Aims and objectives. To explore fatigue levels two months after myocardial infarction and examine the associations with other concurrent symptoms, sleep quality and coping strategies.

Background. Fatigue has been found to be the most frequent and bothersome symptom after myocardial infarction, influencing health-related quality of life negatively.

Design. The present study was explorative and cross-sectional. The focus was on fatigue two months postmyocardial infarction, complemented with a comparative analysis of fatigue dimension levels.

Methods. The sample included 142 persons (mean age 63 years), treated for myocardial infarction, who responded to a questionnaire package measuring fatigue, depression, health complaints (symptoms), sleep quality and coping strategies.

Results. The main results showed that a global fatigue score two months postmyocardial infarction was associated with concurrent symptoms, such as breathlessness and stress, and coping strategies such as change in values, intrusion and isolation. In comparisons of present fatigue dimension levels (general fatigue, physical fatigue, reduced activity and mental fatigue) two months postmyocardial infarction with baseline measurements (first week in hospital), the results showed that levels of fatigue dimensions had decreased. In comparisons with levels of fatigue four months postmyocardial infarction in a reference group, we found lower levels of fatigue two months postmyocardial infarction.

Conclusion. The present findings indicated that postmyocardial infarction fatigue is lowest two months postmyocardial infarction. This may thus be the right time to identify persons experiencing postmyocardial infarction fatigue, as timely fatigue relief support may prevent progression into a state of higher levels of fatigue.

What does this paper contribute to the wider global clinical community?

- Early fatigue prevention interventions after myocardial infarction (MI) should be worthwhile and should include symptom relief and coping support.
- In the context of nursing practice, measuring fatigue two months post-MI enables the identification of persons experiencing fatigue in the early recovery phase and the introduction of interventions intended to prevent progression towards a state of fatigue or, at extreme levels, vital exhaustion.
Relevance to clinic practice. Measuring fatigue two months postmyocardial infarction would enable healthcare professionals to identify persons experiencing fatigue and to introduce fatigue relief support. Tailored rehabilitation support should include stress management and breathlessness relief support. If maladaptive use of the coping strategies isolation and intrusion is observed, these strategies could be discussed together with the patient.

Key words: fatigue, myocardial infarction, regression analysis, symptom assessment

Accepted for publication: 16 April 2015

Introduction

In research of symptom experiences four months after treatment for myocardial infarction (MI), 50% of persons reported post-MI fatigue (Alsén et al. 2010), and this proportion remained after two years (Alsén & Brink 2013). One year post-MI, Andersson et al. (2013) found constant and overwhelming physical and mental fatigue that was difficult to manage and led to obvious restrictions in daily life. Persons treated for MI seldom present with a single symptom, but research on symptom assessment has often focused on isolated symptoms. When a person experiences more than one symptom at the same time, this may pose a challenge to symptom management. Studying co-occurrence may create new insights into the interplay between symptoms.

Therefore, it is of vital importance to study multiple symptoms and their relationships simultaneously (Miaskowski et al. 2004). The research on early recovery after MI, including exploration of fatigue and its relation with other concurrent symptoms, sleep quality and coping, is limited and therefore in need of being extended.

Background

A symptom is generally considered to be a subjective experience (Dodd et al. 2001), and considering the period after MI, the experience of fatigue is one of the most bothersome symptoms (Alsén et al. 2008). Fatigue is defined as a ‘subjective, unpleasant symptom that incorporates body feelings ranging from tiredness to exhaustion, creating an unrelenting overall condition that interferes with persons’ ability to function to their normal capacity’ (Ream & Richardson 1996, p. 527). Research has also shown that persons with heart disease commonly experience illness-related symptoms in the recovery period, such as breathlessness and chest pain, both of which are associated with post-MI fatigue (Alsén et al. 2010). Further, persons may perceive stress due to different kinds of stressors and, in fact, a risk of developing post-traumatic stress disorder after MI has been identified (Bennett et al. 2001). A study of the stressor ‘threat appraisal’ after first MI showed that perceived threat was correlated with depression and that fatigue is a predictor of threat appraisal (Vögele et al. 2012).

