Advanced Role and Field of Competence of the Physical and Rehabilitation Medicine Specialist in Contemporary Cardiac Rehabilitation

JANNIS PAPATHANASIOU¹, TROICO TROEV², ARTHUR S. FERREIRA³, DOROTHEA TSEKOURA⁴, HARIETA ELKOVA⁵, ELIAS KYRIOPULOΣ⁶, ELENA ILIEVA⁷

¹Department of Kinesitherapy, Faculty of Public Health, Medical University of Sofia; ²Clinic of Physical Medicine and Rehabilitation, Military Medical Academy, Sofia, Bulgaria; ³Centro Universitario Augusto Motta/UNISUAM, Rio de Janeiro, RJ, Brazil; ⁴Arethaion University Hospital, Athens, Greece; ⁵Department of Physiotherapy and Rehabilitation Medicine, “St. Panteleimon” Hospital, Plovdiv-Bulgaria; ⁶National School of Public Health, Athens, Greece; ⁷Department of Physical and Rehabilitation Medicine, Medical University of Plovdiv, Bulgaria.

The definition of physical and rehabilitation medicine (PRM) given by the Union of European Medical Specialists (UEMS) is that it is an independent medical specialty concerned with the promotion of physical and cognitive functioning, behavior, and quality of life (QoL), and modifying personal and environmental factors. Nowadays PRM specialists are responsible for the prevention, diagnosis, treatment and rehabilitation management of people with disability. The background competences and skills required of PRM specialists during the cardiac rehabilitation (CR) process are described in the White Book of Physical and Rehabilitation Medicine and the Action Plan of the Professional Practice Committee of the UEMS-PRM Section.¹ ³ The majority of aptitudes and competences of PRM specialists are provided during the core specialty training and are further enhanced by knowledge and experience of work in other medical specialties (orthopedics, neurology, internal medicine, etc.).⁴ Nowadays, CR is increasingly recognized as an integral component of the comprehensive cardiac care of patients with chronic heart failure.⁵ Known benefits of CR include a reduction in morbidity and mortality, improved functional capacity, better QoL, improved blood lipid levels, more psychosocial well-being, less stress, fewer recurrences of myocardial infarction (MI), and less need for myocardial revascularization procedures.⁶-⁸ Contemporary outpatient CR services are medically supervised and conducted by an interdisciplinary team including other professionals, such as cardiologists, PRM specialists, physical therapists, psychologists, dietitians and nurses.⁹ ¹⁰ Outpatient CR programs offer a cost-effective, interdisciplinary and comprehensive approach, aiming to modify the underlying risk factors, and to restore maximal physiological, psychosocial, and functional status.¹¹ Papadakis et al.¹² reported evidence to support the cost-effectiveness of supervised CR services as compared to usual care in MI and heart failure, with the range of cost per life-year gained estimated to be from US$2193 to US$28193.¹² The ultimate goal of the CR process is the reintegration of cardiac patients into the community, although many factors contribute...
to the degree of success achieved. The reported re-
duction in mortality and morbidity rates by super-
vised CR approaches 25%, in comparison with usual
care, where CR services are underutilized.13 Despite
this recognition and exhortation, current statistics
continue to demonstrate disappointingly low partici-
pation and referral rates of eligible patients.14,15 Several
factors are responsible for the poor referral and
participation rates of outpatient CR. Poorest partici-
pation is particularly associated with low socioeco-
nomic status, low education, advanced age, rural ar-
eas, and and/or female sex.16,17 The pioneers of CR
(Tobis, Wenger, Zohman and Bruce) would not be
able to imagine in their time the amount of develop-
ment that their modest exercise training for low-risk
patients underwent in the following decades. The
poor CR program applied in the USA in the early
1960s has now become a multidisciplinary strategy for
secondary prevention and an interventional tool of
public health.18
The role of the PRM specialist in CR has changed
during recent decades, as a result of reductions in
mortality, morbidity, and hospitalizations and im-
provements in QoL.19,20 PRM specialists on CR teams
are optimally situated to ensure that behavioral life-
style treatments and drug therapies are applied sys-
tematically to attain favorable clinical outcomes in
patients with heart disease. The decision-making role
of the PRM specialist in contemporary CR is to de-
fine policies and strategies, to perform patient assess-
ments, to communicate in an effective and timely fash-
ion with the referring cardiologist or general practi-
tioner (GP), to assure patient safety, and to ascertain
that the plan of care is cost-effectively attaining favor-
able patient outcomes for participants.21 Contact with
other medical specialists and health professionals in-
volved in the CR team is vital and should occur regu-
larly.22
Another field of competence (FOC) of the PRM
specialist is to minimize CR team conflicts. The PRM
specialist is ultimately responsible for ensuring that
systems are in place to facilitate this process and that
appropriate communication with referring physicians
is maintained.23 The roles and FOC of the PRM spe-
cialist in contemporary CR are presented in Table 1.

