

Predictor Factors of Return to Work in Workers with Kidney Transplantation in Iran: A Retrospective Cohort Study

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Introduction. Return to work after a kidney transplantation in a previously functioning person is determined by a number of medical and non-medical factors. In this regard, this study was to investigate the factors that influence return to work in kidney transplant recipients.

Methods. This retrospective cohort study was conducted in patients with kidney transplant in the main nephrology center in Tehran (December to April 2022). The primary outcome was the cumulative rate of return to work at 3, 6, and 12 months after transplantation. The secondary outcome was to compare the occupational, individual, and disease-related factors between patients who had returned to work and those who had not.

Results. Among 214 kidney transplant recipients, the overall cumulative rate of return to work after kidney transplantation at 3, 6 months, and 12 months were 44.4%, 63.1% and 69.6%; respectively. According to the univariate analysis, male sex, age less than 40 years, nonphysical jobs, job satisfaction, employer support, partner support, and absence of diabetes mellitus significantly affected the time of return to work ($P < .05$). According to the multivariate analysis, absence of diabetes mellitus, nonphysical jobs and job satisfaction had greater impact on the time of return to work ($P < .05$).

Conclusion. The results showed that older age, female gender, having a physical job, the presence of diabetes mellitus, lack of job satisfaction, and employer and partner support are associated with not returning to work in these patients and adjusting factors linked to the work environment and support of colleagues and supervisors might play an important role in improving the general condition of these patients.

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INTRODUCTION

End-stage kidney disease (ESKD) is one of the main health issues caused by various disorders such as diabetes mellitus, hypertension, and other underlying conditions. By 1960, patients with

ESKD had low survival rates; however, advances in kidney transplantation (KT) have resulted in increased survival in these patients.¹ Currently, KT is the gold standard for patients who need kidney replacement therapy because it reduces mortality

and improves the quality of life compared to dialysis.² After KT, Patients may face medical and surgical complications such as allograft rejection, infection, and cardiovascular disease or psychiatric disorders including depression, anxiety, and other problems related to chronic diseases. These complications can affect individual capabilities in the workplace and social environment.^{3,4} Return to work (RTW) after KT is a recovery factor and an important component of general well-being with many social implications.^{2,5} The results of these components after KT vary in different countries and there is a need for a survey to assess postoperative conditions such as the rate of RTW. Associated variables such as worker-employer relationships, physical factors such as heavy object lifting, and prolonged standing at work all have an impact on RTW in these individuals. Failure in RTW after an illness in a formerly functioning person has great economic and social impacts on individuals and societies.⁶ A systematic review conducted in 2019 has shown that RTW after KT is a dynamic process influenced by the interaction between biological, psychological, and social factors. Pre-transplant employment, clinical characteristics, and comorbidities are considered strong predictors of RTW. Moreover, psychosocial and work environment support are important factors for RTW in transplant patients.⁷ In the cohort study by Vieux *et al.* in 2019 employment rate in one-year period was reported 49.8% and the main predictor of RTW after transplantation was pre-transplant employment.⁸ Eppenberger *et al.* reported a non-return rate of 25.3% one year after KT while, KT improved the condition and ability to work in 10.6% of participants. Transplant from a living donor, dialysis duration of less than one year, pre-transplant employment, and higher education level was associated with post-transplant employment, whereas age over 50 years and duration of dialysis over one year were associated with non-RTW.⁹ Given the high prevalence of KT in Iran (around 2500 to 2700 cases per year) and other countries (21167 cases of KT in 2018 in the United States),¹⁰ identifying the factors determining RTW in previously active patients has particular importance. However, to the best of our knowledge, no research has been conducted in Iran to investigate the rate and the predictors of RTW after KT. Therefore, this study

was an attempt to identify occupational, work-related, individual, and disease-related factors of the time to RTW in employed patients within 12 months from the day of KT.

