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Economic consequences of noncompliant behavior of patients with chronic renal failure and ways of its correction

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Abstract

Introduction. *Kidney transplantation is the main high-tech type of medical care aimed at saving the life of a patient with chronic kidney disease in the terminal stage of the disease. The amount of economic costs for the treatment of patients with chronic renal failure depends on the results of transplantation: the calculation for 1 patient with a favorable outcome is 1,665,110.19 rubles, with an unfavorable outcome – 2,932,078.07 rubles. Noncompliant behavior (non-compliance with doctors' recommendations) directly affects the effectiveness and outcome*

of transplantation, as well as its economic component. In order to minimize the factors affecting transplant rejection after surgery due to patient noncompliant behavior, it is necessary to assess adherence to treatment at the stages before and after transplantation.

Aim. *To assess the adherence to treatment of patients with chronic renal failure of the N.V. Sklifosovsky Research Institute for Emergency Medicine at all stages of kidney transplantation in order to identify risk groups for noncompliant behavior.*

Material and methods. *The study was conducted on the basis of the Department of Kidney and Pancreas Transplantation of the N.V. Sklifosovsky Research Institute for Emergency Medicine. Three groups of patients with a diagnosis of "Chronic renal failure" were examined:* ***1.*** *48 patients before kidney transplantation who were on the waiting list. The average age of patients 48.06±10.21 years. Gender composition of the group 40% men, 60% women.* ***2.*** *62 patients a month after kidney transplantation. The average age of patients 49.49±11.04 years. Gender composition of the group 41% men, 59% women.* ***3.*** *22 patients at more than 1 month after kidney transplantation. The average age of patients 43.39±12.29 years. Gender composition of the group 41% men, 59% women.*

The assessment of the level of adherence to treatment was carried out using the following psychodiagnostic techniques: "Quantitative assessment of adherence to treatment", "Social significance of the disease", and "Compliance level".

Results. *The data obtained by us demonstrated the highest level of adherence to treatment in the waiting list group (90.67±18.91 points); in the group a month after transplantation, this level decreased (71.29±22.70 points), the lowest indicators (65.73±23.47 points) were seen in the group of a few months after kidney transplantation.*

Conclusion. *Noncompliant behavior of patients can affect the treatment outcomes. According to our study, patients on the waiting list have the highest rates in terms of adherence to treatment, the group of patients a month after transplantation is characterized by a decrease in all indicators, and the group a few months after kidney transplantation is characterized by the lowest parameters. According to the dynamics of changes in the level of adherence to treatment in the groups we surveyed, it is recommended to prevent noncompliant behavior in order to increase the treatment effectiveness and minimize financial costs for the consequences of transplant rejection due to patient's fault.*

Keywords: adherence to treatment, kidney transplantation, chronic kidney disease, compliance, psychological support, noncompliant behavior

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CKD - chronic kidney disease
CRF - chronic renal failure
RRT - renal replacement therapy
WHO - World Health Organization

Introduction

Kidney transplantation is a high-tech type of medical care aimed at saving the lives of patients with end-stage chronic renal disease. According to the data of the Russian Transplantation Society, in the Russian Federation the tendency to an increase in the number of organ transplants by 10–15% per year continued until 2020 [1]. In 2019, the

number of transplants increased by 10.7% compared to 2018. In 2020, a decrease in the number of transplants was noted due to the Covid-19 pandemic. However, analyzing the “pre-Covid” time period from 2012 to 2019, one can note an almost two-fold increase in the number of patients on the waiting list for kidney transplantation [2]. While waiting for transplantation, patients with chronic renal failure (CRF) suffer many psychological difficulties that require specialists to solve a number of clinical and psychological problems which include the necessity to assess the psychological status, emotional state, strategies for coping with a stressful situation, patient personal value-motivational sphere, since all this can become factors of non-compliance (lack of adherence to treatment) in CRF patients before and after transplantation [3–8].

