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REVIEW ARTICLE

A Paradigm Shift in Rehabilitation Medicine: From “Adding Life to Years” to “Adding Life to Years and Years to Life”

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ABSTRACT

Medical science basically aims to "Adding Years to Life" by increasing life expectancy. Rehabilitation aims to "Adding Life to Years" by helping patients with impairment achieve, and use, their full physical, mental and social potential. However, recent growing evidence suggests that rehabilitation for patients with visceral impairment such as cardiac, renal and pulmonary impairment can not only improve exercise performance and quality of life, but also increases survival. Therefore, modern comprehensive rehabilitation for patients with visceral impairment does not simply aim to "Adding Life to Years" but “Adding Life to Years and Years to Life“ which is a new rehabilitation concept. Moreover, comprehensive cardiac rehabilitation is feasible and effective for secondary prevention after transient ischemic attack or mild, non-disabling stroke, offering a promising model for vascular protection across chronic disease entities. Therefore, modern comprehensive rehabilitation should improve not only quality of life but also biological lifespan in patients with impairment. This modern comprehensive rehabilitation is an ideal modern medicine and urgent efforts should be made urgently to increase the implementation rate of the rehabilitation.

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"Adding Years to Life" and "Adding Life to Years"

The goal of rehabilitation is to ensure the best possible physical, psychological and social conditions for patients with chronic or post-acute cardiac disease so that they may, by their own efforts, preserve or resume their proper place in the society 1).

There is a word "Adding Years to Life". This means that medical science basically aims to improve biological lifespan. In contrast, there is a word "Adding Life to Years" which means that improvement quality of life in the life.

Rehabilitation aims to "Adding Life to Years" by helping patients with impairment achieve, and use, their full physical, mental and social potential.

Recent evidence suggests that rehabilitation increases survival

However, recent growing evidence suggests that rehabilitation including exercise training for patients with visceral impairment can not only improve exercise performance and quality of life, but also increases survival.

For example, the American Heart Association (AHA) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) define cardiac rehabilitation (CR) programs as, "Coordinated, multifaceted interventions designed to optimize a cardiac patient's physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the underlying atherosclerotic processes, thereby reducing morbidity and mortality" 1). CR is an integral component of the continuum of care for patients with cardiovascular diseases and recent studies have indicated that CR not only alleviates symptoms, but also improves QOL and increases survival in patients with acute myocardial infarction (AMI) 1). Moreover, a growing evidence base suggests that exercise training in patients with stable CHF can reduce exertional symptoms and improve exercise performance and quality of life without adversely affecting left ventricular geometry or contractility 1). Recent studies have indicated that exercise training not only alleviates symptoms, but also improves vascular function and produces positive effects on heart function and increases survival in patients with congestive heart failure (CHF) 2). There has recently been a paradigm shift in the management of CHF.

Moreover, levels of physical exercise among chronic kidney disease (CKD) patients with hemodialysis are low. Increased physical activity in this population has been associated with improved ability and capacity to perform activities in everyday life, occupational tasks, health-related QOL and survival. Therefore renal rehabilitation including regular exercise is recommended to this population and produces positive effects on ADL and QOL with increasing survival in CKD patients with hemodialysis 3). We have established the Japanese Association of Renal Rehabilitation in 2011 to evaluate and promote renal rehabilitation (3, 4).

Chronic obstructive pulmonary disease (COPD) by smoking is a worldwide public health problem. Many patients with COPD lead unsatisfying, sedentary existences, worn down

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by years of dyspnea and exacerbations. A downward spiral links progressive inactivity to accelerating disability and premature mortality. Indeed, cross-sectional COPD studies have demonstrated that inactivity is a potent predictor of early death. A physiological variable — the forced expiratory volume in one second (FEV₁) — is often used to grade the severity of COPD. However, patients with COPD have systemic manifestations that are not reflected by the FEV₁. Celli et al. 5) established the BODE index (the body-mass index (B), the degree of airflow obstruction (O) and dyspnea (D), and exercise capacity (E), measured by the six-minute-walk test), a simple multidimensional grading system, is better than the FEV₁ at predicting the risk of death from any cause and from respiratory causes among patients with COPD. Pulmonary rehabilitation significantly improved the quality of life and exercise tolerance without any change in the pulmonary function in patients with moderate COPD, and there was also a large decrease in the risk of death in rehabilitated patients as measured using the BODE index 6).

