Economic, Social, and Psychological Factors Associated With Health-Related Quality of Life of Chronic Hemodialysis Patients in Northern Taiwan: A Multicenter Study

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Abstract: This study evaluated the associations between economic, social, psychological factors, and health-related quality of life of hemodialysis patients. Cross-sectional study design was used. End-stage renal disease patients who had received maintenance hemodialysis for more than 2 months at 14 centers in northern Taiwan were invited to participate. Demographic, economic, and psychosocial data of patients were collected. Depression was assessed by the Beck Depression Inventory. Health-related quality of life was measured by the Medical Outcomes Study Short-Form 36. Multivariable linear regression analyses were performed. Eight hundred sixty-one patients (373 males, mean age 59.4 ± 13.2 years) completed the study. Higher monthly income was positively associated with role emotional and mental health ($P < 0.05$), and so was increased frequency of social activities with social functioning ($P < 0.05$). The more worries, the stronger the inverse associations with social functioning ($P < 0.05$) and mental health ($P < 0.01$). Higher depression scores were associated with lower scores of all Short-Form 36 dimensions ($P < 0.01$). Higher monthly income and increased social activities are associated with better health-related quality of life, whereas more worries and higher depression scores are associated with worse health-related quality of life of hemodialysis patients. **Key Words:** Economic—Psychosocial—Depression—Quality of life—Hemodialysis.

Survival of end-stage renal disease (ESRD) patients has been largely improved nowadays because of medical progress, advanced technology, and better patient care. Accumulated data in the recent decade show that health-related quality of life (HRQOL) markedly influences dialysis outcomes (1). Attention thus needs to be focused not only on how long but also on how well ESRD patients live (2).

Compared with the general population, ESRD patients have significantly impaired HRQOL (3), whether they are treated with hemodialysis (HD) or peritoneal dialysis (4). HRQOL is an important effectiveness indicator of the medical care a patient receives (5). Higher scores of HRQOL are correlated with higher self-esteem and lower levels of mood disturbance and treatment stresses (6). As HRQOL of HD patients is frequently difficult to improve by medical therapy alone, the identification of psychosocial factors that play an important role in QOL becomes crucial (7). HRQOL of HD patients in Taiwan and its association with nonmedical factors have not been widely investigated. This study aimed to determine the associations between economic, social, psychological factors, and HRQOL of HD patients in Taiwan.

MATERIALS AND METHODS

Patients

ESRD patients who had received maintenance HD for more than 2 months at 14 HD centers in

northern Taiwan were invited to participate in this cross-sectional study. Patients who could not communicate well with others because of old age, dementia, consciousness disturbance, or severe chronic disease, or those who had intercurrent events such as surgery, infection, and hospitalization 1 month prior to the study were excluded, leaving 861 patients eligible. The study was approved by the Institutional Review Board of the National Taiwan University Hospital and relevant units of each hospital, and informed consent was obtained from every patient at the study entry.

Methods of data collection

The principal investigator and a well-trained assistant visited each study hospital and explained to the physicians and HD nurses the detailed methods of data collection and the meaning of each question on the questionnaires at the start of the study. Demographic, economic, social, and psychological data were collected through self-administered questionnaires whereas clinical data were recorded by the HD nurses. Patients who had problems in reading or understanding the questionnaires were assisted by the HD nurses. During the study period, the assistant revisited all study hospitals regularly to gather completed questionnaires.

Measurement of HRQOL

HRQOL was measured by the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) (8), a 36-item questionnaire comprising eight dimensions: physical functioning (PF); role physical (RP); bodily pain (BP); general health (GH); vitality (VT); social functioning (SF); role emotional (RE); and mental health (MH). The SF-36 scores were then transformed to a scale of 0–100, with higher scores indicating better HRQOL, that is, a more favorable health status. This self-assessed questionnaire has been considered a consistent and powerful predictor of morbidity and mortality in dialysis patients (9). The Chinese version (Taiwan standard version 1.0) of the SF-36 was used in this study. It was translated in 1996, and has been tested reliable (10) and valid (11). It has also been applied successfully in previous studies on ESRD patients in Taiwan (12,13).