Symptoms of depression are prevalent in one-third of persons treated for MI (Thombs et al. 2006). Fatigue and depression overlap, as fatigue is a core symptom of depression (American Psychiatric Association 2000). Therefore, in research on post-MI fatigue, symptoms of depression also have to be considered.

Symptom experiences after MI may be associated with the person’s use of coping strategies. Coping is a concept for research on illness adaptation and is defined as conscious, cognitive and/or behavioural efforts to deal with demanding situations that may exceed one’s personal resources (Lazarus & Folkman 1984). Persons experiencing psychological distress after MI (anxiety and/or depression) used fewer positive coping strategies, and more passive coping strategies (Son et al. 2012), than did nondistressed persons. The term coping is used regardless of whether the process is adaptive or nonadaptive, and no single coping strategy is considered inherently good or bad. Some strategies are more effective in certain contexts than others are (Lazarus & Folkman 1984).

Few studies of recovery from MI have emphasised fatigue and sleep quality, but a recent study showed that most patients admitted to hospital with heart disease reported poor sleep quality and that subjective sleep quality and daytime dysfunction were predictors of depressive symptoms (Norra et al. 2012). Sleep quality has been defined as including sleep duration, latency periods before falling asleep, number of awakenings, daytime dysfunction and subjective experiences of sleep quality (Buysse et al. 1989). Research on self-reported sleep quality in persons treated
with percutaneous transluminal coronary angioplasty showed that 42% experienced difficulties in maintaining sleep and that the greatest daytime dysfunction was physical fatigue (Edell-Gustafsson & Hetta 2001). A way to understand the development of fatigue post-MI is through longitudinal mapping of fatigue levels, but also by studying significant variables and their relationships to fatigue simultaneously. Research on fatigue two months post-MI would seem to be worthwhile because at this point persons are expected to have recovered, returned to work and to function in activities of daily living.

Therefore, the aim of the present study was to explore fatigue levels and to examine associations between fatigue and other concurrent symptoms, sleep quality and coping strategies two months post-MI. To evaluate the present fatigue levels two months post-MI, a secondary aim was to compare the present fatigue dimension levels with one baseline measurement point in the present sample and with two reference populations. The first reference group was taken from a four-month post-MI follow-up study and the second reference group from a general population study.

Methods

Respondents and procedure

The present investigation was carried out as an explorative, cross-sectional study of fatigue two months post-MI. Respondents who met the diagnostic criteria for MI based on electrocardiographic, symptom and enzymatic criteria and were ≤75 of age were consecutively recruited by three research nurses during the first week of treatment at a coronary care unit in a Swedish regional hospital between March 2011–March 2012. Exclusion criteria were cognitive disorientation, communicative disabilities and other severe diseases (e.g. cancer). At the present measurement point two months after the heart attack, when most persons treated for MI are expected to have recovered and returned to work, the respondents who agreed to participate during the first week in hospital answered five questionnaires about fatigue, sleep quality, somatic health problems, depression, coping and a single item on stress measurement. To evaluate the present fatigue levels two months post-MI, these means were compared with a baseline measurement in the present sample (first week in hospital) and with two reference groups. The first reference population was taken from a four months post-MI follow-up study comprising 204 persons who received post-MI treatment (percutaneous coronary intervention 71%) and medication (beta blocker 88%) similar to that received by persons in the present study. Moreover, the exclusion and inclusion criteria, with the exception of age (<80 year), were similar. The mean age of the respondents was 64 ± 10, and the majority were men (71%) (Alsén et al. 2010). The second reference group was taken from a general population study consisting of a sample (n = 139) taken from the telephone directories and representing the characteristics of normal controls in the age range 46 ± 16 years (Smets et al. 1998).

Questionnaires

The respondents completed The Multidimensional Fatigue Inventory (MFI-20) (Smets et al. 1995), a 20-item questionnaire assessing fatigue in relation to five dimensions. A Swedish validation study, conducted with Rasch analysis in an MI sample, guided a multidimensional assessment including four dimensions: mental fatigue, general fatigue, physical fatigue and reduced activity. However, the dimension reduced motivation was not valid in the MI sample, and therefore in the present study, this dimension was excluded from the multidimensional analysis of fatigue. Moreover, the Rasch analysis supported the unidimensionality of the total score, measured by a global MFI-20 score.