The importance of an appropriate and effective response to the emotional and psychological difficulties faced by patients with kidney disease is emphasized in a number of national guidelines and directives [9]. In Russia, no studies have been conducted on the relationship of various psychosocial characteristics with adherence to treatment in patients with chronic kidney disease (CKD); there has been no comprehensive psychodiagnostic method developed for assessing non-compliance behavior (violations of doctor's recommendations) and taking preventive measures to increase adherence to treatment.

Economic costs in the treatment of chronic kidney disease

As of December 31, 2019, there were 46 centers in the Russian Federation that performed kidney transplantation. The demand for organ transplantation remains high, but still there are some regions in the Russian Federation that have no functioning transplantation centers, which creates certain difficulties for patients in need of renal replacement therapy (RRT) (a set of therapeutic measures that involves supporting the

kidney functional status during irreversible pathological processes) [2]. The transplantation activity of the centers in the constituent entities of the Russian Federation varies significantly, since a significant part of the country's population lives in regions that have low availability of medical care for organ transplantation.

In 2019, in Russia, 6878 potential recipients were waiting for kidney transplantation (of which 2335 were in Moscow and the Moscow region), which accounted for 13.7% of the total number of patients on dialysis (about 50,000 people); 2053 people were added to the waiting list for the first time. The mortality rate for 2019 was 0.9% (62 patients waiting for kidney transplantation died).

A long wait for kidney transplantation leads to significant financial costs for long-term medical care and drug support for patients on the waiting list. Depending on the indications (CRF, severe acute renal failure, etc.), patients have to undergo RRT while waiting for kidney transplantation and this situation may persist for years.

In their study I.A. Lakman, A.A. Khalikova, and A.A. Korzhenevsky [6] analyzed the approximate costs of dialysis treatment per patient per year. Given that it was not possible to determine which type of dialysis was used in a patient with CKD, the authors took into account all three types. Based on the obtained data, each CKD patient received approximately **156 dialysis sessions per year**, and the total cost of therapy made **1,003,655.12 rubles**. Table 1 shows the cost of 1 dialysis session depending on its type (the required type of dialysis for a patient with CRF is determined by medical indications and the attending physician's judgement). The cost of drug therapy per month turned out to be about **19,000 rubles**, and **228,000 rubles per year**. Thus, the cost of treating a patient with CRF who is on RRT as part of inpatient treatment

in the department is **1,231,655.12 rubles** per year (without kidney transplantation).

Table 1. Cost for one dialysis session depending on its type

Type of dialysis	Cost of 1 session, RUB
Low flow intermittent dialysis,	6225.73
High flow dialysis	6438
Hemodiafiltration	6637.33
Mean cost of a dialysis session	6433.67

Economic assessment of costs associated with the CKD treatment per person per year in 2018 demonstrated that they amounted to 1,266,967.88 rubles with dialysis therapy; 1,665,110.19 rubles with transplantation giving a successful outcome; 2,932,078.07 rubles with transplantation having an unsuccessful outcome (Table 2) [6]. Moreover, an unsuccessful outcome of transplantation leads to increased economic losses by 91,343.77 rubles per year (due to an increase in disability payments).

Table 2. Costs for chronic renal failure treatment depending on the outcome per 1 patient

Expenses, RUB per year	Successful transplantation	Unsuccessful transplantation
The cost of the transplantation procedure (including the cost of graft preservation)	881,261	-
The cost of the drug therapy plus additional costs for inpatient treatment	663,490.67	-
Primary health care costs, including:		
− doctor's appointments;	19,950.15	-
− laboratory tests;	37,601	-
− instrumental investigations	18,170	-
The cost of inpatient treatment of patients with a transplanted kidney	44,637.37	-
Costs associated with switching to dialysis therapy		
Total annual cost of dialysis therapy	-	1,003,655.12
The cost of drug therapy in the dialysis unit	-	228,000

The cost of outpatient care, including:		
- doctor's appointments	-	4,352.76
- diagnostic work-up	-	30,960
Total Costs Associated with the chronic kidney disease treatment including dialysis therapy	-	1,266,967.88
Total	**1,665,110.19**	**2,932,078.07***

Note: *according to the literature source [6]

The amount of economic costs for the treatment of CRF varies significantly depending on the results of the treatments used. Thus, the issues of increasing patient compliance to treatment at all stages of the treatment, following all doctor's recommendations, and identifying factors of non-compliance behavior are crucial for minimizing the risks of graft rejection due to patient's fault.

