

HEALTH-RELATED PHYSICAL ACTIVITY MODULE

October 2011

A. INTRODUCTION

This module covers several important concepts. First, it involves your introduction to many clinical diseases for which prevention is an important therapeutic tool. In addition, is the impact of physical activity on the health of our society. McGinnis and Foege wrote a ground-breaking paper on the actual causes of death in the United States. In the past, the primary pathophysiological condition identified at the time of death had been used on the death certificate as the cause of death. In this paper, McGinnis and Foege pointed out for the first time that a more accurate approach would be to use the root cause of the underlying disease as the cause of death. When analyzing data in this way, it became obvious that the three leading causes of preventable death are tobacco, diet and activity patterns, and alcohol. What a revelation!! These three causes are unique in that they primarily involve behavioral choice on the part of the individual and are chronic in their presentation.

In order to improve our health we must begin to promote prevention rather than always looking for a cure. This concept of promotion continues to be sorely lacking in our thinking and action. There is also a need for change in the way physicians are educated. The goal of medical education is to prepare students to handle the illnesses they will see. This is not happening because the most prevalent problems in health care today are chronic, not acute as in the past. Acute disease has been replaced by chronic disease as the major health care problem currently facing our society. The contrast between these two types of diseases is striking. Acute disease is episodic, and the patient is usually a passive recipient of care. Chronic disease is continuous and the patient must become an integral part of the treatment plan.

The final important concept is that the sites of medical-care delivery have changed and the supporting players needed to carry out care are entirely different. This new partnership of care in which the patient is a participant is a change from the previous situation of the dependent role of the patient. The new power of the patient has been further enhanced by the easy availability of information via the use of the Internet. Unfortunately, much of this information may not be correct, but in fact it demands that the physician be aware of what is available and be able to interpret what the patient is reading. This new relationship between physician and patient is not achieved through new buildings and equipment but through an understanding by the physician and his or her team as to how to best change the behavior of the patient that is largely responsible for his illness.

The **Health-Related Physical Activity module** deals with activity patterns. A major component of the western lifestyle has been the continuous, ongoing, and progressive elimination of regular muscular activity. Unfortunately, modernization and

technology have been very successful in making physical activity largely unnecessary. No longer is there a true need for muscular activity and physical exertion during much of our working lives. There have been numerous studies relating the lack of health-related physical activity to many diseases such as diabetes and hypertension and, most importantly, to the epidemic of obesity in this country. Currently, 16.3% of children and adolescents between the ages of 2-19 are obese, while 33.3% of adults are obese (obesity being defined as a BMI \geq 30). In spite of the numerous studies and statistics that are clearly known and demonstrated, there has been no effective solution to the problem. Should physicians be recommending exercise similar to medication for certain diseases? Should this be part of the patients' recommended preventive care? Are anorectics indicated or effective? What kind of shape are you in? Are you fit (honestly)? Physical activity has the ability to behave like a disease-modifying agent in negating many of the negative physiological changes in the body and preventing the development of many chronic diseases. In addition, physical activity has been shown to decrease all-cause mortality. The required dose of exercise has been extensively studied and may safely and accurately be prescribed. This knowledge and information must become an important part of therapy and prevention not only for the patient but also for every physician.

B. HEALTH-RELATED PHYSICAL ACTIVITY

The focus of this module will be to study the normal functions of an active body and the deterioration brought on by inactivity. Prior to the first small group forum, review these articles. They clearly show that our society is not a physically active one. This lack of activity by itself is responsible for a large number of deaths annually. Decrease in activity hastens the loss of muscle mass, known as sarcopenia, which then leads to a number of other problems. These problems are chronic in nature and affect all age groups.

