Exercise prescription as a medical tool

นาวาอากาศเอก นายแพทย์ไกรสร วรดิถี
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Hypertension: Control

- Limit alcohol intake to one drink per day
- Limit sodium intake
- Stop smoking
- Maintain a low fat diet that still contains adequate vitamins and minerals through adding leafy green vegetables and fruits
- Exercise
- Weight management
- Regular BP checks
- Take meds as directed

"All parts of the body if used in moderation and exercised in labors to which each is accustomed, become thereby healthy and well developed, and age slowly; but if unused and left idle, they become liable to disease, defective in growth, and age quickly."

-Hippocrates

ทุกส่วนของร่างกายหากใช้ในปริมาณที่พอเหมาะและออกกำลังหนักอย่างสม่ำเสมอนำไปสู่สุขภาวะ มีการพัฒนาที่ดีและอายุแก่ช้า แต่ถ้าไม่ได้ใช้และไม่ได้ใช้งานแนวโน้มที่จะเป็นโรคที่มีข้อบกพร่องในการเจริญเติบโตและอายุแก่รวดเร็ว ."

Angina: Control

- Teaching patients and families:
  - Weight management
  - Stress management
  - Limiting caffeine
  - Smoking cessation
  - Regular exercise
  - Control of hypertension
  - Medical management of any co-existing endocrine disorder (such as hyperthyroidism)

CHF: Patient Education

- Teach lifestyle modifications as discussed for promoting a healthy heart
- Limit or eliminate alcohol use
- Maintain a healthy weight
- Stop smoking (no tobacco use in any form)
- Limit sodium intake to 2 – 3 g per day
- Take medications as ordered – do not skip doses
- Exercise to tolerance level
- Alternate rest and activity – learn energy conservation techniques

COPDs: Treatment

- Control symptoms and minimize complications
- Lifestyle modifications
  - Stop smoking
- Respiratory therapy
- Medications
- Pulmonary rehabilitation
- Oxygen therapy required as disease progresses

Stroke: Rehabilitation

- Maximize function
- Prevent complications
- Promote QOL
- Encourage adaptation
- Enhance independence
- Emphasize abilities NOT disabilities

COPDs: Patient Education

- Involve the family and plan for long term
- Lifestyle modifications – reduce factors that contribute to symptoms
- Appropriate use of meds
- Alternating rest and activity (energy conservation)
- Stress management
- Relaxation
- Supplemental oxygen
- Work with respiratory therapist and physician on home maintenance program

GERD: Patient Education

- Lifestyle modifications
  - Smaller, more frequent meals
  - Avoid food and drink within 3-4 hrs of lying down
  - Elevate entire HOB
  - Lose weight
  - Avoid tight fitting clothes
  - Take meds properly
- Avoid:
  - Caffeine
  - Chocolate
  - Nicotine
  - Alcohol
  - Peppermint
  - Spicy and tomato-based foods
  - Acidic products
  - Carbonated beverages
  - Stress

- Previously inactive men over age 40, women over age 50, and people at high risk for CAD should first consult a physician before embarking on a program of moderate physical activity to which they are unaccustomed.
- Strength-developing activities (resistance training) should be performed at a minimum of two times per week. At least 8 to 10 strength-developing exercises that use the major muscle groups of the arm, legs, trunk and shoulders should be performed at each session, with one or two sets of 8 to 12 repetitions of each exercise or until volitional fatigue occurs

- All people over the age of 2 years should engage in at least 20 to 60 minutes of endurancetype physical activity of moderate intensity on most-preferable all-days of the week. Intermittent bouts of physical activity, as short as 8 to 10 minutes, totaling 20 to 60 minutes a day will provide beneficial health and fitness effects.
- Additional health and functional benefits of physical activity can be achieved by adding more time in moderate-intensity activity, or by substituting more vigorous activity.
- Persons with symptomatic CAD, diabetes, or other chronic health problems who would like to increase their physical activity should be evaluated by a HCP and provided an exercise program appropriate for their clinical status.

Table 1

Proportion of Adults Reporting No Leisure-Time Activity Within The Last Month, 1991 Behavioral Risk Factor Surveillance System

Demographic Group	Sedentary, % (95% CI)
Sex	
Male	27.89 (27.18-28.60)
Female	31.48 (30.85-32.11)
Race	
White	27.75 (27.24-28.26)
Nonwhite	37.52 (36.27-38.77)
Age, years	
18-34	23.77 (23.01-24.53)
35-54	29.50 (28.70-30.30)
≥55	38.00 (37.10-38.90)
Annual income, $	
≤14,999	40.14 (39.06-41.22)
15,000-24,999	32.00 (30.90-33.10)
25,000-50,000	25.43 (24.63-26.23)
>50,000	18.64 (17.60-19.68)
Education	
Some high school	48.06 (46.75-49.37)
High school/tech school graduate	33.57 (32.79-34.35)
Some college/college graduate	20.16 (19.55-20.77)

A population-based random-digit-dial-telephone survey with 87,433 respondents aged 18 years and older from 47 states and the District of Columbia. Data are weighted, and point estimates and confidence intervals (CI's) are calculated using the SESUDAAN procedure to adjust for the complex sampling frame.