According to the Rasch model, when the data fit the model, the global score (summarised raw scale scores) should be transformed into interval scale scores, to obtain a more valid measurement of the outcome (Fredriksson-Larsson et al. 2015). The response alternatives run from agreement ‘yes that is true’ to disagreement ‘no, that is not true’ on a scale from 1–5, where higher scores indicate more fatigue, with a possible range of 4–20 for each dimension. Cronbach’s alpha was between 0·88–0·92, and the range 20–100 for the global score.

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al. 1989), which investigates seven components (sleep disturbance, sleep latency, subjective sleep quality, sleep duration, daytime dysfunction, habitual sleep disturbance and use of sleep medication) and gives a total summery score. To complete the 19 items, respondents rated the components on a scale from 0–3, with a possible range of 0–21 and where higher scores indicate poorer sleep quality. In the present study, Cronbach’s α was 0·76.

Somatic health problems were measured using the Somatic Health Complaints Questionnaire (SHCQ) (Brink et al. 2007), which investigates four dimensions: fatigue, breathlessness, pain and unrest. The 13 items were rated on a six-point scale, ranging from ‘never’ to ‘always during the past week,’ with a possible range of 4–24 for the dimensions fatigue and pain, 2–12 for breathlessness and 3–18
Descriptive statistics, frequencies, means and standard deviations were calculated to explore the included variables for unrest. Higher scores indicate more severe somatic health problems. In the present study, the dimension fatigue was excluded from the analysis due to the use of another fatigue inventory. Cronbach’s alpha was 0.87 for breathlessness, 0.60 for unrest and 0.68 for pain.

Depressive symptoms were measured using the Montgomery–Asberg Depression Rating Scale (MADRS-S) (Montgomery & Asberg 1979). The nine self-assessment items measure severity for assessment of depression or depressive symptoms during the past three days using a rating scale from 0–6, with a possible total range of 0–54. Higher scores indicate depression symptoms. In the present study, Cronbach’s α was 0.84.

Coping reasoning was measured using The General Coping Questionnaire (GCQ) (Brink et al. 2009), which investigates 10 dimensions (minimisation, social trust, change in values, problem reduced actions, self-trust, restrain adaptation, intrusion, isolation, fatalism, protest and resignation). The 41 items were responded to on a six-point scale ranging from ‘I always think or act like this’ to ‘I never think or act like this’. All scales were transformed to the same range, with a possible total score range of 0–100. Higher scores indicate greater use of the coping strategy in question. In the present study, Cronbach’s α was between 0.70 (fatalism)–0.89 (protest).

Stress was measured using a single-item measurement of stress symptoms (Elo et al. 2003). This item converges with items on sleep disturbance, psychological symptoms and well-being and covers the general experience of stress. ‘Stress refers to a situation in which a person feels tense, restless, nervous or anxious or is unable to sleep at night because his/her mind is constantly troubled. Do you currently feel this kind of stress?’ The response was recoded on a five-point rating scale ranging from ‘not at all’ to ‘very much’, with a possible total score range of 1–5. Higher scores indicate greater stress.

**Ethics**

The Regional Ethical Review Board in Gothenburg (720-10) approved the study. The participants were informed about the study aim and procedures both in writing and verbally and were given adequate time to consider participation during the first week in hospital. Data collection was performed by trained research nurses. Informed written consent was obtained from those who wished to participate.

**Data analysis**

Descriptive statistics, frequencies, means and standard deviations were calculated to explore the included variables. Correlations between global fatigue and other variables were analysed using Pitman’s permutation test and Pearson’s correlation coefficient (95% confidence interval). Further, for development of a final regression model, a forward stepwise approach was used, choosing variables that had a p-value of < 0.05 in the univariate correlation analyses (Nunnally & Bernstein 1994). These significant independent variables were divided into four groups depending on their content and analysed in four subsequent regression analyses: Group 1: demographic and clinical variables like age, gender, treatment with β-blockers and ejection fraction; Group 2: concurrent symptoms like pain, breathlessness, unrest and stress; Group 3: sleep quality; and Group 4: coping strategies. Then, a final regression model was tested including the remaining significant variables. A p-value < 0.05 was considered statistically significant. To evaluate the present fatigue levels two months post-MI, the MFI-20 dimension means were compared with a baseline measurement in the present sample (first week in hospital) using paired sample t-tests and with two reference groups using independent samples t-tests in IBM SPSS Statistics (version 21 SPSS Inc., Chicago, IL, USA).