1. US Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General Executive Summary, 1996. www.cdc.gov/nccdphp/sgr/sgr.htm.
2. U.S. Department of Health and Human Services. Healthy People 2020: Understanding and Improving Health. Section on Leading Health Indicators, 2011. <http://www.healthypeople.gov/>.
3. Physical activity trends-United States, 1990-1998. JAMA 2001;285:1835 or <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5009a3.htm>.
4. Behavioral Risk Factor Surveillance System (BRFSS), 1984-2007. www.cdc.gov/brfss.
5. McGinnis JM, Foege WH. Actual causes of death in the United States. JAMA 1993;270:2207-12.
6. Mokdad AH, Marks JS, Stroup DF, et al. Actual causes of death in the

- United States, 2000. JAMA 2004;291(10):1238-45.
7. Roubenoff R, Castaneda C. Sarcopenia: understanding the dynamics of aging muscle. JAMA 2001;286(10):1230-1.
 8. Holman H. Chronic disease: the need for a new clinical education. JAMA 2004;292(9):1057-9.
 9. Blair SN, Church TS. The fitness, obesity, and health equation: Is physical activity the common denominator? JAMA 2004;292(10):1232-4.
 10. Chakravarty EF, Hubert HB, Lingala VB, et al. Reduced disability and mortality among aging runners: a 21-year longitudinal study. Arch Intern Med 2008;168(15):1638-46.
 11. Ogden CL, Carroll MD, McDowell MA, et al. Obesity among adults in the United States: no change since 2003-2004. NCHS data brief no 1. Hyattsville, MD: National Center for Health Statistics, 2007.
 12. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003-2006. JAMA 2008;299(20):2401-5.
 13. Xu J, Kochanek KD, Tejada-Vera B. Deaths: Preliminary Data for 2007. National Vital Statistics Reports; vol. 58, no. 1. Hyattsville, MD: National Center for Health Statistics. 2009

In addition to reading the above, review the following objectives and begin to think about what you should learn from this module. These areas of study are important tools for a better understanding of population medicine.

A. Healthy People 2020

1. Identify why regular physical activity is necessary throughout life.
2. Describe the current state of physical activity in the U.S.
3. Identify those populations with low rates of physical activity.
4. Discuss major barriers to physical activity in these populations.

B. Wellness

1. Write an exercise prescription for yourself.
2. Write an exercise prescription for a 55-year-old white male with a normal B.P. two months after a coronary artery bypass graft.
3. Write an exercise prescription for an obese Type 2 diabetic.
4. Write an exercise prescription for a 35-year-old African-American female who has a normal physical exam.
5. Describe how physical activity contributes to wellness.

C. Evidence-Based Medicine

1. Convert concerns about health-related physical activity into answerable questions.
2. Utilize the evidence-based medicine databases to answer questions about physical activity.

D. Epidemiology

1. Assess the importance of regular physical activity.
2. Define a prospective cohort study; understand its advantages, disadvantages, and the type of data it can generate. Relate this to proving physical activity is important for our overall health.
3. Defend this statement: Studies prove that physical activity is important to your overall health.

E. Medical Informatics

1. Use the computer software to prepare a presentation.
2. Use the Internet, intranet, and electronic resources to conduct online literature searches and retrieve and organize information for presentation.

F. Community Health

1. Describe the lack of physical activity as the forerunner of a chronic disease epidemic.
2. Identify a public-health policy that addresses lack of physical activity.
3. Assess our ability to change the social norm concerning the lack of physical activity.

G. Health Psychology

1. Describe how society's behavior concerning physical activity reflects the clinical recommendations of healthcare providers.
2. Define compliance and adherence.
3. Describe behavioral counseling interventions in primary care as they relate to lack of physical activity.

H. Health Law

1. Assess the liability should a sudden death occur during exercise at a health club.
2. Assess the liability should a sudden death occur during a medically prescribed activity at a health club.

C. **INSTRUCTIONS FOR THE FIRST SMALL GROUP FORUM**

(Note: At least one member of your group should bring a laptop to the session. As a group you will need to review certain Web sites.)

