# Quality of life in patients with coronary heart disease after myocardial infarction and with ischemic heart failure

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### Abstract

**Introduction:** Quality of life measures are useful when interventions or treatments are indicated for several reasons such as improvement of physical functioning, pain relief, to estimate the effectiveness of therapies or to predict mortality. The aim of the current study was to describe quality of life in patients with stable coronary artery disease, myocardial infarction and heart failure and to evaluate the relationship between depression and health-related quality of life.
**Material and methods:** Patients after STEMI, with stable coronary artery disease, and heart failure ($n = 332$) completed the MacNew Heart Disease Health-related Quality of Life Questionnaire and the Hospital Anxiety and Depression Scale.
**Results:** Patients with myocardial infarction had significantly higher scores than patients with stable coronary artery disease or heart failure on the MacNew global scale ($p < 0.001$) and the physical ($p < 0.001$), emotional ($p < 0.001$) and social ($p < 0.001$) subscales. The anxiety scores were significantly higher in the group of patients with stable coronary artery disease than in patients with myocardial infarction ($p < 0.05$). The depression scores were significantly higher in patients with heart failure ($p < 0.01$).
**Conclusions:** In patients with stable CAD, anxiety correlated mainly with symptoms, i.e. angina, than with the history of MI. Patients with symptoms of angina react to the illness with anxiety more than depression, whereas patients with heart failure with dyspnea react to the illness with depressive symptoms more than anxiety. In patients after MI and with stable CAD, cognitive-behavioral techniques could be useful to quickly reduce the level of anxiety, while patients with heart failure require long-term support therapy to reduce the risk of depressive symptoms.

**Key words:** health-related quality of life, angina, myocardial infarction, heart failure.

## Introduction

Coronary heart disease (CHD) is the main cause of death in Poland [1]. The aims in the treatment of patients with CHD are to relieve symptoms, to maximize function in everyday life, and to achieve the highest level of health-related quality of life (HRQL) within the specific limits imposed by CHD. The World Health Organization defines quality of life

as 'an individual's perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment' [2]. In a clinical setting, assessment of patient-reported outcomes focuses on HRQL, i.e., how physical, emotional and social well-being are affected by a disease or its treatment [1, 3–5]. Patients with CHD experience numerous symptoms including fatigue, dyspnea, stenocardia or edema, and it is important to assess how the disease or its treatment impacts on the patient's physical, emotional and social well-being [1].

The aim of the current study was to describe HRQL in patients with stable coronary artery disease, myocardial infarction (MI) or heart failure. The secondary aim was to evaluate the relationship between anxiety and depression and HRQL.

## Material and methods

### Study sample

Consecutive patients who gave written consent hospitalized in the Department of Cardiology, Medical University of Gdansk, or referred for cardiac rehabilitation in the health clinic Leśnik, Helios in Sopot and Neptun in Wieżyca were recruited for the international HeartQoL Project [6]. The enrollment lasted 8 months in 2007. Patients were eligible if they had an objective measure of coronary artery disease (CAD) (e.g., previous MI, exercise testing, echocardiogram, nuclear imaging, or angiography). Patients were treated for:
A) stable coronary artery disease (Canadian Cardiovascular Society class II, III or IV) without a history of myocardial infarction (MI); or
B) 4 weeks to 6 months after ST elevation MI (STEMI) during rehabilitation course; or
C) diagnosed ischemic heart failure (New York Heart Association Class II, III or IV), with evidence of left ventricular dysfunction (ejection fraction ≤ 40% by invasive or non-invasive testing).

According to these criteria, we divided the group into 3 subgroups of patients.

Additional eligibility criteria included age 18 years and older, no serious psychiatric disorders, no present substance abuse and able to complete the questionnaires.

The questionnaires were completed by patients with stable CAD a day after elective coronary angiography or elective percutaneous coronary intervention (PCI), whereas in patients after MI and patients with diagnosed ischemic heart failure they were completed during the rehabilitation course.