“Adding Life to Years and Years to Life”

Therefore, modern comprehensive rehabilitation for patients with visceral impairment such as cardiac, renal and pulmonary impairment does not simply aim to "Adding Life to Years" but “Adding Life to Years and Years to Life“ which is a new rehabilitation concept.

Moreover, comprehensive cardiac rehabilitation is feasible and effective for secondary prevention after transient ischemic attack or mild, non-disabling stroke, offering a promising model for vascular protection across chronic disease entities. Therefore, modern comprehensive rehabilitation should improve not only quality of life but also biological lifespan in patients with impairment.

Low implementation rate of rehabilitation

The problem of rehabilitation for patients with visceral impairment is a low implementation. Because the beneficial effects of rehabilitation on exercise capacity, quality of life, and prognosis (mortality) in patients with visceral impairment have been established, the low implementation rate of rehabilitation implies that patients are kept away from the established benefits of rehabilitation by reasons unrelated to the patient conditions. Thus, efforts should be made urgently to increase the implementation rate of rehabilitation.

The CR program usually consists of three stages: the acute stage (phase I), subacute stage (stage II) and maintenance stage (phase III). Phase III CR is recognized as a community or home-based program committed to encourage exercise and a healthful lifestyle with the goal of minimizing the risk of recurring cardiac problems (secondary prevention). A recent study 7) demonstrated that the participation rate of recovery phase II CR to be 12% in the Japanese Circulation Society (JCS)-authorized cardiology-training hospitals (TH) and 5% in all the hospitals in Japan. Major reasons for not implementing CR were lack of staff, equipment and space, and the absence of the approval for the CR facility standards 7). However, THs are usually large-sized, general hospitals

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which would be expected to have sufficient staff, equipment, and space. In addition, 73% of THs that had been approved for specific intensive care did not have an approval for CR despite their ability to fulfill the CR facility standards indicates that there should be reasons other than the CR facility standards for the non-implementation of CR in these hospitals 7).

Ades et al 8) reported that by multivariate analysis, the strength of the physician's recommendation for participation was the most powerful predictor of cardiac rehabilitation entry in patients after AMI or coronary bypass surgery. Thus, physicians' reluctance or lack of proper understanding to use CR after AMI might be the reason for the low implementation rate of CR in Japan. Since the CR facility standards in Japan has been loosened in 2004 ,2006 and 2010, the motivation of physicians and hospitals would be a critically important factor for the implementation of CR.

CR as a success model of rehabilitation

The CR program usually consists of three stages: the acute stage (phase I), subacute stage (stage II) and maintenance stage (phase III). For the patients' benefit, phase III CR programs should be convenient, affordable, safe and enjoyable 9). The European Society of Cardiology also recommends that cardiac patients should be oriented to a long-term maintenance regimen with the use of support systems such as coronary clubs, gymnasiums or other facilities to promote long-term prevention strategies in the community. In Germany, a close network of currently approximately 6600 heart groups has been established 10), the concept of cardiac reconditioning centers for the prevention and rehabilitation of coronary patients has been tremendously successful 11).

Japan Heart Club and the certification program for the masters of CR

With support of the Japanese Association of Cardiac Rehabilitation (JACR), the Japan Heart Club (JHC), a non-profit organization, was established in 2004. The missions of JHC are to 1) organize scientific meetings and workshops for health promotion and prevention of cardiovascular diseases (CVD), 2) publish journals and learning materials for health promotion and prevention of CVD, 3) conduct research for health promotion and prevention of CVD, 4) organize facilities and develop programs for primary and secondary CVD prevention, 5) offer certification and education programs for the Master of Cardiac Rehabilitation (MCR), and other health-related professionals, 6) collaborate with national and international research institutes 9).

