Comparison of psychosocial adjustment in people with diabetes with and without diabetic foot ulceration

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KEY WORDS

Type 1 diabetes mellitus, type 2 diabetes mellitus, diabetic foot ulceration, psychosocial adjustment to illness, metabolic control

ABSTRACT

Objective
To determine whether psychosocial adjustment to illness differs in people with diabetes between those who have or do not have diabetic foot ulceration.

Design
The study employed as a cross-sectional sample survey design.

Setting
The setting for the study was a training hospital, a marine and undersea medicine outpatient clinic and an endocrinology outpatient clinic.

Subjects
Two hundred participants with a diagnosis, according to World Health Organization criteria, of type 1 or type 2 diabetes for at least one year were enrolled in the study. 100 participants receiving hyperbaric oxygen therapy had diabetic foot ulceration (DFU) and 100 participants had diabetes without DFU.

Outcome measures
Data were collected using a demographic data sheet and analysed using the Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR).

Results
Advanced age, low education levels, long diabetes duration, poor metabolic control and not exercising may be risk factors for DFU. Total PAIS-SR score was 61.01±21.42 (poor adjustment) in participants with DFU, and 43 ± 17.13 (moderate adjustment) in participants without DFU. Participants without DFU had fewer problems in the domain of health care orientation, vocational environment, sexual relationships, social environment and psychological distress than participants with DFU. In participants with DFU; poorer psychosocial adjustment was associated with poorer metabolic control, lower education status, not exercising and retirement. In participants without DFU, women had better psychosocial adjustment than men. Also, participants exercising had better psychosocial adjustment than participants not exercising.

Conclusion
The participants without DFU had adjusted better to their illness than participants with DFU. The nurse should evaluate and support the patient for psychosocial adjustment to diabetes to prevent chronic complication such as DFU.

INTRODUCTION

Diabetes is chronic disease; it has been estimated that the world wide prevalence of diabetes will double between 1990 and 2010 (Scott 2005 p.4). In 2003 the total world population with diabetes was estimated at 194 million. Type 2 diabetes constitutes about 85% to 95% of all diabetes cases in developed countries and accounts for an even higher percentage in developing countries (International Diabetes Federation 2007). The result of the Turkish Diabetes Epidemiology Study (TURDEP) indicated the crude prevalence of diabetes was 7.2% (previously undiagnosed = 2.3%) (Satman et al 2002).

People with type 2 diabetes often have established complications at time of diagnosis. In the United Kingdom Prospective Diabetes Study (UKPDS) for example, 36% of newly diagnosed patients had retinopathy, 12% neuropathy and 2% proteinuria at recruitment (Scott 2005 p.4). The late sequelae of diabetic peripheral neuropathy (cumulative lifetime incidence around 15%) are recognised to be foot ulceration and Charcot's neuropathy (Malik 2005 pp.105-107). Strict metabolic control has been shown to significantly reduce rates of diabetic complications (Diabetes Control and Complications Trial Research Group 1993). Metabolic control has been shown to be related to the level of psychosocial adjustment of the individual (Pollock et al 1990). A review of the literature suggests that demographic variables, duration of illness and lifestyle habits influence adjustment to a chronic illness such as diabetes. However because these studies are limited, new research is needed to investigate whether psychosocial adjustment to illness differs between patients with and without diabetic foot ulceration. The purpose of this study was to determine whether the psychosocial adjustment to illness differed between patients with and without diabetic foot ulceration.

THEORETICAL FRAMEWORK

In the UKPDS the risk of each of the microvascular and macrovascular complications of type 2 diabetes was strongly associated with hyperglycaemia, as measured by glycosylated haemoglobin (HbA1c). There was no evidence of a threshold and there was a threefold increase over the range of <6% to ≥10%. HbA1c reflects recent glycaemic control (Scott 2005 p.18). For every percentage point decrease in HbA1c (ie from 9% to 8%) there was a 40% reduction in the risk of complications (UKPDS 1998). Diabetes management guidelines based on the UKPDS (1998) stress the need to achieve good blood glucose, lipid and blood pressure control with treatments linked targets. That is, achieving evidence based metabolic, blood pressure and weight targets. The development of new classes of blood glucose lowering medications to supplement the older therapies, such as lifestyle directed interventions, insulin, sulfonylureas, and metformin, has increased the treatment options for type 2 diabetes (Inzucchi 2002).