### Research tools

To evaluate HRQL in patients with CAD we used the MacNew Heart Disease Health-related Quality of Life Questionnaire (MacNew) [7, 8]. The MacNew questionnaire is a 27-item questionnaire with a global scale and a physical (13-item), an emotional (14-item) and a social (13-item) subscale. The MacNew questionnaire is designed to assess the patient's feelings about how ischemic heart disease (IHD) affects daily functioning, and each item is scored from 1 (low HRQL) to 7 (high HRQL) with the minimal important difference (MID) of 0.50 points on the 7-point MacNew global scale and each subscale [9]. A score is generated for each of the Physical, Social and Emotional HeartQoL subscales as the mean of the number of subscale items with a response. The HeartQoL Global (Physical, Social, and Emotional) score is the sum of the score on all scored items divided by the number of scored items. As part of the international HeartQoL Project [6], the MacNew questionnaire was translated into Polish using forward-backward translation.

To determine the presence or absence of anxiety and depression, we used the Hospital Anxiety and Depression Scale (HADS), which is a screening instrument to identify symptoms of anxiety and depression [10]. Seven of the items relate to anxiety and seven relate to depression. Each item on the HADS is scored from 0 to 3, and this means that a person can score between 0 and 21 for either anxiety or depression. A score of 8 or more is used to classify patients with symptoms of either depression or anxiety [11].

### Statistical analysis

Patient clinical and sociodemographic characteristics are described as either dichotomous (%) or continuous variables (mean ± SD). MacNew HRQL scale scores (mean ± SD) were calculated using established scoring criteria for each instrument. Comparisons among cardiac diagnostic groups were made using analysis of variance (ANOVA) (continuous variables) and the $\chi^2$ test (categorical variables). The assumptions for ANOVA (normality and homoscedasticity) were tested by Kolmogorov-Smirnov, skewness, and kurtosis statistics. The Spearman correlation coefficient was used to calculate relationships between the continuous variables. Statistical significance was established at $p \leq 0.05$. SPSS version 16.0 (SPSS, Inc., Chicago, Illinois) was used for statistical analyses.

## Results

### Patient characteristics

Baseline sociodemographic and clinical variables were collected on the 332 patients (stable cor-

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**Table I.** Sociodemographic and clinical characteristics of patients as a total group and the subgroups of patients with stable coronary artery disease (Stable CAD), myocardial infarction (MI) or heart failure (HF)

| Patients' characteristics | Total group (n = 332) | Stable CAD (n = 115) | MI (n = 112) | HF (n = 105) | Value of p |
|---|---|---|---|---|---|
| Age, mean ± SD [years] | 60.2 ±10.1 | 58.4 ±8.6 | 59.1 ±10.4 | 63.4 ±10.5 | < 0.005[b, c] |
| Gender (%): | | | | | |
| Male | 74.4 | 71.3 | 71.4 | 81.0 | NS |
| Female | 25.6 | 28.7 | 28.6 | 19.0 | |
| Family status (%): | | | | | |
| Single | 15.4 | 12.2 | 17.0 | 17.1 | NS |
| Married | 75.3 | 82.6 | 70.5 | 72.4 | |
| Other | 9.3 | 5.2 | 12.5 | 10.5 | |
| Employment (%): | | | | | |
| White collar | 44.6 | 49.6 | 45.5 | 38.1 | NS |
| Blue collar | 55.4 | 50.4 | 54.5 | 61.9 | |
| Education (%): | | | | | |
| < High school | 40.7 | 33.0 | 39.3 | 50.5 | NS |
| High school | 40.1 | 43.5 | 43.8 | 32.4 | |
| > High school | 19.3 | 23.5 | 17.0 | 17.1 | |
| BMI*, mean ± SD | 28.0 ±4.4 | 29.1 ±4.1 | 27.6 ±3.9 | 27.2 ±4.9 | < 0.01[a, c] |
| Smoker (%) | 25.9 | 21.7 | 35.7 | 20.0 | NA |
| Hypertensive (%) | 59.9 | 73.0 | 56.3 | 49.5 | NA |
| Diabetic (%) | 23.2 | 25.2 | 16.1 | 28.6 | < 0.05[b] < 0.01[c] |
| Hypercholesterolemia (%) | 55.7 | 65.2 | 56.3 | 44.8 | NA |
| Physically inactive* | 54.5 | 68.7 | 46.4 | 47.6 | NA |

*Body mass index, **< times/week, NS – not significant, NA – not applicable, [a]MI vs. Stable CAD, [b]MI vs. HF, [c]Stable CAD vs HF.

onary artery disease, n = 115; MI, n = 112; HF, n = 105) recruited for the study, and these are detailed for the total group and each diagnosis in Table I.