Collection of demographic, economic, social, psychological, and clinical data

Demographic data of the patients such as sex, age, marital status, educational level, religious beliefs, and place of birth were recorded. Economic factors including occupation (work status), monthly income, and sources of economic support were documented.

Sources of social support when difficulties were encountered as well as frequency of joining social activities were considered as social parameters of the patients.

Psychological factors, for example, depressive affect and the most troublesome problem(s) a patient was worrying about, were recorded. Each patient was requested to complete the 21 questions of the Beck Depression Inventory (BDI) (14), a well-validated and frequently used measure of depression for patients with ESRD (15). It asks about symptoms of depression including sadness, pessimism, experience of failure, loss of joyfulness, guilty feeling, sensation of being punished, self-dislike, self-reproach, suicide ideation, crying, irritability, loss of interest, lack of decision, sense of valueless, loss of activity, change of sleep habit, easy anger, change of appetite, decreased attention, tiredness, and loss of sex interest. BDI scores of 14 to 19 represent a mild degree of depression, 20 to 28 a moderate degree, and 29 to 60 a severe degree. This study employed the Chinese version of the BDI-II published by the Chinese Behavioral Science Corporation in Taiwan.

Clinical parameters including body height, body weight, body mass index, primary cause of renal failure, comorbid diseases, hepatitis status, duration on HD, most bothering physical symptoms, use of erythropoietin, complete cell count, blood chemistry data before HD, and dialysis adequacy (Kt/V) were collected around study entry.

Statistical analysis

Percentage, mean, and standard deviation (SD) were used to describe the distribution of all independent variables and SF-36 scores. Through univariable linear regression analyses, the associations between HRQOL and independent variables of interest including demographic, economic, social, psychological, and clinical factors were examined. Variables with P values less than 0.05 in the analyses and other variables of interest were tested with force-in multivariable linear regression models. A two-sided P of 0.05 was considered the cutoff value of statistical significance. Data were reported as mean ± SD. All analyses were performed using the SAS system version 8.1 (SAS Institute, Inc., Cary, NC, USA).

RESULTS

Eight hundred and sixty-one HD patients, among them 373 males (43.3%), completed the study. Their demographic characteristics are displayed in Table 1, and their mean age was 59.4 ± 13.2 years (range 15–89 years). The majority were born in Taiwan, with

TABLE 1. *Demographic characteristics of study HD patients*

	Number of patients	Percentage (%)
Age	861	59.4 ± 13.2*
Sex		
Male	373	43.32
Female	488	56.68
Birth place		
Taiwan	751	88.88
Mainland China	87	10.30
Aborigines	2	0.23
Others	5	0.59
Educational level		
Primary school or below	416	48.48
Junior high school	141	16.43
Senior high school or above	297	34.62
Others	4	0.47
Marital status		
Married	615	71.93
Single	90	10.53
Widowed	108	12.63
Divorced	37	4.33
Others	5	0.58
Religious status		
Without religious belief	169	19.74
With religious belief	687	80.26
Types of religion[†]		
Buddhism	457	53.39
Taoism	251	29.32
Christianity	21	2.45
Catholics	10	1.17
Islam	0	0.00
Others	6	0.70

* Expressed as mean years ± standard deviation.
[†] Patients could choose more than one answer.

TABLE 2. *Economic and social characteristics of study HD patients*

	Number of patients	Percentage (%)
Work status		
Vocationally inactive	394	45.82
Vocationally active	466	54.18
Monthly income		
None	533	63.76
<NT $25 000*	115	13.75
≧NT $25 000*	188	22.49
Sources of financial support[†]		
Oneself	324	37.63
Husband/wife	243	28.22
Relatives (including children)	252	29.27
Government	160	18.58
Others	37	4.30
Sources of social support[†]		
Family	666	77.35
Medical staff	349	40.53
Friends	275	31.94
Religion	2	0.23
Teachers	1	0.12
Number of social support		
0	20	2.32
1	457	53.08
2	250	29.04
≧3	134	15.56
Frequency of joining social activities		
Never/seldom	508	60.40
Occasionally/frequently	333	39.60

* NT, New Taiwan dollars.
[†] Patients could choose more than one answer.

only two aborigines. In total, around 80% of the patients admitted having religious beliefs, mostly in Buddhism; and about 65% had an educational level up to junior high school. Most patients were married (71.9%).