Barriers and Motivators Associated with Physical Activity

Motivators	Barriers
Feeling better/more energy	No time/too busy
Promote health	Exercise will not help me
Prevent heart attacks	Lack of confidence
Lower Blood Pressure	Facilities not convenient
Look better	Too costly
Lose weight	Exercise not interesting/painful
Personal accomplishment	Embarrassed of appearance
Contact with friends	Poor environment
Increase strength	Increased fatigue
Sleep better	Do not make me feel better

Adapted from Will PM, Demko TM, George DL. Prescribing exercise for Health: A Simple 1996; 53: 579-585.

Categories of Activity by Musculoskeletal Impact

High Impact	Low Impact
Jogging/running	Walking/hiking
Basketball	Cycling
Volleyball	Stationary cycling
Hopping/jumping	Swimming
Rope skipping	Rowing
Aerobic dancing	Cross-country skiing
Downhill skiing	

Derived from Pollock ML, Wilmore JH, eds. Exercise in Health and disease: Evaluation and Ed. Philadelphia, PA: WB Saunders Co. 1990.

recommendation also emphasizes muscular strength and flexibility as a means to impr
balance, strength and coordination, which in turn may prevent injuries and falls.

Table 6

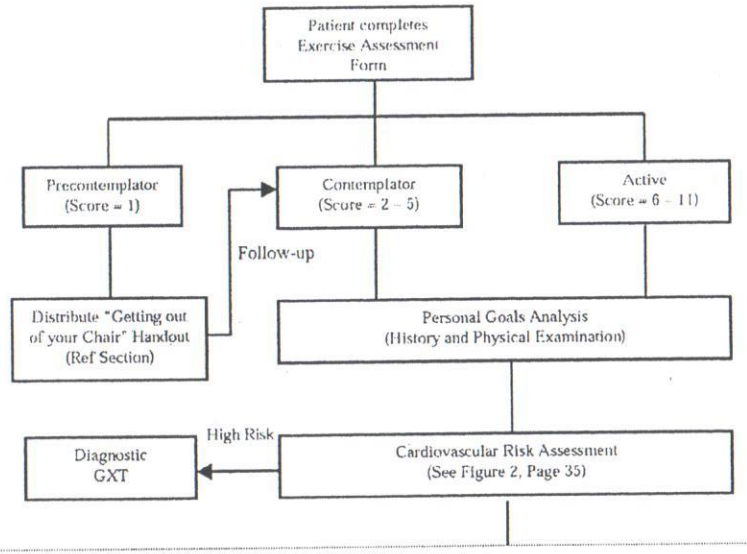
Examples of Common Physical Activities for Healthy US Adults by Intensity of Effort Required

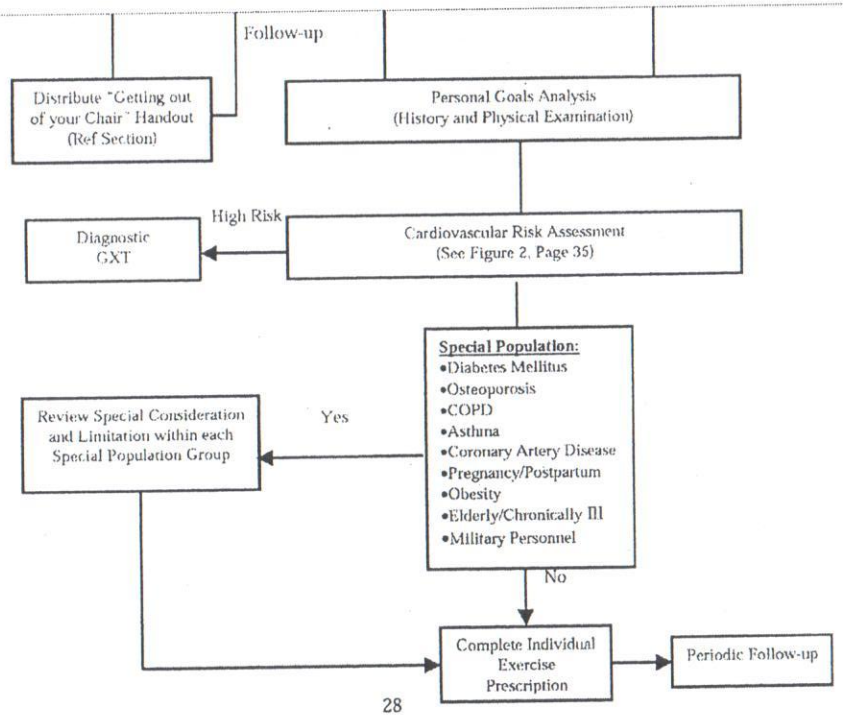
Light	Moderate	Heavy/Vigorous
Walking, slowly	Walking, briskly	Walking, briskly uphill
Cycling, stationary	Cycling, pleasure	Cycling, fast
Swimming, slow treading	Swimming, moderate	Swimming, fast treading
Calisthenics, stretching	Calisthenics, general	Calisthenics, aerobic dance
	Racket sports (leisure)	Racket sports (competitive)
Golf, power cart	Golf, pulling/carrying clubs	
Bowling		
Fishing, sitting	Fishing, standing/casting	Fishing in stream
Boating, power	Canoeing, leisure	Canoeing, rapid (> 4 mph)
Home care, sweeping/vacuuming	Home care, general cleaning	Moving furniture
Mowing lawn, riding mower	Mowing, power mower	Mowing, hand mower
Home repair, carpentry	Home repair, painting	