Total group (n = 332): With an average age of 60 ±10 years, 74.4% were males ranging in age from 33 to 84 years (mean 59 ±10), and 25.6% were females ranging in age from 39 to 84 years (mean 63 ±11). In the total group 25.9% reported that they were current smokers and 54.5% exercised less than three times per week; 59.9% reported that their physician had told them they were hypertensive, 23.2% diabetic, and 55.7% hypercholesterolemic. Two patients had a history of cancer (0.6% of the group), 2 were dialyzed (0.6%), 17 (5.1%) had a history of gastrointestinal symptoms, 14 (4.2%) had respiratory symptoms, 18 (5.4%) had neurological complaints, and 24 patients (7.2%) had disorders of the urinary system.

There were no significant differences between the three groups in terms of their comorbidity.

Stable CAD with stable coronary artery disease (n = 115): The average age of patients with stable coronary artery disease was 58.4 ±8.6; 71.3% were men aged from 33 years to 78 years (mean 58.7 ±10.0), and 28.7% were women aged from 39 years to 81 years (mean 59.1 ±7.8). In this group, 21.7% reported that they were current smokers, and 68.7% exercised less than three times per week; 73.0% reported that their physician had told them they were hypertensive, 25.2% diabetic, and 65.2% hypercholesterolemic. Among the patients, 77.4% were in CCS class II, 18.3% were in CCS class III, and 4.3% were in CCS class IV.

Myocardial infarction (n = 112): The average age of patients with MI was 59.1 ±10.4; 71.4% were men aged from 41 years to 84 years (57.8 ±9.7), and 28.6% were women aged from 39 years to 76 years (mean 62.4 ±11.6). In this group, 35.7% reported that they were current smokers, and 46.4% exercised less than three times per week; 56.3% reported that their physician had told them they

were hypertensive, 16.1% diabetic, and 56.3% hypercholesterolemic. All patients were treated with percutaneous coronary intervention (PCI).

Heart failure (*n* = 105): The average age of patients with HF was 63.4 ±10.5. Among the patients with HF, 81% were men aged from 36 years to 82 years (mean 61.7 ±10.0), and 19% were women aged from 50 years to 84 years (mean 70.5 ±9.7). In this group, 20.0% reported that they were current smokers, and 47.6% exercised less than three times per week; 49.5% reported that their physician had told them they were hypertensive, 28.6% diabetic, and 44.8% hypercholesterolemic. Among the patients, 77.4% were in functional NYHA class II, 33.3% were in functional NYHA class III, and 1% were in functional NYHA class IV.

### Health-related quality of life

Patients with MI had significantly better HRQL than patients with stable coronary artery disease or heart failure, with higher scores on the MacNew global scale and each subscale. There were no differences between patients with stable coronary artery disease and those with heart failure (Figure 1).

The difference between patients with MI and patients with either stable coronary artery disease or heart failure exceeded the MID of 0.50 points on the MacNew global scale, the physical and the social subscales and met or exceeded the MID on the emotional subscale.

The level of HADS anxiety was significantly higher in patients with stable coronary artery disease

than patients with MI. Anxiety scores did not differ significantly between patients with MI and heart failure or between patients with stable coronary artery disease and those with heart failure. The HADS depression scores were significantly higher in patients with heart failure than those with MI. There were no significant depression score differences between patients with stable coronary artery disease and heart failure or between patients with stable coronary artery disease and patients with MI (Table II).