Why does the body need to remain active? The answer can be found in the many studies done on bodies at partial or complete bed rest. In addition, the recent studies done in zero-gravity situations have greatly added to our knowledge. The body at rest and at zero gravity decondition, and those organ systems that respond best to physical activity decondition the most. For example, the heart will lose about 10% of its maximum power after about ten days of bed rest. After thirty days, that number goes to 20%. Skeletal muscle changes also occur rapidly. At first strength declines, and then there is actual wasting of tissue as shown by the increase in urinary nitrogen excretion. This is primarily due to a decrease in muscle mass and eventually results in sarcopenia. This is not a disease but a decline in lean body mass that can also occur normally with age primarily due to lack of skeletal muscle activity. In fact, the development of sarcopenia is one of the main hallmarks of the aging process. It is also an important part of chronic illness, which may impose a significant decrease in physical activity.

Changes in the other organ systems are just as dramatic. There is a remarkable similarity of the physiologic changes that occur from bed rest, chronic lack of physical activity, and the aging process. Obviously, the etiologic environments are different and the changes play out at different rates. However, the lessons learned are similar, and so are the remedies. An understanding of these processes clarifies many clinical findings whether in the wasted body recovering from serious illness, the deteriorating body of the aging, or the body affected by any of the chronic illnesses seen in our society. Obviously the lack of physical activity, however it occurs, is a serious problem and one that is becoming increasingly important for the health of our society.

The purpose of this first meeting is to introduce you to the role physical activity plays in your health. The three case vignettes address a specific problem in which physical activity may help solve certain clinical situations. Review the following in relation to the case vignettes:

1. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 1995;273(5):402-7.
2. Fiatarone MA, O'Neill EF, Ryan ND, et al. Exercise training and nutritional supplementation for physical frailty in very elderly people. *N Engl J Med* 1994;330(25):1769-75.
3. Simon HB. Diet and exercise. *ACP Medicine, Clinical Essentials IV*, 2006.
4. Willett WC, Stampfer MJ. What vitamins should I be taking, doctor? *N Engl J Med* 2001;345(25):1819-24.
5. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the Third National Health and Nutrition Examination Survey. *JAMA* 2002;287(3):356-9.
6. Mayer-Davis EJ, D'Agostino R, Karter AJ, et al. Intensity and amount of

physical activity in relation to insulin sensitivity: the Insulin Resistance Arteriosclerosis Study. *JAMA* 1998;279(9):669-74.

Discuss the following case vignettes with your classmates during the forum. At the end of the discussion period, everyone in the group should be able to answer the questions that are included.

CASE 1

You have just finished the annual physical exam on a 55-year-old white male businessman. You have found no obvious physical signs of disease other than his weight. You have the following facts: CBC, urine, and PSA are normal. His triglycerides are 180 mg/dl, fasting glucose is 125 mg/dl, and his low high density lipoprotein (HDL) cholesterol is 25mg/dl. His BP is 150/90. Height is 72 inches, and weight is 225 pounds. His waist is 44 inches, and his hips 44 inches.

- What is his BMI? What does this mean?
- What is his waist hip ratio? What does this mean?
- Is there a relationship between body habitus and disease?

His stress EKG is normal but his legs became very tired at the end of the test. He smokes one pack of Marlboros a day. He drinks 1-2 vodka martinis every night and has two glasses of red wine with supper (“good for my heart”). He does no regular physical activity, avoids stairs, and parks next to his office. He sleeps six hours a night. He says he wants you to get him in “shape.”

- What advice will you give him and why?
- Does he have the metabolic syndrome? What does this mean?
- Is it reversible? How?

CASE 2

A 24-year-old medical student wants to work out to get into better shape. He asks you how to do this. He also wants to take creatine and DHEA. The local health food store has told him he should take EXCELL (Bio Ace EXCELL with Selenium) for his muscles, heart, and brain.

- What does getting “in shape” mean?
- What would you would tell him to do and why?

- How long will it take him to get in shape? What is needed to stay in shape?

CASE 3

An 80-year-old resident of the Happy Hours Nursing Home refuses to get out of bed without help. Once up, he can get around slowly with his cane. You have been asked to evaluate him and outline an exercise and weight-resistance program for him.

