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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO PATIENTS WITH DIABETES

Effects of Exercise

Regular exercise has been shown to improve blood glucose control, reduce cardiovascular risk, contribute to weight loss, and improve well being. Furthermore, regular exercise may prevent Type 2 Diabetes Mellitus (T2DM) in high-risk individuals. Moderate-intensity (e.g. brisk walking) to vigorous-intensity exercises of ≥150 mins per week have been proven to confer significant benefits in the prevention of T2DM onset (a risk reduction of 46% in the Da Qing Study in mainland China, and by 58% in the Diabetes Prevention Program in the United States) (1-3). Recent follow-up studies suggest that this risk reduction can be sustained over a prolonged period (4). Structured exercise interventions of at least 8 weeks' duration have been shown to lower A1C by an average of 0.66% in people with T2DM, even with no significant change in body mass index (5). While higher levels of exercise intensity are associated with greater improvements in A1C and fitness, milder forms of physical activities, like yoga and tai chi, may also benefit control of blood glucose (6-9).

Progressive resistance exercise improves insulin sensitivity in older men with T2DM to the same or even greater extent as aerobic exercise (10). Clinical trials have provided strong evidence for the A1C-lowering value of resistance exercise in older adults with T2DM and for an additive benefit of combined aerobic and resistance exercise in adults with T2DM (11-13). Resistance exercise also enhances skeletal muscle mass and endurance, and hence may reduce the risk of fall in these elderly

(14).

Recommendations for Exercise Prescription

The *Global Recommendations on Physical Activity for Health* published by the World Health Organisation in 2010 specify that adults over 18 years of age should perform at least 150 mins per week of moderate-intensity or 75 mins per week of vigorous-intensity aerobic physical activity or an equivalent combination of the two. The recommendations further suggest adults to perform muscle-strengthening activities involving all major muscle groups 2 or more days per week. Adults over 65 years of age are advised to follow the adult recommendations if possible or (if this is not possible) be as physically active as they are able. Studies included in the meta-analysis of effects of exercise interventions on glycaemic control had a mean number of sessions per week of 3.4, with a mean of 49 mins per session (5). The Diabetes Prevention Program lifestyle intervention, which involved 150 mins per week of moderate-intensity exercise, had a beneficial effect on glycaemic control in those with pre-diabetes (1). Therefore, it seems reasonable to recommend people with T2DM to follow the same physical activity recommendations for the general population.

The following summarises the exercise prescription that is recommended for patients with T2DM.

Recommendations

Frequency

- Perform aerobic exercise spread out at least 3 days during the week, with

no more than two consecutive days between bouts of activity (14).

- Undertake resistance exercise at least twice weekly on nonconsecutive days, but more ideally 3 times a week, along with regular aerobic exercise (14).

Intensity

- Aerobic exercise should be at least at moderate intensity (e.g. brisk walking), corresponding approximately to 40%–60% of maximal aerobic capacity (VO2max) (14). Relatively, moderate-intensity activity could be expressed as a level of effort of 5 or 6 on a scale of 0 to 10 (where 0 is the level of effort of sitting, and 10 is maximal effort) or 50–70% of maximum heart rate (15-17).
- Additional benefits may be gained from vigorous-intensity aerobic exercise (i.e. >60% of VO2max) (14). Relatively, vigorous-intensity activity could be expressed as a level of effort of 7 or 8 on a scale of 0 to 10 or 70–90% of maximum heart rate (15-16).
- Resistance exercise should be moderate (>50% of 1-repetition maximum, i.e.1-RM – maximum amount of weight one can lift in a single repetition for a given exercise) or vigorous (75–80% of 1-RM) at intensity (14).

Time

- 20 to 60 mins per day of aerobic exercise should be performed continuously or intermittently in bouts of at least 10 mins accumulated to total 150 mins per week (14, 18).
- 3 sets of 8–10 repetitions on 8–10 exercises involving the major muscle groups may be an optimal goal for resistance exercise (14).

Type

- A variety of modes of aerobic exercise is recommended but any form (including brisk walking) that uses large muscle groups and causes sustained increases in heart rate (HR) is likely to be beneficial (14).
- Exercises like walking, swimming or cycling that do not impose undue stress on the feet are some appropriate choices.

Each session of resistance exercise should involve the major muscle groups (legs, hips, chest, back, abdomen, shoulders, and arms). According to the literature, resistance exercise programme involving a combination of bench press, leg extension, upright row, lateral pull-down, standing leg curl (ankle weights), dumbbell seated shoulder press, dumbbell seated biceps curl, dumbbell triceps kickback, and abdominal curls has been shown to improve glycaemic control in older adults with T2DM (11).

Initial instruction and periodic supervision by a qualified exercise trainer is recommended for most persons with T2DM, particularly if they undertake resistance exercise, to ensure optimal benefits to blood glucose control, blood pressure, lipids, and cardiovascular risk and to minimise injury risk (19).

Rate of Progression

Gradual progression of intensity of aerobic exercise is advisable to minimise the risk of injury, particularly if health complications are present, and to enhance compliance (14). Points to be taken into consideration in exercise prescription include age, ability, disease state, and individual preference of type of exercise. In general, the elderly and obese patients with T2DM take longer time for adaptation and may require slower progression, though it is advisable for the aged to be as physically active as possible.

Similarly, to avoid injury, progression of frequency and intensity of resistance

exercise should occur slowly. Increases in weight or resistance are undertaken first and only once when the target number of repetitions per set can consistently be exceeded, followed by a greater number of sets and lastly by increased frequency (14). Early in training, each session of resistance exercise should minimally include 5–10 exercises and involve completion of 10–15 repetitions to near fatigue per set, progressing over time to heavier weights (or resistance) that can be lifted only 8–10 times. A minimum of one set of repetitions to near fatigue for each exercise, but as many as 3 to 4 sets, is recommended for optimal strength gains (14).

Evaluation of the Diabetic Patient Before Recommending an Exercise Programme

Medical practitioners should use clinical judgment in this area. Certainly, high-risk patients should be encouraged to start with short periods of low-intensity exercise and to increase the intensity and duration slowly. Medical practitioners should assess patients for conditions that might contraindicate certain types of exercise or predispose to injury, such as uncontrolled hypertension, severe autonomic neuropathy, severe peripheral neuropathy or history of foot lesions, and unstable proliferative retinopathy as well as take into consideration patients' age and previous physical activity levels (17).

Exercise stress testing is not routinely recommended to detect ischaemia in asymptomatic individuals at low coronary heart disease (CHD) risk (<10 % in 10 yrs.). It is advised primarily for sedentary adults with diabetes who are at higher risk for CHD and who would like to undertake activities more intense than brisk walking, e.g. age > 40, concomitant risk factors such as hypertension, microalbuminuria, etc., or presence of advanced cardiovascular or microvascular complications (e.g. retinopathy, nephropathy) (14).

Exercise in the Presence of Non-optimal Glycaemic Control

Hyperglycaemia

When people with type 1 diabetes are deprived of insulin and are ketotic, exercise can worsen hyperglycaemia and ketosis; therefore, vigorous activity should be avoided in the presence of ketosis (20). On the other hand, T2DM subjects usually are not profoundly insulin-deficient. They do not have to postpone exercise simply because of high blood glucose (e.g. > 16.7 mmol/L), as long as they feel well, and are adequately hydrated without ketosis (14).

Hypoglycaemia

In individuals with T2DM performing moderate exercise, blood glucose utilisation by muscles usually rises more than hepatic glucose production, and blood glucose levels tend to decline. Plasma insulin levels normally fall, however, making the risk of exercise-induced hypoglycaemia in anyone not taking insulin or insulin secretagogues very minimal, even with prolonged physical activities (14). In individuals taking insulin and/or insulin secretagogues (e.g. sulfonylureas like glyburide, glipizide, and glimepiride, as well as nateglinide and repaglinide), physical activity can cause hypoglycaemia if medication dose or carbohydrate consumption is not altered. For individuals on these therapies, added carbohydrate should be ingested if pre-exercise glucose levels are <5.6 mmol/l (21-22). Hypoglycaemia is rare in diabetic individuals who are not treated with insulin or insulin secretagogues, and no preventive measures for hypoglycaemia are usually advised in these cases.