*Data from Ainsworth et al, Leon, and McArdle.[71-73]

Figure 1

Exercise Assessment and Prescription Flow Chart





the individual into the contemplator category. When confronted by a precontemplator, distribu the "Getting Out of Your Chair" handout, located in the Resources/Reference section and schedule a follow-up appointment.

Table 7

How to Approach Roadblocks

Roadblock:	How to get past it:
I do not have time.	We're only talking about three 30 minute sessions each week. Can you do without three television shows a week?
I am usually too tired to exercise.	Regular activity will improve your energy level. Try and see for yourself.
The weather is too bad.	There are many activities you can do in your home, in any weather.
Exercise is boring.	Listening to music during your activity keeps your mind occupied. Walking, biking, or running can take you past lots of interesting scenery.
I do not enjoy exercise.	Do not "exercise." Start a hobby or an enjoyable activity that gets you moving.
I get sore when I exercise.	Slight muscle soreness after physical activity is common when you are just starting. It should go away in 2 to 3 days. You can avoid this by building up gradually and stretching after each activity.

Reproduced from Patrick K, Sallis JF, Long B, Calfas KJ, et al. A new tool for encouraging activity: Project PACE. Phys Sportmed 1994; 22: 45-55.

be dictated by clinical judgment.

Table 9

Pre-exercise Evaluation History

Current and past exercise habits (mode, frequency, intensity, duration)
Current motivation and barriers to exercise
Preferred forms of physical activity
Beliefs about benefits and risks of exercise
Risk factors for heart disease (hypertension, diabetes mellitus, hyperlipidemia, smoking, family history of heart disease before 55 years of age)
Physical limitations precluding certain activities
Exercise-induced symptoms
Concurrent disease (cardiac, pulmonary, musculoskeletal, vascular, psychiatric, etc)
Social support for exercise participation
Time and scheduling considerations
Medication profile

Reproduced from Jones TF, Eaton CB. Exercise Prescription. Am Fam Physician 1995; 52: 543-550.

