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# Relation of the Readiness for Hospital Discharge after Myocardial Infarction Scale to socio-demographic and clinical factors. An observational study

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## ABSTRACT

**Introduction:** The aim of the study was to analyse the relationship between the Readiness for Hospital Discharge after Myocardial Infarction Scale (RHD MIS) scores and socio-demographic and clinical factors in patients after acute myocardial infarction (AMI) treated with percutaneous coronary angioplasty.

**Material and methods:** The study was conducted as a single-centre, prospective, cohort, 6-month observation, including 213 patients: 59 women and 154 men aged 30–91 years (average age of 62.91 ± 11.26 years).

**Results:** Patients' economic status was found to have a significant impact on the readiness for discharge measured by RHD-MIS general score.

Among all three investigated RHD-MIS subscales, objective assessment of knowledge was influenced by gender ( $p = 0.012$ ) and place of residence ( $p = 0.025$ ). There was a linear trend for increase of knowledge along with increase in education level ( $p = 0.030$ ). The only factor influencing patients' expectations was their economic status ( $p$  value for heterogeneity: 0.014). A linear correlation between growing of patients' expectations and worsening of their economic status ( $p = 0.008$ ) was observed.

**Conclusion:** Readiness to discharge should be routinely assessed in all patients hospitalized with myocardial infarction. The result of this assessment should be used to identify patients requiring additional education. Further research is prompted to determine the cut-off values of RHD-MIS results qualifying patients for additional educational interventions.

**Key words:** readiness for discharge from the hospital, myocardial infarction

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## Introduction

Lower levels of patients' readiness for discharge from hospital are associated with a higher risk of complications and a higher frequency of re-hospitalization [1–3].

In-hospital patient education regarding the disease and the specificity of treatment is a prerequisite for successful therapy after discharge [4–8]. Effective education should positively influence the patient's behaviour in reducing risk factors, self-control and adherence to prescribed pharmacotherapy [7,9–11]. On the other hand, non-adherence to medical recommendations results in serious health and economic consequences [12–15]. The Readiness for Hospital Discharge after Myocardial Infarction Scale (RHD MIS) is a validated

tool allowing the assessment of patients before leaving the hospital [16].

The aim of the study was to analyse the relationship between RHD MIS scores and socio-demographic and clinical factors in patients after acute myocardial infarction (AMI) treated with percutaneous coronary angioplasty (PCI).

## Material and methods

The study was conducted as a single-centre, prospective, cohort, 6-month observation. The study protocol was approved by the Bioethics Committee of Collegium Medicum, Nicolaus Copernicus University in

Toruń (No. KB 312/2015 of 21/04/2015). The research was performed in accordance with the Declaration of Helsinki and consistent with International Conference on Harmonization/Good Clinical Practice and applicable regulatory requirements. All AMI patients treated with PCI between May 2015 and July 2016 were considered eligible for the study. Out of 379 consecutive patients who met the inclusion criteria, 213 individuals were enrolled into the study, while 166 were rejected due to lack of consent for participation in the study (127 patients) or incomplete data precluding analysis (39 patients). All study participants gave written informed consent at the time of inclusion into the study. The study population consisted of 59 women and 154 men aged 30–91 years (average age of  $62,91 \pm 11,26$  years). The detailed clinical and sociodemographic characteristics of study population is shown in Table 1.

The readiness for discharge from hospital of patients enrolled into the study was assessed with The Readiness for Hospital Discharge after Myocardial Infarction Scale (RHD-MIS). The previously published RHD-MIS validation study showed a Cronbach coefficient of 0.789, indicating a high level of reliability and homogeneity of the questionnaire [9]. The RHD-MIS consists of 23 questions divided into three subscales: subjective (1) and objective assessment of patient knowledge of the disease (2) and the patient's expectations (3). Each one of the 23 RHD-MIS items is assigned a score from 0 to 3 points. The highest possible total score is 69 points with 21 points for each of the first and second subscales and 27 points for the third subscale. The questionnaire also contains non-scored questions regarding the patient's opinion on his/her readiness to be discharged from hospital. The RHD-MIS total scoring over 57 points indicates high readiness for discharge, while less than 44 points suggests low readiness, and a score of between 44 and 57 points is classified as medium readiness for discharge (Table 2) [16].