Exercise in the Presence of Specific Long-term Complications of Diabetes

Retinopathy

In the presence of proliferative diabetic retinopathy or severe non-proliferative diabetic retinopathy, vigorous aerobic or resistance exercise may be contraindicated because of the risk of triggering vitreous haemorrhage or retinal detachment (23).

Peripheral neuropathy

Decreased pain sensation in the extremities results in increased risk of skin breakdown and infection and of Charcot joint destruction and this is why some prior recommendations have advised non-weight-bearing exercise for patients with severe peripheral neuropathy. Studies have shown that moderate-intensity walking may not lead to increased risk of foot ulcers or re-ulceration in those with peripheral neuropathy (24). Individuals with peripheral neuropathy and without acute ulceration may participate in moderate weight-bearing exercise (14). Comprehensive foot care including daily inspection of feet and use of proper footwear is recommended for prevention and early detection of sores or ulcers (14). Anyone with a foot injury or open sore should confine themselves to non-weight-bearing activities.

Autonomic neuropathy

Autonomic neuropathy can increase the risk of exercise-induced injury or adverse events through decreased cardiac responsiveness to exercise, postural hypotension, impaired thermoregulation, impaired night vision due to impaired papillary reaction, and unpredictable carbohydrate delivery from gastroparesis predisposing to hypoglycaemia (25). Autonomic neuropathy is also strongly

associated with cardiovascular disease in people with diabetes (26-27). People with diabetic autonomic neuropathy should be screened and receive physician approval and possibly an exercise stress test before embarking on physical activity levels more intense than usual. Exercise intensity is best prescribed using the HR reserve method with direct measurement of maximal HR (14).

Albuminuria and nephropathy

Physical activity can acutely increase urinary protein excretion. However, there is no evidence that vigorous exercise increases the rate of progression of diabetic kidney disease and likely no need for any specific exercise restrictions for people with diabetic kidney disease (28). Exercise increases physical function and quality of life in individuals with kidney disease and may even be undertaken during dialysis sessions.

Special Precautions

- Encourage patients with T2DM to monitor their blood glucose level before and after exercise session, especially when beginning an exercise programme. This allows the patient to understand their glucose response to the particular physical activity.
- Encourage patients to keep log with the exercise intensity, duration and type. It helps them know their glucose response to the exercise sessions.
- Encourage patients to exercise with partners, especially when beginning an exercise programme until the patient know very well their glucose response to the exercise sessions.

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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO PATIENTS WITH HYPERTENSION

Effects of Exercise

Epidemiological studies suggest that regular physical activity may be beneficial for both prevention and treatment of hypertension, to enable weight loss, for functional health status, and to diminish all-cause mortality and risk of cardiovascular disease. Cross-sectional studies of select populations from China and other Eastern populations have confirmed the presence of a strong association between physical inactivity and an adverse heart disease risk factor profile (1). In Japanese men, duration of walk-to-work and leisure-time physical activity was significantly associated with a reduction in the risk for incident hypertension (2). A meta-analysis of randomised controlled trials concluded that dynamic aerobic endurance training reduces resting systolic and diastolic blood pressures by 3.0/2.4 mmHg, and daytime ambulatory blood pressure by 3.3/3.5 mmHg. The reduction in resting blood pressure was more pronounced in the hypertensive group (-6.9/-4.9 mmHg) than in the normotensive group (-1.9/-1.6 mmHg) (3). Even moderate levels of exercise lowered blood pressure, and this type of exercise also reduced body weight, body fat and waist circumference (4). Dynamic resistance exercise can also decrease resting blood pressure by 3.5/3.2 mmHg (5).

Recommendations for Exercise Prescription

Regular physical activity of even lower intensity and duration, however, has

been shown to be associated with about a 20% decrease in mortality in cohort studies (11). Individuals engaging in resistance exercise should seek guidance by a trained professional, for appropriate machine adjustment, selection of specific exercises, appropriate initial exercise prescription, and subsequent exercise progression (10). Resistive isotonic activities,

when done as the only form of exercise training, are not recommended for lowering blood pressure in hypertensive patients (12). An exercise prescription for achieving and

maintaining flexibility, such as proper stretching for all the major joints, may be advised after a thorough warm-up and during the cool-down period (6).

Recommendations

Frequency

- Perform aerobic exercise preferably all days of the week (6).
- Supplemented by resistance exercise twice to thrice weekly on nonconsecutive days (6).

Intensity

- Aerobic exercise should be at least at moderate intensity (e.g. brisk walking), corresponding approximately to 40 to 60% of maximal aerobic max) (6). Relatively, moderate-intensity activity could be capacity (VO2 expressed as a level of effort of 5 or 6 on a scale of 0 to 10 (where 0 is the level of effort of sitting, and 10 is maximal effort) or 50 to 70% of maximum heart rate (7-8).
- • Resistance exercise should be at moderate intensity (6), which could be expressed as 50 to 70% of 1-repetition maximum (1-RM – maximum amount of

weight one can lift in a single repetition for a given exercise) (8).

Time

- Perform 30 to 60 mins per day of aerobic exercise continuously or intermittently in bouts of at least 10 mins accumulated to total of at least 30 mins per day (6).
- Each session of resistance exercise should minimally include 8–10 exercises and should consist of at least 1 set of 8–12 repetitions per exercise (6).

Type

- Emphasis on aerobic exercises such as walking, jogging, cycling and swimming (6). Rope skipping is also a very good option that can be performed every day, requires little equipment and learning, and involves a lot of muscle group. However, any activity that uses large muscle groups, can be maintained continuously, and is rhythmical and aerobic in nature is recommended as the primary modality for those with hypertension (9).
- Resistance exercise should involve the major muscle groups (legs, hips, chest, back, abdomen, shoulders, and arms) (6). Either machine weights or free weights might be used while the former is likely the safest approach (10). Resistance exercise performed should be alternating between upper- body and lower-body works to allow for adequate rest between exercises. Some examples of resistance exercise include chest press, shoulder press, triceps extension, biceps curl, pull-down (upper back), lower-back extension, abdominal crunch/curl-up, quadriceps extension or leg press, leg curls (hamstrings), and calf raise (10).

Rate of Progression

In November 2010, the American College of Sports Medicine and the

American Diabetes Association published a joint position statement on exercise recommendations for patients with Type 2 diabetes mellitus which covers rate of progression (13). Their general principles, as outlined below, can also be applied to patients with hypertension:

- To avoid injury, progression of frequency and intensity of resistance exercise should occur slowly.
- Gradual progression of intensity of aerobic exercise is also advisable to enhance compliance.

Evaluation of Patient with Hypertension Before Recommending an Exercise Programme

The need for and scope of pre-exercise evaluation of the cardiovascular status will depend on the extent of the envisaged exercise and on the patient's symptoms and signs, total cardiovascular risk and associated clinical conditions (14). The risk of cardiovascular disease in patients with hypertension is determined not only by the level of blood pressure, but also by the presence or absence of target organ damage and other risk factors such as smoking, dyslipidaemia and diabetes, as shown in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (15). These factors independently modify the risk for subsequent cardiovascular disease, and their presence or absence is determined during the routine evaluation of patients with hypertension (i.e., history, physical examination, and/or laboratory tests). High-intensity resistance training should not be initiated for persons without prior exposure to more moderate resistance exercise independently of age, health status, or fitness level (10). Therefore, patients with hypertension should consult a primary care practitioner prior to any substantive increase in physical activity, particularly vigorous-intensity

activity (16).