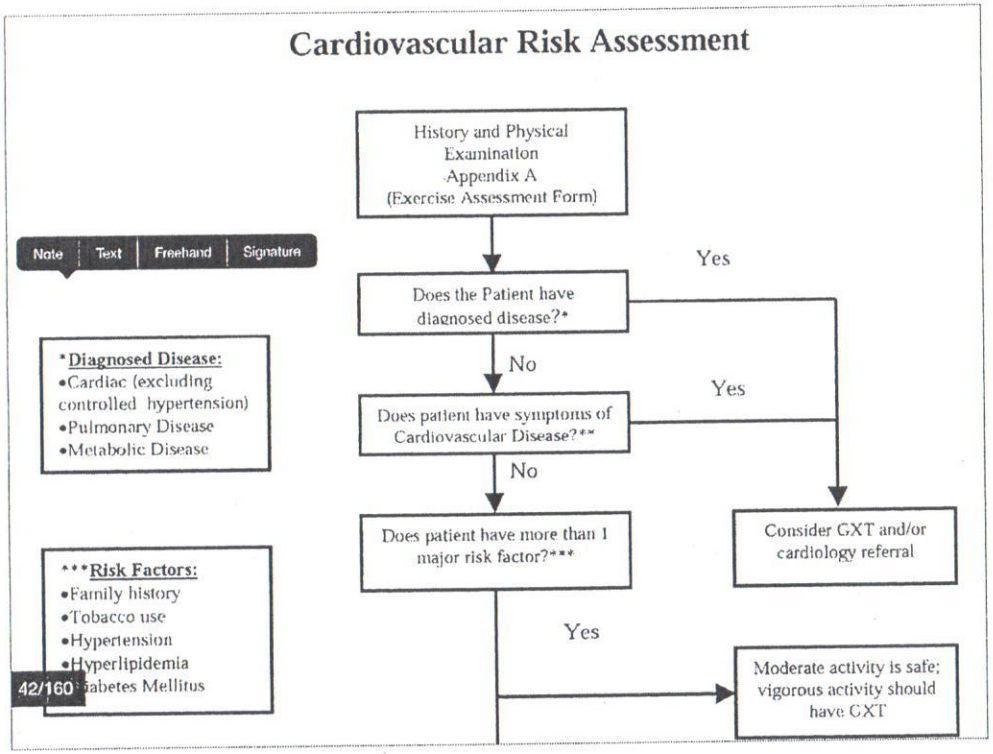
Table 10

Contraindications to Exercise

Absolute Contraindications
Recent acute myocardial infarction
Unstable angina
Ventricular tachycardia and other dangerous dysrhythmias
Dissecting aortic aneurysm
Acute congestive heart failure
Severe aortic stenosis
Active or suspected myocarditis or pericarditis
Thrombophlebitis or intracardiac thrombi
Recent systemic or pulmonary embolus
Acute infection
Relative Contraindications
Untreated or uncontrolled severe hypertension
Moderate aortic stenosis
Severe subaortic stenosis
Supraventricular dysrhythmias
Ventricular aneurysm
Frequent or complex ventricular ectopy
Cardiomyopathy
Uncontrolled metabolic disease (diabetes, thyroid disease, etc) or electrolyte abnormality
Chronic or recurrent infectious disease (malaria, hepatitis, etc)
Neuromuscular, musculoskeletal or rheumatoid diseases that are exacerbated by exercise
Complicated pregnancy

Adapted from British Columbia Ministry of Health and the Department of National Health and Welfare. PAR-Q validation report. In: Canadian standardized test of fitness (CSTF) operations manual. 3rd ed. Ottawa, Ontario: Fitness Canada, Fitness and Amateur Sport Canada, 1986 and American College of Sports Medicine. Guidelines for exercise testing and prescription. 4th ed. Philadelphia: Lea & Febiger, 1991: 59.

Cardiovascular Risk Assessment



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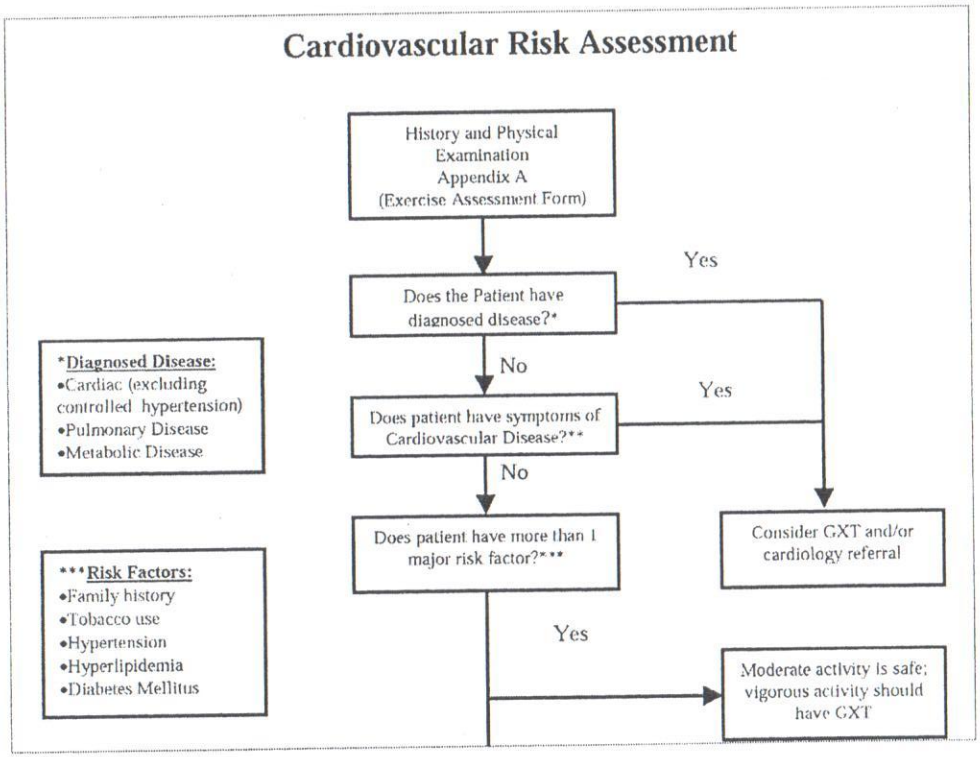
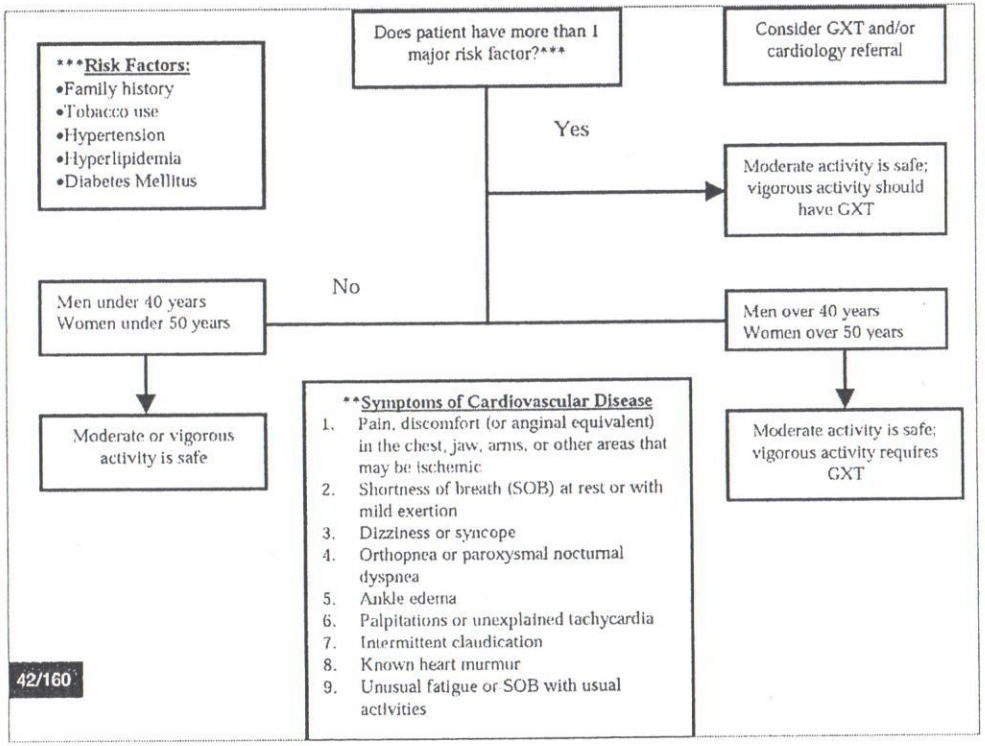
Cardiovascular Risk Assessment





