

A survey of exercise based cardiac rehabilitation services in Northern Ireland

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SUMMARY

A survey was undertaken to establish the extent of provision of phase III exercise-based cardiac rehabilitation in Northern Ireland. Detailed information was obtained on patient referral mechanisms, patient assessment, the exercise component of cardiac rehabilitation and the use of outcome measures. The results suggest that cardiac rehabilitation in Northern Ireland has developed on an *ad hoc* basis, and although most centres accept myocardial infarction and coronary artery bypass graft patients for cardiac rehabilitation, higher risk patients are generally excluded from these programmes. Currently, little in the way of standard outcome measures are being used to evaluate the effectiveness of existing cardiac rehabilitation services. This paper makes several recommendations to facilitate the development of a more standardised service within Northern Ireland.

INTRODUCTION

Rationale for cardiac rehabilitation

The mortality in terms of premature death from coronary artery disease (CAD) in Northern Ireland accounted for 255 deaths in the 15-74 age group per 100,000 population in 1993.¹ These figures suggest that death from CAD in Northern Ireland is still among the highest in the world, even though the rate has been declining in recent years. The increasing number of patients surviving cardiac events may be attributable to primary prevention strategies, recent improvements in the management of acute myocardial infarction (MI) patients, and the increased number of successful revascularisation procedures (coronary artery bypass grafts and angioplasties) performed each year.² However, such successful outcomes are responsible for the continuing financial burden to the Health and Personal Social Services, and although direct costings are not available for Northern Ireland it has been suggested that direct treatment of CAD costs £30 million in Ireland annually, with £100 million lost as an indirect result of the disease each year.³ Even the most successful medical treatment or revascularisation procedure does not counteract the cumulative effect of inactivity, the traumatic effect of the operation, nor does it ensure the adoption of a healthier and more active lifestyle.^{4,5} Signs and

symptoms may return in many patients, and it is suggested that up to 20% of venous coronary bypass grafts may be occluded within the first year, rising to 50% after 10 years.⁶ The rate of restenosis in those treated by Percutaneous Transluminal Coronary Angioplasty (PTA) is similarly high, since as many as 30% of vessels may restenose within the first 6 months.⁷

A cardiac rehabilitation programme aimed at maximising patients' quality of life and reducing signs and symptoms associated with CAD is,

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therefore, an essential component of the secondary prevention of coronary disease. There is also increasing evidence that cardiac rehabilitation may maximise the potential health gains in a wider population of patients, such as those with heart failure, valve surgery, angina, hypertension and after the correction of congenital heart lesions; however many of these patients are currently excluded from cardiac rehabilitation programmes. It has been suggested that for a population of 200,000 up to 600 patients may be suitable for cardiac rehabilitation.⁸ In a population equivalent to Northern Ireland this equates to as many as 4740 patients who may require cardiac rehabilitation each year. However, even this may be a conservative estimate of the numbers that could potentially benefit if this service were available.

CARDIAC REHABILITATION

The misconception in the early part of this century that prolonged bed rest was needed to facilitate healing after a cardiac event was eradicated in the 1960s and 1970s, when the rationale behind early mobilisation and rehabilitation was accepted as a safe and scientifically based practice. It follows that cardiac rehabilitation is still a relatively new contribution to the holistic management of patients with CAD. Cardiac rehabilitation has recently been defined as the sum of activities required to favourably influence the underlying cause of the disease, as well as to ensure the best possible physical, mental, and social conditions so that patients, may, by their own efforts preserve, or resume when lost, as normal a place as possible in the life of the community.⁹

Cardiac rehabilitation has been traditionally described in terms of four discrete phases or stages, although there is still some discrepancy in the literature as to the duration of these phases and how they are utilised in the rehabilitation process. Phase I covers the period of hospital stay, phase II is the period following hospital discharge and can last from two up to twelve weeks, phase III is the period when most gym sessions begin, and phase IV is the period when patients receive less supervision, and may begin six months after the cardiac event.

BENEFITS OF CARDIAC REHABILITATION

Exercise based cardiac rehabilitation may reduce mortality and morbidity by as much as 25%.¹⁰ However, the efficacy of rehabilitation extends far beyond such end points and significant