Special Precautions

- Intensive isometric exercise such as heavy weight lifting can have a marked pressor effect and should be avoided (14).
- If hypertension is poorly controlled, heavy physical exercise as well as maximal exercise testing should be discouraged or postponed until appropriate drug treatment has been instituted and blood pressure lowered (16). When exercising, it appears prudent to maintain systolic blood pressures at ≤220 mmHg and/or diastolic blood pressures ≤105 mmHg (6).
- β-blockers and diuretics may adversely affect thermoregulatory function and cause hypoglycaemia in some individuals. In these situations, educate patients about the sign and symptoms of heat intolerance and hypoglycaemia, and the precautions that should be taken to avoid these situations (6).
- Antihypertensive medications such as calcium channel blockers, β-blockers and vasodilators may lead to sudden reductions in post-exercise blood pressure. Extend and monitor the cool-down period carefully in these situations (6).
- β-blockers, particularly the non-selective types, may reduce sub-maximal and maximal exercise capacity primarily in patients without myocardial ischaemia. Consider using perceived exertion to monitor exercise intensity in these individuals (6).
- Patients should be informed about the nature of cardiac prodromal symptoms e.g. shortness of breath, dizziness, chest discomfort or palpitation and seek prompt medical care if such symptoms develop.

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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO PATIENTS WITH HEART DISEASE

Introduction

Participation in regular exercise by patients with known heart disease poses a number of clinical and ethical questions, including the most appropriate physical activities and sport in which patients may safely be engaged. In fact, identification of a heart disease, or incidence of a cardiac event, is usually associated with prudent advice for patients to reduce (or leave) intensive exercise training and competitive sport, justified by clinical concern for the increased cardiac risk associated with exercise and sport. Therefore, primary care practitioners are often faced with the dilemma of whether to prescribe exercise to their patients or not, knowing that for some medical conditions, exercise is not advisable.

This chapter aims to provide useful references for primary care practitioners who wish to prescribe exercise to adult patients who suffer from certain types of heart disease, including ischaemic heart disease (IHD), chronic heart failure (CHF), arrhythmia and valvular heart disease (VHD). Rarer conditions such as congenital heart disease and cardiomyopathies are not within the scope of this chapter.

It should be emphasised at this point that in any case, patients with heart disease should be referred to a cardiologist or similar specialist for consultation and/or assessment before the exercise programme starts, especially where doubt exists. Exercise prescription for heart disease patients should be individualised according to risk.

Risk of Exercise in Patients with Heart Disease

Physical activity and exercise training may pose risks to individuals with certain heart conditions. While the commonest risk of physical activity among adults is musculoskeletal injury, IHD accounts for most exercise-related sudden deaths among those aged 35 years or above (1). The incidence of major cardiovascular complications during outpatient cardiac exercise programmes, among a mixed group of patients after percutaneous coronary intervention (PCI) or cardiac surgery, or those with other coronary and non-coronary conditions, has been estimated to be one in 50,000 participant-hours (2). In fact, sudden cardiac death (SCD) is often the initial coronary event in patients with either silent or symptomatic IHD (3). Pathology findings suggested that a considerable number of fatal myocardial infarctions (MIs) were not due to significant stenosis of the coronary arteries but rupture of unstable coronary atherosclerotic plaque possibly during exercise (3). Another cause of SCD in patients with heart disease is exercise-induced ventricular arrhythmias which are commonly detected during exercise testing (4).

Benefits of Exercise

Increasing physical activity is universally recognised as a desirable lifestyle modification for improving cardiovascular health, as exercise has been shown to be an important adjunct to reduce atherosclerotic risk factors such as hypertension, hyperlipidaemia, hyperglycaemia, obesity and tobacco use (5-9). In addition, regular physical activity has potential benefits on the autonomic nervous system, ischaemia threshold, endothelial function and blood coagulation. One randomised controlled trial also demonstrated slower disease progression and significantly fewer ischaemic events in patients with stable IHD who regularly exercised (10).

Cardiac rehabilitation (CR) is an important element of a comprehensive plan

for secondary prevention of acute cardiac events in patients with IHD. CR was initially defined by the U.S. Public Health Service as a comprehensive long-term programme involving medical evaluation, prescribed exercise, cardiac risk factor modification, education, and counselling (11). Several meta-analyses have concluded that cardiac rehabilitation reduced mortality rates in patients after MI (12-14). Of these, one (a meta-analysis of 51 randomised controlled trials of CR in patients who have had MI, coronary artery bypass graft (CABG) or percutaneous transluminal coronary angioplasty, or who have angina pectoris or coronary artery disease defined by angiography) also concluded that exercise-only CR, when compared to a comprehensive CR, could also reduce total cardiac mortality and all-cause mortality by 31% and 27% respectively (14). These results suggest that exercise is a crucial component of the rehabilitation process (15).

Benefits of physical activity for CHF patients have also been well documented. These include improved physical capacity (an increase of 10 to 30% of the maximum physical capacity) (16-17), quality of life (18), endothelial function (19), serum catecholamine levels (20), morbidity and hospital re-admission rates (21). Other potential benefits of exercise, with limited scientific evidence to support at this point, include the reduction of all-cause mortality (22) and improving resting cardiac function (23).

Pre-participation Evaluation

In any case, all patients with heart disease should have their clinical status carefully reviewed by relevant specialists before heading for an exercise programme. In addition to history taking and physical examination to identify cardiac and non-cardiac problems that might limit exercise participation and other factors possibly contributing to exercise intolerance, a blood test for basic biochemistries and electrolytes may be indicated (24). A physical exercise testing is also necessary to

identify any potentially dangerous electrocardiographic abnormalities and to stratify risks in patients with heart disease (25). Any recommendation for exercise training should be based on the pathology of the patient's condition, the individual's response to exercise (including heart rate, blood pressure, symptoms, and perceived exertion) as well as measurements obtained during exercise testing (24).

The following evaluation methods may be considered in assessing cardiac patients' risk of exercise participation (26).

- Resting 12-lead electrocardiogram (ECG) for detection of ischaemia, arrhythmias and cardiac hypertrophy.
- Physical exercise test (using treadmill or bicycle) for evaluation of symptoms, ST segment changes, arrhythmias, ischaemia and anginal thresholds, exercise capacity and blood pressure/heart-rate responses.
- Echocardiography for evaluation of left ventricular function, structural abnormalities or regional wall motion abnormalities.
- Physical or pharmacological stress test with single photon emission computed tomography, for detection of regional perfusion defects of the myocardium.
- Maximal physical or pharmacological stress with echocardiography or magnetic resonance imaging, for detection of reversible regional wall motion abnormalities, as a sign of reversible ischaemia.
- Coronary angiography for evaluation of luminal coronary stenosis or occlusion in one or more of the main branches or left main stem, coronary flow disturbances or abnormal coronary anatomy.
- Twenty-four-hour or longer (Holter) electrocardiographic monitoring for detection of electrical instability or ST–T changes.

It should also be noted that some kinds of cardiac arrhythmias can occur in structurally normal hearts or reflect the physiological adaptation to exercise

participation itself. Atrial premature beats, first-degree atrioventricular block or second degree Wenckebach-type atrioventricular block (Mobitz type I), for instance, are prevalent in the general population especially among athletes as they may be part of the physiological adaptations to exercise. In those cases with absence of structural heart disease, there is no need to proceed with further investigation or therapy and participation in all types of exercise are allowed (27).

Recommendations for Exercise Prescription

It is recommended that exercise prescribed should be tailored to each individual in accordance with their physical condition, aerobic/anaerobic fitness and local muscular condition. It is also important that exercise should be suited to each individual in terms of its intensity, duration and volume, in relation to his or her intended level of physical activity and their training goals. The activity should be linked to other lifestyle modifications to minimize the cardiac risk. Adequate pre- and post-exercise medical evaluations (follow-up) are also essential (26).

Good Practices for Cardiac Patients

Undertaking Physical Activity

- Include three periods in each physical activity session: warm-up, training and cool-down (28). Proper warm-up and cool-down phases (5 mins of light activity at a reduced intensity) may have an anti-anginal and possibly cardioprotective effect (28).
- Advise low-impact aerobic activity to minimise the risk of musculoskeletal injury.

Recommend gradual increases in the volume of physical activity over time (28).

