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Original Article

A Comparison of Relation between Resilience, Locus of Control, Quality of Relationship and Pain Intensity with Dialysis Adequacy in Patients with Peritoneal and Hemodialysis

Shamim Eslampour[1], Shahram Hajirezaei[2], Mohammad Mahdi Sagheb[3], Shahrokh Ezatzadegan Jahromi[3], Masoud Mohammadi[1]*

Abstract

Objective: Mental health in people with chronic diseases undergoes many changes due to conflict with the pain caused by the disease, which can have a reciprocal effect on the course and quality of the patient's treatment. The goal of the present study is to compare the correlation between locus of control, relationship quality, pain intensity and resilience with dialysis adequacy and laboratory indicators in peritoneal dialysis and hemodialysis patients.
Method: This causal-comparative study was conducted on 30 hemodialysis (HD) and 30 peritoneal dialysis (PD) patients through the convenience sampling method. The data was collected using Pierce Quality Relationship Inventory (QRI), Conner-Davidson Resilience Scale (CD-RISC), Rotter's Locus of Control Scale (RLOC), and Von Korff's Chronic Pain Grade Scale (CPGS), and experimental data collected through blood and urine sampling and analyzed with Fisher's test and multivariate analysis of variance.
Results: Conclusion of the Fisher test evinced that there was a significant difference between quality of relationships with parents and amount of Potassium (K), Phosphorus (P) and Parathyroid Hormone (PTH) as well between quality of relationships with friends and amount of Creatinine (Cr), and between the intensity of pain with K and Albumin (Alb) in patients with PD and HD ($P < 0.05$, $P < 0.01$). Conclusion of analysis of variance showed that the mean scores of quality of relationships with friends, K, Blood Urea Nitrogen (BUN), Cr, Alb and PTH in the PD group were significantly lower than the mean scores of HD patients ($P < 0.05$, $P < 0.01$). Also, mean of dialysis adequacy in patients with PD was significantly higher ($P < 0.01$).
Conclusion: Based on findings, in order to increase dialysis adequacy of patients, along with medical interventions, psychological variables and mental health improvement of patients should also be considered.

Key words: *Hemodialysis; Locus of Control; Pain; Peritoneal Dialysis; Quality of Relationship*

1. Islamic Azad University, Shiraz Branch, Shiraz, Iran.
2. Deptartment of Psychiatry, Roozbeh Hospital, Tehran University of Medical Sciences, Tehran, Iran.
3. Nephrology-Urology Research Center and Department of Internal Medicine, Shiraz University of Medical Sciences, Shiraz, Iran.

***Corresponding Author:**
Address: Islamic Azad University, Shiraz Branch, Shiraz, Fars, Iran, Postal Code: 7198774731.
Tel: 98-71 36191311, Fax: 98-71 36410059, Email: mohammadi.masoud@iaushiraz.ac.ir

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Among the diseases that affect the quality of life of the individual is Chronic Renal Failure (CRF). CRF can be described as prevenient and irrecoverable damage of renal function. Outbreak of End Stage Renal Disease (ESRD) in the world has been reported at around 2 million people and is rising by 5% each year (1). In Iran, patients with ESRD have reported 8.435 patients per million (2). With reduced kidney function, body fluids and metabolic toxins increase and electrolytes accumulate rapidly in the blood and body tissues. Fluid and metabolic toxins should be reduced by an alternative to let the patient survive. Dialysis is one of the methods of treatment for patients with ESRD (3–5).