Good care, includes long term self care to control blood glucose levels, reduce the risk of complications and adverse medication related events, and early screening for end organ damage, can prevent severe complications in diabetes (Dunning and Manias 2005; UKPDS 1998). Glucose levels must be measured at home and treated with a combination of diet, exercise, and medication. Retinal screening, foot examination, and coordination of care with specialists are necessary, as are checking for early signs of renal, vascular, and neuropathic disease. In addition, screening and treatment for other cardiovascular risk factors such as hypertension, hyperlipidaemia, and tobacco use are important in patients with diabetes. Information and education for the patient is essential and care provided by a multidisciplinary team including physician, nurse, pharmacist, dietician, and health educator (Miller 1994). The diagnosis of chronic illness such as diabetes initiates a process of continuous appraisal and reappraisal through which the individual adjusts to the requirements and limitations imposed by the illness. Successful adjustment allows the individual to deal with illness related changes in ways that facilitate health (Michael 1996). Because research has shown a relationship between the individual's adjustment to diabetes and improved metabolic control, it is important to explore factors that may

affect adjustment to diabetes (Pollock et al 1990). For people with diabetes, better adjustment is associated with better metabolic control (Pollock et al 1990).

There is evidence that the Psychosocial Adjustment to Illness Scale score is significantly elevated relative to a normative diabetic sample. Sample populations with proliferative diabetic retinopathy report the most difficulty in the domain of health care orientation. No significant differences have been observed in adjustment scores between those with recent partial visual loss and those with more stable vision (Wulsin et al 1993). Stable psychosocial resources (ie education, being married, and a positive coping style) have been associated with better chronic glycaemic control, while stress and regimen non-adherence have been associated with reduced transient glycaemic control (Peyrot et al 1999). In relation to psychosocial adaptation, better marital satisfaction is related to higher levels of diabetes related satisfaction and a reduced impact of the disease, as well as less diabetes related distress (Trief et al 2001).

The most consistent predictor of metabolic control, dietary self management and diabetes related distress has been support and confidence in living with diabetes (Whittemore et al 2005). After adjustment for age, gender and diabetes type the best predictors for insulin dependent diabetics have been found to be hardiness and psychosocial adjustment, and for non-insulin dependent diabetics, psychosocial adjustment alone. Self efficacy and coping skills have not been found to predictors for metabolic control (Rapley 1990).

Up to 15% people with diabetes mellitus will develop foot ulceration at some time in their lives (Steed 1998). Four risk factors for foot ulcers have been identified: retinopathy, poor psychosocial status, hyperkeratosis, and diabetes duration (Leymarie et al 2005). Certain foot deformities, reduced skin oxygenation and foot perfusion, poor vision, greater body mass, and sensory and autonomic neuropathy independently influence foot ulcer risk (Boyko et al 1999). 100% oxygen for 90 minutes each day is used as a treatment for patients with ischaemic, non-healing lower extremity ulcers and some patients will eventually require an amputation (Malik 2005 pp.105-107). This suffering might be reduced or prevented with good, consistent foot care, strict metabolic control and improved adjustment to illness. Mobility and hospitalisation are related to problems of coping with diabetic foot ulcer and psychosocial problems (eg job, partnership, and social support). Therefore, disease management programs for patients with type 1 and 2 diabetes should include psychosomatic and psychotherapeutic diagnostics (Lange et al 2003).

Metabolic control has been predicted by adaptation with monitoring of diabetes as the only significant aspect of the adaptation. In turn, adaptation has been predicted by symptoms of depression and metabolic control. In support of this observation, depressed and non-depressed groups have showed significant differences in metabolic control, adaptation and self esteem (Lernmark et al 1999). Randomised controlled intervention trials have shown that treatment with either cognitive behaviour therapy or antidepressant medication (nortriptyline or fluoxetine) can improve both regimen adherence and glycaemic control (Lutman et al 1998;I Lutman et al 1999). A recent meta-analytic review of diabetes self management interventions indicated significant improvements in glycaemic control, as well as reductions in diabetes related hospitalisations and health care costs, particularly when interventions incorporated individually tailored strategies to change behaviour (Clement 1995). Interventions that increase patients' sense of empowerment and self management skills have resulted in improvements in self efficacy, self care behaviours, glycaemic control, patient satisfaction, and quality of life (Anderson et al 1995).

