Barriers to Care Among Post-discharge Chronic Heart Failure Patients

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Preface

The elective period we as medical students have in January our second year is a rare opportunity to combine the educating process of collecting and reviewing data with the extraordinary option of looking at a medical topic through the eyes of another nation. We immediately decided that we wanted to use this period to its full extent. Having a bit of a rough start with finding contacts abroad, our luck eventually turned when we happened to come across a freshly released report on cardiovascular risk and disease in Australian women, *Hidden Hearts*, which Professor Maja-Lisa Løchen at UiT had been a part of. Instantly inspired by the subject’s relevance and seriousness, we decided that cardiovascular disease is a topic in need of more attention.

Through Professor Løchen we got in contact with Professor Simon Stewart, the inaugural Director of the Mary MacKillop Institute for Health Research (MMIHR) located in Melbourne, Australia. He arranged for our stay at the MMIHR during our elective month in January, and gave us access to data to survey, which were collected by him and his research team in advance for the *Which Heart failure Intervention is most Cost-effective in reducing Hospital care (WHICH?) II* trial. Their results and report on the WHICH? II trial is yet to be released, but our assignment will to a great extent be based on our analysis of the study cohort from this trial - more specifically the participants that face hindrances in maintaining their disease because of struggles to attend the existing health services available and/or their ability to self-care.

CHF is a condition that affects the heart’s function or structure, resulting in an insufficient pumping function and delivery of oxygen to the body, and give rise to a series of typical symptoms such as breathlessness and fatigue (1). The aim of this report is to explore as well as describe the obstacles and barriers that CHF-patients may face in their managing of the disease, and how these complications can affect their outcome. By acknowledging these barriers and giving them a character we hope to further the understanding of the complexity and uniqueness that each individual case present, and thereby promote the ability to treat these cases based on their individual demands. Furthermore, we hope that this report will give
some attention to a disease so lacking of awareness and research considering its extreme burden on populations and health care systems worldwide (2).

The WHICH? II trial (from which our data is collected) is financed by the National Health and Medical Research Council Project Grant (2013 - 2016) number 1049133. Lånekassen also contributed with financial support to our project.

We would like to thank our supervisor Tor Brynjjar Stuge, for always being available for questions and for guiding us on our assignment whenever needed. We would also like to show gratitude to Professor Maja-Lisa Løchen, for helping us with getting in contact with the institute that has given us such an educational value.

A special thanks to the whole research team and staff at the MMIHR for taking us in with an extraordinary openness and hospitality, and for their vital help and guidance before, during and after our stay with them. Most importantly we wish to express our sincere thanks to Professor Simon Stewart who has motivated, inspired and guided us with his immense knowledge, and dedicated his time, energy and support throughout this whole experience.

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Abstract

**Background:** Chronic heart failure (CHF) is one of the most mortal and disabling of cardiovascular disease (CVD) syndromes, and represents an international health problem. However, there is currently a lack of awareness and research surrounding the disease, which results in an insufficient understanding of both the nature of the illness as well as the managing of it.

**Objective:** To describe and increase the awareness of specific barriers to care a CHF patient may experience - reporting their commonness, severity and expected consequences.

**Material and methods:** Patients were recruited by research teams for the WHICH? II trial - recruitment beginning 1st of July 2013 and completed the 31st of January 2016. A baseline profile from all the eligible participants was collected by applying a combination of extensive self-report and review of patient records (also conducted by the same research team), and the following analysis and characterization of the study population we carried out was done using the statistical program SPSS. In addition, there was conducted a supplementary literary study.

**Results:** Amongst the study cohort there was an obvious presence of barriers that could hinder the patient in effective managing of their health and disease. We identified and described five of these barriers: living remote from health care services, age in the upper quartile (83+), cognitive impairment and/or language barrier, living alone, NYHA class III or IV. Due to this observable and evident presence one can describe the barriers surveyed as common and with high frequency amongst CHF patients. All of the barriers had a high prevalence, and the least common barrier still was present in around ¼ of the study cohort. All of these barriers can also be viewed as possible roots for complications in the patients maintaining of good health and disease management. Looking at the existing knowledge regarding each individual barrier, it is obvious that these factors have a high potential risk of affecting the patient’s ability to manage their own health and condition.