Dialysis is done in two ways: hemodialysis and peritoneal dialysis. In treatment of patients with CRF, dialysis as a maintenance therapy typically requires continuous use of arterial and venous needles for the patient (6, 7). During PD, the blood vessels of the abdominal visceral layer (peritoneum or mesentery) function as the kidneys through the dialysis solution flowing on the sides of the peritoneum. In PD, the individual can continue to treat himself at home, at work, and even while traveling (8). The factor that can affect lives of people with chronic physical diseases is resilience. Resilience refers to the factors and processes that separate the trajectory of growth from the pathway of problematic behaviors and psychological harms, and results in adaptive consequences despite adverse conditions. In other words, resilience means an explanation of healthy adaptation despite adversity, thus, resilience is a great number of factors and preserved proceedings related to both skills and personal attributes, as well as supportive social environment that provide resilient behavior (9). Resilience is a process that promotes the way a person interacts with a challenging condition in a positive way (10). According to J. Rotter, individuals emphasize the role of two types of factors in explaining causes of their behavior and its consequences. Some individuals have an innate locus of control and attribute the consequences of behavior to personal factors, and others have an exogenous locus control and attribute results to factors beyond their control (11, 12). Research on the source of control has shown people with innate locus of control in dealing with stressful situations act better than those with exogenous locus of control (12). Locus of control is generally referred to as a fundamental difference variable among individuals that is also indicative of their supposed degree of control they may have over the events going on in their lives. It is now commonly acknowledged as one of the main criteria based on which self-evaluation can be conducted (13, 14). Another variable that is important in the lives of patients is the quality of individual relationships. While evaluating an individual's relationship, several criteria should be taken into consideration including the relationship quality and ruling positive, negative feelings, to name a few. Relationship quality comprehends nurturance, affability, cordiality, goodness, comprehension, and accreditation, protection, and even generosity. Quality of a relationship has several components and a person must evaluate quality of his relationships with parents, friends and spouse (15). Quality of relationships is a structure consisting of several distinct but interrelated dimensions, including trust, satisfaction and commitment (16). Interpersonal conflicts, especially those with close people, in the long term is a stressor and can lead to mental damages such as depression and anxiety. In addition to cognitive damages, physical damages caused by maladaptive behaviors for health (such as inactivity, inappropriate diet, sleep, increased drug use), and secretion of the glands involved in stress, cause weakened immune system and cardiovascular disease (17). Although advancement of medical technology has prolonged the lives of people with chronic renal failure, despite all these improvements, these patients are still influenced by physiological stressors caused by the disease itself and its maintenance treatment. Among physiological stressors, we can point out pain during hemodialysis and afterwards (18–20).

Ache is an undesirable feeling or sentient experience relate to virtual injury and is one of the most common phenomena that forces people to seek help from health care systems (21). In clinical situations, pain occurs during various diagnostic and therapeutic procedures, the most common of which is pain due to the introduction of the venous catheter insertion for therapeutic purposes in hospital (22). The repetition of pain associated with the frequent insertion of hemodialytic needles is a common experience of all hemodialysis patients, which causes depression and reduces quality of life among these patients. More than one fifth of hemodialysis patients express this pain intolerable (6, 23–25). Two main methods to dialysis have been proposed to date including HD and PD. Patients diagnosed with CRF usually undergo dialysis. During the PD procedure, as a maintenance treatment, uninterrupted use of venous and arterial needle is suggested for patients. In doing so, the blood vessels of an abdominal visceral layer, i.e., peritoneum or mesentery, compensate for the kidney failure through the dialysis solution flowing on the sides of the peritoneum. Patients in the PD procedure can undergo home treatment, i.e., either at home or work or even on trips. (26). Because there are some differences between HD and PD, also there are certain differences in Procedure and the care that must be taken afterwards (27). In HD, several people are usually treated for together in hospital but in PD, treat is usually done at home. This difference in Procedure may have different psychological consequences, therefore, it seems that there are differences in some psychological variables such as resilience, locus of control, quality of relationship and pain intensity between these two groups (28). Most studies on effects of psychological variables such as

resilience, locus of control, quality of relationship and pain intensity have been performed on HD and no study has been done on PD. For this purpose, a study was performed.

In other words, looking at adequacy of dialysis or laboratory indicators in dialysis patients raises the question of whether there is a difference between these indicators in patients with peritoneal dialysis and hemodialysis, and whether structures such as locus of control source, pain intensity, quality of relationship and resilience are different in these two groups. Therefore, the objectives of this research are: (1) definition of the difference between locus of control, quality of relationship, intensity of pain and resilience with dialysis adequacy and laboratory indicators in PD and HD and (2) definition of the difference between psychological and laboratory variables in patients with PD and HD.

Materials and Methods

Participants

The present study was a causal-comparative research. The statistical population of this study consists of all dialysis patients who had a diabetes treatment file during the period from September2019 to October2020 in Namazi Hospital for HD and Imam Reza Clinic in Shiraz for PD. Among them, 60 patients (30 PD patients and 30 HD patients) who had the criteria for inclusion in treatment were selected according to the convenience sampling method and they were offered the necessary explanations regarding the research goals and need for consent to participate in this study.