- Explore daily schedules to suggest how to incorporate increased activity into usual routine (e.g., parking farther away from entrances, walking 2 flights of stairs, and walking during lunch break) (28).
- Terminate exercise immediately if warning signs or symptoms occur. These include dizziness, dysrhythmias, unusual shortness of breath, angina or chest discomfort.
- No exercise in case of unusual asthenia, fever or viral syndrome (29).
- The level of supervision and monitoring during exercise training depends on the result of risk stratification from patient assessments and clinical evaluations.
- Medical supervision and monitoring are particularly recommended for patients with multiple risk factors, and with moderate-to-high risk of cardiac events (i.e., recent revascularization, heart failure). The supervision should include physical examination, monitoring of heart rate, blood pressure and rhythm before, during and after exercise training (28). The supervised period should be prolonged in patients with new symptoms, signs, blood pressure abnormalities and increased supraventricular or ventricular ectopy during exercise (30).
- Provide progressive updates to the exercise prescription and modify further if clinical status changes.
- Ensure adequate hydration before, during and after physical activity. Adapt the intensity of physical activity to the environmental conditions, temperature, humidity and altitude (31).
- Avoid smoking at all times (32).
- Hot shower, which may result in an increased heart rate and arrhythmias, should be avoided during the 15 mins after physical activity (33).

Special Precautions

Patients with IHD

Patients with unstable angina are not eligible for competitive sports or any other regular physical activity. Patients with stable angina, silent ischaemia or post-PCI/ CABG and with a high probability for exercise-induced coronary events are also not eligible for competitive sports. Recreational sports are also restricted for post-MI patients with a high risk of cardiovascular events while leisure-time physical activity should always be encouraged (26).

Patients with CHF

Specific contraindications to exercise in patients with CHF include new onset atrial fibrillation, obstructive valvular disease, especially aortic stenosis or active myocarditis (either viral or autoimmune) (24).

CHF patients with diastolic and systolic dysfunction should refrain from swimming (24).

Individuals with pacemakers

Patients with heart disease and a pacemaker can participate only in exercises consistent with the limitations of the underlying heart disease.

Individuals with a pacemaker should also be restricted from exercises

with a risk of bodily impact (e.g. rugby, martial arts), because of the possible damage to the electrodes/pacing unit and risk of skin perforation (which may occur late after trauma). Extreme ipsilateral arm movements should be avoided at least until complete fixation of the leads, namely 6 weeks. Sports with pronounced arm movements (such as volleyball, basketball, tennis and climbing) may also increase the risk of late lead damage as a result of subclavian crush (with insulation or conductor failure) (27).

Patients with valvular heart disease

Physical check-ups among individuals with valvular heart disease are of significant relevance and exercise testing should be obtained after evaluation of the heart valves by echocardiography.

Exercise is contraindicated in patients with unexplained syncope, family history of SCD, complex supraventricular or ventricular arrhythmias, long QT interval or severe mitral regurgitation (34).

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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO PATIENTS WITH OSTEOARTHRITIS

Effects of Exercise

Although pain and functional limitations can result in challenges to physical activity among patients with osteoarthritis, regular exercise is essential for managing this condition.

Studies conducted in recent years provided evidence that supports the assumption that muscle weakness and muscle atrophy contribute to the disease process (1-4). Thus, rehabilitation and physiotherapy are often prescribed with the intention to alleviate pain and increase mobility.

However, to counteract muscle atrophy, exercise has to be performed on a regular basis as health benefits do not persist if exercise programmes are discontinued (5). Therefore, people with degenerative joint disease should be put on continuous exercise programmes (5).

Evidence from a large systematic review and a large randomised controlled trial for knee osteoarthritis demonstrated the beneficial effects of exercise compared with no exercise (6-7). Exercise in this context included aerobic walking, home quadriceps exercise, strengthening and home exercise, aerobic exercise with weight training, and diet with aerobic and resistance exercise. These studies showed that exercise was associated with reduced pain and disability, medication intake, as well as improved physical functioning, stair climbing, walking distance, muscle strength, balance, self-efficacy and mental health and physical functioning (6-7). Majority of these beneficial outcomes were observed during follow up at 18 months post-randomisation (6-7). Risk of adverse events is considered low if exercise recommended for the individual has been appropriately assessed by a trained health

professional (8). While some individuals may experience an exacerbation of symptoms, the vast majority (including those severely affected) will neither develop adverse reaction to controlled exercise nor experience an increase in the severity of arthritis (9-10). For example, patients with significant osteoarthritis can ride a bicycle, go swimming or exercise in a gym with often no or minimal discomfort.

Recommendations for Exercise Prescription

Although management guidelines for osteoarthritis recommend exercise therapy, specifics – such as the frequency, intensity, duration and mode – have not been addressed.

In general, the recommendations for exercise participation for apparently healthy adults mentioned in previous chapters could also be followed. The following table summarises the salient points of the FITT framework for patients with osteoarthritis:

Recommendations

Frequency

- At least 3 days per week of aerobic exercise is recommended (11), or follow the recommendations for healthy adults as tolerated.
- Resistance exercise should be performed 2 to 3 nonconsecutive days per week (11).
- Stretching exercise should be emphasised and performed at least daily (11).

Intensity

- General recommendations for exercise intensity apply for aerobic exercises. Initial aerobic exercise should begin at lower levels of moderate intensity (e.g. about 40% heart rate reserve) for individuals who have been sedentary or limited by pain (11-12).
- For resistance exercise, start with a relatively low amount of load (e.g. 10% 1-repetition maximum (1-RM) for individuals with severe arthritis) and progress at a maximal rate of 10% increase per week as tolerated to the point of pain tolerance and/or low to moderate intensity (i.e. 40–60% 1-RM) (11).

Time

- Start engaging in aerobic exercise in short bouts of 5 to 10 mins to accumulate 20 to 30 mins per day as tolerated, with a goal of progressing to a total of 150 mins per week of moderate-intensity activity (11).
- Perform at least 1 set of resistance exercise involving 10 to 15 repetitions per exercise (11).

Type

- Aerobic exercise: activities having low joint stress, such as walking, cycling or swimming are recommended (11). Studies have shown that jogging would neither increase the risk of developing osteoarthritis nor result in increased severity of the disease (13).
- Resistance exercise: Individuals with significant joint pain or muscle weakness may benefit from beginning with maximum voluntary isometric contractions around the affected joint (e.g. partial squat) and progressing to dynamic

training (11). Training all major muscle groups as recommended in healthy adults is the ultimate goal.

- Stretching exercises for stretching all major muscle groups are recommended (11).

Special Considerations

Avoid strenuous exercises during acute flare-ups and periods of inflammation (11).

Progression in duration of activity should be emphasised over increased intensity (11).

Adequate warm-up and cool-down periods of 5 to 10 mins are critical for minimising pain (11).

Inform individuals with osteoarthritis that some discomfort during or immediately after exercise may be expected. However, if joint pain persists for 2 hours after exercise and exceeds the level of pain before exercise, the duration and/or intensity of exercise should be reduced in future sessions (11).

Many patients suffering from osteoarthritis refuse to start exercising due to joint pain.

In such cases, the use of painkillers during the first weeks of an exercise programme might not only facilitate joint movement but can also drastically improve patient compliance (5). Encourage patients to exercise during the time of day when pain is typically least severe and/or in conjunction with peak activity of pain medications (11).

In case of severe joint pain or in obese patients, an initial period of water-based exercise may be helpful (5). As swimming or aqua-jogging provides a muscle workout without joint loading, further pain and weight-related joint destruction can be avoided.

Appropriate shoes that provide shock absorption and stability are particularly important for people with knee osteoarthritis (11).

Because it is common for patients with osteoarthritis of lower extremities to be overweight and obese, healthy weight loss and maintenance should be encouraged (11).

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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO OVERWEIGHT AND OBESE PATIENTS

Effects of Exercise

The increasing prevalence of obesity reflects a lack of energy balance in a large number of people who are consistently expending fewer calories than they consume. It is reasonable to assume that persons with relatively high daily energy expenditures would be less likely to gain weight over time, compared with those who have low energy expenditures.

Research has shown that adults are more likely to maintain a healthy weight if they have an active lifestyle and reduce their physical inactivity (1-3). A systematic review of randomised control trials (RCTs) in early postmenopausal women suggested that walking at least 30 mins per day plus twice weekly resistance exercise sessions was likely to be effective in preserving normal body weight (4). International consensus guidelines, based largely around data from epidemiological prospective studies also recommended that adults should engage in 45 to 60 mins of moderate-intensity physical activity per day to prevent transition to overweight or obesity (5). Currently, the specific types and amounts of activity required to prevent weight gain have not been well established using prospective study designs, and it is best to assume that the specific amount of physical activity that will help prevent unhealthy weight gain is a function that differs between individuals, but that in general more activity increases the probability of success (6).