The concepts of "compliance" and "non-compliance"

Compliance (from English “Patient compliance”) is the adherence to treatment; patient compliance to doctor's recommendations. In medicine, there is no unified term meaning "following recommendations". In foreign and Russian literature, the word "compliance" is most often used. According to World Health Organization (WHO) [10], adherence has been defined as “the extent to which a person’s behavior − taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider”. In many scientific papers and publications, one can find the use of similar concepts of "compliance", "adherence", and "concordance". However, there are some differences between them. The concept of ***"compliance"*** implies the extent of how correct the patient follows the doctor's recommendations in the treatment and diagnostic process (it has a tint of passivity of patient's behavior in relation to his/her own treatment). ***"Concordance"*** involves the principle

of partnership, the patient's point of view regarding the ongoing treatment and the therapeutic decision is taken into account; the clinician-patient alliance at a current moment is the principal element of the concept of concordance. ***Adherence to treatment*** implies the freedom to choose between compliance and non-compliance with the received recommendations based on the "agreement" between the doctor and the patient. In clinical practice, these concepts are usually considered synonymous and interchangeable and are perceived as the exact following of all recommendations that were prescribed in the framework of prevention, treatment, or rehabilitation. Urquhart et al. believe that the entire process from the start of treatment to its completion can be considered compliance [11]: 1) the patient's agreement to the treatment plan; 2) fulfillment of the prescription plan; 3) termination of treatment. Assessment of adherence involves comparing the "actual" process with that already "recommended to the patient".

Non-compliance is a term that reflects non-following recommendations or their persistent violation. Non-compliance can manifest in various ways According to WHO, in industrialized countries, only about 50% of patients suffering from chronic diseases for a sufficiently long time, strictly follow medical recommendations. WHO identifies several groups of factors contributing to the emergence of non-compliant behavior [10]:

1. **Social and economic factors:** poor socioeconomic status, low level of education, illiteracy, old age, long distance from a healthcare facility.
2. **Health system-related factors**: relationship between patient and physician, duration of medical consultation, distribution of medicines.

3. **Condition-related factors**: severity of symptoms, workload associated with physical suffering, the stage of disease progression, comorbidities, availability of effective therapy.
4. **Therapy-related factors**: complex therapy regimen, treatment duration, difficulties in choosing the therapy, drug-adverse reactions, inefficacy of the administered therapy.
5. **Patient-related factors**: fear of adverse side effects, premature termination of treatment, undue expectations, forgetfulness, the presence or absence of information on the disease.

It should be noted that the listed factors do not take into account the mental characteristics of patients, which depend on their system of views, ideas, and cultural beliefs. For inpatients and outpatients, the issue of compliance is relevant. Non-compliant behavior includes: a complete refusal to undergo treatment, irregular medication intake, changing the dosage or stopping the medication on the patient's own accord. Non-compliance can originate from a lack of the trust in the doctor: the patient can constantly double-check doctor's actions (search on the Internet, additional consultations, etc.), try to make changes to the therapeutic process, refuse to follow or modify the diet, arbitrarily cancel the prescribed therapy, increase physical activity prematurely in the postoperative period. The disease affects the human psyche, changes its attitude to the entire treatment process.

Based on the foregoing, the question arises about the methods for assessing compliance, the possibility of measuring the level of compliance, and identifying a risk group. In practice, the most effective measure seems to be the interaction of an attending physician with the medical psychologist who can help to reveal the patient available resources (potential, strong sides), determine the behavioral characteristics (coping strategies and ways of responding to stressful

situations), analyze and work out the factors of non-compliant behavior (violations of recommendations) that affect the treatment outcome.