**Results**

**Descriptive data**

Two months after MI, 142 persons of 165 answered the questionnaire package. The mean age of the respondents

| Total n | Demographics and clinical data | n = 142 ± SD |
|---------|--------------------------------|------------|
| Age mean, (±SD) | 63 (8.2) |
| Gender women, n (%) | 32 (23) |
| Gender men, n (%) | 110 (77) |
| Days in hospital (±SD) | 4.9 (2.8) |
| Interventions | | |
| Percutaneous Coronary Intervention, n (%) | 113 (80) |
| Coronary Artery Bypass Graft, n (%) | 5 (3.5) |
| Beta blocker, n (%) | 116 (82) |
| History of Co morbidity, n (%) | | |
| Hypertension | 52 (37) |
| Diabetes | 18 (13) |
| Stroke | 2 (1.4) |
| Smoking | 12 (8.4) |
| Cohabiting n (%) | 115 (81) |
| Education ≤9 years n (%) | 67 (47) |
| Grammar/High school | 48 (34) |
| University | 23 (16) |
| Occupation employed n (%) | 62 (44) |
was 63 ± 7.7 and the majority were men (77%). A total of 50% were employed prior to the MI and 81% were cohabiting. A commonly used in-hospital treatment was percutaneous coronary intervention (80%). Demographics and clinical data are presented in Table 1. Descriptive data and correlations for the global score of fatigue, sleep quality, coping scales and symptom experiences are presented in Table 2.

Associations between variables

The univariate analyses of associations between fatigue (the summed MFI-20 score) and independent variables two months post-MI showed that age, concurrent symptoms (stress, pain, breathlessness and unrest), sleep quality and all coping strategies were correlated with fatigue; see Table 2. Furthermore, in the four preceding multivariate regression analyses, aimed at identifying a final regression model, nine independent variables remained significantly associated with fatigue: age ($p = 0.035$), depression ($p = 0.002$), breathlessness ($p < 0.001$), stress ($p = 0.007$), sleep quality ($p < 0.001$), and the coping strategies change in values ($p = 0.044$), isolation ($p < 0.001$), minimisation ($p = 0.001$) and intrusion ($p = 0.012$). In the end, based on a regression analysis including these nine independent variables, the final multiple regression model was developed, explaining 49% of the variance in fatigue and comprising five predictors: symptoms of stress and breathlessness and the coping strategies isolation, intrusion and change in values; see Table 3. Concerning concurrent symptoms, each unit increase in stress increased fatigue by 3.6 units (CI 95%; 2.09–5.11), and each unit increase in breathlessness increased fatigue by 1.45 units (CI 95%; 0.74–2.16). Regarding coping strategies, the relationships were also significant; each unit increase in change in values decreased fatigue by 0.09 units (CI; 95% −0.16 to −0.02) and each unit increase in isolation and intrusion increased fatigue by

### Table 2: Descriptive data and correlations between transformed fatigue score, concurrent symptoms, sleep quality and coping strategies