MATERIALS AND METHODS

This retrospective cohort study was conducted in patients with ESKD who underwent KT in the main nephrology center in Iran from December 2020 to April 2022. Patients under the age of 18 and above the age of 66, housewives, and patients who were not professionally active at the time of KT, patients with post-transplant period of less than one year and those who had another organ transplant were excluded from the study. The protocol was reviewed and approved by the ethics committee of the Iran University of Medical Sciences (code: IR.IUMS.FMD.REC.1399.157). Before obtaining required information, participants signed an informed consent form. Medical information of patients was collected through existing records in the hospital and demographic, and occupational information was obtained through a clinical interview performed by an occupational specialist. The first part of the interview included demographic information such as age, gender, education level, marital and smoking status, body mass index, and history of underlying diseases. The second part of the interview included occupational information such as job title, work experience, employment status, basic and supplementary insurance status, daily and weekly working hours, shift work status, the amount of employer support, partner support, and job satisfaction rate. In this study, participants were classified into two groups of physical and non-physical according to their job type.²⁷

Disease-related information included causes of KT (diabetes mellitus, hypertension, glomerulonephritis, cystic disease and others) duration of chronic kidney disease, other comorbidities, type of donor (cadaveric vs living), related or unrelated donor, type of treatment before KT (dialysis or non-dialysis), and duration of hospital stay following transplantation.

The following question was asked to the study participants in this cohort study: Have you returned to work after KT? If so, how long did you RTW after KT? Participants were divided into two groups based on their responses: those who returned to work (full time, part-time) and those who did not.

In this study, partial RTW refers to part-time and short-term jobs for handicapped patients, whereas complete RTW refers to full-time jobs for healthy people. We asked the non- RTW group why they did not RTW (e.g., fired, retired, inability to do work, and unwillingness), and then compared these groups in terms of occupational, individual, and disease-related factors. The study data were analyzed by SPSS (Version 24). The quantitative data were analyzed by independent sample t- test and were presented by mean and standard deviation. The qualitative data were analyzed by chi-square test and presented by frequency and percentages. We employed univariate analyses for all variables as well as multivariable analyses for significant variables. Survival analysis was performed to illustrate the cumulative RTW rates after KT. The cumulative rate of RTW was measured at 3, 6, and 12 months after the day of KT by using the Kaplan-Meier estimate. To identify the predictors of RTW, we used the logistic regression model; an odds ratio (OR) of more than 1 indicated a shorter

time to RTW, as compared with the reference. All statistical test results of less than 0.05 were considered significant.

RESULTS

A total of 309 KT recipients presented the nephrology clinic from December 2020 to April 2022. Participants under the age of 18 and over the age of 66 years (n = 19) who were not professionally active at the time of KT (n = 37), and who had a post-transplantation period of less than one year (n = 29) were excluded from the study. Finally, 214 KT recipients met the inclusion criteria and were included in the study (Figure 1).

The mean age of the participants (48.9 ± 2.42) and the age range (23 to 66) were obtained. Among the participants, 136 (63.55%) were male and 170 (79.44%) were married. The mean year of work experience of the participants was 21.78 ± 12.1 with a range of (1 to 40). According to the results, 110 participants (51.31%) had physical occupations, and the most common causes of