Economic characteristics of these patients including vocational status, monthly income, and sources of financial support are shown in Table 2. In Taiwan, people usually retire at the age of 65 years, and the mean monthly income is around 41 333 New Taiwan dollars (US $1333). Of all the patients, about 46% were retired or jobless, and about 64% had no income; yet 37.6% could live by themselves without any financial support from others. Social characteristics of the patients are also shown in Table 2. When in difficulties, most patients could receive help from their family (77.4%), followed by medical staff (40.5%), and friends (31.9%). Nearly all patients (97.7%) could obtain social support from one source or another. More than half of the patients never or seldom joined any social activities (60.4%).

Psychologically, most patients worried about their own health (72.4%), followed by financial burden

(18.8%), and family (17.7%), as shown in Table 3. Only 70 patients (8.1%) did not worry about anything and none worried about social security as it is generally good in Taiwan. The mean score of the 352 patients

TABLE 3. *Psychological characteristics of study HD patients*

	Number of patients	Percentage (%)
Worries*		
Health	623	72.36
Economic burden	162	18.82
Family	152	17.65
Job	54	6.27
Marriage	27	3.14
Others	7	0.08
Number of worries		
0	70	8.13
1	567	65.86
2	168	19.51
≧3	56	6.50
Severity of depression		
No depression (BDI < 14)	139	39.49
Mild (BDI 14–19)	66	18.75
Moderate (BDI 20–28)	73	20.74
Severe (BDI ≥ 29)	74	21.02

* Patients could choose more than one answer.

TABLE 4. *Clinical characteristics of study HD patients*

	Number of patients	Percentage (%)
Causes of renal failure		
Diabetes mellitus	322	37.79
Chronic glomerulonephritis	291	34.16
Hypertension	92	10.80
Systemic lupus erythematosus	15	1.76
Others	132	15.49
Number of comorbidities		
0	426	49.48
1	290	33.68
2	107	12.43
≧3	38	4.41
Number of symptoms		
0	76	8.91
1	383	44.90
2	236	27.67
≧3	158	18.52
Laboratory data	Number of patients	Mean ± SD
Hematocrit (%)	849	29.75 ± 4.19
Iron (μg/dL)	784	70.99 ± 35.32
TIBC (μg/dL)	830	225.78 ± 55.86
Ferritin (ng/mL)	823	529.68 ± 528.05
Albumin (g/dL)	843	4.06 ± 0.39
GOT (U/L)	800	21.10 ± 14.44
GPT (U/L)	835	20.57 ± 23.43
Phosphorus (mg/dL)	851	5.01 ± 1.51
Uric acid (mg/dL)	814	7.59 ± 1.51
iPTH (ng/L)	767	185.80 ± 239.55
Triglyceride (mg/dL)	838	169.42 ± 130.40
Cholesterol (mg/dL)	836	188.30 ± 46.34
Kt/V_{urea}	794	1.41 ± 0.29

GOT, aspartate aminotransferase; GPT, alanine aminotransferase; iPTH, intact parathyroid hormone; TIBC, total iron-binding capacity.

who completed the BDI was 19.2 ± 11.5. Depression was detected in around 60.5% of these patients.

Table 4 shows the clinical characteristics of all patients. The mean body height was 160.0 ± 8.2 cm and the mean body weight was 56.3 ± 10.3 kg. Diabetes mellitus and chronic glomerulonephritis were the main causes of renal failure. Hypertension, angina, myocardial infarction, congestive heart failure, and peripheral arterial occlusive disease were common cardiovascular comorbidities (45.3%). Mean duration on dialysis therapy was 6.0 ± 4.3 years, and 91.1% of the patients received erythropoietin therapy for their renal anemia. Around 91% of all patients reported symptoms such as pruritus (36.8%), insomnia (31.0%), and fatigue (30.6%). From the laboratory data as in Table 4, the mean serum albumin level was 4.1 ± 0.4 g/dL and the mean Kt/V_{urea} was 1.4 ± 0.3.

Mean values of the eight dimensions of SF-36 from all patients are displayed in Table 5. Scores from the general population in Taiwan are shown for comparison.