The purpose of our study was to make a comparative analysis of psychodiagnostic aspects of the adherence to treatment in patients with chronic renal failure in the N.V. Sklifosovsky Research Institute for Emergency Medicine at all stages of kidney transplantation in order to identify risk groups for non-compliant behavior. The development of the response et of measures will help to improve the psychological support of this nosological group of patients, increase the treatment efficacy and reduce the economic costs that rise considerably when an organ rejection occurs due to the patient's non-compliant behavior and requires further treatment.

Material and methods

A comprehensive psychodiagnostic assessment of the treatment adherence level was made in patients with chronic renal failure at different stages of kidney transplantation and using a set of techniques. The study conduct was based on the Department of Kidney and Pancreas Transplantation at the N.V. Sklifosovsky Research Institute for Emergency Medicine. We examined 3 groups of patients with a diagnosis of "Chronic renal failure":

1. Group 1: 48 pre-kidney transplant patients who **were on the waiting list**. The mean age of the patients was 48.06±10.21 years. There were 40% men, 60% women in this group.

2. Group 2: 62 patients after kidney transplantation (**at one month after transplantation**). The mean age of the patients was 49.49±11.04 years. There were 41% men, 59% women in the group.

3. Group 3: 22 patients after kidney transplantation (**more than 1 month after transplantation**). The mean age of patients was 43.39±12.29 years. There were 41% men, 59% women in the group.

The treatment adherence level was assessed using psychodiagnostic tools:

1. "Quantitative assessment of adherence to treatment (KOP-25" [12, 13]. This questionnaire allows one to evaluate and compare the adherence level in patients at all stages of treatment across the following items: "adherence to taking medication", "adherence to medical support", "adherence to lifestyle modification" and "general adherence to treatment".

Each item is scored as a value calculated for a particular respondent and expressed as a percentage of the theoretically possible and taken as 100%. The obtained data are assessed across the (pre-set) ranges of values and their referred characteristics (Table 3). Each item can be considered independently or in interrelation with other ones [13].

Table 3. Ranges of adherence levels

Level	Values	Interpretation
High	76% or more	Medical recommendations and recommendation-based actions will be or are likely to be followed by patients
Medium	51–75%	Medical recommendations and recommendation-based actions are more likely to be followed than not be followed by patients
Low	50% or less	Medical recommendations and recommendation-based actions will not be followed by patients or most likely will not be followed.

2. **Compliance level questionnaire**. The questionnaire scores the compliance level (the extent to which the doctor's recommendation are followed by the patient), and the compliance is presented by three components [3]:

- ***Social level of compliance*** is the compliance with medical prescriptions based on the social approval of patient's actions;
- ***Emotional level of compliance*** is the compliance with the recommendations based on increased susceptibility (sensitivity) to what is happening;
- ***Behavioral level of compliance*** implies fulfillment of prescriptions due to the perception of the disease as "life hardship (trial) that must be overcome".

The data obtained for each level are compared with the ranges of compliance with prescriptions, readiness to follow the recommendations [3]: where scores **from 0 to 15** represent a non-pronounced indicator of compliance, scores **from 16 to 29** denote a medium-pronounced indicator of compliance, and scores **from 30 to 40** denote a highly pronounced indicator of compliance.

The overall level of compliance is the sum of scores calculated for all levels of compliance behavior (scores **from 0 to 40** denote low level, scores **from 41 to 80** mean medium level, scores **from 81 to 120** refer to a high level).

3. Study of self-assessment of the social significance of the disease.

The questionnaire consists of 10 statements assessing the subjective impact of the disease on various areas of the patients' social status [14]. Five answers are offered with a maximum value for each question scored 5 (the closer to score 5, the more significant is the impact of the disease).

Statistical data processing was carried out using Microsoft Office Excel 2019, SPSS for Windows Version 26.0. In order to determine statistically significant differences in psychodiagnostic assessments between three groups of patients with CRF the following were used:

descriptive analysis (calculation and description of mean values (M), standard deviations (SD), and errors of mean values (m), as well as calculation of the Mann-Whitney test for two independent samples with Bonferroni correction).

Results

Tables 4, 5 and 6 show the assessments on the scales in the above methods (tools), which were used to obtain statistically significant differences between the groups.