### Anxiety and depression

The presence of anxiety and depression symptoms (HADS score ≥ 8) in the total group was reported by 45.2% of the total group for anxiety and by 31.3% for depression (Figure 2). Patients with MI most frequently reported anxiety symptoms (57.10%), whereas symptoms of depression were most frequently reported by patients with heart failure (37.10%). The differences in the results obtained in different groups of patients for both depression and anxiety are statistically insignificant.

### Relationship between HRQL and HADS anxiety and depression

Correlation analysis between the level of HADS anxiety and depression and MacNew HRQL in the total group and by diagnosis demonstrated a significant negative relationship between HADS anx-
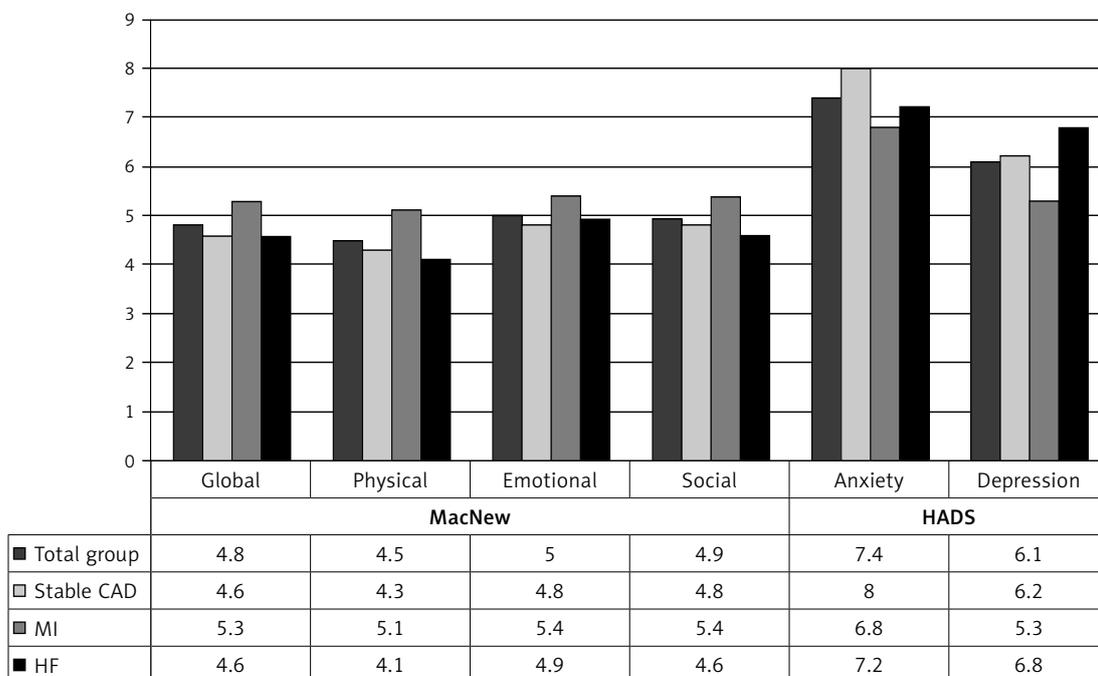
| | Global | Physical | Emotional | Social | Anxiety | Depression |
|---|---|---|---|---|---|---|
| | **MacNew** | | | | **HADS** | |
| ■ Total group | 4.8 | 4.5 | 5 | 4.9 | 7.4 | 6.1 |
| □ Stable CAD | 4.6 | 4.3 | 4.8 | 4.8 | 8 | 6.2 |
| ■ MI | 5.3 | 5.1 | 5.4 | 5.4 | 6.8 | 5.3 |
| ■ HF | 4.6 | 4.1 | 4.9 | 4.6 | 7.2 | 6.8 |

**Figure 1.** Patients' quality of life (global, as well as physical, emotional and social aspects) and depression level. Mean MacNew and HADS scores in the total group and the subgroups of patients with stable coronary artery disease (stable CAD), myocardial infarction (MI) or heart failure (HF)