Statistical analysis was performed using Statistica 13.0 (StatSoft, Tulsa, USA). Continuous variables were presented as means with standard deviations. Due to non-normal distribution of the investigated continuous variables as indicated by the Shapiro-Wilk test, non-parametric tests were used for further statistical analysis. Comparisons between two groups were performed with the Mann-Whitney unpaired rank sum test. For comparisons between three groups, the Kruskal-Wallis one-way analysis of variance and multiple comparisons for assessment of heterogeneity were applied. The Jonckheere-Terpstra test for evaluation of a linear trend was used. Results were considered significant at  $p < 0.05$ , with  $p$  values  $\geq 0.05$  and  $< 0.10$  regarded as a trend towards significance and  $p$  values  $\geq 0.10$  marked as insignificant.

## Results

The level of readiness for discharge from hospital assessed with RHD-MIS general score as well as results obtained in three RHD-MIS subscales are shown in Table 3. Among the analysed clinical and sociodemographic factors, only patient self-reported economic status had significant impact on hospital discharge readiness measured with RHD-MIS general score. Statistical significance was found for heterogeneity and linear trend ( $p = 0.043$  and  $p = 0.015$  respectively) (Table 1). Multiple comparisons tests revealed a trend towards significance for differences in RHD-MIS general scores for patients with very good vs. acceptable ( $p = 0.093$ ) and very good vs. bad ( $p = 0.051$ ) economic status. The difference between acceptable and bad economic status was not significant.

Among the three RHD-MIS subscales, objective assessment of knowledge regarding coronary artery disease was influenced by the highest number of clinical and sociodemographic factors. Female gender was associated with significantly better knowledge ( $16.86 \pm 2.71$  vs.  $15.41 \pm 3.58$ ;  $p = 0.012$ ). Patients living in cities ( $> 100,000$  inhabitants) had better knowledge as compared with town or village residents ( $16.27 \pm 3.40$  vs.  $15.31 \pm 3.41$ ;  $p = 0.025$ ). The level of education showed a trend towards statistical significance for heterogeneity ( $p = 0.090$ ). However, test for linear trend revealed a significant increase of knowledge along with increase in education level ( $p = 0.030$ ). There was also a trend towards statistical significance for better knowledge of the disease in subjects aged  $< 65$  years ( $p = 0.074$ ), patients with a positive family history of CAD (chronic artery disease) ( $p = 0.072$ ) and without prior PCI ( $p = 0.053$ ) (Table 1).

Only the economic status was found to have significant influence ( $p$  value for heterogeneity: 0.014) on patients' expectations. There was also a strong linear correlation between the growing of patients' expectations and worsening of their economic status ( $p = 0.008$ ). Multiple comparisons tests revealed significant differences in expectations of patients with very good vs. acceptable ( $p = 0.020$ ) and very good vs. bad ( $p = 0.03$ ) economic status. The difference between acceptable and bad economic status was not significant. Regarding other parameters, a trend towards significance for lower expectations among patients aged  $< 65$  years ( $p = 0.098$ ) and professionally active patients ( $p = 0.091$ ) was present (Table 1).

No significant impact of the analyzed factors on subjective knowledge assessment was found.

## Discussion

It is necessary to perform hospital discharge readiness assessment in order to identify patients requiring

**Table 1.** Characteristics of study population and the RHD-MIS scores according to selected clinical parameters and sociodemographic factors.

