

Lifestyle Medicine: Physical Activity

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*“Eating alone will not keep a man well;
he must also take exercise.”
—Hippocrates*

INTRODUCTION

Nearly half of all adults in the United States have at least 1 preventable chronic disease.^{1,2} Seven of the 10 most common chronic diseases are positively influenced by physical activity.¹ The Centers for Disease Control and Prevention (CDC) estimates that getting enough physical activity could prevent 13% of breast and colorectal cancer, 8% of diabetes, and 7% of heart disease, as well as 1 in 10 premature deaths.¹ It has also been shown to aid in the management of, or as an adjunctive treatment for, colorectal cancer,³ renal disease,⁴ sleep apnea,⁵ osteoarthritis,⁶ hypertension,⁷ cardiovascular disease,⁸ type 2 diabetes,^{9,10} and obesity.^{11,12} Despite this knowledge, only 23% of adults meet both the aerobic and muscle-strengthening physical activity guidelines (**TABLE 1**), with only half of US adults meeting the aerobic activity guidelines.¹³

Physicians have an important role in counseling and prescribing physical activity to patients. Research has shown that physical activity promotion within primary care settings significantly increases physical activity levels in adults for up to 12 months.¹⁴ Physicians who exercise regularly are more likely to counsel their patients about exercising.¹⁵ Unfortunately, as recently as 2010, only 34% of US adults reported receiving exercise counseling at their last medical visit.¹⁶ Although this lack of counseling is multifactorial, inade-

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quate time and inadequate knowledge/experience regarding exercise are the most common barriers cited.^{15,17} This paper reviews the basics of physical activity and focuses on ways to incorporate physical activity counseling, assessments, and referrals within the clinical practice.

FOUNDATIONAL PHYSICAL ACTIVITY DEFINITIONS

Being able to clearly articulate the difference between physical activity, exercise, and health-related fitness is foundational to effectively counseling patients. Physical activity is defined as any bodily movement that is produced by the contraction of skeletal muscle that increases energy expenditure above a basal level.² Exercise represents a subset of physical activity that is characterized by being planned, structured, repetitive, and performed with the goal of improving health or fitness.²

For example, emptying a dishwasher is a form of physical activity that also meets some criteria for exercise (eg, it is repetitive, structured, and planned). However, it is not performed with the goal of improving health or fitness. Going for a brisk walk or doing 10 push-ups would meet the definition for exercise as these activities are repetitive, structured, planned, and performed with the intent of improving health or fitness. Although any amount of physical activity is better than none, it is important that adults engage in both general physical activity as well as purposeful exercise as part of their weekly physical activity. General physical activity can burn calories and is important in combating the negative effects of sedentary behavior¹⁸; however, exercise improves cardiorespiratory and strength fitness and leads to substantial health benefits.^{1,19}

The physiologic effects of exercise are commonly assessed using the framework of health-related fitness. Health-related fitness includes 5 domains: (1) cardiorespiratory fitness, (2) muscular strength and endurance, (3) body composition, (4) flexibility, and (5) balance.²⁰ Means for primary care physicians to appropriately assess and prescribe interventions for each of these domains are discussed in detail below.

PHYSICAL ACTIVITY GUIDELINES

The Physical Activity Guidelines (PAG) from US Department of Health and Human Services are updated every 10 years,

TABLE 1. Summary of US Department of Health and Human Services Physical Activity Guidelines (PAG) for healthy adults, 2nd edition²

General PAG	Specific PAG
Inactivity should be avoided	150-300 min of moderate-intensity aerobic physical activity per wk
Aerobic activity should be spread throughout the wk	OR 75-150 min of vigorous-intensity aerobic physical activity per wk
Strength training should be of moderate or greater intensity	An equivalent combination of moderate and vigorous activity can be conducted to meet the recommended time duration
Health benefits can be achieved by adults who sit less and do any amount of moderate to vigorous physical activity	Additional health benefits can be achieved by doing more than 300 min of moderate-intensity physical activity per wk Strength training exercises should be done for all major muscle groups 2 or more days per wk.

with the most recent iteration published in 2018.² The PAG serves as a valuable tool for clinicians to help guide their patients on specific recommendations regarding frequency, duration, and type of physical activity one should participate in to achieve or maintain optimal health.

The guidelines listed in **TABLE 1**² can serve as a foundation for exercise prescription in healthy adults. When considering special populations such as people older than 65 years of age, pregnant and postpartum women, and those with chronic healthcare conditions, appropriate modifications to these guidelines are made.