The criteria for inclusion in the study included: ages between 22 to 55 years, married, parents being alive, more than six months passed since the first dialysis, dialysis being at least 2 times a week, having a degree higher than middle school. The criteria for exclusion in the study included: lack of cancer and history of mental illness, and the patient did not undergo surgery or hospitalization in the past month.

IRB approval was obtained from Islamic Azad University, Shiraz branch: Shiraz (IRB# ir.iau.rec.1398.1816. approved 10/5/2019) prior to implementation of questionnaires. Written consent was obtained from those who accepted to partake in the study in accordance with the stipulated IRB procedure.

Measurements

Pierce' Quality Relationship Inventory (QRI), Conner-Davidson Resilience Scale (CD-RISC), Rotter's Locus of Control Scale (RLOC), and Von Korff's Chronic Pain Grade Scale (CPGS) were used to collect data. Quality Relationship Inventory (QRI) was developed by Pierce *et al.* (1991). This questionnaire contains 25 Items, in which, the person must evaluate the quality of his relationships with parents, friends and spouse (29). In research by Iranian *et al.* its reliability was 0.83 with the retest method and the internal consistency was reported to be 0.92 using Cronbach's alpha of 0.92 (30). Rotter's Locus of Control Scale (RLOC) was developed in 1966. The scale has 29 items, each item having a pair of questions (A and B). The study in Iran showed a test-retest reliability of 0.84 over 3 weeks, and the alpha estimates were .82 for both samples (31).

Conner-Davidson Resilience Scale (CD-RISC) is a 25-item questionnaire which was developed by Connor and Davidson to measure the ability to adapt to stress. Scoring of its questions is based on the 5-point Likert scale between zero (at all) and 4 (always) (32). Conclusion of correlation coefficients of concurrent validity in Iran demonstrated a negative significant correlation between flexibility and violence and a positive significant correlation with self-efficacy and contentment with life. Cronbach's alpha coefficient and Spearman correlation–Brown were 0.669 and 0.665, sequentially (33).

Chronic Pain Grade Scale a measure developed by Von Korff *et al.* (1992) to measure the intensity of chronic pain. The scale has 7 items and measures pain severity, constancy or length of pain and the degree of inability due to pain in a span of 0 to 10 grades, in which 0 means "painless" and 10 means "the worst" possible pain (34). Research by Majidi' *et al.* indicated that the Persian version of this scale has good internal consistency (35).

Statistical analysis

Data for this research were analyzed using SPSS 22 software in two levels of descriptive statistics (mean and standard deviation) and inferential statistics (Pearson correlation, Z-Fisher test and multivariate analysis of variance).

Results

The mean age of the PD group was 42.7 and the mean age of the HD patients was 41.7 years. Table 1 shows the mean and standard deviation of psychological variables. The mean and standard deviation of Resilience in PD were 94.8 ± 13.6 and in HD were 92.0 ± 15.8. The mean and standard deviation of Locus of Control in PD were 8.2 ± 4.0 and in HD were 9.4 ± 3.1. The mean and standard deviation of Intensity of pain in PD were 29.3 ± 14.8 and in HD were 30.8 ± 16.6. The mean and standard deviation of Quality of relationships with parents in PD were 79.3 ± 9.8 and in HD were 77.4 ± 15.6. The mean and standard deviation of Quality relationship with spouse in PD were 82.3 ± 7.7 and in HD were 79.9 ± 8.2. Finally, the mean and standard deviation of Quality relationship with friends in PD were 70.6 ± 7.8 and in HD were 75.2 ± 8.8.

Table 2 demonstrates a significant difference between locus of control, quality of relationship, intensity of pain and resilience with dialysis adequacy and laboratory indicators in PD and HD patients. To test this assumption, the Pearson correlation coefficient and the Z-Fisher test were used. As shown in Table 2, there was a negative and significant relationship between quality of relationships with parents and the value for K (P = -0.2). A negative and significant relationship between

quality of relationship with spouse and amount of P and PTH (P = -0.3) and a positive and significant relationship between quality of relationships with friends and dialysis adequacy (P = 0.3), and a negative and significant relationship between quality of relationships with friends and level of PTH (P = -0.2). Also, there was a positive and significant relationship between intensity of pain and K (P = 0.4), and a positive and significant relationship between severity of pain and creatine level (P = 0.3). As well, there was a positive and significant relationship between pain severity and albumin levels and PTH (P = 0.5). There was a positive and significant relationship between resilience and dialysis adequacy in the PD group (P = 0.3).