Variable	N %	The subjective knowledge assessment		The objective knowledge assessment		The patient's expectations		General RHD-MIS score	
		mean±SD	p	mean±SD	p	mean±SD	p	mean±SD	p
<b>Gender</b>									
Female	59(27.7%)	17.88±3.04	ns	16.86±2.71	0.012	18.86±6.28	ns	53.61±8.33	ns
Male	154(72.3%)	17.75±3.30		15.41±3.58		17.07±7.20		50.23±10.27	
<b>Age</b>									
<65 years	119(55.87%)	17.51±3.42	ns	16.12±3.44	0.074	16.95±7.02	0.098	50.58±9.98	ns
≥65 years	94(43.13%)	18.13±2.95		15.43±3.40		18.35±6.90		51.90±9.72	
Primary	26(12.21%)	18.15±2.95	ns	14.69±3.69	0.090	17.96±6.66	ns	50.81±10.21	ns
Vocational/ Secondary	156(73.24%)	17.78±3.24		15.86±3.35	<b>0.030*</b>	17.71±7.10		51.34±9.84	
Higher	31(14.24%)	17.52±3.44		16.52±3.51		16.55±6.81		50.58±10.02	
<b>Employment status</b>									
Employed	86(40.38%)	17.57±3.50	ns	16.10±3.35	ns	16.49±7.31	0.091	50.16±9.99	ns
Unemployed/ OAP/ DLA recipient	127 (59.62%)	17.93±3.03		15.61±3.48		18.30±6.69		51.84±9.76	
<b>Economic status</b>									
Very good	12(5.6%)	17.92±2.07	ns	15.50±3.06	ns	11.42±7.96	0.014	44.83±9.52	0.043
Acceptable	190(89.2%)	17.71±3.33		15.81±4.47		17.84±6.82	0.008*	51.35±9.82	0.015*
Bad	11(5.16%)	19.00±2.14		16.27±3.23		19.55±5.92		54.82±8.92	
<b>Place of residence</b>									
City	112(52.58%)	18.05±3.21	ns	16.27±3.40	0.025	17.48±7.52	ns	51.80±10.06	ns
Town/Village	101(47.42%)	17.49±3.23		15.31±3.41		17.66±6.38		50.46±9.65	
<b>Marital status</b>									
Unmarried	21(9.86%)	17.43±3.64		15.24±3.92		17.05±6.71		49.71±10.86	
Married	163(76.53%)	17.85±3.23	ns	15.88±3.43	ns	17.45±7.00	ns	51.18±9.99	ns
Widowed	29(13.62%)	17.69±2.99		15.86±3.10		18.59±7.26		52.14±8.56	
<b>History of CAD</b>									
Yes	100(46.95%)	17.65±3.40	ns	15.69±3.31	ns	17.87±6.87	ns	51.21±	ns
No	113(53.05%)	17.90±3.07		15.92±3.54		17.30±7.11		51.12±	
<b>Prior hospitalization for CAD</b>									
Yes	82(61.5%)	17.95±3.13	ns	15.43±3.45	ns	18.29±6.64	ns	51.67±9.66	ns
No	131(38.5%)	17.68±3.29		16.05±3.41		17.11±7.18		50.85±10.01	
<b>Prior MI</b>									
Yes	60(28.17%)	17.95±2.90	ns	15.37±3.41	ns	17.95±7.12	ns	51.27±10.09	ns
No	153(71.83%)	17.72±3.35		15.99±3.43		17.42±6.95		51.12±9.81	
<b>Prior PCI</b>									
Yes	80(37.56%)	17.68±3.25	ns	15.26±3.43	0.053	18.25±6.49	ns	51.19±9.83	ns
No	133(62.44%)	17.85±3.22		16.14±3.40		17.16±7.26		51.15±9.93	
<b>Prior CABG</b>									
Yes	32(15.02%)	18.06±2.68	ns	14.97±3.66	ns	18.22±6.70	ns	51.25±9.84	ns
No	181(84.98%)	17.73±3.32		15.96±3.38		17.45±7.05		51.15±9.90	



**Table 1 cont.** Characteristics of study population and the RHD-MIS scores according to selected clinical parameters and sociodemographic factors.

Variable	N %	The subjective knowledge assessment		The objective knowledge assessment		The patient's expectations		General RHD-MIS score	
		mean±SD	p	mean±SD	p	mean±SD	p	mean±SD	p
Yes	157(73.71%)	17.81±3.23	ns	15.72±3.40	ns	17.97±6.84	ns	51.50±9.83	ns
No	56(26.29%)	17.71±3.23		16.07±3.53		16.45±7.33		50.23±10.01	
<b>Hyperlipidemia</b>									
Yes	145(68.08%)	17.68±3.38	ns	15.74±3.43	ns	18.08±6.75	ns	51.50±9.86	ns
No	68(31.92%)	18.00±2.89		15.97±3.46		16.49±7.40		50.46±9.93	
<b>Diabetes</b>									
Yes	61(28.64%)	18.05±3.05	ns	15.51±3.22	ns	18.13±7.02	ns	51.69±9.48	ns
No	152(71.36%)	17.68±3.30		15.93±3.51		17.34±6.99		50.95±10.04±	
<b>Current smoking staus</b>									
Yes	74(34.74%)	17.72±3.25	ns	16.03±3.61	ns	17.93±7.23	ns	51.68±10.41	ns
No	139(65.26%)	17.82±3.22		15.70±3.33		17.37±6.87		50.89±9.59	
<b>Family burden</b>									
Yes	128(60.09%)	17.65±3.27	ns	16.17±3.29	0.072	17.58±7.04	ns	51.40±9.55	ns
No	85(39.91%)	17.99±3.16		15.27±3.57		17.55±6.95		50.81±10.37	

Abbreviations:

CABG - coronary artery bypass grafting; CAD - coronary artery disease; DLA - Disability Living Allowance; MI - myocardial infarction; ns - not significant; OAP - old age pensioner; PCI - percutaneous coronary intervention; RHD-MIS - Readiness for Hospital Discharge after Myocardial Infarction Scale; SD - standard deviation

Notes:

City > 100,000 inhabitants; town ≤ 100,000 inhabitants

\* - p value for linear trend

**Table 2.** Results of the Readiness for Hospital Discharge after Myocardial Infarction Scale - (RHD-MIS) (General score assessment and subscales: 1. Knowledge - subjective assessment; 2. Knowledge –objective assessment; 3. Patient's expectations) [9].