**Conclusions:** The barriers to health care described can despite their variations all be characterized as common hindrances for the typical CHF patient. Some of the individual barriers vary in severity and therefore also in their potential risks and likelihood.
Abbreviations

CVD; Cardiovascular disease(s)
CBI; Clinical-based intervention
CHF; Chronic heart failure
CHF-MP; Chronic heart failure managing programs
HBI; Home-based intervention
MMIHR; Mary MacKillop Institute for Health Research
MoCA; Montreal Cognitive Assessment
NYHA; New York Heart Association
SPSS; Social Sciences Statistical Package
WHICH?; trial Which Heart failure Intervention is most Cost-effective in reducing Hospital care trial
Introduction

Cardiovascular disease

Cardiovascular disease is used to describe all the diseases and conditions that have an effect on the heart and blood vessels of the body (3, s.3). Currently regarded as a major cause of death, as well as a leading burden of disease, we could consider the term as highly relevant on a global scale. Presented by the World Health Organization, data from 2012 estimate that 31% of all deaths worldwide were CVD-related, corresponding to a total of 17.5 million people (4). Despite a still high rate, the overall mortality seems to have declined since its peak in the late 1960s, partly due to increased focus on prevention, but also as a consequence of improved treatment methods, detections and research on the area (3, s.4-5). Having said that, improved survival of patients, along with an ageing population in most developed countries, results in a greater amount of individuals who have to live with a cardiovascular condition, and therefore an expanded burden both globally and for individual nations.

One of the conditions that is considered to contribute to a larger pool of CVD patients in the future, and therefore attributable to an increased burden of heart disease worldwide, is chronic heart failure (2). Based on these expectations, it is beyond any doubt a need to further improve health care services and follow-up of this particular group of patients.

What is chronic heart failure (CHF)?

Chronic heart failure (CHF) is a long-term, life-threatening disease which primarily affect elderly individuals (5). Considered as a complicated condition with a set of underlying causes, symptoms and characterizations, it can be viewed as a complex clinical syndrome (6). Despite highly variable differences regarding their state, a common hallmark for the majority of CHF-patients is an abnormal ejection or filling phase carried out by the left ventricle of the heart, resulting in an insufficient blood stream to the rest of the body (1). Most frequently, this situation is caused by a structural abnormality or cardiac dysfunction from protracted hypertension, diabetes, dilated cardiomyopathy or other cardiovascular conditions (7, s.12).

There are two main forms of CHF. The first one is known as systolic heart failure which means that ability to pump blood to the rest of the body is reduced. The other form is
recognized by an abnormal relaxation of the heart, referred to at diastolic dysfunction (8).

The current situation of CHF
Despite improved treatment of cardiovascular disease since the 1960s, the prognosis of CHF patients is still considered as poor, with 5-year survival rate still under 50 % in most age-groups (9).

One of the countries that currently face a major challenge of heart disease, especially regarding a major CHF-burden, is Australia. Numbers from 2011, show that CHF as a cause of death contributed to 13 % of the overall mortality (10), a rate which highlight the need for further research on prevention and improved treatment methods. In addition, as a consequence of data indicating that hospitalization account for close to 70 percent of the total HF-related costs (11), several studies currently aim to develop management programs which decline the frequency and durations of hospital stays in CHF-patients. A recent one, called the WHICH? trial, elaborated by the NHMRC centre of research excellence (CRE), emphasized the importance of HBI as a source to reduced health costs by comparing it to a CBI on patients receiving a post-discharge CHF-MP.

On one hand, the WHICH? trial illustrates the need for an extended focus on home-visits rather than seeing hospitals as the exclusive treatment arena for post-discharge CHF-patients. On the other hand, this trial applied a “one size fits all” model. In aiming to further improve poor outcomes in CHF by developing a cost-effective individualized program, it is important to be aware of the barriers each patient may face.

Barriers to health care
In this report, the term barrier refers to “any factor that can be seen as a hindrance for disease management, including access to health-services and/or the ability to self-care”.