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**Table II.** Mean MacNew and Hospital and Anxiety Scale (HADS) scores (± standard deviation) in the total group and the subgroups of patients with stable coronary artery disease (stable CAD), myocardial infarction (MI) or heart failure (HF)

| Scale | Total group | Stable CAD | MI | HF | Value of p |
|---|---|---|---|---|---|
| MacNew: | | | | | |
| Global | 4.8 ±1.0 | 4.6 ±0.8 | 5.3 ±0.9 | 4.6 ±1.0 | < 0.001[a,b] |
| Physical | 4.5 ±1.2 | 4.3 ±0.9 | 5.1 ±1.1 | 4.1 ±1.2 | < 0.001[a,b] |
| Emotional | 5.0 ±1.0 | 4.8 ±0.9 | 5.4 ±1.0 | 4.9 ±1.0 | < 0.001[a,b] |
| Social | 4.9 ±1.1 | 4.8 ±1.0 | 5.4 ±1.1 | 4.6 ±1.1 | < 0.001[a,b] |
| HADS: | | | | | |
| Anxiety | 7.4 ±3.7 | 8.0 ±3.6 | 6.8 ±3.5 | 7.2 ±4.1 | < 0.05[a] |
| Depression | 6.1 ±3.6 | 6.2 ±3.5 | 5.3 ±3.5 | 6.8 ±3.7 | < 0.01[b] |

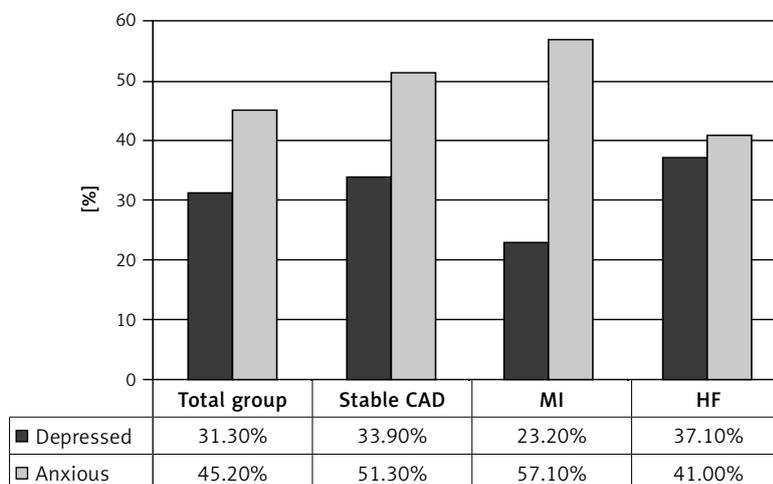[a]MI vs. stable CAD, [b]MI vs. HF, [c]Stable CAD vs. HF



**Figure 2.** Prevalence of depression and anxiety symptoms in the total group and the subgroups of patients with stable coronary artery disease (Stable CAD), myocardial infarction (MI) or heart failure (HF)

iety and depression and MacNew HRQL, with correlations ranging from –0.37 to –0.57 for anxiety and from –0.46 to –0.58 for depression (Table III).

## Discussion

Quality of life measures are useful when interventions or treatments are indicated for several reasons such as improvement of physical functioning, pain relief, to estimate the effectiveness of therapies and to predict mortality [1, 3, 12]. Studies of HRQL have examined various populations of patients with CHD including survivors of an acute MI, patients who have undergone coronary artery bypass surgery (CABG) or percutaneous coronary intervention (PCI), patients suffering from ischemic heart failure, patients enrolled in cardiac rehabilitation, and patients who have never experienced an acute event or procedure but nonetheless suffer from chronic stable coronary artery disease [13–17].

In our study, we compared quality of life in each of the three diagnostic groups of patients – sta-

ble coronary artery disease, heart failure, and MI – using the MacNew questionnaire [7, 8]. Our findings show significant differences in assessment of HRQL between the group of patients with MI and patients with either stable coronary artery disease or heart failure, who both have significantly poorer HRQL. These observations applied to the global MacNew HRQL and each of the three dimensions. Physical limitation due to heart failure and discomfort in the chest due to stable coronary artery disease significantly impact the assessment of quality of life, as reported before [18–21].

