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Hospitalization phase of cardiac rehabilitation: protocol for acute coronary syndrome

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ABSTRACT
The hospitalization phase of cardiac rehabilitation has evolved and has been shortened considerably over the years. On the one hand, the rise of therapeutic percutaneous coronary intervention and, on the other, the fundamental purpose of reducing the harmful effects of prolonged rest have been aspects that have motivated the update the physiotherapy intervention program during this phase in our hospital. Action guidelines were established in each stage of the program, as well as an exercise schedule according to the stage of the patient, the use of controls in the fitness session and aspects of psychological intervention. The benefits of a prompt and adequate physiotherapy intervention for continuing into convalescence and the patient's consequent social and labor return were considered when updating the action protocol, which would help to unify criteria and working strategies in the hospitalization phase of the Cuban National Program for Cardiac Rehabilitation.
Key words: Hospitalization phase, Acute coronary syndrome, Acute myocardial infarction, Cardiac rehabilitation, Exercise

Fase hospitalaria de la rehabilitación cardíaca. Protocolo para el síndrome coronario agudo

RESUMEN
La fase hospitalaria de la rehabilitación cardíaca ha ido evolucionando y se ha abreviado considerablemente en el transcurso de los años. Por una parte, el auge del intervencionismo coronario percutáneo terapéutico y por otro, el objetivo fundamental de disminuir los daños nocivos del reposo prolongado, aspectos que motivaron a actualizar el programa de intervención fisioterapéutica durante esta fase en nuestra institución. Se establecieron pautas de actuación en cada etapa del programa, la utilización de una tabla de ejercicios según estadios del paciente, el uso de controles de la sesión de acondicionamiento físico, así como aspectos de intervención psicológica. Se consideraron los beneficios que aporta una pronta y adecuada intervención fisioterapéutica para la continuidad a la fase de convalecencia y su consecuente reincorporación social y laboral para actualizar el protocolo de actuación, que contribuya

a unificar criterios y estrategias de trabajo en la fase hospitalaria del Programa Nacional de Rehabilitación Cardíaca de Cuba.
Palabras clave: Fase hospitalaria, Síndrome coronario agudo, Infarto agudo de miocardio, Rehabilitación cardíaca, Ejercicio físico

INTRODUCTION

When in 1802 William Heberden[1] described angina, he also reported improvement in one of his patients related to the fact that he engaged in timber sawing half an hour every day. This early observation relating physical activity to the relief of symptoms was underestimated; and when in the early nineteenth century myocardial infarction was defined as clinical disease, the view that post-myocardial infarction patients required a prolonged bed rest was generalized, seeing it almost as a definite physical disability. In 1944, Dock[2] already emphasized the high risk of prolonged bed rest; and although in 1952 Levine and Lown[3] showed that armchair rest at the end of the first week of progress was beneficial and had no risk, the mobilization of the patient before the sixth week and the shortening of hospital stay were only very slowly and gradually accepted.

The gradual development of the concept of early mobilization and early ambulation was encouraged due to the drawbacks and deleterious effects of inactivity and rest in cardiac patients, and particularly in those who have suffered an acute myocardial infarction (AMI). It was implemented with the creation, in the early fifties, of special units for the treatment of AMI[4]. Later, as a result of different experimental studies, first in Scandinavia and subsequently around the world, demonstrating the acute and chronic changes in sedentary healthy subjects, athletes and coronary patients, various newsletters and other publications of the World Health Organization recommended the implementation of exercise programs in the treatment of patients with heart disease. In 1969, this organization defined the concept of cardiac rehabilitation as "the sum of activity required to ensure cardiac patients the best possible physical, mental, and social conditions so that they may by their own efforts regain as normal as possible a place in the community and lead an active and productive life"[5].

The 1970s marked a turning point with regard to the content of cardiac rehabilitation programs, since a psychological protocol, recommendations for sexual activity and counseling for the return to work were added to the supervised physical training. Later in the 1990s, the need for control of cardiovascular risk factors was reasserted, and smoking cessation and nutrition education programs began to emerge, in order to prevent disease progression and reduce the number of acute episodes[6,7].