Despite the intuitive appeal of the idea that physical activity helps in losing weight, physical activity appears to produce only modest increments of weight loss beyond those achieved by dietary measures and its effects no doubt vary among people (7). A meta-analysis of RCTs on the effectiveness of physical activity for

weight loss in obese individuals revealed physical activity (minimum of 45 mins 3 times a week) combined with diet (600 kcal/deficit or low fat) results in an approximate weight change of –1.95 kg (95% CI -3.22 to -0.68) (range –1.00 kg to –3.60 kg) compared to diet alone at 12 months (1). Whilst the addition of physical activity on top of a dietary intervention enhanced weight loss, physical activity appeared to be less effective than diet as a sole weight loss intervention (8).

Several observational studies have been conducted on the role of physical activity in preventing weight regain after an initial sizable weight loss (9-13). Although these studies had different study design and methodology, all of them focused on people who had lost 30–50 lb (13.6–22.7 kg) and had not regained after several years. Studies using self-reported physical activity and energy expenditure generally support the notion that 60–90 mins of moderate-intensity physical activity per day might be necessary for weight maintenance after such large weight losses (11-12).

Recommendations for Exercise Prescription

Adults who are overweight or obese should be encouraged to increase their physical activity levels even if they do not lose weight as a result, because physical activity can bring other health benefits such as reduced risk of type 2 diabetes and cardiovascular disease. Overweight or obese adults should be encouraged to perform at least 30 mins of at least moderate-intensity physical activity on 5 or more days a week. The activity can be undertaken in one session or several lasting 10 mins or more. For those who have already achieved this level of activity, an increase in the amount of their physical activity is a reasonable component of any strategy to lose weight. It is generally estimated that 1 pound (0.45kg) of body fat loss requires about 3,500 kcal of energy consumption. As studies on the effect of prescription of muscle strengthening exercise on weight loss are limited, it seems reasonable to recommend

overweight/obese people to follow the same muscle strengthening exercise recommendations for the general population for having a balanced exercise programme.

The following is the recommended FITT framework for prescribing aerobic exercises to people who are overweight and obese:

Recommendations

Frequency

- ≥5 days per week of aerobic exercises to maximise caloric expenditure (14).

Intensity

- Moderate- to vigorous-intensity aerobic exercises should be encouraged.
- Some individuals may prefer doing vigorous exercise as it is less time consuming, but vigorous exercise is probably not appropriate for the very obese (BMI > approximately 35 kg/m^2) (8).
- Individuals choosing to incorporate vigorous intensity activity into their programme should do this gradually and after an initial 4–12 week period of moderate-intensity activity (8).

Evaluation of Overweight or Obese Patients Before Recommending an Exercise Programme

It is important to ensure that individuals have no contraindications to exercise

before commencing a physical activity programme. The presence of other comorbidities (e.g. dyslipidaemia, hypertension, hyperinsulinaemia, hyperglycaemia, etc.) may increase the risk stratification for overweight and obese individuals, resulting in the need for additional medical screening before exercise testing. The presence of musculoskeletal and/or orthopaedic conditions and limitations of exercise capacity may require modifications to the exercise testing procedure.

Special Considerations

Prescription of higher physical activity targets (i.e. >300 mins per week of moderate-intensity physical activity) only resulted in significantly greater weight loss when participants received additional support, such as inclusion of family members in programme, small group meetings with exercise coaches or small monetary incentives, to help them to achieve their activity goals (15). When additional support is not provided, prescription of higher physical activity targets may not result in significantly greater weight loss than prescription of standard physical activity (8).

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RECOMMENDATIONS FOR PRESCRIBING EXERCISE TO PATIENTS WITH OSTEOPOROSIS

Effects of Exercise

Weight-bearing aerobic exercises and muscle-strengthening exercises have been shown to be an integral part of osteoporosis prevention, as well as a part of the treatment process (1).

There is strong evidence that physical activity early in life contributes to higher peak bone mass. Physical activity during early age was more strongly associated with higher bone mineral density (BMD) at all sites than was physical activity in the past two years (2). Lifetime weight-bearing is more strongly associated with higher BMD of the total and peripheral skeleton than is non-weight-bearing exercise (2). Exercise during the later years in the presence of adequate calcium and vitamin D probably has a modest effect on slowing the decline in BMD (3). Physical activity, particularly weight-bearing exercise, is thought to provide the mechanical stimuli or "loading" important for the maintenance and improvement of bone health (1). A number of systematic reviews and meta-analyses have suggested that an exercise programme combining low impact weight bearing exercise and high-intensity resistance training maintains bone density in men and postmenopausal women (4-6). Resistance training may have more profound site-specific effect than aerobic exercise (7). High-intensity resistance training may have added benefits for decreasing osteoporosis risks by improving strength and balance, and increasing muscle mass (7).

Although patients with osteoporosis may think exercise increases the risk of injury from broken bones, the truth is quite the opposite. A regular and properly designed exercise programme may help to prevent falls and fall-related osteoporotic fractures, which in turn reduces the risk of disability and premature death among

patients with osteoporosis. Randomised clinical trials have shown exercise to decrease the risk of falls by approximately 25% (8-10). Stronger back extensor muscles have been shown to decrease the risk of vertebral fractures independent of pharmacotherapy (8-10).

Recommendations for Exercise Prescription

All three components of an exercise program are needed for strong bone health: weight-bearing aerobic exercise such as jogging, brisk walking, stair climbing; muscle strengthening exercise with weights; and balance training such as Tai Chi. Patients should be encouraged and offered assistance in developing a lifetime programme of exercise that they will continue to do and enjoy.

Recommendations

Frequency

- To perform at least 3 days per week of aerobic exercise (11).
- To perform resistance exercise 2 to 3 nonconsecutive days per week (11).

Intensity

- To perform moderate intensity for weight-bearing aerobic exercise (11).
- To perform moderate intensity for resistance exercises in terms of bone-loading forces, although some individuals may be able to tolerate more intense

training (11). Individuals at risk of osteoporosis are recommended to perform high-intensity training (80-90% 1-repetition maximum for 5 to 6 repetitions) to help preserve bone health (11).

Time

- Initial goal of 20-30 mins per session of moderate-intensity aerobic activity is reasonable, with a goal of progressing to a total of 150 mins per week. In case of extreme reconditioning, a shorter duration at the beginning should be employed (12).
- Perform at least 1 set of resistance exercise involving 8 to 10 repetitions per exercise at moderate intensity (11).

Type

- Weight-bearing aerobic exercise includes stair-climbing/ descending, walking with intermittent jogging and table-tennis.
- Resistance training of a high intensity produces gains in strength and BMD. Any form of resistance training should be site specific i.e. targeting areas such as the muscle groups around the hip, the quadriceps, dorsi/plantar flexors, rhomboids, wrist extensors and back extensors (13). Certain types of movements should be avoided (refer to the section “Special Considerations” below)
- For older women and men at increased risk for falls, the exercise prescription should also include activities that improve balance.

To be effective, all exercise programmes need to be progressive in terms of impact and intensity as fitness and strength levels improve. Programmes should begin at a low level that is comfortable for the patient. It would be the best if an initial assessment by a suitably trained individual such as a physiotherapist could be done for giving the patient a reference point from which to start the exercise programme.

Special Considerations

Because the majority of individuals with osteoporosis are older in age and sedentary, they are usually considered as moderate to high risk for atherosclerotic disease. Based on this, it would be prudent to assess the patient before participating in exercise of level higher than usual (12). For resistance training involving use of weight-lifting machines, initial training sessions should be supervised and monitored by personnel who are sensitive to special needs of older adults.

There are currently no established guidelines regarding contraindications for exercise for people with osteoporosis. The general recommendation is to prescribe moderate intensity exercise that does not cause or exacerbate pain.

Exercises that involve explosive movements or high-impact loading should be avoided.