AIM OF THE STUDY

The purpose of this study was to determine whether psychosocial adjustment to illness differs for people with diabetes between those with or those without diabetic foot ulceration.

The three research questions were as follows: does psychosocial adjustment to illness differ between people with diabetes who have or have not diabetic foot ulceration? What are the relationships between psychosocial adjustment to illness and demographic factors, diabetes duration and habits? What is the relationship between psychosocial adjustment to illness and metabolic control?

METHODS

This study used a cross-sectional sample survey design. A purposive sampling technique was used to recruit people with diabetic foot ulceration from a marine undersea medicine unit and people with diabetes from an endocrinology outpatient clinic from a large metropolitan area in Turkey, between September 2005 and May 2006.

Sample and data collection procedures

Each day, approximately 20 people with diabetes attend the endocrinology outpatient clinic and 18 people with diabetic foot ulceration attend the marine undersea medicine unit. The researchers visited each clinic twice a week. 100 people with diabetes and 100 people receiving hyperbaric oxygen therapy for diabetic foot ulceration met the criteria and agreed to participate.

The participants were selected according to the following criteria:

- diagnosed with type 2 diabetes mellitus according to WHO criteria for at least one year and using insulin;
- over 18 years and below 65 years of age;
- free of any psychiatric disorders or cancer;
- able to read and write Turkish; and
- willing to participate.

This study protocol was approved by Marmara University Ethics Committee. Participants were informed about the aim and nature of the study. Data were collected through face to face interviews by the researchers in a private room of the outpatient clinic. Each interview took approximately 40 minutes. The response rate was 100%.

The questionnaire

Data were collected using a demographic data sheet and the Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR). The demographic data sheet consisted of information about participant's age, gender, education, marital and employment status, diabetes duration, HbA1c and lifestyle habits (monitoring blood glucose, exercising, smoking cigarettes and drinking alcohol).

The PAIS-SR was developed by Derogatis and Lopez (Derogatis and Derogatis 1990) and the validity and reliability of the Turkish version was tested by Adaylar (1995). PAIS-SR is used to gather information on patients' opinions about their own adjustment. PAIS-SR's 46 items consists of a multiple choice questionnaire which measures the impact of chronic illness in seven domains, including health care orientation, vocational environment, domestic environment, sexual relationships, extended family relationships, social environment, and psychological distress. All items were used from the original version PAIS-SR questionnaire. When summed over the individual domains, the total score reflects the individual's overall adjustment to illness. Each item is comprised of four statements given on a 4-point scale and scored from 0='no disturbance', to 3='marked disturbance'. PAIS-SR total score ranges from 0 to 138. Thus, lower scores indicate better adjustment while higher scores indicate worse adjustment. Reliability coefficients for the total PAIS-SR scale have been found to be 0.95, with subscale reliabilities ranging from 0.67 to 0.90 when reported among women with diabetes (Willoughby et al 2000). In the present study, the coefficient alpha for the total PAIS-SR scale was 0.92, with subscale reliabilities ranging from 0.80 to 0.95.

Data Analysis

Chi-square, Wilcoxon sum-rank, variance analysis and t-tests were used to determine differences between the two groups. Spearman's correlation analysis was used to examine relationships. Probability values less than 0.05 were considered statistically significant.

RESULTS

The study participants were 100 people with diabetic foot ulceration and 100 people without diabetic foot ulceration.

Demographic data and differences between two groups

The demographic characteristics of the studied population are summarised in table 1. There were no significant differences between the two groups for gender and marital status (p>0.05). Significant differences were found between the two groups for age (p=0.000), education levels (p=0.001), employment status (p=0.004) and durations of diabetes (p=0.000). That is, participants with diabetic foot ulceration were older, had lower education levels, had diabetes for less than 10 years and were more likely to be retired than participants without diabetic foot ulceration. All participants were living with their family (partner, child or parents) and had social insurance. Thirty five percent of participants with diabetic foot ulceration had previous finger amputation.