Components of an Exercise Prescription

Activity Selection
Duration
Frequency
Intensity
Progression
Resistance Training
Flexibility Training

Exercise Prescription

Table 13

Activity Selection Guide

Purpose	Muscular Strength	Muscular Endurance	Cardiorespiratory Endurance	Flexibility	Body Composition	Speed/ Agility	Coordination
Aerobics		X	X	X	X		X
Bicycling		X	X			X	
Calisthenics		X		X	X	X	X
Golf							X
Skiing	X	X	X	X	X		X
Jogging/Running		X	X		X		
Racquet Sports			X	X	X	X	X
Stair Climbing		X	X				
Stretching				X			
Swimming		X	X	X	X		X
Walking (Fast)			X				
Weight Training	X	X				X	X

Energy Expenditures for Various Activities

Activity	METs*	Kilocalories per hour**
Aerobic dancing	6 to 9	440 to 660
Bowling	2 to 4	150 to 300
Calisthenics	3 to 8	220 to 600
Canoeing (leisure)	3 to 6	220 to 440
Cycling (< 10 mph)	3 to 6	220 to 440
Cycling (> 10 mph)	6 to 8	440 to 600
Dancing	3 to 7	220 to 510
Desk Work	1.5 to 2.5	110 to 180
Fishing (sitting)	1.5 to 3	110 to 220
Fishing (standing/casting)	3 to 6	220 to 440
Football (touch)	6 to 10	440 to 740
Golf (walking)	2 to 3	150 to 220
Handball	8 to 12	600 to 880
Hiking (cross-country)	3 to 7	220 to 510
Lawn mowing	3 to 8	220 to 600
Running at 5 mph	8.7	640
Running at 6 mph	10.2	750
Running at 10 mph	16.3	1,200
Sexual intercourse	2 to 5	150 to 370
Shoveling	4 to 7	300 to 510
Shuffleboard	2 to 3	150 to 220
Skating (ice/roller)	5 to 8	370 to 600
Skiing (cross-country)	6 to 12	440 to 880
Skiing (downhill)	5 to 8	370 to 600
Soccer	5 to 12	370 to 880
Softball	3 to 6	220 to 440
Stair climbing	4 to 8	300 to 600
Swimming (moderate)	4 to 6	300 to 440
Swimming (fast treading)	6 to 8	440 to 600
Tennis	4 to 9	300 to 660
Volleyball	3 to 6	220 to 440
Walking at 2 mph	2	150
Walking at 4 mph	4.5	330
Walking (4 mph and uphill)	6	440

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Walking (4 mph and uphill)	6	440

mph = miles per hour

* - 1 MET = resting metabolic rate, 3.5 mL of O2 per kg per minute

** - The kilocalories expended during a particular activity are based on a person weighing 70 kg (154 lb). One kilocalorie = approximately 200 mL of O_2 consumed.[21,61,75,76]

Table 19

Prevention of Hypoglycemia or Hyperglycemia

Before Exercise

- Estimate intensity, duration, and energy expenditure of exercise
- Eat a meal 1-3 hours before exercise
- Insulin:
  - Administer insulin more than 1 hour before exercise
  - Administer insulin in abdomen and avoid extremity injections
  - Decrease insulin that has peak activity coinciding with exercise period (may not be required)
  - Assess metabolic control:
    - If blood glucose < 100 mg/dL, take supplemental pre-exercise snack
    - If blood glucose > 250 mg/dL or serum ketones are positive, delay exercise

During Exercise

- Supplement calories with carbohydrate feedings (30-40 grams for adults, 15-25 grams for children) every 30 minutes during extended, strenuous exercise
- Replace fluid losses adequately
- Monitor blood glucose during exercise of long duration

After Exercise

- Monitor blood glucose, especially if exercise is not consistent
- Increase calorie intake for 12-24 hours after activity, according to intensity and duration of exercise
- Reduce insulin, which peaks in the evening or night, according to intensity and duration of exercise (may not be required)

Adapted from Horton ES. Role and management of exercise in diabetes mellitus. Diab Care 1988; 11: 201-211.