Older adults (older than 65 years of age) should be cognizant of various physical or fitness level limitations that may preclude their ability to reach the above-noted guidelines.^{21,22} In addition to aerobic and strength training, older adults benefit from adding balance exercises to their weekly regimen.²³

In women who are pregnant or postpartum, the PAG is still at least 150 minutes of moderate aerobic activity spread throughout the week. Women in this cohort should maintain close follow-up with their healthcare providers in the event any modifications to their exercise programs need to be made.

Adults with chronic health conditions should follow the PAG in **TABLE 1**² but modify their exercise program under the direction of their healthcare provider and/or exercise specialist.²¹ If those with chronic health conditions are unable to meet the PAG for healthy adults owing to various medical or physical limitations, they should be as physically active as these limitations allow.

When considering physical activity guidelines, individuals living with and beyond a cancer diagnosis are worth mentioning as a separate subpopulation. Traditionally, exercise has not been at the forefront of a comprehensive care plan within the field of oncology.²⁴ Evidence supporting the positive role of exercise in cancer prevention, treatment,

and survival continues to evolve. As such, the American College of Sports Medicine (ACSM) International Multidisciplinary Roundtable on Exercise and Cancer recently published guidelines that support a minimum effective dose of 30 minutes of moderate-intensity aerobic exercise 3 times per week as an evidence-based intervention to help improve cancer-related health outcomes including, but not limited to, depression, anxiety, physical function, fatigue, and health-related quality of life.²⁵ The decrease in duration of moderate-intensity aerobic exercise is the one notable deviation from PAG in healthy adults. The remaining guidelines for this population are consistent with what is noted in **TABLE 1**.²

EVALUATING PHYSICAL ACTIVITY AND EXERCISE

Prior to performing any formal assessments, the clinician may find significant value in inquiring about the patient's preferences and values surrounding fitness.

- How do you feel about your current levels of physical activity?
- What role does physical activity play in your life?
- Is exercise or physical fitness important to you?
- Are there any types of physical activities that you enjoy?
- What would need to be different for exercise to be a priority for you?
- What do you need more or less of to improve your physical fitness?

A myriad of clinical tools have been developed to ensure exercise safety, evaluate health-related fitness domains, and aid in exercise prescription. Each of these tools are covered below.

EXERCISE VITAL SIGN

The exercise vital sign (EVS) is a simple, validated method for physicians to monitor patients' physical activity and initiate a conversation about exercise, and it can be entered into the

electronic health record (EHR). It is a self-reported exercise assessment consisting of 2 questions:

1. "On average, how many days per week do you engage in moderate to strenuous exercise (like a brisk walk)?"
2. "On average, how many minutes do you engage in exercise at this level?"

Additionally, physicians should consider asking their patients, "How many days per week do you perform muscle-strengthening exercises, such as body weight exercises or resistance training?"

Patients should be asked the EVS questions during each visit and then be screened according to the ACSM preparticipation recommendation below to clear them for exercise.²⁶

EXERCISE CLEARANCE

Recently, the ACSM updated and simplified its exercise preparticipation screening guidelines based on the rationale that light- to moderate-intensity exercise is safe for most people.²⁷ Cardiovascular (CV) disease risk factors do not predict adverse CV events, and the risk of CV events is much higher during vigorous-intensity exercise. Recommendations are now for physician clearance as opposed to medical clearance or exercise testing, and are based on:

- the individual's current level of structured exercise
- the presence of major signs and symptoms suggestive of cardiovascular, metabolic, or renal disease
- the desired intensity of exercise

A helpful figure, created by Magal and Riebe,²⁸ that discusses the new preparticipation health screening recommendations can be found at doi: 10.1249/FIT.0000000000000202.

ASSESSMENT

An initial assessment should occur before developing an exercise program. The purpose of performing an initial assessment is to identify the individual's current fitness level; establish a baseline for future comparison and progression rate; identify needs; develop a safe and effective program; and determine short-, medium-, and long-term goals.

These assessments are usually conducted by an exercise specialist and fall into the 5 previously mentioned domains:

1. Body composition
2. Cardiovascular endurance
3. Muscular strength and endurance
4. Flexibility
5. Balance

Body composition. Gold standard methods of measurement include air-displacement plethysmography (BOD POD), underwater weighing, and dual-energy X-ray absorptiometry (DEXA), usually occurring in clinical or sports performance settings. Common field or in-office ways to assess

this include body mass index (BMI) calculations, measuring waist circumference, performing skinfold measurements, or using a bioelectrical impedance device. All of these options have a window of error of approximately $\pm 4\%$ to 6% .