In the univariable linear regression, many socioeconomic factors were significantly associated with most of the SF-36 dimensions. However, after adjusting for clinical covariates and other significant predictors, only the following were found significantly associated with HRQOL (Table 6): older age was significantly inversely associated with PF ($P < 0.01$), RP ($P < 0.05$), VT ($P < 0.01$), and SF ($P < 0.05$); higher monthly income (NT\$ <25 000 vs. none) was significantly positively associated with RE ($P < 0.05$) and MH ($P < 0.05$); increased frequency of joining social activities was significantly positively associated with

TABLE 5. *Mean values of the dimensions of SF-36 of study HD patients and the general Taiwan population*

Variable	Scores of HD patients mean ± SD	Scores of population* mean ± SD
PF	47.90 ± 30.49	92.24 ± 16.16
RP	37.57 ± 44.41	83.65 ± 33.27
BP	67.50 ± 27.49	84.84 ± 19.42
GH	43.10 ± 24.07	69.29 ± 21.27
VT	48.32 ± 22.43	68.27 ± 18.66
SF	60.96 ± 27.26	86.81 ± 17.05
RE	49.20 ± 46.16	79.40 ± 36.07
MH	59.04 ± 21.46	73.01 ± 16.55

* Adapted from Tseng et al. 2003 (11).

TABLE 6. *Significant associations between SF-36 scales and different factors using multiple linear regression after adjustment for clinical factors*

Variable	PF β ± SE	RP β ± SE	BP β ± SE	GH β ± SE	VT β ± SE	SF β ± SE	RE β ± SE	MH β ± SE
Intercept	−11.4 ± 27.5	−6.3 ± 39.3	66.9 ± 27.7*	41.4 ± 22.5	63.8 ± 20.6**	38.4 ± 26.3	73.1 ± 43.1	58.2 ± 21.5*
Sex	5.2 ± 4.2	6.2 ± 6.0	3.5 ± 4.2	0.7 ± 3.4	−2.5 ± 3.1	4.0 ± 4.0	−4.4 ± 6.6	−1.1 ± 3.3
Age (year)	-7.1×10^{-6}** $\pm 1.9 \times 10^{-6}$**	-6.5×10^{-6}** $\pm 2.7 \times 10^{-6}$**	-2.5×10^{-6} $\pm 1.9 \times 10^{-6}$	-1.9×10^{-6} $\pm 1.5 \times 10^{-6}$	-4.1×10^{-6} $\pm 1.4 \times 10^{-6}$**	-4.5×10^{-6} $\pm 1.8 \times 10^{-6}$**	-3.6×10^{-6} $\pm 3.0 \times 10^{-6}$	2.2×10^{-7} $\pm 1.5 \times 10^{-6}$
Marital status†	4.9 ± 3.9	4.7 ± 5.5	−2.1 ± 3.9	4.0 ± 3.2	3.9 ± 2.9	−4.4 ± 3.7	0.9 ± 6.0	2.8 ± 3.0
Junior high school	3.6 ± 5.0	−6.2 ± 7.1	2.4 ± 5.0	4.8 ± 4.1	1.0 ± 3.7	3.1 ± 4.8	−1.4 ± 7.8	1.4 ± 3.9
SHS or above	4.2 ± 4.5	−3.1 ± 6.5	−3.9 ± 4.6	1.4 ± 3.7	3.3 ± 3.4	−2.0 ± 4.3	−0.02 ± 7.1	1.8 ± 3.5
Vocationally active	−1.0 ± 3.9	−6.3 ± 5.6	−0.9 ± 3.9	−2.0 ± 3.2	−5.6 ± 2.9	−0.2 ± 3.7	0.4 ± 6.1	−3.6 ± 3.1
Income <25 000 versus 0‡	6.3 ± 5.0	8.6 ± 7.2	1.7 ± 5.1	2.8 ± 4.1	6.8 ± 3.8	−1.0 ± 4.8	21.3 ± 7.9*	10.2 ± 3.9*
Income ≥25 000 versus 0‡	6.1 ± 4.9	5.0 ± 7.1	7.9 ± 5.0	1.9 ± 4.1	−0.7 ± 3.7	−2.0 ± 4.7	1.8 ± 7.7	1.1 ± 3.9
Number of social support	0.4 ± 2.0	3.0 ± 2.9	−1.9 ± 2.0	1.0 ± 1.7	−0.5 ± 1.5	−3.1 ± 1.9	2.9 ± 3.2	1.1 ± 1.6
Frequency of social activity								
Rare	−2.3 ± 4.3	−10.9 ± 6.1	−6.1 ± 4.3	−0.4 ± 3.5	2.0 ± 3.3	1.7 ± 4.1	−11.1 ± 6.7	−0.9 ± 3.3
Frequent	5.1 ± 4.4	−0.7 ± 6.3	−3.9 ± 4.4	1.5 ± 3.6	−3.4 ± 1.9	10.1 ± 4.2*	−2.0 ± 6.9	3.4 ± 3.4
Number of things being worried about	−2.1 ± 2.6	−0.1 ± 3.7	−2.0 ± 2.6	−3.0 ± 2.1	−1.8 ± 3.2	−5.4 ± 2.5*	−4.2 ± 4.0	−6.1 ± 2.0**
BDI score	−0.5 ± 0.2**	−0.8 ± 0.2**	−1.1 ± 0.2**	−0.7 ± 0.1**	−0.8 ± 0.1**	−0.8 ± 0.2**	−1.3 ± 0.3**	−0.9 ± 0.1**