Certification program for MCR started in 2000. The objectives of the certification program are to improve quality of cardiac rehabilitation services and to educate the professionals playing a pivotal role in a primary CVD prevention programs in Japan. The JACR certifies those who understand the purpose of CR and have knowledge, skills and abilities for providing comprehensive CR program through a comprehensive team approach. Referring to American College of Sports Medicine certification objectives 12), the MCR certification examination is based upon the knowledge, skills and abilities (KSA's) in each of the 11 categories below 9).

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1. Anatomy and Biomechanics (4 KSAs)
2. Exercise Physiology (8 KSAs)
3. Electrocardiology (7 KSAs)
4. Human behavior and psychology (6 KSAs)
5. Pathophysiology (13 KSAs)
6. Clinical diagnosis and treatment (7 KSAs)
7. Health appraisal and fitness testing (10 KSAs)
8. Cardiac rehabilitation (3 KSAs)
9. Secondary prevention and patient education for CAD (11 KSAs)
10. Exercise programing (14 KSAs)
11. Safety, injury prevention and emergency care (3 KSAs)

Minimum requirements for candidates are as follows:

- Candidates must possess any of the following certifications or degrees: physician, registered nurse, physical therapist, occupational therapist, clinical laboratory technician, medical engineer, clinical psychologist, and/or exercise trainer.
- Have been a member of the JACR for more than 2 years.
- Have a minimum of 1 year of experience in a CR program or equivalent, and submit 10 case reports about the diagnosis, tests, treatment, and rehabilitation for patients with CVD.

The number of MCR has increased to 2336 by 2011. The MCR attracts health-related professionals with various backgrounds some of which include physical therapists, physicians, nurses, and clinical laboratory technicians.

Community-based Phase III CR & primary prevention programs in Japan

One of the missions for JHC is providing opportunities to participate in a CR program in the community. MedEX club, a multidisciplinary facility provides MCR-supervised exercise sessions, education for patients and training classes for citizens and health professionals. There are seven MedEx club regional branches and 11 classes are being offered nationwide.

The purpose of the MedEx club is to promote regular physical activity in CR patients and prevent cardiac disease and the recurrence of coronary events. Exercise training classes are held in various settings, some of which include hospitals, community centers, fitness facilities, and schools. The classes are typically held once or twice a week under the supervision of the MCRs 9). In the MedEx branch in Sendai, each session lasts 70 minutes and has a capacity of 12 people. Prior to and post-exercise session, participants measure their blood pressure and body weight and fill in the self-health check sheet. The exercise session starts with a 15 minute warm-up, either sitting or standing, followed by 15 minutes of aerobic exercise and 15 minutes of resistance training using elastic bands or their own body weight. The intensity of the aerobic exercise is determined by the cardiopulmonary exercise test measured upon entry to the club. Each session ends with cool down for 15 minutes which includes stretching of the major muscle groups. In addition to weekly exercise

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sessions, each patient keeps a log for blood pressure and body weight in the morning and night as well as step counts and exercise energy expenditure measured by an accelerometer. The log is submitted to the MCR program every 2 weeks. The MedEx club mainly offers exercise-based CR program, but patients also learn about physical activity, lifestyle modification, psychological management from the MCRs and other participants 9).

Cardiac rehabilitation is an integral component of the continuum of care for patients with CVD, the MedEx club can offer convenient, affordable, safe and enjoyable phase III programs and, in the near future, it may be recognized as a standard model of phase III CR service in Japan.

Conclusions

Comprehensive rehabilitation brings a paradigm shift from “Adding Life to Years” to “Adding Life to Years and Years to Life” in our modern rehabilitation world. This modern comprehensive rehabilitation is an ideal modern medicine and urgent efforts should be made urgently to increase the implementation rate of the rehabilitation.

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