Table 4. Comparative results of using psychodiagnostic methods in patients of the 1st and 2nd groups with chronic renal failure (M±SD)

No.	Items assessed in each tool (method)	Patients before transplantation (n=48)	Patients 1 month after transplantation (n=62)	p	Bonferroni criterion
Study of self-assessment of the social significance of the disease					
1	Limited sensation of strength and energy	1.89±1.28	3.09±1.53	**0.000***	**0.000**
2	Restricted pleasure	2.81±1.56	3.72±1.40	**0.003***	**0.003**
3	Career restriction	1.96±1.58	3.55±1.60	**0.000***	**0.000**
4	Decreased physical attractiveness	1.72±1.24	2.61±1.34	**0.000***	**0.000**
5	Material losses	2.23±1.6 4	3,22±1.46	**0.001***	**0.001**
Quantitative assessment of adherence to treatment (KOP-25)					
1	Adherence to lifestyle modification	56.30±20.60	71.50±19.18	**0.000***	**0.000**
Compliance level questionnaire					
1	Social compliance	30.81±7.21	23.72±8.11	**0.000***	**0.000**
2	Emotional compliance	30,83±6.36	24.92±8.60	**0.000***	**0.000**
3	Behavioral compliance	28.70±6.75	23.77±8.94	**0.001***	**0.000**
4	Total level of compliance	90.30±18.94	71.89±22.8 0	**0.000***	**0.000**

Note: *Significant differences are highlighted (p≤0.05). M, mean value; SD, standard deviation; p, asymptotic significance

In Table 4, the differences identified between the 1st and 2nd groups of CRF patients, indicate that patients after transplantation, compared with the data of the waiting list group, show higher values in terms of "Limited sensation of strength and energy", “Restricted pleasure”, “Career restriction”, “Decreased physical attractiveness”, “Material losses”, as well as “Adherence to lifestyle modification”. At the same time, compliance at all three levels (social, emotional and behavioral), including the overall score, was higher in patients on the waiting list.

Table 5. Comparative results of using psychodiagnostic methods in patients of the 2nd and 3rd groups with chronic renal failure (M±SD)

No.	Items assessed for the method (tool)	Patients 1 month after transplantation (n=62)	Patients more than 1 month after transplantation (n=22)	p	Bonferroni criterion
Study of self-assessment of the social significance of the disease					
1	Worsened attitude to the patient in the family	2.31±1.47	1.59±1.18	**0.028***	**0.000**

Note: *Significant differences are highlighted (p≤0.05). M, mean value; SD, standard deviation; p, asymptotic significance

As can be seen from Table 5, the comparison of assessments between the 2nd and 3rd groups of CRF patients demonstrates a statistically significant difference only while scorring on the scale "Worsened attitude to the patient in the family". Patients 1 month after kidney transplantation feel these changes more acutely.

Table 6. Comparative results of using psychodiagnostic methods in patients of the 1st and 3rd groups with chronic renal failure (M±SD)

No.	Items assessed in each method (tool)	Patients before transplantation (n=48)	Patients more than 1 month after transplantation (n=22)	p	Bonferroni criterion
Study of self-assessment of the social significance of the disease					
1	Restricted pleasure	2.81±1.56	3.73±1.31	**0.024***	**0.003**
2	Career restriction	1.96±1.58	3.32±1.61	**0.001***	**0.000**
3	Decreased physical attractiveness	1.72±1.24	2.45±1.05	**0.001***	**0.001**
Quantitative assessment of adherence to treatment (KOP-25)					
1	Adherence to lifestyle modification	56.30±20.60	69.32±16.26	**0.003***	**0.000**
Compliance level questionnaire					
1	Social compliance	30.81±7.21	22.00±7.74	**0.000***	**0.000**
2	Emotional compliance	30.83±6.36	23.05±8.31	**0.000***	**0.000**
3	Behavioral compliance	28.70±6.75	20.68±8.87	**0.000***	**0.000**
4	Total level of compliance	90.30±18.94	65.73±23.47	**0.000***	**0.000**

Note: *Significant differences are highlighted ($p \leq 0.05$). M, mean value; SD, standard deviation; p, asymptotic significance

Table 6 presents the comparison results of using psychodiagnostic methods in the 1st and 3rd groups of patients with CRF showing that patients on the waiting list demonstrated lower rates of Adherence to lifestyle modification, as well as Restricted pleasure, Career restriction, and Decreased physical attractiveness, but at the same time had a higher compliance level across all items of the method compared to the patient group of a few months after kidney transplantation.