Patients with symptoms of stable coronary artery disease react to their illness with anxiety more than depression, whereas patients with heart failure with dyspnea react with symptoms of depression more than anxiety.

Several studies have reported that depression and anxiety predict subsequent mortality in patients with CHD [22, 23]. Anxiety is common in cardiovascular diseases [22], and a high proportion

**Table III.** Correlation between HADS anxiety and depression symptoms and HRQL in the total group and the subgroups of patients with stable coronary artery disease (stable CAD), myocardial infarction (MI) or heart failure (HF)

| Scale | Value | Total group | Stable CAD | MI | HF |
|---|---|---|---|---|---|
| **Anxiety:** | | | | | |
| Global | r | −0.53 | −0.57 | −0.50 | −0.53 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Physical | r | −0.36 | −0.39 | −0.39 | −0.34 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Emotional | r | −0.62 | −0.64 | −0.53 | −0.67 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Social | r | −0.41 | −0.46 | −0.37 | −0.40 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| **Depression:** | | | | | |
| Global | r | −0.58 | −0.58 | −0.57 | −0.56 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Physical | r | −0.48 | −0.48 | −0.46 | −0.44 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Emotional | r | −0.63 | −0.64 | −0.62 | −0.60 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |
| Social | r | −0.53 | −0.52 | −0.46 | −0.54 |
| | p | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

*r – Pearson's correlation coefficient.*

of depressed patients with CHD also have anxiety symptoms due to co-morbid socioeconomic factors [24–26]. In our study, we observed a higher prevalence of anxiety symptoms than depression symptoms in the total group: 45.2% vs. 31.3%, respectively. In the group of patients with anxiety symptoms, the highest prevalence was observed in patients with MI (57.1%); the proportion of patients with MI and anxiety symptoms in our study is considerably higher than in other studies, where symptoms of anxiety were observed in about 19% soon after MI [27, 28]. In our study, 41.0% of patients with HF reported anxiety symptoms, which is consistent with other studies which examined co-morbid anxiety in HF patients, where the range of anxiety symptoms reported was from 11% to 45% [29–31].

Depression is common in patients with CHD [23], and a high proportion of anxious patients with CHD also suffer co-morbid depression disorders [26, 32, 33]. In the group of patients with depressive symptoms, the highest prevalence in our study was observed in patients with HF (37.1%), which was at the higher end of results reported in other studies, where the prevalence of depression in patients with HF ranged from 15% to 40% [34–36]. The prevalence rate of depression symptoms was 23.5% in patients with MI, which is consistent with other studies, where the range of prevalence rates of major depression within 2 weeks after the MI was 16% to 27% [37–43].

There is evidence that both anxiety and depression predict HRQL in patients with CHD [44]. Our study indicates a negative correlation between the symptoms of both the HADS level of anxiety and depression scale and HRQL in the total group and in all three subgroups. This is consistent with other studies, where depression and anxiety after MI predict poorer HRQL, less effective cardiac rehabilitation, and more frequent visits to the cardiac outpatient clinic [45–47]. Other studies reported that the relationship between depression and HRQL may be dependent on the degree of functional impairment [18, 19].

In conclusion, in patients with CAD, anxiety correlated mainly with symptoms, i.e. stable coronary artery disease, than with the history of MI. This observation will individualize psychotherapeutic interventions. In patients after myocardial infarction and with stable coronary artery disease, cognitive-behavioral techniques could be useful to quickly reduce the level of anxiety and increase the competence of the patient in the control of anxiety. Patients with heart failure require long-term support therapy to reduce the risk of depressive symptoms. The highest MacNew HRQL scores were reported by patients after myocardial infarction. Patients with heart failure and stable coronary artery disease reported similar MacNew HRQL scores. HADS anxiety symptoms were reported by more than half of patients with either stable coronary artery disease (51.3%) or MI (57.1%), where-

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as HADS depression symptoms were reported less frequently, with the highest prevalence rate reported by patients with heart failure (37.1%).

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## Conflict of interest

The authors declare no conflict of interest.

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