- What will you do and what might you expect?
- Will it improve his ability to care for himself? Will it improve his cognitive ability?
- How long will it take to see improvement if any? How can this be maintained?

Plan your group project and presentation. Your group has been asked to research one of four topics for a symposium to be held in two weeks. At that time, one or two members of the group will be expected to give a fifteen-minute PowerPoint presentation. The others in the group will be available to answer questions on their colleagues' presentation. Look over your assigned topic and the guidelines that have been provided. A librarian will help you conduct a proper literature search. All members of the group should participate in the preparation of the presentation. The presenters should practice the final program before all of their colleagues who will critique not only the content of the program but also the manner of presentation. Never underestimate the importance of eye contact. Remember this is a joint effort for all in the group, and everyone should be prepared to discuss the topic. If there are any questions please call me at 568-4570 or e-mail me at klebla@lsuhsc.edu.

D. INSTRUCTIONS FOR INDEPENDENT STUDY WEEK

Review bibliography
Participate in preparation of the presentation
Rehearse, rehearse, rehearse

E. INSTRUCTIONS FOR POWERPOINT PRESENTATION

STUDY TOPIC 1 - SMALL GROUPS 1, 5, 9, and 13

A review of the population - There are many studies and reports on the lack of physical activity in the U.S. population. As you know, this has been blamed for our rising obesity levels and as a contributor to many illnesses in society. Review and analyze these studies with the following in mind. Have there been changes in physical activity over time, and if so what are they? What has been the effect on various age groups? What specific diseases have resulted from this inactivity? What are the projections for the future? Is there a

solution? Is it important for the nation's health? How would you go about defining and implementing a solution? How much does an inactive society increase health care costs?

STUDY TOPIC 2 - SMALL GROUPS 2, 6, 10, and 14

A review of exercise physiology - The physiological effects of physical activity depend on intensity, duration, and frequency. Exercise is either isometric or isotonic. Define these terms and give examples of each. What effect does zero gravity have on the function of the human body, and what have you learned from studies done on astronauts in weightlessness? Are any of the effects related to the aging process? How do you define cardio-respiratory fitness in normal people? What is the maximal oxygen uptake (VO_{2max})? How is this measured in the laboratory? How can it be estimated outside the laboratory? Discuss the VO_{2max} levels in various human conditions. Why is this important?

STUDY TOPIC 3 - SMALL GROUPS 3, 7, 11, and 15

Physical activity and disease - The most extreme example of physical inactivity is seen in the hibernating bear. How does a bear survive a winter's hibernation from the physical and nutritional point of view? Does hibernation affect any of his organ systems? In humans, please discuss how physical activity can prevent or favorably alter the following: cardiovascular disease, osteoporosis, fatigue, depression, and sarcopenia. Can certain physical activities improve pulmonary function in someone with emphysema? How does resistance weight training fit into overall fitness and prevention? Can you improve and enlarge an aged muscle? Is this important to know and why? What is the difference between aerobic training and weight-resistance training?

STUDY TOPIC 4 - SMALL GROUPS 4, 8, 12, and 16

The exercise prescription - Many patients ask, "What can I do to get in shape?" Many physicians give general answers without any specificity. A specific individually oriented exercise prescription is important not only for your patients, but also for you. After all, "I am my own first patient." Write a prescription for a normal individual who wants to start health-related physical activity. This should include food and health-related physical activity. What are your answers to the following questions:

1. Should I prescribe DHEA? What is it and does it play a role slowing the aging process?
2. Should I prescribe creatine to increase strength? What is it and does it play a role in the supplement intake of a normal person?
3. Should I prescribe an antioxidant?
4. Should I prescribe human growth hormone? What does it do?
5. Should I prescribe multivitamins?

Write an exercise prescription for a 60-year-old African-American female who is obese, hypertensive, and has Type 2 diabetes. Write an exercise prescription for a 35-year-old white male who wants to enter an Iron Man contest.