| Variables | Mean ± SD (Range) | $p$-Value* | Pearson’s correlations coefficient† |
|-----------|------------------|------------|-------------------------------------|
| Dependent | Fatigue          | 59.15 ± 11.72 (20–89.4) | >0.30 | Nonsignificant |
| Group 1   | Gender           | n = 110 men, 32 female | >0.30 | Nonsignificant |
| Group 1   | Ejection fraction| >50% n = 85, <50% n = 38 | 0.12 | Nonsignificant |
| Group 1   | Beta blockers    | n = 116 yes, 26 no | >0.30 | Nonsignificant |
| Group 1   | Age              | 63.04 ± 8.23 (35–75) | 0.034 | r = −0.18 (−0.33 to −0.01) |
| Group 2   | Stress           | 2.10 ± 1.04 (1–5) | <0.001 | r = 0.51 (0.38 to 0.62) |
| Group 2   | Depression symptom| 5.76 ± 5.98 (0–29) | <0.001 | r = 0.54 (0.41 to 0.65) |
| Group 2   | Pain             | 6.04 ± 2.59 (4–16) | <0.001 | r = 0.39 (0.24 to 0.52) |
| Group 2   | Breathlessness   | 4.66 ± 2.18 (2–12) | <0.001 | r = 0.48 (0.34 to 0.60) |
| Group 2   | Unrest           | 5.91 ± 2.58 (3–13) | <0.001 | r = 0.52 (0.39 to 0.64) |
| Group 3   | Sleep quality    | 6.13 ± 3.79 (1–17) | <0.001 | r = 0.50 (0.36 to 0.61) |
| Group 4   | Coping: Fatalism | 27.70 ± 18.40 (0–75) | <0.001 | r = 0.30 (0.15 to 0.45) |
| Group 4   | Coping: Problem reduced activity | 78.43 ± 19.10 (20–100) | 0.032 | r = −0.18 (−0.33 to −0.01) |
| Group 4   | Coping: Resignation | 19.30 ± 20.23 (0–90) | <0.001 | r = 0.33 (0.17 to 0.47) |
| Group 4   | Coping: Change in values | 58.20 ± 21.10 (5–100) | 0.005 | r = −0.23 (−0.39 to −0.07) |
| Group 4   | Coping: Protest  | 19.33 ± 22.93 (0–90) | <0.001 | r = 0.37 (0.22 to 0.50) |
| Group 4   | Coping: Social trust | 80.90 ± 20.16 (0–100) | 0.043 | r = −0.17 (−0.33 to 0.00) |
| Group 4   | Coping: Isolation | 13.03 ± 16.50 (0–84) | <0.001 | r = 0.51 (0.37 to 0.62) |
| Group 4   | Coping: Minimisation | 77.20 ± 17.09 (28–100) | <0.001 | r = −0.44 (−0.57 to −0.30) |
| Group 4   | Coping: Intrusion | 17.36 ± 18.31 (0–90) | <0.001 | r = 0.51 (0.38 to 0.62) |
| Group 4   | Coping: Self-trust | 72.66 ± 20.40 (15–100) | <0.001 | r = −0.36 (−0.5 to −0.2) |

SD, standard deviation.
*Pitman’s test.
†Pearson’s correlation coefficient; with 95% confidence interval.

### Table 3: The final multiple regression analysis. Explaining 49.2% of the variance of fatigue two months post-myocardial infarction

|          | B     | 95% CI   | $p$-value |
|----------|-------|----------|-----------|
| Stress   | 3.59  | 2.09 to 5.11 | <0.001    |
| Breathlessness | 1.45 | 0.74 to 2.16 | 0.001    |
| Isolation | 0.14 | 0.02 to 0.25 | 0.017    |
| Intrusion | 0.11 | 0.00 to 0.21 | 0.041    |
| Change in values | −0.09 | −0.16 to −0.02 | 0.009    |

B, Beta; CI, confidence interval for beta.
that stress was associated with fatigue has also been found emphasizing coping strategies. The present result showing entended towards relieving stress and breathlessness, as well as cate that early fatigue prevention after MI should be ori-

Discussion

The findings showing that the MFI-20 global score was associated with other concurrent symptoms and coping strategies (change in values, intrusion and isolation) indicate that early fatigue prevention after MI should be orien-
ted towards relieving stress and breathlessness, as well as emphasising coping strategies. The present result showing that stress was associated with fatigue has also been found in other studies (e.g. Vögele et al. 2012). Persons stricken by a heart attack describe recovery as a traumatic experience, including unusual tiredness and presence of fear and anxiety owing to their unreliable body and altered outlook on life (Andersson et al. 2013). Moreover, fatigue, general health and disease-specific symptoms were important stressors immediately after the MI (Vögele et al. 2012). Stress occurs when environmental demands exceed the person’s resources, and endangering his/her well-being (Lazarus & Folkman 1984). Accordingly, related to the subjective experience of MI, stressors such as greater fear of dying and experiences of helplessness predicted stress status better than objective measures of MI severity did (Guler et al. 2009). In a study of post-traumatic stress three months post-MI, a higher frequency of intrusive and distressing memories of the MI was a potential trigger of post-trau-
matic stress, as was a higher frequency of symptoms that persons believed were associated with the coronary event (Bennett et al. 2001).