Cardiovascular endurance. Cardiovascular endurance is defined as the ability to perform large-muscle, dynamic, moderate- to high-intensity exercise for prolonged time periods.

Field tests for measuring cardiovascular endurance include treadmill tests, various walk/run tests (eg, Rockport walking test, 12-minute walk/run), step testing, and ergometer testing.²⁸ Nonexercise methods of assessing cardiovascular fitness, or prediction equations, have also been developed as an alternative when traditional exercise testing is not feasible.²⁹

Muscular strength. Muscular strength is defined as the maximum force a muscle group can produce at a specified velocity.³⁰ It is expressed as the maximum load an individual can lift while maintaining proper form (ie, 1 repetition maximum). Common methods to assess muscular strength include:

- Bench press and overhead press (upper body)
- Smith machine squat, leg press, and knee extension (lower body)

Local muscular endurance. Muscular endurance is the ability of a muscle group to execute repeated contractions over a period of time sufficient to cause muscular fatigue or maintain a specific percentage of maximum voluntary contraction for a prolonged period of time.

- Curl-ups (crunches)
- Push-ups

Flexibility. Flexibility is the ability to move a joint through its complete range of motion. Common methods to assess flexibility include:

- Joint range of motion assessment
- Sit-and-reach or modified/unilateral sit-and-reach test

FITT-P PRINCIPLE

A simple acronym known as the FITT-P principle is normally used to design cardiovascular and flexibility exercise programs, where the "F" stands for frequency, "I" for intensity, "T" for time (or duration), the second "T" for type (or mode) of exercise, and the "P" for progression.

CARDIOVASCULAR EXERCISE PRESCRIPTION

Frequency. Established guidelines suggest 150 to 300 minutes of moderate-intensity or 75 to 150 minutes of vigorous-intensity CV exercise per week, or some combination. Time and desire are also common factors that determine the frequency of CV exercise training. When the goals pertain to

weight loss or improvement in aerobic capacity, increasing frequency is indicated.

Intensity. Intensity of CV exercise can be measured objectively by measuring heart rate in beats per minute, and subjectively by measuring RPE (rate of perceived effort) scales. Equations or field tests are used to determine the low and high end of an individual's CV training zone, but because these methods include a window of error, assessing intensity of effort both objectively and subjectively is important during initial testing and exercise.^{31,32}

Time. The duration of CV exercise can vary from very short bouts (eg, 5 minutes for the very deconditioned) to 60 minutes or more. Fitness level, individual goals, motivation, and the type of CV exercise determine duration. Individuals with weight loss as a goal should strive to maximize weekly duration (eg, 200 to 300 minutes per week).

Type. There are 2 types of CV exercise:

1. Impact (eg, running)
2. Non-impact (eg, elliptical machine, swimming, cycling)

The general recommendation is to alternate between impact and nonimpact from session to session. The ratio is at the discretion of the coach or individual (eg, 3 sessions of impact exercise for every 1 session of nonimpact exercise).

Progression. Progression can occur by increasing frequency, duration, and/or intensity of exercise and is at the coach's or individual's discretion. For safety reasons, high-intensity interval training (HIIT) and sprint interval training (SIT) should not be programmed until the person can comfortably sustain at least 20 minutes of continuous aerobic exercise at moderate intensity.³³

FLEXIBILITY EXERCISE PRESCRIPTION

Frequency. Frequency can range from 2 to 7 days per week. Restricted areas often require a higher frequency in days per week and/or sets performed per session to increase overall volume.

Intensity. The intensity of a stretch may vary based on an individual's tolerance of discomfort. The general recommendation is to stretch to the point of mild or moderate discomfort.

Time. The time, or duration, of a stretch can range from 20 seconds to longer than a minute and depends on the goal (ie, to maintain or improve joint range of motion) or type of stretch.

Type. Common types of stretching include passive, active, and proprioceptive neuromuscular facilitation (PNF). Although all types of stretching improve joint range of motion when performed properly, PNF stretching has been shown to be the most effective.³⁴

Progression. Progression is only indicated at areas where movement restriction exists, and the purpose is to increase joint range of motion toward the normal range. Progression occurs with adequate frequency, volume, intensity, and duration, combined with finding a new end range, all of which create a stimulus whereby joint range of motion is increased.