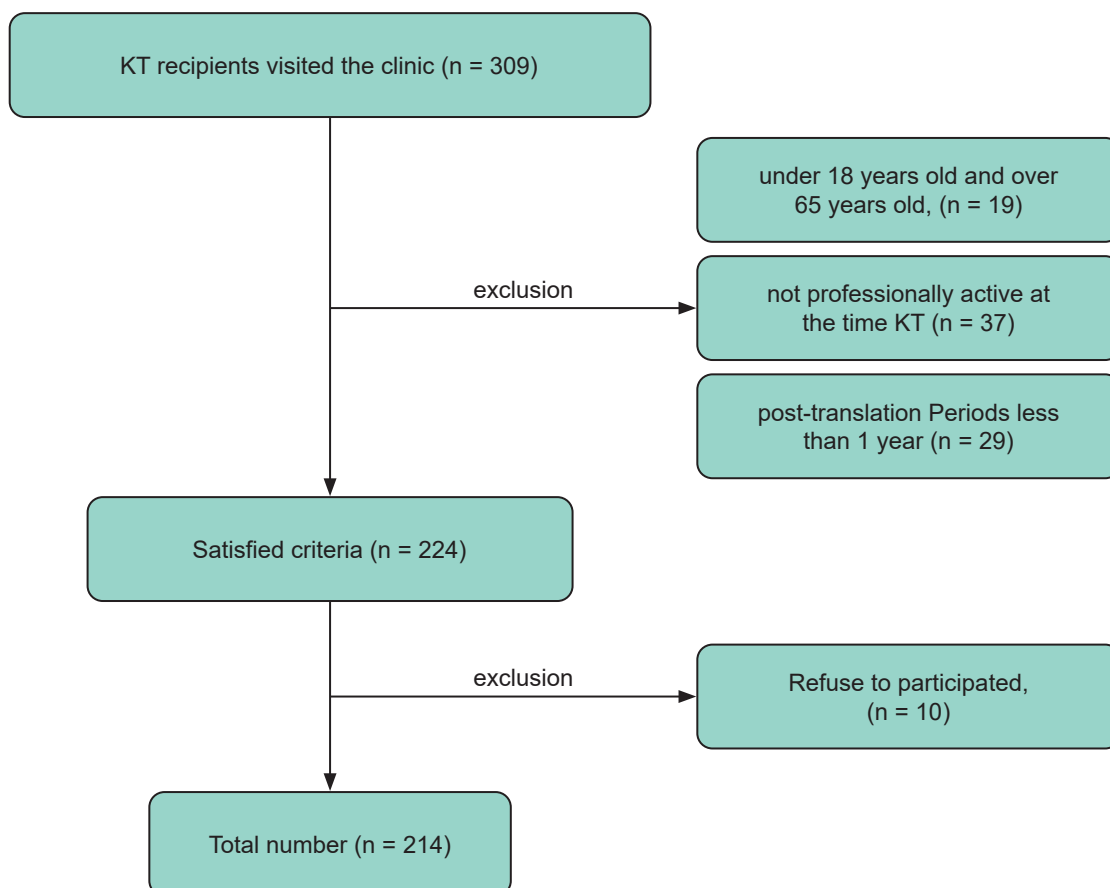


Figure 1. Study diagram

chronic kidney disease were hypertension and glomerulonephritis with a frequency of 29% and 13.6%, respectively. The duration of kidney failure in patients and the duration of hospitalization after KT were 29.35 ± 10.89 months and 19.8 ± 11.2 days, respectively. The mean RTW after KT was 8.32 ± 3.3 months with a range of 1 to 48 months. Figure 2 shows the Kaplan-Meier cumulative curve of time of RTW after KT. In the survival analysis, the overall cumulative RTW rates after KT at 3 and 6 months were 44.4% and 63.1%, respectively. After one year of KT, 149 (69.6%) of patients returned to work and 65(30.4%) did not. There was a steep increase in the partial/full RTW rate in the first year after KT (Figure 2).

Among those who returned to work, 134 (89.9%) were full-time, and 15 (10.1%) were part-time. Among those who did not return to work, 1(1.5%) was fired, 15 (23.1%) were retired, 36 (55.4%) did not have the ability to work and 13 (20%) were unwilling to work. The demographic and work-related characteristics of the participants are shown in Table 1.

RTW and Demographic Variables

According to the univariate analysis, male sex

(OR = 5.36, 95% CI: 2.47 to 11.63), and the age less than 40 years old (OR = 3.12, 95% CI: 1.54 to 3.17), significantly affected the time of RTW ($P < .05$). Patients who returned to work were younger and the majority of them were male. Moreover, there was no significant relationship between BMI of more than 25 kg/m^2 , smoking, and marital status and RTW ($P > .05$).

RTW and Work-related Variables

Patients who returned to work had a higher percentage of nonphysical work than those who did not (OR = 3.3, 95% CI: 1.19 to 4.69). Those who returned to work had higher job satisfaction (OR = 2.77, 95% CI: 2.08 to 3.82), employer support (OR = 2.42, 95% CI: 2.17 to 4.03) and partner support (OR = 1.06, 95% CI: 1.11 to 2.29) ($P < .05$). There was no statistically significant relationship between work experience (OR = 0.77, 95% CI: 0.49 to 1.22), and basic (OR = 0.94, 95% CI: 1.17 to 2.32), and supplementary insurance (OR = 1.14, 95% CI: 0.18 to 1.75) ($P > .05$) and RTW (Table 2).