Table 20

Exercise and the stress across selected joints

	Hip	Knee	Ankle	Shoulder	Spine
Bicycling	++	++	+	---	+
Arm-cranking	---	---	---	++	++
Rowing	---	---	---	++	++
Cross-country skiing	+	±	±	±	+
Climbing	++	++	++	+	+
Water running	---	---	---	±	±

+ = degree of increased impact --- = no significant impact ± = potentially significant

Reproduced from Barry HC, Eathorne SW. Exercise and aging. Med Clin North Am 1994; 78: 357-376.

Exercise Guidelines for Pregnancy and the Postpartum Period

There are no data in humans to indicate that pregnant women should limit exercise intensity and lower target heart rates because of potential adverse effects. For women who do not have any additional risk factors for adverse maternal or perinatal outcomes, the following recommendations may be made:

1. During pregnancy, women can continue to exercise and derive health benefits even from mild to moderate exercise routines. Regular exercise (at least 3 times per week) is preferable to intermittent activity.
2. Women should avoid exercise in the supine position after the first trimester. Such a position is associated with decreased cardiac output in most pregnant women; because the remaining cardiac output is preferentially distributed away from splanchnic beds (including the uterus) during vigorous exercise, such regimens are best avoided during pregnancy. Prolonged periods of motionless standing should also be avoided.
3. Women should be aware of the decreased oxygen available for aerobic exercise during pregnancy. They should be encouraged to modify the intensity of their exercise according to maternal symptoms. Pregnant women should stop exercising when fatigued and not exercise to exhaustion. Weight-bearing exercises may under some circumstances be continued at intensities similar to those before pregnancy throughout pregnancy. Non-weight-bearing exercises, such as cycling or swimming, minimize the risk of injury and facilitate the continuation of exercise during pregnancy.
4. Morphologic changes in pregnancy should serve as a relative contraindication to types of exercise in which loss of balance could be detrimental to maternal or fetal well-being, especially in the third trimester. Further, any type of exercise involving the potential for even mild abdominal trauma should be avoided.
5. Pregnancy requires an additional 300 kcal/day to maintain metabolic homeostasis. Thus, women who exercise during pregnancy should be particularly careful to ensure an adequate diet.
6. Pregnant women who exercise in the first trimester should augment heat dissipation by ensuring adequate hydration, appropriate clothing, and optimal environmental surroundings during exercise. Avoid body temperatures above 100.4 degrees Fahrenheit (hot tubs, saunas, prolonged exercise in heat and humidity).
7. Many of the physiologic and morphologic changes of pregnancy persist 4 to 6 weeks postpartum. Thus, pre-pregnancy exercise routines should be resumed gradually based on a woman's physical capability. Acceptable guidelines are to resume activity 1 week after vaginal delivery and 6 to 10 weeks following a cesarean-section.
8. Strenuous exercise should not exceed 15 minutes and may require adjusting as the pregnancy advances.

The following conditions should be considered contraindications to exercise during pregnancy:

- -Pregnancy-induced hypertension
- -Pre-term rupture of membranes
- -Pre-term labor during the prior or current pregnancy or both
- -Incompetent cervix/cerclage
- -Persistent second or third trimester bleeding
- -Intrauterine growth retardation

From American College of Obstetricians and Gynecologist: Exercise During Pregnancy and the Postpartum Period. Technical Bulletin No. 189. Washington, DC. ACOG, 1994.