As shown in Table 2, there was a positive and significant relationship between locus of control and K (P = 0.3), between locus of control and P (P = 0.3) and there was a negative and significant relationship between quality of relationships with parents and level of P (P = -0.4) and PTH (P = -.03). In addition, there was a negative and significant relationship between quality of relationships with friends and creatine levels (P = -0.3). There was a positive and significant relationship between pain severity and P (P = 0.3). There was a positive and significant relationship between pain severity and parathyroid hormone levels (P = 0.3). A significant negative relationship between resilience and sodium levels (P = -0.3), and a negative and significant relationship between resilience and creatine levels in HD (P = -0.04) was also demonstrated.

As shown in Table 3, in accordance with the outcome of the Z-Fisher test, there was no significant difference between locus of control with dialysis adequacy and the laboratory indicators of PD and HD but there was a significant difference between quality of relationship with parents and potassium content, phosphorus and PTH in PD and HD. Also, there was no significant difference between quality of relationship with spouse and dialysis adequacy and the laboratory indicators in PD and HD. As well, there was a significant difference between quality of relationships with friends and Cr in PD and HD (P < 0.05) and there was a significant difference between intensity of pain with amount of K and Alb in PD and HD (P < 0.05). Also, there was no significant difference between resilience and dialysis adequacy and laboratory indictors in Patients with PD and HD patient.

To test differences between psychological and laboratory variables in patients with PD and HD, we applied variance of multivariate analysis. But before the analysis, outcomes of the Levene's Test confirmed variances in the equation assumption, and the results of multivariate analysis of variance demonstrated that all indicators presented were significant at level of 0.01, indicating that there was a significant difference between the groups compared. Finally, the inter-group effects test indicates to the researcher that the present significance is related to dependent variable. More results are presented in Table 4 and 5.

As Table 4 shows, the observed difference between the mean scores for the quality of relationships with friends in PD patients and HD patients based on the F value and the significance level indicates that the mean scores for the quality of relationships with friends in the PD group are significantly lower than the mean scores in HD group (F = 4.5, P < 0.05).

According to Table 5, the observed difference between the mean scores of K, Bun, Cr, Alb, PTH and dialysis adequacy in the two groups of PD and HD patient based on the F values and the significant levels, respectively, indicated that the mean scores of potassium, urea blood, creatine, albumin parathyroid in peritoneal dialysis patients are significantly lower than the mean scores of hemodialysis patients (F = 21.6, P < 0.01). Also, the mean scores for dialysis adequacy in PD patients were significantly higher compared to HD patients (P < 0.05).

Table 1. Mean ± Standard Deviation of Resilience, Locus of Control, Intensity of Pain, Quality of Relationships with Parents, Quality Relationship with Spouse and Quality Relationship with Friends

Group	Resilience	Locus of Control	Intensity of pain	Quality of relationships with parents	Quality relationship with spouse	Quality relationship with friends
Peritoneal Dialysis	94.8 ± 13.6	8.2 ± 4.0	29.3 ± 14.8	79.3 ± 9.8	82.3 ± 7.7	70.6 ± 7.8
Hemodialysis	92.0 ± 15.8	9.4 ± 3.1	30.8 ± 16.6	77.4 ± 15.6	79.9 ± 8.2	75.2 ± 8.8

Table 2. Correlation Coefficients between Psychological and Laboratory Variables in Peritoneal Dialysis and Hemodialysis Patients

variable	KT/V	Na	K	Ca	P	Bun	Cr	Hb	Alb	Pth
Resilience in PD	0.3*	-0.2	-0.1	-0.01	-0.1	-0.2	-0.3*	-0.06	-0.2	-0.2
Resilience in HD	0.2	-0.3*	-0.07	-0.03	-0.1	-0.2	-0.04*	-0.2	-0.006	-0.1
Locus of control in PD	-0.1	0.2	0.04	0.003	0.2	0.1	0.1	0.05	0.08	0.01
Locus of control in HD	-0.1	0.1	0.3*	0.1	0.3*	0.1	0.1	0.2	0.02	0.08
Pain intensity in PD	-0.06	0.03	0.4**	0.05	0.2	0.08	0.3*	0.04	0.5*	0.3*
Pain intensity in HD	-0.004	0.1	0.02	0.2	0.3*	0.04	0.05	0.2	0.1	0.3*