F. **BIBLIOGRAPHY**

There are many places where you can find information for these presentations. The following articles may be helpful and informative. This is not an exclusive list. In addition, please share with your fellow students and faculty any additional articles you found helpful and informative.

1. Miller, K. Gravity hurts (so good): Strange things can happen to the human body when people venture into space -- and the familiar pull of gravity vanishes. http://science.nasa.gov/headlines/y2001/ast02aug_1.htm
2. Pollock ML, Franklin BA, Balady GJ, et al. Resistance exercise in individuals with and without cardiovascular disease: benefits, rationale, safety, and prescription. *Circulation* 2000;101:828-33.
3. Gill TM, DiPietro L, Krumholz HM. Role of exercise stress testing and safety monitoring for older persons starting an exercise program. *JAMA* 2000;284(3):342-9.
4. Maximum heart rate: a new formula for fitness. *Harvard Men's Health Watch* 2002;7(4):4-5.
5. McGuire DK, Levine BD, Williamson JW, et al. A 30-year follow-up of the Dallas Bed Rest and Training Study. *Circulation* 2001;104:1350-7.
6. Roubenoff R, Hughes VA. Sarcopenia: current concepts. *J Gerontol A Biol Sci Med Sci* 2000;55(12):M716-24.
7. N IH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Osteoporosis Prevention, Diagnosis, and Therapy. *JAMA* 2001;285(6):785-95.
8. Blair SN, Kohl HW, Barlow CE, et al. Changes in physical fitness and all-cause mortality: a prospective study of healthy and unhealthy men. *JAMA* 1995;273(14):1093-8.
9. Lee IM, Paffenbarger RS. Associations of light, moderate, and vigorous intensity physical activity with longevity. *Am J Epidemiol* 2000;151(3):293-9.
10. Sesso HD, Paffenbarger RS, Lee I-M. Physical activity and coronary heart disease: the Harvard Alumni Heart Study. *Circulation* 2000;102:975-80.
11. Kokkinos PF, Narayan P, Collieran JA, et al. Effects of regular exercise on blood pressure and left ventricular hypertrophy in African-American men with severe hypertension. *New Engl J Med* 1995;333(22):1462-7.
12. Cassel CK. Use it or lose it: activity may be the best treatment for aging. *JAMA* 2002;288(18):2333-5.
13. Manson JE, Greenland P, LaCroix AZ, et al. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *New Engl J Med* 2002;347(10):716-25.
14. Myers J. Exercise and Cardiovascular Health. *Circulation* 2003; 107:e2-e5
15. Blair SN, Church TS. The fitness, obesity, and health equation: Is physical activity the common denominator? *JAMA* 2004;292(10):1232-4.
16. Abbott RD, White LR, Ross GW, et al. Walking and dementia in physically capable elderly men. *JAMA* 2004;292(12):1447-53.

17. Wei M, Kampert JB, Barlow CE, et al. Relationship between low cardiorespiratory fitness and mortality in normal-weight, overweight, and obese men. *JAMA* 1999;282(16):1547-53.
18. Wee CC, McCarthy EP, Davis RB, et al. Physician counseling about exercise. *JAMA* 1999;282(16):1583-8.
19. Rosamond W, Flegal K, Furie K, et al. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics – 2008 update. *Circulation* 2008;117(4):e25-e146
20. Djoussé L, Driver JA, Gaziano JM. Relation Between Modifiable Lifestyle Factors and Lifetime Risk of Heart Failure. *JAMA* 2009;302(4):394-400.
21. Forman JP, Stampfer MJ, Curhan GC. Diet and Lifestyle Risk Factors Associated with Incident Hypertension in Women. *JAMA* 2009;302(4):401-411.
22. Gordon-Larsen P, Boone-Heinonen J, Sidney S, et al. Active Commuting and Cardiovascular Risk: The *CARDIA* Study. *Arch Intern Med.* 2009;169(13):1216-1223