Low impact weight-bearing activity is characterised by always having one foot on the floor. Ballistic movements or jumping (both feet off floor) is termed high impact training. (11-13)

Exercises that cause twisting (e.g. golf swing), bending or compression of the spine (e.g. rowing or other dynamic abdominal exercises including sit-ups) should also be avoided. (11-12)

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SITUATIONAL TASKS

CASE 1 – RISK STRATIFICATION

Mr. C. is a 43-year-old man with known history of hypertension on medication under good control. He works as a construction site labourer. He smokes one and a half pack of cigarettes per day, and has done so for over 25 years. His father died from a heart attack at age 60. CY has no signs and symptoms of cardiorespiratory disease. He has just completed a body check-up and the report showed body height of 173cm and body weight of 80kg, whereas blood test showed total cholesterol was found to be 8 mmol/L and fasting glucose of 5.4 mmol/L.

You are going to suggest Mr. C. to perform regular aerobic and muscle-strengthening exercises as some primary preventive measures for future cardiovascular events. Before that, you would like to stratify his risk to see if he should need further medical workup or exercise testing before increasing his physical activity level.

What risk stratification category is Mr. C. in?

Mr. C. has FOUR risk factors: cigarette smoking, hypertension (because he is on medication, even though his current blood pressure is under controlled), hypercholesterolaemia (based only on knowing his total cholesterol), and obesity (his BMI is 26.7kg/m^2 , which is regarded as obese according to the WHO's standard Asian classification of weight status).

He would not be classified as sedentary because of his physically active job nature. He does not have a family history of heart disease for screening purposes, because his father's heart attack occurred after the age of 55. His fasting glucose is normal. Although Mr. C. is considered to be young (less than 45), he is in the

moderate-risk category, because he does not have any signs or symptoms of cardiorespiratory disease or know cardiovascular, pulmonary or metabolic disease.

At this stage, for performing low- to moderate-intensity physical activity, further medical workup and exercise testing are not necessary, although a sub-maximal exercise test of his cardiovascular fitness can offer a comprehensive appraisal of his condition. However, for embarking on a vigorous exercise programme, he would need further medical clearance from specialists or equivalent professionals according to the recommendations from the American College of Sports Medicine.

CASE 2 – PRESCRIBING EXERCISE INTENSITY

Mr. P. is a 56-year-old, moderate-risk male client. His old friend suffered a heart attack a week ago and he is worried about his own health. He wants to control his body weight so as to reduce his risk of heart disease. You are going to advise him to embark on moderate-intensity aerobic exercises on regular basis. His resting heart rate is 86 bpm.

What would be an appropriate target heart rate (HR) range for Mr. P.?

You could estimate Mr. P. maximal heart rate (HRmax) as 220 – 56 = 164bpm. You may prescribe his target HR range by the following methods:

(1) %HRmax Method

The target HR range for performing moderate-intensity aerobic physical activity is 64 – 76% of HRmax.

Lower target HR = 164(0.64) = 105bpm Upper target HR = 164(0.76) = 125bpm

(2) %HRR (Heart Rate Reserve) Method

The target HR range for performing moderate-intensity aerobic physical activity is 40 – 59% of HRR.

Lower target HR = (0.4)(164-86)+86 = 117bpm Upper target HR = (0.59)(164-86)+86 = 132bpm

%HRmax Method of prescribing exercise intensity is simple to use and therefore very popular. However, it does not account for resting HR, which means clients with a slower resting HR would have a relatively higher exercise intensity compared to those with a faster resting HR. The %HRR Method avoids the problems association with these variations in resting HR.

CASE 3 – PRESCRIBING EXERCISE TO HEALTHY ADULT

Ms. T. is 40-year-old housewife seeing you for contact dermatitis. She enjoys good past health and has got no other significant risk factors for cardiovascular disease and is in the low risk category for exercise participation. Upon further exploration, she is interested in embarking on more physical activity for better health.

Design a comprehensive exercise prescription for Ms. T.

You could apply the FITT principle (Frequency, Intensity, Time [duration] and Type [mode]) for devising an appropriate exercise prescription for Ms. T.

Aerobic Physical Activity

(1) Frequency

Perform moderate-intensity aerobic physical activity on at least 5 days per week or vigorous-intensity activity on at least 3 days per week, or a weekly

combination of 3 to 5 days per week of moderate- and vigorous-intensity exercise.

(2) Intensity

A combination of moderate- and vigorous-intensity aerobic exercise is recommended. You could calculate a target heart rate range based on 64-93% maximal heart rate or based on 40-84% heart rate reserve.

(3) Time [duration]

Perform moderate-intensity aerobic exercise for at least 30 mins per day to a total of at least 150 mins per week, or vigorous-intensity exercise for at least 20 mins per day to a total of at least 75 mins per week. Performance of intermittent exercise of at least 10 mins in duration to accumulate the minimum duration prescribed above is an effective alternative to continuous exercise.

For additional and more extensive health benefits, you could advise her to increase her aerobic physical activity to 300 mins (5 hours) a week of moderate-intensity, or 150 mins a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate-and vigorous-intensity activity.

(4) Type [mode]

Aerobic exercise should be rhythmic in nature that involves large muscle groups and best require little skill to perform. Depending on Ms. T. present skill and fitness, exercise and sports requiring skill to perform or higher level of fitness could also be recommended.

Muscle-strengthening Physical Activity

(1) Frequency

Perform resistance exercise of each muscle group on 2 to 3 days per week with at least 48 hours separating the exercise training sessions for the same muscle group.

(2) Intensity

A load of 60 to 80% of 1 repetition maximum is recommended for resistance exercises.

(3) Time [duration]

8 to 10 resistance exercises are recommended. Each muscle group should be trained for a total of 2 to 4 sets with 8 to 12 repetitions per set and a rest interval of 2 to 3 mins in between.

(4) Type [mode]

Progressive weight training programme, weight bearing calisthenics, stair climbing and other muscle strengthening activities that use all major muscle groups are recommended. Multi-joint exercises involving more than one muscle group and targeting agonist and antagonist muscle groups are recommended, while single-joint exercises targeting major muscle groups may also be included. You should advise her to receive professional instruction in proper resistance exercise techniques.

Others

A stretching exercise of at least 10 mins involving the major muscle tendon groups of body (i.e., neck, shoulder, upper and lower back, pelvis, hips and legs) with 4 or more repetitions (with 10 to 30 seconds for a static stretch) per muscle group performed on a minimum of 2 days per week is also recommended. Preferably, stretching activities are performed on all days that aerobic or muscle-strengthening activity is performed.

Initiation and Progression of Exercise

Besides setting the recommended level of physical activity, you could also prescribe the rate of progression of exercise. Gradual increase in the volume of physical activity over time to pursue the above prescribed level is recommended.

Follow Up

You must monitor Ms. T. response to the exercise prescription. If she has difficulty completing this level, you need to reduce the intensity/duration. If she finds that at this level is very easy, increase the intensity/duration until it feels somewhat hard.

CASE 4 – PRESCRIBING EXERCISE TO SEDENTARY OLD MAN

Mr. N. is 68-year-old man, who used to enjoy a sedentary lifestyle. His past

medical history is unremarkable and he has got no other significant risk factors for cardiovascular disease and is in the moderate risk category for exercise participation.

Design a comprehensive exercise prescription for Mr. N.

You could apply the FITT principle (Frequency, Intensity, Time [duration] and Type [mode]) for devising an appropriate exercise prescription for Mr. N.

Aerobic Physical Activity

(1) Frequency

Perform moderate-intensity aerobic physical activity on at least 5 days per week.

(2) Intensity

Moderate-intensity aerobic exercise is recommended. On a scale of 0 to 10 for level of physical exertion, 5 to 6 is for moderate intensity. Alternatively, you could calculate a target heart rate range based on 64-76% maximal heart rate or based on 40-59% heart rate reserve. (For embarking on vigorous-intensity aerobic exercise, further medical workup and exercise testing is necessary.)

(3) Time [duration]

Perform moderate-intensity aerobic exercise for 30 to 60 mins per day to a total of 150 to 300 mins per week. Performance of intermittent exercise of at least 10 mins in duration to accumulate the minimum duration recommended above is an effective alternative to continuous exercise.