Table 1: Demographic data, and differences between the two groups

Variables	DFU		Non-DFU		Total		p values
	n	%	n	%	N	%	
Gender							
Female	39	39.0	50	50.0	89	44.5	x^2= 2.450
Male	61	61.0	50	50.0	111	55.5	p= 0.155
Marital status							
Married	84	84.0	80	80.0	164	82.0	x^2= 0.542
Single	16	16.0	20	20.0	36	18.0	p= 0.581
Education							
Elementary school	73	73.0	58	58.0	131	65.5	x^2= 17.443
High school	24	24.0	22	22.0	46	23.0	**p= 0.001
University	3	3.0	20	20.0	23	11.5	
Employment status							
Housewife	35	35.0	35	35.0	70	35.0	
Retired	56	56.0	40	40.0	96	48.0	x^2= 13.333
Worker	4	4.0	20	20.0	24	12.0	**p= 0.004
Employer	5	5.0	5	5.0	10	5.0	
Smoking cigarettes							
Yes	13	13.0	26	26.0	39	19.5	x^2= 5.383
No	87	87.0	74	74.0	161	80.5	*p= 0.031
Drinking alcohol							
Yes	3	3.0	8	8.0	11	5.5	x^2= 2.405
No	97	97.0	92	92.0	189	94.5	p= 0.213
Monitoring blood glucose							
Yes	65	65.0	62	62.0	127	63.5	x^2= 0.456
No	31	31.0	35	35.0	66	33.0	p= 0.796
Don't know	4	4.0	3	3.0	7	3.5	
Exercising							
Yes	17	17.0	34	34.0	51	25.5	x^2= 7.606
No	83	83.0	66	66.0	149	74.5	**p= 0.009
Duration of diabetes							
1-10 years	35	35.0	74	74.0	109	109.0	x^2=31.003
11-20 years	43	43.0	19	19.0	62	62.0	***p=0.000
21+ years	22	22.0	7	7.0	29	29.0	
Age (year)	Mean ± SD 61.84 ± 9.34		Mean ± SD 55.22 ± 3.77		200 100.0		t= 3.978 **p= 0.003
HbA1c (%)	8.65 ± 1.98		8.18 ± 1.57		200 100.0		T=51.928 ***p=0.000

Note: DFU=patients with diabetic foot ulceration, Non-DFU= patients without diabetic foot ulceration, *p< 0.05, ** p< 0.01 and ***p<0.001

Findings with regard to lifestyle habits are reported in table 1. A significant difference was found between the two groups in relation to smoking ($p<0.05$), indicating there were more people who smoked without diabetic foot ulceration than there were people who smoked with diabetic foot ulceration. No significant differences were observed in relation to drinking alcohol and monitoring blood glucose ($p>0.05$). A significant difference was observed between the two groups in relation to exercising ($p=0.009$) and HbA1c levels ($p=0.000$). That is, fewer participants with diabetic foot ulceration exercised and had poorer metabolic control than the participants without diabetic foot ulceration.

Table 2: Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR) scores and differences between the two groups

PAIS-SR	DFU Mean ± SD	Non-DFU Mean ± SD	p values
Total PAIS-SR	61.01 ± 21.42	43.12 ±17.13	t=6.012 ***p= 0.000
Health care orientation	8.64 ± 4.58	5.43 ± 4.14	t=5.076 ***p= 0.000
Vocational environment	9.81 ± 4.03	6.14 ± 3.98	t= 6.567 ***p= 0.000
Domestic environment	9.58 ± 4.71	8.66 ± 4.83	t= 1.282 p= 0.203
Sexual relationships	11.64 ± 4.88	8.37 ± 6.22	t= 3.915 ***p= 0.000
Extended family relationships	3.31 ± 2.96	3.09 ± 3.42	t= 0.495 p= 0.622
Social environment	10.52 ± 4.57	5.73 ± 2.99	t= 8.263 *p= 0.000
Psychological distress	7.34 ± 4.17	5.73 ± 3.00	t= 3.066 **p= 0.003

Note: DFU=patients with diabetic foot ulceration, Non-DFU= patients without diabetic foot ulceration, **p< 0.01 and ***p< 0.001

Research question

Question 1: Does psychosocial adjustment to illness differ between people with diabetes who have or who do not have diabetic foot ulceration?