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SE, standard error; SF, social functioning; SHS, senior high school; VT, vitality.
* $P < 0.05$, ** $P < 0.01$.
† Living versus not living with partner.
‡ New Taiwan dollars.

SF ($P < 0.05$); more worries was significantly inversely associated with SF ($P < 0.05$) and MH ($P < 0.01$); and a higher BDI score was significantly inversely associated with all dimensions of the SF-36 ($P < 0.01$).

DISCUSSION

Compared with the general population in Taiwan, HRQOL of the HD patients in this study was impaired for all SF-36 dimensions (Table 5). Molsted et al. demonstrated similar results in their local study (3).

Sex difference was found insignificant in the multivariable regression analyses of this study. Similar to previous cross-sectional (16) and prospective follow-up (17) studies, the result suggested that HRQOL scores were independent of gender.

The multivariable linear regression of this study showed that older age was significantly inversely associated with PF, RP, VT, and SF, but not MH. Previous studies conducted in different countries also demonstrated that age was strongly inversely associated with the physical domain scores (18). As age increases in the elderly, physical function of the body decreases (11). This applies to our study HD patients as well and thus the significant inverse association between age and domains reflecting physical function (PF, RP, and VT). Limitations of work and social activities also become more prominent among aged people. Rehabilitation programs, which aim to restore patients' work capacity and social function, can alleviate the impact of ageing on both RP and SF QOL. As age is an unmodifiable risk factor for worse HRQOL, older HD patients, whose muscle mass has decreased and vitality lessened, should have more attention and encouragement about keeping physically fit from medical staff in order that part of their VT QOL scores may be preserved.

Marital status was not associated with HRQOL of HD patients in this study. In a study on Hong Kong dialysis patients using the Chinese Dialysis QOL Scale, marital status also appeared to have no relation to QOL (19). As our study found the numbers of both single (10.5%) and divorced (4.3%) patients were relatively low in comparison with married patients (71.9%), and the times of divorce or remarrying were not recorded, further investigations may be needed to clarify the causal relationship between marital status and HRQOL.

In this study, educational level was not associated with HRQOL in the multivariable regression analyses despite previous studies from which higher educational level was reported as significantly associated

with better HRQOL (4,20). Further study is needed to clarify their causal relationship.

Work status in this study was found insignificantly associated with HRQOL using multivariable regression analyses, in contrast to previous studies that demonstrated that vocationally active ESRD patients had higher QOL (20,21). The discrepancy may be due to the fact that HD patients who can work are generally younger and have better physical function, that is, healthy worker effect may be present. Moreover, when compared with other stronger correlators of HRQOL such as age and depression, nonworking status has a relatively small effect and appeared only in some QOL scales (21).

Through the multivariable regression analyses, this study showed that higher monthly income was significantly positively associated with RE and MH scores. Moreno et al., in their multicenter cross-sectional study, and Sesso et al., in their prospective cohort study, also found that higher socioeconomic level was significantly related to better QOL (20,22). ESRD patients in many countries have to pay for all or most of the dialysis treatment costs themselves, whereas HD patients in Taiwan enjoy free yet high-quality dialysis under current government policy. Financial burden was therefore less prominent in HD patients of this study when compared with other factors associated with HRQOL. Additionally, strong family support as reported in this study can explain why physical-related QOL dimensions were less affected by low monthly income.