RTW and Disease-related Factors

According to the univariate analysis, the absence of diabetes mellitus significantly affected the

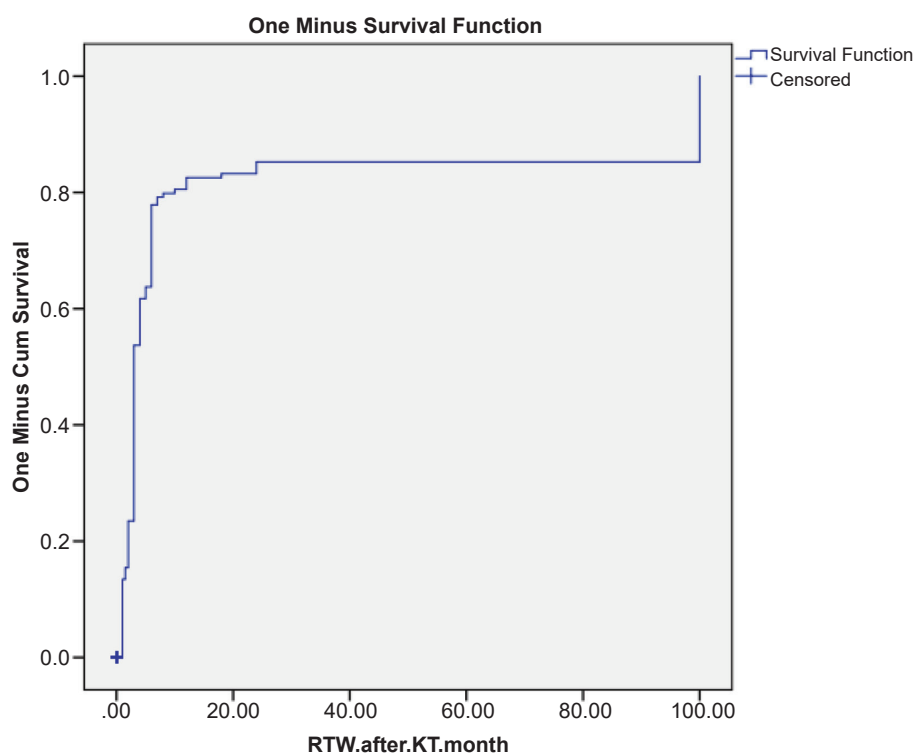


Figure 2. Return to Work After Kidney Transplantation

Table 1. Demographic, Occupational, and Disease-related Characteristics of the Participants

Variables	Mean ± SD (number (%))
Age, y	48.9 ± 2.42
BMI, kg/m ²	26.02 ± 4.39
Work Experience, y	21.78 ± 12.1
Work, hour/d	7.71 ± 2.95
Work, hour/w	53.53 ± 18.71
Employer Support	8.39 ± 2.5
Partner Support	7.99 ± 2.49
Job Satisfaction	7.79 ± 2.96
Gender	
Male	136 (63.55)
Female	78 (36.45)
Marital Status	
Single	44 (20.56)
Married	170 (79.44)
Smoking	
Smoker	15 (7.01)
Non-Smoker	199 (92.99)
Education	
High School	76 (35.5)
Associate Degree and Diploma	88 (41.1)
Bachelor	37 (17.3)
Master's Degree	13 (6.1)
Job Category	
Non-Physical	104 (45.6)
Physical	110 (51.4)
Duration of Renal Failure, mo	29.35 ± 10.89
Duration of Hospitalization After Kidney Transplantation, d	19.8 ± 11.2
Pre-transplant Treatment	
Dialysis	203 (95)
Dialysis Free	11 (5)
Type of Donor	
Cadaveric	86 (40.19)
Living	128 (59.81)
Related / Non-related	
Related	198 (92.99)
Unrelated	16 (7.01)
Diabetic / Non-diabetic	
Diabetic	171 (80.37)
Non-diabetic	41 (19.63)
Time From KT to RTW, mo	8.32 ± 3.3

time of RTW (OR = 1.2, 95% CI: 1.11 to 2.29), but there was no statistically significant relationship between other comorbidities (OR = 0.85, 95% CI: 0.42 to 1.74), type of donor (cadaveric or living) (OR = 0.84, 95% CI: 0.36 to 1.52), related or unrelated donors (OR = 1.15, 95% CI: 0.38 to 1.53), duration of kidney disease (OR = 0.54, 95% CI: 0.32 to 1.67), and RTW ($P > .05$).