A significant difference was observed in total PAIS-SR scores (lower scores denote better adjustment) between the two groups ($p=0.000$) indicating that participants without diabetic foot ulceration had better psychosocial adjustment to their illness than participants with diabetic foot ulceration. Psychosocial adjustment to illness domains namely domestic environment and extended family relationships were no different between the two groups ($p>0.05$), but health care orientation ($p=0.000$), vocational environment ($p=0.000$), sexual relationships ($p=0.000$), social environment ($p=0.000$) and psychological distress ($p=0.003$) showed differences between the two groups. That is, participants without diabetic foot ulceration had fewer problems in these five domains than participants with diabetic foot ulceration (table 2).

Question 2: What are the relationships between psychosocial adjustment to illness and demographic data, diabetes duration and habits?

In participants with diabetic foot ulceration, no significant relationships were observed between total PAIS-SR score and age ($r=0.185$, $p=0.065$), gender ($Z=0.688$, $p=0.491$), marital status ($Z=1.199$, $p=0.231$), diabetes duration ($F=4.758$, $p=0.093$) monitoring blood glucose ($F=3.060$, $p=0.217$), smoking cigarettes ($Z=1.528$, $p=0.127$) and drinking alcohol ($Z=0.758$, $p=0.449$), but significant relationships were observed between total PAIS-SR score and education levels ($F=15.975$, $p=0.001$), employment status ($F=15.473$, $p=0.001$) and exercising ($Z=2.882$, $p=0.004$). That is, psychosocial adjustment to illness was not affected by age, gender,

marital status, diabetes duration, monitoring blood glucose, smoking cigarettes and drinking alcohol, but it was affected by education levels, employment status and exercising. Lower education status and retirement were associated with more problems in psychosocial adjustment to illness. On the other hand, participants who exercised had better psychosocial adjustment than participants who did not exercise.

For participants without diabetic foot ulceration, no significant relationships were observed between total PAIS-SR score and age (r=0.128, p=0.206), marital status (Z=1.155, p=0.248), education levels (F=5.491, p=0.139), employment status (F=5.470, p=0.140), diabetes duration (F=0.772, p=0.680), monitoring blood glucose (F=1.813, p=0.404), smoking cigarettes (Z=1.879, p=0.060) and drinking alcohol (Z=0.159, p=0.874), but significant relationships were found between total PAIS-SR score and gender (Z=2.232, p=0.026) and exercising (Z=2.770, p=0.006). That is, women had better psychosocial adjustment than men. Also, participants who exercised had better psychosocial adjustment than participants who did not exercise.

Question 3: What is the relationship between psychosocial adjustment to illness and metabolic control?

A significant positive correlation was found between total PAIS-SR scores and HbA1c levels in participants with diabetic foot ulceration (r=0.208, p=0.038) indicating that poorer psychosocial adjustment to illness was associated with poorer metabolic control in participants with diabetic foot ulceration. Adversely, there was no significant correlation between total PAIS-SR scores and HbA1c levels in participants without diabetic foot ulceration (r=0.048, p=0.635). According to this finding, the psychosocial adjustment to illness did not affect the metabolic control of participants without diabetic foot ulceration.

LIMITATIONS

The results of this study may not be generalised outside the study participants because of the small sample size.

DISCUSSION

The demographic characteristics of the sample were similar to other studies undertaken in similar sampling populations (Willoughby et al 2000, Trief et al 2001).

Compared to participants without diabetic foot ulceration, participants with diabetic foot ulceration had poorer metabolic control, advanced age, lower education levels and longer diabetes duration. Additionally, many were retired and did not exercise. According to these data, poor metabolic control, advanced age, low education levels, long diabetes duration and not exercising may be risk factors for diabetic foot ulceration. Leymarie et al (2005) observed that diabetes duration was a risk factor for foot ulceration. Boyko et al (1999) found that unrelated to foot ulcer risk in multivariate models were diabetes duration, smoking status, and joint mobility. Research supports the concept that physical activity increases insulin sensitivity, improves glycogen storage, and allows for more efficient use of glucose in muscles (Duncan et al 2003). This research concluded that diabetic foot ulceration may force people with diabetes to quit their job and stop smoking cigarettes. Smoking is an independent risk factor for macrovascular disease and in the MRFIT study increased the 10-year risk of dying from coronary heart disease by 1.6 times in non-diabetics and by 2.4 times in those with diabetes. Analysis of the MRFIT data suggests that stopping smoking was one of the most effective interventions in reducing mortality from macrovascular disease (Scott 2005 pp.13-22).