Discussion

According to the results obtained, **patients on the waiting list** have the highest level of adherence to treatment at all three Compliance levels (social, emotional and behavioral) compared to both groups of patients after kidney transplantation. According to the method **Quantitative**

assessment of adherence to treatment (KOP-25) in terms of "Adherence to lifestyle modification", the patients from the waiting list have a "medium level of adherence", according to the ranges of values presented in Table 3, which suggests that patients would rather follow medical recommendations and perform actions based on them. A high level of adherence to treatment at this stage combined with the lowest rate of adherence to lifestyle modification, the importance of modifications among the surveyed groups may be due to the ***social desirability bias*** of patients, their confidence that psychological survey can affect their place on the waiting list. Based on this assumption, we believe that patients before transplantation while waiting and undergoing dialysis may have unrealistic ideas about modifying their lifestyle, not fully aware of what kind of efforts they will have to make to implement the necessary therapy.

The group of patients at one month after kidney transplantation is characterized by a decrease in all levels of adherence to treatment compared with patients before transplantation. The results obtained using the method "Study of self-assessment of the social significance of the disease" demonstrated stronger perception of the restrictions imposed by the disease. Patients consider themselves less attractive physically, notice changes in the amount of energy and strength, fewer opportunities for enjoyment, they experience limitations in their performance and career, which causes material (financial) losses (many patients cannot work or continue working and quit, which affects their material position; cost of medicines, etc.).

In this group, the level of adherence to lifestyle modification is higher compared to that of patients on the waiting list and corresponds to the upper limit of the medium level of adherence (see Table 3). They are ready to follow recommendations regarding dietary changes (following a

certain diet), physical activity, as well as restrictions (or refusal) of unwanted habits; but given the marked restrictions imposed by the disease, the lack of support at this stage may level out their adherence to treatment over time and lead to a breakdown in their adherence to doctor's recommendations.

The third group surveyed a few months after kidney transplantation, had low levels of adherence to treatment at all compliance levels (social, emotional and behavioral), these patients consider modifying their lifestyle more important than the patients on the waiting list. Patients of the third group feel less physically attractive and limited in their enjoyment and employment opportunities.

When comparing the obtained data in two groups after kidney transplantation (between groups No. 2 and No. 3), no statistically significant differences were found for the methods: "Quantitative assessment of adherence to treatment" and "Compliance levels". These groups differ statistically significantly only when using the method "Self-assessment of the social significance of the disease" in terms of "Worsened attitude to the patient in the family". Patients at one month after kidney transplantation (Group No. 2) demonstrated higher scores on this scale of self-assessment compared to the group of patients who underwent kidney transplantation later than 1 month after surgery. These differences may be due to the physiological and psychological state in the early postoperative period. Patients may be more vulnerable to the words of relatives, feel a lack of communication and participation in the lives of their loved ones due to staying in hospital [7, 8, 15].

Since there are practically no statistically significant differences between groups, it can be said that patients after kidney transplantation, regardless of how long ago the operation was performed, feel a decrease in their physical attractiveness, face restrictions in work and enjoyment.

Having a lower level of adherence to treatment on a social, emotional and behavioral level, but given that they have already had a kidney transplantation, they understand what exactly is happening to them, what is needed to maintain their physical condition and what kind of efforts need to be made. Thus, a decrease in all levels of adherence (general level, social, emotional, and behavioral) in combination with severe restrictions after kidney transplantation leads to a high risk of non-compliance behavior. This stage is the culmination in the patients' awareness of their future plan of action, which can lead to both a positive result in the form of full compliance with the recommendations, and a negative result in the form of a breakdown and violation of the prescriptions given by the doctor.