According to the multivariate analysis, using

Cox regression models, risk factors such as the absence of diabetes mellitus (OR = 1.08, 95% CI: 1.01 to 1.76), nonphysical work (OR = 2.07, 95% CI: 2.01 to 2.44) and job satisfaction (OR = 1.27, 95% CI: 1.10 to 1.68) had a greater impact on time of RTW. However, sex (OR = 0.34, 95% CI: 0.28 to 1.04) and age (OR = 1.02, 95% CI: 0.78 to 1.09) had no significant association with time of RTW. The results of the univariate and multivariate analyses, using Cox regression models, are presented in Tables 2 and 3.

DISCUSSION

The current study included 214 employed patients with end-stage kidney disease who had KT to determine their RTW status. To the best of our knowledge, this study is the first report on demographic, work-related, and clinical factors leading to unemployment in this group of patients in Iran. In this study, the rate of RTW after 3, 6, and 12 months of KT were reported at 44.4%, 63.1%, and 69.6%; respectively. Eppenberger *et al.*⁹ reported a non-return rate of 25.3% one year after KT; indicating that the post-transplant employment in their study was higher in their study than in ours. In contrast to the cohort studies of Vieux *et al.*⁸ and D'Egidio *et al.* which found an employment rate of 49.8% and 39.4%, respectively, over one year,⁷ our study showed a higher employment rate after KT.

This study showed that demographic factors such as higher age and female sex had a negative impact on RTW. On the other hand, BMI of more than 25 kg/m², smoking, and marital status were not significantly associated with RTW. Other studies have shown that some sociodemographic characteristics such as higher educational level,^{9,11,12,13,14} male gender,^{11,15,16} and younger age^{11,13,15,17} were associated with early RTW, while the findings on marital status have shown inconsistent results.^{11,15} This could be attributed to younger patients' higher motivation, life expectancy, and acceptance of different conditions. Moreover, younger age is usually associated with better general health status, and greater possibility of finding a new job. Older patients have less RTW due to the presence of underlying diseases and other comorbidities. There are several probable explanations for the gender disparity in RTW. Most married female patients whose husbands were

Table 2. RTW Status Based on Demographic, Occupational, and Disease Characteristic of Participants

Variables	Univariate Analysis		Multivariable Analysis	
	OR (95% CI)	P	OR (95% CI)	P
Age, y				
≥ 40	1	< .001	1	> .05
> 40	3.12 (1.54 to 3.17)		1.02 (0.78 to 1.09)	
Sex				
Female	1	< .05	1	> .05
Male	5.36 (2.47 to 11.63)		0.34 (0.28 to 1.04)	
Marital Status				
Married	1	> .05		
Single	0.82 (0.39 to 1.73)			
BMI				
> 20 to ≤ 24	1	> .05		
> 25	0.33 (0.27 to 1.49)			
Smoking				
Smoker	1	> .05		
Non-Smoker	0.86 (0.28 to 2.63)			
Work category				
Physical	1	< .001	1	< .05
Non-physical	3.36 (1.19 - 4.69)		2.07 (2.01 to 2.44)	
Work experience				
8 <	1	> .05		
8 ≥	0.77 (0.49 to 1.22)			
Employer Support				
No	1	< .05	1	> .05
Yes	2.42 (2.17 to 4.03)		0.83 (0.52 to 1.37)	
Partner Support				
No	1	< .05	1	> .05
Yes	1.06 (1.11 to 2.29)		0.9 (0.11 to 1.29)	
Job Satisfaction				
No	1	< .05	1	< .05
Yes	2.77 (2.08 to 3.82)		1.27 (1.10 to 1.68)	
Basic Insurance				
No	1	> .05		
Yes	0.94 (1.17 to 2.32)			
Supplementary Insurance				
No	1	> .05		
Yes	0.14 (0.18 to 1.75)			

paid work employees did not require early RTW. Considering that a large proportion of the female population is engaged in unpaid housework and was excluded from the study, the predominance of males in formal employment is a social phenomenon just like the general population.