When a diagnosis of chronic illness is first made, a period of adjustment is initiated (Pollock 1993). Successful adjustment allows individuals to deal with a chronic illness in ways which enhance health. This research found that participants with diabetic foot ulceration had poorer adjustment to their illness, whereas participants without diabetic foot ulceration had moderate adjustment to their illness. That is, participants without diabetic foot ulceration had better adjustment to their illness than participants with diabetic foot ulceration. Willoughby et al (2000)

found that women with diabetes were well adjusted to their illness (mean total PAIS-SR was 30±21). Wulsin et al (1993) found that the PAIS-SR scores of a sample of people with proliferative diabetic retinopathy were significantly elevated relative to a normative diabetic sample.

Moderate psychosocial adjustment was found in patients with acute myocardial infarction (Drory et al 1999) and moderate (Courts 2000; Zimmermann et al 2001) and fairly well psychosocial adjustment (Tanyi and Werner 2003) in patients on haemodialysis. The total PAIS-SR score was 51.46 ± 9.97 in patients with breast cancer (Swain et al 1996). According to these findings, patients with diabetic foot ulceration have poorer psychosocial adjustment than patients with other chronic illnesses.

In this study we found that participants with diabetic foot ulceration had most adjustment problems with respect to sexual relationships, social environment, vocational environment, domestic environment and health care orientation; while participants without diabetic foot ulceration had most adjustment problems with respect to domestic environment and sexual relationships. When the two groups were compared, participants without diabetic foot ulceration had fewer problems in the domain of health care orientation, vocational environment, sexual relationships, social environment and psychological distress than participants with diabetic foot ulceration. Willoughby et al (2000) found that women with diabetes had most adjustment problems with respect to psychological distress, social domains and health care domain. Domains with the least problems were the extended family, sexual relationships and vocational environment (Willoughby et al 2000). These findings are not supported by the present study.

This study observed that participants with diabetic foot ulceration who have poorer metabolic control, lower education status and are retired had the most problems in psychosocial adjustment to illness. Also, all participants who were exercising had better psychosocial adjustment than participants not exercising. On the other hand, women with diabetes had better psychosocial adjustment to illness than men with diabetes. Pollock et al (1990) reported that for people with diabetes, better adjustment is associated with better metabolic control. Whittemore et al (2005) showed that support and confidence in living with diabetes was the most consistent factor associated with metabolic control, dietary self management and psychosocial adjustment. There is a lack of research addressing the relationship between diabetic foot ulcers and psychosocial adjustment to illness, but four risk factors for foot ulcers have been identified: retinopathy, poor psychosocial status, hyperkeratosis, and diabetes duration (Leymarie et al 2005). In this study, the patients with diabetic foot ulceration had longer diabetes duration, older age, lower education status, worse metabolic control and lower psychosocial adjustment than the patients without diabetic foot ulceration. Lower psychosocial adjustment to illness is associated worse metabolic control in patients with diabetic foot ulceration; but this result does not indicate whether lower psychosocial adjustment comes before the development of the diabetic foot ulceration or is a reaction to the development of the diabetic foot ulceration. This study design was a cross-sectional design, therefore causality could not be determined. Finally, this study showed a relationship between psychosocial adjustment to diabetes and metabolic control in patients with diabetic foot ulceration.

CONCLUSIONS AND IMPLICATIONS FOR NURSING PRACTICE

This study showed that advanced age, low education levels, long diabetes duration, poor metabolic control and not exercising are associated with diabetic foot ulceration. This study suggests that participants without diabetic foot ulceration are better adjusted to their illness than participants with diabetic foot ulceration. The nurse should evaluate and support the patient for psychosocial adjustment to diabetes to prevent chronic complication such as DFU.

Research is needed to identify ways to increase psychosocial adjustment and understand how

psychosocial adjustment to diabetes effects metabolic control. The findings of this study suggest that further research is needed to understand the differences in psychosocial adjustment between people with and without diabetic foot ulceration.

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