Quality of relationships with parents in PD	0.05	-0.08	-0.2*	-0.2	-0.1	-0.01	-0.1	-0.2	-0.1	-0.1
Quality of relationships with parents in HD	0.3*	-0.2	-0.1	-0.1	-0.4**	-0.2	-0.09	-0.1	-0.04	-.03*
Quality of relationships with spouse in PD	0.1	-0.06	-0.07	-0.04	-0.3*	-0.3	-0.2	-0.2	-0.1	-0.3*
Quality of relationships with spouse in HD	0.05	-0.01	-0.03	-0.09	-0.2	-0.09	-0.1	-0.1	-0.05	-0.09
Quality of relationships with friends in PD	0.3*	-0.2	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.03	-0.2*
Quality of relationships with friends in HD	0.1	-0.01	-0.1	-0.08	-0.05	-0.2	-0.3*	-0.07	-0.08	-0.1

(P < 0.05*, P < 0.01**)
†KT/V = K: dialyzer clearance of urea. T: dialysis time. V: volume of distribution of urea
‡ NA = Sodium, § K = Potassium, ¶ Ca = Calcium, € P = phosphorus, £ Bun = Blood Urea Nitrogen,
¥ Cr = Creatinine, β Hb = Hemoglobin, α Alb = Albumin, ∑ Pth = Parathyroid Hormone

Table 3. Comparison of Correlation Coefficients between Psychological and Laboratory Variables in Peritoneal Dialysis and Hemodialysis Patients

variable	KT/V	Na	K	Ca	P	Bun	Cr	Hb	Alb	Pth
Resilience	0.3	0.4	0.3	0.07	0.04	0.08	1.03	0.6	0.9	0.4
Locus of control	0.1	0.3	1.1	0.5	0.6	0.1	0.08	0.6	0.2	0.2
Pain intensity	0.2	0.5	1.7*	0.7	0.2	0.1	1.0	0.8	1.5*	0.2
Quality of relationships with parents	1.2	1.2	1.6*	1.1	2.3**	1.01	0.8	1.3	0.6	1.8*
Quality of relationships with spouse	0.2	0.1	0.1	0.1	0.3	0.8	0.2	0.2	0.3	0.3
Quality of relationships with friends	0.7	0.7	0.07	-0.3	-0.4	0.1	1.6*	0.7	0.1	0.6

(P < 0.05*, P < 0.01**)
†KT/V = K: dialyzer clearance of urea. T: dialysis time. V: volume of distribution of urea
‡ NA = Sodium, § K = Potassium, ¶ Ca = Calcium, € P = phosphorus, £ Bun = Blood Urea Nitrogen,
¥ Cr = Creatinine, β Hb = Hemoglobin, α Alb = Albumin, ∑ Pth = Parathyroid Hormone

Table 4. Observed Difference between Mean Scores of the Quality of Relationships with Friends in Peritoneal Dialysis and Hemodialysis Patients

Source of change	Dependent variable	SS	Df	MS	F	η^2
Peritoneal dialysis or hemodialysis	Resilience	120.4	1	120.4	0.5	0.009
	Locus of control	21.6	1	21.6	1.6	0.02
	Pain intensity	33.7	1	33.7	0.1	0.002
	Quality of relationships with parents	58.0	1	58.0	0.3	0.006
	Quality of relationships with spous	86.4	1	86.4	0.7	0.01
	Quality of relationships with friend	317.4	1	317.4	4.5*	0.07

(P < 0.05*, P < 0.01**)

Table 5. The Observed Difference between the Mean Scores of Potassium, Blood Urea Nitrogen, Creatinine, Albumin, Parathyroid Hormone and Dialysis Adequacy in Peritoneal Dialysis and Hemodialysis Patient