An obvious barrier in disease management is distance to health care services. The majority of post-discharge CHF-patients are dependent on continuous management (12), and their geographical location could therefore be seen as a hindrance, as it influence the ability to readily access the services and resources needed to take care of their health (13-15). An ongoing study, which is yet to be published, called the WHICH? II trial, was both initiated as
a response to the "one size fits all" model, but also with an aim to put a light on management in remote areas (16, 17). In this, the NHMRC CRE explore the outcome of a more individual approach to post-discharge CHF-management, and at the same time the advantages of telephone support to people living in regional Australia (18).

In addition to distance, there are several other barriers in need of attention. One recent study elaborated in Australia in 2015 claimed that personal, sociodemographic and health characteristics are important factors in order to prevent hospitalisations (19), and it is therefore important to look at some of these factors. One widely discussed and highly relevant is the age among CHF-patients. As a part of the natural biological changes from birth to old, including weakened muscle strength, hearing and vision, we could assume that the ability to self-care and accessing hospitals may be reduced. Moreover, many elderlies are affected by multiple diseases in addition to CHF (20), which make the disease management even more challenging. Although it is hard to do something about the development in age pattern, it is important to be aware of the individual hindrances these patients may face in order to come up with well-established prevention methods. This is particularly relevant these days considering the current situation in many countries, including in Australia.

Due to a tendency of decline in mortality and fertility among the Australian population since the 1960s (21), the life expectancy at birth between 2011-2013 was stated to be 80.1 years among men and 84.4 among females, compared to 67.9 and 74.2 in 1960-62 (22). As a consequence of an older population, as well as data indicating that the prevalence of CHF increase remarkably by age (23), a great amount of individuals, and mostly elderly, are living with the syndrome. Based on both the magnitude of elderly CHF-patients and their variety of obstacles, we could claim that it is beyond any doubt important to describe this barrier.

Two other factors that can be seen as impediments to disease management are the severity of CHF-symptoms and cognitive impairment. Firstly, the most important CHF-symptoms are breathlessness, fatigue and ankle swelling (24). One of the standardized test used to measure breathlessness, is the NYHA score (described in material and methods), which among others could be used to indicate to what degree the patient is able to take care of their health and disease. Secondly, cognitive impairment (here defined as having a MoCA score $\leq 23$), which range from mild to severe, include reduced ability to remember, learn and concentrate (25).
These factors, especially on a severe level, could be seen as an obstacle in management and awareness of the disease.

Combined with other barriers, an additional one is whether or not the patient lives alone. A lack of network while having other complications, such as increased age, cognitive impairment and/or NYHA class III or IV, could lead to even more complex challenges concerning self-care, including awareness of CHF danger-signs, and also the ability to access hospital when needed.

It is important to highlight that it is a set of barriers to care, including the ones mentioned above. However, in this assignment we have chosen to focus on these factors due to its relevance and their consequences in the development of the disease. A more detailed definition of the variables can be viewed in the material and methods section.

**Aim**

To describe and increase the awareness of specific barriers to care a CHF patient may experience - reporting their commonness, severity and expected consequences.
Material and methods

This report is based on data obtained through varying methods: a literary study done prior, throughout and subsequent to our stay at the MMIHR, the reception of a portion of the WHICH? II trial results, and an analysis of said results.

Literature

The literature utilized in this report were collected mainly from two sources; PubMed (U.S National Library of Medicine National Institutes of Health), and articles either published or recommended by the research team and staff at the MMIHR and Professor Simon Stewart.

Literature required through PubMed

Keywords in searching:
- Cardiovascular disease
- Heart failure+epidemiology
- Heart failure+burden
- Heart failure + heart failure, systolic + heart failure, diastolic

Literature published or recommended by MMIHR

A large proportion of the sources utilized were given to us by the research team and Professor Simon Stewart. Some of these articles are yet to be published and/or not available to the public, these include:
- The WHICH? II trial protocol (18)
- Barriers to care (Ahamed Y, Chan Y, Crystal LJ et al. Manuscript submitted for publication.)