Any contemporary CR program should have a
manual issued, describing the elements that are also
managed by the PRM specialist (Table 2).

The American Heart Association suggests that
strict compliance with the indications and contrain-
dications listed in Table 3 is of crucial importance to

<table>
<thead>
<tr>
<th>Table 1. Key roles of the physical and rehabilitation medicine specialist in cardiac rehabilitation (CR).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrying out and coordination of diagnostic therapeutic CR events</td>
</tr>
<tr>
<td>Design and assessment of included patients</td>
</tr>
<tr>
<td>Monitoring patient progress and modifying the CR program</td>
</tr>
<tr>
<td>Coordination of the safety parameters for CR programs and management of emergency and urgent conditions</td>
</tr>
<tr>
<td>Communication with referring cardiologists and GPs</td>
</tr>
<tr>
<td>Coordination and resolution of health insurance issues</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Cardiac Rehabilitation Manual.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic and evaluation criteria for inclusion and exclusion of patients</td>
</tr>
<tr>
<td>Methodology of the various cardiac rehabilitation programs</td>
</tr>
<tr>
<td>Measures for clinical assessment of patients</td>
</tr>
<tr>
<td>Daily notes on the course of treatment after every training session, including the achieved parameters and results</td>
</tr>
<tr>
<td>Keeping a record of changes in patient’s functional status</td>
</tr>
<tr>
<td>Registration of changes in drug therapy</td>
</tr>
<tr>
<td>Registration of changes in patient’s psycho-emotional status</td>
</tr>
<tr>
<td>Emergency management activities</td>
</tr>
<tr>
<td>Communication with referring health professionals to report the results achieved by patients</td>
</tr>
</tbody>
</table>


the safety and success of CR programs.24 Of all the
criteria, the following have to be taken most atten-
tively into account: basic and accompanying/concom-
itant disease; type of treatment—drugs or interven-
tion; electrocardiogram (ECG) and echocardiogram
data; patient lipid profile; functional capacity; risk
factors; and psychoemotional and occupational status.25 In addition to the abovementioned criteria for
assessing patients for inclusion in CR programs, an
in-depth analysis and evaluation of the QoL of car-
diac patients is carried out by means of health-relat-
ed QoL questionnaires, such as the Minnesota Liv-
ing with Heart Failure26 and the MacNew question-
aire.27

Recently, the National Institute for Health and Care Excellence, (NICE) published an updated, and
much wider list of inclusion criteria, recommending
the delivery of CR with an exercise component in a
non-judgmental, respectful and culturally sensitive
manner to all patients, regardless of their age. Fur-
thermore, it suggests that people should not be ex-
cluded from the entire program if they choose not to
attend specific components of it, and most important-
ly, that CR should be started as soon as possible, at
least within 10 days of their discharge from hospital,
and preferably before discharge. Despite all such ef-
forts, the NICE report bitterly notes that only 44% of English post-MI patients start an outpatient CR program, with an average waiting period of 53 days.28

The PRM specialist must:

- be completely aware that the patients’ diagnosis allows for his/her inclusion in the CR program;
- be certain about the clinical and psychological status of every patient;
- have investigated the patient’s exercise tolerance.