Special Populations

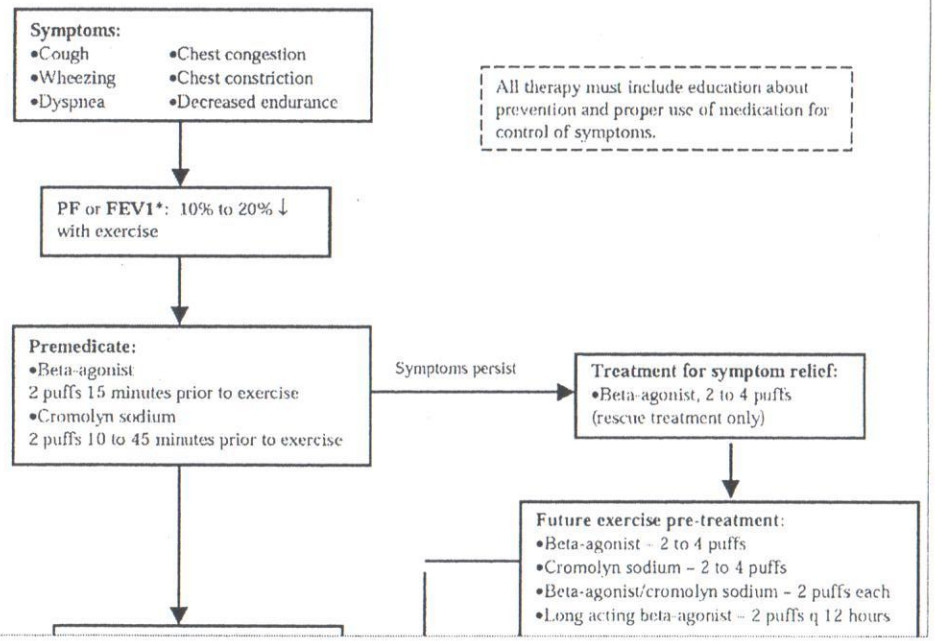
Table 22

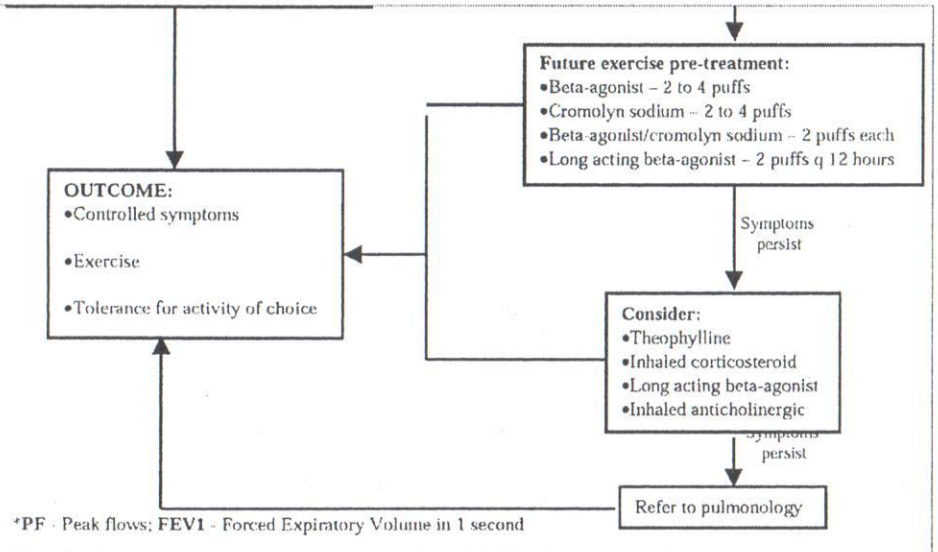
Factors that Suggest Exercise-Induced Asthma

1. Coughing, wheezing, dyspnea, or chest discomfort occurring during or shortly after exercise
2. Symptoms that vary by season, temperature, or intensity of activity
3. Complains of decreased, limited exercise tolerance
4. Complains of "being out of shape"
5. Minimal problems with swimming or warm, humid weather
6. Complains of frequent "colds"

Figure 3

Management of Exercise Induced Asthma





Adapted from Expert Panel Report. Guidelines for the diagnosis and management of asthma. National Heart, Lung, and Blood Institute of Health publication # 91-3042: 121 August 1991.

Table 23

Components of the COPD Exercise Prescription

Evaluation

- -Assess cardiac risk
- -Assess exercise capacity using a treadmill (Naughton protocol) or stationary cycle, starting at a low workload and increasing extremely slowly, and monitoring desaturation with a pulse oximeter
- -Determine appropriate exercise levels to prevent arrhythmias or hypoxia in cardiac-impaired patients
- -Determine the amount of supplemental oxygen needed during exercise
- -Determine need for bronchodilators during exercise
- -Assess side effects of beta-agonist inhalers or aminophylline derivatives during exercise

Supervised Exercise

- -Direct patient to a supervised rehabilitation program if disease is significant
- -Set a goal of eventually graduating to independent exercise (many patients do this in about 6 weeks)

Independent Exercise

- -Suggesting an appropriate training mode: stationary cycling, bicycling, treadmill walking, outdoor walking, stair climbing, or arm ergometry
- -Set a goal of 60% to 80% of maximum heart rate for 20 to 30 minutes, 3 days a week (build on individual ability)
- -Expect a 70% to 80% increase over initial work capacity within 6 weeks
- -Provide active encouragement and reassurance (especially at first) to overcome anxiety associated with dyspnea

Exercise Aids

- -Oxygen supplementation
- -Bronchodilators
- -Mucolytics
- -Corticosteroids (inhaled or oral)
- -Monitoring

Reproduced from Mink BD. Exercise and Chronic Obstructive Pulmonary Disease. Phys Sportsmed 1997; 25: 43-52.