	General RHD-MIS score	Subjective knowledge assessment	Objective knowledge assessment	Patient's expectations
Low level	≤43	≤15	≤12	≤13
Intermediate level	44-57	16-18	13-18	14-22
High level	≥58	≥19	≥19	≥23

**Table 3.** Results of the RHD-MIS in study population.

	Mean	Standard deviation	Min-max
I. Subjective knowledge assessment	17.78	3.23	8.0-21.0
II. Objective knowledge assessment	15.81	3.43	6.0-21.0
III. Patient's expectations	17.57	6.99	0.0-27.0
General RHD-MIS score	51.16	9.68	29.0-69.0

additional interventions preparing them for continuation of the therapy at home. Effective in-hospital education of patients leads to a better long-term clinical outcome and increases patient comfort [1–2]. Information regarding

the illness, methods of treatment, secondary prevention and possible sources of support are necessary for the good functioning of the chronic disease [4–5], however, in practice, some patients leaving hospital report lack

of this knowledge [17–18]. A research conducted by Kubica et al. [4–5] showed that the in-hospital education of myocardial infarction survivors is often insufficient or may not meet patients' needs, while in other studies excess of information provided to the patient at one time and maladjustment of content to the ability of the recipient were also showed [2,19].

To the best of our knowledge, no research results have been published so far showing the relationship between a comprehensively assessed readiness for hospital discharge and socio-demographic and clinical factors in patients with myocardial infarction. Readiness for discharge assessed with the RHD-MIS in the present study population was on an average level (RHD-MIS score =  $51.16 \pm 9.87$ ).

Patients' economic status was the only factor influencing the RHD-MIS results. The overall result of the RHD-MIS was largely dictated by significant differences in patients' expectations (subscale III). Patients who judged their status as bad were the ones who had the greatest expectations. Another interesting study finding was the difference between patients' subjective self-assessment of knowledge (subscale I) – usually producing higher scores, and the objective evaluation of patients' knowledge performed by medical staff (subscale II) – producing lower ratings. The opposite was found by Weiss et al. [3], the level of readiness to discharge was higher as assessed objectively by nurses as compared with subjective assessment performed by patients themselves. The results of objective assessment were associated with a higher complications rate and subsequent hospitalizations within 30 days after discharge from hospital [3].

In our study, a higher score for objective knowledge assessment was achieved by women as compared with men ( $16.86 \pm 2.71$  vs.  $15.41 \pm 3.58$ ,  $p = 0.012$ ) and by residents of cities as compared with residents of towns and villages ( $16.27 \pm 3.40$  vs.  $15.31 \pm 3.41$ ,  $p = 0.025$ ). These observations are difficult to explain and partly inconsistent with the results of other publications [20]. In previous studies [5,21–22], women achieved slightly lower results in terms of knowledge regarding coronary artery disease, and the effectiveness of in-hospital education was similar for both sexes [13,21–22]. Our observations concerning the differences related to the place of residence were similar to the results obtained in previous studies [5,21–22]. Higher results of objective knowledge evaluation were obtained by patients with higher education, which is consistent with many previous observations [5,21–26].

We have observed a tendency for higher results of objective knowledge assessment in younger patients (under 65 years of age) and in those without a history of previous revascularization. Lower results seen in elderly patients and confirmed in other publications

[5,21–22,27], may be related to memory impairment and cognitive dysfunction. Lower results of knowledge evaluation in patients after PCI suggest educational failure during the previous hospitalization, which possibly might contribute to re-occurrence of acute coronary syndrome.

Interestingly, we did not notice any relationship between the evaluated factors and the results of subjective assessment of knowledge performed by patients themselves (subscale I). It should be emphasized that on multivariate analysis the economic status of patients was the only independent factor influencing discharge readiness.

In order to be effective, in-hospital education of patients requires all members of the therapeutic team to be involved. The process of preparing the patient for discharge should start already at the time of admission to the ward and be consistently continued throughout the period of hospitalization [28]. Education should be individualized according to the continuous clinical observation of the patient, the progress evaluation and the identification of factors limiting the implementation of the assumed therapeutic goals.

## Conclusion

Discharge readiness assessment should be routinely performed in all patients hospitalized with myocardial infarction. The results of this assessment should be used to identify patients requiring additional education. Further research is required to determine the cut-off values of RHD-MIS qualifying patients for additional educational interventions.

## Statement of competing interests

None of the authors has any conflict of interest to declare regarding the article.

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