(4) Type [mode]

Walking is most commonly recommended type of activity. Aquatic exercise and stationary cycle exercise may be advantageous for a sedentary old man with limited tolerance for weight bearing activity.

Muscle-strengthening Physical Activity

(1) Frequency

Perform resistance exercise at least 2 days per week.

(2) Intensity

Moderate-intensity (5 to 6) on a 10-point scale is recommended.

(3) Time [duration]

8 to 10 resistance exercises are recommended and each muscle group should be trained for a total of 1 or more sets with 10 to 15 repetitions per set.

(4) Type [mode]

Progressive weight training programme, weight bearing calisthenics, stair climbing and other muscle strengthening activities that use all major muscle groups are recommended. For resistance training involving use of weight-lifting machines, initial training sessions should be supervised and monitored by personnel who are sensitive to special needs of older adults.

Others

For enhancing Mr. N. physical flexibility, stretching exercise of at least 10 mins involving the major muscle tendon groups of body with 4 or more repetitions (with 10 to 30 seconds for a static stretch) per muscle group performed on a minimum of 2 days per week is recommended.

For improving balance, agility and proprioception, neuromuscular exercises is also recommended at least 2 days per week.

Initiation and Progression of Exercise

Besides setting the recommended level of physical activity, you could also prescribe the rate of progression of exercise. Since Mr. N. used to be sedentary, the intensity and duration of physical activity to be performed should be low at the beginning of the exercise programme for enhancing compliance and ensuring safety. Gradual increase in the volume of physical activity over time to pursue the above prescribed level is recommended. Subsequent to a period of adaptation and improved musculo-tendinous conditioning, Mr. N. may also choose to follow guidelines for younger adults in the long run.

Follow Up

You must monitor Mr. N. response to the exercise prescription. If he has difficulty completing this level, you need to reduce the intensity/duration. If he finds that at this level is very easy, increase the intensity/duration until it feels somewhat hard.

CASE 5 – PRESCRIBING EXERCISE TO OBESE ADULT

Ms. A. is 35-year-old female with a BMI of 28.5kg/m^2. She asks you for the types of exercise she should do for shaping up her body. Her past medical history is unremarkable and she has got no other significant risk factors for cardiovascular disease and is in the low risk category for exercise participation.

Design a comprehensive exercise prescription for Ms. A.

You could apply the FITT principle (Frequency, Intensity, Time [duration] and Type [mode]) for devising an appropriate exercise prescription for Ms. A.

Aerobic Physical Activity

(1) Frequency

Perform aerobic physical activity on at least 5 days per week.

(2) Intensity

Moderate- to vigorous-intensity aerobic exercises are recommended. Subject to Ms. A. availability and ability, she may prefer doing vigorous exercise as it is less time consuming. You could calculate a target heart rate range based on 64-93% maximal heart rate or based on 40-84% heart rate reserve.

(3) Time [duration]

Perform 45 to 60 mins of moderate-intensity activity a day (corresponding to approximately 225 to 300 mins/week of moderate-intensity physical activity or lesser amounts of vigorous physical activity)

(4) Type [mode]

Walking is most commonly recommended type of activity. Weight-bearing physical activity may be difficult for some obese individuals particularly for those with joint problems. For these individuals, gradually increasing non-weight-bearing moderate-intensity physical activities (e.g. cycling, swimming, water aerobics, etc.) should be encouraged.

Muscle-strengthening Physical Activity

(1) Frequency

Perform resistance exercise of each muscle group on 2 to 3 days per week with at least 48 hours separating the exercise training sessions for the same muscle group.

(2) Intensity

A load of 60 to 80% of 1 repetition maximum is recommended for resistance exercises.

(3) Time [duration]

8 to 10 resistance exercises are recommended. Each muscle group should be trained for a total of 2 to 4 sets with 8 to 12 repetitions per set and a rest interval of 2 to 3 mins in between.

(4) Type [mode]

Progressive weight training programme, weight bearing calisthenics, stair climbing and other muscle strengthening activities that use all major muscle groups are recommended.

Initiation and Progression of Exercise

If Ms. A. is sedentary, she should build up to her physical activity targets over several weeks, starting with 10 to 20 mins of physical activity every other day during the first week or two, to minimise potential muscle soreness and fatigue for enhancing compliance.

If she chooses to incorporate vigorous intensity activity into her programme, she should do this gradually and after an initial 4–12 week period of moderate-intensity activity.

With additional social and technical support (e.g. inclusion of family members in programme, small group meetings with exercise coaches or small monetary

incentives), prescribing higher physical activity targets (i.e. >300 mins per week of moderate-intensity physical activity) may resulted in significantly greater weight loss.

Follow Up

You must monitor Ms. CHAN's response to the exercise prescription. If she has difficulty completing this level, you need to reduce the intensity/duration. If she finds that at this level is very easy, increase the intensity/duration until it feels somewhat hard.

TESTS

1. Patient in 1954 after myocardial infarction is aimed at passing the medical complex exercise. That first doctor to do gymnastics?

A. A survey of the patient, collect anamnesis.

B. Immediately move to the exercises.

C. Determine the type of patient body type.

D. No correct answer.

E. All answers are correct.

2. Patient C in 1950, with excessive body weight complains: breathlessness, fatigue rapid acceleration walking, climbing stairs, lower efficiency, which are signs of myocardial dystrophy. What method will depend on physical therapy for this patient?

A. From state of the cardiovascular system.

B. From the age of the patient.

C. The degree of adaptability to the patient's physical activity.

D. The correct answer A and B.

E. All answers are correct.

3. In women 38 years diagnosed with diabetes. The range of therapeutic measures doctor has ordered therapy. Methods on the classes

A. Therapeutic exercises is recommended after directly input patient insulin.

B. Medical gymnastics classes should not bore.

C. Necessary before and after school to measure patient pulse, AT and record them in case history.

D. All answers are correct.

E. No correct answers.

4. In patients 30 years revealed rheumatic affection of the cardiovascular system. Therapeutic exercise in rheumatoid affection of the cardiovascular system is aimed at.

A. Restoration of CNS functions.

B. Increased excitability of cortical.

C. Mobility of nervous processes.

D. All answers are correct.

E. No correct answer.

5. In a woman 40 years diagnosed with diabetes. In the complex therapeutic measures specific location given therapy. The main contraindications are

A. All severe forms of diabetes.

B. Quick tiredness.

C. Denominated in violation of various organs and systems.

D. All answers are correct.

E. No correct answers.

6. The patient was a course on physical therapy patolohiyiyi cardiovascular system, that positive effects should be carried out after therapy:

A. Activity improves the cardiovascular system: increased systolic volume and decreasing heart rate.

B. Increased systolic volume and increased heart rate.

C. Decreasing systolic volume and increased heart rate.

D. Decreasing systolic volume and decreasing heart rate.

E. No positive results.

7. The patient who suffered 5 years 1 hypertension cent. In addition to primary therapy designed set of exercises. Objectives pursued doctor recommending exercise?

A. Pereferychnyy and improve coronary blood flow.

B. Enhance contractile ability of cardiac muscle.

C. Prevent progression of atherosclerosis.

D. Ekonomizuvaty activity to reduce myocardial oxygen requirements.

E. All of the above is true.

8. The patient who suffered 5 years 1 hypertension cent. In addition to primary therapy designed set of exercises. Is Contraindications for appointment exercise respiratory arrhythmia

A. No.

B. So.

C. Temporary Contraindications.

D. Permanent Contraindications.

E. All answers are correct.

9. Patients after myocardial infarction was designed therapeutic exercises: slow pace of the exercises, repeat each exercise 3-4 times, playing zanyat3-5 min. Forgot about that indicate the doctor?

A. Starting position lying on his back.

B. Starting position standing.

C. Original sitting position.

D. Starting position is irrelevant.

E. Correct answer is no.

10. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. What kind of exercise should be conducted with patients extent of bed rest.

A. It is not safe, get up near the bed, turn on your side in bed, exercise-I.

B. Walk down the corridor, and LFC-2.

C. Walk 200 m, LFK-2.

D. Sit on the House-and exercise.

E. Perform breathing exercises, turn to the side, active prysadzhuvannya LFC-2.

11. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. What is the objective performance for transferring a patient to palatnyy mode?