STRENGTH EXERCISE PRESCRIPTION

Unlike cardiovascular and flexibility program design, where the prescription can follow the FITT-P principle, designing a strength training program is more complex. Examples of the variables involved in designing a strength training program include:

- Frequency
- Sets per muscle group
- Repetitions per set
- Objective (load) and subjective (relative effort) intensity
- Choice of exercise
- Order of exercise
- Rest between sets and exercise sessions
- Repetition tempo

Individuals new to strength training will have a learning curve for developing proper form, developing mind-muscle connections, determining initial loads and available range of motion, and understanding the general flow of a strength workout. This initial phase, known as the "familiarization phase" or "adaptation phase," may take several weeks before the individual is ready to progress. This underscores the need for professional guidance, at least initially.

A CALL TO ACTION FOR PATIENT REFERRAL

In 2019, 3 large organizations (the National Physical Activity Plan Alliance, the National Coalition for Promoting Physical Activity, and the National Physical Activity Society) and scores of government, medical, and fitness entities formed the Physical Activity Alliance (PAA). This new entity recognized unanimously that comprehensive physical activity guidance requires the coordinated efforts of the entire healthcare team.³⁴ It recognized that no single member of the healthcare team should be entirely responsible for promoting physical activity, and that more team members lead to a more comprehensive effort, which benefits the patient. Because of barriers such as lack of time, low reimbursement rates, and inadequate professional education and training, the PAA proposed a Physical Activity Care Continuum, in which the physician's primary role is to diagnose, provide a basic prescription and counseling, and then refer the patient to the appropriate rehabilitation or exercise professional.³⁵

TABLE 2. Roles and actions within the physician–rehabilitation–fitness pathway

Role	Physician	Physical therapist (PT)	Exercise specialist (ES)
Patient/Client visit frequency and length	1 to 4 times/y 15-to-20 min session 5 min avg talk time for both doctor and patient Need to refer out and oversee pathway ³⁶	8 to 12 sessions on avg 30-to-60-min session length Need to refer out and advise exercise specialist ³⁷	5 sessions to several years 30- or 60-min session length
Body fat testing and weight management counseling	Can perform in clinic	Can perform in clinic	Can perform as part of assessment and counsel on weight management ongoing
Design and implementation of trigger point release treatment plan	Can educate on FITT-P principle and give general advice/recommendations	Can educate on FITT-P principle, design and initiate treatment plan, and monitor short-term	Can educate on FITT-P principle, design and monitor progress of treatment plan
Design and implementation of flexibility training treatment plan	Can educate on FITT-P principle and give general advice/recommendations	Can educate on FITT-P principle, design and initiate treatment plan, and monitor short-term	Can educate on FITT-P principle, design and monitor progress of treatment plan
Design and implementation of balance training treatment plan	Can educate on FITT-P principle and give general advice/recommendations	Can educate on FITT-P principle, design and initiate treatment plan, and monitor short-term	Can educate on FITT-P principle, design and monitor progress of treatment plan
Design and implementation of aerobic training treatment plan	Can educate on FITT-P principle and give general advice/recommendations	Can educate on FITT-P principle, design and initiate treatment plan, and monitor short-term	Can educate on FITT-P principle, design and monitor progress of treatment plan
Design and implementation of initial strength training treatment plan	Can educate on general strength training variables and answer basic questions	Can educate, initiate, and monitor early stages	Can educate, initiate, and monitor
Design and implementation of progressive strength training treatment plan	Can educate on general strength training variables and answer basic questions	Rarely has time to implement/oversee this stage Needs to refer out and avoid home exercise program whenever possible	Can educate, initiate, and monitor

FITT-P, Frequency Intensity Time (or duration) Type (or mode) of exercise Progression.

Patient services in the physician’s clinic are described as the “spark that ignites the flame,” with connection to community-based resources being “the fuel that sustains the fire.”

The Call to Action includes 2 important points:

- Referrals by clinicians to community-based programs regularly occur and are documented. Data and outcomes are fully incorporated into EHR systems.
- The healthcare system is integrated with community systems and resources, such as referral networks, workplace wellness programs, school systems, and park networks.

TABLE 2 provides a general description of the roles and actions of each domain within the physician-rehabilitation-fitness pathway.