Stress appraisal is based on personal beliefs, values and goals, and the options for coping are determined by the person’s health and biopsychosocial resources (Lazarus & Folkman 1984). The present study showed that coping strategies such as isolation, intrusion and change in values were associated with fatigue two months post-MI. The cop-
ing strategy intrusion includes the inability to keep threats at a distance and a feeling of anxiety about how the situation will end (Brink et al. 2009). During early recovery post-MI, persons are worried about suffering a new MI, but over time they gradually get better, some requiring the support of a mentor and some being able to handle the fear themselves (Jünhag et al. 2013). After MI, persons described no longer daring to trust their bodies or their minds, because their heart could stop without warning, and new signs of irritation and anger were present that had not occurred pre-MI (Andersson et al. 2013). Moreover, threat appraisal changes over time, and results have shown that threat appraisal was related to strategies such as a search for affiliation (contacting people who have had a similar experience) and threat minimisation (things are bad now, but they will get better) (Vögele et al. 2012).

Our results showed that the coping strategy isolation was associated with perceived fatigue two months post-MI. This

Original article

Fatigue two months after myocardial infarction

Table 4 Multidimensional Fatigue Inventory 20 (MFI-20) levels, in patients with MI at baseline (during first week post-MI) compared with two months post-MI, with four months post-MI (another sample) and general population

| MFI-20 scale | Fatigue at baseline | Fatigue two months post-MI | Paired-samples t-test | Fatigue four months post-MI | Two-sample t-test (two months–four months) | General Population* | Two-sample t-test (two months–general population) |
|--------------|---------------------|----------------------------|-----------------------|-----------------------------|-------------------------------------------|----------------------|-----------------------------------------------|
|              | n = 165             | n = 142                    | p-Value               | Mean (SD)                   | Mean (SD)                                 | n = 204              | Mean (SD)                                    | p-Value                        |
| General fatigue | 11.9 (4.5)          | 10.9 (4.4)                 | 0.007                 | 12.3 (4.3)                  | 0.003                                     | 9.9 (5.2)          | 0.083                                         |
| Physical fatigue  | 11.7 (4.8)         | 10.6 (4.4)                 | 0.010                 | 11.9 (4.7)                  | 0.009                                     | 8.8 (4.9)           | 0.001                                         |
| Reduced activity  | 12.1 (6.5)          | 10.7 (4.3)                 | 0.016                 | 12.1 (4.5)                  | 0.004                                     | 8.7 (4.6)           | 0.000                                         |
| Mental fatigue  | 9.3 (3.6)           | 8.7 (4.0)                  | 0.036                 | 10.2 (3.8)                  | 0.000                                     | 8.3 (4.8)           | 0.448                                         |

SD, Standard deviation; MI, myocardial infarction.
*Alsen et al. (2010).
†Smets et al. (1998).

0.14 (95% CI; 0.02–0.25) and 0.11 (95% CI; 0.00–0.21) units, respectively.
coping strategy involves the person choosing not to talk about the disease, a lack of open communication with the family and thinking that no one understands one’s problems, resulting in self-isolation (Brink et al. 2009). Persons have different expectations about and approaches to their future life. Some have a tendency to be self-centred and to go their own way, while others take a short-term perspective and are cautious about the future, constantly prepared for a setback (Eriksson et al. 2010). It seems important to receive social support, e.g. peer support from lay people with similar experiences and from relatives or family support in the early rehabilitation phase, as such support promotes feelings of security (Juntehag et al. 2014). Conversely, persons lacking in support may experience undesired loneliness and doubt (Juntehag et al. 2013). Research on rehabilitation support has shown that couples who were given opportunities to discover differences in their thoughts and expectations regarding the future were able to compensate for and balance each other by working on developing a positive attitude towards life and the future (Eriksson et al. 2010).