Table 25

Functional Changes Associated with Age

Cardiovascular	
Decreased cardiac output	20-30% decline by age 65
Elevated systolic and diastolic blood pressure	10-40 mm Hg
Decreased maximum heart rate	10 beats/min/decade
Reduced hemoglobin, hematocrit and red cell mass	
Respiratory	
Decrease vital capacity	40-50% decline by age 70
Musculoskeletal	
Loss of muscle strength and mass	20% decline by age 65
Osteoporosis	1% loss per year after 35, 2-3% per year after menopause
Decreased elasticity and synovial fluid viscosity	
Height loss	Age 65-74, 1.5" loss; 85-94, 3.0" loss on average
Central Nervous System	
Reduced number of neurons	
Impaired motor response	
Decreased brain mass	

Adapted from Barry HC, Eathorne SW. Exercise and Aging. Med Clin N Am, 1994; 2: 357-376

General Guidelines for the Exercise Prescription in Chronically Ill Patients

Evaluation

- -Discuss benefits of exercise with patients (increased functional capacity, increased strength and endurance, and improved medical status)
- -Review on-going medical conditions, medications and potential physical limitations
- -Assess the need for formal exercise testing. Not all chronically ill patients require exercise testing since most patients are rarely fit enough to undergo the intensity of testing required to produce an adequate rate-pressure-product.
- -Educate patients on warning symptoms and risk of exercise based on their medical condition
- -Assess the need for exercise aids

Component of Training

- -Exercise daily if not fatigued
- -Adequate warm-up for minimum of 3 minutes
- -Initiate exercise at a target heart rate of no more than 20 beats per minute over resting heart rate, or at normal walking pace (if intensity effort improves, it may then be reasonable to consider exercise stress testing)
- -Mode of activity should include walking or equivalent aerobic activity (will be based on physical limitations) to include resistance training and stretching exercises as tolerated
- -Accumulate 20 to 30 minutes of exercise daily in one or several sessions
- -Progression should be gradual

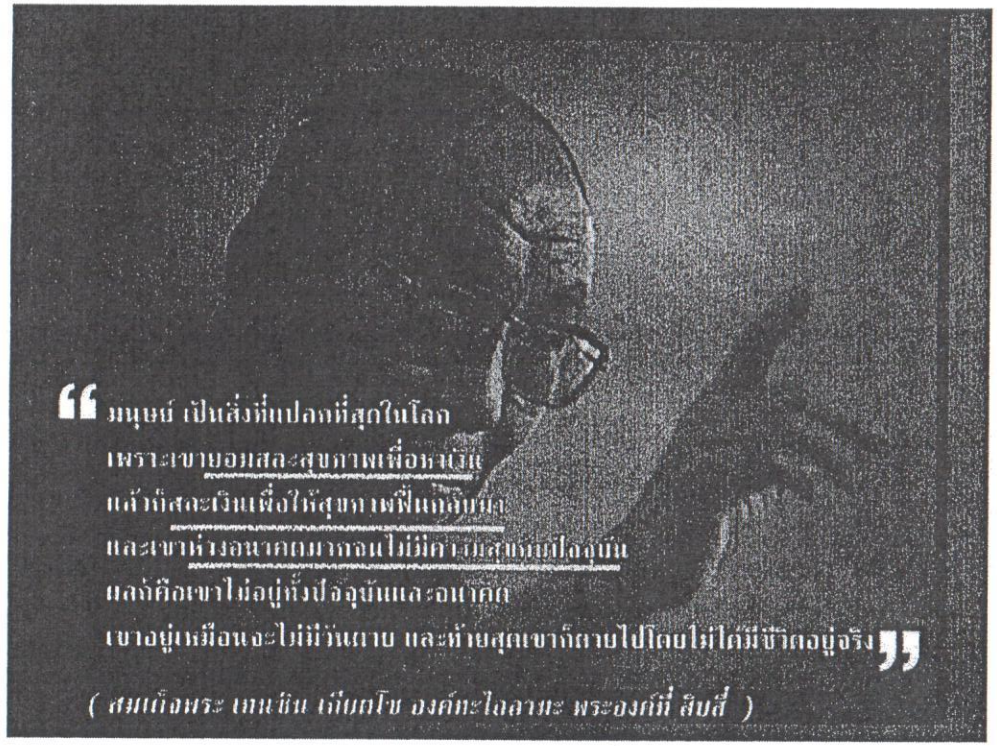
Injury Prevention

- -Include warm-up and cool-down periods
- -Low intensity activity
- -Adequate hydration
- -Appropriate clothing and footwear
- -Encourage safer modes of aerobic activity (walking-with or without walker, stationary bicycle)
- -Inform patient on injury prevention (proper biomechanics)
- -Consider home health visit to assess hazards in the home

Compliance

- -Set realistic goals
- -Reassess every 1-2 months initially then every 3 months thereafter
- -Praise compliance and instill motivation

Adapted from Lampman RM. Exercise prescription for chronically ill patients. Am Fam Physician 1997; 55: 2185-2192.


“มนุษย์ เป็นสิ่งที่แปลกที่สุดในโลก
เพราะเขายอมสละสุขภาพเพื่อหาเงิน
แล้วก็สละเงินเพื่อให้สุขภาพฟื้นกลับมา
และเขาห่วงอนาคตมากจนไม่มีความสุขกับปัจจุบัน
ผลก็คือเขาไม่อยู่ทั้งปัจจุบันและอนาคต
เขาอยู่เหมือนจะไม่มีวันตาย และท้ายสุดเขาก็ตายไปโดยไม่ได้มีชีวิตอยู่จริง”
(สมเด็จพระ เทนซิน เกียตโซ องค์ทะไลลามะ พระองค์ที่ สิบสี่)