Therefore, cardiac rehabilitation and secondary prevention programs have become, in the course of the years, the most effective tools for reducing cardiovascular morbidity and mortality[8-12]. That is why this study aims to update the intervention protocol for the hospitalization phase, in patients with acute coronary syndrome in our hospital.

HOSPITALIZATION PHASE

It is the first phase of the three phases comprising cardiac rehabilitation, and follows the guidelines of the World Health Organization[13], which includes the intervention from the moment of admission to discharge. This phase has evolved and has been shortened considerably over the years; on the one hand, due to the rise of percutaneous coronary intervention and its favorable results[14,15], on the other, the fundamental purpose of reducing the harmful damage of prolonged rest. Therefore, the rehabilitation protocols that were designed years ago including 15 and 21 days of hospitalization and 9 rehabilitation stages[16] are currently designed in a more aggressive way. This approach prevents cardiovascular, respiratory, musculoskeletal, metabolic, gastrointestinal, genitourinary, neurological and psychological complications resulting from prolonged immobilization, and helps patients become self-sufficient in daily life activities in a short period of time[17-22].

At this stage, it is vital the assessment by the multidisciplinary team formed by physician, nurse, nutritionist, psychologist, physiatrist and physical rehabilitation specialist, which operate on three aspects: physical level, psychological level and control of risk factors, in order to incorporate behavioral changes in the secondary prevention of the disease[10,22-25].

STAGES OF PHYSIOTHERAPY INTERVENTION

Stage I: Intensive Coronary Care Unit

This stage is very important because it is the first contact with the patient. In it, the patient is informed about the object of rehabilitation. The patient's medical history is recorded in order to adjust the physiotherapy program to individual needs, and educational tips on controlling risk factors are given. With the aid of the psychologist, the patient is reassured and encouraged in order to favor a comprehensive progress, since there is evidence of severe depressive symptoms and fear of the future at this stage[19,26,27].

The objectives of this first stage are aimed at early and progressive mobilization (**Figure 1**); and they gradually incorporate the activities of daily living such as sitting, combing one's hair, eating alone, toileting needs, shaving, as well as respiratory reeducation through diaphragmatic breathing[11,12,17-23,25,28]. To implement diaphragmatic breathing, the patient is instructed to take a slow, deep breath through his nose, trying to raise the abdomen rhythmically, and then to let the air out through the half-open lips, and see how the abdomen descends[29]. The patient will start by taking between 6 and 10 diaphragmatic breaths, and will be encouraged to continue practicing several times a day.

Figure 1. A patient does active free exercises under the supervision of a nurse and the physiotherapist at the Intensive Coronary Care Unit.

After 24 hours, if the patient is stable from a clinical, hemodynamic and electrocardiographic point of view, he will do passive movements, active assisted exercises or active free exercises depending on his clinical status and tolerance to the activity. With regard to passive mobilization or active assisted exercises, it is necessary to prepare the area to be treated by manual contact: touch, pressure, stretching and traction-approximation.

The exercise program for inpatient rehabilitation (**Table 1, Stages I and II**) will be used. Patients should do 6-10 repetitions of each exercise 2 times a day, and it will be combined with diaphragmatic breathing.

When an interventional procedure including puncture of the femoral, radial or brachial arteries is performed, it is necessary to begin rehabilitation 24 hours after removal of the pressure dressing to prevent complications secondary to the puncture, specifically hematoma.

Although the patient is under constant electrocardiographic monitoring, any signs or symptoms suggesting exercise intolerance should be noticed.

Stage II: Intermediate Coronary Care Unit

It aims to improve exercise tolerance and increase functional capacity. To prescribe the individual fitness program, it is necessary to carry out a general assessment including any musculoskeletal limitations the patient may have, and taking into account the patient's medical history recorded in stage I.

In group and individually, it continues with educational advice on how to control coronary risk factors, the objectives and benefits of cardiac rehabilitation programs, how to measure radial pulse (**Figure 2**), and becoming familiar with Borg Scale[30], as way of controlling the intensity of the fitness session.