Source of change	Dependent variable	SS	Df	MS	F	η^2
Peritoneal dialysis and Hemodialysis	Na	17.8	1	17.8	1.1	0.02
	K	7.3	1	7.3	9.8**	0.1
	Ca	0.2	1	0.2	0.3	0.006
	P	4.9	1	4.9	3.6	0.06
	Bun	2156.5	1	2156.5	10.9**	0.1
	Cr	16.7	1	16.7	4.7*	0.07
	Hb	5.6	1	5.6	1.9	0.03
	Alb	3.9	1		21.6**	0.2
	Pth	483016.5	1	483016.5	9.5**	0.1
	KT/V	5.4	1	5.4	34.8**	0.3

(P < 0.05*, P < 0.01**)
†KT/V = K: dialyzer clearance of urea. T: dialysis time. V: volume of distribution of urea
‡ NA = Sodium, § K = Potassium, ¶ Ca = Calcium, € P = phosphorus, £ Bun = Blood Urea Nitrogen,
¥ Cr = Creatinine, β Hb = Hemoglobin, α Alb = Albumin, ∑ Pth = Parathyroid Hormone

Discussion

Several studies have shown that depression and cognitive impairment are independent risk factors for mortality in End-Stage Renal Disease (ESRD) patients (36) and quality of life has been recognized as strong indicator of the result, and when selecting between PD and HD for ESRD ailments, it is a key factor to consider (23,24,37,38). It seems that psychological variables can determine the way an individual interacts with himself and his life, and this determines level of control over life, which also affects dialysis adequacy and laboratory indicators (25). Therefore, it is expected that psychological structures can influence the laboratory indicators in addition to affecting the type of dialysis. We found that there was a significant difference among quality of relationships with parents and the level of K, P and PTH in PD and HD patients. These results show that PD patients have significantly better quality of life in physical as well as psychological aspects and our findings are in line with these studies (23, 24, 39–42). Wolfe, in an aligned study, showed that quality of care is a determining factor in improving dialysis adequacy in patients. It seems that quality of relationships can also determine the amount of perceived support obtained. This means that the greater relationships of quality a person experiences, the greater the chances that he has healthier behaviors (43). On the other hand, the quality of relationships also affects the type of dialysis. PD gives an individual more freedom to control their relationships because they experience less need and more freedom of action (44). In a similar study, Ebrahimi *et al.* stated that quality of life is relevant to dialysis adequacy and laboratory indicators in HD patients. We found that there was a significant difference in quality of relationships with friends and levels of CR in patients with PD and HD. It can be said that social communication provides better conditions for healthy behaviors (45, 46). We found that the mean scores of quality of relationships with friends in the PD group were significantly lower than the mean scores of the HD patient group. Probably, doing dialysis in a collective environment makes this difference significant for someone who undergoes HD as mentioned in study by Rydell *et al.* (19). We found there was a significant difference in pain intensity and K and Alb level in patients with PD and HD. It can be said that the lower the pain intensity, the lower the level of laboratory indicators. Because with increasing pain one may exercise behaviors that reduce pain, unfortunately, these exercises do not help the patient. Finally, PD probably caused pain in patients because they had more control over their own dialysis. The results showed that the mean scores of K, Bun, Cr, Alb and PTH in the PD group were significantly lower than the mean scores of HD group. In a similar study, Sa'ei *et al.* (2012) concluded that the "continuous care model" is effective in dialysis adequacy of HD patients (47). In general, we can state that the present study is in line with previous studies (23, 24, 39, 41, 42, 45, 47–49).

Limitation

Among the limitations of this research, the fact that the subjects were non-random, and the limited statistical population solely in Shiraz can be named. Therefore, it is recommended that larger research samples be selected for future research.

Conclusion

In this study of Iranian home dialysis patients, PD was correlated with better technique compared with HD. According to the results, the correlation among variables such as resiliency and quality of relationships with laboratory indicators in PD patients was higher than HD patients and the correlation among variables such as pain intensity and locus of control with laboratory indicators in PD patients was less than HD patients and this relationship was reversed with dialysis adequacy. That is, psychological structures can affect the dialysis adequacy and laboratory indicators and also affect type of dialysis. As well, strategies to improve patient maintenance through all home dialysis modalities are needed.

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Conflict of Interest

None.

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