Study design

The data analysed and presented in the results were collected prior and separate to our involvement, and was executed in correlation with the WHICH? II trial - a randomised controlled trial. Only a selected portion of the study population originally recruited were used in our analysis (specified further down).
Study population

Recruitment

The recruiting of participants for WHICH? II trial began the 1st of July 2013 and was complete the 31st of January 2013. Patients admitted to five different hospitals situated in various locations were screened for eligibility by research teams.

Selection criteria

Inclusions: Patients aged $\geq 18$ years discharged from hospital, diagnosed with CHF and with a history of $\geq 1$ admission for acute decompensated heart failure (including the index event).

Exclusions: Presence of a terminal condition and/or incapable of providing fully informed consent. Patients living in or being admitted to nursing homes were also excluded.

Ethical aspects

All participants of the WHICH? II trial gave written informed consent to take part of the trial. This consent also involves the approval of using their data for research and analysis outside of the WHICH II trial, such as the ones conducted in this report.

Baseline profiling

A baseline profile was established for all qualified participants by extensive self-report and review of patient records. This profiling were conducted by a research team involved in the WHICH II trial, and the questionnaire used was developed without any of our involvement. We analyzed only a limited portion of the baseline details obtained, as these were the ones we judged to be relevant for our report. The participants were analysed and characterized based on the answers on these questions.

Analysis of the collected data

The following data collected were analysed by the use of SPSS, and the results were converted to figures, tables and charts. The analysis was done during our stay at the MMIHR, and in total 13 days were spent at the institute working with the data. All of the finished results were assessed by the research team we collaborated with, to further secure that the results in this report did not contain any errors or inaccuracy. Only the participants with complete data for the variables reviewed were included in our analysis.
Specification on the variables analysed and presented in the results

The analysis consists of characterizing the participants by the information collected in the baseline profiling, and by the help of SPSS we could analyse the commonness and combination amongst the barriers. Based on questions from the baseline profiling questionnaire we defined five different factors that could act as a hindrance in obtaining and/or maintaining good health and disease management for an individual patient; five barriers to health care. These are as following:

- Living remote from health care services (remote here defined as living $\geq 25$ km from a hospital)
- Age in the upper quartile (83+)
- Living alone
- Impaired cognitive function and/or language barrier
- NYHA class III or IV at discharge

Instruments used in measuring variables

In measuring the subject’s cognitive function the Montreal Cognitive Assessment (MoCA) tool (attachment 1) was used, and in this report we define cognitive impairment as having a MoCA score $\leq 23$. However, in the case of language barriers in the patient it is unclear whether a MoCA score $\leq 23$ is due to actual cognitive impairment or a result of the language barrier, and on account of this a percentage of the participants did not take the MoCA test. In defining the barrier as either having impaired cognitive function and/or a language barrier, we prevent excluding a significant percentage of the participants. For assessing the patient’s CHF symptoms and their severity the New York Heart Association (NYHA) Functional Classification System (attachment 2) was used.

By the use of SPSS we could illustrate and thereby describe the commonness and severity as well as the correlation among the different barriers. Furthermore, we could describe the potential consequences associated with the presence of one or a combination of the barriers, by the support of a supplementary literary study.
Results

Description of the study cohort

In total we analysed 783 patients diagnosed with CHF, and of these patients 323 were female and 460 were male. The mean age amongst the women was 77.8 years, while 71.8 years for men. The mean age for the whole study cohort independent of sex was 74.3 years.

The upper quartile (75) for men was 81 years and for woman 86 years. For the whole study cohort the upper quartile independent of sex was 83 years.

Prevalence of the barriers to care

Table 1: Amount and percentages of our selected barriers

<table>
<thead>
<tr>
<th></th>
<th>Distance &gt; 25km</th>
<th>Age 83+</th>
<th>NYHA class III, IV</th>
<th>MoCa_NES ≤ 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Amount of study cohort</td>
<td>146 (18.6)</td>
<td>196 (25)</td>
<td>224 (28.9)</td>
<td>403 (51.5)</td>
</tr>
</tbody>
</table>

Based on our specification of the variables, 18.6 % of the participants were living remote, which correspond to an amount of 146 patients. Looking at the age, one quarter (196) of the 783 patients were 83 years or older. Moreover, 224 had been considered to be NYHA class III or IV at discharge. Lastly, almost half of our study cohort had either cognitive impairment and/or a language barrier.
Variance