In the present study, breathlessness makes a strong contribution to the explained variance in fatigue two months post-MI. This result is consistent with an interview study three weeks post-MI showing that persons complained of weakness and shortness of breath (Webster et al. 2002). In another interview study six weeks post-MI, persons described breathlessness as the most harmful symptom, leading to disturbed sleep and resulting in fatigue during daily activities (Roebuck et al. 2001). Also, at six months post-MI, fatigue and breathlessness were associated with less physical activity measured using pedometer registration (Brändström et al. 2009). On the basis of all of these results, we can reasonably conclude that it is important to prevent development of fatigue through early identification and support of persons experiencing breathlessness. An important aspect to consider in helping MI patients be physically active is their possible thoughts about the relationship between tiredness, breathlessness and heart dysfunction. Azevedo et al. (2007) showed that a clinical syndrome of heart failure (two or more cardiac symptoms) was common in middle-age and older persons, but that less than half of these cases were objectively related to cardiac abnormality. This means that it is difficult to distinguish pathological conditions from the mere physical decline often associated with ageing. Further, research has shown that persons interpret fatigue incorrectly, believing it to be a sign that cardiac function is impaired and that physical activity is harmful (Webster et al. 2002). This may mean that, in the recovery phase, persons who experience fear of movement (Bück et al. 2013) related to the heart attack event should be encouraged and helped to engage in physical activity, which in turn may have positive effects on breathlessness and fatigue.

The findings at two months post-MI showed that the mean scores for fatigue dimensions in the MFI-20 (physical, mental and general fatigue and reduced activity) were slightly decreased compared to an earlier baseline measurement in the present sample. Furthermore, compared with persons who were tested for fatigue four months post-MI (Alsén et al. 2010), the present study group scored lower on general fatigue, physical fatigue, reduced activity and mental fatigue. These comparisons are interpreted as possibly indicating an increase in fatigue from two months to four months post-MI. Compared to the second reference group – the general population – physical fatigue and reduced activity scores were higher in the present sample. This may indicate a recovery problem due to the fact that, at two months post-MI, persons are expected to return to work when their sick leave period has ended. This will likely cause problems for some persons experiencing post-MI fatigue and other concurrent symptoms if they need time for rest and recuperation. Therefore, measuring fatigue after two months could help guide nursing care strategies aimed at early identification of fatigued persons and help prevent progression towards a state of increased fatigue or at extreme levels vital exhaustion.

Finally, other studies have shown that disturbed sleep has an impact on fatigue experience after MI (Brink et al. 2012). In the present study, sleep quality was associated with fatigue, but the association was not statistically significant in the final regression analysis. This result does not in any way imply that sleep quality is not important or that it should be excluded from future research on fatigue. Newer research showed that 52% of the participants (n = 259) in cardiac rehabilitation reported poor sleep quality, and poor sleep quality occurred more often in persons with depressive symptoms. Poor sleep quality was also associated with decreased health-related quality of life (Banack et al. 2014).

Conclusion
The present findings indicated that post-MI fatigue is lowest two months after MI. Thus, this may be the appropriate time to identify persons experiencing post-MI fatigue, as timely fatigue relief support may prevent progression into a state of increased fatigue. Fatigue relief support may rely on identification not only of fatigue, but also other concurrent symptoms.
Relevance to clinic practice

Screening for fatigue two months post-MI would enable healthcare professionals to identify persons experiencing fatigue and introduce fatigue relief support. Tailored rehabilitation support should include stress management and breathlessness relief support. If maladaptive use of the coping strategies isolation and intrusion is observed, these strategies could be discussed together with the patient. Identifying and supporting persons experiencing fatigue, but also emphasising the symptoms of breathlessness and stress is of importance in preventing fatigue levels two months post-MI from getting worse.

Limitation

The present study explored fatigue two months post-MI. The comparison between the fatigue dimension levels of the MFI-20 at two months and four months post-MI was carried out on two different samples, yet these two samples were based on the same diagnosis as well as similar inclusion and exclusion criteria. The conclusion that there is a risk that fatigue may increase from 2–4 months post-MI has to be handled with some caution. Additional longitudinal research is needed.

Acknowledgements

This work was supported by the Centre for Person-Centred Care at the University of Gothenburg (GPCC), Sweden. GPCC is funded by the Swedish Government’s grant for Strategic Research Areas, Care Sciences (Application to Swedish Research Council no. 333-02) and co-funded by the University of Gothenburg, Sweden.

Contributions

Study design: UFL PA, BWK EB, data collection and analysis: UFL PA EB and manuscript preparation: UFL, PA BWK, EB.

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