To start these sessions, it is necessary that the patient is in stable condition, from a clinical, hemodynamic and electrocardiographic point of view.

The exercise program for inpatient rehabilitation (**Table 1, Stages II and III**) will be used. Patients should do 8-10 repetitions of each exercise 2 times a day, and it will be combined with diaphragmatic breathing.

It will also include:

- Deambulation: Starting with 25 and 50 meters, increase 10 to 15 meters per day. It is necessary that the patient could make at least 150 to 200 meters before discharge.
- Climbing stairs: Starting with 5 steps, increase 3 to 5 steps a day. It is necessary that the patient could climb 20 steps before discharge.

Table 1. Exercise program – Inpatient rehabilitation.

STAGE I	STAGE II	STAGE III
Lying in supine position	**Sitting position in bed or chair**. If in a chair, the patient should be sitting at a height that allows him to have the knee flexed to 90° in relation to the hip and the floor.	**Standing position. Legs spread to shoulder width.**
1. Flexion and extension of the toes.	**1.** Flexion and extension of the toes.	**1.** Neck movements. Forward flexion and backward extension.
2. Active dorsiflexion and plantarflexion of the ankle.	**2**. Active dorsiflexion and plantarflexion of the ankle.	**2**. Lateral flexion to the right and to the left.
3. Active inversion and eversion of the ankle.	**3**. Active inversion and eversion of the ankle.	**3**. Rotation of the neck to the right and left.
4. Flexion-extension knee-hip, sliding the foot on the mattress.	**4**. Knee extension and flexion.	**4**. Shoulder abduction-adduction (90°-180°).
5. Abduction and adduction of the hip.	**5**. Hip flexion. One leg up and down, alternating with the other leg.	**5**. Horizontal abduction-adduction of the shoulder. Arms raised to 90°.
6. Flexion and extension of the fingers.	**6**. Flexion and extension of the fingers.	**6**. Alternating flexion and extension of the shoulder.
7. Dorsal and palmar flexion. Radial and ulnar deviation of the wrist.	**7**. Dorsal and palmar flexion and radial and ulnar deviation of the wrist.	**7**. Flexion and extension of the elbows.
8. Pronosupination of the forearm with elbow flexion to 90°.	**8**. Pronosupination of the forearm with elbow flexion to 90°.	**8**. Dorsal and palmar flexion and radial and ulnar deviation of the wrist.
9. Flexion and extension of the elbows.	**9**. Flexion and extension of the elbows.	**9**. Forward flexion and trunk extension.
10. Abduction and adduction of the shoulder. The patient abducts the arm (90°-180°) and returns to the starting position.	**10**. Abduction- adduction of the shoulder. The patient abducts the arm (90°-180°) and returns to the starting position.	**10**. Lateral trunk flexion.
11. Shoulder flexion (90°-180°).	**11**. Horizontal abduction-adduction of the shoulder. Arms raised to 90°.	**11**. Circumduction of the hip. Hands on waist, make circumduction to the right and left.
12. Internal and external rotation of the shoulder. With the arm abducted to 90° and flexed elbow.	**12**. Shoulder flexion (90°-180°).	**12**. Hip flexion with flexed knee.
13. Neck movements. Lateral flexion of the neck to the right and left.	**13**. Neck movements. Forward flexion and backward extension.	**13**. Active dorsiflexion and plantarflexion of the ankle.
14. Rotation of the neck to the right and left.	**14**. Lateral flexion of the neck to the left.	**14**. Active inversion and eversion of the ankle.
	15. Rotation of the neck to the right and left.	**15**. Lift on toes.

Figure 2. The physiotherapist teaches the patient how to measure the radial pulse as a control of the fitness session at the Intermediate Coronary Care Unit.

Stage III: Hospital discharge

The patient is now ready for discharge and initiates the recovery phase at home, for which he will be given a series of recommendations (Table 2). The patient should follow these recommendations until consultation with the rehabilitation cardiologist, and should continue this phase at the specialized center or in a therapeutic area in the community. The patient should follow the guidelines of the national program for cardiac rehabilitation in the community[31]. These recommendations should be made in the presence of the physician, psychologist, physiatrist, physiotherapist and a family member, and the multidisciplinary team should explain every detail and answer any questions that the patient or the family member may have.