In the multivariable regression analyses of this study, social support was not significantly associated with HRQOL. Previous studies suggested that better social support was correlated with higher HRQOL scores (7,21), whereas a study by Kimmel et al. showed that responses to the Support Network Scale correlated positively only with scores on some of the McGill QOL subscales, but not the Satisfaction With Life Scale (23). The differences might be because of two reasons: first, the methods for measuring the strength of social support were inadequate, for example, Kimmel's Support Network Scale was not well validated whereas this study counted solely the number of sources of social support and assumed that more sources represented stronger support; and second, patients of this study had good social support generally (about 97% had at least one source of social support), that is, the difference in HRQOL scores between patients with and without social support was not distinct and could not be demonstrated clearly.

Increased frequency of joining social activities was found positively associated with the SF scores ($P < 0.05$) in this study. Similarly, Wolcott et al. demon-

strated in their study that a higher rate of participation in community activities was significantly correlated with higher QOL (6). In fact, physically as well as mentally healthier HD patients are willing to join social activities, especially outdoor ones that require more physical strength. As reluctance to join any social activity may be an early sign of physical function deterioration and/or depression, HD patients should be encouraged to take part in these activities to enhance their HRQOL.

Using the multivariable regression analyses, a greater number of worries was significantly inversely associated with SF ($P < 0.05$) and MH ($P < 0.01$) scores. Worries can lead to decreased appetite, poor sleep, depressive mood, reduced concentration, and decreased interest in surrounding people and things. A decreased scoring of SF and MH may be the result. On the other hand, increased limitation of social functioning may be a source of worries itself. As most HD patients of this study worried about their own physical health, economic status, and family, it can be easily understood why they had significantly lower scores of MH. Psychological consultation, psychotherapy, and better mental support should be given to HD patients to improve their MH QOL.

BDI scores were significantly and strongly inversely associated with all the eight dimensions of SF-36 in both univariable and multivariable regression analyses ($P < 0.01$). It means that depression is the most important factor that is associated with HRQOL of our HD patients. This result confirmed Vázquez's report that concluded that psychological factors including depressive symptoms are crucial HRQOL determinants (21). Currently, depression is believed to be the most common psychiatric problem in HD patients (24). Around 60.5% of the patients in this study who had completed the BDI suffered from depression of various degrees. This prevalence rate was much higher than that reported by Taskapan of Turkey (35%) (25). Depression can have adverse effects on HD patients' nutrition, immunology, dialysis compliance, and social interaction. Poor physical and emotional status will certainly further aggravate depression. As depression affects dialysis outcome and survival (23), early detection and proper management of depression should be emphasized and practiced.

This study was the first in Taiwan that successfully evaluated the associations between economic, social, psychological factors, and HRQOL of HD patients using the SF-36. Its sample size was large enough to truly reflect the HRQOL status of HD patients in Taiwan. To our best knowledge, it was also the first study to find that having "more worries" is signifi-

cantly inversely associated with the mental HRQOL of HD patients. Medical staff should pay more attention to elder HD patients who have worse HRQOL. Regular assessment of HD patients' psychological condition, especially the severity of depression, should also be carried out at every dialysis center. Early and appropriate treatment of depression will hopefully improve the HRQOL as well as survival of HD patients in Taiwan.

A few limitations were noted in this study. First of all, like many other studies investigating HRQOL in ESRD, this study was cross-sectional and could not differentiate the exact causal relationships between various factors and HRQOL. Second, as patients who were too sick—of whom the HRQOL scores were expected to be lower—were excluded, valuable information about this subgroup might have been missed. Third, other validated objective questionnaires were not used for grading variables such as socioeconomic status and social support as reliable questionnaires of the kind are still lacking.

CONCLUSIONS

HRQOL of HD patients in northern Taiwan is significantly associated with socioeconomic condition and psychological status. After adjustments for variables of interest, higher monthly income, and joining more social activities are significantly positively associated with HRQOL, whereas more worries and deeper depression are significantly inversely associated with HRQOL.

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