The above precautions aim at setting up an appropriate personalized CR program that is safe for the patient, while on the other hand preventing major cardiovascular events.25 The patient’s functional capacity assessment is aided by cardiopulmonary exercise tests (CPET)29 and field tests (fixed duration walking tests and fixed distance walk test),30 which are the key examinations from which the PRM specialist prescribes a CR program and decides which patients to discharge from the hospital.31 The data obtained from patient’s medical history, clinical and laboratory data, as well as from CPET, assist the PRM specialist to individualize an exercise training program that aims to improve the cardiac patient’s functional capacity. The prescribed CR program needs to be flexible and adapted to the needs of the individual patient. While focusing particularly upon the patients’ physical needs, the PRM specialist should also address the patient’s emotional concerns and explore any perceived barriers to exercise.32 In fact, the assessment of functional capacity in the inpatient setting by the PRM specialist decides which patients are deemed ready to return home or need to spend additional time at outpatient CR centers.33

Various CR programs include different types of exercises—aerobic, endurance, strength, interval or continuous training with a variable intensity, duration and frequency34—which may be preferred depending on personal characteristics such as age, sex, and comorbidities. For instance, exercise training programs for elderly women aim to improve muscle strength, muscle mass and endurance. CR programs designed for younger males suffering from metabolic syndrome are focused on increased calorie consumption, longer periods of walking, and other aero-

<table>
<thead>
<tr>
<th>Table 3. Indications and contraindications for exercise training.24</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indications</strong></td>
</tr>
<tr>
<td>Primary:</td>
</tr>
<tr>
<td>• Detection of coronary artery disease (CAD) in patients with chest pain (chest discomfort) syndromes or potential symptom equivalents</td>
</tr>
<tr>
<td>• Evaluation of the anatomic and functional severity of CAD</td>
</tr>
<tr>
<td>• Prediction of cardiovascular events and all-cause death</td>
</tr>
<tr>
<td>• Evaluation of physical capacity and effort tolerance</td>
</tr>
<tr>
<td>• Evaluation of exercise-related symptoms</td>
</tr>
<tr>
<td>• Assessment of chronotropic competence, arrhythmias, and response to implanted device therapy</td>
</tr>
<tr>
<td>• Assessment of the response to medical interventions</td>
</tr>
<tr>
<td>Additional:</td>
</tr>
<tr>
<td>• Development of the exercise plan or prescription</td>
</tr>
<tr>
<td>• Response to medication</td>
</tr>
<tr>
<td>• Evaluation of perioperative risk for non-cardiac surgery</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
bic workouts with the aim of maximum weight loss.\textsuperscript{35} Despite these differences, their aim is to facilitate recovery to a level necessary for patients to resume their work and other activities of daily living.\textsuperscript{36} Moreover, patients could be included in group-based CR programs if they are available to participate. There is abundant evidence that group-based models of CR present many advantages, such as eliminating the feeling of anxiety and depression that is characteristic of cardiac patients.\textsuperscript{37}

The Bruce protocol is one of the most basic and most common CPET used by the Medical Center of Sport Medicine and Rehabilitation in Plovdiv, Bulgaria.\textsuperscript{38} The beginning of the abovementioned protocol is more progressive, providing an evaluation of the patient's hemodynamic and respiratory response to fatigue. Sudden and increased fatigue ensures the optimal duration of the test. Several other protocols exist, such as those of Naughton and Balke\textsuperscript{39} and the modified Bruce protocol.\textsuperscript{40} It is estimated that the cardiopulmonary fatigue protocols, such as that of Bruce, increase the possibility of achieving high levels of VO\textsubscript{2}/kg (range 45.9-61.3 mL.min\textsuperscript{-1}.kg\textsuperscript{-1}), which are rarely seen in patients with chronic heart failure. Frequently, Naughton's protocol is used, consisting of 2 minute MET steps, which are achieved by simultaneously increasing the speed and slope of the treadmill.\textsuperscript{41} The optimal duration of the CPET is considered to be 8-12 minutes, while the protocols of Naughton and Balke usually extend the duration up to 15 minutes.\textsuperscript{34,42} For patients who have been almost totally inactive, the PRM specialist needs to design an appropriate CR program, encouraging such patients to initiate and continue the recommended exercises. Patients included in CR programs enjoy training sessions and this places great importance upon what they can do physically. Exercise is viewed by patients as something tangible, measurable and understandable. Patients training at high levels require particular attention and a stable functional status. Such patients may benefit from referral to a trained physical therapist.

After the accomplishment of the various CR phases the PRM specialist should:

- set a date for a check-up by the cardiologist in charge and the GP;
- send a report to the cardiologist in charge and the GP.