A. Appropriate reaction to earlier views on load and bringing ST to izolinii.

B. Buying pain.

C. Respond to previous types of stress and when there are changes on the ECG scar.

D. ST approximation to izolinii.

E. Adequate response to previous types of loading.

12. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. What is the objective performance for the patient transferred to free mode?

A. Respond to previous types of stress and when there are changes on the ECG scar.

B. Buying pain.

C. Appropriate reaction to earlier views on ¬ load and bringing ST to izolinii.

D. ST approximation to izolinii.

E. Adequate response to previous types of loading.

13. Patient T., 56 years is in the cardiology ward with a diagnosis of CHD, acute myocardial infarction dribnovohnyschevyy left ventricle. When the examination is set and severity of MI and class is 3 - week rehabilitation program. On

what terms should be walking down the hall?

A. Individually.

B. 8-10 days.

C. For 10-18 days.

D. For 18-20 days.

E. For 20-28 days.

14. Patient C in 1950, with excessive body weight complains: breathlessness, fatigue rapid acceleration walking, climbing stairs, lower efficiency, which are signs of myocardial dystrophy. What method will depend on physical therapy for this patient?

A. From state of the cardiovascular system.

B. From the age of the patient.

C. The degree of adaptability to the patient's physical activity.

D. The correct answer A and B.

E. All answers are correct.

15. Patient in 1954 after myocardial infarction is aimed at passing the medical complex exercise. That first doctor to do gymnastics?

A. A survey of the patient, collect anamnesis.

B. Immediately move to the exercises.

C. Determine the type of patient tilobudovy.

D. No correct answer.

E. All answers are correct.

16. Patient K. decade sick hypotonic disease, is willing to engage in therapy. What is described Contraindications to this?

A. Hypotonic crises.

B. Cardiac arrhythmia.

C. Heart pain.

D. Dizziness.

E. All answers are correct.

17. Patient K., 1946. Entered the intensive care unit with the diagnosis: CHD. Acute myocardial velykovohnyschevyy myocar front, side walls and top. The state of clinical death. Defibrillation was carried out twice. The sixth day of a heart attack. Kupuvavsya pain syndrome after defibrillation. No complaints. Dynamics of electrocardiogram positive. Identify patient rehabilitation program.

A. First rehabilitation program.

B. Second rehabilitation program.

C. 3-a rehabilitation program.

D. 4th rehabilitation program.

E. 5-a rehabilitation program.

18. Patient K., 1946. Entered the intensive care unit with the diagnosis: CHD. Acute myocardial velykovohnyschevyy myocar front, side walls and top. The state of clinical death. Defibrillation was carried out twice. The sixth day of a heart attack. Kupuvavsya pain syndrome after defibrillation. No complaints. Dynamics of electrocardiogram positive. When you assign remedial gymnastics

A. After buying pain.

B. At 3 day treatment.

C. 4 days of treatment.

D. At 5 day treatment

E. At 6 day treatment.

19. Patient K., 1946. Entered the intensive care unit with the diagnosis: CHD. Acute myocardial velykovohnyschevyy myocar front, side walls and top. The state of clinical death. Defibrillation was carried out twice. The sixth day of a heart attack. Kupuvavsya pain syndrome after defibrillation. No complaints. Dynamics of electrocardiogram positive. What kind of exercise should be conducted with patients

extent on Day 6.

A. Perform breathing exercises, turn to the side. LFC-I.

B. Perform breathing exercises, turn to the side, passive exercise prysadzhuvannya-I.

C. Perform breathing exercises, turn to the side, passive exercise prysadzhuvannya-2.

D. Perform breathing exercises, turn to the side, active-and prysadzhuvannya exercise.

E. Perform breathing exercises, turn to the side, active prysadzhuvannya LFC-2.

20. Patient K., 1962 is in the cardiology ward with a diagnosis of CHD, acute myocardial infarction dribnovohnyschevyy left ventricle. When the examination is set and severity of MI and class is 3 - week rehabilitation program. At that time rising appointed by the bed?

A. In a day.

B. In Day 2.

C. In Day 3.

D. In 4 days.

E. In 6-7 days

21. Patient M. was 50, suffered a myocardial infarction that was recommended dosed physical load. What kind of exercise can be used?

A. Classes at the Gym.

B. Tennis.

C. Therapeutic gymnastics, morning gymnastics hygienic.

D. Football.

E. Horseback Riding.

22. Patient M., 1952 is in the cardiology ward with a diagnosis of CHD,

acute myocardial infarction dribnovohnyschevyy left ventricle. When the examination is set and grade severity of IM. Forms of exercise therapy, the patient displayed on bed rest:

A. Therapeutic exercises, individual tasks for their independence Occupation.

B. Morning AMI nastyka hygienic, therapeutic exercises.

C. Individual tasks for their independence classes, morning hygiene AMI nastyka.

D. Individual tasks for their independence classes, walking.

E. Morning AMI nastyka hygienic, therapeutic exercises, walking.

23. Patient M., 1952 is in the cardiology ward with a diagnosis of CHD, acute myocardial infarction dribnovohnyschevyy left ventricle. When the examination is set and grade severity of IM. Forms of exercise therapy, the patient displayed on palatnomu mode:

A. Morning AMI nastyka hygienic, therapeutic exercises, individual tasks for their independence Occupation.

B. Morning AMI nastyka hygienic, therapeutic exercises.

C. Individual tasks for their independence classes, morning hygiene AMI nastyka.

D. Individual tasks for their independence classes, walking.

E. Morning AMI nastyka hygienic, therapeutic exercises, walking.

24. Patient M., 1952 is in the cardiology ward with a diagnosis of CHD, acute myocardial infarction dribnovohnyschevyy left ventricle. When the examination is set and grade severity of IM. Forms of exercise therapy, the patient displayed on free mode:

A. Morning AMI nastyka hygienic, therapeutic exercises, individual tasks for their independence classes, walking.

B. Morning AMI nastyka hygienic, therapeutic exercises.

C. Individual tasks for their independence classes, morning hygiene AMI nastyka.

D. Individual tasks for their independence classes, walking.

E. Morning AMI nastyka hygienic, therapeutic exercises, walking.

25. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. Identify rehabilitation program patients swarms on the third day.

A. Third rehabilitation program.

B. First rehabilitation program.

C. Second rehabilitation program.

D. 4th rehabilitation program.

E. 5-a rehabilitation program.

26. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. What kind of exercise should be conducted with patients extent on the third day.

A. Perform breathing exercises, turn to the side. LFC-I.

B. Perform breathing exercises, turn to the side, passive exercise prysadzhuvannya-I.

C. Perform breathing exercises, turn to the side, passive exercise prysadzhuvannya-2.

D. Perform breathing exercises, turn to the side, active-and prysadzhuvannya exercise.

E. Perform breathing exercises, turn to the side, active prysadzhuvannya LFC-2.

27. Patient N., 1955. Diagnosis at postuplenni: IXS. Acute transmural front

side and left ventricular myocardial infarction. Kupuvavsya pain syndrome on the second day. Complications are not available. When you assign remedial gymnastics

A. After buying pain.

B. In a day treatment.

C. At the 2 day treatment.

D. At 3 day treatment.

E. 4 days of treatment.

28. In women 38 years diagnosed with diabetes. The range of therapeutic measures doctor has ordered therapy. Methods on the classes

A. Therapeutic exercises is recommended pisllya directly input patient insulin.

B. Medical gymnastics classes should not bore.

C. Necessary before and after school to measure patient pulse, AT and record them in case history.

D. All answers are correct.

E. No correct answers.

29. In a woman 40 years diagnosed with diabetes. In the complex therapeutic measures specific location given therapy. The main contraindications are

A. All severe forms of diabetes.

B. Quick vtomlyuvalnist.

C. Denominated in violation of various organs and systems.

D. All answers are correct.

E. No correct answers.

30. The patient 50 years old suffers III heart failure, active rheumatic heart disease, notes frequent attacks of angina. Is it displayed a submaximal loads?

A. Shown.

B. Contraindications.

C. Partially shown.

D. All answers are correct.

E. No correct answer.

CONTENTS

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