Table 2: NYHA classification at discharge

<table>
<thead>
<tr>
<th>NYHA classification</th>
<th>Did not take the test</th>
<th>I (%)</th>
<th>II (%)</th>
<th>III (%)</th>
<th>IV (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Amount of study cohort</td>
<td>2 (0.3)</td>
<td>95 (12.1)</td>
<td>462 (59.0)</td>
<td>211 (26.9)</td>
<td>13 (1.7)</td>
<td>783 (100)</td>
</tr>
</tbody>
</table>

Of the 783 participants, two did not take the test for unknown reasons. More than half of the patients were classified as II at discharge, which means that the majority had slight limitation in physical activity. Even though a small amount were classified as IV, 211 were considered as moderate (III), assumed to have marked limitation of physical activity, which means that less than ordinary activity cause shortness of breath, rapid heartbeat and chest pain.

Table 3: Age percentiles

<table>
<thead>
<tr>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (M)</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>Percentiles</td>
</tr>
<tr>
<td>75</td>
</tr>
</tbody>
</table>

Among the 460 male participants, one quarter were under 64 years and 50 % under 71. Furthermore, three fourths were 81 years or younger. For female the corresponding numbers were 72, 80 and 86 years. In the total study cohort independent of sex, one quarter were over 83 years, which is our lower limit for the age barrier in this report.
Figure 1:
The combination and prevalence of three barriers (age 83+, NYHA III or IV and MOCA_NES ≤ 23)

Figure 2:
The combination and prevalence of three barriers (NYHA III or IV, live alone and age 83+)
The first Venn diagram shows the combinations between Age 83+, MoCa_NES (cognitive impairment and/or language barrier) and NYHA class III or IV. 71 participants had both an age barrier and NYHA class III or IV, while 125 were 83+ and had cognitive impairment and/or a language barrier. One hundred and thirty-three of our study cohort were classified as moderate (III) or severe (IV) on the NYHA scale in combination with cognitive impairment and/or a language barrier. Moreover, 46 of the patients in our cohort were facing all of the three barriers presented.

The second diagram illustrates the combinations between patients living alone, having NYHA class III or IV and aged 83 years or older. Of the 314 participants living alone, 84 were also facing an obstacle in breathlessness, having NYHA class III or IV at discharge. One hundred and twenty-five of the patients with this particular obstacle were over 83 years. Moreover, 108 were both old and living alone. Adding all, 33 patients aged over 83 with NYHA class II or III were living alone.
Discussion

The results of this study as well as existing knowledge promise a high chance of presence by impediments to successful and effective health care in the individual CHF patient. Each of the barriers described in this report have a high prevalence amongst our study cohort, and in assuming the study cohort represents an accurate representation of the actual population of CHF patients, one can describe these barriers as common and widespread.

Having a NYHA class III or IV at discharge was the most common hindering for the participants (not including the impaired cognitive function and/or language barrier, as this is a barrier combined of two variables), with over ¼ of the participants struggling with breathlessness at rest or when doing less than ordinary activity. Not only is this the most common impediment present in our study cohort, it is also an impediment that affects their quality of life (26), increases the yearly mortality (27), and presumably their ability to manage their own health and condition. One can assume that such a disabling symptom as breathlessness in resting state or when doing less than ordinary activities will prevent the typical patient physically or psychologically from doing regular exercise. Exercise has been shown to reduce major cardiac events such as hospitalization and mortality (28), and with an absence of regular exercise a patient will also have an absence of its beneficial effects on their health and disease. One can also assume that symptoms such as dyspnea, fatigue and palpitation at rest or when doing less than ordinary activities will potentially reduce the patient's quality of life, as well as reduce their ability to take care of themselves and their own health because of the physical activity such tasks demand.