Control of fitness session for stages II and III

- Heart rate: It may increase up to 20 beats above the heart rate measured while resting[28].
- Borg Scale from 6 to 20. Method of rating perceived exertion: the patient should do the exercises and perceive the effort as very light or light (range in Borg Scale from 6 to 12)[18]. This method is safe and effective in controlling the intensity of effort, and is useful in patients with arrhythmias, chronotropic incompetence and implantation of rate-responsive pacemakers or fixed-rate pacemakers[28, 32].
- Blood pressure: Systolic blood pressure should be increased 10 to 40 mmHg with respect to the measurement obtained while resting[28].

Although an initial schedule is planned for the exercises, from stage I to III, it may be modified according to tolerance, risk stratification and patient outcome.

The hospital physiotherapy protocol for patients with acute coronary syndrome with ST segment elevation is the same protocol used for those without ST

Table 2. Recommendations at discharge.

1.	Diaphragmatic breathing.
2.	Calisthenics.
3.	Walk _____ meters, the first week and then increase 50 meters every 3 days.
4.	Climb _____ steps daily for the first week, then increase gradually one step a day up to 60 steps.
5.	Do not to ride on bicycle or on horseback.
6.	Do no lift anything heavier than 10 pounds (5 kg).
7.	Decrease salt and fat consumption in food.
8.	Sexual relationships: when you are in good physical condition and always consult with your physician.
	• At discharge, arrange a visit to the rehabilitation department. You must visit the rehabilitation department _____ days after discharge. • You must meet these recommendations until the day of the consultation at the rehabilitation department.

Blanks depend on the individualization of physical activity.

segment elevation, as well as for those undergoing percutaneous transluminal coronary angioplasty with or without stenting.

PSYCHOLOGICAL INTERVENTION

For the patient, the occurrence of AMI is a loss of health and a loss of the ability to make decisions. It affects job activities, everyday tasks and social support networks. This situation stimulates depression, anxiety, irritability, hypersensitivity, feelings of fear and uncertainty. It is then necessary to properly evaluate and treat the psychological reactions that occur in patients, to help them adapt to the new disease, develop appropriate coping styles and personal self-regulation mechanisms, which will allow them to come through the whole process they face: symptomatology, diagnosis, treatment and rehabilitation[33].

It is important to consider the psychosocial risk factors for the onset of cardiovascular disease, which include depression, anxiety, changes in behavior patterns, aggression-hostility-anger syndrome and life stress. All these aspects can be factors for the onset of the disease, and may also arise or worsen after its occurrence. There is a hypothesis about the relationship between psychological factors and cardiovascular disease, which explain the relationship between them, a certain psychological profile and its relationship with specific conflicts[33].

The Intensive Coronary Care Unit treats patients who have had a sudden onset of an unforeseen illness, forcing them to be hospitalized. There, they are monitored, isolated and subjected to continuous surveillance. When the psychosocial balance is broken, negative emotional states arise, which have a direct and important effect on the anatomy and physical condition of patients, hindering recovery, rehabilitation and lifestyle changes[27].

The psychological intervention may be carried out individually or in groups. It also includes psychological tests to assess emotional states and behavior patterns [33].

Objectives of psychological intervention:

- Reduction of acute emotional states
- Modification of coping styles
- Psychological and physical adjustment
- Identification and a regulating activation of behavior
- Provide information, advice, knowledge of the disease and its possibilities
- Training in relaxation techniques, breathing and visualization.

With the above, it is clear the importance of psychological intervention to promote, maintain or restore the patient's health, and to support physiotherapy intervention during the rehabilitation process, from the time of admission to the Intensive Care Unit until hospital discharge.

CONCLUSION

The action protocol is updated to help unify criteria and work strategies in the hospitalization phase of the Cuban National Program for Cardiac Rehabilitation. It is undeniable the benefits of prompt and adequate physiotherapy intervention in patients admitted for acute coronary syndrome, for their convalescence and consequent social and occupational reintegration.

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