Among work-related factors, having a non-physical job, higher job satisfaction, employment, and partner support were associated with more RTW. There was no statistically significant relationship between work experience and basic and supplementary insurance. Green and Cavanaugh, in 2015, discussed that social supports

such as employment and partner support were associated with increased quality of life and RTW.¹⁴ Miyake *et al.* showed that a managerial position was a better predictor of partial/full-time RTW than a non-managerial position. They concluded that physical work was a barrier to RTW, and non-manual workers may benefit from this issue.¹⁶ The study by Nour *et al.* suggested that those who returned to work changed the nature of their work from heavy to sedentary.¹²

There is no shadow of doubt that, the higher the level of job satisfaction and support from employers and colleagues, the better conditions will

Table 3. RTW Status Based on Disease Characteristics of the Study Participants

Variables	Univariate Analysis		Multivariable Analysis	
	OR (95% CI)	P	OR (95% CI)	P
Diabetes				
Present of Diabetes	1		1	
Absents of Diabetes	1.2 (1.10 to 2.14)	< .001	1.08 (1.01 to 1.76)	.01
Comorbidity				
Yes	1			
No	0.85 (0.42 to 1.74)	> .05		
Type of Donor				
Cadaveric	1			
Lived	0.84 (0.36 to 1.52)	> .05		
Related vs. Non-related Donor				
Related Donor	1			
Non-related Donor	1.15 (0.38 to 1.53)	> .05		
Duration of CKD, mo				
< 29	1			
≥ 29	0.54 (0.32 to 1.67)	> .05		

be provided for the patients to RTW. Patients with light and nonphysical jobs have a greater ability to adapt themselves to the work environment. Long working hours, heavy lifting, and working in polluted industrial environments are not compatible with the health conditions of KT recipients due to the increased risk of infections and morbidities such as incisional herniation.

According to the univariate analysis the absence of diabetes mellitus as an comorbidity, significantly affected the time of RTW; however, there was no statistically significant relationship between other comorbidities, type of donor (cadaveric or living), related or unrelated donor, and RTW.

D' Egidio *et al.* identified the underlying disease, pre-transplant dialysis, donor type (cadaveric with living), and operation technique as effective factors in RTW.⁷ Eppenberger *et al.* showed that transplant from a living donor, dialysis duration of less than one year and maintenance of pre-transplant employment were associated with post-transplant employment.⁹

In the study by Nour *et al.*, patients with lower levels of mental health and physical health were less likely to RTW.¹² Considering that diabetes mellitus is the most common cause of ESKD and can cause irreversible complications in patients, it is expected that patients with diabetes mellitus would face more difficult RTW conditions since their performance and attendance at work will be unpredictable.

This study had some limitations. First, the sample size was relatively small. The small sample size could be attributable to the possibility of the COVID -19 pandemic and its high mortality in immune-deficient patients, since many patients with compromised immune systems after KT were rejected by the medical team, and patients with better conditions were accepted for the study. Second, because this study was retrospective, recalling the timing of RTW was not possible. Third, other factors affecting patients' RTW, such as psychological factors and economic conditions, were not addressed in the study. Fourth, we were unable to include patients who had died after KT or who did not show up for the follow-up appointments, so RTW rates could have been overestimated.

One of the strengths of this study was that it was one of the first studies to evaluate the rate of RTW in KT recipients in our country. And, to conduct this study, we were supported by the patient information registration system.

In this study, we not only investigated occupational predictor factors, but also compared them to individual and disease-related factors, and most importantly, except for diabetes mellitus, we also investigated the comorbidities in the patients, all of which could affect RTW.

It is suggested that by increasing the sample size, performing a long-term study, having follow-up for patients, and considering other effective

factors in RTW in future studies, a more significant association will be found.

CONCLUSION

The findings of our study showed that the cumulative rates of RTW at 3 and 6, and 12 months after KT were 44.4% and 63.1%, respectively; and 69.6% of patients returned to work one year after KT while 30.4% did not. Moreover, in this study the presence of diabetes mellitus, physical work, and lack of job satisfaction were associated with unemployment in the study participants; whereas individual factors had less impact on RTW. Given the high prevalence of KT, which is more common in working age, facilitating employment, modifying factors related to the work environment, and support of colleagues and supervisors in the workplace play an important role in reducing stress and improving the general condition of the disease in affected individuals.

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CONFLICT OF INTEREST

There is no conflicts of interest.

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