improvements in quality of life in terms of physical well-being, psychological well being, decreased hospitalisation, and ability to return to work are well documented. More specifically, the benefits of the exercise component of cardiac rehabilitation occur via the following mechanisms: increasing ischaemic threshold, improving left ventricular function, increased coronary circulation, improving lipid profiles, decreasing serum catecholamines, lowering blood pressure, decreasing platelet aggregation and stimulating fibrinolysis, improving psychological status, and reducing skeletal muscle wasting".¹¹ As not all exercise will result in the above purported improvements, it is thought that the key to optimising these outcomes lies within the exercise dose. It is somewhat surprising then that the concept of exercise dose has gained only lukewarm interest in the field of cardiac research, and as no standard protocol for exercise prescription exists in Northern Ireland it is likely that these services will vary considerably at local, district and regional level. The aims of our survey were therefore to establish the extent of the provision of phase III, exercise-based cardiac rehabilitation in Northern Ireland, and to identify the components of these schemes. Specific objectives were employed to identify the characteristics of patients referred to cardiac rehabilitation schemes; to identify the indices used to ascertain the health status of individuals on entry to, and discharge from cardiac rehabilitation schemes; to identify the exercise dose currently used in cardiac rehabilitation schemes; to identify the outcome measures currently used to assess health gain following cardiac rehabilitation; and to ascertain the facilities available for the provision of phase IV of cardiac rehabilitation.

METHODS

Survey research techniques were used in the present study. To identify centres offering cardiac rehabilitation, each of the four health boards in Northern Ireland was initially contacted. As none of the health boards could provide the information sought, the Northern Ireland Chest Heart and Stroke Association was contacted, and subsequently a comprehensive list of hospital and health centre-based cardiac rehabilitation, and independent self-help cardiac groups, was obtained. At this point each of the services was contacted to determine whether or not their service constituted Phase III of cardiac rehabilitation. A

total of eight hospital-based, and one health centre-based, cardiac rehabilitation programmes were identified as offering a phase III service. A postal questionnaire was then sent to the co-ordinators of each programme, which sought information pertaining to the extent of the current provision and the components of each programme. Specifically, this data included entry criteria, details of assessment of health status, details of exercise dosage and the outcome measures currently used.

RESULTS

Eight of the nine identified centres returned a completed questionnaire. All eight centres offered rehabilitation to MI patients, seven centres included coronary artery bypass graft (CABG) patients, but only one programme accepted valvular disease, heart failure, angina, PTCA and stent patients. Most programmes have adopted exclusion criteria to ensure that high risk patients are not included in their moderate intensity exercise based rehabilitation programmes. Those exclusion criteria common to all centres included uncontrolled arrhythmias, acute illness, active pericarditis, with a majority of centres (n=6) also listing severe aortic stenosis, tachycardia (>120 bpm), uncontrolled hypertension, valvular disease and ischaemic signs occurring early on exercise test as exclusion criteria.

While cardiologists were largely responsible for the referral of patients to cardiac rehabilitation programmes, a diversity of professions including general practitioners, physiotherapists, nurses, and surgeons were also identified as being involved in the referral process.

The use of exercise testing as a measure of functional capacity and assessment of health status was by no means the norm in our study. In only one out of the seven programmes involving CABG patients was preadmission graded exercise testing (GXT) a requirement, with a further four centres reporting that GXT's were "sometimes" performed and the remaining two stating that they were never carried out. Routine preadmission GXT is standard practice for MI patients in only three of the programmes, performed sometimes in four of the programmes, and never performed in the one remaining programme. Furthermore, in four centres where GXT's are conducted, the respondents stated that they did not in fact receive the results of the tests.

Those programmes which did obtain the results of the GXT's incorporate these values along with scores from the Borg scale of perceived exertion¹² to determine and subsequently monitor appropriate exercise intensities. Most centres prescribed exercise intensity levels of 60-70% of determined maximal heart rate and/or Borg ratings of between 11-15.¹² It is assumed that those centres with no objective measure of functional capacity depend on an age-related equation to determine exercise intensity level, which is further used along with a Borg scale to monitor subsequent gains in functional capacity.

All the programmes recognised the importance of exercise progression. When the patient failed to reach a Borg rating of 11 and/or when they were not achieving their target heart rate during their routine exercise, the level was increased. However, the manner in which the exercise demands were increased varied between programmes. Some programmes considered it to be initially safer to progress the exercise by increasing the frequency or the duration of the exercise, rather than its intensity. Others also concomitantly increased the intensity. All patients irrespective of geographical location or clinical presentation were offered cardiac rehabilitation once a week, but were also advised to take part in an additional home exercise programme several times per week. The duration of the third phase of cardiac rehabilitation varied from three up to thirteen weeks in the eight centres. The most common duration was six weeks (n=4), followed by eight weeks (n=2), with one programme of three weeks and the remaining centre offering a thirteen-week programme. These findings reflect a general trend in Northern Ireland towards the provision of a short course of physical training, with "advice to continue exercising after discharge".