**Communication with the cardiologist and health professionals**

Contact and communication with other health professionals involved in the CR team is vital and should occur regularly.\textsuperscript{22} It favors better awareness of the patients' status, thus ensuring referral of patients to existing CR programs.\textsuperscript{43} By working closely with referring cardiologists and GPs, the PRM specialist can assist the patient in reaching target goals more efficiently. He is responsible for ensuring that systems are in place to facilitate this process and that appropriate communication with referring cardiologists and GPs is maintained.\textsuperscript{44} Interim communications may refer to possible adverse cardiovascular events, or to changes in drug therapy, e.g. regulation of antihypertensive therapy and lipid control.

Specialist communication between the PRM and the referring cardiologists and GPs needs to include at least the elements listed in Table 4.

**Safety**

One of the most important responsibilities of the PRM specialist is the prescription and implementation of a safe CR program.\textsuperscript{45} The PRM specialist should provide practical advice to patients about what they can and cannot do safely, including any sport activities. The PRM specialist and the entire CR team must be able to cope with exceptional emergencies and to be trained and re-trained periodically in basic and advanced cardiopulmonary resuscitation (CPR). Cardiac rehabilitation settings in hospitals, CR outpatient centers, and sports dispensaries need to meet all the requirements for carrying out CPR. CR is not assigned to high-risk patients as the goal is to return them to the moderate risk group. Customized activi-

---

**Table 4. Communications of the physical and rehabilitation medicine specialist.**

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Preliminary basic assessment of the patient and design of the cardiac rehabilitation plan</td>
</tr>
<tr>
<td>- Interim report on the results achieved in terms of functional capacity and quality of life</td>
</tr>
<tr>
<td>- Final summary report supplemented by long-term training program</td>
</tr>
</tbody>
</table>
ties of daily living, accompanied by light exercise in order to maintain the range of motion of the upper and lower limbs, are allowed. Guidelines for the exclusion of high-risk patients are given by different safety protocols issued by the American College of Cardiology and the American Heart Association. These protocols provide guidelines for the close monitoring of high-risk patients, as well as guidelines for managing extraordinary emergencies, e.g. arrhythmias, acute coronary events, cardiac arrest. The safety of contemporary CR programs is quite high, and must be in compliance with the above guidelines: no more than one cardiovascular event per 50,000 patient training hours, or one death per 120,000 patient training hours. Each training session needs to be recorded and all the routine activities have to be described in detail. The name of the CR team member who is responsible for extraordinary emergencies must also be registered.

Prevention

Other key roles of PRM specialists include monitoring patients during CR sessions. Pain and other physical problems reported by patients need to be assessed and managed by the PRM specialists. Many patients exhibit increased fatigue after workout. Since cardiac patients have an increased risk of sudden death, major interventions by psychologists are needed for depression and stress management. Stress syndromes and depression are highly prevalent in cardiac patients, with estimates ranging from 15% to more than 40%. Among others, the following recommendations apply for prevention of adverse events during CR programs:

- training sessions in patients with arrhythmias are avoided, according to a guideline requirement;
- isometric exercises are avoided;
- ECG monitoring is imperative in patients with ventricular tachycardia or hypotension after exercise load;
- longer warm-up and recovery periods are necessary.

Future prospects

The future roles and FOC of PRM specialists will be the promotion, coordination and implementation of randomized controlled trials that include cohorts receiving contemporary CR services, and comprehensive cost-effectiveness analyses of CR services. These types of trial should produce new findings and data for updating the contemporary state of CR services.

Conclusion

The roles, responsibilities and FOC of PRM specialists in contemporary CR have been substantially expanded and enhanced. The PRM specialists are the decision makers who are responsible for the design and strategy of contemporary CR programs; the assessment of patients eligible for inclusion; recording their clinical results and progress; and maintaining a dynamic and effective communication with referring cardiologists and GPs. They are also responsible for the efficiency, safety and cost-effectiveness of CR programs, as well as the overall care of participating patients. An important key role of the PRM specialist is to minimize team conflicts, to determine which health professionals have more appropriate skills, and to allocate roles accordingly.

References

9. Lavie CJ, Milani RV. Cardiac rehabilitation and exercise training in secondary coronary heart disease prevention. Prog
43. Thomas RJ, King M, Lui K, Oldridge N, Püha IL, Spretus J. AACVPR/ACC/AHA 2007 performance measures on cardiac rehabilitation for referral to and delivery of cardiac re-

(Hellenic Journal of Cardiology) HJC • 21


