.6)
Race, No. (%)	
White	128/198 (64.6)
Black	50/198 (25.3)
Other	20/198 (10.1)
Duration since transplantation, mean±SD, mo	79.67±77.24
RTRs with baseline values, No. (%)	
BP <130 mm Hg	94/195 (48.2)
LDL-C <100 mg/dL	121/165 (73.3)
HbA_{1c} <7.5%	105/130, (80.8)
Diabetes status, No. (%)	
No diabetes	120/198 (60.6)
Pre-transplant diabetes	53/198 (26.8)
Post-transplant diabetes	25/198, (12.6)

Abbreviation: BP, blood pressure; HbA_{1c}, glycated hemoglobin; LDL-C, low-density lipoprotein cholesterol; RTRs, renal transplant recipients, SD, standard deviation.

TABLE IV. Change of the Percentage of Renal Transplant Recipients Within Each Category of Clinical Action After the Educational Intervention

	No Clinical Action	Equivocal Action	Appropriate Action
Effect of educational intervention on clinical inertia in blood pressure control			
Pre-intervention (n=195)	21 (10.8%)	45 (23.1%)	129 (66.2%)
Intervention (n=197)	5 (2.5%)	35 (17.8%)	157 (79.7%)
P value[a]	<.001	.21	.003
Post-intervention (n=130)	5 (3.8%)	16 (12.3%)	109 (83.3%)
P value[b]	.024	.12	<.001
Effect of educational intervention on clinical inertia on LDL-C control			
Pre-intervention (n=195)	55 (28.2%)	6 (3.0%)	134 (68.7%)
Intervention (n=197)	36 (18.3%)	15 (7.6%)	146 (74.1%)
P value[a]	0.04	0.07	0.14
Post-intervention (n=131)	22 (11.1%)	5 (2.5%)	104 (79.4%)
P value[b]	.008	.62	.008
Effect of educational intervention on clinical inertia in diabetes control			
Pre-intervention (n=195)	20 (10.3%)	9 (4.6%)	166 (85.1%)
Intervention (n=198)	13 (6.6%)	10 (5.1%)	175 (84.4%)
P value[a]	.13	.51	.21
Post-intervention (n=133)	6 (4.5%)	3 (2.3%)	124 (93.2%)
P value[b]	.047	.26	.031

Abbreviation: LDL-C, low-density lipoprotein cholesterol. [a]Comparison between pre-intervention and intervention visit. [b]Comparison between pre-intervention and post-intervention visit.

surveys of RTRs and physicians.[19,20] We decided to use simple tools such as one-on-one educational sessions and simple informational sheets to increase patient awareness. Checklists were provided to patients to facilitate their participation in care. Physicians were also given checklists to remind them about cardiovascular risk factor control. Our results indicate that, after intervention, the degree of "no action" or "equivocal action" by the physicians decreased and "appropriate action" increased for the control of BP, LDL-C, and diabetes. These differences were more robust in the control of BP. This could be related to the fact that BP readings were readily available at each clinic, whereas LDL-C and HbA_{1c} values were not checked as often.

STUDY LIMITATIONS

There are several limitations to our study. There is no existing standard for measurement for CI. Few studies in the primary care setting have used therapeutic inertia scoring. Using such scoring was not possible in our study because of the limited number of visits for each patient.[21] The CI categorization that we used has been used in previous studies.[19] There are few studies documenting the need to differentiate CI from appropriate care where "no action" did not always mean inappropriate action.[22] In our categorization of clinical action, we did take this into consideration and gave credit to the physicians if they had documented the reason for not intensifying treatment to meet goals. Physician notes were handwritten and scanned into the EMR that made interpretation of physician assessment and plan challenging. Documentation of medication dosage changes and medication addition were available electronically, which often helped to overcome the limitation of handwritten notes. In some instances, patients had their LDL-C and/or HbA_{1c} checked routinely at their primary care or other specialist office and tracking these results was challenging and may have led to some degree of overestimation of the percentage of patients within the "no clinical action"' category. However, the majority of these records were scanned in the EMR, limiting this possibility. Because of the limited duration we could not assess clinical outcomes for the study. Reinforcement of patient and physician educational intervention was difficult because of the time constraints in the busy transplant clinic. The Hawthorne effect as an explanation to the positive changes seen in clinical action cannot be completed excluded. Even if this were true, it should not undermine the beneficial results observed in the study since many of the chronic disease management programs are based on similar models where the physicians are aware of the monitoring and in some cases incentivized for better outcomes.[23] At the same time we do acknowledge the need for further long-term studies that could validate our results and observe effects on actual clinical outcomes.

Despite some of the limitations, the important message from this study is that even at busy transplant clinics where complicated issues such as immunosuppression regimens need to be addressed, management of uncontrolled CVD risk factors is challenging yet possible. Simple measures such as increasing awareness among RTRs about the severity of their risk of CVD, increasing self-efficacy through self-monitoring their target numbers, and encouraging their involvement in care seems to facilitate the management of these risk factors by their physicians.

CONCLUSIONS

Patient education measures along with frequent reminders to physicians to monitor CVD risk can help increase the compliance with clinical guideline goal adherence thereby improving the care of RTRs and also help reduce CVD mortality in the long run.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Patient and physician checklists.