While most programmes did not rely solely on referral forms for baseline measures, not all programmes obtained a baseline measure of functional capacity, and only one programme obtained a baseline measure of cholesterol. Furthermore, only two of the programmes measured whether there was a programme-mediated improvement in functional capacity, as measured by GXT (one treadmill and one cycle ergometer), three did not attempt to measure outcomes, and one centre relied on perceived satisfaction on the part of the patients. However, none of the centres reported the use of quality of

life (QOL) as a specific outcome measure. None of the current programmes evaluated the effect of exercise on other baseline measures. Although attendance rates, resting and maximum heart rate were recorded daily, not all programmes documented adverse patient reactions that occurred during the exercise sessions.

DISCUSSION

The development of cardiac rehabilitation services in Northern Ireland has been on an *ad hoc* basis and is mainly confined to large specialist hospitals. Northern Ireland lags well behind the rest of the United Kingdom in the provision of such programmes, and their availability depends more on geographical location than on the physical or psychological needs of the patient.

The lack of facilities in some areas of Northern Ireland is sometimes attributed to limited resources. However, the cost of setting up a cardiac rehabilitation service in any centre throughout Northern Ireland could be negligible if the hospitals and large health centres already had gym facilities and suitable equipment available. The running costs vary but may be as little as £5 per person per session.⁸ It may be that the lack of facilities available to cardiac patients is due to the autonomous nature of, and lack of support from, cardiologists. Certainly a divergence of opinion among cardiologists about the physical and psychological effects, as well as the cost effectiveness of cardiac rehabilitation has been documented.⁸ If medical opinion continues to question the cost effectiveness of cardiac rehabilitation and fails to recognise its benefits, it is not surprising that this service is not more widespread. Perhaps in the future the Health and Personal Social Services, as Commissioners of services, will specify that cardiac rehabilitation services should be made available by providers, as suggested in the recently published draft Regional Strategy.¹³ Unlike much of the United Kingdom and many other European Countries, exercise-based phase III cardiac rehabilitation in Northern Ireland has remained mostly hospital based. The majority of the programmes cater for small numbers of patients and target mainly "low risk patients", usually stable MI and/or CABG patients. There are many suggested reasons for this. Some programmes, although recognising the benefits cardiac rehabilitation offers severely disabled patients, are limited by lack of resources or patient-monitoring equipment. In other areas

where cardiologists are responsible for the policy, patient referrals to cardiac rehabilitation programmes may be limited by personal opinion and a reluctance to refer a more diverse range of patients for rehabilitation. This reluctance may however be justified, as there remains a dearth of scientifically controlled, randomised studies conclusively demonstrating cardiac rehabilitation as significantly improving the physical and psychological status of higher risk patients.

As there is a diversity of professions responsible for patient referral throughout Northern Ireland, this may lead to very different information being included in the referral forms, inappropriate referrals or inadequate referrals, and ultimately a non uniform cardiac rehabilitation service. These findings therefore highlight the need for an agreed, standardised, and user-friendly protocol of referral.

Graded exercise testing (GXT) has been deemed mandatory prior to entry to a well organised exercise programme.¹⁴ Nevertheless, the use of exercise testing as a measure of functional capacity was by no means routine in our study, and reflected findings of the surveys conducted in Ireland,⁸ and in England and Wales.¹⁵

The use of an age-related equation to determine exercise intensity is subject to considerable error, and is invalidated in any patient on beta blockers as they exhibit exercise induced bradycardia. It is well documented that they should not be used for patients with cardiac disease.¹⁶ The Borg scale represents a reliable and valid measure of perceived exertion,¹⁷ but as with other measures used to prescribe and monitor exercise intensity, such as breathlessness, pain, or angina, it may not be sensitive enough to demonstrate a training effect. Some programmes have adopted the American College Sports Medicine (ACSM) guidelines¹⁸ which suggest intensities between 60-70% heart rate max are adequate to attain health related benefits such as decreased angina,¹⁹ decreased hospitalisation,²⁰ and increased vital capacity,²⁰ while others have argued that in previously sedentary persons even lower will result in health related benefits.²¹

Without a formal exercise test, or the use of some other valid and reliable functional capacity measure, it is difficult to prescribe an exercise programme suited to the individual needs of the patient. It has been suggested that GXT and risk factor assessment are necessary to classify patients

into low, intermediate, or high risk categories and to individualise exercise programmes accordingly.²² This highlights the importance of GXT in patient categorisation which will be a major determinant in the design of the patient's programme with regard to the type, frequency, intensity, and duration of training.

At present cardiac rehabilitation is currently based on the provision of moderate intensity exercise programmes. This survey has therefore identified the need for development of additional programmes, designed to take into account the needs and limitations of special cardiac patient populations. More scientific data regarding the optimum exercise intensity for the different groups of patients is needed if a comprehensive service is to be offered to this ever-increasing section of the population. Findings from this survey highlight the need to find an alternative, user-friendly measure of functional capacity that is sensitive, but which still correlates strongly with the GXT.