REFERRAL TO A REHABILITATION OR EXERCISE SPECIALIST

While physicians are ideally positioned to start the physical activity and exercise conversation with patients, it is helpful for many patients to have a qualified rehabilitation or exercise professional with whom they can also work to oversee their program and get more nuanced feedback. Whether this

TABLE 3. Description of the academic and certifying or licensing requirements of exercise specialists

Title	Academic requirements	Certifying/licensing organization
Exercise physiologist ³⁸	4-year bachelor's degree, usually in exercise science, kinesiology or related field. Completing a 1-to-2-year master's program in exercise physiology usually required for obtaining research or clinical opportunities. 2-to-3-year exercise physiology PhD degree typically required for academic and independent research positions.	No official certifying or licensing organizations exist that regulate the practice of exercise physiology. However, the American Society of Exercise Physiologists (ASEP) and American College of Sports Medicine (ACSM) offer Exercise Physiologist certifications that may be required by some employers.
Strength and conditioning specialist ³⁹	4-year bachelor's degree in any subject is required to sit for the Certified Strength and Conditioning Specialist (CSCS) certification exam. Certification in cardiopulmonary resuscitation (CPR) and automated external defibrillation (AED) is also required. Must complete a number of continuing education credits every 2 years as defined by the NSCA.	National Strength and Conditioning Association (NSCA)
Personal trainer ⁴⁰	Depending on the certifying organization, requirements can range from high school diploma/GED to a bachelor's degree from an accredited college or university, other than passing the personal trainer certification exam. Certification in cardiopulmonary resuscitation (CPR) and automated external defibrillation (AED). Must complete a number of continuing education credits or units every 2 to 3 years depending on certification agency.	Numerous trainer certifying organizations exist, including American College of Sports Medicine (ACSM), American Council on Exercise (ACE), International Sports Science Association (ISSA), National Academy of Sports Medicine (NASM), National Exercise & Sports Trainers Association (NESTA), National Federation of Professional Trainers (NFPT), and National Strength & Conditioning Association (NSCA).
Physical therapist ⁴¹	4-year bachelor's degree followed by completion of a 3-year Doctor of Physical Therapy (DPT) program and licensing through the Federation of State Boards of Physical Therapy.	Each state has their own specific board certification requirements. Must pass state-administered national licensing exam. Individual states may require continuing education or may have in place other standards to maintain licensure.
Athletic trainer ⁴²	4-year bachelor's degree in athletic training or related discipline, such as exercise physiology or kinesiology. 2-year master's degree in athletic training programs are available, but a graduate degree is not required. Certification in cardiopulmonary resuscitation (CPR) and automated external defibrillation (AED).	National Athletic Trainers' Association (NATA) Board of Certification. Candidates are required to pass the Board of Certification (BOC) exam to practice as an athletic trainer. Certain states have their own certification exams and require in-state licensure or registration to practice.

is a referral to a physical therapist or athletic trainer for injury rehabilitation, an exercise physiologist for cardiac rehabilitation, or a strength and conditioning coach or personal trainer to help design a progressive resistance training program, there are professionals available to fit the needs and conditions of any patient. The qualifications and licensing requirements for each exercise specialist are included in **TABLE 3**.

It is important to recognize that patients can be referred to rehabilitation or exercise professionals in hospital set-

tings, independent clinics (eg, rehabilitation, wellness), and commercial settings. The simplest approach in making this connection is for the physician to first utilize shared decision-making to identify the best setting to refer the patient to. Once the setting has been determined, either the physician or the patient should ask the facility manager to assist with finding the appropriate trainer. Trainers should be instructed to provide occasional feedback to the physician regarding patient progression and health status. This information can then

be entered into the patient's medical records. Hospitals and independent clinics may provide an additional layer of safety because the patient is being trained within a clinical setting under the watchful eye of other healthcare providers.

Lastly, it is critical to recognize the roles of each professional involved in the physician-rehabilitation-fitness pathway, which are succinctly summarized in **TABLE 2**. It is important for physicians to understand and to further educate themselves on the exercise prescription principles previously described in this section to be better prepared to disseminate this information when counseling patients.

CONCLUSION

Physical activity and exercise play critically important roles in preventing and treating chronic disease. Family physicians are well positioned to discuss physical activity with patients, provide general counseling on physical activity prescriptions using the FITT-P principle, and refer patients to rehabilitation or exercise specialists within the community when appropriate. ●

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