Looking at the variance in age, we saw that 25 % (196) of the study cohort were aged 83 or more. Based on our results, 71 of these participants also had NYHA class III or IV, which means that around ⅓ of the elderly have struggles when they are in activity. As mentioned, this could have an impact on disease management and their ability to improve their condition. Moreover, studies suggest that physical activity could reduce hospitalization and mortality (28) as well as the likeliness of cognitive impairment (29), which also could be seen as an impediment, as mentioned in the introduction part. This is an example of a possible chain reaction as an effect of the age, and illustrate the variety of obstacles the elderly have in addition to their heart disease.
When selecting the barriers to survey we included how many of the participants were living alone. However, we chose to combine this variable with one or more of the other variables described as barriers to health care, as living alone only complicate maintenance of the disease if the patient is affected by other impediments and therefore in need of assistance through a cohabitant. Of the 314 participants living alone, around one out of ten had a NYHA class III or IV, 13.7 % were in the upper quartile of age and 4.2 % had both of the barriers. Having a combination of barriers such as seen here will increase the amount of complications in managing their health condition, as each barrier is associated with different sort of complications.

There are a few limitations to our report. Due to the lack of research and studies done to the current day, a big proportion of the data and statistics presented are not up to date or inadequate. In addition, the data collected by self-report may not represent an accurate picture of the reality. One of the reasons behind this is that the tools used to grade certain features may not always be reliable - in example the MoCA test can be influenced by interfering factors, such as the patient’s general health at the time the test was taken. This limitation includes other self-reported data that may be subject to inaccuracy because of the subjects involvement in assessing their own condition. Also the study cohort surveyed might not represent the actual population of CHF patients due to its small size, or the recruitment criteria may exclude a big portion as well as include a specific kind of CHF patients that does not represent the typical CHF patient.

In addition, there should be a mentioning that in the defining of the barriers we had to combine having impaired cognitive function with having a language barrier, to prevent the exclusion of a significant percentage of the participants (the complete description on the combining of these two barriers can be found under Material and methods). This combining of two barriers does however limit the actual and accurate picture of the reality of each barrier. It creates a barrier which makes it hard to tackle and describe the actual issue, as one cannot know for certain if the numbers are due to a predominance from one of the impediments. Also in creating a combination barrier you broaden the definition, which results in a higher likeliness of a subject falling in under this definition - which might be why the percentage of subjects with impaired cognitive function and/or language barrier is so high.
There should also be a mentioning of the fact that this report does not determine whether the patient’s outcome is a result of the impediments hindering them in effective managing of their health and disease, as it doesn’t evaluate the progression of the disease in each participant. Therefore, this is purely a descriptive survey, that can only serve as a characterisation of the barriers based on their frequency and associated consequences. Nevertheless, the results suggest that these are widespread barriers to health care, and the findings in this report should still serve as an encouragement to further research on the barriers to care and to what extent they interfere with effective management of the disease.
Conclusion

In conclusion, the five different barriers to effective health care in CHF patients that are reviewed in this report can all be described as common and widespread. The five barriers reviewed were living remote from health care services, age in the upper quartile (83+), cognitive impairment and/or language barrier, living alone, NYHA class III or IV. Additionally, they all constitute a potential threat in the worsening of the condition due to their possible hindrance to effective treatment and management, and there are therefore a number of likely consequences associated with the presence of one or a combination of the barriers. In some of the barriers there can also be described different levels of severity in regards to which extent a patient is affected. All of these characteristics needs to be taken into account when evaluating the requirements that need to be met for each individual CHF case.

Desired prospects

Currently CHF remains one of the most mortal and disabling of CVD states (4), and even though there are currently established various CHF-MP there is still an obvious room for improvement. By understanding the likely hindrances a CHF patient may face in the managing of their disease, you also develop an understanding on how to overcome these barriers. Moreover, by describing and thereby putting a character to each barrier, you develop a way of recognising the barriers in the patients. With further analysis of an even broader spectre of barriers to effective health care in CHF patients, we could give a more effective and successful managing of the disease, that to a greater extent recognizes and deals with the complexity and diversity of each individual case.
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Attachments

Attachment 1: MoCA classification system
### Attachment 2: NYHA classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Patient Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea (shortness of breath).</td>
</tr>
<tr>
<td>II</td>
<td>Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).</td>
</tr>
<tr>
<td>III</td>
<td>Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea.</td>
</tr>
<tr>
<td>IV</td>
<td>Unable to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort increases.</td>
</tr>
</tbody>
</table>