It has been recommended that programmes should be of at least 12 weeks' duration, based on the suggestion that training effects increase in an S shaped curve plateauing at thirteen/fourteen weeks.²³ In view of the more conservative approach to exercise in the cardiac patient, and the fact that individuals do not adapt to lifestyle changes in the same way, or at the same pace, a much longer time span may be needed to obtain optimal health related benefits. Despite the acclaimed additional benefits of longer programmes, it would seem that the duration of cardiac rehabilitation programmes is determined by financial limitations rather than sound scientific research. If the current programmes are of insufficient duration to bring about noticeable improvements in the patient's functional status, it is unlikely that the patient will be led to continue with the prescribed regime of exercise or adopt a healthier lifestyle. Conversely, it is not the aim to offer cardiac rehabilitation for an indefinite period, but rather through rehabilitation and education to enable the patient to achieve optimal functional status in an independent manner. Thus there is an urgent requirement to determine the optimum programme length and to subsequently implement such findings into good practice. One of the main criticisms of hospital based cardiac rehabilitation programmes in Northern Ireland is their limited duration which brings any controlled benefit to an abrupt end. Self help/support groups

could constitute phase IV of cardiac rehabilitation and act as an invaluable step-down mechanism from hospital based cardiac rehabilitation, by providing the reinforcement considered necessary for long term compliance to a healthier and more active lifestyle. Nevertheless, this service is largely under-developed (only one of the self help groups participated in any regular supervised exercise) and frequently patients are not made aware of the continuing help available to them.

All of the programmes recognised the benefits of group rehabilitation, although the length of time spent on the warm-up and the aerobic/circuit section varied between groups and not all groups have included a cool down, stretch and relaxation section. Additionally many of those that have incorporated these into their exercise programme do not spend sufficient time on them. Most complications occur during exercise classes because of an inadequate warm-up or cool down period. A period of at least 10 minutes should be spent on the warm up and cool down to minimise the risk of adverse reactions. It is also well documented that psychological disturbance can inhibit the physical outcome of these programmes, and therefore stress management strategies such as relaxation training should be an integral part of all these programmes.

These findings call for a recognised set of guidelines with respect to the components of the exercise programme and highlight the need for a specialised workforce in the area of cardiac rehabilitation. Although a retrospective audit using crude measures such as attendance or resting heart rates may be undertaken in most of the programmes examined, these measures are unlikely to demonstrate any benefits that cardiac rehabilitation has to offer. The reluctance to use more sensitive and reliable outcome measures is often attributed to limited resources, and the belief that the reliable and valid measures developed by academics are for research purposes, rather than incorporation into the day to day functioning of a cardiac rehabilitation programme. The lack of resources and support from physicians and purchasers for these programmes could be attributed to the finding that little in the way of standard outcome measurements is being used to demonstrate the effectiveness of the existing services. In this era of evidence-based medicine, audit needs to be undertaken alongside an ongoing cardiac rehabilitation service to assess the effectiveness of that service. The total lack of

recognised quality of life measures was rather surprising, given the fact that the ultimate aim of cardiac rehabilitation is to improve the patient's overall lifestyle.

In conclusion, cardiac rehabilitation in Northern Ireland appears to have developed on an *ad hoc* basis and has generally targeted low risk patients, excluding many of the patients who may benefit most from such programmes. Fundamental differences in the length of the programmes and a reluctance to use objective outcome measures have made it difficult to provide evidence of the benefits of this type of service. Based on the findings of this study, the following recommendations have been made to facilitate the development of a more coherent service within Northern Ireland:

- (i) The development of a reliable and valid user-friendly measure of functional capacity that correlates well with GXT. This test could be applied in the clinical setting to prescribe an exercise programme suited to the individual needs of the patient, and subsequently to measure the outcomes of cardiac rehabilitation. There is also the need to investigate whether changes in functional capacity translate to changes in quality of life.
- (ii) The use of existing, or development of new, appropriate and valid quality of life measures with which to determine outcomes of cardiac rehabilitation programmes.
- (iii) The development of agreed guidelines on the components of cardiac rehabilitation programmes, protocols for referral, discharge arrangements, and the development of a service structure that will enable the implementation by members of the multidisciplinary team of a more cost effective cardiac rehabilitation service.
- (iv) The need to develop and support the step down mechanism that currently exists, that is, community support groups, including a need for increased liaison between hospital programmes and community based programmes.
- (v) Increased funding for research and staff training and equipment.
- (vi) The setting up of a multidisciplinary Cardiac Interest Group in Northern Ireland

that meets regularly to discuss recent developments and agree on a standard form of audit (based on scientific research) to evaluate the true value and cost effectiveness of cardiac rehabilitation.

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