Analyzing the obtained data on qualitative and quantitative changes in the level of adherence to treatment in the studied groups and correlating them with previous studies [4, 5, 7, 8, 15], we can note that each stage of treatment that patients go through is accompanied by its own difficulties that affect the physical and psychological state of patients and increase the risk of non-compliance behavior. Based on this, we recommend psychological support for patients at all stages of treatment, including diagnosing and monitoring the level of compliance, undertaking psychological interventions in the form of psychological counseling and psychoeducational training (with the participation of attending physicians, as well as work with their relatives and immediate environment) in order to increase the treatment efficacy and minimize financial costs for the graft rejection consequences due to patient's fault.

Thanks to our study, we can note that chronic renal failure patients on the waiting list and those at a month after kidney transplantation have a sufficient level of adherence to treatment, which indicates a high

probability of fulfilling medical recommendations. Nevertheless, it is worth considering the difference in the chronic kidney disease course and the length of being on the "waiting list" in order to track the dynamics of their adherence to treatment due to possible episodes of deterioration in their condition and the presence of individual characteristics of hemodialysis.

Patients a few months after kidney transplantation have the lowest treatment adherence rates among the study groups. They are ready to follow the recommendations in the form of dieting, giving up bad habits and physical activity; but amid pronounced restrictions in career, working capacity, enjoyment and reduced physical attractiveness, there is a high probability of failure to comply with medical recommendations.

Taking into account the varied level of adherence in the studied groups, we recommend a psychological support at all stages of treating patients with chronic renal failure to diagnose and monitor the level of compliance (adherence to treatment) and undertake psychological interventions in order to ensure compliance with attending physician's prescriptions, and as a result, to increase treatment efficacy and reduce its cost.

Conclusions

1. The amount of economic costs for the treatment of patients with chronic renal failure depends on the results of transplantation, making 1,665,110.19 rubles per patient in a favorable outcome, and 2,932,078.07 rubles per patient in an unfavorable outcome. According to the dynamics of changes in the level of adherence to treatment in the studied groups, we recommend to prevent non-compliance behavior in order to increase the treatment efficacy and minimize the financial costs for the consequences of graft rejection due to the patient's fault.

2. Patients with chronic renal failure on the waiting list have the highest levels of adherence to treatment at all levels (general, social, emotional, and behavioral) and a low "Adherence to lifestyle modification" compared to both groups of patients after transplantation. This ambivalence may be due to social desirability bias, as patients are convinced that their answer in the survey can influence the duration of their being on the waiting list for kidney transplantation.

3. The group of chronic renal failure patients at a month after kidney transplantation is characterized by a decrease in all levels of adherence to treatment (general, social, emotional, and behavioral) and higher rates in terms of "Adherence to lifestyle modification" compared to the group of patients before kidney transplantation. They are ready to follow the recommendations in the form of diet, refusal of bad habits and physical activity, but amid pronounced restrictions in career, decreased working capacity, enjoyment, and reduced physical attractiveness, there is a risk of failure to comply with the recommendations if insufficient support is rendered.

4. The chronic renal failure patients from group(s) after kidney transplantation show the lowest levels of adherence to treatment at all levels (general, social, emotional, and behavioral) compared to the patients on the waiting list. The patients already have an idea of the limitations they will face (work restrictions, reduced attractiveness, material losses in the form of financial costs, reduction in salary or loss of work, lack of strength and energy), so they attach more importance to lifestyle modification than the patients before kidney transplantation. At more than 1 month after transplantation, the patients are most prone to violation of the recommendations and to non-compliance behavior.

5. The group of patients at a month after kidney transplantation has a higher value in terms of "Worsened attitude to the patient in the family"

compared with the group of more than 1 month after the operation. These differences may be due to the physiological and psychological state in the early postoperative period. Patients may be more vulnerable to the words of loved ones, feel a lack of communication and participation in the lives of their loved ones due to being in hospital.

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